Conservation Biology

Conservation Focus: *Priorities for Policy-Relevant Conservation Research: a View from SCB Regional Sections*

Conservation Challenges for the Austral and Neotropical America Section

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Abstract: *The Austral and Neotropical America (ANA) section of the Society for Conservation Biology includes a vast territory with some of the largest relatively pristine ecosystems in the world. With more than 573 million people, the economic growth of the region still depends strongly on natural resource exploitation and still has high rates of environmental degradation and biodiversity loss. A survey among the ANA section membership, with more than 700 members, including most of the section's prominent ecologists and conservationists, indicates that lack of capacity building for conservation, corruption, and threats such as deforestation and illegal trade of species, are among the most urgent problems that need to be addressed to improve conservation in the region. There are, however, strong universities and ecology groups taking the lead in environmental research and conservation, a most important issue to enhance the ability of the region to solve conservation and development conflicts.*

Keywords: Austral and Neotropical America, capacity building, Latin America

Retos de Conservación para la Sección América Austral y Neotropical

Resumen: *La sección América Austral y Neotropical (AAN) de la Sociedad para la Biología de la Conservación incluye un vasto territorio con unos de los ecosistemas relativamente prístinos más extensos del mundo. Con más de 573 millones de habitantes, el crecimiento económico de la región aun depende fuertemente de la explotación de recursos naturales y aún tiene altas tasas de degradación ambiental y pérdida de biodiversidad. Un sondeo de la membresía de la sección AAN, con más de 700 miembros, incluyendo la mayoría de los ecólogos y conservacionistas más prominentes de la sección, indica que la carencia de desarrollo de capacidades para la conservación, la corrupción y amenazas como la deforestación y el comercio ilegal de especies, son algunos de los problemas que requieren ser atendidos más urgentemente para mejorar la conservación en la región. Sin embargo, hay universidades y grupos ecológicos que están tomando el liderazgo*

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en investigación ambiental y conservación, un tema importante para mejorar la habilidad de la región para resolver conflictos de conservación y desarrollo.

Palabras Clave: América Austral y Neotropical, América Latina, desarrollo de capacidades

Introduction

The Austral and Neotropical America (ANA) section of the Society for Conservation Biology comprises the Americas and the Caribbean, except the United States and Canada. With about 20 million km^2 and 575 million people (CIA 2008), ANA has a heterogeneous natural and cultural landscape. It also has phenomenal biodiversity. Seven biodiversity hotspots—with almost 50,000 endemic plants and 5,000 endemic vertebrates (about 17% of global diversity for these groups)—are located in ANA (Ceballos & Brown 1995; Myers et al. 2000). Fifty percent of all endemic bird areas (Stattersfield et al. 1998) and 52% of all the Alliance for Zero Extinction sites are in ANA (Ricketts et al. 2005). It also has a number of relatively well-preserved areas; for example, Amazonia is the world's largest major tropical wilderness (Mittermeier et al. 1998).

Austral and Neotropical America often is perceived as being united by the Spanish language. In fact, it spans countries speaking Portuguese, English, French, and hundreds of indigenous languages (Gordon 2005). The region depends heavily on natural resource exploitation and has high rates of environmental degradation and biodiversity loss (e.g., Ceballos & Simonetti 2002; WRI 2003; Vale et al. 2008*a*). The socioeconomic scenario is equally dissimilar between emerging economies, such as Brazil and Mexico, and underdeveloped economies, such as Haiti. Environmental challenges in Latin America are further complicated by limited opportunities for conservation capacity building that encompass many levels, audiences, and contexts (e.g., Bonine et al. 2003; Mendez et al. 2007; Rodríguez et al. 2007).

Clearly, there is no one-size-fits-all approach when it comes to conservation strategies for the region. Therefore, we conducted a survey of the ANA section membership, asking them to help identify the most pressing conservation challenges facing the region. Here we present the results of the survey and discuss tangible actions that can be taken by the section to address these challenges.

