

THE VICUÑA

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Chapter 2

The Historical Relationship Between People and the Vicuña

Hugo Yacobaccio

2.1 Introduction

The relationship between man and wildlife has changed over time in many ways (Woodroffe et al., 2005). Today's hunter-gatherers have sophisticated management tools, based on detailed knowledge of successional patterns and ecological inter-relationships (Nelson, 1982) and many societies have taboos, rules or traditions that prevent overhunting by limiting the practice to certain events or seasons of the year. Restriction of overhunting is common in certain Amazonian peoples (Chicchón, 2000), although there are cases of species driven to local extinction due to the spatial variation in limits to hunting control (Hitchcock, 1995). Conservation behaviour in hunting societies is often embedded in religious beliefs and ritual practices which act to ensure the continuity of the populations (Loring, 1997).

When the process of animal domestication began at the end of the Pleistocene, the level of human intervention of animal populations increased; for example, in the southern Levant (Israel), sex-selective culling of *Capra* spp. eventually led to their domestication (Tchernov, 1993). The relationship between environment and social sustainability has been studied in complex societies of the Old World (e.g. the Roman Empire, Abbasid Caliphate), and sometimes the demise of these empires has been attributed to unsustainable policies of environmental management (Allen et al., 2003). In complex pre-Hispanic Andean societies, a sophisticated semiotic lexicon for describing wildlife existed; these societies recognized two kinds of animals, domesticated (*uywa*) and wild (*sallka*). The Spirit of the Mountain (*Mallku*) is the owner of the *sallka* and controls them. People had to make offerings and sacrifices to the *Mallku* in order to use wild resources properly. The vicuña (*Vicugna vicugna*) is a highly regarded member of the *sallka* in the Andean mythological world, and, at least during the Inca Empire, their exploitation was regulated by cultural and religious rules (Dedenbach-Salazar Sáenz, 1990).

My aim in this chapter is to analyse the relationship between people and vicuña through time. As with other human/animal interactions, understanding the historical background is useful, not only for increasing our knowledge about the impact of different kinds of management on the wildlife resource, but also in informing guidelines for future management policies (Allen et al., 2003).

The data for this chapter is provided by both archaeological and historical sources. A long period of human occupation of the Andes is recorded from archaeological evidence left in the form of material artefacts and ecofacts. After the arrival of Europeans in the mid-fifteenth century, historical accounts are added as a source of knowledge about the relationship between vicuña and people. We will focus on the southern section of the Andes (South of Bolivia, Northern Chile and North-western Argentina). In analysing the exploitation of vicuña in historical times (i.e. ad 1535–1916), we will use data on exports of vicuña skins and fibres from the port of Buenos Aires.

2.2 Prehistoric Period (10500 BC– AD1535)

2.2.1 *Hunter-Gatherer and Agro-Pastoralist Societies* (10500 BC – AD 1470)

The altiplano was first peopled by hunter-gatherer groups around 11,000 years BC¹. The radiation of these hunters was rapid, and a thousand years after their arrival, human presence was widespread across the Puna environments. Remains of vicuña bones, fibres and skins are found in the archaeological record from the very beginning of human settlement in the altiplano. The establishment of a predator–prey relationship is the most likely form of co-evolution between people and vicuña during the prehistoric period.

Vicuñas were hunted across the region, but with varying intensity (Table 2.1; Fig. 2.1); in some localities, especially in the Salt Puna, vicuña remains are dominant, for example in Quebrada Seca². The vicuña remains range from 44 to 99% of all camelid bones. At this site the exploitation of vicuña continued from 8,300 to 3,225 years BC. During this period it appears that the hunters killed family groups as evidenced by the analysis of age-class profiles (Elkin, 1996). The hunts of vicuña were continuous during the occupation of the site, although they involved only a few vicuña individuals in each hunt. In the nearby Cueva Salamanca, large quantities of vicuña skins and ropes were recovered (Pintar, pers. commun., 2004). This is the first evidence in the region of the use of vicuña fibre for rope making.

