EVALUATION OF AN ENVIRONMENTAL EDUCATION PROGRAM FOR THE ANDEAN BEAR IN AN ECUADORIAN PROTECTED AREA

By

SANTIAGO ESPINOSA ANDRADE

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by

Santiago Espinosa Andrade

To Maiko, for 9 years of loyal company.

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Santiago Espinosa Andrade

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This study evaluates the impact of an environmental education program to protect the Andean bear (*Tremarctos ornatus*) in the Cayambe-Coca Ecological Reserve in Ecuador. Andean bears are threatened by reduction and fragmentation of their habitat, hunting, and persecution by farmers. To help conserve this species, the Andean Bear Conservation Project, with an Environmental Education Program (EEP), were implemented in 1997 in the community of Oyacachi, located within the boundaries of the reserve. The EEP's objective was to stimulate local support toward conservation of the Andean bear and its habitat, targeting school children and adults.

Methods to assess the EEP's impact on the community after 5 years of implementation include a personal survey with 146 adults; a written survey completed by 44 children; and three focus groups conducted with authorities, teachers and para-biologists. Baseline data were available from 1997 for adults and from 2000 for children. Program success was analyzed based on changes in levels of environmental knowledge,

attitudes and behavioral intentions toward bear protection after program inception, along with support for the program.

The evaluation revealed partial success of the ABCP-EEP in achieving its objectives. Children's level of knowledge, attitudes and behavioral intentions did not change between 2000 and 2003, although the frequencies of positive responses were high in these two last indicators, ranging from 80-97% and 84-100% for both years, respectively. Adults' positive attitudes toward bear protection, and behavioral intentions based on a conflictive situation with bears had a positive association with participants' levels of knowledge and education. Positive attitudes toward bear presence in Oyacachi were negatively associated with respondents' past experiences with livestock predation. Program support was positively associated with respondents' participation in the Andean Bear Conservation Project.

To increase program success recommendations include creating more continuity in project activities; reaching more sectors of the population; improving communication strategies for informing the public about activities conducted by the ABCP, along with the results of these activities; and planning future evaluations and monitoring of the ABCP-EEP. Because livestock predation was a factor that decreased community support for conservation of the Andean bear, our study suggests the importance of coordinating educational activities with development projects that shift dependence on cattle to other livelihoods and thereby reduce conflicts with bears.

CHAPTER 1
INTRODUCTION

Since 1998, the Andean Bear Conservation Project has been conducting an Environmental Educational Program in the community of Oyacachi, Ecuador, with the objective of increasing community support for conservation of this endangered species. To date, the results obtained by the program have not been described. Have the inhabitants of Oyacachi gained more knowledge since the program's inception? Do they have positive attitudes toward conserving the environment and the Andean bear population? Do they support the activities conducted by the program? These and many other programmatic questions can be answered through an evaluation.

Evaluation, in its broadest sense, is a process for determining the value or worth of something (Rossi & Freeman 1993). Program evaluations are important (Jacobson 1999) because they permit us to measure achievement of program objectives, assess secondary outcomes and unanticipated impacts, identify strengths and weaknesses in the program, analyze the program from a cost-benefit perspective, improve program effectiveness, collect evidence to promote future programs, and share experience and lessons learned with similar programs.

Evaluations have been demonstrated to be essential components in educational programs, allowing for the collection of relevant information in order to identify failures and adapt programs to improve their probability of success (Pádua & Jacobson 1993, Gerakis 1998, Heffernan 1998, Archer 2002, Rovira 2002). In an analysis of 56 tropical conservation education programs conducted between 1975 and 1990, Norris and

Jacobson (1998) found that fewer than the half of the programs had achieved their goals. One main attribute significantly correlated with program success was the use of either formative or long-term evaluation.

Our study evaluated results of the Andean Bear Conservation Project's Environmental Education Program (ABCP-EEP) by measuring changes in individuals' levels of environmental knowledge, attitudes, and behavioral intentions. An increase in knowledge is considered an important indicator of the success of an environmental education program (McDonough & Lee 1990), along with public satisfaction with, and support for, a program (Rossi et al. 1999). Our study provides an assessment of the ABCP-EEP, with the goal of enhancing program success, which ultimately will contribute to the conservation of this endangered species.

Trends in the Conservation of the Andean Bear in Ecuador

The Andes are the home of the only species of bear occurring in South America, the Andean, or spectacled, bear (*Tremarctos ornatus*) (Figure 1-1). The spectacled bear is mainly distributed through Venezuela, Colombia, Ecuador, Peru, and Bolivia (Peyton 1999) (1-2), but has been occasionally reported in the Darien region of Panamá (Jorgenson 1984) and in northwestern Argentina (Brown & Rumiz 1989). The Spectacled Bear Specialist Group (SBSG) has estimated a population of at least 18,250 individuals in the wilderness (Peyton 1999). In Ecuador, the spectacled bear population has been calculated to be around 2,500 individuals, with no subpopulation at more than 250 mature individuals (Cuesta & Suárez 2001). An effort to protect this species at an international level is reflected in its inclusion in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES (UNEP-WCMC 2004), and its classification as a vulnerable species in the Red List of

Threatened Species of the International Union for Conservation of Nature and Natural Resources, IUCN (IUCN 2003).

In Ecuador, the spectacled bear inhabits a variety of Andean ecosystems (such as cloud forests and páramos) along an altitudinal range of 900-4,250m, on both western and eastern Andean slopes (Suárez 1999). The main threat to the long-term survival of the spectacled bear is the loss and fragmentation of its habitat (Suárez 1999). Montane [cloud] forests have been drastically reduced in the last decades, by deforestation and habitat conversion to other land uses. Dodson and Gentry (1991) point out that almost nothing is left from the original forest of the inter-Andean valleys, with only 4% of montane forests remaining on the western slopes. Valencia (1995) notes that montane forests are the most threatened ecosystems in Ecuador, with only 7% of their original distribution left.

Although Ecuadorian law prohibited the hunting of the spectacled bear in 1970, poaching (for commercial sale of its parts, in local and international markets) currently constitutes a significant threat to bear populations (Cuesta & Suárez 2001). Mazariegos and Adams (1994) reported 15 bears killed in 1993, in two communities neighboring protected areas in Ecuador (to obtain bear fat, considered by local people to have medicinal properties). They estimated 70-120 bears killed annually in Ecuador. The expansion of the agricultural frontier has increased human-bear conflicts. As their habitats are reduced, bears are forced to feed on crops, particularly corn (Suárez 1999). Bear predation on livestock is reported in areas where cattle-ranching activities are conducted near bear habitats (Goldstein 1991). These negative interactions increase

farmers' willingness to participate in the extermination of this animal, which is considered by many to be a pest (Suárez 1999).

The Andean Bear Conservation Project

As a response to the critical status of the spectacled bear population and its habitat, in 1997, the non-governmental Ecuadorian organization EcoCiencia, with the support of the World Conservation Society for the Protection of Animals (WSPA), created the Andean Bear Conservation Project (ABPC). This project consisted of the following two components: research on Andean bear ecology, and an environmental education program.

The Environmental Education Program's (EEP) objective was to increase people's level of knowledge about the environment, and to promote positive attitudes and behaviors toward conservation of the Andean bear and its habitat. The program began in 1997, in the Cayambe-Coca Ecological Reserve (RECAY), with an assessment of people's attitudes toward bears in the communities of Sardinas and Oyacachi (Cuesta 1998). The EEP activities have continued in Oyacachi, addressing both children and adults.

The activities for adults have included: (1) workshops dealing with local environmental issues, such as a campaign for solid waste management; (2) collaboration with SEC[1], a high school long distance program for adults who are not able to conduct their studies in one of the cities closer to Oyacachi[2]; and (3) the training and recruitment

[1] An important activity with students in their last year at the SEC, was the creation of environmental interpretative trails for tourists. This activity was worth as a final project for the students in order to obtain their high school diplomas.

[2] The Training and Capacity Building System (SEC) was created by the Ministry of Environment as a initiative to provide education to the personnel who work in the National System of Protected Areas. This program has a strong environmental education component, and due to its success, was expanded to provide education to local communities established in and around protected areas.

of community members to work as “para-biologists” in collaboration with research being conducted on Andean bear ecology.

The EEP’s efforts with children have been directed at collaborations with the local school. From June through October of 1998, a pilot program was developed by the ABCP, which included three primary components: (1) the insertion of environmental education in the curriculum of the school; (2) the design and elaboration of didactic materials for this school; and (3) the creation of a summer school program for the children of Oyacachi. One year later, the pilot program was improved by the ABCP-EEP, resulting in the School Plan for Environmental Education and Capacity Building (PECAE).

From December 1999 to April 2000, the ABCP conducted a diagnosis of socio-pedagogic and educational needs of the school before designing the PECAE. The resulting PECAE consisted of four components: (1) a curricular program, which incorporated environmental education as a theoretical framework in the learning process of children; (2) a capacity building program, which was conducted with teachers at the school to improve their skills in environmental education; (3) an infrastructure program, to improve the learning platform for children; and (4) a communication program, to share acquired information and experiences with other people, both within and outside of the community (Flores et al. 2000).

Tangible results of these activities include people’s personal accounts of the workshops, EEP publications, didactic materials produced with the teachers and students and even a radio program, narrated by local people, telling the story of an Andean bear. However, there has not been any monitoring or evaluation of the EEP. This study is the

first attempt to evaluate the processes and results obtained by the Andean Bear Conservation Project and its Environmental Education Program.

Theoretical Framework of Responsible Environmental Attitudes and Behavior

There are several theories that attempt to elucidate pro-environmental behavior and are relevant to understanding people's interactions with wildlife. Most notably, these theories suggest the importance of people's attitudes as predictors of their behavior. Therefore, in understanding the interactions between people and bears in Oyacachi, it is important to first define the variables that influence attitudes toward wildlife.

Kellert (1996) proposed four interacting variables that shape individuals' attitudes toward wildlife: (1) individuals' basic values toward animals and nature that inevitably affect their perceptions about a particular species; (2) physical and behavioral characteristics of an animal, such as its size, perceived intelligence, morphology, mode of locomotion, and cultural and historical associations; (3) knowledge and understanding about a particular species, including factual, conceptual and conservation awareness; and (4) past and present interactions with a particular species, including conflicts, recreational use, property relationships and management status.

According to Ajzen and Fishbein's "Theory of Reasoned Action" (Ajzen & Fishbein 1980), a person's intention to perform a pro-environmental action is determined by a combination of two components: (1) his or her attitude toward the behavior, which is influenced by beliefs that are shaped by a person's experiences and knowledge, and (2) subjective norms, which refer to the social context in which a person acts. For example, if a person thinks that it is good to protect bears, and this sentiment is reinforced in their community, it is more likely this person will behave positively toward bears. This theory was extended by Ajzen (1985) in his theory of planned behavior, which added that even

if individuals have the intention of performing a particular behavior, the behavior will only happen if an individual both perceives that he or she has the capability to perform it (perceived control) and also the necessary skills (actual control). These variables determine whether behaviors actually follow people's intent to behave in a certain way and demonstrate the importance of capacity-building in reinforcing pro-environmental behavior.

Hines et al. (1986/87) created a "model of responsible environmental behavior" based on six variables, observed to be the most influential in shaping individuals' intentions to act and therefore their behavior

1. **Knowledge of issues**: In this case, a person needs to be aware of the issues surrounding conservation of the spectacled bear, in order to influence his or her intention to act.
2. **Knowledge of action strategies**: A person needs to know what his or her choices are for reducing human impact on the bear population;
3. **Locus of control**: The individual has to have the perception that his or her actions will make a difference in bear conservation;
4. **Attitudes**: A person must have a positive attitude toward the bear, in order to want to protect it;
5. **Verbal commitment**: If there is an expressed intention to collaborate with a bear conservation program, it is more likely that a person will adopt positive behaviors toward bears; and
6. **Individual's sense of responsibility**: A person with a stronger feeling of duty or obligation will be more likely to perform pro-environmental behaviors

Other variables, or 'situational factors,' such as economic constraints, social pressures and opportunities to choose multiple actions, are also aggregated in this model as directly influencing a person's behavior. Such 'situational factors' are extremely relevant to conservation of the spectacled bear in Oyacachi.

Hines et al. (1986/87) and Kellert (1996) highlight the importance of knowledge and attitudes in influencing positive behaviors toward nature and wildlife. These theories are essential in understanding the significance of environmental knowledge and attitudes, gained through the Andean Bear Conservation Project's Environmental Education Program, in promoting pro-environmental behavioral intentions of program participants toward the spectacled bear. Despite the fact that knowledge per se may not lead to an individual's performance of a pro-environmental action or behavior, it represents one important precondition for a behavior's development (Jensen 2002). This last assertion is supported by numerous studies focusing on environmentally responsible behavior, which have found positive correlations between knowledge and pro-environmental attitudes and behaviors (Infield 1988; Armstrong & Impara 1991; Lyons & Breakwell 1994; White & Jacobson 1994; Fiallo & Jacobson 1995; Kellert 1996; Zimmermann 1996; Tikka et al. 2000; Kasapoğlu & Ecevit 2002; Archer 2002; Caro et al. 2003).

This study attempts to assess the importance of enhancing local knowledge and support, as fundamental to the Andean Bear Conservation Project-Environmental Education Program. Additionally, in order to evaluate this program more broadly, this research includes analysis of how people's past and present interactions with spectacled bears have shaped their current attitudes toward the bear. Finally, it explores how other 'situational factors', such us income or dependence on natural resources, influence people's attitudes toward the bear and toward the ABCP.

Research Objectives and Hypothesis

Objectives of this evaluation are as follows:

- **Objective 1.** Assess current levels of knowledge, attitudes and behavioral intentions toward the conservation of Andean bear and its habitat, and changes since the program's inception.

- **Objective 2.** Measure public support and satisfaction with the Andean Bear Conservation Project and its Environmental Education Program in the community of Oyacachi.

- **Objective 3.** Analyze the influence of participants' level of environmental knowledge, sociodemographic and economic attributes, and interactions with the Andean bear on their attitudes, behavioral intentions and project support.

- **Objective 4.** Improve program delivery by identifying strengths and weaknesses and suggesting future modifications.

Research hypotheses of this study are as follows:

- **H1.** Participant's knowledge, positive attitudes and behavioral intentions will have increased since program inception.

- **H2.** Participants' level of knowledge about the environment and socioeconomic situation will be positively correlated with their attitudes, behavioral intentions and program support.

Objectives 1 and 2 attempt to determine whether the program was successful. Project success would be represented by a higher level of knowledge, positive attitudes and behavioral intentions toward the conservation of the spectacled bear, along with high levels of support and satisfaction with the project.

Objective 3 attempts to contribute to an understanding of how people's knowledge, socioeconomic conditions and interactions with the bear can influence their attitudes, behavioral intentions and, ultimately, behaviors. Understanding these associations is critical in facilitating improvement of the strategies of the Andean Bear Conservation

Project, since people's attitudes and behaviors may be influenced by their knowledge, livelihood systems and past experiences with the bear.

Objective 4 is intended to contribute to the improvement of the Andean Bear Conservation Project and provide important insight for other programs directed toward conservation of the spectacled bear. The Andean Bear Conservation Project is still being conducted in Oyacachi. Furthermore, other countries in the Andean region are working toward the conservation of the spectacled bear and its habitat.

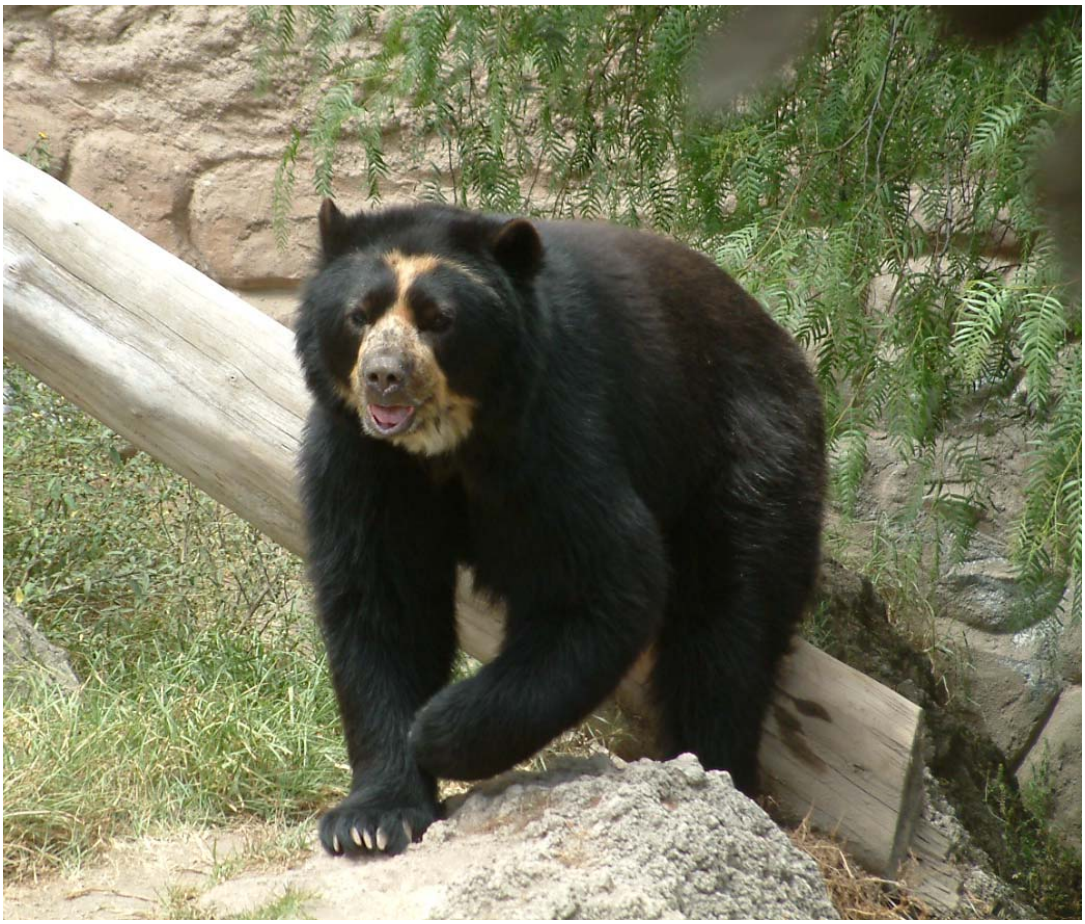

Figure 1-1. Spectacled bear (*Tremarctos ornatus*) (Photo by Rafael Reyna)

