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Chapter
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Sustainable Use of the Vicuña (*Vicugna Vicugna*): A Critical Analysis and the MACS Project (Manejo De Camelidos Sudamericanos Silvestres)

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Introduction

The vicuña is a South American Camelid belonging to the infra-order Tylopoda, and family Camelidae (Osgood 1943, Wheeler 1995). Other species of South American Camelid are the guanaco (*Lama guanicoe*), which is also a wild species, the llama (*Lama glama*) and the alpaca (*Lama pacos*), both domesticated species (Bonacic 1991, Franklin and Fritz 1991, Bonacic et al. 1995). The vicuña inhabits high regions of the Andes at altitudes between 3,000 and 4,600 meters. Its range covers 9° 30' to 29° 00' latitude South (Koford 1957).

Vicuña have been protected by the International Convention for the Trade of Endangered Species (CITES) since 1973 and by the Vicuña Convention signed by Argentina, Bolivia, Chile and Perú since 1979. The Vicuna Convention was initially signed by Perú and Bolivia in 1969, and followed by Chile and Argentina in 1974. It ensured the protection of the species in national parks and private lands for future sustainable use by requiring animals to be sheared alive and returned to the wild. The successful partnership between Government agencies, local communities and international conservation agencies resulted in a rapid population recovery and the vicuña population is now classified as "out of danger of extinction" in the northern range of distribution (Parinacota Province in Chile). However, the southern populations are still in danger of extinction and little progress has been made to effectively protect them from poaching. The estimated current population size is 17-22,000 animals in Chile (99 percent of which is in the northern range) and more than

220,000 in the Andean region of Peru, Bolivia and Argentina (Bonacic et al. 2002). The ban on the trade of their fibre has been lifted to allow shearing, and a program of sustainable use has been promoted. Since it was stated in the Vicuña Convention that protection would be followed by sustainable use for the local people's benefit, vicuña conservation is now inextricably linked to sustainable use. In 1997, the Convention for the Conservation and Traffic of Endangered Species (CITES), held in Zimbabwe, authorized Perú to sell three tonnes of stockpiled vicuña fiber and to develop a trade in raw fleece (CITES 1997, Bonacic et al., 2002). As a result, the strict controls formerly imposed on vicuña wool harvest were relaxed, allowing international trade in wool sheared from live vicuñas. Currently, Perú is harvesting fiber from wild vicuñas maintained in extensive plots and Bolivia and Chile are developing capture methods and harvest systems for future large-scale exploitation (Wheeler and Hoces 1997).

This paper describes the current status of the vicuna's sustainable use status in the region. In addition, we identify research needs for the future and we describe the main priorities set for the MACS project for the coming years. Finally, we discuss the importance of the animal welfare factor when a species is managed in a nonconsumptive way and how to include perceptions about animal welfare into the equation of sustainability.

METHODS

A description of the current state of the knowledge regarding the vicuna management in Chile is summarized, followed by a comparison of management in other countries in the Region. Conflicts and uncertainties for the long-term conservation of the species are analyzed based on a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis. The SWOT analysis method is used in business science to gather essential information before management decisions are taken (Miser 1995). This analysis classifies different components of the problem into standard categories to identify the critical aspects of the problem. It is the first step taken before quantitative models are developed for a particular management problem (Rea and Kerzner 1997). We used the concept of SWOT analysis by assuming that the sustainable use of the vicuña could be studied from an entrepreneurial perspective. The meaning of "business" is used here in a broad context where success can be evaluated from different points of view (ecological, economic, or social). Data and information from local communities, such as policies and ways of utilization of the species were collected between 1995 and 1998 in Bolivia and Chile through fieldwork, training courses with local communities, interviews with government officers, and literature reviews. No fieldwork was carried out in Perú, and only official information presented from papers in recent conferences was used.

RESULTS AND DISCUSSION

Conservation and Management

Two geographic subspecies of vicuña have been described in Chile, the Northern vicuña, *Vicugna vicugna mensalis* (18° 45'S to 19° 00'S) and the Southern vicuña, Vicugna vicugna vicugna (19° 00'S to 27° 30'S) (Bonacic et al. 2002). The Northern

vicuña is not in danger of extinction while the Southern vicuña is endangered. The distribution between both subspecies corresponds to a continuum of scattered and fragmented groups that are less frequent from North to South. Their survival in this habitat is due in part to their highly territorial social organization and patterns of habitat use, and also to their physiological and anatomical adaptation to conditions of high altitudes and cold weather. The Vicuña Convention originally identified three main issues that needed to be considered for the protection and sustainable use of the species: (1)population recovery, (2)ecosystem conservation and, (3)social benefits from the use of the species.