The evidence of these two sites is not isolated; from 7,700 years bc onward a long-term trend of intensification of camelid use, very similar to that of the Central Andes (Peru), occurred (Wheeler, 1985). This rise culminated in a process of domestication of the guanaco (*Lama guanicoe*) from about 4,200 years BC (Yacobaccio, 2004).

The presence of vicuña is variable from site to site, but is significant (Table 2.1); the sites of Tulán 52 and Puripica 1 are both small villages in which people were

¹Radiocarbon dates calibrated in years before Christ (BC).

²Bone counts are number of total identified bones per taxon (NISP).

Table 2.1 Archaeological sites with recorded evidence of vicuña

Site	Level	Country	Location	Elevation (m)	Dates	Percentage of total camelids ^a	Percentage of small camelids ^b (vicuña)	Presence of vicuña fibre or skins
Inca-Cueva 4	2	Argentina	Jujuy	3,650	10900 BC	10% (1,045)	Presence	X
Quebrada Seca 3	Lower levels	Argentina	Catamarca	4,050	8300–7300 BC	81% (373)	44%	X
Homillos 2	Lower levels	Argentina	Jujuy	4,020	9650–8270 BC	5.5% (1,976)	Presence	
Homillos 2	Middle levels	Argentina	Jujuy	4,020	7480–5040 BC	15.5% (1,909)	Presence	
Cueva Salamanca	2	Argentina	Catamarca	4,000	5200 BC	–	Presence	X
Quebrada Seca 3	Middle levels	Argentina	Catamarca	4,050	6050–5075 BC	92% (881)	90%	X
Quebrada Seca 3	Upper levels	Argentina	Catamarca	4,050	4185–3225 BC	94% (1,393)	99%	X
Tulán 52	II–IV	Chile	Atacama	3,200	3000 BC	86% (14,264)	32%	X
Chiu Chiu Cementerio	–	Chile	Atacama	2,300	2670 BC	98% (5,873)	2.5%	
Puripica 1	II–IV	Chile	Atacama	3,250	2600 BC	76% (4,490)	58%	
Morro del Ciénego Chico	–	Argentina	Jujuy	3,750	770 BC	–	–	X
Huirun-pure	E2	Argentina	Jujuy	4,020	345–323 BC	92% (340)	50%	X
Casa Chavez Montículos	VIII–Vc	Argentina	Catamarca	3,600	175 AD	89% (3,632)	20%	
Real Grande	II	Argentina	Catamarca	4,050	1230 AD	92% (438)	95%	
Sara-huaico	–	Argentina	Jujuy	2,600	1340 AD	96%	35%	
La Huerta	PS1	Argentina	Jujuy	2,600	1415 AD	99% (1,888)	11%	
Alero Atuya	–	Argentina	Jujuy	3,700	1475 AD	100% (390)	90%	

^a Percentage of camelid bones in total faunal assemblage. Total number of bones in parenthesis