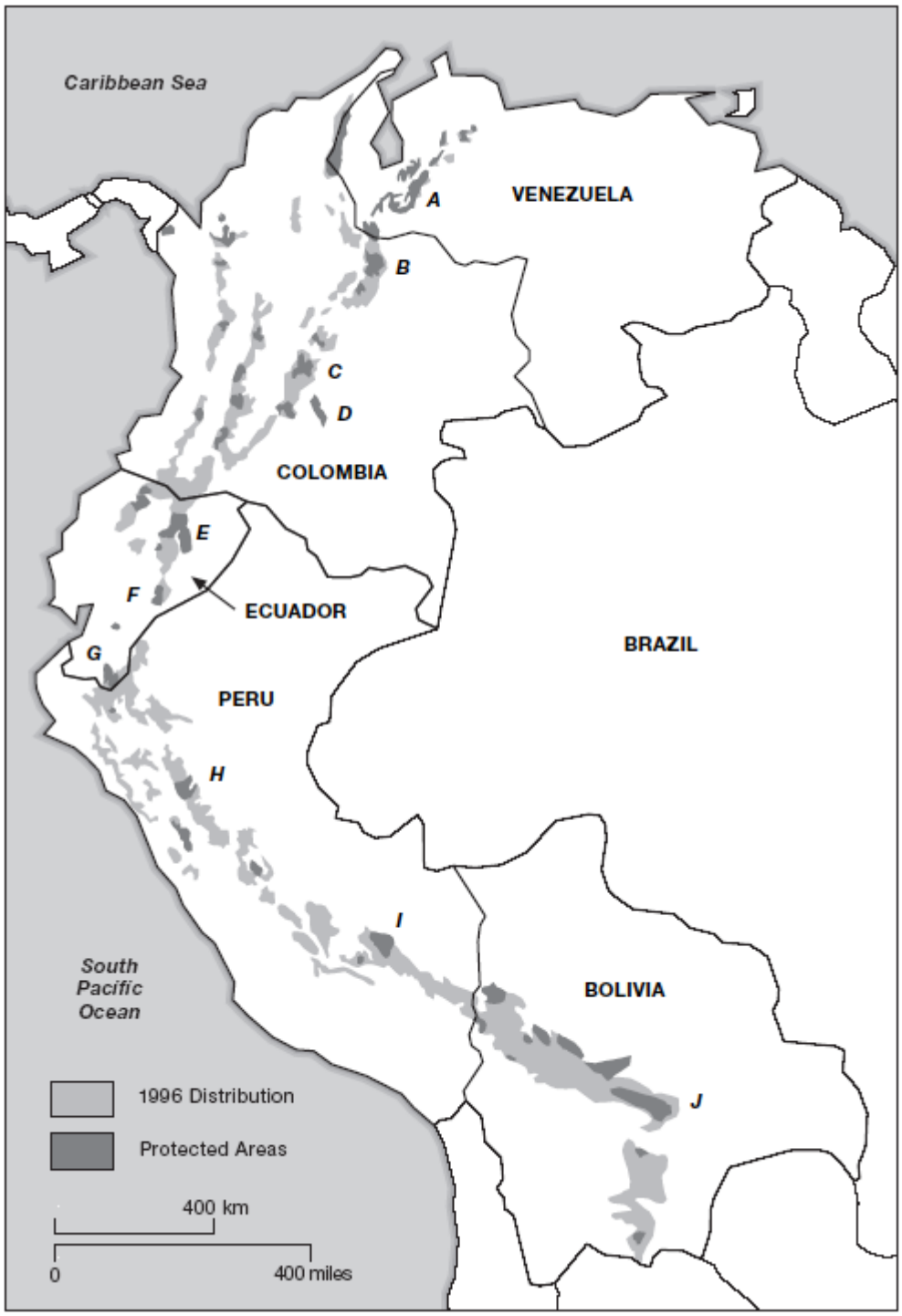

Figure 1-2. Distribution of the Spectacled Bear along the Andean Region (Figure 9.1., p 160, in Peyton, B. 1999. Spectacled Bear Action Plan. Pages 157-198 in C. Servheen, S. Herrero and B. Peyton, editors. Bears Status Survey and Conservation Action Plan. UICN/SSC, Gland.)

CHAPTER 2
DESIGN AND METHODS

This systematic evaluation uses a variety of methods to collect information needed to assess local support of the Andean Bear Conservation Project and changes in knowledge, attitudes and behavioral intentions after implementation of the Environmental Education Program in the community of Oyacachi. Structured interviews were conducted to collect qualitative and quantitative information, which permitted statistical analyses on associations between attitudes and behavioral intentions and participant variables such as knowledge, sociodemographic and economic characteristics, and interactions with bears. Previous questionnaires conducted with adults (1997) and children (2000) are used as baseline information to look for changes in knowledge, attitudes and behavioral intentions, by comparing responses given to the same questions before and after EEP implementation.

Focus groups were conducted with teachers, para-biologists and local authorities. Focus groups are planned, relaxed discussions among small groups of people about a specific topic, in order to obtain information more quickly than one-on-one interviews and allow individuals to use the ideas of others in the group as cues to elaborate more fully on their own points of view (Israel 1994). This technique was used to include the opinions of three different groups, composed of people who had participated in the program and who are key members in the decision-making processes in the community.

Site Description

The Cayambe-Coca Ecological Reserve (RECAY), created in 1970, is a national protected area located in the eastern branch of the northern Ecuadorian Andes (Figure 2-1). It has an area of 403,103 ha and ranges from 600 to 5790 m in altitude. Within the boundaries of the RECAY, the Quichua indigenous community of Oyacachi is located, having been established in the area since the pre-Hispanic period (Kohn 2002). Oyacachi is a small community, with approximately 550 inhabitants grouped into 105 households (Comuna de Oyacachi, Plan de Manejo Comunitario 2001-2004). People's livelihoods are dependent on livestock, handicrafts and subsistence agriculture. They have 44,500 ha available for these practices, however, the management of this territory is under the regulations of the Ecuadorian National System of Protected Areas.

Sampling Design for Surveys

Heads of households to be interviewed were chosen randomly from a list of 103 community households provided by local authorities. If possible, both male and female heads of each household were interviewed separately. It has been suggested that gender of interviewers can affect responses of interviewees (Bernard 2002). In order to reduce this effect, which is very important in this case due to the culture of the Oyacachi community, a previously trained female field assistant helped to conduct surveys with female interviewees.

Retired heads of households (people over the age of 60) were omitted from the selection process after pre-testing the questionnaire. The reason for this decision was based on two main factors: (1) elderly people speak little Spanish, and (2) they had not received any formal education, making their understanding of the issues touched on by the questionnaire quite low.

The survey evaluating the EEP's impacts on children at the elementary school program was delivered by the local teachers to all students in the three upper-level grades, 5 to 7 (children approximately between the ages of 9 and 12 years).

Structure of Surveys

Survey for Adults

To evaluate the impacts of the ABCP-EEP, two surveys were developed. The first consisted of a face-to-face interview with adults, and the second consisted of a written questionnaire for children. Both surveys were reviewed by the ABCP-EEP coordinators and by teachers in the local community to ensure usefulness of the results. The surveys followed standard survey techniques (Salant & Dillman 1994). The survey for adults was pre-tested in the first 20 interviews to correct problematic questions.

For adults, the questionnaire included 9 questions from the questionnaire conducted in 1997 with the general population (Questions 10, 11, 16, 19, 24, 31-34 in Appendix A), 12 questions from the questionnaire for children conducted in 2000 (Questions 1-6, 8, 14, 27-29), and 48 new questions. In total, the adult survey comprised 71 questions, which were organized into seven topical sections (Appendix A):

1. **Knowledge**: This section includes 14 questions (Q 1-13, Q 16), which measure people's knowledge about bear behavior, local flora and fauna, concepts of ecology and conservation, and knowledge regarding environmental regulations and natural resource management.

2. **Attitudes**: 12 questions (Q 14, Q 15, Q 17-26) measure people's attitudes toward the environment, and toward the bear and its protection.

3. **Behavioral intentions**: 10 questions (Q 27-36) measure the behavioral intentions of people in activities that affect bear conservation and in their personal interactions with the bear.

4. **Interaction with bears**: 3 questions (Q 37-39) were designed to provide information about conflicts between people and bears in Oyacachi.

5. **ABCP-EEP evaluation**: 17 questions (Q 40-56) solicit information about program support, satisfaction and perceived results by the community, as well as information that will be useful to improve program delivery from the community perspective.

6. **Sociodemographic and economic information**: 13 questions (Q 57-69) were designed to address variables such as education level, income, family size, and other factors that could influence responses regarding the attitudes and behavioral intentions of interviewees toward the bear and their support of the ABCP.

7. **Questions added as a request of local teachers**: Two questions (Q 70 and Q 71) were added to the adult questionnaire as a request of local teachers. They wanted to know how much support the creation of a local radio for delivering educational programs would have in the community.

Survey for Children at the Elementary School

The questionnaire for children contained 44 questions, divided into the following 5 sections (Appendix B):

1. **Knowledge:** 14 questions (Q 1-13, Q 16), including 9 from the previous questionnaire conducted in 2000 (Q 1-7, Q 9, Q 16).

2. **Attitudes:** 10 questions (Q 14, Q 15, Q 17-24), including 2 from the previous questionnaire conducted in 2000 (Q 14, Q 17).

3. **Behavioral intentions**: 9 questions (Q 25-29, Q 32-35), 4 of which come from the previous questionnaire conducted in 2000 (Q 25, Q 26, Q 27, Q29).

4. **Contact with bear**: Questions 30 and 31

5. **ABCP-EEP evaluation:** 8 questions (Q 36-43), to measure children's satisfaction with their school. Three of these questions were included in the survey conducted in 2000 (Q 38, Q 39, Q 42).

Focus Groups

Three focus groups were conducted for approximately a one-hour period with each group. Participants were invited and attended the meetings voluntarily. All sessions were tape recorded and notes were taken. Focus group guides are found in Appendix C. It is important to mention that 15 out of 16 participants in focus groups also participated in face-to-face interviews.

Focus Group with Authorities

A meeting was conducted with members of the Cabildo, the political organization of the community. A total of 6 out of 9 invited members attended the meeting and discussed their perceptions and support of the ABCP and its EEP.

Focus Group with Para-Biologists

A total of 7 out of the 8 invited para-biologists, the people trained by the ABCP to collect biological data for the Andean bear ecological study, participated in the second focus group. The discussion was focused on their perceptions about people's support for the ABCP in the community, and about the results this project has had in changing the attitudes and behavioral intentions of people regarding the conservation of the Andean Bear and the environment.

Focus Group with Teachers

A third focus group meeting was conducted with 3 of the 5 teachers from the school to understand their perceptions regarding the success of project activities conducted with the school since the beginning of the program in 1998. Teachers' thoughts on the strengths and weaknesses of the EEP at the school were discussed, along with the ways in which program delivery could be improved in the future. Since teachers are important decision makers in the community, this focus group also discussed the role of the ABCP in influencing community development.

Data Analysis

Quantitative Data

Statistical analysis was conducted with SPSS 11.5 software. Questionnaire responses were first analyzed with descriptive statistics to determine the overall pattern of responses. Differences between groups' responses regarding knowledge, attitudes and

behavioral intentions before and after program inception were tested using Chi-Square analyses (Appendix D) and T-tests.

Some responses concerning economic data were inconsistent between the husband and wife of individual households. These data were household income, amount of cattle owned, and amount of trees and firewood used. In order to better estimate these variables, divergent responses given by husbands and wives were averaged in the case of income and amount of cattle. For number of trees used, the response of the male was determined to represent the household use, since men extract timber for the manufacture of handicrafts. In the case of firewood, the answer given by the female was determined to represent the use of this resource by the household, because it is women who more frequently collect firewood for use in cooking.

Questions regarding knowledge, attitudes and behavioral intentions were grouped to form unidimensional indices through a factor analysis (Appendix E). The indices were tested with a reliability analysis using Cronbach's alpha coefficient.

Linear multiple regression models were used to analyze the ways in which environmental knowledge, interactions with bears, and sociodemographic and economic variables influence participants' responses on attitudes and behavioral intentions toward the bear and the environment, as well as their support for the ABCP. Bivariate Pearson correlation matrices were created to look for relationships between pairs of variables. For these analyses, statistical significance is reported as significant (alpha 0.05) and highly significant (alpha 0.01).

Qualitative Data

Qualitative data from the three focus groups conducted with local authorities, teachers and para-biologists were used to provide a deeper understanding of the ABCP

results in the community of Oyacachi and contribute to the improvement of the EEP, based on suggestions from these key community members. Information from notes and recordings from these focus groups was transcribed and merged to summarize participant's opinions of the program.

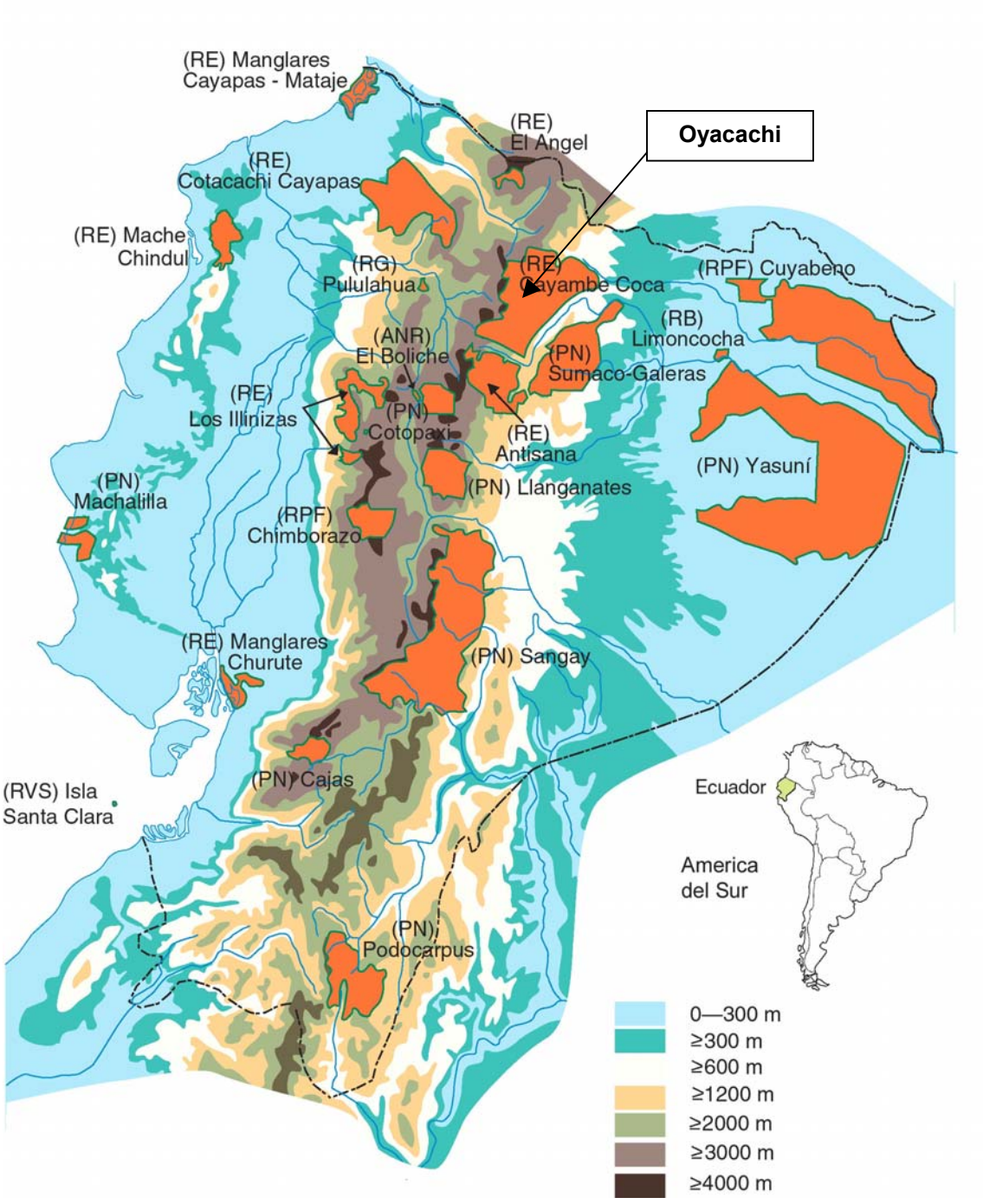

Figure 2-1. National System of Protected Areas in Ecuador, Location of the community of Oyacachi at the Cayambe-Coca Ecological Reserve.

CHAPTER 3
RESULTS

Survey Results

In order to evaluate the Andean Bear Conservation Project's Environmental Education Program (EEP) with adults of the community, 147 interviews were conducted between May and August 2003 with 72 males and 75 females. These interviews represent 88% of possible participants (168 people) who were husband and wife of each household. A total of 84 out of 87 target households were covered by this study. This number (87) excluded households where both husband and wife were retired. In 64 cases, it was possible to interview both husband and wife; in 5 cases only single heads of household were found. People who were not interviewed (21 people) either did not want to participate (2 people) or were living outside of Oyacachi.

In order to evaluate the results of the EEP at the elementary school, 44 surveys were conducted with children in the last three grades, 5 through 7. Their responses are compared to results obtained from 36 surveys, conducted in 2000, with children from the same grade level.

Evaluating the ABCP-EEP with Adults

The analysis for evaluating the effectiveness of the ABCP and its EEP with adults in the community focuses on their responses to questions regarding attitudes, behavioral intentions, project support, and people's perceptions about the ABCP results. These responses can be explained by other factors, such as knowledge about the environment, interaction with bears, sociodemographic and economic conditions, and whether or not

respondents have participated in project activities. Before and after program implementation comparisons have to be interpreted with caution for three reasons: (1) A limited sample size of interviewees in 1997 (n = 35); (2) the reduced amount of information useful for evaluation provided by the original questionnaire; and (3) general factors that jeopardize the validity of quasi-experimental designs (Campbell & Stanley 1963), especially *history*, *maturation* and *instrumentation*, which need to be considered in interpretation of the results.

Sociodemographic and Economic Background

Respondents had a mean age of 34 (SD = 11.20) and on average they had two children under the age of 15 (SD = 1.55) (Table 3-1). For further analysis, the age of 15 was chosen arbitrarily as a cutoff point for children, because it was observed that older than 15 years daughters or sons are considered more as contributors rather than dependents in the household economy.

The income of households ranged from 18 to 400 US dollars per month, with a mean of 119 (SD = 73.10) (Table 3-1). In Ecuador, the minimum wage per month in May 2004 was US$ 166, and the minimum monthly amount of capital needed by a family to satisfy their basic needs was US$ 388 (INEC 2004). The main source of economic revenue comes from cattle ranching. An average of 8 head of cattle were owned per household (SD = 3.60) (Table 3-1). Timber is also important; an average of 4 small trees (SD = 5.10) were used monthly for handicrafts, which constitutes the second most important economic activity after cattle ranching, and for construction purposes. Ninety-four kilograms of firewood (SD = 64.85) were used per week (Table 3-1).

Of the people interviewed, 8% had no education at all. Twenty-five percent had attended a few years of elementary school, with 32% having completed elementary

education. Eighteen percent had attended some high school, with 14% having completed high school education. Only 4 participants (3%), had pursued further studies beyond high school (Table 3-2). This low level of education reflects normal patterns in rural Ecuador, where 61% of the population has completed elementary school, 15% high school and 13% has not received any sort of formal education (INEC 2001). The main reason for not attending a formal educational institution is lack of financial resources (INEC 2004).

