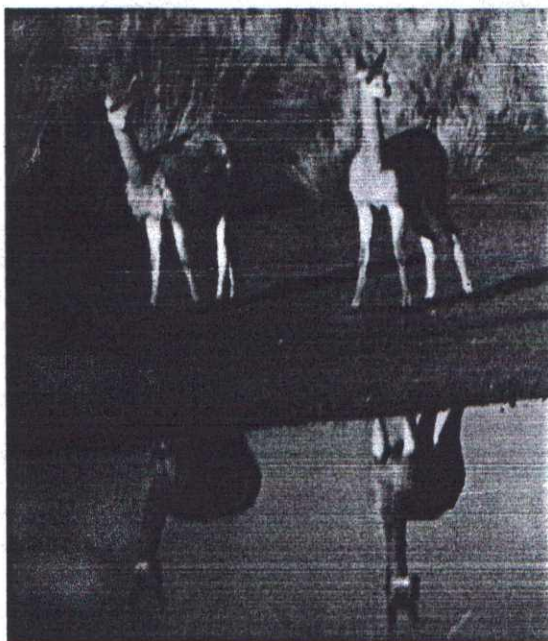


19. Vicuñas – the Andean jewel.



The vicuña *Vicugna vicugna* is the smallest of the camelids, and lives in the Puna ecosystem in the South American Andes. Vicuñas are both culturally, ecologically and economically important, but little is known of their behaviour, in particular the extent to which their management for shearing could be harmful. Our study of the behaviour and reproduction of vicuñas in Argentina compared the behaviour of corralled animals with wild ones. Vicuñas live in stable family groups or bachelor groups, and mothers spend much of their time close to their calves. Simple behavioural data were a useful tool for estimating the ages of calves in the field. Males with more females grazed less and were more alert than males with fewer females in their group. Ironically, while camelids are being undervalued in their native South America, they are increasingly being used for wool production in Europe and the USA.

The vicuña *Vicugna vicugna* is a small, woolly, llama-like animal, with the nervous movements of a wild gazelle. Sedentary and not sexually dimorphic, the vicuña is the smallest of the camelids with a mean weight of 45kg. My research concerns the social behaviour of vicuñas, and is relevant to their management and conservation.

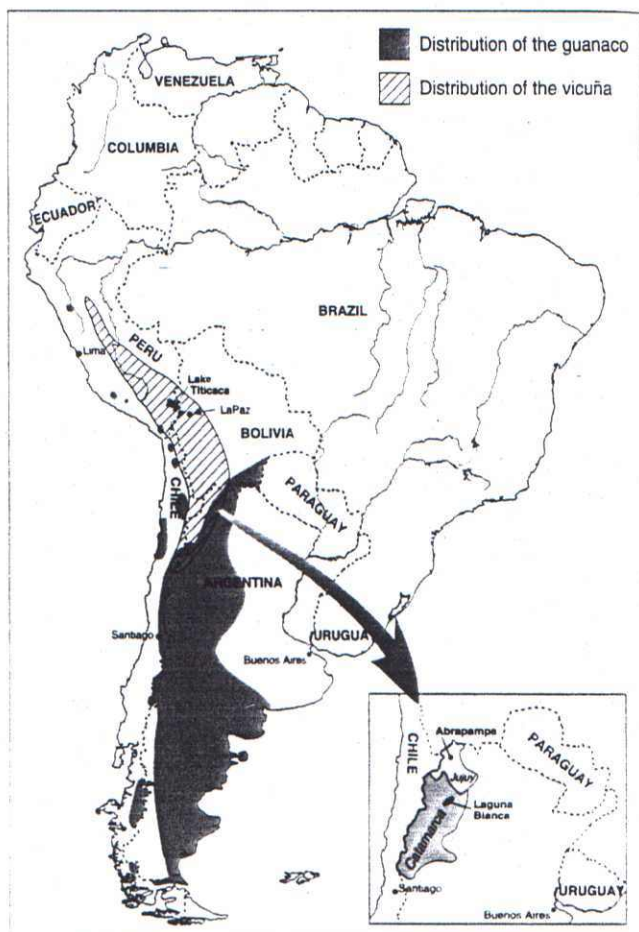
Vicuñas live wild in the Puna ecosystem of Argentina, Bolivia, Chile and Peru, and their distribution (Fig. 1) is limited by water availability. The Puna, an extremely harsh environment situated 4,000m above sea level in the high Andes, is composed of semi-desert vegetation adapted to cold, dry and windy conditions. There is huge diurnal climatic variation and 40% less oxygen than at sea level.