^b Percentage of small camelid (vicuña) bones in camelid assemblage

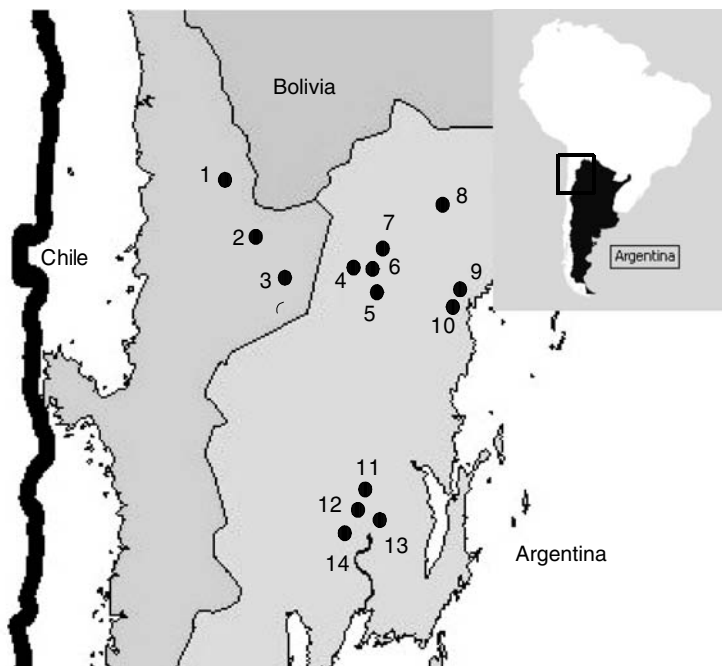


Fig. 2.1 Map of the archaeological sites mentioned in the chapter. Contexts and chronology in [Table 2.1](#). References: (1) Chiu Chiu Cementerio; (2) Puripica 1; (3) Tulán 52; (4) Huirunpure; (5) Morro del Ciénego Chico; (6) Hornillos 2; (7) alero Atuya; (8) Inca Cueva 4 and 7; (9) La Huerta; (10) Sarahuaico; (11) Real Grande; (12) Quebrada Seca 3; (13) Cueva Salamanca and (14) Casa Chávez Montículos. Highlighted areas above 2,000 m a.s.l

domesticating camelids and also hunting vicuñas (32% and 58% of the camelid bones were identified as vicuña in the two sites, respectively).

The emergence of camelid pastoralism in the high Andes (around 1800 bc) and of intensive agriculture in temperate valleys did not mean that hunting was not occurring at this time. On the contrary, hunting was evidently an activity for obtaining meat supplies from the wild, acting as a buffer in periods of shortage that allowed people to maintain the size of their domestic herds. The social organization of human societies became more complex during this period, and this included the appearance of labour specialization (metal-working, pottery-making, etc.). Economic regionalization was present by about ad 100 (Núñez, 2005); from ad 1300, urban settlements started to appear as a consequence of the intensification in agricultural production and of population aggregation (Nielsen, 1996).

Vicuña fibre was used during this period ([Fig. 2.2a, b](#)), and vicuñas were highly regarded in the ideology of these herders. The depiction of vicuña in rock-art was different from the other domestic camelids ([Fig. 2.2c](#)) (Gallardo and Yacobaccio, 2005); this could be the origin of the symbolism of the vicuña as “herds of the Gods”, as is still the case in certain parts of the Andes today. Furthermore, bone



Fig. 2.2 Cloth made with vicuña fibre. **a** A fragment of a bag from Morro del Ciénego Chico site (Susques, Argentina) dated at 770 years BC; **b** A rope from Huirunpure (Susques, Argentina), dated from around 345–323 years bc; **c** A depiction of a vicuña, Confluencia style, Northern Chile, from around 1400–500 BC

remains of vicuña were found not only in urban centres such as Sarahuaico or La Huerta, but also in hunting spots like Real Grande (Table 2.1).

2.2.2 *Vicuña Exploitation During Inca Times (AD 1470–1535)*

The Incas constructed the largest empire in pre-Hispanic America ranging from Ecuador to south-central Chile and Argentina (D’Altroy, 2003), known as the Tahuantinsuyu (“the land of the four places”). This empire was a centralized state. The economic activities were planned by the Inca elite, at least at the core of the empire, and included the management of wild animals, especially the vicuña, through the royal hunts organized by the Inca himself (Cieza de León, 1959/1553). The vicuñas were property of the Inca, who regulated the capture activities in the core of the empire. There were two types of collective hunting during this time (1) the *chaku* made by the Inca himself (Royal Hunts) and (2) regional *qayqus* carried out by *curacas* (local indigenous authorities).

Cieza de León (op. cit.: 104) provides a detailed description of the royal hunt (see also Garcilaso de la Vega, 1980/1609):

When the Lord-Inca (sic) decided to organize a royal hunt, the number killed and taken was amazing; these were days when over thirty thousand head were taken (...). There fifty or sixty thousand people having gathered (...) they encircled the thickets and fields and with the noise of their shouts and cries the animals came down from the hills to the level ground, where, little by little the men closed ranks until they could join hands, and in the circle formed by their bodies the game was brought together and penned in...