Bear Interactions

The Andean bear is a very well-known animal in Oyacachi, where it is considered a beautiful, powerful and mythical animal. It is viewed with respect and also with fear by local people, due to its destruction of corn crops and occasional predation on cattle and sheep. Three-fifths of participants reported having seen a bear at least once in their lifetime (Table 3-3). Currently, corn production is not a common activity in Oyacachi, so the destruction of corn is not a widespread problem. However, 20% of participants mentioned having had their corn crops destroyed by a bear in the past (Table 3-3). This proportion represents 14 households, who reported a mean economic loss of US$ 67.50 (SD = 67.10) per corn crop (Table 3-4).

Currently predation on cattle and sheep is the major problem that creates conflict between the community members and bears. One-fifth of participants reported having had their cattle or sheep attacked by a bear (Table 3-3). This proportion represents 16 households that had attacks to cattle and 4 that had attacks to sheep. The economic loss of each attack ranges from US$ 40 to 1000, with a mean of US$ 343 (SD = 308.87) (Table 3-4). This amount (US$ 343) represents one-quarter of the mean annual income of a household in Oyacachi.

Knowledge Indicators about the Environment and Conservation

Thirteen questions were used to measure people's knowledge about the environment and bear conservation (Table 3-5). Knowledge scores varied on a scale from 0 to 13, with each question answered correctly counted as 1 point. The total knowledge score of participants had an average of 9.62 (SD = 2.48). The mean knowledge score for men, 11.14 (SD = 1.79), was significantly higher than that for women, 8.15 (SD = 2.144) (Table 3-6).

In order to conduct further analyses of the relationship between knowledge and attitudes, behavioral intentions and program support, principal component analysis was used to group knowledge indicators (Appendix E). Four different indices were created, dividing knowledge into four domains: (1) knowledge about ecology and conservation (5 questions), (2) knowledge about local flora and fauna (2 questions), (3) knowledge about bear behavior (3 questions) and (4) knowledge about environmental regulations (3 questions) (Table 3-5). Men were more knowledgeable than women in each of these knowledge domains (Table 3-6).

In order to test the consistency of the indices, a reliability analysis was conducted with the knowledge indicators comprising each index. Cronbach's alpha measure of inter-item correlation was used for this purpose. Usually, a Cronbach's alpha value higher than 0.7 is an acceptable reliability coefficient (Nunnaly 1978), whereas a value less than or equal to 0.30 indicates that items do not share a common theme (Witter 1978). The indices measuring ecology and conservation, local flora, bear behavior, and environmental regulations knowledge had Cronbach's alphas of 0.73, 0.58, 0.22 and 0.35, respectively. In spite of the lower alpha value of the bear behavior knowledge index, it

was maintained because conceptually it is known to measure a common theme (as demonstrated by principal component analysis).

Attitudes toward Bears and the Environment

Participants had a positive response toward the conservation of natural resources and the bear. When asked about the need to conserve nature and the persistence of natural ecosystems such as forests and páramos, 99% and 100% of participants, respectively, answered positively to both questions (Table 3-7), mainly mentioning that those ecosystems were important for obtaining natural resources. The general attitude toward the natural reserve was also positive; 97% mentioned that it was either good or very good to have the RECAY present (Table 3-7). The principal explanation participants gave for this response was that the RECAY protects them against intruders and colonists. Also, 93% of participants thought that the RECAY is necessary for bear survival, and 81% mentioned that this animal needs to be protected (Table 3-7). The majority of respondents were supportive of laws to protect the bear and other animals (93%) (Table 3-7).

When asked more specifically about the bear and its presence in the area, responses were more divided than in previous questions. People were asked to give names of animals that they consider beneficial and animals considered detrimental. The bear was named by 62% (Table 3-8) of the participants as one of the animals considered detrimental, along with others like the puma, which predates on small farm animals, and parrots, which destroy crops. Only 14% of participants included the bear with animals considered beneficial, such as the tapir and deer, which were frequently mentioned (Table 3-8). Most people, 88%, perceived that there are presently more bears than in previous years. The reason given by respondents for this increase is that nobody is hunting the

bear in the reserve. When asked if they would prefer more or fewer bears in the vicinity of Oyacachi, 48% said fewer or much fewer, 39% said the same amount, and only 13% responded they would like to see more bears (Table 3-8). The increase of bear predation on cattle in the last few years was the reason provided for why people were reluctant to have more bears close to them. However, for 67% of participants the bear was important at a personal level, related to aesthetic, utilitarian, ecological or cultural values. Also, three-fifths of the participants thought that the bear could become extinct if it is not protected against hunting (Table 3-8).

Two questions regarding attitudes toward bears can be compared with responses given in 1997, before program implementation. The first question concerns what people think about protecting the bear. No significant differences appear in this response before and after program implementation; 88% of participants in 1997 and 81% in 2003 said the bear should be protected ($X^2 = 0.873$, $p = 0.350$) (Table D-1). The second question makes reference to whether the bear is important to the person being interviewed. In this case, a significant difference is observed. In 1997, 97% of participants said the bear was important for them, while in 2003 a lower proportion, 67%, gave the same response ($X^2 = 10.812$, $p = 0.001$) (Table D-2).

Factors Influencing Attitudes

In order to explore the association of attitudes with other factors, such as knowledge, interactions with bears, and sociodemographic and economic variables**,** the first step consisted of aggregating attitude items by creating indices that represented common themes. Factor analysis was conducted with 10 attitude items (Appendix E), and three indices were created: (1) index about bear protection, grouping 4 questions; (2) index about bear presence, grouping 4 questions; and (3) index about the personal

importance of the bear, grouping 2 questions (Table 3-9). The reliability of these indices was tested using Cronbach's alpha, which had a value of 0.63, 0.53 and 0.33 for indices 1, 2 and 3, respectively.

A set of linear multiple regression models was elaborated, taking each attitude index as the response variable. The explanatory variables incorporated into each model included:

1. **Knowledge indices**: indices measuring knowledge about ecology and conservation, local flora and fauna, bear behavior and regulations.
2. **Sociociodemographic and economic attributes**: Gender, age of participants, number of children under age 15, education level, monthly income, amount of trees used per month, amount of firewood used per week and number of heads of cattle.
3. **Interaction with bear:** One indicator of these variables, whether the bear has predated on cattle or sheep of participants or not, was set aside for the linear multiple regression analysis. The reason for including only this indicator of interaction with the bear, and not including corn crop predation and bear sightings, was that livestock predation was a main issue in the community at the time of the study. The objective was to see the extent to which this conflict was affecting people's support of the conservation of the bear.
4. **Program participation:** To assess program effectiveness, it is important to see if respondents' participation in the ABPC-EEP influenced their attitudes. Their participation in the long distance high school program "SEC" was also included, as this program has had strong support from the ABCP.

Statistical interaction can cause some predictors to appear unassociated with the response variable. A Bivariate Pearson correlation matrix was performed to detect if there was a significant association of each explanatory variable with the response variables, ignoring the rest of the predictors (Appendix F).

Attitudes toward bear protection had a highly significant association with knowledge about ecology and conservation in the linear multiple regression model (Table 3-10). The standardized beta for this predictor was 0.436 ($p < 0.001$), indicating a positive association between this domain of knowledge and people's attitude toward

protecting bears. In contrast, knowledge of local flora and fauna was negatively associated with attitudes toward bear protection, (*Std. beta* = -0.232, $p = 0.022$) meaning that those who know more about local flora and fauna are less likely to have positive attitudes toward bear protection.

The correlation matrix demonstrated that other predictors had an association with attitudes toward bear protection when compared independently. Respondent's age and amount of trees used per month were negatively associated (Appendix F), indicating that elderly people and those who use more trees were more likely to have negative attitudes toward bear protection. Regardless of whether respondents had participated in the ABCP or in the SEC, their education level, knowledge about bear behavior and knowledge about regulations were positively associated with attitudes toward bear protection (Appendix F). This last result indicates that people who have participated in any of these programs, ABCP or SEC, and are therefore more educated and knowledgeable, are more likely to have improved attitudes toward bear protection. In this correlation matrix knowledge of local flora and fauna did not have a significant association with people's attitudes toward bear protection, suggesting that this variable became significant due to statistical interaction with other variables in the multiple linear regression model. A correlation matrix between the explanatory variables (Appendix F) demonstrated a significant positive association between knowledge of local flora and fauna and age, which provides evidence of the interaction between these two variables in the model.

Three factors were significantly associated with attitudes toward bear presence in the linear multiple regression model. Gender was negatively associated (*Std. beta* = -0.225, $p = 0.038$), as women are coded with 1 and men with 2; this indicates that women

are more likely to have a more positive attitude towards bear presence than men. Cattle predation by bears had a negative association with people's willingness to have bears in the area (*Std. beta* = -0.195, $p = 0.034$) (Table 3-10). The last significant variable was an unexpected relationship with the amount of harvested trees per month, which appeared to be positively associated (*Std. beta* = 0.241, $p = 0.016$). This could have been caused by the interaction of this variable with others, such as age and education level, while in a correlation matrix the amount of harvested trees per month appeared not to be associated with attitudes toward bear presence ($r = 0.089$, $p = 0.330$) (Appendix F).

The correlation matrix, comparing the attitude toward bear presence with each predictor (Appendix F), demonstrated that two other variables were related. The number of children under 15 years of age in the household was negatively associated with people's attitude toward the presence of the bear, indicating that people with younger children are more likely to hold negative attitudes. Participation in the SEC program was positively associated with respondents' attitudes toward the bear.

The index measuring the personal importance of the bear combines people's perception of the bear, and their beliefs as to whether this animal can go extinct. The only variable significantly related to this index in the linear multiple regression model was education level (*Std. beta* = 0.326, $p = 0.022$) (Table 3-10); the bear was more important for people who had more formal education than for people who did not. However, many other factors appeared to be related to this attitude in the correlation matrix (Appendix F). As in the previous case of attitude toward bear protection, participants' ages and the amount of trees used per month were negatively associated with their attitudes about the importance of the bear. The variables that proved to have a

positive association with attitudes regarding bear importance were consistent with the previous analysis comparing attitudes toward bear protection. ABCP and SEC participation, education level, knowledge of bear behavior, knowledge of environmental regulations and knowledge about conservation were significantly associated with attitudes about the importance of the bear.

Behavioral Intentions toward Bears and the Environment

Participants' behavioral intentions to protect and conserve the environment were very positive. Almost all of the respondents indicated something that they could do to help conserve their environment (Table 3-11), such as planting some trees instead of only harvesting them, or not hunting wildlife in the reserve. In Ecuador, a common practice that negatively impacts highland ecosystems is the burning of páramo to facilitate the germination of grasses for cattle grazing. Almost everyone interviewed knew that this practice had negative environmental impacts and was forbidden inside the RECAY, and they were willing to report this action to local authorities or forest rangers in order to impede it (Table 3-11). Also, 92% of participants said that they would like to collaborate with forest rangers (Table 3-11) in helping watch for illegal behaviors when they are ranching their cattle in the páramos, for instance inside the RECAY. Also, since the ABCP created workshops that addressed more local environmental problems, such as one with waste management, at the time of this evaluation, 99% of respondents managed their garbage correctly, differentiating between organic and inorganic waste (Table 3-11).

When participants were asked about what to do in the case of an encounter with a bear, their intentions in general were good, but were quite strongly influenced by the context. For instance, people's reactions would vary based on whether the encounter is with a cub or with an adult bear (Table 3-12). When faced with an adult bear, 17% of

respondents said that they would run away because the animal could be dangerous. Five percent said the same if it were a cub. However, 18% responded that they would scare the adult bear using a stick or shooting in the air, while 65% said that they would just leave the animal alone. In front of a cub, only 4% responded that they would try to scare it. Most people would leave it alone (84%), but 7% responded that they would like to catch the animal either to keep as a pet or to play with for a while before releasing it.

Respondents' behavioral intentions in a hypothetical encounter with an adult bear or a cub were more negative before program implementation. In an encounter with an adult bear, the main difference appears to be due to an increase in the proportion of people who said that they would leave the bear alone (52% in 1997 vs. 65% in 2003) (X^2 = 12.714, p = 0.013) (Table D-3). Also, none of the 2003 respondents said that they would catch or shoot the bear, while in 2000 two people mentioned that action. In the case of an encounter with a cub (X^2 = 15.978, p = 0.001) (Table D-4), the difference was due to the increase in the number of participants who said that they would leave the cub alone (58% in 1997 vs. 84% in 2003) and in the reduction of people who said they would catch the cub (30% in 1997 vs. 7% in 2003).

An interesting difference occurs when people see the bear at different distances from their property (Table 3-13). If participants encountered a bear in the forest, they would either let it go (88%) or scare it (12%). The situation changes when people see a bear in their crops. In this case, most participants would scare the bear (80%) or even shoot to kill it (7%). Only 14% said that they would leave it alone. If the bear were found close to respondents' cattle, people's behavioral intentions would be even more negative toward the animal. Three quarters of respondents said that they would scare the

bear, and 16%, more than twice that of the previous scenario, said that they would shoot the bear. Only 8% responded that they would leave the bear alone if it was close to their cattle. When people were asked what they would do if a bear was close to their homes, behavioral intentions were more positive than in the two previous situations (crops and cattle). Half of respondents said that they would scare the bear, 47% would leave it alone and just 3% would shoot it. People in Oyacachi commonly believe that the bear can kill humans, so this last result shows the importance of crops and cattle in people's lives, indicating that they seemingly value these resources more than their personal security. A significant proportion of the participants, 18% (Table 3-14), believed that their best recourse against avoiding bear damage to their cattle and crops would be to kill them. However the majority, 82%, thought that alternative actions could be taken to solve this problem. For example, participants suggested that they could watch over their cattle more vigilantly or build fences to keep bears away. This question was also asked in the 1997 survey, when 20% of participants responded that the best course of action would be to kill the bear. There was no significant difference between the responses to this question before and after program implementation ($X^2 = 0.038$, $p = 0.846$) (Table D-5).

Due to its location inside a natural reserve, tourism in Oyacachi is increasing as an important local economic activity. When asked about how people could best use the bear, in 1997, 67% of respondents indicated that it would be to use the bear as an attraction for tourists. In 2003, there was a significant increase to this response, with 84% ($X^2 = 4.554$, $p = 0.033$) sharing this same idea (Table D-6). This can be considered a positive change, since people who see the bear as useful when it is alive could be more in favor of supporting its conservation. However, 60% of respondents also expressed an

interest in having the opportunity to sell bear parts, which are very sought after in local and international markets (Table 3-14).

Factors Influencing Behavioral Intentions

The principal objective of this analysis is to explore what variables could be influencing people's positive or negative behavioral intentions in conflict situations between humans and bears. Three indicators, which clearly measured the behavioral intentions of people in a conflict situation, were grouped and transformed into an index through factor analysis. The three indicators were: a) Action to avoid bear damage to crops and cattle; b) reaction of participants when a bear is close to their crops; and c) reaction when a bear is close to their cattle. The reliability of the index was a Cronbach's alpha coefficient of 0.58.

A linear multiple regression model was conducted using the behavioral intention index as a response variable. As in the previous analysis, the explanatory variables were knowledge indices, sociodemographic and economic attributes, interaction with bears, and program participation. The model explained 23% of the variance on the response variable. Only two variables were significantly related to people's responses when presented with a hypothetical conflict situation with a bear (Table 3-10). Gender had a negative beta coefficient (*Std beta* = -0.464, $p < 0.001$). This indicates more positive behavioral intentions of women, in an interaction with the bear, than of men. The second significant variable was a knowledge index about ecology and conservation, which had a beta coefficient of 0.243 ($p = 0.044$) This signifies that people who know more about these issues are more likely to express positive behavioral intentions toward the bear. Conversely, the correlation matrix showed knowledge about local flora and fauna to have a significant negative association with people's behavioral intentions (Appendix F).

ABCP -EEP Perceived Results by the Community

In order to evaluate the achievements of the ABCP with the adult population, a set of questions covering multiple topics was posed to indicate project success (Table 3-15). For this purpose, the analysis started by identifying whether the project was known within Oyacachi. Almost all interviewees (97%) had heard about the project, and 91% could say what people working in the ABCP were doing in Oyacachi. However, participants mostly made reference to the research being conducted on bear ecology, rather than mentioning activities conducted with residents themselves.

A total of 63 interviewees (43%) said that they had participated in at least one activity of the ABPC. When asked about how they felt about this experience, the response was generally positive, with respondents stating that they had had either a very good (36%) or good (52%) experience because they had learned new things. For the 10% who had participated but stated that the experience was neither good nor bad, these respondents said that they had learned very few things and that nothing was put into practice. Only one person thought the experience was bad, after attending one workshop that she considered a waste of time. Most adults also supported the activities conducted with children at the school. Although less than half of the respondents (41%) knew about the activities with children, after having the change in the curriculum that included environmental education explained to them, 82% supported this initiative.

The ABCP seems to have reached a significant proportion of the population. Half of respondents mentioned that the project has provided them with increased knowledge about the environment. However, it is important to mention that other organizations and projects working in the RECAY were mentioned as sources of environmental education along with the ABCP. These included the Ministry of Environment, which is the national

organization in charge of administrating protected areas, and the Ecuadorian NGOs, Fundación Antisana and Fundación Ecológica Rumicocha. Despite the fact that the ABCP and other groups have been conducting different forms of environmental education in the RECAY, 92% of respondents said that they would like to learn more about the environment, and 88% would like to be enrolled in an activity for conserving natural resources in the area. The main topics in which participants mentioned having interest were related to the management of natural resources, particularly tourism, organic agriculture, and low impact cattle ranching. This positive result presents evidence of local people's support for conservation programs, like the ABCP in Oyacachi, through the willingness of people to continue participating in it.

Sixty-five percent of participants thought that a positive change in people's attitudes toward the environment has occurred in Oyacachi since implementation of the ABCP. They mentioned that there is currently more local awareness about the environment than in previous years. A similar proportion of participants (66%) thought that the ABCP was also useful (56%) or very useful (10%) for the development of the community. They justified this response by saying that having more knowledge of the environment helps them to better manage their natural resources. However, people who thought that the project was not useful (16%) or only slightly useful (18%) for the community mentioned that they did not need more education, but rather more "things" to help them in their daily life, such as a project to improve their cattle ranching and agriculture systems.

