

Children's Values and Attitudes About the Wild Vicuña (*Vicugna vicugna*) in Andean Argentina



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ABSTRACT

Vicuñas (*Vicugna vicugna*) are South American camelids whose valuable fleece led to their overexploitation and near extinction in the 1960s. Since then, conservation measures enabled the wild population to rebound, and vicuñas are now viewed as strategic resources for the development of Andean communities. Perceptions of wild vicuñas are changing owed to a transition from strict conservation to managed harvest of fleece from live-shorn animals. Understanding the values and attitudes of human populations toward wildlife is important in the frameworks for developing conservation and sustainable management plans. Attitudes of children are an overlooked area of focus in this field. We surveyed children ($n=348$) from four Andean communities of the Puna region in Argentina regarding their perceptions of wild vicuñas and their relationships with domesticated animals. They recognized the potential of wild vicuñas to promote economic development, although they believed that the wild nature of vicuñas made management difficult and not always desirable.

INTRODUCTION

Vicuñas (*Vicugna vicugna*) are the emblematic species of the **altiplano**—the high altitude Andean plains. South American camelids, they are the wild ancestors of the alpaca (*Vicugna pacos*), while the guanacos (*Lama guanicoe*) are the ancestors of the llama (*Lama glama*). Vicuñas are important both in ecological terms and in the Andean cosmogony, for they are considered the livestock of **Pachamama** (Mother Earth) (Dedenbach 1990; Koford 1957; Yacobaccio 2009). The vicuña's valuable fleece resulted in five centuries of over-exploitation, which led the species to the brink of extinction in the 1960s (Laker 2006).

After decades of strict conservation, wild vicuñas are re-colonizing former habitats that are now occupied by local communities and their pastoral activities. This situation leads to various relationships between human populations and natural resources, and these interactions are important for developing an environmentally sustainable situation with the potential of use of the species.

These relationships can be explained in reference to the complex social-ecological systems described by Ostrom (2009). Ostrom presents a general framework

to identify subsystem variables that affect complex social-ecological systems. One subsystem is that of the users, their ethical standards, and their knowledge of resources as a way to understand the mechanisms by which they conceive their own environments. A cognitive approach examines values, attitudes, and rules underlying the processes that lead from human thought to action, while the motivational approach seeks to explain underlying impetuses to human behavior (Pierce 2001). Ajzen and Fishbein (1977, 1980) introduced the use of the cognitive approach by studying human interactions with wildlife and their environments, and developed a theory which proposed that human thought is arranged into cognitive hierarchies. This cognitive approach stressed the influence of people's values to determine attitudes that ultimately affect their behavior (Father 1990; Fishbein and Ajzen 1975). Several authors pointed out that some attitudes can predict and influence personal behavior (Ajzen and Fishbein 1980; Tesser and Shafer 1990). In relation to nature, the intensity of the value placed on wild places and species is strongly related to the convergence of people's sensitivities, and emotional and intellectual experiences (Myers 1998; Piaget 1969). Attitudes towards wildlife are the result of four main factors: culturally-acquired values, perceptions about the species, knowledge of the species, and relationships between species and societies (Kellert 2002; Kellert and Westervelt 1983). A feasible and sustainable wildlife utilization project must underlie local community attitudes to wildlife (Pratt et al. 2004).

The vicuña is the smallest South American camelid, and has shoulder height around 80 cm and average weight around 50 kg; llamas are typically two to three times heavier. Vicuñas live in territorial groups with one male, a mean of 3-4 females, and two calves, or in groups of bachelor males that can be variable in size. The vicuña thrives at 3500-4800m above sea level in the central Andes, including the altiplano or **puna** of Peru, Bolivia, Argentina, and Chile, and the highest number of vicuñas is found in Peru (Vilá 2012).

The Andean puna is a plateau of semi-desert steppe located over 3,500 m above sea level, and exhibits

two strong seasonalities: the wet season during the summer and the dry season from April to December (Dollfus 1991). Andeans have used wild camelids for more than 11,000 years (Flores Ochoa 1994; Yacobaccio 2004). Pre-Hispanic cultures regulated the exploitation of vicuñas (Cieza de León 1959[1553]). Vicuña decreased from two million at the time of the Spanish conquest to fewer than 10,000 in 1964 due to indiscriminate hunting (Hofman 1983).

Beginning in the late 1960s, several conservation laws and land policies were created on regional, national, and provincial scales. These included strict limits for hunters and high penalties for poachers, enabling the population of vicuñas to recover (Laker et al. 2006; Renaudeau D'arc 2005). With the success of these strict protective measures, Andean countries incorporated the paradigm of conservation through sustainable use for the benefit of the Andean people with the International Convention for Conservation and Management of the Vicuña signed in 1979. The population of wild vicuñas increased, and their ranges overlapped with domestic livestock, which generated some complaints in nearby communities (Wawrzyk 2003; Wawrzyk and Vilá 2006). Recovering from extinction, the status of the "newcomer" vicuñas as common property resources is still controversial (Lichtenstein 2010).

As part of the Argentine project, Sustainable Management of Wild Camelids (MACS), the traditional **chak'u** capture technique for capturing vicuñas has been recovered in Cieneguillas, Argentina. This involves a large group of people walking slowly and holding ropes with colored strings driving vicuñas into a corral for live shearing (Custred 1979). In Incan times, this involved thousands of vicuñas and stone corrals. Today, herders in Argentina drive tens of animals (20-60 head) typically into net corrals. In 2003, the first contemporary chak'u was carried out in Jujuy Province (Vilá 2004; Vilá and Lichtenstein 2006).

In this research, we wanted to understand the variability in values and perceptions of vicuñas among

children in the **altiplano** (highlands) as an input for long-term work in environmental education and sustainable management projects in the area. We analyzed the values and attitudes of children from seven to 18 years old toward wild vicuñas in four Andean communities. The main objective was to analyze the differences in perceptions relating to locality, the presence and density of local vicuña populations, the recent history of the relationships between communities and vicuñas, and the participation or lack of participation of the community in the *chak'u*. We hypothesized that children who live closer to the vicuñas show more positive or pleasant feelings towards the species and that the experience of the *chak'u* influenced children's knowledge of vicuña management.