Although the mechanics of the hunt are well described, there are differences in the descriptions of the number of people involved, and the number of animals captured in different written sources (Dedenbach-Salazar Sáenz, 1990). The people involved varied from 4,000/5,000 to 50,000 or even 100,000 in a circle around a wide area (from 40 to 100 km), and the animals captured ranged from 300/400 to

30,000/40,000. A certain proportion of these animals were killed, while the remainder were sheared and released. The royal hunts had a ceremonial significance and occurred every 4 years. The fibre obtained from the vicuña in these hunts was used to make clothes for the Inca. This shows that the vicuña fibre was highly regarded as a raw material and was only to be used to make prestige textiles for the elite (Morris and von Hagen, 1993; Murra, 1978). As the *chakus* were regulated by political, religious, social and cultural mechanisms (Acosta, 1962/1590; Custred, 1979), they can be seen as a highly organised, sustainable use of vicuña.

The *qayqus* also were collective hunts, but, in contrast to the *chaku*, were outside the control of the Inca. They were carried out by professional hunters (*huaricatur*), or directed by *curacas* in special game preserves, such as in Hatuncolla, west of Lake Titicaca (Bolivia) (Millones and Schaedel, 1980). The *qayqu* is similar to other types of hunt called *lipi* in aymara (Bertonio, 1984/1612) which involved the construction of enclosures or corrals between hills and gorges to catch vicuña as they were driven by humans. As we shall see, this form of hunt was employed until the 1930s.

2.3 Historic Period

2.3.1 Colonial Society (AD 1535–1810)

After the arrival of Spanish *conquistadores*, the exploitation of vicuña grew in a way never seen before. The cause of this expansion was related to the demands of the world market for vicuña fibres and skins; the slaughter was maintained at a high level for over 270 years. In the 1500s, the colonial government in the Andes developed an agrarian economy to feed the urban and mining centres, particularly the silver mines of Potosí. Silver and, to a lesser extent, vicuña fibre were exported to Europe, while European goods were imported (Palomeque, 1989; Rock, 1985). In this society, the indigenous peoples were obliged to provide a regular supply to the European community, both in labour and in kind (Spalding, 1982).

Vicuñas were abundant in a number of areas of the southern Andes, defined politically from the second half of the seventeenth century as the Viceroyalty of Río de la Plata (Fig. 2.3). A report on livestock production issued in 1797 at Jujuy highlighted the existence of places in which vicuñas were present in large numbers and useful to man (Noticias del Correo Mercantil, 1977/1797). An average of 20,410 vicuña skins per year was exported from the port of Buenos Aires (now in Argentina) in the eighteenth century (Fig. 2.4).³ The vicuñas were obtained not only from north-western Argentina, but also from the then Alto Perú (Bolivia). This fibre would have had been from two origins (1) the *chakus* conducted by *encomenderos* or other Spaniards and (2) the skins obtained from indigenous communi-

³The number of vicuña wereas obtained by converting fibre and skin weights into animal units; 250 g of fibre per animal and 400 g of each skin were taken as parameters.