It is worth mentioning that before this study began, the *Cabildo* did not approve the ABCP to continue with its research on the bear in Oyacachi. This internal governance

system of the community involves all community members over the age of 18. The reasons given by the *Cabildo* for their decision were discrepancies among community members' opinions about project activities, which had become more negative following events of bear predation on cattle. The *Cabildo* also argued that the ABCP was not leaving any benefit for the community, such as contributing directly to their economy (David Parión, President of the Cabildo, pers. comm. 2003). In order to assess whether the ABCP was indeed causing conflicts between community members, a fact that would not be positive for further development of the project and the EEP, participants were asked their opinion on this matter. A significant proportion of the responses (41%) indicated that the project creates some (31%) or a lot of conflicts (10%). Another 41% of respondents said that it caused few (5%) or very few (36%) conflicts, while 18% indicated that the project was not a source of conflict (Table 3-16). The main source of conflict mentioned by respondents concerned the procedures that were being used to research the bear at that time. Respondents complained about the bait, which included cattle blood among other ingredients, to attract bears to hair traps planted in close proximity to the community. People thought that the use of this bait could likely be the cause of the increase in cattle predation by bears.

Another source of conflict that would not favor EEP implementation would be if people felt that their culture was not being respected by an external intervention. This is particularly important in this context, since Oyacachi is made up of a group of indigenous people who have inhabited the area for more than five centuries, and have a strong culture and unique worldview. In regards to this topic, participants responded favorably to the ABCP, with 97% agreeing that the project's respect of their culture was either good

(56%) or very good (41%) (Table 3-16). People mentioned that in addition to respecting their culture, the ABCP also encouraged the recovery of Oyacachi traditions.

Factors Related with Perception about ABCP-EEP Results

As in the case of attitudes and behavioral intentions, people's perception of ABCP-EEP results could be related to multiple factors, so an index was created through factor analysis (Appendix E) to measure this. The index included three items: (1) whether the project was mentioned as a source of environmental learning; (2) if the project has resulted in changing attitudes that favor conservation in the community; and (3) the perceived usefulness of the project to development of the community. The index reliability was tested with Cronbach's alpha coefficient, which had a value of 0.47. After this procedure, a linear multiple regression model was conducted to look for associations between perceived results (response variable) and knowledge, bear interaction, sociodemographic and economic attributes**,** and program participation (explanatory variables).

The explanatory variables included in the linear multiple regression model (Table 3-10) explained 31% of the variance in the response variable – perceived program results. Three variables had a significant association with the perception of the ABCP-EEP results. Gender was negatively correlated (*Std. beta* = -0.233, $p = 0.024$), indicating that women had a better perception of the project's results than men. Participation in the ABCP (*Std. beta* = 0.255, $p = 0.017$) and in the SEC program (*Std. beta* = 0.204, $p = 0.049$) was positively associated with people's responses that supported project's results. This indicates a positive experience and perception of the project after participation in it. Besides these three variables, the correlation matrix showed that income, education level,

and knowledge about conservation were significant in their positive correlation with participants' perceptions about program results (Appendix F).

Evaluating the ABCP-EEP on Children

To evaluate results with children, the following analysis was conducted: (a) Children's knowledge level in 2000 and 2003 were compared; and (b) current attitudes, behavioral intentions and school/program support of children were described and compared to results obtained in 2000. This before-and-after comparison was possible through the analysis of 9 questions from the 2000 survey that could be repeated in 2003 (Table 3-17).

Knowledge

In order to examine a change in children's knowledge level, the 9 knowledge questions conducted in 2000 and repeated in 2003 were summed to create a total knowledge score with a maximum value of 9. The results of comparing the knowledge score between these two years showed similar media, 5.62 in 2003 and 6.04 in 2000 (Table 3-18). A t-test confirmed that there was no statistical difference between these two means ($t = 1.214$, $p = 0.229$), indicating no significant change in children's knowledge after PECAE implementation.

Attitudes

Children expressed a very positive attitude toward the environment. In 2003, 100% of them responded that the environment should be protected, and 85% thought that forests and páramos should persist in their environment. Most children (91%) believed that it is good for them to have the RECAY in the area, because it helps to protect plants and animals (Table 3-19). The first and third responses were compared with results from 2000. A Chi-Square test shows there is no significant difference between both years. In 2000, 97% ($X^2 = 1.245$, $p = 0.265$) (Table D-7) of children were in favor of protecting the

environment, and 86% ($X^2 = 0.362$, $p = 0.547$) thought that the RECAY was positive (Table D-8).

Children's attitudes toward bear protection also were very positive. Ninety percent thought that this animal needs to be protected, and that the RECAY is essential for its survival (Table 3-19). However, similarly to the adult respondents, children also did not seem to favor having more bears around Oyacachi. Half of them mentioned they would prefer fewer or far fewer bears present in the area (Table 3-19), because the bear kills cattle. A smaller proportion (33%) of children said they would like to have more bears living around Oyacachi, so that they could see them more often. When asked if the bear was important to them for any reason, 48% responded positively, largely due to aesthetic values. Children also were aware of the possibility of the bear's extinction, with 64 % of them responding that this could happen; the main reasons given by children were that if it is not protected, the bear would be hunted, and also that few bears remain in the forest.

Behavioral Intentions

Children's behavioral intentions toward the environment also are positive. When asked about what they could do to help to conserve the environment, 86% of children mentioned ideas, such as planting trees or not hunting animals (Table 3-20). Children also were aware of damage caused by burning the páramo. When asked what they would do if they saw someone setting fires in this ecosystem, 84% of children responded that they would do something, such as call a forest ranger. Their intention to help take care of the environment is also reflected in the fact that 87% of children responded that they would like to help forest rangers with their work (Table 3-20). These same three questions were asked in 2000. The frequencies of positive responses between years 2000 and 2003 did not show statistical differences (Tables D-9. D-10 and D-11).

When asked about what they would do in an encounter with a bear, 17% of children in 2000, and 7% in 2003, responded that they would call an adult to kill it. This difference may represent a positive trend in children's attitudes toward the bear, despite the fact that it was not statistically significant ($X^2 = 1.823$, $p = 0.177$) (Table D-12). Similarly to the adult respondents, children's behavior would depend on the context where the encounter with a bear occurred. No children said that they would call an adult to kill the bear if the bear were seen in the forest, while 5, 12 and 26% of children would do so if they saw the bear in their crops, home or close to their cattle, respectively (Table 3-21).

School and Program Support

Sixty-one percent of children at the school have heard about the ABCP, and 47% of them could say something about the activities of the ABCP in the community. However, these answers primarily made reference to the ecological study of the bear (Table 3-22). When asked about their school, almost all the children responded they like it (98%) and are happy with their teachers (95%) (Table 3-22). In 2000, children had the same positive responses to these two questions, showing no significant difference when compared to 2003 (Tables D-13 and D-14). Also, almost all of the children supported the school curriculum. Most of them (98%) said that they like what they are currently learning, and when asked about environmental themes, 84% said that they enjoy learning about the environment (Table 3-22).

The motivation of children to continue on to high school is very strong, with almost all of them (96%) wanting to enroll. When asked if they would like to continue studying in Oyacachi, 81% responded affirmatively (Table 3-22). Children in 2000 had the same feelings about continuing on to high school, with no significant difference in responses

between the two years (Tables D-15 and D-16). In Oyacachi, it is possible to choose between two systems of high school, the Crecerá and the SEC. The first is the traditional system, whereas the SEC, which is designed for people who live within or in the buffer zones of protected areas, has a strong environmental education component. When asked which program they would like to continue with for high school, most children (77%) chose the SEC, which might reflect their interest in learning about the environment.

Focus Group Responses

Focus groups were conducted with local authorities, teachers and para-biologists. The opinions of these community members were essential in understanding the project and in evaluating its success. The central topics of the focus group discussions were: (1) perceptions about the project's results or achievements in Oyacachi regarding education and capacity-building in conservation; (2) perceived problems or failures faced by the ABCP-EEP, and ways in which the project could be improved; and (3) views about the collaboration between the ABCP and EcoCiencia, the NGO that administrates the ABCP.

Focus Group with Authorities

Six members of the *Cabildo*, including its president, participated in this focus group. They expressed the belief that the ABCP increased community awareness toward protecting the environment, as people have more knowledge now than before the project's implementation. Authorities also thought that the project had contributed to a reduction of wildlife poaching and deforestation in Oyacachi. They indicated that the collaboration between the ABCP and SEC program was the most successful activity conducted with the adults, since its participants are the most motivated and supportive of conservation activities. The EEP (PECAE) with the elementary school was also well

supported by these authorities, because they recognize its contribution to the development of children's skills.

The authorities recognized some failures that, they believe, hindered the success of the EEP conducted by the ABCP in Oyacachi. Their perception was that the project had not reached the entire population, but rather only those who had participated in the workshops or in the SEC, and those who had worked as para-biologists. Also, they mentioned a lack of continuity in the EEP activities conducted with children and adults, which had reduced the motivation of the participants. Finally, they viewed people's lack of practicing what they had learned as a failure of the project. As an example, they gave the case of an ecotourism project, designed by the ABCP and students at the SEC, which never was implemented, leaving participants feeling as if their efforts were a waste of time.

A general concern of the authorities was that the main problem of the ABCP-EEP, and other similar conservation initiatives, was a lack of community-based development projects in their agendas. They emphasized the importance of creating projects that can provide alternatives for people's livelihoods, particularly since the management of natural resources in Oyacachi is restricted because they are located inside a natural reserve, hindering community development. Projects that they thought could contribute to community development, while achieving conservation goals, included improvements in dairy cattle, sale of handicrafts, ecotourism and organic agriculture. The need for development projects was a recurrent theme during the meeting. One participant even mentioned that people of Oyacachi already know what is good or bad for the environment, and what they really need is these kinds of projects. They spoke about

being the ones who are forced to conserve nature at the expense of their own wealth and possibility for development, while researchers are the ones who can profit from this.

The authorities also expressed concerns regarding bear predation on cattle. They noted that the ecological study of the bear, which had been conducted for more than four years in Oyacachi, had not resulted in finding useful information toward a solution for this problem. The ABCP had not made any suggestions to help them deal with this conflict. In this focus group, the authorities made it clear that the bear is a problem in the community. Without project-supported research toward finding a solution to this problem, it would be difficult for the community to support conservation of this species.

Focus Group with Teachers

Three teachers participated in this focus group. They believed that their collaboration with the ABCP had positive results. All teachers agreed that children have better attitudes and behaviors toward the environment since implementation of PECAE. Attendance in school was considered normal, and children were motivated to learn new things, particularly in the area of natural science, where themes regarding animals and plants highly interest them. However, teachers also mentioned difficulties with teaching children to take care of wildlife, especially the bear, because the children also perceive conflicts with this animal and ask their teachers how it is possible to conserve an animal that kills their cattle and sheep.

The teachers mentioned two kinds of limitations in teaching children. The first was related to a lack of resources. Some themes could not be studied in depth, because the school did not have appropriate didactic materials, such as audiovisuals, microscopes or a library where children could sit and study. The second limitation was related to the teachers' own training. They needed more capacity-building in areas like pedagogy, in

order to develop methodological strategies to implement the program. They also thought that better language, arts and sports programs would complement the children's education. Also, the teachers felt that they needed to develop a better evaluation system, to permit them to keep better track of the teaching and learning processes. They felt comfortable teaching themes related to the environment, where they thought that the capacity- building process had been successful. Aside from the previous limitations, the only problem teachers saw in the school was the apathy of some students; however, they thought that this problem could be resolved by talking with them. Teachers did not see any failures of the EEP conducted with children and wanted to continue collaborating with the ABCP.

When asked about the results that the project had with the rest of the community, teachers mentioned changes since the project's implementation five years ago, namely that there had been an increase in environmental awareness. However, this change was not only attributed to the activities conducted by the ABCP, but also to the work of other entities, such as the NGOs *Antisana* and *Rumicocha*.

Teachers believed that the project was not as fully supported as it should have been, largely because the community was waiting for more tangible results, such as an ecotourism project, which could bring economic benefits to the community. Teachers also mentioned that, in 2002, the *Cabildo* did not give the ABCP permission to continue with its research on the bear. The main reasons provided for this were that community members thought the project was not giving anything back to the community (e.g., development projects) and only those who worked directly on the project, such as para-

biologists, were gleaning any benefits. These last comments reflect the opinions gathered from the members of the *Cabildo* themselves.

Focus Group with Para-Biologists

Seven para-biologists participated in this focus group. They perceived no noticeable change in people's attitudes or behaviors since implementation of the ABCP five years before. Before the project began, people in Oyacachi were already aware of the need to protect nature, since they are located within a natural reserve, although they thought that people had gained more knowledge about the environment. They also contrasted Oyacachi with communities located outside the RECAY, which had already devastated all their forests.

The para-biologists thought the project had positive results in working with individuals, allowing them in particular to acquire a lot of experience. They saw the project as failing to involve the entire community in its activities. However, EcoCiencia was perceived by the community as the organization that has been working more continuously and for a relatively longer period of time (since 1997) than other NGOs, which was acknowledged as a positive trend for this organization and the ABCP. They recognized that the community had been supported by the ABCP in a variety of aspects, from the program with the school, to workshops with adults, to their collaboration with the SEC. Also, they appreciated the contribution of the ABCP in the elaboration of a map that demarcated the boundaries of Oyacachi's territory within the RECAY.

They supported the idea of conducting workshops in the community, although they thought that what was lacking was an application of the concepts learned. They would have liked to see more activities of the ABCP contributing to the economic development of the community, such as projects to improve cattle ranching and family crops. They

felt that these activities would provide people with alternative livelihoods and, therefore, contribute to the conservation of ecosystems and animals like the bear.

The para-biologists had positive attitudes toward the ABCP's research on the bear, which they thought would provide valuable information on its management and help the community in preventing bear attacks on cattle. Para-biologists mentioned the conflict that currently exists with this species, which had started in the preceding five years. The ABPC was currently being blamed for this increase in cattle predation, through the use of cattle blood in the bait for attracting the bear to hair traps.

The para-biologists also mentioned that people in Oyacachi think that there is more concern for bear survival than for the social welfare of its people, since they are highly restricted by the reserve in the management of their natural resources. They believed that the problem with the bear needed to be resolved as soon as possible, in order to improve the support for the ABCP in the community. A plan to give economic compensation to people who had lost their cattle was suggested in the meantime.

Limitations of the Study

There are three main factors that limit the results of this evaluation:

1. The lack of baseline information for an appropriate measure of changes in knowledge, attitudes and behavioral intentions of the target population, before and after implementation of the ABCP. This was primarily a problem in evaluating program impacts on adults. Also, the differences of sample sizes between years 1997 and 2003 represent an important source of error in the results that needs to be considered in their interpretation.

2. Confounding factors are important to consider when interpreting the results of this evaluation. As mentioned previously, several governmental and non-governmental organizations have been performing activities related to environmental education in the community of Oyacachi. It was not possible to separate the potential influence of these other activities from results that could have been caused by the ABCP-EEP.

3. When evaluating EEP activities with children, the baseline information available for comparison was the response of students to a questionnaire conducted in 2000, before

PECAE implementation. However, in 1998 a pilot EEP was performed at the school by the ABCP, which means the children and teachers had already received some environmental education when they performed the surveys in 2000, used as a baseline for the present evaluation.

Table 3-1. Sociodemographic and economic indicators

	N	Minimum	Maximum	Mean	SE	SD
Age	147	17	60	34.367	0.924	11.198
Daughters and sons Under the age of 15	145	0	6	2.324	0.129	1.554
Monthly income ($US)	145	18	400	118.816	6.028	73.086
Trees harvested per month*	127	0	24	4.314	0.417	5.055
Firewood used (Kg/week)	101	7	345	94.050	5.349	64.851
Head of cattle	147	0	17	7.843	0.296	3.591

*(1 unit equals one small tree of approximately a DBH of 20 cm)

Table 3-2. Education levels of survey respondents

	Frequency	Percentage	Cumulative percentage
No formal education	12	8.2	8.2
Some elementary school	37	25.2	33.3
Completed elementary school	47	32.0	65.3
Some high school	27	18.4	83.7
Completed high school	20	13.6	97.3
More than high school	4	2.7	100.0
Total	147	100	

Table 3-3. Interaction/conflicts between the bear and participants

	Percentage	Frequency	N
Have ever seen a bear	59.9	88	147
Corn crops destroyed by bear	19.7	29	147
Cattle or sheep killed by bear	21.8	32	147

Table 3-4. Costs of damages caused by bear ($US)

	N*	Minimum	Maximum	Mean ($US)	SE.	SD
Corn crops	14	10	200	67.5	17.934	67.104
Cattle or sheep	20	40	1000	343	69.066	308.871

*N=participants that reported predation on crops or cattle and provided an estimated cost of those damages.

Table 3-5. List of knowledge indicators, grouped in four domains

Knowledge Indicators
Domain 1. Knowledge about ecology/conservation
Q 3.What is an ecosystem?
Q 4.Where do we find a diversity of animals and plants?
Q 6.What species are in danger of extinction?
Q 7.Are there any animals in the forest or páramo that can go extinct?
Q 8.Why is the bear important for the forest and the páramo?
Domain 2. Knowledge about local flora and fauna
Q 1.Which of these animals lives in the forest or the páramo?
Q 2.Which of these plants is found in the forest or in the páramo?
Domain 3. Knowledge about bear behavior
Q 9.What does the bear eat?
Q 10.How does the bear live?
Q 11.Does the bear take care of its cubs?
Domain 4. Knowledge about regulations
Q 12.Is there a law that protects the spectacled bear?
Q 13.Is there a management plan for Oyacachi?
Q 16.Do you know what the RECAY is?