STUDY AREA

The research took place in four communities in the Jujuy puna region of Argentina: Cieneguillas, Santa Catalina, Rinconada and Abra Pampa (Figure 1). Jujuy province is one of the poorest provinces of Argentina. In 2001, 29 percent of the population of Jujuy lacked basic needs; in the puna, poverty rates exceeded 50 percent (INDEC 2001). In 2004, Jujuy's child malnutrition rate was among the highest in the country at 25.24 (Ministerio de Salud Argentina 2004), and its infant mortality rate exceeded 13.4 (Ministerio de Salud Argentina 2012). The unemployment rate in the province was approximately 28 percent, and 22 percent of the employed people work under social programs

(INDEC 2001). This situation motivates migration from rural to urban areas.

A main economic and cultural resource in the altiplano region is the production of livestock, mainly llamas and sheep (Göbel 2002). Care of the herds requires seasonal migration (Browman 1991; Göbel 2002; Medinaceli 2005). In the puna region, most of the schools offer education at the primary level (six to 12 years old), so many children do not complete the state-mandated thirteen years of education (five to 18 years old). Some of the schools in the puna are organized as boarding schools, and most of them offer four meals daily to their students. The school curriculum is usually the same for the entire province and varies little regionally (Vilá 2006; Vilá et al. 2009).

Selection of the four communities took into account both environmental and cultural particularities, including: 1) the presence and the density of the vicuñas in the area; and 2) experience in wild vicuña capture and management (Table 1).

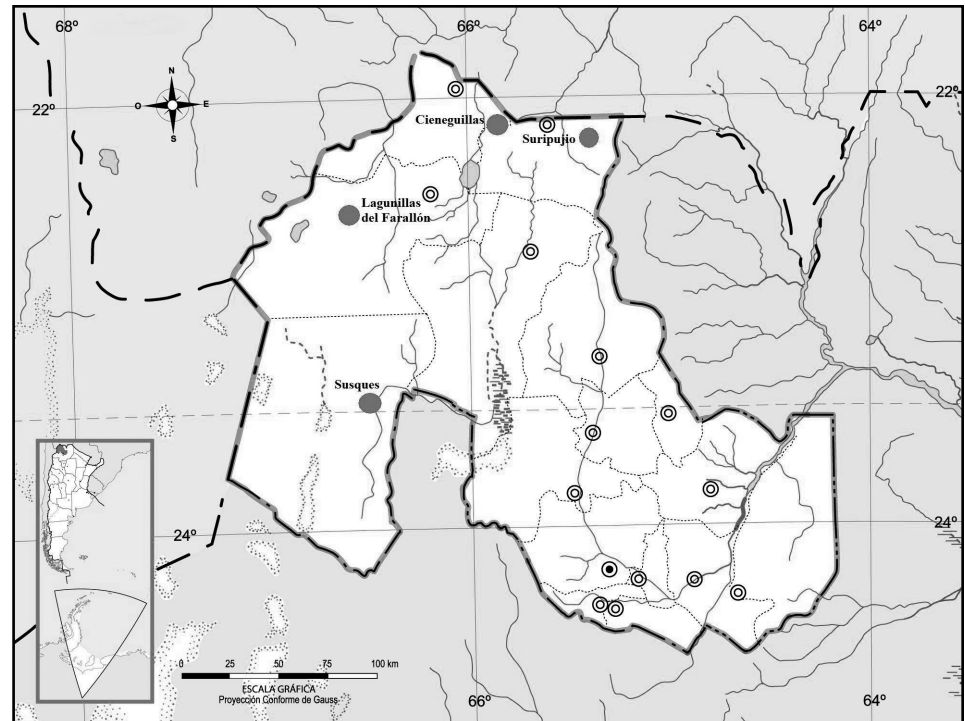


FIGURE 1. Study Area.

TABLE 1. Main characteristics of the four studied communities in the Puna region of Argentina.

Communities	Environmental Characteristics							Management		
	m.a.s.l.	Localization	MAB-UNESCO	Vicuñas density	Number of inhabitants	Economic Base	No. schools	No. students	wild vicuñas experience	Special features
Cieneguillas	3,700	66°15' w 21° 50' s	Yes	20 vicuñas/ km ²	270	Rural subsistence, economy base on raising llamas and sheep	2	132	Yes	Declared as "Protector town of vicuñas" because of conservation attitudes
Rinconada	3,950	66° 10' w 22° 25' s	Yes	5 to 8 vicuñas/ km ²	360	Rural subsistence, economy base on raising llamas and sheep	2	216	No	
Santa Catalina	3,800	66° 4' w 21° 56' s	No	1 to 3 vicuñas/ km ²	332	Rural subsistence, economy base on raising llamas and sheep	3	175	No	Old traditional mining town is still in activity
Abra Pampa	3,480	65° 42' w 22° 43' s	No	No wild vicuña population. 1,100 vicuñas in captivity in INTA nearby	7,496	Commercial, administrative and rural activities	9	3,474	No	Small city, declared the Puna capital. Has intermediate educational institutions

The four sites were selected for population density of vicuñas and whether the local vicuña populations were managed or unmanaged. Cieneguillas had the highest population density of vicuñas at over 20 vicuñas per square kilometer, and was particularly important because the chak'u was undertaken annually from 2003 to 2005, making it the only town in Jujuy where this activity took place (Vilá and Arzamendia 2006) at the time we collected our data. Similarly, Rinconada had a high vicuña population and no population management. Santa Catalina was chosen for its rural profile and showed a medium density of wild vicuñas. Abra Pampa had no wild vicuñas, but captive vicuñas were housed at the nearby National Institute of Agricultural Technology station (INTA).