Survey of ANA Section Membership

In July 2008 we sent an email inquiry to all 711 members of the Society for Conservation Biology (SCB) affiliated with the ANA Section. In the short questionnaire, distributed in both Spanish and English, we asked members to rank a number of conservation challenges according to their relevance for ANA. Over the two-week response period, we received 115 responses. The majority of responses (63%) were from members residing in ANA countries, although this group constituted only 25% of the section's membership at the time of the survey. Prioritization of conservation challenges among residents and nonresidents, however, was quite similar (Table 1). The top four conservation challenges identified by ANA members were deforestation and fragmentation, industrial agriculture and extensive ranching, climate change, and lack of capacity for conservation.

The survey also had open-ended questions that asked participants to report other relevant conservation challenges not addressed in the questionnaire. About 40% of respondents answered these questions, pointing to a vast array of issues. The two most-mentioned topics were illegal trafficking in wildlife, and lack of political will and corruption. The lack of capacity for conservation, although already addressed in other questions in the survey, was mentioned again by 30% of the respondents to the open-ended questions. The perceived challenges to capacity building included: lack of university programs in conservation, lack of environmental education, little access to information, lack of capacity to publish and

Table 1. Average ranking of conservation challenges as perceived by members of the ANA Regional Section of the Society for Conservation Biology.*

Conservation challenge	*ANA resident* (n = *73*)	*Not ANA resident* (n = *43*)
Deforestation and fragmentation	3.68	3.64
Extensive/industrial agriculture and ranching	3.21	3.05
Climate change	3.11	3.30
Lack of capacity for conservation	3.07	3.07
Overfishing	2.99	2.85
Energy production (hydrocarbons and biofuels)	2.94	2.85
Pollution	2.89	2.55
Invasive species	2.86	2.70
Involvement of traditional and indigenous communities in conservation	2.85	2.83
Population growth	2.74	3.12
Infrastructure (highways, dams, etc.)	2.66	2.85
Mining (nonhydrocarbon)	2.61	2.40

**Rankings range from 4 (highest priority) to 1 (not a priority).*

publicize scientific research, and dependence on foreign institutions.

Deforestation and Fragmentation

The most extensive tropical forest in the world is in the Neotropics. Brazil and Peru are among the top 10 countries with the largest forest area (4,780,000 and 690,000 km^2, respectively). Between 1990 and 2005, South America experienced one of the largest rates of forest loss in the world, although the rate of loss appears to be declining (FAO 2006).

More promising are recent studies showing that Neotropical dry forest are recovering significantly in some areas in Mexico (Abizaid & Coomes 2004), Costa Rica (Calvo-Alvarado et al. 2008), Honduras and Guatemala (Klooster 2003; Tucker et al. 2005), El Salvador (Hecht & Saatchi 2007), Panama (Sloan 2008), Puerto Rico (Grau et al. 2003), Brazil (Baptista & Rudel 2006; Baptista 2008), and Argentina (Izquierdo et al. 2008). These studies show that particular processes are contributing to this forest recovery: past patterns of land use, economic globalization, urbanization, population change, government economic and environmental policies, diversification of wage labor, and agricultural transformation. The importance of this forest-restoration process deserves careful attention because for the most part the causes are associated with changes in socioeconomic and political drivers. New opportunities for conservation that arise could be seized if appropriate strategies are set to conserve and manage these recovering forests.

Industrial Agriculture and Extensive Ranching

Agricultural practices determine level of food production and, to a greater extent, the state of the global environment. About half of global usable land is already in pastoral or intensive agriculture. Austral and Neotropical America has been highly modified by extensive cattle ranching. Nearly 30% of the total land of Latin America is covered by grassland-like ecosystems, and in larger countries such as Argentina, Mexico, Colombia, Brazil, and Venezuela, human-made grasslands are a dominant landscape (FAO 2006). There are 514 million domestic livestock in South America, mostly (approximately 70%) cattle. Sheep, goats, equines, buffaloes, and camelids are also present. Overall, the total number of livestock present in South America increased slightly (2%) between 1993 and 2002; this increase puts additional pressure on habitats and biodiversity.