Table 3-6. Comparison between knowledge level of male and female participants

	Gender	N	Mean	SD	SE	T-test for Equality of Means		
						t	df	P
Conservation knowledge	Male	72	2.390	1.124	.132	-4.828	145	.000
	Female	75	1.516	1.071	.124			
Local flora and fauna knowledge	Male	72	1.589	.120	.014	-5.983	145	.000
	Female	75	1.438	.1801	.021			
Bear behavior knowledge	Male	72	1.677	.298	.035	-5.457	145	.000
	Female	75	1.328	.457	.053			
Regulations knowledge	Male	72	2.903	.298	.035	-2.913	145	.004
	Female	75	2.667	.622	.072			
Total knowledge score	Male	72	11.142	1.794	.211	-9.156	145	.000
	Female	75	8.149	2.144	.248			
	Total	147	9.615	2.480	.205			

Table 3-7. Attitudes toward conservation of bears and the natural environment

	Percent	Frequency	N
The environment should be protected	99.3	146	147
Forest and páramos should persist	100	146	146
It is good to have the RECAY:			
Not good at all	0	0	138
Not good	1.4	2	138
Neither good nor bad	1.4	2	138
Good	64.5	89	138
Very good	32.6	45	138
The RECAY is needed for bear survival:			
Not necessary at all	0	0	132
Not necessary	6.0	8	132
Neither necessary nor unnecessary	0.8	1	132
Necessary	71.2	94	132
Very necessary	22.0	29	132
The bear needs to be protected	81.0	115	142
Laws to protect the bear and other animals are needed	92.7	127	137

Table 3-8. Attitudes toward bears

	Percent	Frequency	N
Bears are mentioned as detrimental animals	61.9	91	147
Bears are mentioned as beneficial animals	14.3	21	147
Amount of bears participant would prefer to exist around Oyacachi:			
Much less bears	2.1	3	145
Less bears	45.5	66	145
Same amount	39.3	57	145
More bears	11.7	17	145
Many more bears	1.4	2	145
Amount of bears perceived at the present time compared with previous years:			
More	87.8	108	123
Same amount	6.5	8	123
Less	5.7	7	123
Thinks the bear has personal importance	67.1	98	146
Thinks the bear can go extinct	61.0	75	123

Table 3-9. Questions grouped in indices

Index 1: Bear protection (Mean = 4.886, SD = .902, N= 122)
Q 17. Do you think it is good to have the RECAY?
Q 18. How necessary do you think the RECAY is for bear survival?
Q 19. Do you think the bear needs to be protected?
Q 26. Do you think laws to protect the bear and other animals are needed?
Index 2: Bear presence (Mean = 4.886, SD = .902, N= 122)
Q 20. Do you think there are animals in the forest that are detrimental?
Q 21. Do you think there are animals in the forest that are beneficial?
Q 22. Are there currently more bears than in previous years?
Q 23. Would you prefer more or fewer bears in the forest?
Index 3: Bear persona importance (Mean = 2.018, SD = 1.141, N= 122)
Q 24. Does the bear have any importance for you?
Q 25. Do you think the bear is an animal that can disappear from the forest forever?
Index 4: Behavioral intention in a conflict with a bear (Mean = 3.264, SD = .999, N= 146)
Q 33. Take action to avoid bear damages
Q 36. Reaction in front of a bear close to crops
Q 36. Reaction in front of bear close to cattle
Index 5: ABCP-EEP perceived results (Mean = 2.032, SD = .970, N= 115)
Q 44. Is the project useful for the community?
Q 45. Observed changes in people?
Q 54. Project as a source of environmental learning?

Table 3-10. Linear multiple regression models

Explanatory variables	Attitudes toward bear protection		Attitudes toward bear presence		Bear personal importance		Behavioral intention in a conflict with a bear		ABCP-EEP perceived results	
	Std. Beta Coefficient	Sig.	Std. Beta Coefficient	Sig.	Std. Beta Coefficient	Sig.	Std. Beta Coefficient	Sig.	Std. Beta Coefficient	Sig.
Gender	.060	.540	-.225	.038	-.063	.550	-.464	.000	-.233	.024
Age	-.037	.713	-.050	.653	-.022	.830	.113	.267	.078	.469
Education Level	.044	.734	-.195	.195	.326	.022	.079	.560	.252	.089
Children under 15 yrs	.030	.742	-.161	.107	-.015	.881	.050	.573	.064	.507
Monthly income	-.101	.240	.021	.822	-.001	.989	-.023	.784	.145	.101
Trees harvested per month	-.014	.873	.241	.016	.001	.993	-.056	.520	-.064	.496
Firewood used per month	.031	.713	-.007	.942	.080	.374	-.076	.375	.087	.340
Heads of cattle	-.108	.230	.197	.054	.019	.843	-.042	.640	.042	.652
Cow predation by bears	-.105	.200	-.195	.034	.136	.126	.011	.890	.021	.810
SEC participation	.075	.441	.126	.268	-.021	.837	-.013	.895	.204	.049
ABCP participation	.083	.387	.184	.104	.061	.557	.030	.757	.255	.017
Conservation knowledge	.436	.000	.225	.089	.150	.234	.243	.044	-.036	.772
Local flora and fauna knowledge	-.232	.022	-.098	.343	-.058	.568	-.103	.273	-.088	.388
Bear behavior knowledge	.107	.218	.090	.369	.154	.114	.019	.839	.030	.743
Regulations knowledge	.099	.244	-.028	.778	.092	.333	-.051	.563	-.016	.861
R^2	.364		.225		.302		.225		.361	
Adjusted R^2	.274		.115		.203		.135		.264	
SE of the estimate	.769		1.087		1.019		.929		.833	

Table 3-11. Behavioral intentions toward environmental protection

	Percent	n	N
Would do something to help to protect the environment	99.3	139	140
Reacts positively if someone burns the páramo	97.9	138	141
Would collaborate with forest rangers	92.3	132	143
Manage their garbage correctly	99.3	145	146

Table 3-12. Reaction in hypothetical encounter with a cub and an adult bear

	Bear cub		Adult bear	
	Frequency	Percent	Frequency	Percent
Shoot it	0	0.0	0	0.0
Catch it	10	6.8	0	0.0
Scare it	6	4.1	27	18.4
Run	8	5.4	25	17.0
Leave it alone	123	83.7	95	64.6
Total	147	100.0	147	100.0

Table 3-13. Behavioral intentions toward a bear at different degrees of proximity

	Forest		Your crops		Your cattle		Your home	
	%	n	%	n	%	n	%	n
Shoot it	0.0	0	6.8	10	15.8	23	2.7	4
Catch it	0.0	0	0.0	0	0.0	0	1.4	2
Scare it	12.2	18	79.6	117	76.7	112	49.3	72
Leave it alone	87.8	129	13.6	20	7.5	11	46.6	68
Total	100.0	147	100.0	147	100.0	146	100.0	146

Table 3-14. Behavioral intentions toward bear management

	Percent	Frequency	N
Think killing the bear is the best solution to avoid bear attacks on cattle	18.4	27	147
Think the bear can best be used as a tourism attraction:			
Response in year 1997	66.7	22	33
Response in year 2003	83.5	101	121
Would like to sell bear parts	59.9	81	137

Table 3-15. ABCP-EEP perceived achievements by the community

Abbreviated topic statement		Percentage	Frequency	N
Have heard of the ABCP		97	143	147
Know what ABCP is doing		91	131	144
Have participated in any ABPC activity		43	63	147
Felt the experience was:	Very bad	0	0	63
	Bad	1.6	1	63
	Nor good nor bad	9.5	6	63
	Good	52.4	33	63
	Very good	36.5	23	63
Know about the change in the school's curriculum		41	58	142
Agree with new program at the school		82	121	147
Mentioned the ABCP as a source of environmental learning		49	71	145
Interested in learning more about the environment		92	134	145
Interested in participating in a conservation activity		88	121	138
See any positive change in people's behavior toward the environment		65	80	123
Perceived usefulness of the ABCP for community development:				
	Not useful	15.9	20	126
	Somewhat useful	18.3	23	126
	Useful	56.3	71	126
	Very useful	9.5	12	126

Table 3-16. Other important perceptions about ABCP

Abbreviated topic statement		Percentage	Frequency	N
ABCP as a source of conflict between community members:				
	Creates a lot of conflicts	9.9	13	131
	Creates some conflicts	31.3	41	131
	Creates few conflicts	35.9	47	131
	Creates very few conflicts	4.6	6	131
	Creates no conflicts	18.3	24	131
Project's respect toward the culture of the community:				
	Very bad	0	0	136
	Bad	0.8	1	136
	Neither good nor bad	1.5	2	136
	Good	56.2	73	136
	Very good	41.5	54	136

Table 3-17. Questions for children compared between the years 2000 and 2003

Question	Attitudes
Q 14	Do you think the environment should be protected?
Q 17	Do you think it is good to have the RECAY?
	Behaviors intentions
Q 25	What would you do to help to conserve the environment?
Q 26	What would you do if you see someone burning the páramo?
Q 27	Would you like to collaborate with the work of forest rangers?
Q 29	If you encountered a bear, what would you do?
	School evaluation
Q 38	Do you like school?
Q 39	Are you happy with your teachers?
Q 42a	Would you like to continue with high school?
Q 42b	Would you like to study in Oyacachi or in another place?

Table 3-18. Comparison between knowledge scores in 2000 and 2003

	Test Year	N	Mean	SD	SE	T-test for Equality of Means		
						t	df	P
Knowledge score*	2000	36	6.04	1.625	.271	1.214	78	.229
	2003	44	5.62	1.509	.227			

*Maximum score = 9

Table 3-19. Attitudes of children at the school

	Percentage	Frequency	N
The environment needs to be protected	100.0	43	43
Forests and páramos should exist	85.4	35	41
Having the RECAY is good	90.5	38	42
Bears need the reserve to live	89.5	34	38
Bears need to be protected	90.0	36	40
Amount of bears wanted in Oyacachi:			
Much less	10.0	4	40
Less	40.0	16	40
Same amount	15.0	6	40
More	17.5	7	40
Many more	17.5	7	40
Think bear has personal importance	47.6	20	42
Think bear can go extinct	64.3	27	42

Table 3-20. Behavioral intentions of children at the school

		Percentage	Frequency	N
Actions to conserve the environment		86.4	38	44
Would stop burning of páramos		84.1	37	44
Would like to help forest rangers		87.2	34	39
Reaction in an encounter with an adult bear:				
	Shoot it	7.0	3	43
	Take it home	2.3	1	43
	Scare it	7.0	3	43
	Get scared	9.3	4	43
	Run away	16.3	7	43
	Take a picture	25.6	11	43
	Leave it alone	32.6	14	43

Table 3-21. Children's behavioral intentions toward a bear at varying degrees of proximity

A bear in:	Forest		Crops		Cattle		Home	
	%	n	%	n	%	n	%	n
Call an adult to kill it	0.0	0	4.8	2	25.6	11	11.6	5
Scare it	15.9	7	42.9	18	48.8	21	51.2	22
Run away	13.6	6	9.5	4	16.3	7	16.3	7
Leave it alone	70.5	31	42.9	18	9.3	4	20.9	9
N		44		42		43		43

Table 3-22. Students awareness of ABCP-EEP and support of the school program

		Percentage	Frequency	N
Have heard of ABCP		61.4	27	42
Know what ABCP is doing		47.4	18	38
Enjoy the school		97.7	42	43
Happy with teachers		95.3	41	43
Enjoy what s/he is learning		97.7	43	44
Enjoy what s/he is learning about environment		84.1	37	44
Would like to continue on to high school		95.5	42	44
Would like continue high school in Oyacachi		81.0	34	44
In what program would like to be				
	Did not know	2.9	1	34
	Crecerá	17.6	6	34
	SEC	76.5	26	34
	Both programs	2.9	1	34

CHAPTER 4
DISCUSSION

This study evaluates the Environmental Education Program of the Andean Bear Conservation Project (ABCP-EEP). The goal of the research is to provide information that will help the ABCP improve its future conservation strategies toward protecting the spectacled bear population inside the RECAY. The results of this evaluation demonstrate partial success of the ABCP-EEP. Environmental knowledge, socio-economic attributes, and conflicts with the bear, are highlighted as important variables in influencing participants' positive attitudes and behavioral intentions toward conservation of the Andean bear and support for the ABCP.

In order to address the four objectives proposed at the beginning of the study, the discussion is organized as follows: (1) I describe the results of the evaluation in regards to changes in environmental knowledge levels, attitudes, and behavioral intentions, before and after ABCP-EEP educational interventions; (2) I assess the influence of knowledge, socioeconomic variables, and previous interactions with the bear on these attitudes and behavioral intentions; (3) I discuss people's perceptions of program results and support that they give to the ABCP, and how knowledge levels, socioeconomic variables and participants' interaction with the bear influence this support; and finally (4) I compare the ABCP-EEP with other efforts to conserve large carnivores conducted in different parts of the world.

Knowledge, Attitudes, and Behavioral Intentions in Oyacachi

The first objective of this study is to assess current levels of environmental knowledge, attitudes and behavioral intentions toward the conservation of the Andean bear, along with changes since program inception. This evaluation is essential for identifying whether or not the environmental education program has been successful.

Knowledge, Attitudes and Behavioral Intentions in Children

The questionnaires conducted with students at the elementary school provided little evidence of the EEP success in heightening their environmental knowledge. There was a slight decrease in the environmental knowledge of children from 2000, when the PECAE began to be implemented, to 2003. Additionally, children had moderate levels of environmental knowledge, with a mean of 66% and 62% of the total knowledge scores for the years 2000 and 2003, respectively. However, it is important to point out that the ABCP conducted educational activities with children, along with environmental capacity-building for teachers, at the school in 1998, before the collection of baseline information in 2000. This could explain the observed decrease in children's level of environmental knowledge from 2000 to 2003, as teachers began to incorporate environmental education into the curriculum in 1998. Unfortunately, it was not possible to measure the impact of these previous activities on results obtained in 2003. The finding of no changes in children's knowledge level, along with their overall low score, suggest that greater efforts are needed to increase children's environmental knowledge. This result also provides evidence that does not support first hypothesis of this study, which anticipated an increase in knowledge, positive attitudes and behavioral intentions of children after the implementation of the ABCP-EEP.

Although children's level of knowledge, attitudes and behavioral intentions toward the environment and the bear, between 2000 and 2003, did not show a significant change, it is notable that attitudes and behavioral intention measurements were highly positive in both years. The minimum and maximum proportions of positive responses to questions regarding attitudes and behavioral intentions were 80-97% and 84-100% for the years 2000 and 2003 respectively. This positive response could be an effect of the ABCP, which, as described earlier, had been working with the local school on environmental education since 1998. Despite the fact that it was not possible to statistically test this change between 1998 and 2003, the teachers in the focus group reported that they saw children demonstrating more favorable attitudes and behaviors toward the environment than before their collaboration with the ABCP. The teachers' opinion can be considered a positive and direct outcome of the ABCP's work with this subset of the community.

Knowledge, Attitudes and Behavioral Intentions in Adults

A difference in knowledge level before and after program implementation could not be tested in adults due to the lack of baseline data. However, in 2003, the overall environmental knowledge of the adult population in Oyacachi appeared to be relatively high. Men had greater average knowledge scores than women, following the general trends perceived in previous environmental education research (Chawala 1988, Tikka et al. 2000, Archer 2002). Both cultural and social factors could explain the difference in knowledge according to gender. For example, historically women have had the role of looking after the home and children, while men have been in charge of hunting and resource provision (Gilligan 1982). In much of Ecuador, this division of gender roles has been maintained, resulting in men being better educated than women to be able to financially support their families. The unintentional bias of the ABCP toward reaching

mostly men in the adult population could also be related to women having lower environmental knowledge than men. Some examples of this bias are that the para-biologists are only men, four of the five teachers at the school are men, when the project collaborated with the SEC there were eight male students and only four females in the program. Men are more likely to attend workshops or meetings than women due to a community structure in which males are generally more involved in community relations and decision-making processes.

Between the years 1997 and 2003, the attitudes and behavioral intentions of adults changed in both positive and negative ways toward the conservation of the spectacled bear. The significant increase in positive responses of participants (52% in 1997 to 65% in 2003) stating that they would leave the bear alone in a hypothetical encounter, along with the significant increase (67% in 1997 to 84% in 2003) in people's perception of the bear as a tourist attraction can be considered indicators of success for the ABCP in promoting positive attitudes and behaviors toward the conservation of this species in Oyacachi. Limits to this success are seen in the following observations: (1) A significant decrease (97% in 1997 to 67% in 2003) in the perception of whether or not the bear is important for aesthetic, humanistic, symbolic, ecologistic or utilitarian reasons; (2) A downward trend (88% in 1997 to 81% in 2003), although not significant, in people's responses toward bear protection; and (3) No significant change observed in the behavioral intentions of people toward avoiding damages caused by bears. In both years, nearly a fifth of the respondents said they would shoot a bear in order to kill it.

These final unfavorable results for the ABCP reflect the problem of bear predation on livestock in Oyacachi at the time the study was conducted. Most participants

expressed their concern about this conflict and stated that they were willing to collaborate in conservation of the Andean bear, under the condition that this problem be resolved. The necessity of solving human conflicts with bears, in order to assure community support for the ABCP, was also remarked upon in the focus groups conducted with local authorities, teachers and para-biologists. Due to the division of positive and negative results, along with the conditioning of positive responses by participants, it is difficult to show evidence in favor or disfavor of the first hypothesis of this study which expected an increase in positive attitudes and behavioral intentions after program implementation. Therefore, it can be said that the program had partial success in promoting positive attitudes and behavioral intentions among adults in Oyacachi, and that the future success of the ABCP-EEP depends on whether or not a solution is found to the problem of bear predation on livestock.

The results of questions conducted only in 2003 show that community members unanimously supported the idea of conserving natural ecosystems, such as Andean forests and páramos. Also responses that supported taking action to protect the environment were nearly unanimous, with the most common being reducing deforestation, planting trees and not hunting animals inside the RECAY. Participants also mentioned their willingness to collaborate with forest rangers, such as calling attention to someone who is burning páramo illegally. Others demonstrated proper management of their garbage. These results are evidence of the high level of environmental awareness that currently exists in Oyacachi, due to educational outreach by the ABCP and other governmental and non-govermental organizations, such as the Ministry of Environment and the '*Antisana'* and '*Ecológica Rumicocha'* foundations.

Participants also demonstrated positive attitudes toward efforts for conserving the Andean bear. The majority (81%) mentioned that the bear needed protection and believed that the RECAY is necessary for ensuring the survival of this species (93%). The same proportion, 93%, favored laws to protect this animal. However, people's opinions were more divided when behavioral intentions were measured based on varying contexts of bear proximity to their crops and livestock, two main sources of income in Oyacachi. The context in which an attitude or behavioral intention develops has been considered an important factor in determining whether these variables will be positive or negative (Hines 1986/87). These study results support this notion in that people's attitudes and behavioral intentions toward the Andean bear are clearly related to previous conflicts with the animal. For instance, 62% of respondents perceived the bear as a detrimental animal and only 14% considered this animal as beneficial for any reason. This is likely due to the increase of bear predation on livestock at the time research was conducted For this same reason, the majority of participants (87%) were also opposed to the idea of having more bears in the vicinity of Oyacachi.

The results obtained regarding people's attitudes and behavioral intentions toward conservation of the environment and the Andean bear are puzzling. Hines et al. (1986/87) mention that situational factors can interfere in the gap that exists between an attitude or intention and its development into a behavior, particularly considering economic constraints or social pressures as factors that determine individuals final decision to perform or not perform an action. Also, Ajzen (1985) mentions that intentions will lead to particular behaviors only if a person perceives that he or she has the capability and the necessary skills to perform a behavior. Following this line of

reasoning, participants in Oyacachi expressed positive attitudes and intentions toward protecting their natural ecosystems. This was expected, since forests and páramos provide them with many benefits, such as water, wood, food and medicine. Their attitudes toward bear conservation were also positive in a general context, such as 'the bear needs to be protected.' However, when presented with the idea of conserving the bear in a conflictive scenario, such as 'what would you do if a bear is in your crops or close to your cattle?' or 'would you like to see more bears close to Oyacachi?,' responses were more divided, since these situations were related to the potential threat that the bear represents to their economic goods, especially livestock. Due to a fragile local economy, participants likely perceived their low capacity to deal with the costs of damage that the bear could inflict. Therefore, when this conflict was perceived, people's intention to adopt behaviors favorable to bear conservation was a difficult issue to consider, which was reflected in more divided, positive vs. negative, responses.

