Evaluating a capacity-building program in conservation biology for Shuar and Awá indigenous communities in Ecuador

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ABSTRACT: Collaboration with indigenous groups is necessary to conserve biological diversity in neotropical forests, since these groups maintain much of the intact forest that lies outside of protected areas. I assess a program entitled “Training and development of conservation biology capacity for indigenous organizations in Ecuador,” conducted by the Missouri Botanical Garden and the Wildlife Conservation Society, and link the success of this program to future conservation on indigenous lands. In my research, I evaluated: (1) How effective is this training program in preparing four Shuar interns for natural resource management leadership in the biologically-rich Cordillera del Cóndor? (2) How are members of one Shuar community in the Cordillera del Cóndor presently using natural resources and what are their views on conservation? Fieldwork was conducted at three sites in Amazonian Ecuador during July – August of 2002 and January – February of 2003 and involved the use of participant observation, and structured and semi-structured interviews with program interns and 25 members of one Shuar community. Four main concerns were identified as affecting the success of the training program: (1) The lack of a long-term evaluation component. (2) The wide variation in the interns’ educational backgrounds and ability to comprehend scientific information. (3) The curriculum’s questionable ability to prepare the interns for future natural resource leadership. (4) The possibility that even if the Shuar interns complete the two-year program, they may not ultimately be accepted as natural resource managers by their Federation or community members. Major identified threats, which the Shuar interns will need to address in future conservation efforts in the Cordillera del Cóndor, include the unsustainable hunting of wildlife, the encroachment of mining companies and the possibility of road construction in the region. My data are combined with several previously published case studies to formulate overall recommendations for supporting Shuar community-based conservation in the Cordillera del Cóndor.

Keywords: Conservation, neotropical forests, indigenous groups, Shuar, capacity-building.
participantes shuar deberán confrontar en futuros esfuerzos para la conservación en la Cordillera del Cóndor, incluyen la caza sostenible de vida silvestre, la intervención de companías mineras y la posibilidad de la construcción de nuevas carreteras en la región. Los datos recopilados están combinados con varios estudios de caso publicados previamente, de tal manera que se puedan formular recomendaciones que apoyen la conservación basada en las comunidades Shuar en la Cordillera del Cóndor.

Palabras clave: Conservación, bosques neotropicales, grupos indígenas, Shuar, capacitación.

INTRODUCTION

There is great potential for collaboration with indigenous groups on the conservation of biological diversity in neotropical forests. In land holdings alone, indigenous territories encompass more than half of the protected areas in the Amazon Basin (Peres 1994, Zimmerman et al. 2001), and in countries like Ecuador these groups maintain much of the intact forest that lies outside of protected area status (Bennett et al. 2002). In the past few decades, Latin American governments have focused their attention on many of these “undeveloped” lands, leading to an exploitation of natural resources and tremendous social change among many indigenous groups in this region (Brandon 1996). Along with such external threats, the main factors which affect conservation of biological diversity on indigenous lands are considered to be land tenure security, the ability to resolve conflicts and the internal strength of indigenous natural resource management institutions (Brandon 1996).

There is clear evidence from indigenous groups like the Kayapó in Brazil and the Cofán in Ecuador that conservation can work on indigenous lands, while these people are able to maintain self-determination and autonomous control of natural resources (COICA 1989, Conklin and Graham 1995). In addition, two relatively recent studies in Ecuador demonstrate that indigenous people are less destructive to their immediate environment than colonists in the region when all other factors are considered equal (Sierra 1998, Rudel 1999). But, although some indigenous groups demonstrate leadership in conservation, others are quite capable of overexploiting their resources (Redford 1990, Redford and Stearman 1993, Peres 1994). The vast heterogeneity among indigenous groups in their resource-use practices forces conservationists to question the actual “protected” nature of tropical forests that lie within indigenous territories.

Ecuador hosts an exceptional amount of biological diversity and species endemism because it is composed of four distinct tropical geographic regions – the Amazon lowlands, the Andes mountain range, the Pacific coastal region, and the Galapagos Islands. For instance, there are over 1,600 species of birds in Ecuador, which comprise 18% of the world’s total, and more
than 16,000 species of vascular plants, or 7% of the world’s total, are found there (Mittermeier et al. 1997, Neill 1999). In the past 25 years, Ecuador has increased its national parks system to a total of 26 national parks and reserves that cover about 17% of the country’s land area (US AID 2003, Neill 2001). The majority of these parks are inhabited by both legal and illegal occupants, making conservation of biodiversity within their borders a constant challenge. In the spirit of the Ecuadorian government’s policy of bureaucratic devolution, the Ministry of the Environment is delegating the management of protected areas to local and regional governmental agencies. In this context, national and international non-governmental organizations (NGOs) are increasingly taking a leading role in the conservation of protected areas in Ecuador, with indigenous groups considered important participants in this effort. Of the 16 or more distinct ethnic groups in Ecuador, half of these live in Amazonia, many occupying the last remaining intact habitats that lie in and around protected areas (Bennett et al. 2002).