The nature and extent of the impact is hugely variable and most extreme when natural ecosystems are converted to fertilized, exotic pastures to support livestock. The impacts of ancillary activities, such as water provision, fencing, fire management, and pest control, also lead to major shifts in the abundance and distribution of many of the native biota. Introduction of domestic livestock into a new grassland ecosystem immediately generates hunting and displacement of wild ungulates from their habitat. Usually, predator control follows because of lack of natural prey, and the abundance of poorly managed domestic livestock creates the scenario for predation on domestic animals. In the early 1990s, the share of developing countries of the world's meat and milk consumption was 47% and 41%, respectively. Projections estimate an increase of these figures by 2020 to 60% and 52%, respectively, creating a "livestock revolution" (C.B. et al., unpublished data). A major priority should be to strengthen the engagement of agriculture and veterinary schools in promoting conservation and sustainable livestock-production systems, with a focus on minimizing conflicts between livestock and large predators and preventing further native herbivore declines.

Climate Change

The world community of climate scientists agrees that global warming is largely the result of human activities (IPCC 2007). For the wide range of Intergovernmental Panel on Climate Change (IPCC) emission scenarios, global average surface warming is predicted to increase 1.1–6.4 °C, sea level is estimated to rise 0.16–0.56 m by the end of the 21st century, land areas are predicted to warm more than the oceans, and high latitudes are predicted to warm more than the tropics (IPCC 2007). Austral and Neotropical America will experience substantial climate change, which will affect ecosystems and the services they provide (IPCC 2007). The first recorded case of an extinction associated with climate change is of an amphibian endemic to Costa Rica (Pounds et al. 1999). In 2005 Caribbean coral reefs underwent a major disruption due to heat stress and a strong hurricane season (Wilkinson & Souter 2008). In the same year, the Amazon "dried out," raising concerns over the predicted "savannization" of the basin (Cox et al. 2004). Less-well-known changes include rapid tropical glacier retreats (e.g., the Chacaltaya glacier in Bolivia [Francou et al. 2003]) and impacts on montane wetlands (*páramos*) (e.g., Los Nevados Natural Park in Colombia [Ruiz et al. 2008]). The predicted socioeconomic impacts are also worrisome: increased incidence of malaria, dengue, and dysentery, and a large number of people exposed to coastal flooding and pollution of fresh water (Vergara et al. 2007).

There is clear need for better predictions of impacts of climate change and identification of suitable adaptation strategies. Many good suggestions have been proposed (e.g., IPCC 2002; IPCC 2007; Vergara et al. 2007). The

World Bank has developed an adaptation program for Latin America that addresses the Caribbean and Trans-Andean countries (Vergara et al. 2007). Initiatives have also arisen at the local level, as exemplified by the Rio de Janeiro project on vulnerability to climate change (SEA 2008).

Nevertheless, ANA should not focus only on impacts and adaptation strategies. The region is an active player in climate change, with a relatively modest contribution to greenhouse gas emissions from fossil-fuel burning, but a very significant one from deforestation. Continued deforestation at current rates in Brazil alone would equal 40% of the annual carbon reduction targets for developed countries in the Kyoto Protocol (Santilli et al. 2005). Developed countries can reduce emissions by investing in reforestation and afforestation that cut greenhouse gas emissions in developing countries. But countries undergoing or at risk of large-scale deforestation, such as Brazil, Bolivia, Peru, and Colombia, have no incentive to reduce or avoid emissions from deforestation (Santilli et al. 2005). In 2005 the United Nations Framework Convention on Climate Change launched an initiative to assess prospects for reducing emissions from deforestation in developing countries (UN 2005). Avoided deforestation as a means to reduce the substantial emissions from deforestation could stimulate participation of developing countries in the Kyoto Protocol and, as a bonus, reduce deforestation (Santilli et al. 2005; Gullison et al. 2007).