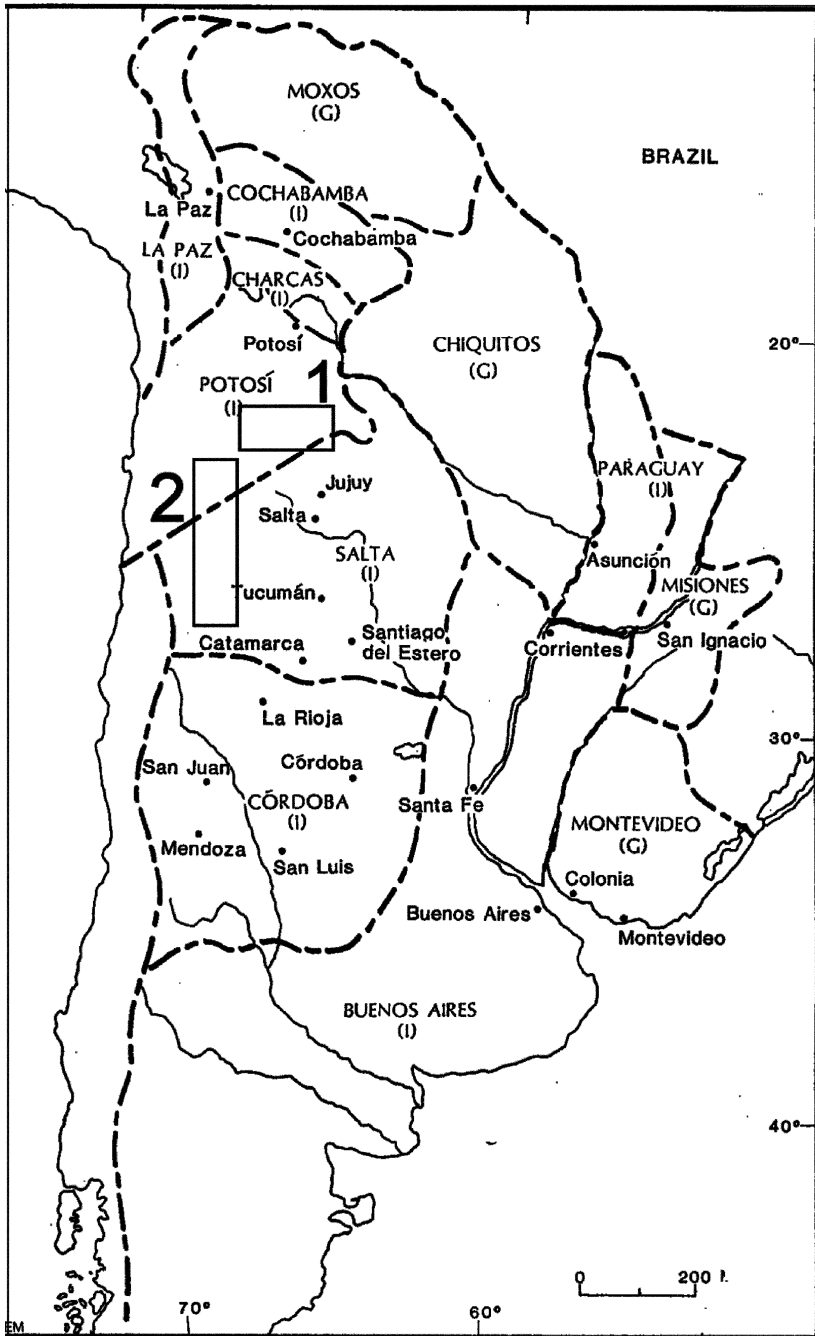


Fig. 2.3 Map of the Viceroyalty of Rio de la Plata. Squares are the zones where vicuña skins and fibres were obtained following written records: (1) Alto Perú and (2) Puna of Jujuy, Salta and Catamarca