The Shuar are the second largest native ethnic group in Ecuador, with a population of 40,000 people distributed in more than 400 villages in the eastern Andean slopes and Amazon lowlands of southeastern Ecuador, which encompasses more than 10% of Ecuador’s total land cover (Bennett et al. 2002). The Shuar are considered to be the most-highly organized indigenous group in Ecuador, under the political umbrella of the Federación Interprovincial de Centros Shuaras (FICSH), established in 1974 (Salazar 1981). Most Shuar live below 1000 m, occupying both flooded and upland habitats (Harner 1972), with varying productivity and resource use associated with the different forest types (Descola 1994).

Included in the Shuar territory is the biologically unique Cordillera del Cóndor region. This range rises to a maximum elevation of 2800 m and lies to east of the main Andean chain. It juts into the upper Amazon basin, forming a portion of the border between Ecuador and Peru. The unique geological composition of steep ridges and sandstone mesas is believed to contribute to a high degree of plant endemism with possibly the “richest flora of any similar-sized area anywhere in the New World,” attracting the interest of biologists and conservation organizations worldwide (Schulenberg & Awbrey 1997, RAP Working Papers #7 1997, Neill 2001). Because this region was the center of the border dispute between Ecuador and Peru for the past 160 years, and Shuar settlements are generally small in size, there has been little development or research in the area. The last war occurred in 1995, and a peace treaty was signed in 1998. Since then, two “peace parks” have been created along the international border, which are managed jointly by the
governments of Ecuador and Peru (McNeely in press). Due to recent conflicts, there are still active land mines in the region, which are presently being removed by trained military personnel.

Market-driven forces, colonists from the highlands, and local and international NGOs are now beginning to play an active role in shaping the future of this area. In addition, Ecuador’s population is currently growing at more than 3% each year, which is the largest rate of population growth in South America (Neill 2001). Recent colonization by mestizos from the Ecuadorian highlands has affected the majority of lowland indigenous groups, including the Shuar, through increased deforestation and acculturation. External mining, oil and environmental interests are also contributing to the massive changes that impact Shuar lands and culture. Many Shuar villages have clear land titles, while others do not (Neill 2001). The Ecuadorian government retains all subsoil land rights and grants concessions to mining and oil companies, who have paid Shuar land owners large sums of money for access to explore their land. Internally, hunting of wild game and forest product extraction have largely altered forest composition, while the overall productivity of the land has declined due to population growth and the subsequent intensification of swidden agriculture (Neill 2001). FICSH supports the creation of some kind of protected area in this region, but only if it is under Shuar jurisdiction and management – not part of the Ecuadorian Ministry of Environment’s system of national parks and reserves (RAP Working Papers #7 1997, Neill 2001).

It is with this background that I chose to explore connections between the Missouri Botanical Garden and the Wildlife Conservation Society’s “Training and development of conservation biology capacity for indigenous organizations in Ecuador” and the potential for future conservation by the Shuar in the Cordillera del Cóndor region of Ecuador. To help promote the conservation of biological diversity on indigenous lands in Ecuador, the Missouri Botanical Garden (MBG) and the Wildlife Conservation Society (WCS), with the financial backing of the Liz Claiborne and Art Ortenberg Foundation, launched a two-year capacity-building program in conservation biology for two indigenous groups: the Shuar and the Awá. This collaborative initiative, which began in July of 2002, was designed to promote community-based conservation on indigenous lands in Ecuador, by helping the Shuar and Awá indigenous organizations develop the technical capacity to plan and carry out natural resource management and conservation projects in their respective territories. Four interns from each organization were chosen by their Federation leaders to participate in this training program, which included
formal training sessions with MBG and WCS biologists in plant and wildlife management and monitoring, land use planning and work on field conservation projects. The MBG/WCS program coordinators had almost no involvement in selecting the interns, except to ensure that at least one of the Shuar interns was from the Cordillera del Cóndor in order to facilitate future access to this region. Theoretical and practical information in the disciplines of conservation biology, tropical ecology and forests and wildlife management formed the backbone of the formal training program curriculum, which during the first year was presented to the interns in six one-month modules. In alternating months, the interns were expected to work somewhat independently on conservation projects in their home territories. Following their training, the Shuar and Awá interns would be employed by their respective Federations to serve as natural resource managers in spearheading conservation initiatives and dealing with the multiple threats that affect future conservation of biological diversity on indigenous lands in Ecuador.

