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Diversity

Conservation in Austral and Neotropical America: Building Scientific Capacity Equal to the Challenges

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Introduction

Austral and Neotropical America (ANA), which extends from Mexico to Argentina and Chile and includes the Caribbean, is often presented in the conservation literature as a biologically rich region, lacking in financial and technical resources for achieving biodiversity conservation (e.g., Toledo & Castillo 1999; Galindo-Leal 2002; Rodríguez 2003). This is part of a larger problem that also characterizes other tropical regions (Bonine et al. 2003).

The Society for Conservation Biology (SCB) is taking concrete steps to improve technical conservation capacity worldwide and has selected "Conservation Biology Capacity Building and Practice in a Globalized World" as the theme for their nineteenth annual meeting, to be held in Brasília, Brazil, 15–19 July 2005 (www.conbio.org/2005). In order to be able to successfully address the problem of conservation capacity building in the region, it is necessary to first estimate the scale of the financial resources required to move forward. Available information to date is qualitative and anecdotal. We focused on academic training opportunities in ANA countries, quantified a series of conservation capacity indicators in the region, and contrasted them with similar figures calculated for the United States, where conservation capacity building is well developed. We drew on information about investments to expand conservation biology graduate study opportunities in the United States to produce a back-of-the-envelope estimate of the costs of achieving similar objectives in ANA. Analogous analyses could be performed for other developing regions in the world, with the goal of compiling a database of global investment needs for conservation capacity building.

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The answers to three fundamental questions are needed to define the needs of conservation capacity building: How large is the demand? How many people are available for the job? and How much is there to conserve? To answer the first question, we analyzed the demand for two recent graduate-level training opportunities available to ANA students. We addressed the other two questions by calculating the ratio between the number of conservation biology academic programs available in each country and (1) the total human population, and (2) the number of bird species in that country. Total human population suggests how many people need to be considered when planning conservation in each country, and the potential size of the workforce available for biodiversity conservation. We used bird species richness as a surrogate estimate for total biodiversity because there are relatively good estimates for each country, but other measures of biodiversity may also be appropriate. Country land area is not included explicitly in our analysis because it is correlated with human population ($r = 0.96$).

The Demand

During the last 10 years, J.A. Simonetti (Universidad de Chile) and R. Dirzo (Universidad Nacional Autónoma de México), under the sponsorship of the Red Latinoamericana de Botánica (Latin American Botanical Network; Kalin de Arroyo et al. 1994) have periodically offered an international course on conservation biology. The course analyzes the conceptual bases of conservation biology, including philosophical, theoretical and practical aspects, emphasizing theoretical challenges in general and Latin American researchers' challenges in particular. The aim is to depict conservation biology as both a social and biological endeavor in which multi- and interdisciplinary work is mandatory to be successful.

Overall, 751 students from 23 different countries (including a few from the United States and Europe) have applied, representing 46% of applications to all Red Latinoamericana de Botánica courses combined. Most applicants were from Colombia (19%, 150 students) and Argentina (14%, 100 students). Roughly 13% of applicants were accepted (94 students), with a mean number of 19 students per course. The course has been held twice in Chile (1993 and 2003) and México (1994 and 2000) and once in Argentina (1996) and has included the participation of instructors from throughout the region. The most recent session (2003) had 159 applicants, of which 18 were admitted (from 15 countries). Similar to previous sessions, 59% of applicants were women, around 17% already held a masters or doctoral degree, 30% were enrolled in a graduate program, and the remaining 53% were undergraduate students. Applicants to this course were mostly interested in plant ecology and conservation (approximately 66%), whereas the rest were interested in conservation of fauna.

In May 2004 a course for Latin American graduate students, Conservation Genetics: From Genes to Practice, was held in Bariloche, Argentina, organized by A. Premoli (Universidad Nacional del Comahue), with funding from the American Genetics Association and the Universidad Nacional del Comahue-BIOCORES project. The aim of the course was to improve technical capacity in conservation genetics and therefore contribute to biodiversity conservation. A total of 107 applications were received from 13 Latin American countries, including 1 from Spain. Only 20 students (19%) were admitted to the course. Most applicants were from Argentina (48%) and Brazil (18%). Two-thirds were students who studied animals, whereas one third were students who studied plants.

We present these two examples only to illustrate the existing demand for specialized training in conservation biology in ANA. There are many others. Applicant rejection rates of 80–90% indicate that many more individuals are interested in acquiring skills than there are opportunities to learn. Occasional, itinerant courses perform a valuable function, but they must complement gradual, formal training in academic institutions.