The vicuña, along with other South American Camelids, is one member of a group of animals that produces rare fibres. The vicuña has a double-coated fleece and is one of the most valuable and highly prized sources of animal fibre. The fine fibres are the commercially important part of the fleece and since only two percent of the fleece is made up of the coarser primary hairs, it is highly prized. Chile auctioned the first 20 kilos of fibre collected from animals captured for farming in May 2002. It is estimated that a total yield of 250 g of fibre could be obtained from vicuñas by shearing every two years. Considering a life span of ten years in the wild a potential total of one kg of fibre could be harvested from an adult vicuña.

Current management policies for vicuña include: (1)capture and shearing of wild animals, (2)captivity and farming, and (3)translocation and reintroduction. The current trend in Chile is to promote capture and extensive captive herds in the altiplano or Andean puna for commercial use. The consequences of captivity and possible future artificial selection in vicuñas are not known. Hence, from the conservation point of view three main aspects should be studied to evaluate the conservation value of in situ captive herds programs: (1)the genetic impact of artificial selection on the captive vicuñas and the positive or negative effects that this practice may cause on wild populations, (2)the risk of cross species disease transmission between livestock and enclosed wild vicuñas and the likelihood of disease transference to wild populations from accidental escapes of captive vicuñas, and (3)the impact of habitat use restriction caused by captive farming considering that vicuñas are adapted to move and select habitats in a very fragile ecosystem.

SWOT Analysis

The SWOT analysis identified five main issues that need to be studied. Ecosystem, population and socioeconomic factors were already suggested by others in previous studies (Cueto et al. 1985, Hoffmann et al. 1983). We also have included two new factors in our analysis: (1)economic globalization, and (2)animal welfare. Table 2 lists the main components of the SWOT analysis for the vicuña sustainable use program in the regions discussed in this case study.

The first factors to be considered were density–dependent (e.g., population growth rate inverse to population size) and density–independent factors (e.g., rain and primary productivity influencing carrying capacity) at the ecosystem or population levels. Both density-dependent and density-independent factors may regulate the current vicuña population structure (Bonacic 2000). In addition, competition with livestock can play a major role in the carrying capacity available for vicuña. Bonacic (2000) describes how the total vicuña population size in the Parinacota province of Chile began to fluctuate around an estimated carrying capacity available when domestic livestock numbers were equated to the potential primary productivity of the area

The social and economic characteristics of each country are different and relate to the different organization of human communities (Hoffmann et al. 1983, Cueto et al. 1985, Eyzaguirre and Velasco 1997). Local communities are well organized and in high numbers in Bolivia and Perú, while in Chile they are small and scattered with poor social organization. The impact of vicuña exploitation on a community's economy cannot be modeled uniformly for the three countries. The main differences are in terms of resource availability and the level of poverty in each country. While vicuña population size is small in Bolivia (33,844 animals) and Chile (27,000), the total Peruvian vicuña population is estimated at over 102,000 (Bonacic 2000, Eyzaguirre and Velasco 1997, Hoces 1999). However, the levels of poverty are higher in Bolivia and Perú compared to Chile (Cueto et al. 1985, Gonzalez et al. 1991, Eyzaguirre and Velasco 1997, Galaz and Bonacic 1998).

Table 2. SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis for the Sustainable Use of the Vicuña in South America.

Strengths
- Vicuña population increases within its range of distribution.
- Appropriate legal framework (CITES and Vicuña Convention).
- Humane capture and shearing methods.
- First sales with high price of the product and international market available.
- World–wide image of vicuña fiber as premium product.
- Label of ecological sustainability and non–consumptive use of wildlife.

Weaknesses
- Low production volume and lower quality of product than expected.
- Strong competition from other fine fibers (e.g. cashmere).
- No clear regional common policy about "sustainable use" of the vicuña.
- Increasing poaching.
- Few buyers and North American market is not open
- Scientific controversy about the sustainability of management in the wild towards captive–management.
- No clear concern about animal welfare in the Region.

Opportunities
- To improve income of poor local communities.
- To replace domestic livestock with wildlife species and protect the environment.
- To change attitudes of local people towards the vicuña.
- To maintain a successful conservation program.
- To provide a new fine fiber for the international market.

Threats
- Uncertainty about price stability.
- Poaching.
- Unclear legal framework to distribute the benefits.

Another primary factor is the potential market for products and a common international price for products. The commercial value of the fiber may vary when Chile and Bolivia enter the market, with an increase in the fiber many offers potentially lower prices. The globalization of the economy could threaten the original aim of the program. Globalization could increase the demand for vicuña fiber beyond natural production limits. As a consequence, poaching may increase to meet the demand and drive the population towards extinction. Conversely, global fashion

trends and interest in animal product change and prices could decline below a commercially viable threshold for exploitation. Lastly, competition from countries such as China with cashmere products and genetic improvement of domestic species (sheep, alpaca) may make vicuña fiber less desirable than in the past.