Since working with the Shuar to create a management plan for the biologically fragile areas in the Cordillera del Cóndor was an integral part of the MBG/WCS two-year training program in conservation biology, my participation in the project was two-fold; 1) to initiate evaluation of the training modules and offer recommendations to the program coordinators and instructors on how to conduct future monitoring activities; and 2) to explore Shuar natural resource use in the Cordillera del Cóndor, and within the context of conservation in Ecuador, make suggestions for the interns’ future work in promoting community-based conservation in this region.

METHODS

Fieldwork was conducted at several sites in Amazonian Ecuador during two seven-week periods: July – August of 2002 and January – February of 2003 and involved participant observation and interview methods.

Study Areas

Most of the research for this thesis took place in the Shuar centro of Warints, located in the Coangas Watershed in the heart of the Cordillera del Cóndor (Figure 1). The Shuar Associations of Nunkui and Sinip have primary jurisdiction over the Cordillera del Cóndor. Nunkui is comprised of six centros: Warints, Maikuints, Shuar Ampam, Kuankus, Yunkumas
and Union Zamora. Sinip is comprised of five: Numpatkaim, Tinkimints, Uwints, Kunkuk and Banderas. The data for this map was gathered by AmazonGISnet, an organization dedicated to helping indigenous communities map their territorial lands and aid in the management of natural resources by using GIS software and techniques. AmazonGISnet also works on collaborations in Santiago and Bamboisa, which lie to the north and southwest of Warints respectively.

Warints is comprised of approximately 250 Shuar people distributed among 50 households. The centro, where the airstrip and school are located, lies at 850 m elevation and is surrounded on three sides by steep mountains. The actual territory of Warints extends to the crest of the Cordillera del Cóndor at 2800 m. A government supported small-scale copper mining company conducted exploratory work from 1999–2000 on some of the adjacent slopes, about 10 km from the village.

Under the approval of the leaders of Warints, the company set up a mining camp and brought in outside workers, but also hired many Shuar men and boys from Warints at a rate of $8 per day to carry copper ore samples down the mountain. FICSH intervened after just over one year of operation and evicted the miners based on Shuar legislation that prohibits dialogue with mining and oil companies. Now, the main cash generating activity in the community is raising beef cattle. This is not a very worthwhile enterprise, since cattle must be walked for three days to be sold in the nearest town of Limón. Also, according to the residents of Warints, the cattle have suffered from an epidemic of attacks by vampire bats in 2002, and the herds were significantly reduced. Since there are few sources of cash income for residents in Warints, subsistence farming is the main activity for the majority of people. MBG and WCS began to explore economic alternatives for Warints, such as the sale of handicrafts, non-timber products and ecotourism, but the remote location of this centro puts it at a disadvantage in terms of market accessibility (Neill pers. comm. 2002).

Initial fieldwork was conducted during the summer of 2002 at Jatun Sacha Biological Station, in the Napo province of lowland Amazonia, and in the town of Santiago along the border with Ecuador and Peru. Jatun Sacha, which includes a reserve of more than 2,000 ha, research facilities, a botanical garden and a plant conservation center, was established in 1986 by MBG Associate Curator and former Director of the National Herbarium of Ecuador, Dr. David Neill. This was the site of the first training module. The town of Santiago, which is situated in the Santiago River Valley between the Cordilleras del Cóndor and Cutucú, is home to a sustainable
forestry project sponsored by the Ecuadorian NGO, Fundación Natura. In August 2002, David Neill held a dendrology course there for the Shuar foresters involved in the project, which included the myself and the four Shuar interns.
**Research Questions**

For this project, I explored the following research questions:

1. How effective is the MBG/WCS training program in conservation biology in preparing the Shuar interns for natural resource management leadership in the Cordillera del Cóndor?
2. How are the members of one Shuar community in the Cordillera del Cóndor presently using their natural resources and what are their views on conservation?

**Methods Used**

To answer Question #1 – assessing the MBG/WCS training program in its attempt to meet the educational goals of preparing the Shuar and Awá interns for natural resource management leadership – I participated in the first training module of the program, which was held over two weeks in July of 2002 at Jatun Sacha. I listened to lectures and participated in field activities and also led several lessons, including an activity in which the Shuar and Awá participants worked in groups to create conceptual models that diagrammed the direct and indirect threats affecting conservation of natural resources in their territories (Ch. 3 in Margolius and Salafsky 1998).

The main objective of the capacity-building program is to have the participants create resource management plans for communities in their respective territories over a two-year period and then return to work as natural resource managers there. Several steps of this process were initiated in the first module. All four of the Shuar participants, and a member of the Awá team, drew maps of their communities and presented them to the rest of the group, indicating various physical features (rivers, roads, primary forest, pasture) and potential threats to the area. Ethnozoological information was attained through discussions about the mammals that live in their respective territories. Through participation in these activities, I gained a much better sense of the Shuar and Awá cultures and the issues surrounding community-based conservation in both territories.
At the end of the first module, I created an evaluation form for the participants to fill out to assess participants’ impressions of this module. During this first stage of my field research, I cultivated relationships with the key participants in the program and worked to better understand the program curriculum and goals. This provided an important base from which to explore the effectiveness of the training program in meeting its educational goals in the second stage of my fieldwork.