METHODOLOGY

Children from seven to 18 years of age attending different schools in the puna region were surveyed with structured questionnaires. Each survey was administered by someone experienced in environmental education. Children capable of filling out questionnaires on their own were given surveys with twenty-four questions (Emerson 1995). The distribution of the sample by age is shown in Table 2 and Figure 2.

The questionnaires were adapted from previous studies, and incorporated questions derived from informal meetings and unstructured interviews. The questionnaires were pre-tested in three different villages before final modifications for the main study.

TABLE 2. Number of children surveyed in the four Andean communities' ages 7 to 18 years.

Residence	No. surveyed	Gender		Age		
		Boys	Girls	Under 11	Between 11 and 14	Older than 14
Santa Catalina	81	35	46	12	54	15
Cieneguillas	75	37	38	20	40	15
Rinconada	72	38	34	3	46	23
Abra Pampa	120	60	60	29	63	28
Total	348	170	178	64	203	81

The final version of the questionnaire was structured around four main issues: 1) family composition and parental occupation of informants; 2) informants' knowledge about wild vicuñas; 3) relationships between livestock and wild vicuñas; and 4) general environmental knowledge. Questions about informants' knowledge of wild vicuñas included a set of closed-answer questions about long-term population trends, usefulness of vicuñas, attitudes toward vicuñas, problems relating to interactions between vicuñas and humans, the frequency of poaching, and the future of the vicuña population.

Previous research on children's relationships with nature indicated that values and attitudes developed at different ages, so we grouped children into three age groups: 1) 11 years old and below; 2) between 11 and 14 years old; and 3) older than 14 years old. Responses relating to parental employment were placed into the following categories: 1) domestic employment including housewives; 2) civil and government employment; 3) employment in family businesses and self-employment; 4) wage labor; 5) employment in the education sector; 7) professional employment; 8) retired; 9) employed under a government social plan; 10) unemployed; and 11) non-response.

The answers about family composition were classified into categories reflecting the variety in the Andean family structure in different combinations of: "family

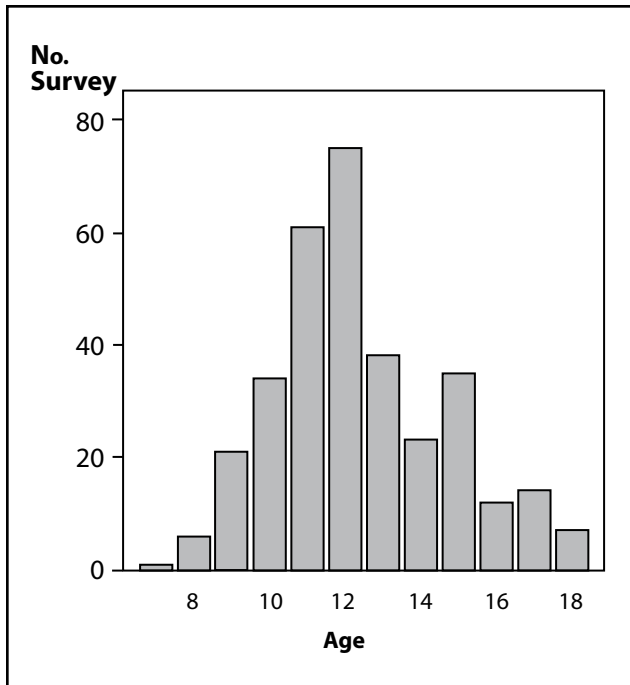


FIGURE 2. Distribution of the total number of surveys in relation to the age of the children and teenagers sampled.

with father, mother and brothers,” “mother alone,” “grandparents alone,” and “extended families composed with other relatives.” The answers regarding the causes of change in the vicuña population trends were grouped into the following causes: 1) poaching; 2) climate change (rain; pastures; water); 3) biological constraints (reproduction; number offspring; death); 4) human care and protection; and 5) other causes. To analyze the perceptions of population trends over the years we used a closed question: “Some years ago the number of vicuñas in the area was: 1) more than at present; 2) the same; 3) less than in the present; or 4) there never were vicuñas in the area.” The usefulness responses to open questions were classified into: 1) meat; 2) fiber; 3) tourism; and 4) other, being possible multiple responses. The answers regarding ownership of vicuñas were grouped in seven categories: 1) owned by themselves; 2) owner of the land; 3) province/state; 4) no one; 5) everybody; 6) do not know; and 7) other cases (an individual person, the institution which organizes the management experience). Using a five-point Likert scale: 1) much; 2) quite a bit; 3) little; 4) very little; and 5) nothing, we

measured attitudes toward vicuñas by asking “How many people want wild vicuñas that live in the area?” and “How many people look after the vicuñas?”

Additionally, we asked informants whether they considered conservation of vicuñas to be worthwhile. To address the relationship between vicuñas and domestic livestock, children were asked whether they would be willing to replace their herds with wild vicuñas, and then we asked them how many llamas, sheep, or goats they were willing to exchange for one vicuña. An independent chi-square test with a significance level of five percent was used to analyze the correlations among responses. For each question, the confidence interval of the answer was calculated using an approximate normal curve with a confidence level of 95 percent.

RESULTS

Most of the students (57 percent) lived with their mother and father at least in some months of the year. In other cases, the family included other relatives such as grandparents, uncles, cousins and nephews (16 percent). In seventeen percent of households, the only adult is the mother. Most children’s fathers in the four localities worked in municipal activities as part of government-sponsored social plans (36 percent), while 19 percent worked in mining and construction, and 17 percent were peasants and artisans. Thirty-five percent of mothers were housewives. Another 24 percent of mothers were dedicated to the care of livestock and made handcrafts and 22 percent worked under social plans mainly as cooks and janitors in schools or public institutions. Santa Catalina and Abra Pampa children perceived that local populations of vicuñas were higher in the past. In contrast, Cieneguillas and Rinconada students believed that vicuña populations had increased substantially over the last years (Table 3).