Support for the ABCP Environmental Educational Program

The second objective of this evaluation was to measure public support and satisfaction with the Andean Bear Conservation Project and its Environmental Education Program in Oyacachi. The study demonstrated that the ABCP was well known within the community; almost all respondents (97%) had heard about the project and knew about its activities (91%). General public support for the ABCP and its activities was high. This was reflected in the high proportion of respondents who were willing to participate in a conservation activity (88%) or interested in learning more about the environment (92%). Also, the 88% of respondents who participated in at least one activity with the ABCP mentioned that their experience with the project was either good or very good. Further

evidence of local support toward the project is that the ABCP is seen as an entity that respects and promotes the culture of the community.

Opinions were more divided regarding the perceived results of the ABCP and people's support for the project. The information collected through surveys revealed that a modest majority (65%) perceived that there had been an increase in positive behaviors toward the environment, after the program's inception in 1998, and that the ABCP had been useful for community development (66%). However, only 49 % of participants mentioned the ABCP as a source of environmental learning. In focus groups, this disparity in opinions was also expressed. While teachers and authorities perceived positive changes in the community since program implementation, the para-biologists, who worked most directly with the ABCP, thought that such changes had not occurred. They instead felt that the project had not reached the entire community through its concentration on specific groups of people, such as themselves. Additionally, they mentioned that people in Oyacachi had been aware of conservation issues before implementation of the ABCP, since they were living inside the RECAY and had received environmental information from other sources, such as the Ministry of Environment and '*Fundación Antisana*.'

A clear success of the ABPC was its collaboration with the local school. Teachers were very supportive of the ABCP activities and were motivated to continue their involvement with the project. Children also enjoyed both the program and their teachers and were interested in continuing with their education in Oyacachi. The ABCP's success with the school may be largely due to the fact that the ABCP encouraged participation of

the teachers, supporting the importance of collaborating with local people to promote the success of conservation efforts (Wondolleck & Yaffee 2000, Schelhas et al. 2001).

These results show evidence of the ABCP-EEP's partial success as the program is highly supported by the community, but the perceived results in promoting pro-environmental attitudes and behaviors in Oyacachi is not clear among community members. For instance, the project was viewed by a significant proportion of respondents (77%) as a source of conflict between community members. This perception was based on the fact that participants believed the bait, made of cattle blood, used to attract bears to traps, was 'teaching' bears to feed on livestock. This result is not positive for the ABCP and indicates that such misunderstandings must be cleared up if the ABCP hopes to collaborate with the community in achieving its goal of improving the conservation status of the Andean bear in the RECAY.

Unfortunately, local support for a conservation program alone will not determine its success. For instance, although support for the ABCP was high in Oyacachi, personal interviews and focus groups revealed there was a clear agreement among community members that they would like the project to include activities that promote community development. This would provide them with alternative choices for making a living, in attempting to cause less impact to the environment. This response was framed in the context of cattle predation by bears, which caused major economic losses for local people and encouraged local conflicts with the bear. When interviewed, people's support for conservation of the Andean bear was frequently accompanied by statements that expressed their concern about finding a solution to the problem of depredation on livestock. Authorities, para-biologists and teachers also expressed the need to find a

solution to the conflictive situation with the bear, in order to assure the support and collaboration of the community toward the protection of the Andean bear. Therefore, the future success of the project largely depends on whether or not a solution can be found for this problem.

Variables Influencing Attitudes and Behavioral Intentions

The third objective of this evaluation included analyzing the association between people's level of knowledge, sociodemographic and economic attributes and previous interactions with the bear, with their attitudes and behavioral intentions toward bear conservation. The results of the linear multiple regression models demonstrated that the variables, which influenced people's positive attitudes or behavioral intentions toward the Andean bear, were determined by their situational context. Indices that measured attitudes toward bear protection and the personal importance of the bear for respondents were consistently associated with participants' knowledge, or variables correlated with knowledge, such as level of education or age. In these two indices, participants' socioeconomic status was not associated with their attitudes and, surprisingly, neither was whether a person had experienced bear predation on their livestock. These results support the second hypothesis of this study, which expected knowledge to be positively associated with peoples' attitudes toward bear protection. However, it is important to note that these two indices are comprised of items that do not make reference to a specific context, such as a conflictive situation. This could be the reason why other variables, such as the socioeconomic situation of participants and past conflictive experiences with the bear, did not appear to be associated with these two attitudes when all variables interacted in the linear multiple regression model.

In contrast to these previous indices, measuring people's attitudes toward bear conservation and the personal importance of this animal, the index that measured participants' attitudes toward the presence of the bear in close proximity to Oyacachi, was associated with variables other than knowledge. Past experiences with bear predation on livestock had a negative association, indicating that participant attitudes toward the presence of bears was more negative if they had experienced livestock predation. Gender also had a negative association, demonstrating that women were more in favor of having bears in close proximity to Oyacachi. The last significant variable in the linear multiple regression model was the amount of trees harvested by respondents, which also had a negative association, suggesting that people who use more timber are less likely to want more bears in the area. The theories of Hines et al. (1986/87) and Ajzen (1985), help explain this lack of association between knowledge-related variables and attitude toward the presence of bears. The context in which this attitude develops involves participants reflecting on a possible personal conflict with the bear, based on its presence close to the community. Therefore, it is possible to predict that attitude toward the presence of bears will be more influenced by participants' past and present experiences (Kellert 1996) with the bear, and their perceived lack of capacity to deal with a possible loss of livestock, than with their levels of environmental knowledge.

This reflects how people's attitudes can change when they perceive that bear conservation may increase the number of bears in Oyacachi and, ultimately, conflict with their own livelihood. This emphasizes the importance of understanding the context in which pro-environmental attitudes develop in order to determine which variables are influencing them (Hines et al. 1986/87). Understanding which variables are influencing

people's attitudes toward the Andean bear in Oyacachi, can contribute to the design of future ABCP conservation strategies in the RECAY.

A surprising result arose from examining variables that appeared to influence people's behavioral intentions toward bears in a conflict situation. Due to the problem of bear predation on livestock and the results obtained regarding people's attitudes toward the presence of bears in Oyacachi, it was expected that participants' previous experience with bear attacks on their livestock, along with economic variables, would have been significantly related to people's behavioral intentions in a hypothetical conflict with a bear. However, only two variables, knowledge and gender, appeared to have a significant association with people's behavioral intentions in the linear multiple regression model. Knowledge about conservation and ecology issues had a positive association, indicating that more knowledgeable people are more likely to have a positive behavioral intention when presented with a conflict situation with the bear. Gender appeared to have a negative association, which indicates that women −despite having a lower level of environmental knowledge than men− expressed significantly more positive behavioral intentions. This pattern has been observed in other studies, such as Tikka et al. (2000), who suggest that women's attitudes are partly independent of their knowledge levels, and that other factors, such as culture and evolutionary history, are often more relevant in explaining their behaviors. Määttä (1996 in Tikka et al. 2000, p.18) supports this in saying that "benignity and universal responsibility are general guiding principles in women's lives." This may be reflected in their higher level of environmental responsibility in Oyacachi.

These linear multiple regression analyses on attitudes and behavioral intentions provide evidence supporting the second hypothesis of this study, since they confirm the positive correlation of environmental knowledge with participants' positive attitudes and behavioral intentions toward the environment and the Andean bear. This supports the importance of continuing with environmental educational activities in the ABCP, since they provide participants with relevant knowledge that contributes to the development of environmentally-responsible attitudes and behaviors toward the conservation of the Andean bear.

However, the results also demonstrate the importance of finding a solution to the conflict created by livestock depredation, which negatively influences people's attitudes toward the spectacled bear. We can observe that determining which variables are most relevant in explaining people's attitudes and behaviors may depend on the threshold at which people's willingness to behave in an environmentally-responsible way conflicts with their ability to satisfy their own livelihood needs. If conserving the Andean bear will lead to greater destruction of people's livestock, and no alternatives to ameliorate this problem are presented, it is likely that attitudes and behaviors will not change in favor of conserving this threatened species.

Finally, it is important to note that the proportion of the indices' variance, explained by variables included in the linear multiple regression models, was relatively low in all cases (as little as 22% and as much as 36%) This suggests that other important variables, such as individuals' values, beliefs, or situational factors, which are not considered in the models, could also be influencing respondents' attitudes and behavioral intentions toward the conservation of the Andean bear.

Variables Influencing Support for the ABCP

An analysis of how respondents' level of knowledge, sociodemographic and economic attributes, and previous interactions with bears relate to perceived achievements of the Andean Bear Conservation Project's Environmental Educational Program completes the analysis of the third objective of this study.

Whether people have been involved in the ABPC strongly influenced both their perception and support of the program. The linear multiple regression model demonstrated that perceived results of the ABCP had a significant positive association with whether people had participated in any ABCP activity (e.g. attendance at a workshop) or had attended the SEC high school program. This suggests the importance for the ABCP to reach as many people as possible in order to increase support for this project in the community as a whole. Once again, gender appeared to be significantly associated with people's perceptions of the project. Despite the fact that a lower proportion of female (32%) to male (51%) respondents had participated in any project activity, women were more likely to perceive positive results of the ABCP in the community. This result provides additional evidence that women support conservation activities more than men. The ABCP could use such information to design a program for women, since this segment of the population expresses more positive attitudes toward conservation and could be important allies to the project in helping foster environmental awareness in children, and also in adults.

Comparison of the ABCP -EEP Strategy to other Environmental Education Efforts to Conserve Large Carnivores

As livestock depredation signifies an economic loss to anyone who experiences it, particularly in developing countries[3], many programs for the conservation of large carnivores have focused on either providing financial compensations for loss or economic incentives to discourage people from killing these animals (Mishra et al. 2003, Naughton-Treves 2003). Nevertheless, the importance of concomitantly providing education and outreach programs to increase public knowledge and promote positive attitudes has been proposed as essential for improving the conservation of these animals (Jhala 1991, Mech 1995, Mishra et al. 2003).

Environmental education has been used worldwide as an effective strategy to alleviate conflicts with large carnivores. For example, in the United States of America, 21 states provide educational programs related to bears. These programs are designed to increase the knowledge of audiences about general bear ecology, hunter safety, prevention of human-bear interactions, and habitat protection (Peyton et al. 1999). Two examples of successful environmental education programs designed to promote public support of large carnivore conservation are conducted in Florida and the Wyoming region.

In Florida, the Florida Fish and Wildlife Conservation Commission (FWC) and Defenders of Wildlife have implemented the Florida Black Bear Curriculum, which is part of FWC's Wild K-12 education program (FWC 2004). This project is designed to educate and stimulate teachers and students in grades 3-8 regarding the conservation of

[3] Oli et al. (1994) found that in Nepal, livestock predation by the snow leopard represented a loss of one-quarter of the average annual income for local people, and another study on the snow leopard in India, estimated this lost to be as twice as great (Mishra 1997).

the Florida black bear. The curriculum guide comprises subjects related to bear biology and ecology, conservation status of the Florida black bear, interaction and conflicts among bears and humans, and the future of the conservation of this species.

Some factors considered to contribute to curriculum success are: the curriculum teaches students how, and not what, to think; it was reviewed by professionals in biology and education; a wide variety of instructional approaches are used to meet the needs of verbal learners, visual learners and kinesthetic learners; whole-class instruction and small group settings allow students to learn from each other; it offers guidance to teachers to continue increasing their knowledge and understanding of the black bear; lessons are flexible, they can be modified and may be taught in any order depending on students' interests; lessons require minimal preparation time and use inexpensive, easy-to-obtain materials; an evaluative system is incorporated to assess how much students have learned.

Another useful example is the environmental education and communications campaign for the gray wolf reintroduction to Yellowstone National Park (Jacobson 1999). This campaign was led by the U.S. Fish and Wildlife Service (USFWS) of the U.S. Department of Interior, in cooperation with the National Park Service, U.S. Forest Service, and state fish and game agencies in Wyoming, Montana and Idaho. The campaign succeeded by strategically identifying problems and selecting target audiences, which was followed by the selection of appropriate media, content areas and strategic messages to the public. Educational activities were conducted before, during and after wolf reintroduction. From 1988 to 1992, an intensive public education program was conducted by the USFWS, which included 260 presentations to more than 13,000 people,

hundreds of printed materials, and integrative activities such as campfires and interpretive walks covering topics about wolf natural history and recovery. The education program was complemented with an Environmental Impact Study (EIS) conducted from 1991 to 1994, during which thousands of individuals participated in open house meetings and formal hearings. In this period, the EIS incorporated approximately 130 public meetings, distributed 750,000 documents, and received 170,000 comments from the public. This overwhelming campaign resulted in the success of the reintroduction of gray wolves in Yellowstone. However, agency representatives continue experiencing public opposition to reintroduction efforts, suggesting that future communication efforts still need to be conducted in order to have extensive public support.

In spite of the fact that these examples are located in a different social context than the Andean Bear Conservation Project, they demonstrate that through education it is possible to increase the success of conservation efforts of large carnivores. This supports the need for the Andean Bear Conservation Project to continue environmental education activities in Oyacachi, in order to increase public support toward the conservation of the spectacled bear. However, as suggested by other studies (Mehta & Kellert 1998, Udaya-Sekhar 1998, Bauer 2003, Mishra et al. 2003), educational activities should be complemented with other interventions that pursue economic development in order to provide local people with alternatives that permit them to change livelihood systems that conflict with wildlife conservation.

Conclusion

The Andean Bear Conservation Project has been ongoing since 1998. Based on the results of this evaluation, the ABCP has had partial success in meeting its goals. Although there have been only slight changes in people's knowledge, attitudes and

behavioral intentions toward bear conservation during this time, the ABCP is well supported by the community of Oyacachi, which continues to be interested in participating in similar conservation activities in the future.

The results of this evaluation provide evidence for the importance of including environmental educational programs in conservation strategies, since environmental knowledge of participants was positively correlated with positive attitudes and behavioral intentions toward the Andean bear. Additionally, this study supports the importance of complementing environmental education programs with other conservation and development initiatives. In this case, since the ABCP is being conducted in a rural region with a very fragile economy, environmental education must go hand in hand with efforts that promote sustainable economic development, providing individuals with both economic alternatives and the capacity to develop and perform environmentally-responsible behaviors.

Bear predation on cattle is a significant problem that could cause major conflicts between the Cayambe-Coca Ecological Reserve and people in the community of Oyacachi. This could also upset local people's support for the ABCP, threatening the achievements that the project has already obtained in Oyacachi toward conservation of the Andean bear. As cases of bear predation on cattle have increased in Oyacachi in the last five years, conflicts in the community have also arisen. Its inhabitants have had to assume the economic losses caused by this animal, without being compensated for damages to their property.

Current policies for the management of protected areas in Ecuador, do not contribute to conflict resolution between humans and wildlife. In developing countries,

the management of protected areas commonly includes restrictions on the use of natural resources by local people (Hough 1988, Machalis & Tichnell 1985, Wells et al. 1992). Such regulations are seen in protected areas management in Ecuador, where the hunting of wildlife is prohibited within reserve boundaries, particularly of species recognized as internationally endangered on the IUCN Red List and CITES, such as the spectacled bear. These regulations, which control the use of natural resources by communities inside the RECAY, have exacerbated conflicts between local people and the Andean bear, as people are given few options for improving their livelihoods. If people perceive only economic losses from wildlife conservation efforts, it is very likely that such efforts will not succeed (Metha and Kellert 1998).

This reflects the need for governmental and non-governmental organizations, working toward conservation of Ecuador's biodiversity and natural resources, to consider the welfare of local people in developing conservation strategies. If such strategies are a collaborative process that includes both the education of local people and the development of projects designed to improve sustainable livelihoods, there may be a reduction in environmental conflicts and more long-term success of conservation efforts.

CHAPTER 5
RECOMMENDATIONS

The final objective of this evaluation was to contribute to the improvement of the Environmental Educational Program of Andean Bear Conservation Project delivery by identifying its strengths and weaknesses and suggesting future modifications. The strengths and weaknesses of the program were mainly identified in the focus group discussions. The principal strengths of the program are: (1) the relatively long-term work within the community, which has resulted in its recognition by the entire community; and (2) the collaborative process through which ABCP-EEP has conducted its activities with target audiences, based on the suggestions of local people in proposing activities to be conducted. The best example of this collaborative process is the work that the ABCP-EEP conducted with the teachers at the local school.

The main weaknesses of the ABCP-EEP are: (1) a lack of continuum in activities, although the project has been working in the area for a long time; (2) the ABCP-EEP's lack of communication with the community about project activities and results; and (3) the little effort that has been put into monitoring and evaluating program activities.

Based on the results obtained in this evaluation, the following recommendations are proposed to the ABCP in order to address its weaknesses and improve its strategy for the conservation of the Andean bear in collaboration with the community of Oyacachi in the Cayambe-Coca Ecological Reserve.

(1) Create more continuity in project activities. Although EcoCiencia, the organization responsible for the ABCP, was positively viewed as an organization that had

been working in the RECAY for a long time, participants also were discouraged by the lack of continuity in the ABCP activities. An important determinant of this interruption of activities was a limitation in project funding. However, it is recommended the ABCP design their programs toward maintaining a more continuous collaboration with the community. If financial limitations do not permit the implementation of new project activities, maintaining communication between the ABCP staff and local authorities and teachers through regular meetings would help promote community support for the ABCP.

(2) Involve more sectors of the population. Many people felt that the project had focused on a select group of people, namely the para-biologists. A suggested future target group is women, who were less involved in project activities and had less environmental knowledge than men. Despite this, they showed more support for project results and demonstrated more positive attitudes than men toward bear conservation. As women's role in raising and educating children is more central than men, they are important actors in influencing the development of children's values and beliefs toward nature, along with providing them with the relevant knowledge that in the future could shape their attitudes and ultimately behaviors toward the Andean bear.

(3) Improve communication strategies for informing the public about activities conducted by the ABCP, along with the results of these activities. This would both help create increased awareness about the project in the community and avoid misunderstandings about the project activities by community members. Such misunderstandings could decrease the project's credibility and create negative feelings toward the project among local people. An example of such a misunderstanding was people's negative feeling about the ABCP's use of cattle blood as bait in attracting bears

to hair traps for ecological research. Despite the fact that this procedure was only used in the first six months of 2003, community members blamed the ABCP for attracting bears to the community and teaching them to feed on livestock, through the use of this procedure. This negative feeling could have been avoided if the project had clearly communicated with the community that the bait they were using to attract bears had not influenced bears' feeding behavior in its four months of use. In Oyacachi, the leadership council, or *Cabildo*, organizes meetings regularly with all community members to discuss current issues and events. The ABCP could ask to use a portion of this meeting to present its results, obtain community feedback and resolve confusion regarding its activities.

(4) Include future evaluations and monitoring of the ABCP. If the project continues in Oyacachi, or is expanded to other communities, it is essential that the ABCP create a set of specific goals, define indicators to measure the project's failure or success, and establish a solid baseline that permits the evaluation of program results. This research has provided the ABCP with baseline information for continued work in Oyacachi. However, as the program develops in other communities, it would be helpful to standardize evaluation methods in order to have a common, solid baseline that permits future evaluation of the ABCP and comparison of results between different communities involved in the project.