Vicuñas are one of four species of South American camelids, which include the wild guanaco *Lama guanicoe* and the two domesticated species, the llama *Lama glama* and the alpaca *Lama pacos*. These camelids are ecologically important because South America has few medium to large herbivores, and has only 20 species of native ungulates compared with more than 90 in Africa.

Vicuñas and man

Vicuñas are not only ecologically, but also economically important because they have one of the finest animal fibres in the world, with a diameter of 11–14µm. The vicuña's silky wool is one of the most valuable luxury fibres.

The long relationship between man and vicuña embraces both harmony and conflict. About 5,000 years ago some vicuñas were domesticated, forming the present day alpaca. Alpacas were used primarily for their wool and, together with llamas which were domesticated from guanacos, became the main resource for the Inca culture. Vicuñas and other South



▲ Figure 1. Map showing the distribution of the vicuña and other camelids in South America (adapted from the South American Camelids Action Plan), and the location of study sites.

American camelids are low-impact grazers: they have digital pads that do not dig up vegetation and erode the friable local soil, they select specific parts of the vegetation using their prehensile, split upper lip and are adapted to digest vegetation with a high fibre to protein ratio.

When the Spaniards arrived in 1530, there were millions of llamas and alpacas, but the Conquistadors brought over their own domestic animals, to the detriment of the Andean environment. With the destruction of Inca society, traditional restrictions on the use of wild vicuñas vanished and there was a catastrophic decline in their numbers.

In 1825 Simon Bolivar passed one of the first environmental laws in South America, banning the killing of vicuñas. Nevertheless, the situation worsened. In the 1950s and 1960s the world population of vicuñas was just 10,000 animals and it was classified as 'rare' by the IUCN. In 1979 the 'Agreement for the Conservation and Management of the Vicuña', was signed by Argentina, Bolivia, Chile, Peru and Ecuador, and numbers have now risen to approximately 160,000 animals.

Vicuñas are currently classified as 'vulnerable', and some populations are included in Appendix 1 of CITES, prohibiting all trade. However, all populations in Peru, and one in Chile, have passed to Appendix 2, allowing animals to be captured, sheared and released. Management of this sort could, however, have a detrimental effect on social organization, and the validity of such sustainable utilization depends on the level of disturbance. For example, vicuñas defend territories all year round, and management could mean that territories would have to be redefined more frequently, possibly with harmful consequences.

Research into changes in the behaviour of populations that are being managed (Box 19.1), and a better understanding of



▲ Bibiana with her field assistants in the harsh Puna.

◀ Field work was often carried out on horseback.

the vicuña's habitat requirements, especially of those populations going through expansion, is vital. Knowledge of factors affecting the reproductive success of males and females, activity rhythms, dependence on water and territory boundaries must be taken into account if management plans are to be successful. However, this research requires base-line data from unmanaged populations for comparison.

I studied the behaviour of corralled and free-living vicuñas in Argentina in the Laguna Blanca Reserve, Catamarca, and in INTA-Abrapampa, Jujuy (Fig. 1). My aim was to try to answer some of the questions likely to be important for effective conservation and management.

Social organization and reproduction

Vicuñas live in stable family groups composed of one territorial male, approximately four females and two or three calves, or in groups of bachelor males. Some females remain in the same family for several years. Within a family, females maintain an inter-individual distance of 2–3m, while the male is usually found towards the periphery of the group.