When asked about the reasons for their answers about the increase in number of vicuñas, the answers identified: 1) less hunting because it was prohibited (26 percent); 2) increase in vicuña reproduction (11 percent); and 3) greater care and protection of the species by local people (11 percent). The decrease in

TABLE 3. Perception of vicuña local status by children in four Andean communities in Argentina (percentage of answers).

Communities	Now there are...		
	less	same	more
Cieneguillas	35.7	3.6	61.9
Rinconada	35.1	19.3	45.6
Santa Catalina	46	7.9	30.2
Abra Pampa	58.6	11.5	29.9

vicuña populations was explained to be due to the following: 1) poaching (15 percent); 2) decreasing pasture and water resources due to climate change (12 percent); and 3) no care of the species by local people (8 percent). Most of the surveyed children (87 percent) said that the vicuñas were valuable animals because of their fine fiber (55 percent), their importance as a tourist resource (28 percent), their meat (14 percent), and other uses (3 percent). Statistical analysis of the entire sample showed that this result on “the value of the vicuña as a resource” had no association with the place of residence ($\chi = 1.0382$, $df = 3$, $p = 0.792$), the gender of the surveyed children ($\chi = 0.514$, $df = 1$, $p = 0.668$), the presence of the species in the area ($\chi = 0.426$, $df = 1$, $p = 0.172$), or whether or not the respondents had participated in capturing and shearing of wild vicuña ($\chi = 0.426$, $df = 1$, $p = 0.514$).

Besides being considered a valuable resource, children perceived (63 percent) that vicuñas caused some problems. Sixteen percent of the children pointed out that the displacement of the animals into different fields limited the possibility of ownership, 15 percent believed that the vicuña overgrazed the pastures, 12 percent of the children perceived the increasing population density of vicuñas to be a problem, and 12 percent responded that vicuñas destroy fences. Moreover, 35 percent of the children surveyed said that vicuñas transmitted diseases to livestock. This was found more frequently in children ages 11 to 14 ($\chi = 7.878$, $df = 2$, $p = 0.019$). Although some problems

associated with vicuñas have been identified, mainly in regions with high population densities of vicuñas, most of the children (74 percent) believed that wild vicuñas did not cause damage or harm to the puna environment. This affirmation did not depend on the gender of the surveyed children ($\chi = 0.543$, $df = 1$, $p = 0.461$), whether or not the respondents had participated in capturing and shearing wild vicuñas ($\chi < 0.010$, $df = 1$, $p = 0.986$), the presence of the species in the area ($\chi = 0.010$, $df = 1$, $p = 0.919$), or place of residence $\chi = 3.193$, $df = 3$, $p = 0.363$).

Notable differences were perceived in responses to questions about poaching activities and the illegal trade in vicuña products. Most of the children in Abra Pampa (75 percent) stated that the identity of poachers was known in the area; many of them even said that their parents or grandparents used to hunt vicuñas in the past. Likewise, children could describe the illegal circulation of vicuña fiber: where it could be sold, its monetary value, and who the people involved in the process were. Similar views were collected by analyzing the responses of the children of Santa Catalina and Rinconada. In the town of Cieneguillas, in contrast, 57 percent of the students said that there were no poachers in that area. Many respondents (38 percent) believed that vicuñas “belong to nobody” in accordance with the provisions of the Civil Code. Other children were uncertain of the right to ownership of the vicuñas (24 percent), while some believed that they “belonged to the province” (10 percent). A smaller percentage said that they belonged to the owners of the grazing fields (12 percent), while eight of the polled felt that the wild vicuñas “belong to everybody.”

Regardless of the place of residence and the characteristics of the surveyed children, it was believed that vicuñas were animals with considerable opportunity for taming, although 84 percent of respondents indicated that caring for vicuñas as difficult.

When we asked the students about what animal they preferred to raise, most of them (71 percent) responded llamas, except for Santa Catalina’s

TABLE 4. Favorite animal to raise chosen by children in four Andean communities in Argentina (percentage of answers).

Species	Residence				Gender		Age		
	Santa Catalina	Cieneguillas	Rinconada	Abra Pampa	Male	Female	Under 11	Between 11 and 14	Older than 14
Llama	43	63	62	37	49	48	33	30	79
Sheep	39	47	33	37	35	43	42	26	47
Vicuña	27	31	42	22	30	29	16	17	49
Goat	21	19	8	12	14	15	17	8	14
Donkey	54	24	37	14	28	31	28	15	46
None	4	8	7	12	8	8	6	5	14

children, who chose cattle. Llamas were preferred because of their docile and tame behavior implying it is easier to look after them than it is to look after sheep or goats that require continuous pastoral care while grazing. Cattle were preferred for their milk rather than their meat, while llamas were preferred because of their fiber and meat. In general, llamas were preferred over vicuñas because of their domesticity that more easily allow a clear right of ownership and management (Table 4).

When asked about the possibility of replacing domestic livestock (sheep and llamas) with wild vicuñas, 55 percent of the students expressed negative opinions. However, when asked about partial replacement of the llamas or sheep with vicuñas, 48 percent responded that they would be happy to exchange them, but not completely replace their flocks. In Abra Pampa, 62 percent of children were willing to replace llamas or sheep with vicuñas, in contrast with the children of Cieneguillas who preferred not to replace livestock with vicuñas (67 percent) (Table 5).

We asked about how local people raise vicuñas, and nearly one third of the children (33 percent) perceived that the care of vicuñas by the local people was “low;” 12 percent “very low;” and 17 percent “not at all.” This trend was consistent over the four surveyed areas. In addition, when asked whether it is “beneficial to take care of and preserve vicuñas,”

76 percent concluded that it was. The principal reasons that the children expressed for raising of vicuñas were not only utilitarian (because of its fiber and because it could be a tourist attraction), but also because of aesthetic, scientific, ecological, ethical and cultural reasons.