Three more recommendations that may be outside the realm of the ABCP and its Environmental Educational Program, but could be addressed through partnerships with other governmental or non-governmental organizations, are suggested to improve the conservation of the Andean bear:

(5) Create a system to alleviate the impact of livestock predation on the household economy. For example, introduce financial compensation for the damage caused by wildlife, which as mentioned earlier has been suggested as a positive alternative to this problem in similar cases inside protected areas where large carnivores prey on livestock (Mishra 1997, Mehta & Kellert 1998, Udaya Sekhar 1998, Bauer 2003).

(6) Conduct applied research that can contribute to improved management of natural resources in the area. For instance, if the ABCP's research could contribute to solutions to the conflict caused by bear predation on livestock, community members will likely have greater support for the ABCP and for conservation of the Andean bear.

(7) Link educational activities with development projects that promote the improvement of sustainable livelihood systems in the community. These projects could encourage a shift away from local dependence on cattle ranching, which currently is the most important source of income in Oyacachi. Activities could be promoted that foster fewer conflicts between humans and wildlife and are less detrimental to the ecosystems protected inside the RECAY. Some suggestions, provided by community members of Oyacachi, would include improving the marketing of local handicrafts, incorporating a better system of organic agriculture, and developing an ecotourism program.

APPENDIX A
QUESTIONNAIRE FOR ADULTS

(Present yourself) "My name is SANTIAGO Espinosa, I am conducting an investigation to evaluate the environmental education program of the Andean Bear Conservation Project. I would like to ask you some questions regarding this project and also some questions about the environment. Your participation is voluntary and you may withdraw without penalty at any time you want. There is no compensation for participating in this study. It will take about 1 hour of your time. Answering this questions won't affect you either for better or worse. You do not need to answer any question you do not wish to answer; I have had people refuse before. You do not need to stop working to answer them. If you would prefer, I can come back at another time. The answers you provide will remain confidential. Do you have any questions? May I begin asking my questions? Remember you can stop me any time or we can schedule for another time or day."

Date:_____
Name: _____
Age:_____

Section 1: Knowledge

Q 1. Where do the following animals live, in the forest or the páramo? (Local names)

lobo__ semicabra__ chucuri__ tucán__ pava__ guatusa__ curiquingue__ huaucu__

Q 2. Which plants are in the forest or in the páramo? (Local names)

yagual__ pántag__ matachig__ urcu rosa__ canelo__ cedro__ pinan__ quishuar__

Q 3. What is an ecosystem? (Choose the right answer)

A. All the animals and plants in a place that are related each other and with their environment.
B. A science that studies animals and plants.
C. A group of plants that live in a certain place.

Q 4. Where do we find more kinds of animals and plants? (Choose the correct answer)

A. Forest B. Páramo

Q 5. Name 5 benefits obtained from the forest and 5 benefits obtained from the páramo_____

Q 6. What are species in danger of extinction? (Choose the correct answer)

A. They are animals and plants that are very abundant in a place.
B. They are animals and plants that can disappear because they have many threats.
C. They are animals and plants similar to each other.

Q 7. Do you know if there are some animals that are living close to Oyacachi that could disappear from the forest or the páramo forever? Name three of them.

a)_____ b)_____ c)_____ Don't know____

Q 8. Why is the bear important for the forest and the páramo? (Choose the correct answer)

A. Because it is an animal that is very abundant, like the rabbit.
B. Because it helps to carry the seeds of the plants from one place to another in the forest.
C. Because it eats the achupallas that are destroying the soil of the páramo and the motilón that is bad for other animals.

Q 9. What does the bear eat?_____

Q 10. How does the bear live? (Choose the correct answer)

Mostly alone__ Mostly in families__ Mostly in groups__ Don't know__

Q 11. Does the bear take care of its cubs?

Yes__ No__ Don't know__

Q 12. Is there a law that protects the spectacled bear?

Yes__ No __ Don't know__

Q 13. Is there a management plan for Oyacachi?

Yes__ No __ Don't know__

Q 16. Do you know what the RECAY is?

Yes__ No__ (What is it?_____)

Section 2: Attitudes

Q 14. Do you think nature should be protected?

Yes__ No__ (Why?_____)

Q 15. Do you think forests and páramos need to exist?

Yes __ No__ (Why?_____)

Q 17. Do you think it is good to have the RECAY?

Very good__ Good__ Nor good nor bad__ Not good__ Not good at all__
Don't know __ (Why?_____)

Q 18. How necessary do you think the RECAY is for bear survival?

Very necessary___ Necessary___ Neither necessary nor unnecessary___
Not necessary___ Not necessary at all___ Don't know___
(Why?_____)

Q 19. Do you think the bear needs to be protected?

Yes__ No__ (Why?_____)

Q 20. Do you think there are animals in the forest that are detrimental?

Yes__ No__ If yes, name the three most detrimental animals:_____

Q 21. Do you think there are animals in the forest that are beneficial?

Yes__ No__ If yes, name the three most beneficial animals:_____

Q 22. Are there currently more bears than in previous years?

There are more bears___ There are the same amount___
There are less bears___ Don't know___
If there are more or less, give one or two reasons you think are the cause:____

Q 23. Would you prefer more or less bears in the forest?

Many more__ More__ Same__ Less__ Much less__ (Why?_____)

Q 24. Does the bear have any importance for you?

Yes__ No__ (Why?_____)

Q 25. Do you think the bear is an animal that can disappear from the forest forever?

Yes__ No__ (Why?_____)

Q 26. Do you think laws to protect the bear and other animals are needed?

Yes__ No__ (Why?_____)

Section 3: Behavioral intentions

Q 27. What would you do to help to conserve the environment?_____

Q 28. What would you do if you see someone burning the páramo?_____

Q 29. Would you like to collaborate with the work of forest rangers?

Yes__ No__ (Why and how?_____)

Q 30. What do you do with your garbage? How do you manage it?

Organic:_____
Inorganic: _____

Q 31. If you encountered a bear cub, what would you do? (Choose the correct answer)

Leave it alone __ Run away__ Scare it__ Catch it __ Shoot it __

Q 32. If you meet an adult bear, what you would you do?

Leave it alone __ Run away__ Scare it__ Catch it __ Shoot it __

Q 33. What would you do to avoid bear attacks to your crops and cattle?

Kill the bear ___
Scare the bear ___
Spend more time watching over the crops and cattle___
Not destroy the forest ___
Harvest earlier ____

Build a fence___
Other? ___

Q 34. How can the bear be used?

Food___ Tourism___ Hunting___ Medicinal___ Fur___ Other?___

Q 35. Would you like to be able to sell bear parts?

Yes__ No__ (Why?_____)

Q 36. What would you do if you encounter an adult bear in:

	Leave it alone	Scare it	Catch it	Shoot it
Forest or páramo				
Your crops				
Close to your cattle				
Close to your home				

(Why?_____ _)

Section 4: Interaction with Bears

Q 37. Have you ever seen a bear?

Yes__ No__ (If yes, how long ago, where?_____)

Q 38. Have you ever had a bear or group of bears feeding on your crops?

Yes__ No__ (If yes, how long ago?_____)
Could you estimate the cost of that damage? (USD)_____

Q 39. Have you ever had a bear attack your cattle or sheep?

Yes__ No__ (If yes, how long ago?_____)
Could you estimate the cost of this damage? (USD)_____

Section 5: ABPC-EEP Evaluation

Q 40. Have you heard about the Andean Bear Conservation Project conducted by EcoCiencia?

Yes__ No__

Q 41. Do you know what the people of this Project are doing?

Yes__ No__ (What are they doing?_____)

Q 42. Have you ever participated in an activity of this Project?

Yes__ In which one? _____
No__ Why not?_____

If participated. How was his/her experience with the Project?
Very good__ Good__ Neither good nor bad__ Not good__ Not good at all __
(Why?_____)

Q 43. Would you participate in other similar conservation activities?

Yes__ No__ Don't know __ (Why?_____)

Q 44. Do you think the Project is useful for the development of your community?

Very useful__ Useful__ Somewhat useful__ Not useful__ Don't know __
(Why?_____)

Q 45. Do you see any change in people's behavior in Oyacachi since the Project's implementation?

Yes__ No__ Don't know __ (What changes?_____)
Do you think these changes are: Positive__ Negative__ (Why?_____)

Q 46. How would you categorize the impacts that the Andean Bear Project has had so far in the conservation of the natural resources of your community?

Very good__ Good__ Neither good nor bad__ Not good__ Not good at all __
Don't know__
(Why? Any difference between the past and the present?____)

Q 47. What do you think about the Project's respect toward the culture of your community?

Very good__ Good__ Neither good nor bad__ Bad__ Very bad __
Don't know__ (Why?_____)

Q 48. Do you think the Project has created conflicts between community members?

A lot of conflicts __ Some conflicts __ Few conflicts __ Very few conflicts __
No conflicts __ Don't know__ (Why?_____)

Q 49. Do you have children that are or were at the school as long as three years ago?

Yes__ No__

Q 50. Do you know about the change in the school's program of study, conducted in collaboration with the Project?

Yes__ No__ (What was this change? _____)

Q 51. Do you agree with the new school's program of study?

Yes__ No__ (Why?_____)

Q 52. Do you agree with the activities conducted by the Project with your children?

Strongly agree __ Agree __ Neither agree nor disagree __ Disagree__
Strongly disagree__ Don't know__ (Why?_____)

Q 53. How would you categorize the experience of your children at the school?
(Do they have enthusiasm? Speak about the environment?)

Very good__ Good__ Neither good nor bad__ Not good__ Not good at all __
Don't know__ (Why?_____)

Q 54. Where did you learn about the bear and the environment? (Do they mention the EcoCiencia-ABPC?)

Observing nature___
Talking with family or friends___
Talking with researchers that visit the area___
In workshops or meetings? (With whom and where?___)
At the school___
At the high school___
In radio programs___
In videotapes___
Reading in books or magazines___
Other?___

Q 55. Are you interested in learning more about the environment?

Yes__ No__

Q 56. Which other things could be done by the Project, regarding education and natural resource management?_____

Section 6: Sociodemographic and Economic Information

Q 57. What is your education level?

No formal education___
Some elementary school___
Elementary school___
Some high school___
High school___
More than high school ___

Q 58. What is your spouse's education level?

No formal education___
Some elementary school___
Elementary school___
Some high school___
High school___
More than high school ___

Q 59. Have you attended the distance SEC program?

Yes__ No__

Q 60. How long have you been in Oyacachi?

All my life___ / ___ years
Where did you live before?_____

Q 61. What is your family size?

	Age
Sons	
Daughters	

Q 62. What activities represent your main source of income? (In order of importance)

Economic activities	% percentage it represents/amount per month
1.	
2.	
3.	
4.	
5.	

Q 63. What forest resource is most important to you?_____

Q 64. Could you estimate the value of this resource, or what amount of it you use per month or year?

_____ Monthly___ Annually___
Firewood:_____

Q 65. ¿What is your income per month? (US$)____

Depending on the case, a rank option also was suggested:
Less than 50___
50-100___
100-200___
200-300___
More than 300___

Q 66. How much land do you own? _____

Q 67. How much maize do you harvest each season?_____

Q 68. How many cattle (or sheep) do you have, where is they located? (Map was shown to men)

Q 69. Would you like the road continue to:

Pueblo viejo__
Mangahuaico___
El Chaco __
Stay in present location __

Section 7: Questions added as a request of local teachers

Q 70. Have you heard a radio program "Enfoque Ambiental desde Oyacachi" in "Radio Mensaje"?

Yes__ No__

Which radio do you listen to?_____

Q 71. Would you like a radio for Oyacachi where you can hear educative programs and issues relating to your community?

Yes__ No__

APPENDIX B
QUESTIONNAIRE FOR CHILDREN AT THE SCHOOL

Date:_____ Level:_____Age:_____ Sex: Female___ Male___

Section 1: Knowledge

Q 1. Do you know these animals (10 pictures were presented)

A._____ F._____
B._____ G._____
C._____ H._____
D._____ I._____
E._____ J._____

Q 2. Where do the following animals live, in the forest or the páramo? (Local names)

lobo__ semicabra__ chucuri__ tucán__
pava__ guatusa__ curiquingue__ huaucu__

Q 3. Which plants are in the forest or in the páramo? (Local names)

yagual__ pántag__ matachig__ urcu rosa__
canelo__ cedro__ pinan__ quishuar__

Q 4. What is an ecosystem? (Choose the right answer)

A. All the animals and plants in a place that are related each other and with their environment.
B. A science that studies animals and plants.
C. A group of plants that live in a certain place.

Q 5. Where do we find more kinds of animals and plants?
(Choose the correct answer)

A. Forest B. Páramo

Q 6. Name 5 benefits obtained from the forest and 5 benefits obtained from the páramo.

Forest: Páramo
1._____ 1. _____

2. _____ 2. _____
3. _____ 3. _____
4. _____ 4. _____
5. _____ 5._____

Q 7. What are species in danger of extinction? (Choose the correct answer)

A. They are animals and plants very abundant in a place.
B. They are animals and plants that can disappear because they have many threats.
C. They are animals and plants similar to each other.

Q 8. Do you think there are some animals that are living close to Oyacachi that can disappear from the forest or the páramo forever? Name three of them.

a)_____ b)_____
c)_____ Don't know____

Q 9. Why is the bear important for the forest and the páramo? (Choose the correct answer)

A. Because it is an animal that is very abundant, like the rabbit.
B. Because it helps to carry the seeds of the plants from one place to another in the forest.
C. Because it eats the achupallas that are destroying the soil of the páramo and the motilón that is bad for other animals.

Q 10. What does the bear eat?_____

Q 11. How does the bear live? (Choose the correct answer)

Mostly alone__ Mostly in families__ Mostly in groups__ Don't know__

Q 12. Does the bear take care of its cubs?

Yes__ No__ Don't know__

Q 13. Is there a law that protects the spectacled bear?

Yes__ No __ Don't know__

Q 16. Do you know what the RECAY is?

Yes__ No___ (What is it?_____)

Section 2: Attitudes

Q 14. Do you think nature should be protected?

Yes__ No__ (Why?:_____)

Q 15. Do you think forests and páramos need to exist?

Yes __ No__ (Why?_____)

Q 17. Do you think it is good to have the RECAY?

Yes__ No___ (Why?_____)

Q 18. Do you think the bear needs the reserve to live?

Yes__ No__ (Why?_____)

Q 19. Do you think the bear needs to be protected?

Yes__ No__ (Why?_____)

Q 20. Do you think there are animals in the forest that are detrimental for humans?

Yes__ No__
If yes, name the three most detrimental animals_____

Q 21. Do you think there are animals in the forest that are beneficial for humans?

Yes__ No__
If yes, name the three most beneficial animals_____

Q 22. Would you prefer more or less bears in the forest?

Many more__ More__ Same__ Less__ Much less__ (Why?_____)

Q 23. Does the bear have any importance for you?

Yes__ No__ (Why?_____)

Q 24. Do you think the bear is an animal that can disappear from the forest forever?

Yes__ No__ (Why?_____)

Section 3: Behavioral intentions

Q 25. What would you do to help to conserve the environment?_____

Q 26. What would you do if you see someone burning the páramo?

Q 27. Would you like to collaborate with the work of forest rangers?

Yes__ No__ (Why and how?_____)

Q 28. What do you do with garbage at home?

With organic garbage (leaves, peals):
Throw it far away__
Bury it__
Burn it__
Make compost __
Other?_____

With inorganic garbage (plastics, glass)
Throw it far away__
Bury it__
Burn it__
Make compost __
Other?_____

Q 29. If you encountered a bear, what would you do? (Choose one answer)

Get scared__ Take a picture__
Run away__ Leave it alone __
Scare it__ Take it home __
Shoot it __

Q 32. What would you do if you see an adult bear in the FOREST?

Leave it alone __
Run away__
Scare it__
Call an adult to kill it __
Other?_____

Q 33. What would you do if you see an adult bear in the CROPS?

Leave it alone __
Run away__

Scare it__
Call an adult to kill it __
Other?_____

Q 34. What would you do if you see an adult bear close to the CATTLE?

Leave it alone __
Run away__
Scare it__
Call an adult to kill it __
Other?_____

Q 35. What would you do if you see an adult bear close to your HOUSE?

Leave it alone __
Run away__
Scare it__
Call an adult to kill it __

Section 4: Interaction with Bears

Q 30. Have you ever seen a bear?

Yes___ No___ (How long ago?_____)

Q 31. Has someone in your family ever had a problem with the bear?

Yes___ No___ (What problem, how long ago?_____)

Section 5: ABCP- EE/School Program Evaluation

Q 36. Have you heard about the Project for protecting the Bear conducted by EcoCiencia?

Yes__ No__

Q 37. Do you know what the people in this Project are doing?

Yes__ No__ (What?____)

Q 38. Do you like school?

Yes__ No__ (Why?_____)

Q 39. Are you happy with your teachers?

Yes__ No__ (Why?_____)

Q 40. Do you enjoy what you are learning in school?

Yes__ No__ (Why?_____)

Q 41. Do you enjoy what you are learning about the natural environment?

Yes__ No__ (Why?:_____)

Q 42. Would you like to continue on to high school?

Yes__ No__
Where?: In Oyacachi___
In another place ___

Q 43. If you would like to continue with high school, in which program would you like to be?

Crecerá___ SEC___

APPENDIX C
FOCUS GROUPS GUIDES

Local authorities' focus group guide

Objective: (1) To understand the community authorities' perception on results and problems of the ABCP in Oyacachi. (2) To receive their feedback on how to improve the ABCP.

Participants: David Parión, Hector Parión, Ricardo Ascanta, Fausto Aguagallo, Jaime Aigaje, Abelardo Aigaje.

- Have you seen positive changes in people's attitudes and behaviors toward the environment and bear conservation?
- Are there positive results coming from the project activities?
- Are more environmental educational activities needed with the community?
- How could environmental capacity-building in the community be improved?
- What other activities do you see as being needed to conserve and manage the natural resources of the community in a sustainable way?
- Do you think it is possible for people to have positive attitudes toward bear conservation activities? What do you think is needed to reach that objective?
- How do you see the collaboration between the project and the community? What has been successful and what has failed?
- How do you perceive the collaboration with the ABCP (EcoCiencia)?
- Do you have any other comments?

Teachers' focus group guide

Objectives: (1) To understand teacher's perceptions about the results and problems of the EEP with the elementary school. (2) To gain their perspective on the results and problems of the ABCP in the community. (3) To receive their feedback on how to improve the ABCP project

Participants: Teodoro Ascanta (School Director), César Aigaje and Nelly Iza.

Success of EE insertion in school's curriculum

- What results have been obtained?
- What problems have you had?
- Were they resolved? How?
- What problems do you have at the present time?

- How could these problems be resolved?
- Do you think the topics are appropriate for your social reality?