Bachelor groups form when young males are chased away from their families, and are very variable in composition and location. They are tight-knit, with individuals maintaining an average distance of 1–2m apart. Bachelor groups are frequent targets for territorial male aggression, and consequently are more mobile than vicuña families. Males live in bachelor groups for several years, until they can take over a territory containing females.

In general, the reproductive success of female ungulates depends on their acquisition of nutritional resources, while that of males depends on the defence of females or of a resource needed by females. Vicuña females spend more of their time grazing than do males, which are frequently involved in territorial disputes. Females with young graze for 70–90% of the diurnal period. Although low in intensity, female aggression is directed principally towards alien calves, to prevent them suckling, and also towards other females while grazing.

The calving season is at the end of summer and females have only one calf per year. Two or three weeks after parturition, females come into oestrus and copulate. Gestation takes approximately 11 months, while lactation lasts six to eight



months, so females nurse while pregnant. Calves from different families form 'clubs' that play and rest together. When the young of both sexes are six to eight months old they are chased away from the family by the territorial male.

Mother-offspring relationships

I studied mother-offspring relationships among calves of different sizes and compared animals living in a 2ha corral with free-living, unmanaged animals living in an area of about 400ha. Vicuñas can be characterized as a 'follower' species because mother and young are usually less than one mother-length apart, particularly in the first week of the calf's life when they spend much of their time lying close together (82% of time in the corral and 99% in the wild).

In the wild, mother-offspring distances were small during the first month after birth, but thereafter increased. In the corral, however, mother-offspring distances were greater than in the fields and did not increase significantly with time. During the third month, in both field and corral, mothers tended to avoid their calves more than in the first month. Although calves initiated approximately 90% of suckling bouts, the percentage terminated by the mother rose significantly from 56% in the first month to 96% in the third month.

Cluster analysis and principal component analysis showed that simple behavioural data were a useful tool for estimating the ages of calves in the field. Three groups were defined: one month old calves in the corral; one month old calves in the wild; and three month old calves in both corral and wild. More than 89% of variance between these groups was explained by the distance between mothers and their young,

and the time calves spent lying or grazing. These data are easy to sample in the field and do not require the calves to be caught.

Territorial defence and inter-male aggression

A male's territory usually includes dusty, shallow pits where the vicuñas roll vigorously several times a day to dust their fleece, and dung piles where both males and females, adults and young, defecate and urinate. Some dung piles are used exclusively by a particular family, while others are shared between families with overlapping territories. In almost all cases bachelor males also use the piles, while the family is away from the area.

There is an important relationship between male behaviour and the number of females: males with more females graze less and are more alert than males with fewer females in their group (Fig. 2). Males usually herd females and do not let them move freely between territories, suggesting that, in Abrampampa at least, males defend females as well as territories. One implication of this result is that group members should be sheared together, taking care not to allow families to mix.

Territorial males initiate most aggressive encounters, but only when females are in oestrus does the level of aggression escalate to that where there is a high risk of injury. Aggression between territorial males of similar strength generally involves a chase, with some kicking and biting. Where the initiator is a territorial male and the recipient a bachelor, however, the level of aggression is even higher.

In the past, bachelors have been seen as the best animals to



19.1. Sustainable use of the vicuña in Chile.

The long-term conservation of the vicuña depends on the acceptance of its sustainable utilization by local communities. In order to achieve this, local people should obtain either direct or indirect benefits from the species' conservation.

In the northern Chilean Altiplano, the Chilean Forestry Service (CONAF) and local communities have successfully protected and increased vicuña populations for the last 25 years. It is now time to begin to consider how vicuña conservation can benefit local

people through active management. But this raises several questions. One of the most important is whether sustainable use is compatible with animal survival and welfare: any system of ranching implies the stresses of capture and management.