DISCUSSION

In this study, children differed in their appreciation of vicuñas: in communities with low population densities of vicuñas, children were able to understand the history of the wild populations in their area, and in areas of high population densities, children described the current situation of vicuñas becoming more numerous. The perceptions of the children of Cieneguillas and Rinconada are verified by censuses of vicuñas conducted in the area since 1999 (Arzamendia 2008), although no changes have been observed in the last 20 years in Santa Catalina (Canedi 1995; Secretaría de Ambiente y Desarrollo Sustentable 2006) until a recent increase in population described from 2010 onwards. We could not find significant differences in relation to age and gender—this can imply that school environments serve to homogenize the responses.

In many areas of the puna, vicuñas share their territory with domestic livestock, and the local people (in

TABLE 5. Differences between positive responses regarding the replacement of llamas or sheep with vicuñas (percentage of answers).

Replacement of livestock	Residence				Age			Gender	
	Santa Catalina	Cieneguillas	Rinconada	Abra Pampa	Under 11	Between 11 and 14	Older than 14	Male	Female
Sheep and llama	14	21	17	31	19	24	19	24	20
Llamas only	16	3	11	12	10	10	11	11	10
Sheep only	11	8	13	15	10	12	13	12	12
No Change	58	67	57	38	60	51	54	49	57
Nk/Na	1	1	2	4	1	3	3	4	1

this case children) identified the overlap in pasture and water resources although only 26 percent of the children believed that wild vicuñas caused damage or harm to the puna. The underlying concept was that vicuñas are good for the environment (in an abstract sense), but not so good for everyday pastoral life. Recent research has indicated that vicuñas are usually displaced from the best grazing areas due to local disturbances (Arzamendia 2008; Borgnia 2008). Many Andean communities in Argentina lack secure tenure rights over land and wildlife, so this situation provides more incentives for locals to own domestic livestock instead of wild vicuñas (Stollen 2009); this appears to be reflected in the responses of children who preferred domestic species.

About 10 percent of the children said that vicuñas ate all the pastures. Because vicuñas are among the lowest impact grazers of the altiplano, this opinion denoted that vicuñas were blamed for the consequences of overgrazing by domestic livestock. Other children pointed out that the vicuñas did not cause damage to the ecosystem, because they are recognized as wild components of the environment. Another finding of this research is that of the relationship between broken fences and vicuñas. It is notable that several vicuñas died hooked in the fences, so there is a contradiction between what the children had described, and what was actually happening. This new situation in which vicuñas come to live in the area is not always

perceived by locals as a good situation. This negative perception owes partly to the wildness of vicuñas, in that they require no care and generally cannot be owned. Recognizing this diversity of perspectives is important. Community-based conservation initiatives are more effective when recognizing a community's internal differences, their relations with external actors, and the institutions that affect both (Agrawal and Gibson 1999).

As described before, since ancient times, Andean communities have established a close relationship with vicuñas, which were considered the livestock of the Pachamama (Mother Earth). Therefore, we expected that those symbolic and moralistic values would emerge in our study. However, most of the children pointed out the utilitarian value of vicuñas with its great potential for profit, mainly due to the quality of the fiber and its importance as a landscape component for promoting tourism—especially in Cieneguillas and Rinconada, where the population density of vicuñas is higher and where the implementation of management plans is possible. As Kellert affirmed (1980), farmers as a group are unique in their attitudes towards wildlife because they tend to view wildlife in utilitarian terms, particularly on their economic value.

Many wildlife managers believe that farmers consistently overestimate wildlife damage (McIvor

and Coner 1994; Wakely and Mitchell 1981). It is important to emphasize that estimations of damage by farmers (or in this case, children) may be inaccurate, but perception of damage surely influence attitudes towards wildlife management, as well as their behaviors regarding damage prevention and habitat protection.

Children showed diverse responses about the ownership of vicuñas, and these responses appear to us to be similar to those of adults. In fact, local administrative authorities had not determined clear policies about this issue. It would have been expected that after the experience of vicuña management in Cieneguillas via live captures (chak'u) by the community that local children would show a greater preference towards vicuñas. However, responses were conditioned more by associations with the free range and wild nature of the species and by the difficulty in individual appropriation of vicuñas for human use. Children of Cieneguillas were less willing to replace part of their livestock with more vicuñas because they believed there were already enough vicuñas in the area. In contrast, children in Abra Pampa were happy to replace some llamas and sheep with more vicuñas. As Bjerke (1998) showed, children living in areas populated by wolves (*Canis lupus*) express more negative attitudes toward these animals, compared with children living in wolf-free (i.e., urban) areas. British children like tigers (*Panthera tigris*) and lions (*Panthera leo*), and similar preferences apply to Italian urban children (Rusca and Tonucci 1992). But children in Tanzania, where lions live, express fear of these carnivores and consider them a nuisance (Entwistle and Stephenson 2000). Thus, familiarity with wild species can breed contempt as easily as it can engender affinity.

In any case, the surveyed children were not willing to completely replace their llamas and sheep flocks to have only vicuñas because they live in a risky environment—making the diversity the species in their flocks an optimal strategy for managing risk (Göbel 1998). Our results are consistent with the idea showed by Heinen and Low (1992), whose study indicated

that human beings in most cultures showed positive attitudes toward wildlife in the context of abstract existential values, but these attitudes easily turned more negative when the presence of animals in their immediate surroundings appeared to incur economic consequences. The ownership of natural resources is often a critical point in the design of management and conservation plans, and usually generates tension among stakeholders (Bromley 1991; McNeill 2009; Norton Griffiths 2007).

In *Governing the Commons*, Ostrom (1990) presented the design of durable cooperative institutions that are organized and governed by the resource users as the best way to manage small-scale communal resources. In her approach some issues are identified, a key point of which was that the demarcation of clearly defined physical boundaries was a way to identify the members of the user pool. This is problematic with mobile animals, particularly because Argentina is a federal country in which wildlife has the status of *res nullius*, meaning “without owner.” According to Bromley (1982), property regimes in both land and wildlife are determinants of strategies for conservation and use that different societies find optimal, including rights over wildlife, distribution of benefits, and costs of conservation and use. Most children in our survey believed that vicuñas belonged to nobody because they are considered public resources, but in other cases they believed that the owner of the land was the owner of the vicuñas that lived on that land.