The Task Force

The SCB maintains an on-line database of academic programs in conservation biology that lists 95 programs in the United States (http://www.conbio.org/SCB/Services/Programs/ [accessed September 2004]). The ANA section of SCB recently compiled a similar list for its region, and came up with a total of 42 programs in 12 countries, predominantly leading to a master's degree (Table 1, http://www.conbio.org/ANA). Both of these lists include academic programs that cite conservation biology as one of their principal disciplines of interest. Professional training in conservation biology may be pursued in many other academic settings, but we assumed these two lists contain comparable information across the United States and in countries in ANA.

In the United States there are approximately 0.329 academic programs in conservation biology for each 1 million inhabitants (A/10^6 people). In contrast, the mean figure for ANA is 0.064 A/10^6 people, one order of magnitude lower. However, the variance around this number is large, ranging from 0 in 14 countries to Costa Rica's impressive 0.476 A/10^6 people (Table 1). The mean value for ANA, excluding the two countries with figures comparable to the United States (Costa Rica and Paraguay), is just 0.036 A/10^6 people. The 14 countries of the region with no programs (Table 1), have a total population of nearly 64 million people—a larger population than in the United Kingdom.

The picture is more dramatic if one considers how much there is to conserve in ANA. In the United States, there are 8.8 academic programs for every 100 bird species (A/10^2 species), whereas the mean figure for ANA is 0.1 A/10^2 species, almost three orders of magnitude lower (Table 1). Brazil and Mexico are the only countries with a value near 1.0 A/10^2 species, whereas all other countries range from zero to 0.4 A/10^2 species. The Dominican Republic and Cuba (although they have only one academic program in conservation biology each) rank third and fourth after Brazil and Mexico and are among the lowest-ranking countries in terms of their bird species richness.

It is useful to compare these figures with those of the United States, because during the late 1980s there was an explicit effort to build the country's graduate programs in conservation and sustainable development. Major universities in the country were invited to participate in a $2.3 million initiative (all monetary units are in U.S. dollars) funded by the Pew Charitable Trusts (Jacobson et al. 1992). After the discipline became popular in the U.S. in the early 1980s, the number of academic programs in conservation grew to approximately 20 in 1990, approximately 50 in 1995, and approximately 100 at present (Jacobson 1990, Jacobson et al. 1995, Table 1). Although the Pew grant may not account for all of the academic growth of conservation biology in the United States, it undoubtedly had a profound influence. Investment in professional capacity building for conservation has paid off, generating one of the largest communities of conservation professionals in the world. Of the approximately 7,150 members of the SCB, 82% are from the United States (Table 1).

Solid academic institutions are essential for building long-term technical capacity in ANA because they provide stable, predictable training opportunities for students and conservation professionals. Structured, formal training is

Table 1. Indicators of conservation capacity building in Austral and Neotropical America, compared with the United States.

Country	Academic programs (A)	Population[a] (P) (10^3 people)	Land area[b] (10^3 km^2)	Bird richness[c] (B)	A/P (per 10^6 people)	A/B (per 10^2 species)	SCB members[d]
United States	95	288,530	9,629	1,082	0.329	8.8	5,874
Central America and the Caribbean							
Belize		236	23	356	0	0	3
Costa Rica	2	4,200	51	900	0.476	0.2	14
Cuba	1	11,273	110	362	0.089	0.3	14
Dominican Republic	1	8,639	49	269	0.116	0.4	1
El Salvador		6,520	21	552	0	0	1
Guatemala		11,995	109	737	0	0	1
Haiti		8,400	28	250	0	0	0
Honduras		6,732	112	738	0	0	1
Jamaica		2,621	11	320	0	0	3
Mexico	10	101,842	1,958	1,081	0.098	0.9	68
Nicaragua		5,347	130	700	0	0	1
Panama		2,942	77	974	0	0	2
Trinidad and Tobago		1,306	478	5	0	0	0
South America							
Argentina	2	37,944	2,767	1,041	0.053	0.2	27
Bolivia	1	8,705	1,098	1,414	0.115	0.1	15
Brazil	17	174,706	8,512	1,749	0.023	1.0	61
Chile	2	15,589	757	491	0.128	0.4	15
Colombia	1	43,495	1,139	1,853	0.023	0.1	16
Ecuador		13,112	283	1,643	0	0	14
French Guiana		187	90	738	0	0	0
Guyana		765	215	796	0	0	1
Paraguay	2	5,778	407	701	0.346	0.3	1
Peru	2	26,523	1,285	1,851	0.075	0.1	10
Suriname		421	163	713	0	0	0
Uruguay		3,385	176	421	0	0	2
Venezuela	1	25,093	912	1,384	0.040	0.1	5