Lack of Capacity for Conservation

Developing the human capacity to carry out effective conservation entails both formal and informal training for a variety of audiences, including conservation professionals, undergraduate and graduate students, and decision makers at all levels. Recent studies show that in a number of countries in ANA there are significant gaps in training for those who manage landscapes, work in sectors that directly affect these landscapes, or decide on policy that affects them (Chek et al 2007; Romo & Villegas 2007). Furthermore, challenges in meeting these needs are growing, with trends such as decentralization, expansion, and diversification of the protected-area system and with increasing pressure from industry, infrastructure projects, and other activities that compete for land use. In an attempt to mitigate this problem, some countries (e.g., Peru, Bolivia) have developed strategies for expanding and improving the conservation workforce, but these initiatives are not currently funded and have yet to be implemented fully. Compounding the problem in some areas is political instability, which can translate into uncertain legal management jurisdictions among competing government agencies and results in the constant restructuring of protected areas and their personnel.

A number of universities in the region have impressive technical capacity, relative stability, and credibility, and are strategically positioned to provide training for future and in-service conservation professionals due to the high proportion of professionals that already go through biological and environmental sciences undergraduate programs (Rodríguez et al. 2005). Nevertheless, the per capita availability of academic programs in conservation is six times lower in Latin America than in the United States (Mendez et al. 2007). Across the region, there are 35 conservation-focused programs that have a clear conservation mission and a range of courses and requirements strongly oriented to conservation biology. An additional 54 programs have some conservation content. The distribution by country is strongly skewed; five countries (Mexico, Brazil, Argentina, Colombia, and Chile) have over half the programs. In 2007 several countries in the Latin America and Caribbean region did not have a single course with identifiable conservation biology content (Mendez et al. 2007).

Many universities in ANA suffer from an acute lack of infrastructure, educational resources, and professional-development opportunities for educators. In most universities in the region, there is also limited knowledge of learner-centered and collaborative teaching methods, which promote the skills needed by well-equipped professionals in biodiversity conservation and other integrative fields (Colker & Day 2004). Expanding the pedagogical toolbox and developing and disseminating open source and locally relevant curricular materials are particularly important to institutions of higher education ANA and are efforts that can be supported by the ANA Section and the Education Committee of SCB.

Improving Research Quality and Applicability

In the last 2 decades, ecological research has boomed throughout Latin America. Several countries such as Mexico, Brazil, Argentina, and Chile have strong research groups at local universities and research institutions (Rodríguez et al. 2005; Karlssona & Srebotnjakb 2007). Nevertheless, two issues limit the impact of ecological research in ANA: a strong reticence on the part of academic institutions to address practical environmental problems and a lack of effective bridges between the academic world and decision makers (e.g., Castillo 2000; Sarukhan 2006). The first problem is a historical one, derived from the strong division between scientists working on basic and applied sciences in the United States and Europe in the early and mid-20th century. In many cases the new academic institutions in the ANA region were established using this system as a model. In the last decade, however, this has been changing rapidly. Countries such as Mexico, Chile, United Kingdom, South Africa, and Australia are

taking the lead in coupling ecological research with conservation and management of biological diversity (e.g., Figueroa & Simonetti 2003; Ceballos et al. 2005; Ceballos 2007).