In January of 2003, I returned with the eight interns to the Shuar community of Warints, in the Cordillera del Cóndor of southeastern Ecuador, to participate in the fourth training module of the program. This module focused on the themes of wildlife ecology and conservation, community development projects and basic training in the applications of Geographical Information Systems (GIS) for mapping indigenous lands. At the end of Module 4, the interns were also given another evaluation form to provide personal feedback about the module.

Because I took part in the training modules, participant observation techniques proved to be an extremely effective method for assessing the interns’ understanding of the scientific concepts presented in each module. For instance, in conducting several material retention tests, I was able to qualitatively evaluate what basic information on wildlife ecology and conservation was retained from the lectures and field activities. In this same discussion, the interns analyzed the strengths and weaknesses of the creation of a biological research station and reserve in the Awá territory. In February 2003, I watched the Shuar interns present botanical and conservation information to elementary and high school classes of Warints, which enabled me to view their interpretation and presentation of a variety of scientific concepts. All of these experiences led to a better understanding of the educational effectiveness of the MBG/WCS capacity-building program in conservation biology.

To augment the observations made as a participant, I also used formal interviews to assess the interns’ perceptions of the program and understandings of the scientific concepts presented over time. In the first module, I conducted interviews with the eight interns to gather individual background information, which provided useful baseline project data for the Missouri Botanical Garden and Wildlife Conservation Society. Before the fourth training module began in the Shuar community of Warints in January 2003, I conducted follow-up interviews with the interns about their progress in the capacity-building program and gathered information about their understanding of wildlife management and conservation. Follow-up interviews were
conducted several weeks later after the interns’ field experience in Warints to assess their understanding of the wildlife management themes taught by the instructor and the results of the interview methods that I introduced. Because these interviews were taped, I was able to listen to the recordings and transcribe the information in a written form. These conversations were then “theme coded” for later analysis of the qualitative data needed to understand Research Question #1.

The primary method used to address Question #2 – How are the members of one Shuar community in the Cordillera del Cóndor presently using their natural resources and what are their views on conservation? – was to conduct formal interviews with 25 members of the community of Warints with the help of the Shuar and Awá interns as part of their fourth training module. These interviews provided insight into the following: 1) resource use and value of men and women in the community; 2) community understanding of the MBG/WCS training program in conservation biology; 3) perceived threats to the environment in Warints; and 4) general views on conservation and perceptions of the potential creation of protected areas in this region that could restrict their access to natural resources. Unlike previous interviews conducted in my research, the information gathered was not about the indigenous interns’ educational experience in the training program, but rather targeted towards gaining a broader understanding of future possibilities for conservation in the Shuar territory.

RESULTS

The results of this research are organized into two sections, which address the main research questions:

1) A general evaluation of the Missouri Botanical Garden (MBG) / Wildlife Conservation Society (WCS) program in conservation biology for indigenous groups in Ecuador, focusing on the identification of concerns that could potentially affect the overall success of the training program.

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1 It is important to note that my close affiliation with both the coordinator and instructors of the MBG/WCS training program, as well as the fact that I am a foreigner, could have biased the interview results towards more positive feedback on the training program. These qualitative assessment techniques were adapted from methods used in research at Edgewood Campus School in Madison, WI as a National Science Foundation K-Through Infinity Fellow, under the guidance of consultants at the LEAD (Learning through Evaluation, Adaptation and Development) Center.
2) A summary and analysis of the natural resource use data by the Shuar in the community of Warints through interviews with community members.

These seemingly disparate strands of data are woven together to demonstrate the complexity of the internal and external factors that affect the potential for successful conservation initiatives in Ecuador’s indigenous territories.

1) Evaluation of the MGB / WCS training and development of conservation capacity for indigenous organizations in Ecuador

Concerns regarding the future success of the capacity-building program

Four major concerns regarding the future success of the training program became apparent through participation in the training modules and association with the interns during the two field periods. Many of these concerns were apparent in the first training module and were further developed upon access to more information in Module 4.

1) The first major concern is the lack of a formal evaluation component built into the capacity-building program that is necessary for monitoring its success over time. A long-term assessment is needed to gain a true understanding of the training program’s success in meeting its goals.

2) The wide variation in the interns’ educational backgrounds and ability to comprehend scientific information was a strong limiting factor in the interns’ satisfaction with the program. This diversity in educational preparedness also relates to the third concern, 3) the program’s ability to adequately prepare the interns for future natural resource leadership in their respective territories. Finally, 4) there was concern that some participants would not complete the two-year program, and that if they did, it was unlikely that the Shuar interns would remain committed to working for FICSH or be accepted as natural resource managers by their community members and official Shuar leaders.