Long before European colonization, the Incas developed a system of vicuña ranching called 'chaku', in which they killed a number of animals from different places every year. They returned to managed areas at intervals of several years, allowing the vicuña populations to recover. However, modern vicuña densities and land use patterns are not compatible with chaku. Current management proposals are to capture, shear, and then return vicuñas to the wild every one or two years, depending on population status.

We are beginning to study the consequences of these proposed management activities on the physiological ecology and population

dynamics of the vicuña. In particular we plan to: a) measure physiological parameters associated with different situations and treatments; b) compare micro-habitat selection by vicuñas after capture and shearing, using behavioural records of marked animals and radio-telemetry; and c) record any mortality associated with management, to contribute to further models of maximum sustainable yields.

We hope that our study of the vicuña's response to management conditions will provide the information needed to develop further techniques for the species' sustainable use. Our work aims to improve vicuña management, not only at the individual level through improved welfare of captured animals, but also at the population level through better estimation of maximum sustainable yields.

CB



▲ Clinical examination of vicuña after shearing.



Christian Bonacic

shear because they do not reproduce. However, they play an important indirect role through competition in maintaining the quality of territorial males, because only the best males that hold territories can reproduce.

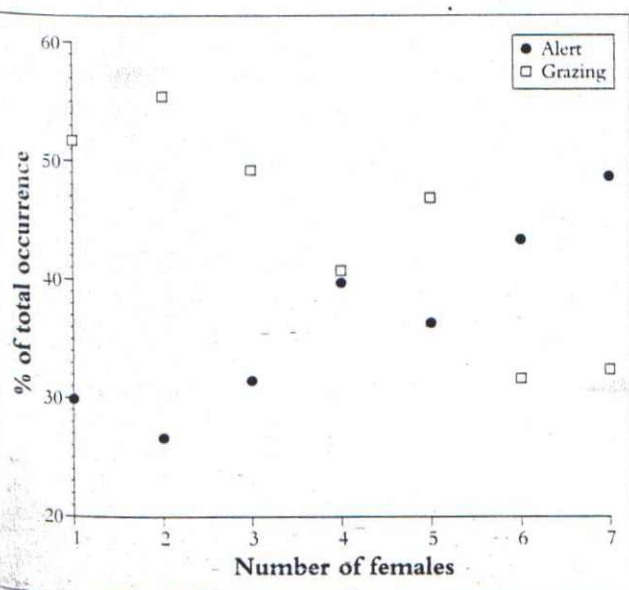
Conservation of vicuñas and other South American camelids

Vicuñas are vulnerable animals in a vulnerable habitat, but despite their potential economic importance, conservation of vicuñas and other South American camelids is fraught with problems. The countries containing the Puna ecosystem are in deep economic and social crisis, and consequently lack the funds to patrol the parks and reserves that already exist, let alone the extra parks and reserves that are needed. The Inca descendants are now subsistence farmers with 'alien' livestock, and families can no longer rely on the sale of llama or alpaca wool as relatively few people buy the bulk of the wool, creating an unhealthy market and suppressed prices.

The situation in South America is an ironic contrast to that in Europe, USA and Australia, where South American camelid breeders are increasing in numbers and camelid wool commands extremely high prices. Paradoxically, in Patagonia some sheep owners control guanacos because they allegedly compete with sheep, yet in England guanacos are being considered as an alternative to sheep, because their wool is much more valuable.

The descendants of the Incan 'creators' of llamas and alpacas currently receive little or no benefits from the international market for their wool. With the vicuña becoming less vulnerable to extinction, there is now an exciting chance of bringing economic resources to the marginal areas of South America by sustainable exploitation. While this is to be encouraged, we should not forget that wild populations of vicuñas must also be allowed to run wild in the Andes just as the 'Pachamama', the mother-earth goddess who according to Andean tradition owns all wild animals, dictates.

BV



▲ FIGURE 2. Percent of time spent alert and grazing by males in relation to the number of females present in their group.



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Bibiana Vila