There is a strong need, however, to improve measures of success for the scientific community in ANA by moving away from simply judging achievement on publications in international journals (Colquhoun 2003; Collazo-Reyes et al. 2008) and instead encouraging and rewarding solid science that has implications for local, regional, and global problems (e.g., Bazzaz et al. 1998; Lubchenko 1998; Ceballos 2004). Although the ANA Section is limited in its ability to address these complex issues, through SCB and other means it can encourage environmental scientists to undertake research directed at solving environmental problems at all geographic scales. It is clear that novel ways to evaluate and reward academic excellence have to be developed and take into account the increasing value of activities that bridge the gap between the scientific communities and the public. A first step towards this goal is for SCB to take the lead in suggesting mechanisms for evaluating conservation scientists in collaboration with national science foundations in ANA and other parts of the world.

Access to Conservation Biology Information

Several authors have discussed the difficulties involved in getting accurate and up-to-date conservation and management information into the hands of politicians and decision makers (e.g., Castillo 2000; Sarukhan 2006). A recent survey in Chile showed that local officials in charge of conservation and resource management policies usually do not read English-language journals and books and tend to rely almost completely on literature published in Spanish (J.A.S., personal observation). Although we have no direct evidence indicating whether this applies to other countries throughout the region, we suspect it does. Therefore, academic institutions should develop ways to encourage their best scientists to produce literature that is accessible at least in Spanish and Portuguese for the decision-making community. Mexico's National Commission for the Knowledge and Use of Biodiversity (CONABIO) and the Universidad de Chile are stellar examples of national institutions promoting updated scientific literature accessible to the nonscientific sectors of society (e.g., Castillo 2000).

Within Latin America, a small proportion of professionals and students speak English, and the number of people bilingual in Spanish and Portuguese is also small. Available books and periodicals in Spanish or Portuguese that feature conservation biology articles or themes are small and generally not up to date. As a regional section, we should make the information produced within ANA available in the primary languages of ANA countries. Currently, the most effective method to reach a wide audience in a timely manner at a low cost is through the Internet. Therefore, the ANA Section is developing its Web page as a resource for students and professionals in the region, regardless of whether they are members of the SCB or not.

Simultaneously, the ANA Section encourages some of its members to publish open educational resources and textbooks on conservation biology in Spanish and in Portuguese. Such efforts are already underway with projects such as the Network of Conservation Educators and Practitioners (NCEP) (http://ncep.amnh.org) and the translation of conservation biology texts into Spanish (e.g., Primack et al. 2001).

Reduction of the Bureaucracy Associated with Scientific Research

Governmental agencies in ANA countries hold a substantial amount of data of great value to conservation biologists. These include (but are not limited to) population censuses, water-quality assessments, land prices and tenure, planned and implemented development projects, and specimens in herbariums and zoological collections. These data are often extremely hard to get: there is a lack of information about their existence, the data are not organized or available in digital format, or there is no assigned staff or protocol for their distribution. A question that can be answered in a matter of hours in the United States or Europe, with data readily available on the Internet, can take months in an ANA country.

Another important deterrent of scientific research in the region is the bureaucracy involved in obtaining permits. Permits often take so long to be issued that when they arrive research funds may have already run out (Rull & Vegas-Vilarrúbia 2008). Local scientists are the most affected by this bureaucracy, often dedicating an unreasonable amount of time and energy to the process. Although ANA cannot directly interfere with governmental procedures and protocols, it can call attention to the significant deterrent that excessive bureaucracy represents to research in the region. We would like to see existing data widely available to conservation biologists and decision makers. Reduction of bureaucracy in acquiring data and permits has the potential to greatly expedite scientific research and promote better-informed decision making in the region (Vale et al. 2008*b*).

Conclusion

Conservation action, when confronted with global and regional environmental problems, will be required to

maintain social, economic, and political stability throughout ANA. But a major challenge is to make conservation and development compatible: generating wealth while avoiding the devastation of biodiversity. Although the obstacles to making conservationists more efficient and effective are significant, an academic organization such SCB can help improve the situation and further the conservation agenda through its regional sections. One first, simple step is to become more vocal and visible in promoting the use of science to support decision making related to global warming, extinction, conservation, development, land-cover change, and other major environmental challenges of the decades to come.

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