In regards to the first concern, a more formal, long-term evaluation component would enable the training program instructors to adapt their teaching methods based on the needs of the participants and assess how the participants are using the information in activities within their communities (Whorley 1994). This could also augment the progress reports submitted annually
to the Liz Claiborne and Art Ortenberg Foundation with more specific data on the participants’ progress.

My second concern that the educational differences in the interns would weaken the training program was reinforced by several comments made by the interns in follow-up interviews at the beginning of Module 4. As seen from interview results before and after Module 4, the interns widely differed in their ability to retain scientific information, and few were able to conceptualize application of the material in their own territories. Those who were able to retain scientific concepts and facts, and then correlate those with future application, already had a relatively high degree of educational training. Those who did not have this background struggled to remember basic concepts and facts and were not able to envision applicability of the material in their home territories.

With regard to the third concern, most of the interns believe that education beyond the two-year training program will be required to meet their goals of effectively working as natural resource managers in their respective territories. More formal education/training may be needed beyond that which is provided in the capacity-building program to adequately prepare them to work as natural resource managers in their territory.

The last concern, whether the participants would actually complete the two-year program and be accepted as natural resource managers by FICSH and their communities, was based on three reasons. First, in the case of the Shuar, the interns had been ostracized in their communities and within FICSH by being called “los chicos gringos” (a perjorative term meaning “foreign boys”). Second, the students complained of not being paid on time by the Federation, and at the end of January 2003 had actually not yet been paid for their work in the months of December or January. The money had already been given to FICSH by MBG/WCS, but was not being transferred to the interns. Although the monetary aspect of the training program has already been agreed on, possibly a reward upon completion of the two-year program would be a further incentive for the participants to stick with it. Third, at the FICSH annual assembly held in Sucúa in January 2003, the Shuar interns were discouraged by the top Federation officials from sitting in on the assembly since they were not association representatives. Only one of the four was initially allowed to enter the assembly at a time.

In addition to assuming that the Shuar interns complete the two-year program, there was concern about the strength of their commitment to eventually working for FICSH. Originally,
three of the four Shuar interns mentioned a desire to pursue a university degree upon completion of the program, while only one mentioned a loyalty to working in his specific community. In the follow-up interviews conducted after six months of participation in the program, all four of the Shuar interns seemed dedicated to eventually working in the Shuar territory. Each mentioned eventually implementing conservation projects and training people on forest conservation and natural resource management, even though several would like to pursue university-level training first. This is also the goal of several of the leaders of FICSH as they intend to augment their Division of Natural Resources and Ecotourism, which will work alongside the other commissions. It is notable that very few indigenous people in Ecuador receive higher education, and of those that do, few return to work in their territories. It is possible that meeting dynamic university graduates who have remained professionally loyal to their indigenous communities would further inspire the interns to do the same.

2) Natural resource use and conservation potential in Warints

The Shuar and Awá interns were directly involved in conducting interviews about the natural resource use and conservation views of people in Warints. Ten men and eight women were the principal informants in these interviews.

Since one of the goals of the capacity-building program was to prepare the Shuar interns for natural resource management and conservation outreach in the Cordillera del Cóndor, gathering information from community members in Warints about their understanding of the program and their amount of present contact with FICSH provides an important information base for further outreach efforts in this community, as well as for other communities in the region. The results of this research show that most of the people interviewed had contact with representatives of FICSH only when they came to Warints (once per year). Those who had more contact with these Shuar officials had the opportunity to travel to the larger towns in Morona-Santiago during the year, or were directly involved in FICSH as community leaders. Those with no contact were people who lived in remote areas outside the centro, and felt too socially removed to associate with representatives of FICSH. Nearly half of the people interviewed had little or no knowledge of the capacity-building program. Others were able to provide specific notions about what they thought the program was about, but most were vague in their broader understanding of the program’s goals.
To guide future community-based conservation efforts in the Cordillera del Cóndor, it is important to understand the natural places and resources most valued by the people of Warints. Nearly 44% of the people interviewed mentioned the mineral deposits or other income-generating natural resources as being of primary importance. Almost as frequently, waterfalls were given as being valuable places for their significance to Shuar culture. Natural resource use activities, such as collecting plants, hunting, and fishing, along with the protection of forests were discussed in the interviews. 83% of the people interviewed considered hunting to be the most important natural resource use activity in the territory of Warints. Animals commonly hunted include wild cracids (*Chamaepetes goudotii*, *Penelope jacquacu* & *Pipile pipile*), peccary (*Pecari tajacu*), paca (*Agouti paca*), armadillo (*Cabassous unicinctus* & *Dasypus novemcinctus*), agouti (*Dasyprocta fuliginosa*), a variety of birds and occasionally tapir (*Tapirus terrestris*). In general, fishing is considerably less important in Warints, and five respondents indicated that this is the case because there are very few fish left in the rivers.