As stated in Blaikie (2006), one of the most important tenets of community-based natural resource management is the right to use the resource(s) and control the use of the resource(s). Control of poaching is a key aspect for the success of vicuña conservation. Although, there is a strict legislation disallowing illegal practices, it is important to show local communities the potential of vicuñas' sustainable use, thus the need for the control of poaching, as animals must be habituated to humans to facilitate management. Poaching areas were very distressing to vicuñas, which made them very reluctant to capture. McAllister, McNeill and Gordon (2009) showed

that the role of international markets can promote excellent opportunities for conservation of vicuñas and promotion of local economies, with large populations of vicuñas generating high revenues. But the existence of international legal markets can also pull interests in the commercialization for illegal fiber; this is a significant risk to the vicuña population. In Cieneguillas, most of the students said that there were no poachers in that region, an assertion supported by the high population density of vicuñas, over 20 per km² (Arzamendia and Vilá 2006).

This situation differed in the rest of the locations under study. Recent studies pointed out that the poaching activities were still the major risk to conservation of wildlife in the Andes, especially on the border areas with Bolivia and Chile (Fish and Wildlife Service 2002; Secretaria de Ambiente y Desarrollo Sustentable de la Nación 2008). The only way to find a creative solution is through community-based conservation founded on principles of checks and balances among various parties, including local groups, government actors, and institutions. We are convinced that children are key actors toward this objective. Therefore, it is important to recognize that children construct knowledge and values not only through interaction with the physical world, but also through interactions with the social world and with social discourses and institutions (Kahn 2002).

CONCLUSION

Although the vicuñas have been a cultural symbol for Andean communities in the past, today utilitarian values have been imposed over symbolic and religious values. Children from the four communities under study recognized the potential of vicuñas for economic development, but also identify their wildness as a potential disadvantage. The children affirmed that vicuñas needed “no care” because they belonged to nobody and that it was unnecessary for humans to control their life cycles. This is an important issue to take into account in policy-making for use and conservation. Children in Cieneguillas had experience managing wild vicuñas, though they did

not differ from other children in their perspectives. As the population density of vicuñas increased, children were less willing to exchange domestic livestock for vicuñas. Children in Cieneguillas affirmed that there were no poachers in the region due to conservation laws concerning vicuñas, while children in Abra Pampa were able to describe the illegal market for vicuña fiber. Children can actively participate in vicuña management plans thus encouraging sensitive and emotional experiences towards the species, especially because it appears that some negative perceptions are not based on scientific data on the behavior or sanitary aspects of the animal.

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REFERENCES CITED

- AGRAWAL, A., AND C.C. GIBSON.
1999 Enchantment and disenchantment: The role of community in natural resource conservation. *World Development* 27(4):629-49.
- AJZEN, I., AND M. FISHBEIN.
1977 Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin* 84(5):888-918.
- AJZEN, I., AND M. FISHBEIN.
1980 *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- ARZAMENDIA, Y.
2008 Estudios etoecológicos de vicuñas (*Vicugna vicugna*) en relación a su manejo sostenido en silvestría, en la Reserva de Biosfera Laguna de Pozuelos. Ph.D. diss., University of Córdoba, Argentina.
- ARZAMENDIA, Y., AND B. VILÁ.
2006 "Estudios etnoecológicos de vicuñas en el marco de un plan de manejo sustentable, Cieneguillas, Jujuy," in *Investigación, conservación y manejo de icuñas*. Edited by B. Vilá, pp. 69-84. Buenos Aires: Talleres Gráficos Leograf.
- BJERKE, T., O. REITAN, AND S.R. KELLERT.
1998 Attitudes toward wolves in southeastern Norway. *Society and Natural Resources* 11(2):169-178.
- BLAIKIE, P.
2006 Is small really beautiful? Community-based natural resource management in Malawi and Botswana. *World Development* 34(11):1942-1957.
- BORGNIA, M.
2008 Ecología espacial y alimentación de vicuñas (*Vicugna vicugna*): Interacciones con el ganado doméstico en la Reserva de Laguna Blanca, Catamarca, Argentina. Ph.D. diss., National University of Lujan, Argentina.
- BROMLEY, D.W.
1982 Land and water problems: An institutional perspective. *American Journal of Agricultural Economics* 64(5):834-844.
- BROMLEY, D.W.
1991 *Environment and economy: Property rights and public policy*. Oxford: Blackwell.
- BROWMAN, D.
1991 "Llama caravan fleteros: Their importance in production and distribution," in *Nomads in a changing world*. Edited by P.C. Salzman and J. G. Galaty, pp. 408-455. Naples, Italy: Instituto Universitario Orientale di Napoli.
- CANEDI, A.
1995 Biología y uso sustentable de las poblaciones de vicuñas en la provincia de Jujuy-Argentina: Informe estado de avance. San Salvador de Jujuy, Argentina: Universidad Nacional de Jujuy, Instituto Nacional de Tecnología Agropecuaria y Secretaría de Agricultura y Ganadería de Jujuy.
- CIEZA LEÓN, P.
1959/1553 *The Incas*. Edited by V.W. Von Hagen. Norman, OK: University of Oklahoma Press.