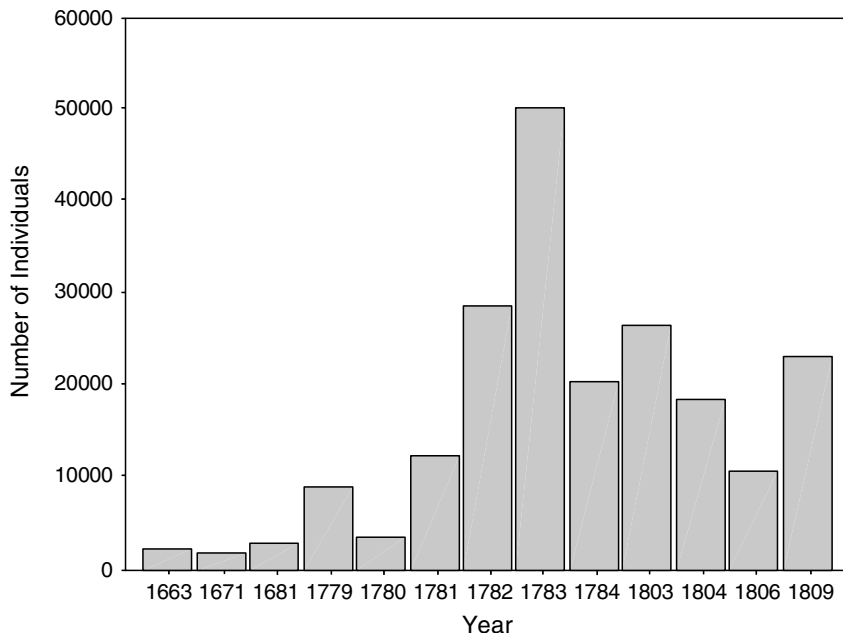


Fig. 2.4 Exports of vicuña fibre between the seventeenth and nineteenth centuries

ties in the Puna to pay taxes to the colonial authorities. These two sources were supplemented by the day-to-day hunts by Puna inhabitants carried out for obtaining meat (Acosta, 1962/1590). These combined activities for collecting fibre resulted in the killing of vicuña at a rate which worried the colonial authorities; by the end of the sixteenth century Father Joseph de Acosta stated that:

“Some complain that after the Spaniards entered, too much license has been granted to the chacos or vicuña hunts, and that they have diminished” (Acosta, 1962/1590: 209).

This early reference was made only 60 years after the first arrival of Europeans in the Andes, highlighting the declining numbers of vicuña in the region. Even earlier, in 1557, the Spanish government of Peru forbade the hunting of vicuña and guanaco for 5 years, because the frequency of *chakus* was so high (Millones, 1975).

Acarette, a French trader, made a journey from Buenos Aires to Potosí in 1657. In the town of Humahuaca (today in the Province of Jujuy, Argentina), he met some priests working for Don Pedro de Obando, owner of the Humahuaca valley, and other lands in which there were a great number of vicuña (Acarette, 1943/1672). Obando organized periodic *chakus* in the Puna of Bolivia (Lipez) and Argentina (Casabindo). In these hunts: “They seize these animals with much ease, by means of their subjects, the Indians, who have no more toil than to make a great enclosure with nets” (Acarette, 1943/1672: 65). Much of this fibre was exported (or smuggled – see Villalobos, 1981), from Buenos Aires (Argentina), Lima (Peru) or Copiapó (Chile) to Europe. The *qayqus* were the main source for collecting vicuña fibre for trade.

The taxes paid by indigenous people to the colonial authorities became an important source of vicuña fibres and skins; the records of vicuña fibre sent from Tucumán (Argentina) to Buenos Aires state that the fibre was bought from the indigenous taxpayers of Atacama (Palomeque, 1989: 168). This situation was also recorded in 1712 in Yavi (Jujuy, Argentina) where the indigenous community paid part of their tributes in vicuña and guanaco skins (Palomeque, 1994). Although it is very difficult to know the exact quantity of vicuña skins involved in these payments, it is possible to make an estimate – the Province’s *Libros Mayores* recorded that the inhabitants of the Puna, the “atacames”, who paid taxes in Salta, Catamarca and Jujuy (Argentina) were forced to tribute 9,815 *pesos* every year, which were most likely to have been obtained from selling vicuña and guanaco fibre (Palomeque, 1989: 169). If we assume that 70% of this figure was the product of selling vicuña fibre (the other 30% would be of guanaco fibre, as shown by the exportation figures of the Province of Jujuy, Palomeque, 1989), the amount in vicuña fibre paid by the indigenous people of the Puna was nearly 6,870 *pesos*. The value of vicuña fibre in the Buenos Aires port was around 1.56 *pesos* per kg. If it is assumed that this was the value obtained by the indigenous community – in fact, it is likely to have been much less – then a total of 4,404 kg of fibre could have been necessary to pay the annual tribute. This is equivalent to more than 17,000 vicuñas per year.