Results with the children

- Are the children motivated at school?
- Are they interested in their environment?
- Have they improved in their knowledge regarding the environment?
- Can you observe any change in attitudes or behaviors of children, regarding the environment? (e.g. do not throw garbage everywhere, do not kill birds, do not destroy plants)

Success of the project and collaboration with the community.

How do you see the work of the ABCP (EcoCiencia) with the community? Is there enough collaboration between the ABCP and the community?

- Are there positive changes regarding the conservation of the environment and the protection of the Andean bear since the program's inception?
- How could the EEP with the community be improved?
- Do you have any other comments?

Para-biologists' focus group guide

Objective: (1) To understand para-biologists' perceptions on the results and problems of the ABCP in the community and of their own work with the project. (2) To receive their feedback on how to improve the ABCP project.

Participants: Patricio Aigaje, Cristóbal Ascanta, Wilson Ascanta, Mauricio Parión, Claudio Aigaje, Holger Aigaje, Luciano Aigaje.

- Have you seen positive changes in people's attitudes and behaviors toward the environment and bear conservation?
- Are there positive results coming from project activities that benefit the community?
- Are more environmental educational activities needed with the community?
- How could environmental capacity-building in the community be improved?
- What other activities do you see as needed to conserve and manage the natural resources of the community in a sustainable way?
- Do you think it is possible for people to have positive attitudes toward bear conservation activities? What do you think is needed to reach that objective?
- How satisfied are you with your work as para-biologists with the project?
- How do you view the collaboration between the project and the community? What has been successful and what has failed?
- How could the project's collaboration with the community be improved?
- Do you have any other comments?

APPENDIX D
CHI-SQUARE TESTS

Chi-Squares comparing adults attitudes and behavioral intentions between the years 1997 and 2003

Table D-1. Attitude toward bear protection

			YEAR		Total
			1997	2003	
Bear needs to be protected	No	Count	4	27	31
		% within year	12.1%	19.0%	17.7%
	Yes	Count	29	115	144
		% within year	87.9%	81.0%	82.3%
Total		Count	33	142	175
		% within year	100%	100%	100%
Pearson Chi-Square		.873			
Asymp. Sig. (2-sided)		.350			

Table D-2. Attitudes about personal importance of bear

			YEAR		Total
			1997	2003	
Bear personal importance	No	Count	1	48	49
		% within year	3.3%	32.9%	27.8%
	Yes	Count	29	98	127
		% within year	96.7%	67.1%	72.2%
Total		Count	30	146	176
		% within year	100%	100%	100%
Pearson Chi-Square		10.812			
Asymp. Sig. (2-sided)		.001			

Table D-3. Behavioral intentions when participant encounters an adult bear

			YEAR		Total
			1997	2003	
Reaction in encounter with an adult bear	Shoot it	Count	1	0	1
		% within year	3.0%	.0%	.6%
	Catch it	Count	1	0	1
		% within year	3.0%	.0%	.6%
	Scare it	Count	4	27	31
		% within year	12.1%	18.4%	17.2%
	Run away	Count	10	25	35
		% within year	30.3%	17.0%	19.4%
	Leave it alone	Count	17	95	112
		% within year	51.5%	64.6%	62.2%
Total		Count	33	147	180
		% within year	100%	100%	100%
Pearson Chi-Square		.013			
Asymp. Sig. (2-sided)		12.714			

Table D-4. Behavioral intentions when participant encounters a bear cub

			YEAR		Total
			1997	2003	
Reaction in encounter with a bear cub	Catch it	Count	10	10	20
		% within year	30.3%	6.8%	11.1%
	Scare it	Count	2	6	8
		% within year	6.1%	4.1%	4.4%
	Run away	Count	2	8	10
		% within year	6.1%	5.4%	5.6%
	Leave it alone	Count	19	123	142
		% within year	57.6%	83.7%	78.9%
Total		Count	33	147	180
		% within year	100%	100%	100%
Pearson Chi-Square		15.978			
Asymp. Sig. (2-sided)		.001			

Table D-5. Behavioral intentions to prevent bear damage to cattle and crops

			YEAR		Total
			1997	2003	
Action to avoid bear damage	Kill the bear	Count	5	27	32
		% within year	20.0%	18.4%	18.6%
	Take another action	Count	20	120	140
		% within year	80.0%	81.6%	81.4%
Total		Count	25	147	172
		% within year	100%	100%	100%
Pearson Chi-Square		.038			
Asymp. Sig. (2-sided)		.846			

Table D-6. Behavioral intentions of how participants would use the bear (as an attraction for tourists or other).

			YEAR		Total
			1997	2003	
Bear as a tourist attraction	Other use	Count	11	20	31
		% within year	33.3%	16.5%	20.1%
	Tourist attraction	Count	22	101	123
		% within year	66.7%	83.5%	79.9%
Total		Count	33	121	154
		% within year	100%	100%	100%
Pearson Chi-Square		4.554			
Asymp. Sig. (2-sided)		.033			

Chi-Squares comparing children's attitudes and behavioral intentions between the years 2000 and 2003

Table D-7. Attitudes toward protecting nature

			Test Year		Total
			2000	2003	
Do you think nature needs to be protected?	No	Count	1	0	1
		% within test year	2.9%	.0%	1.3%
	Yes	Count	34	43	77
		% within test year	97.1%	100.0%	98.7%
Total		Count	35	43	78
		% within test year	100%	100%	100%
Pearson Chi-Square		1.245			
N of Valid Cases		.265			

Table D-8. Attitudes toward the RECAY

			Test Year		Total
			2000	2003	
Do you think it is good to have the RECAY?	No	Count	5	4	9
		% within test year	13.9%	9.5%	11.5%
	Yes	Count	31	38	69
		% within test year	86.1%	90.5%	88.5%
Total		Count	36	42	78
		% within test year	100%	100%	100%
Pearson Chi-Square		.362			
Asymp. Sig. (2-sided)		.547			

Table D-9. Behavioral intentions toward helping conserve the environment

			Test Year		Total
			2000	2003	
What would you do to help to conserve the environment?	Do not know	Count	7	6	13
		% within test year	19.4%	13.6%	16.3%
	Will do something	Count	29	38	67
		% within test year	80.6%	86.4%	83.8%
Total		Count	36	44	80
		% within test year	100%	100%	100%
Pearson Chi-Square		.491			
Asymp. Sig. (2-sided)		.484			

Table D-10. Behavioral intentions toward burning páramos

			Test Year		Total
			2000	2003	
Reacts positively if sees someone burning the páramo?	Do nothing	Count	4	7	11
		% within test year	11.1%	15.9%	13.8%
	Do something positive	Count	32	37	69
		% within test year	88.9%	84.1%	86.3%
Total		Count	36	44	80
		% within test year	100%	100%	100%
Pearson Chi-Square		.384			
Asymp. Sig. (2-sided)		.535			

Table D-11. Behavioral intentions toward collaborating with forest rangers

			Test Year		Total
			2000	2003	
Would like to collaborate with forest rangers?	No	Count	2	5	7
		% within test year	5.7%	12.8%	9.5%
	Yes	Count	33	34	67
		% within test year	94.3%	87.2%	90.5%
Total		Count	35	39	74
		% within test year	100%	100%	100%
Pearson Chi-Square		1.088			
Asymp. Sig. (2-sided)		.297			

Table D-12. Behavioral intentions in an encounter with a bear

			Test Year		Total
			2000	2003	
Reaction in encounter with an adult bear	Call an adult to kill it	Count	6	3	9
		% within test year	16.7%	7.0%	11.4%
	Other reaction	Count	30	40	70
		% within test year	83.3%	93.0%	88.6%
Total		Count	36	43	79
		% within test year	100%	100%	100%
Pearson Chi-Square		1.823			
Asymp. Sig. (2-sided)		.177			

Table D-13. Children satisfaction with school

			Test Year		Total
			2000	2003	
Do you like school?	No	Count	0	1	1
		% within test year	.0%	2.3%	1.3%
	Yes	Count	35	42	77
		% within test year	100.0%	97.7%	98.7%
Total		Count	35	43	78
		% within test year	100%	100%	100%
Pearson Chi-Square		.825			
Asymp. Sig. (2-sided)		.364			

Table D-14. Children satisfaction with teachers

			Test Year		Total
			2000	2003	
Are you happy with your teachers?	No	Count	0	2	2
		% within test year	.0%	4.7%	2.6%
	Yes	Count	35	41	76
		% within test year	100.0%	95.3%	97.4%
Total		Count	35	43	78
		% within test year	100.0%	100.0%	100.0%
Pearson Chi-Square		1.671			
Asymp. Sig. (2-sided)		.196			

Table D-15. Willingness to continue on to high school

Crosstab

			Test Year		Total
			2000	2003	
Would you like to go to high school?	No	Count	2	2	4
		% within test year	5.7%	4.5%	5.1%
	Yes	Count	33	42	75
		% within test year	94.3%	95.5%	94.9%
Total		Count	35	44	79
		% within test year	100%	100%	100%
Pearson Chi-Square		.055			
Asymp. Sig. (2-sided)		.814			

Table D-16. Place where children would like to attend high school

			Test Year		Total
			2000	2003	
Where would you like to attend high school?	Outside Oyacachi	Count	7	8	15
		% within test year	21.9%	19.0%	20.3%
	In Oyacachi	Count	25	34	59
		% within test year	78.1%	81.0%	79.7%
Total		Count	32	42	74
		% within test year	100%	100%	100%
Pearson Chi-Square		.090			
Asymp. Sig. (2-sided)		.764			

APPENDIX E
FACTOR ANALYSIS

Factor Analysis for Knowledge Indicators

a) Factor analysis grouping knowledge indicators about ecology and conservation

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.416	48.323	48.323	2.416	48.323	48.323
2	.952	19.040	67.363			
3	.791	15.812	83.175			
4	.436	8.717	91.892			
5	.405	8.108	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
KECOSYS	.805	.649
KBIODIV	.314	.099
KEXTINT	.829	.688
SPEXT	.578	.334
KBECO	.804	.647

b) Factor analysis grouping knowledge indicators about local flora and fauna

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.410	70.512	70.512	1.410	70.512	70.512
2	.590	29.488	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
KPLANT	.840	.705
KANIM	.840	.705

c) Factor analysis grouping knowledge indicators about bear behavior

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.220	40.658	40.658	1.220	40.658	40.658
2	.967	32.218	72.877			
3	.814	27.123	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
KBLIVE	.548	.301
KNBDIET	.600	.360
KNCUBS	.748	.559

d) Factor analysis grouping knowledge indicators about regulations

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.458	48.610	48.610	1.458	48.610	48.610
2	.962	32.052	80.662			
3	.580	19.338	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
KNRECAY	.834	.695
KPLAN	.752	.565
KNLAW	.446	.199

Factor Analysis for Attitudes Indicators

a) Factor analysis with attitudes toward bear protection

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.049	51.235	51.235	2.049	51.235	51.235
2	.893	22.329	73.564			
3	.604	15.103	88.667			
4	.453	11.333	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
Having the RECAY is good	.742	.550
Bears need the reserve to live	.737	.543
Bear needs protection	.644	.415
Laws to protect bears are needed	.736	.542

b) Factor analysis with attitudes toward bear presence

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.809	45.224	45.224	1.809	45.224	45.224
2	.848	21.190	66.414			
3	.770	19.262	85.676			
4	.573	14.324	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
Bears are detrimental	.670	.449
Bears are beneficial	.604	.365
How many bears wanted	.764	.583
Perception of bear abundance	.642	.412

c) Factor analysis with attitudes toward bear's personal importance

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.199	59.933	59.933	1.199	59.933	59.933
2	.801	40.067	100.000			

Extraction Method: Principal Component Analysis.

Factor loadings

	Component	Communality
Bear's personal importance	.774	.599
Bear can go extinct	.774	.599

Factor Analysis for Behavioral Intentions Indicators

a) Factor analysis with 3 behavior indicators measuring participant's reaction in a hypothetical conflict situation with a bear

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.755	58.493	58.493	1.755	58.493	58.493
2	.858	28.586	87.079			
3	.388	12.921	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
Take action to avoid bear damages	.574	.330
A bear close to crops	.806	.650
A bear close to cattle	.881	.776

Factor Analysis for ABCP-EEP Results

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.516	50.522	50.522	1.516	50.522	50.522
2	.784	26.121	76.643			
3	.701	23.357	100.000			

Extraction Method: Principal Component Analysis.

Factor Loadings

	Component	Communality
Is the project useful for the community?	.740	.548
Observed changes in people?	.717	.514
Project as a source of environmental learning?	.673	.454

APPENDIX F
PEARSON CORRELATIONS

Pearson Correlation Matrix between Response and Explanatory Variables

Explanatory variables		Response variables: Attitudes toward bear protection	Attitudes toward bear presence	Bear personal importance	Reaction in a hypothetical conflict with a bear	ABCP-EEP Perceived results
Gender	r	.155	-.135	.141	**-.388**	-.143
	p	.088	.138	.122	**.000**	.127
Age	r	**-.240**	-.062	**-.218**	-.091	.017
	p	**.008**	.499	**.016**	.273	.853
Education Level	r	**.367**	.154	**.461**	.077	**.383**
	p	**.000**	.090	**.000**	.357	**.000**
Children under 15 yrs	r	-.115	**-.181**	-.120	-.026	-.104
	p	.209	**.046**	.189	.755	.269
Monthly income	r	-.076	.122	.066	-.025	**.246**
	p	.403	.181	.470	.765	**.008**
Trees harvested per month	r	**-.225**	.089	**-.184**	-.078	-.130
	p	**.013**	.330	**.043**	.348	.165
Firewood used per month	r	-.054	-.078	-.051	-.093	.034
	p	.556	.390	.575	.263	.720
Heads of cattle	r	-.054	.139	.143	-.007	.182
	p	.557	.127	.117	.930	.052
Cow predation by bears	r	-.151	**-.191**	.102	-.006	.011
	p	.097	**.035**	.261	.956	.911
SEC participation	r	**.230**	**.211**	**.257**	.061	**.401**
	p	**.011**	**.019**	**.004**	.463	**.000**
ABCP participation	r	**.229**	.146	**.299**	.024	**.397**
	p	**.011**	.110	**.001**	.771	**.000**
Conservation knowledge	r	**.500**	.165	**.414**	.069	**.198**
	p	**.000**	.069	**.000**	.409	**.034**
Local flora and fauna knowledge	r	-.051	-.118	.028	**-.211**	-.101
	p	.576	.198	.764	**.011**	.284
Bear behavior knowledge	r	**.202**	.018	**.260**	-.115	-.006
	p	**.026**	.841	**.004**	.167	.946
Regulations knowledge	r	.160	.003	**.306**	-.044	.136
	p	.078	.978	**.001**	.600	.148

Pearson Correlation Matrix between Explanatory Variables

		Age	Education Level	Children under 15 yrs	Monthly income	Trees harvested per month	Firewood used per month	Heads of cattle	Cow predation by bears	SEC participation	ABCP participation	Conservation knowledge	Local flora and fauna knowledge	Bear behavior knowledge	Regulations knowledge
Gender	r	.073	**.255**	-.009	.052	-.047	-.021	.057	-.055	.091	**.224**	**.372**	**.449**	**.413**	.199
	p	.382	**.002**	.911	.533	.569	.800	.496	.507	.271	**.006**	**.000**	**.000**	**.000**	.016
Age	r	1.000	**-.341**	.067	.101	**.351**	**.280**	-.029	-.023	-.117	.016	**-.374**	**.231**	-.081	**-.191**
	p		**.000**	.418	.223	**.000**	**.001**	.726	.780	.158	.849	**.000**	**.005**	.327	**.021**
Education Level	r		1.000	**-.331**	**.196**	**-.187**	**-.285**	**.191**	-.132	**.563**	**.502**	**.677**	.113	**.234**	**.349**
	p			**.000**	**.017**	**.023**	**.000**	**.020**	.111	**.000**	**.000**	**.000**	.175	**.004**	**.000**
Children under 15 yrs	r			1.000	-.141	.080	.048	**.207**	.165	-.156	**-.189**	**-.163**	.085	-.010	-.117
	p				.090	.338	.566	**.012**	.046	.059	**.022**	**.049**	.310	.907	.157
Monthly income	r				1.000	.054	.002	**.251**	-.061	**.175**	.130	.100	.073	.093	.037
	p					.513	.983	**.002**	.465	**.034**	.117	.226	.380	.263	.660
Trees harvested per month	r					1.000	.109	-.149	-.043	-.129	-.105	**-.293**	.040	**-.193**	**-.235**
	p						.189	.072	.604	.120	.205	**.000**	.632	**.019**	**.004**
Firewood used per month	r						1.000	-.099	.114	**-.219**	-.062	**-.222**	-.102	-.055	-.113
	p							.234	.168	**.008**	.455	**.007**	.221	.511	.174
Heads of cattle	r							1.000	.120	**.267**	.056	**.201**	.098	.051	**.201**
	p								.149	**.001**	.502	**.015**	.241	.538	**.015**
Cow predation by bears	r								1.000	-.024	.010	-.076	.039	-.090	.088
	p									.773	.909	.357	.636	.278	.289
SEC participation	r									1.000	**.387**	**.369**	.090	.129	**.219**
	p										**.000**	**.000**	.281	.119	**.008**
ABCP participation	r										1.000	**.381**	.156	.088	**.280**
	p											**.000**	.061	.287	**.001**
Conservation knowledge	r											1.000	**.237**	**.344**	**.337**
	p												**.004**	**.000**	**.000**
Local flora and fauna knowledge	r												1.000	**.284**	.132
	p													**.001**	.112
Bear behavior knowledge	r													1.000	**.227**
	p														**.006**

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BIOGRAPHICAL SKETCH

Santiago Espinosa is a wildlife biologist whose primary career goal is to contribute to the conservation of neotropical ecosystems, the sustainable management of Ecuador's natural resources, and the development of local communities. He believes that through a better understanding of how to integrate ecological, socioeconomic and political systems, this goal is possible.

Santiago's higher education began with the pursuit of a bachelor's degree in biology, at the Pontificia Universidad Católica del Ecuador, Quito, with a focus on the ecology of Ecuadorian wildlife. Through conducting wildlife research in remote areas in Ecuador, he was exposed to rural communities, and became interested in understanding the human dimensions of conservation. After completing his BS, Santiago was hired by the Ecuadorian non-governmental organization, Salud, Infancia, Genero y Ambiente, where he primarily worked on environmental capacity-building with indigenous groups.

In the fall of 2002, Santiago moved to Gainesville, to pursue his M.S. degree in the Department of Wildlife Ecology and Conservation, at the University of Florida, with the support of a LASPAU-OAS scholarship. Santiago has received support from the Tropical Conservation and Development, and Wildlife Ecology and Conservation programs, in order to continue with his Ph.D. at the University of Florida. He will focus his doctoral research on the integration of ecological, socioeconomic, and political systems, with the goal of improving the management and success of protected areas in Ecuador.