- CORNELL, J.
1979 *Sharing nature with children*. Nevada City, CA: Dawn Publications.
- CUSTRED, G.
1979 Hunting technologies in Andean culture. *Journal de la Societe des Americanistes* 66(1):7-12.
- DEDENBACH, S.
1990 *Uso y crianza de los camélidos en la época Incaica*. Bonn: Bonner Amerikanistische Studien.
- DOLLFUS, O.
1991 *Territorios andinos: Reto y memoria*. Lima: Instituto Frances de Estudios Andinos e Instituto de Estudios Peruanos.
- EMERSON, R.M., R.I. FRETZ, AND L.L. SHAW.
1995 *Writing ethnographic fieldnotes*. Chicago: The University of Chicago Press.
- ENTWISTLE A.C., AND P.J. STEPHENSON.
2000 "Small mammals and the conservation agenda," in *Priorities for the conservation of mammalian diversity. Has the panda had its day?* Edited by A. Entwistle and N. Dunstone, pp. 119-139. Cambridge, UK: Cambridge University Press.
- FATHER, N. T.
1990 "Bridging the gap between value and actions: Recent applications of the expectancy value model," in *Handbook of motivation and cognition. Volume 2*. Edited by E.T. Higgins and R.M. Sorrentino, pp. 151-92. New York: Guilford.
- FISH AND WILDLIFE SERVICE.
2002 Endangered and threatened wildlife and plants; reclassification of certain vicuña populations from endangered to threatened with a special rule. Federal Register, 67:37695-37723.
- FISHBEIN, M.
1967 "Attitude and the prediction of behavior," in *Readings in attitude theory and measurement*. Edited by M. Fishbein, pp. 477-492. New York: Wiley. FISHBEIN, M., AND I. AJZEN.
1975 *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- FLORES OCHOA, J.
1994 "Man's relation with the camelids," in *God of the Andes: The llama, alpaca, vicuñas and guanacos of South America*. Edited by J. Martinez, pp. 22-35. Barcelona: Francis O. Patthey and sons.
- GÖBEL, B.
1998 "Risk, uncertainty and economic exchange in pastoral community of Andean highlands (NW- Argentine)," in *Networks and exchange*. Edited by T. Schweizer and D. White, pp. 158-177. Cambridge, UK: Cambridge University Press.
- GÖBEL, B.
2002 La arquitectura del pastoreo: Uso del espacio y sistema de asentamientos en la Puna de Atacama (Susques). *Estudios Atacameños* 23:53-76.
- HEINEN, J.T., AND B.S. LOW.
1992 Human behavioral ecology and environmental conservation. *Environmental Conservation* 19(2):105-116.
- HOFMAN, R., H. OTTE, C. PONCE, AND M. RÍOS.
1983 *El manejo de la vicuña silvestre*. Eschborn, Germany: GTZ.

- INSTITUTO NACIONAL DE ESTADÍSTICAS Y CENSOS (INDEC).
2001 *Censo nacional de población y vivienda, Argentina*. Retrieved March 28, 2013, from http://www.indec.gov.ar/webcenso/provincias_2/provincias.asp.
- KAHN, P.H.
2002 "Children's affiliations with nature: Structure, development and the problem of environmental generational amnesia," in *Children and nature: Psychological, sociocultural and evolutionary investigations*. Edited by P. Kahn and S. Kellert. Cambridge, MA: The MIT Press.
- KELLERT, S.R.
1980 "Contemporary values of wildlife in American society," in *Wildlife values*. Edited by W.W. Shaw and E.H. Zube, pp. 31-59. Fort Collins, CO: United States Forest Service, Rocky Mountain Experiment Station.
- KELLERT, S.R.
1985 Social and perceptual factors in endangered species management. *Journal of Wild Management* 49(2):528-536.
- KELLERT, S.R.
1996 *The value of life: Biological diversity and human society*. Washington, DC: Island Press/Shearwater Books.
- KELLERT, S.R.
2002 "Experiencing nature: Affective, cognitive and evaluating development in children," in *Children and nature: Psychological, sociocultural and evolutionary investigations*. Edited by P. Kahn and S. Kellert. Cambridge, MA: The MIT Press.
- KELLERT, S.R., AND E. WESTERVELT, EDs.
1983 *Children's attitudes, knowledge and behaviors toward animals*. Washington, DC: United States Fish and Wildlife Service.
- KOFORD, C.B.
1957 The vicuña and the Puna. *Ecological Monographs* 27:153-219.
- LAKER, J., J. BALDO, Y. ARZAMENDIA, AND H. YACOBACCIO.
2006 "La vicuña de los Andes," in *Investigación, conservación y manejo de vicuñas*. Edited by B. Vilá, pp. 37-50. Buenos Aires: Talleres gráficos Leograf.
- LAKER, J., N. RENAUDEAU D'ARC, AND B. VILÁ.
2003 "Involving communities in wildlife management in the Andean altiplano through sustainable use of vicuña," in *Proceedings of the 3rd International Wildlife Management Congress*. Christchurch, New Zealand: Wildlife Management Congress.
- LICHTENSTEIN, G.
2010 Vicuña conservation and poverty alleviation? Andean communities and international fibre markets. *International Journal of the Commons* 4(1):100-121.
- MCALLISTER, R.J., D. MCNEILL, AND I.J. GORDON.
2009 Legalizing markets and the consequences for poaching of wildlife species: The vicuña as a case study. *Journal of Environmental Management* 90(1):120-130.
- MCLVOR, D.E., AND M.R. CONER.
1994 Impact of greater sandhill cranes foraging on corn and barley crops. *Agriculture Ecosystems and Environment* 49(3):233-237.
- MCNEILL, D., G. LICHTENSTEIN, AND N. RENAUDEAU D'ARC.
2009 "International policies and national legislation concerning vicuña conservation and exploitation," in *The vicuña: The theory and practice of community based wildlife management*. Edited by I.J. Gordon, pp. 63-79. Townsville, Australia: Springer Science.