Protection of forests is important to 55% of the informants, with the main reason given being to maintain land for their children’s use in the future. Only 28% of the respondents considered collecting wild plants to be an important natural resource use activity. In response to what specific areas of their territory they would like to conserve for traditional uses, protection of animals or other reasons, seven informants said that they would consider setting aside private land for conservation ranging from 10 - 300 ha areas. Nearly half of the respondents (44%) own more than 100 ha of primary forest. Only two own less than 5 ha of land.

89% of those interviewed believed that threats to the environment existed in Warints. Of these, the mining company was considered to be the most destructive, with the threat of inter-territorial and inter-familial land conflicts ranked second and third. When asked if they would like to see the mining company return to Warints, 67% of those interviewed responded negatively. Community members gave the following reasons for not wanting the mining company to return to Warints: illnesses caused in children and pollution of air and water by the chemicals used, land damage, division within the community, noise pollution, harassment of Shuar women by miners from outside the community and the fact that many children quit school to work for the company. All of the female respondents were adamantly against the mining company returning.

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2 The use of woody and herbaceous plant species by the Shuar in Warints was explored through an ethnobotanical study that I conducted in February of 2003, with the help of Nixon Revelo and the Shuar interns.
company, except for one whose husband translated for her and seemed to guide her interview responses – he was strongly supportive of the company’s return. The six people who supported the return of the mining company justified their response with the fact that the mining company provided an important internal source of income that was needed to take care of their families (e.g., provide a better education for their children).

Finally, since legal and illegal logging are a major threat in parts of the Shuar territory that are more easily accessed by roads, the informants were asked whether or not they would be willing to harvest and sell timber from their land if the opportunity presented itself (i.e. a road was built near Warints). Nearly two-thirds of the respondents said yes, with more than half of these qualifying their positive response by adding that some sort of management plan would need to be in place first.

**DISCUSSION**

After examining the results of the data collected, and reviewing relevant literature, I am prepared to offer several insights on the future of the MBG/WCS training program in conservation biology for indigenous organizations in Ecuador, and in particular on future community-based conservation in the Cordillera del Cóndor. First I will offer recommendations for the training program; second, I will address the main issues surrounding conservation in Warints; and third I will make overall recommendations of focus for FICSH and the Shuar interns in creating community-based conservation plans in the Cordillera del Cóndor.

**Future of the capacity-building program in conservation biology**

The main recommendation to enhance the success of the MBG/WCS capacity-building program in conservation biology for indigenous groups in Ecuador is development of a long-term evaluation component. The brief evaluation performed during the first and fourth training modules shed light on concerns with the program, but will not be sufficient for long term monitoring. Inclusion of an ongoing evaluation process could serve to address two of the other main concerns mentioned earlier: heterogeneity among the educational backgrounds and experience of the interns and the ability of the training program curriculum to prepare the interns for natural resource leadership. The second recommendation is that if MBG and WCS plan to train other groups of indigenous interns in the future, the program coordinators may want to have
more control in the selection of the interns who will be involved. Thirdly, the program curriculum could be tailored to train some of the interns or other community members as “parataxonomists” (INBio 2003) or field biologists and others as general resource managers with a focus on social and leadership skills. The final recommendation is that the program coordinators work more directly with the indigenous federations and communities to help ensure opportunities for the interns to work as natural resource managers in their respective territories upon completion of the training program.

**Threats to conservation in the Cordillera del Cóndor**

As the Shuar interns assume leadership roles in conservation in the Cordillera del Cóndor, they will need to address multiple threats to the conservation of biological diversity in the region, which became clear through fieldwork in Warints. Although the program coordinators and instructors clearly outlined the threats to conservation in the Shuar territory at the onset of the program, three of these require immediate attention for conservation in the Cordillera del Cóndor. The first is the unsustainable hunting of wildlife. Hunting provides indigenous people with their main source of protein and is also culturally significant among the majority of these groups, including the Shuar (Harner 1972, Robinson and Redford 1991). Large-bodied animals are selectively hunted throughout the Amazon lowlands and highlands, markedly changing the faunal composition and eventually affecting forest ecology (Peres 2000). A scarcity of large-bodied animals in Warints can be inferred from the profusion of small-bodied game species in the vicinity (Robinson and Redford 1986, Peres 2000). Even though four Quichua communities that were studied in the northeastern Ecuadorian Amazon were able to maintain relatively constant levels of hunting, quantitative research showed that their hunting practices were not sustainable, having resulted in a severe depletion of larger mammalian species (Zapata Ríos 2000). In contrast, in Warints, there had already been a noticeable decline in abundance and diversity of wildlife among community members interviewed. Even though community members had to travel much farther from the centro to find game and therefore hunted less frequently than in earlier years, hunting was still considered a primary resource-use activity. Since “traditional practices” of using blowguns and barbasco have evolved into firearms and dynamite, the dynamic of hunting and fishing in the region has changed, and several community members linked these high-impact practices with the large disappearance of
wildlife in the area. Unsustainable hunting, along with human population growth, could result in further disappearance of wildlife in the Cordillera del Cóndor unless FICSH, with the technical advice of the trained Shuar interns, implements and monitors regulations for effective wildlife management.