The increasing concern about animal welfare and the use of wildlife has been broadly discussed around the world. Western cultures (the main market for the vicuña fiber) could reject any exploitation of the species. The ethics behind sustainable use of wildlife is still a controversial topic (Taylor and Dunstone 1996). Therefore, the welfare of the vicuña is an understudied but very essential issue that must be added to the three main issues initially proposed by the Vicuña Convention (Figure 2). When the aim of the Convention shifted from protection (1979-1990) to sustainable use (1990 onwards) by shearing wild vicuña in situ, considerations about animal welfare have been largely forgotten (Bonacic and Gimpel 1995). Although shearing seems less intrusive than an alternative program based on culling, it does involve procedures that may stress the animals and even lead to mortality. Chile has addressed some of the main issues about animal welfare by implementing experimental research looking at the effects of capture and shearing in the natural habitat of the species (Bonacic 2000).

The vicuña represents a special case of nonconsumptive use of wildlife, where captured animals are sheared alive and returned to the wild with the assumption of little or no impact. However, the effect of vicuña exploitation may not just be at the level of the individual. Potentially, consequences may extend to the whole population as well as to the environment. Whereas consumptive sustainable use of wildlife (i.e. culling), affects the individual (death) causing changes to the population (i.e. changes in mortality rate), in the case of the vicuña, changes in the individual could be more subtle and a consequence of the response to stress (e.g., reproductive failure or considerable behavioral changes). Therefore, the sustainable use of the vicuña raises concerns about animal welfare as well as about conservation (Bonacic, 2000, Bonacic and Gimpel 2001).

The emphasis of sustainable use is on population viability, environmental protection and economic benefits, with little or no interest in the welfare of individual animals. However, it is not reasonable to neglect concern about individuals when there is a prospect of exploitation of large numbers within a population, especially when there has been a sustained effort to reach an "out of danger" status. It is thus essential to study the effects of the different management practices at an individual level in order to assess potential population consequences. This will allow the design of a thoroughly planned management system that will be truly sustainable. In terms of vicuña management, three key aspects can be a matter of welfare concern: capture, shearing and the overall effect of captivity.

THE MACS PROJECT: SUSTAINABLE ECONOMIC UTILISATION OF WILD SOUTH AMERICAN CAMELIDS

The MACS project provides information for the design and operation of the systems used for the exploitation of fibre from the wild camelids; this information is important as policy moves from being conservation orientated to allowing limited exploitation. The MACS project is funded by the European Union and began in late 2001. It will run for 4 years with two main aims: (1)to develop guides for best practice in systems of sustainable economic utilisation of wild South American camelids (e.g., the vicuña

and guanac) in Argentina, Bolivia, Chile, and Peru, for the production of luxury textile fibrea; and (2)to disseminate this information to producers, the European textile industry, rural communities, and regional policy makers both through publications and by establishing a network of researchers and experts.

The main project activities are organised around five semi–independent "work packages." Each work package represents a collaborative research venture between a research team in Latin America, and a leading research institution in Europe, and each covers the range of scientific disciplines addressed by the project. The work packages focus on: utilisation systems, economic and social impacts, environmental impacts, biodiversity conservation, and networking and dissemination. The first work package focuses on assessing health, welfare and product quality impacts of management options for vicuña and guanaco at a system level, and the development of recommendations for best practices. The second work package evaluates the economic viability of management options for wild South American camelids and trade in their fibres. It also helps to identify policies to encourage appropriate management approaches and equitable distribution of benefits. The third work package evaluates significant environmental interactions and maps ecosystem indicators, such as carrying capacities. The biodiversity conservation workpackage aims to develop management strategies which will minimise the impact of sustainable utilisation on wild camelid populations. Finally, the networking workpackage aims to consolidate all the information arising from the project. It focuses on bibliography, networking, conferences, and training courses for teachers and community representatives on local ecology, conservation and development options. A strong emphasis within MACS is placed on adding appropriate high quality data to the existing sum of knowledge, and then using this through networking and dissemination to achieve action by consensus, education and influence on policy.

CONCLUSIONS

The vicuña conservation program in South America is entering a critical stage, and the direction that the program takes could conflict with the original objectives of the Vicuña Convention (i.e., to use the species in the wild for local communities' benefits). The trend for exploiting in captivity by fencing wild vicuña or captive programs is not compatible with the initial criteria of sustainable use. Captivity may promote artificial selection and natural traits could be lost in the process. Global economics and increasing concern for animal welfare threatens the long-term program viability in different ways. The impact of how global demand could stimulate poaching and how animal welfare campaigners would perceive the use of the species remains to be investigated. A sustainable use program based on capture and release of small groups of vicuña with minimal interference on the natural populations should be considered the method of choice, to which other methods should be compared. Some of the main aspects to compare between methods of management are: (1)the impact of capture, handling and shearing on different systems of use; (2)the comparative studies of carrying capacity in different regions of the altiplano and livestock competition; and (3)the social and potentially evolutionary consequences of captive programs.

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