- MEDINACELI, X.
2005 Los pastores andinos: Una propuesta de lectura de su historia. Ensayo bibliográfico de etnografía e historia. *Bulletin de l'Institut Français d'Études Andines* 34(3):463-474.
- MINISTERIO DE SALUD ARGENTINA. PROGRAMA NACIONAL DE ESTADÍSTICAS DE SALUD.
2004 Tasa de mortalidad infantil por cada 1000 nacidos vivos según lugar de residencia de la madre. Retrieved March 28, 2013, from <http://www.indec.mecon.ar/nuevaweb/cuadros/65/SH-mortalidad4.xls>.
- MINISTERIO DE SALUD ARGENTINA, ORGANIZACIÓN PANAMERICANA DE LA SALUD Y OFICINA REGIONAL DE LA ORGANIZACIÓN MUNDIAL PARA LA SALUD.
2012 Indicadores básicos 2012. Retrieved March 28, 2013, from <http://www.msal.gov.ar/images/stories/pdf/indicadores-basicos-2012.pdf>.
- MYERS, O.
1998 *Children and animals: Social development and our connections to other species*. Boulder, CO: Westview Press.
- NORTON GRIFFITHS, M.
2007 Property rights and wildlife conservation options in Kenya. CSERGE Working Paper GEC 95-07. Norwich, UK: Centre for Social and Economic Research on the Global Environment.
- OSTROM, E.
1990 *Governing the commons: The evolution of institutions for collective action*. Cambridge, UK: Cambridge University Press.
- OSTROM, E.
2009 A general framework for analyzing sustainability of social-ecological systems. *Science* 325(5939):419-422.
- PIAGET, J.
1969 *The child's conception of the world*. Totowa, NJ: Littlefield, Adams.
- PIERCE, C.L., M.J. MANFREDO, AND J.J. VASKE.
2001 "Social science theories in wildlife management", in *Human dimensions of wildlife management in North America*. Edited by D.J. Decker, T.L. Brown and W.F. Siemer, pp. 39-56. Bethesda, MD: The Wildlife Society.
- PRATT, D., D. MACMILLAN, AND I. GORDON.
2004 Local community attitudes to wildlife utilization in the changing economic and social context in Mongolia. *Biodiversity and Conservation* 13(3):591-613.
- RENAUDEAU D'ARC, N.
2005 Community-based conservation and vicuña management in the Bolivian highlands. Ph.D. diss., Universidad of East Anglia, Norwich, Scotland.
- RUSCA G., AND F. TONUCCI.
1992 Development of the concept of living and animal in the child. *European Journal of Psychology of Education* 7(2):151-176.
- SECRETARÍA DE AMBIENTE Y DESARROLLO SUSTENTABLE DE LA NACIÓN, DIRECCIÓN DE FAUNA.
2008 *Primer censo nacional de camélidos silvestres al norte del río Colorado*. Buenos Aires: Gráfica Cane.
- SOBEL, D.
1993 *Children's special places: Exploring the role of forts, dens and bush houses in middle childhood*. Tucson, AZ: Zephyr Press.

- STOLEN, K., G. LICHTENSTEIN,
AND N. RENAUDEAU D'ARC.
2009 "Local participation in vicuña management," in *The vicuña: The theory and practice of community based wildlife management*. Edited by I.J. Gordon, pp. 81-96. Townsville, Australia: Springer Science.
- TARRANT, M.A., BRIGHT, A.D.,
AND H.K. CORDELL.
1997 Attitudes toward wildlife species protection: Assessing moderating and mediating effects in the value-attitude relationship. *Human Dimensions of Wildlife* 2(2):1-20.
- TESSER, A., AND D. SHAFFER.
1990 Attitudes and attitude change. *Annual Review of Psychology* 41: 479-523.
- VILÁ, B.
2006 *Investigación, conservación y manejo de vicuñas*. Buenos Aires: MACS Project.
- VILÁ, B.
2012 *Camélidos sudamericanos*. Buenos Aires: EUDEBA.
- VILÁ, B., AND G. LICHTENSTEIN.
2006 "Manejo de vicuñas en Argentina," in *Manejo de fauna silvestre en la Argentina*. Edited by M.L. Bolkovic and D. Ramadori, pp. 121-136. Buenos Aires: Dirección de Fauna Silvestre, Secretaría de Ambiente y Desarrollo Sustentable.
- VILÁ, B., C. BONACIC, Y. ARZAMENDIA,
A. WAWRZYK, AND H. LAMAS.
2004 Captura y esquila de vicuñas en Cieneguillas. *Ciencia Hoy* 14(80):44-55.
- VILÁ, B., J. GARCIA GÓMEZ, AND A. WAWRZYK.
2009 "Environmental education as a tool in the sustainable management of vicuña in the Altiplano of South America," in *The vicuña: The theory and practice of community based wildlife management*. Edited by I.J. Gordon, pp. 97-112. Townsville, Australia: Springer Science.
- WAKELY, J.S., AND R.C. MITCHELL.
1981 Blackbird damage to ripening field corn in Pennsylvania. *Wildlife Society Bulletin* 9(1):52-55.
- WAWRZYK, A., AND B. VILÁ.
2006 "Los niños de la puna jujeña y su mirada sobre la vicuña silvestre: percepción y valores," Paper presented at IV Congreso Mundial de Camélidos. Catamarca, Argentina.
- WAWRZYK, A., B. VILÁ, Y. ARZAMENDIA,
H. YACOBACCIO, H. LAMAS, M. BORGNA,
C. BONACIC, AND J. LAKER.
2003 "Management plan, capturing, and local community involvement of vicuñas in Argentina," Paper presented at XIX Annual Meeting of the Society for Conservation Biology. Brasilia, Brazil.
- WRIGHT, S.R.
1979 *Quantitative methods and statistics: A guide to social research*. Beverly Hills, California: Sage Publications.
- YACOBACCIO, H., L. KILLIAN, AND B. VILÁ.
2004 "Explotación de la vicuña durante el período colonial 1535-1810," Paper presented at III Taller Internacional de Zooarqueología de Camélidos Sudamericanos, (GZC – ICAZ): Manejo de los Camélidos Sudamericanos. Tilcara, Jujuy, Argentina.
- YACOBACCIO, H.
2009 "The historical relationship between people and the vicuña," in *The vicuña: The theory and practice of community based wildlife management*. Edited by I.J. Gordon, pp. 7-20. Townsville, Australia: Springer Science.