Second, as future conservation biologists in the region, the Shuar interns will also need to deal with the future encroachment of mining companies. Gold, copper and other mineral deposits are abundant in the Shuar territory, and few other land-use practices are as destructive as small-scale mining. Extensive gold mining, in southern Ecuador, has been done informally by small-scale miners who lack the financial resources and information needed to encourage the use of finer extraction and processing techniques and pollution controls. The most severe impact of small-scale uncontrolled mining is the abundance of toxic pollutants which enter local watersheds (Tarras-Wahlberg et al. 2000). There is also evidence for the social destruction caused by miners entering into communities, including increases in violence and the spread of malaria and sexually-transmitted diseases to local people (Bezerra et al.1996, Faas 1999). Lands that have been cleared for mining are left essentially bare and dramatically altered in their re-vegetation potential due to the fact that the soil is turned multiple times in order to secure mineral deposits (Peterson 2001). The area that was explored for copper in Warints lies at about 1800 m and is visible from the centro by the large patches of exposed rock and soil that mar the old-growth forest on the mountainside.

The results of monitoring done by the Ecuadorian Proyecto Desarrollo y su Control Ambiental (PRODEMINCA 1999) show that mining in this region has severely contaminated waterways with waste products of cyanide, mercury and other metals and metalloids. This has resulted in a decrease of faunal diversity, with no animal species present in several highly polluted stretches of river (Tarras-Wahlberg et al. 2000). Many residents of Warints commented on the decrease in abundance of fish in the Warints River once the copper mining company began working in the territory and persisting one year after the company had abandoned the mining camp. Several of the women in the community also attributed recent sicknesses in their children (including boils on the skin, weight loss and loss of hair) to pollution of river water by the mining company, which was subsequently consumed by the community. The severe environmental impacts and the division of the community regarding this issue are the most severe impacts of the mining threat. Earning $8 per day was enough incentive for most men and
children in Warints to dedicate themselves to mining, even though many were well aware of the environmental and social destruction this land-use was inflicting. Even in retrospect, 50% of the people interviewed wanted to see the mining company return. An alternative, more sustainable source of income is clearly needed in this community.

The pressing need for cash among the Shuar in Warints, particularly with the community’s increasing exposure to an outside cash economy, must be weighed against ecological concerns. Villagers with greater financial resources can pay for their children to go to school; own cattle; travel to and from the larger Ecuadorian towns; and buy guns, pots and pans, medicine and clothing. In 1999, it was leaders from the centro of Warints who privately contracted with the copper mining company, dismissing the FICSH legislation that prohibits any agreements with mining, logging or petroleum companies on Shuar lands.

In relation to the need for economic development in Warints, a third threat to conservation in the Cordillera del Cóndor is the potential for construction of a road through the Coangas Valley. This would not only severely alter habitats in the region, but it would substantially change the livelihoods of people in Nunkui and Sinip. For instance, since there is no road close to Warints, selling timber from private lands is not yet a viable economic option in this community. But, given that two-thirds of the people interviewed said they would be willing to commercially harvest timber from their land should the option exist, logging (even of less valuable timber) could pose a severe threat to conservation of forest habitat. The presence of a road would likely increase the amount of cattle ranching and cash-cropping in the vicinity.

Alternatives for future conservation in the Cordillera del Cóndor

According to representatives from Conservation International–Ecuador, EcoCiencia and Fundación Natura, the most logical focus for conservation in the Cordillera del Cóndor is fostering collaborations between NGOs, FICSH and local people in creating protected areas and cultivating opportunities for sustainable livelihoods. Additionally, the Ecuadorian government and the military presence in the region, in particular, must be taken into account. Although not an immediate threat in most of Nunkui or Sinip, the effects of the military presence and active land mines on conservation and development in the region also must be further examined to effectively include military interests in future conservation collaborations in the Shuar territory, particularly since military leaders often have ownership in mining and oil companies.
The biggest challenges facing conservation in the Shuar territory will be building conservation capacity and commitment within FICSH, ensuring long-term employment for the four Shuar interns, providing adequate community outreach and support in the management of natural resources and offsetting the main market-driven forces that threaten conservation in the region.