[a] *Population data from UNDP et al. (2003), except French Guiana which is from http://www.nationmaster.com/country/fg/People.*
[b] *Land areas from National Geographic Society (1999).*
[c] *Bird species richness from Lepage (2004).*
[d] *Number of SCB members in each country were provided by the SCB Executive Office, and they reflect the membership as of September 2004.*

a key component because it permits the gradual development of consecutive cohorts of professionals, who are exposed to a wide variety of topics before specializing in a particular field. We believe this strategy, although unquestionably slow, produces high returns in the future.

Austral and Neotropical America is home to approximately 530 million people (Table 1) and at least 4,000 bird species (Lepage 2004). To achieve the same number of per capita conservation biology academic programs as in the U.S., the region would require 174 programs (530 10^6 people $*$ 0.329 A/10^6 people). Furthermore, to reach the same number of programs per bird species, the region would require 351 programs (40 10^2 species $*$ 8.8 A/10^2 species). In order for there to be equivalent conservation training opportunities in ANA and in the U.S., the number of graduate programs would need to increase at least between 4 and 9 times (from 42 to 174 or from 42 to 351, respectively). Productivity of scientists in Latin America (measured as per unit U.S. dollars invested in research and development) has steadily increased during the last decade; by 2000 it surpassed that of scientists in Canada and the U.S. (Holmgren & Schnitzer 2004), suggesting that investing in academic institutional building within ANA would be likely to yield returns.

In order to have a significant impact on conservation capacity building in ANA, donors should be persuaded to invest in both short- and long-term initiatives. Short-term initiative requires a regionwide, rapid increase in the exposure of students to conservation biology. This could be achieved by implementing five to six short courses per year, distributed throughout the region (assuring the proximity of a course venue for applicants in any country), repeated every two to three years, and rotated among host countries. Such a short course should (1) be widely publicized, (2) fully fund all admitted participants, (3) have top conservation biologists from the region as instructors, (4) be taught in the local language, (5) distribute basic textbooks in the local language, if available, for free, and (6) sponsor a 2-year membership in SCB for all participants.

Each one of these courses would probably cost about \$35,000 (according to the experiences described above).

This amount multiplied by six courses per year for 3 years would total $630,000. An additional amount of $100,000 per year would provide support for conservation biology research projects proposed by students of the courses. This brings the total for the short-term stage to just under $1 million.

A complementary strategy to temporarily overcome reduced academic capacity would be to support networking activities, which has been demonstrated to be cost-effective for solving chronic human and financial limitations (Simonetti 1998). Such collaboration, in addition to promoting interdisciplinary conservation efforts within the ANA region, is also a basis for developing strong academic institutions.

In the long term, however, individual courses and networking are not enough. We envision an initiative similar to the strategy promoted by the Pew Charitable Trusts in the United States (Jacobson et al. 1992). In a first phase, academic institutions would be invited to present proposals for developing conservation biology programs. In a second phase, a subset of these would receive funds for their implementation. This process, when developed in the U.S., involved 36 universities and cost $2.3 million. Most universities received $30,000 grants, but three received $300,000 each. We used the average figure of $64,000 per institution for our back-of-the-envelope calculation.

To achieve the same intensity of conservation capacity building as in the U.S., the number of academic institutions in ANA has to increase from 42 to 174 or from 42 to 351, according to the target chosen (per capita or per species, respectively). This means the number of new programs would be somewhere between 132 and 309. At $64,000 each, it would require an investment ranging between $8.4 million and $19.8 million. At first glance this may seem costly, but it is a fraction of the amount currently spent by international governmental and nongovernmental organizations on biodiversity conservation in ANA. For example, between 2000 and 2004 the Global Environmental Facility alone approved or endorsed biodiversity-related proposals in Brazil, Costa Rica, Ecuador, and Mexico, totaling approximately $140 million in just four ANA countries (www.gefonline.org [accessed October 2004]).

If institutions value their long-term conservation investment in ANA, the rational decision is to increase allocations for strengthening local capacity and institutional development. Unless ANA residents take the lead in conservation efforts in their own region, long-term, sustainable solutions are unlikely to be found. We conclude that $20 million could make the difference in finding those solutions and change the face of the discipline of conservation biology in Austral and Neotropical America.

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