Fortunately, the assurance of long-term external funding for conservation in the Cordillera del Cóndor, as of the year 2003 (Neill 2003), enhances the possibility for capacity-building within FICSH and that the newly trained Shuar interns will be able to be involved in conservation work in their territories upon completion of the MBG/WCS training program. The “Peace and Conservation Bi-National Program for the Cordillera del Cóndor of Ecuador and Peru,” sponsored by the Ecuadorian NGO Fundación Natura with support of the International Tropical Timber Organization (ITTO), has engaged political leaders of FICSH and the associations of Nunkui and Sinip in a planning process for future land management and the designation of protected areas in the Shuar territory. At the Nunkui Association assembly that I attended in the Shuar centro of Maikuints, the association leaders spent a great deal of time explaining this collaboration to the community members in attendance. The potential for development of ecotourism programs in the region, as a main component of this program, was particularly well received.

The creation of a biological reserve and research station, with ecotourism opportunities, may be the most sustainable among future income-generating options in Warints. It was quite obvious that the community members who wanted a biological research station in Warints, or on their private lands, perceived the benefits that foreigners and cash could bring to the community in the name of conservation.

In conjunction with Fundación Natura’s conservation efforts, AmazonGISnet is working to define Shuar land ownership in support of the Ecuadorian law of Circumscripción Territorial Indígena (CTI) in the Cordillera del Cóndor. This project entails mapping the boundaries of Shuar associations and centros, and including specific features such as hunting grounds, farms, gardens, forest-types, areas of conflict, infrastructure and sacred sites, such as waterfalls. Interviews with community residents have been conducted to gather some baseline information for this large-scale mapping project. This effort is integral in defining legal land rights of the Shuar and could aid in conservation efforts by offsetting people’s need to develop their land in
order to uphold rights to it. In addition, the Missouri Botanical Garden received a five-year grant, “The Taylor Fund for Ecological Research” to continue botanical inventories in the Cordillera del Cóndor and the Chocó, assuring a long-term conservation presence in both regions.

Successful case studies on collaborations between NGOs and indigenous groups in the creation/maintenance of biological research stations, reserves and ecotourism programs, validate these as potential sustainable income-generating land use options in the Cordillera del Cóndor. As noted earlier, effective alliances have been fostered between the indigenous Kayapó and the NGO Conservation International (CI)–Brazil, enabling effective conservation of several endangered mammal species and one of the last stands of mahogany (*Swietenia macrophylla*) in the state of Pará in the Brazilian Amazon. The biological research station and 8,000 ha reserve found outside the village of A´Ukre is a collaboration between the Kayapó people, CI–Brazil and scientists who perform research there (Zimmerman et al. 2001). Also, one community of Cofán people, located in northeastern Ecuador, currently own and manage 100,000 hectares of rainforest as part of the Cuyabeno Wildlife Reserve. The Cofán work as guides and service-providers for more than 3,000 tourists who visit the community annually. Ecotourism in this community has enabled effective conservation of forests, provided a sustainable economic alternative to community members and encouraged the maintenance of traditional knowledge in younger generations of people (Borman 1999). Finally, two other recent case studies performed with Shuar and Chachi indigenous groups in Ecuador support the notion that indigenous people often freely choose to engage in more sustainable practices of natural resource use, even without external rewards, highlighting other facets of conservation potential in the Cordillera del Cóndor (Sierra 1998, Rudel 1999).

Based on this background information and information gathered through fieldwork in Warints, the following are specific recommendations for conservation in the Cordillera del Cóndor region of Ecuador:

1) Support the construction of a biological research station and reserve in Nunkui or Sinip to promote scientific research and collaboration with one or two local communities.
2) Promote opportunities for ecotourism throughout Nunkui and Sinip, with a focus on unique regional features – waterfalls, oilbird caves, upland tropical wet forest.
3) Provide ongoing training for community members on sustainable resource practices (e.g., hunting / plant conservation) and promote partnerships with community schools in environmental education.

4) Implement and support small-scale livestock production, such as chickens, guinea pigs and tilapia.

5) Research current Shuar agroforestry and silviculture practices and link these with scientific understandings in these disciplines as they relate to forest management.

6) Support legal and activist NGOs who lobby against mining and road building interests in the region.

As land and resource use practices of the Shuar in the Cordillera del Cóndor continue to be examined in conservation planning done by the Shuar interns, it is important to refer to current behaviors and initiatives that contribute to successful conservation on indigenous lands, in creating realistic management plans towards conservation of biological diversity in the region. While low population density and abundance of land and general exclusion from the global market currently exist in Warints, rapid integration into more modern ways of life among the Shuar living there will largely affect future conservation in the Cordillera del Cóndor. Most importantly, Shuar community members will need viable economic incentives and ongoing training in sustainable resource-use practices to encourage the conservation and management of natural resources in the region. FICSH, with the support and guidance of conservation professionals, including the four Shuar interns, and through collaborations with non-governmental and governmental organizations is ultimately responsible for the conservation of biological diversity on Shuar lands.

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LITERATURE CITED