The third source of vicuña fibre was day-to-day hunting from which the skins were a by-product as these hunts were primarily to obtain meat. However, for the Spaniards the meat of vicuña was no good, “*the Indians eat them and make charqui (dry meat) with them*” (Acosta, 1962/1590: 209).

The declining vicuña population came to the attention of the Spanish crown almost a century after the initial warning by Joseph de Acosta. Concern to protect this resource resulted in a succession of *Reales Ordenes* (laws released by the Crown) promoting the protection of the species, but this legislation was counteracted by other laws that favoured the trade in camelid fibre, including vicuña, especially after 1778 (Rock, 1985). These latter orders advocated the use of two methods for obtaining vicuña fibre without killing them (1) capture, shearing and release the animals and (2) taming and domestication. For example, an order issued in 22 February 1768 to the *corregidores* of all the provinces in which vicuña occurred stated:

... that the Indians kill the vicuñas to tear the wool after being killed, that they occasion two injuries of consequence, one that it may become extinct or diminish and the other that a lot of Wool is lost when torn. To avoid these inconveniences the King would desire that they not be killed, nor their Wool torn but that they be shorn and after released, as it is practiced with our livestock, if at all possible (Documentos..., 1913).

This order was supported by two *Reales Cédulas* issued in August 30, 1777 to the Viceroyalty of Rio de la Plata and to the *Audiencia de Charcas* warning that:

“... for no motive allow the Indians to kill the Vicuñas at those hunts where voluntarily, or under order of their Priests, or Corregidores they regularly practice; and warn them that the sole thing that they can, and must do with the said animals is to shear them..” (Documentos..., 1913).

Also the vicuñas were made the property of the King of Spain in order to increase royal finances. Two years later, on 30 April 1779 a new order again stated that:

“... all the wool that the Vicuñas have produced up to now has been at the expense of forfeiting the life of the Animals...” (AGN 13-40-3-4 al 10).

This order also advised the indigenous people of the Puna of their obligation to tame and domesticate vicuña.

These *Reales Ordenes* failed to fulfil the goal of protecting the vicuña because the issue of domestication continued to be discussed in 1805, and again in 1811 (letter to the *Semanario*, 1805; Walton, 1811). The proposal was settled by crossing vicuña with llamas (*Lama glama*), alpacas (*Lama pacos*), or guanacos, and even sheep (*Ovis aries*) (N.B.: a cross that is biologically highly unlikely) at a range of localities in the Puna, such as Queta, Humahuaca, and Acay (Argentina) (letter to the *Semanario*, 1805).

2.3.2 *Independence Period (AD 1810–1926)*

Up until 1860 the economy of the Andean zone of Argentina was very similar to that during colonial times (Rock, 1985); again a commercial network extended across the Andes supplying urban and mining centres (Langer and Conti, 1991). Certain local economies increased, such as Tucumán (Argentina), which specialized in the transportation of goods, particularly textiles, from Alto Perú (Bolivia) to Buenos Aires. The internal market was connected with the international trading networks through urban centres (Conti, 1993), especially Buenos Aires (more than 70% of the export of goods originating in north-western Argentina went to Buenos Aires and then on to Europe). The exports in the post-independence stage are characterized by an increase in the volumes of skins, instead of fibre, meaning that there were high rates of vicuña hunting over this period (Conti, 2002) (Fig. 2.5). Between 1813 and 1823, the exports of skins and fibres averaged an equivalent of 1,374 individuals, increasing to 5,887 between 1829 and 1834, diminishing to 1,156 individuals in 1850/1851. Although these figures were lower than the exports during the eighteenth century, they continued to be very high.

During the post-independence stage, the method for obtaining vicuña skins and fibres was the *qayqu*,⁴ a description of a *qayqu* made in 1868 in the Puna of Salta (Argentina) gives some information about the size of these hunts – more than 60 hunters participated, some with their wives. They built an enclosure 2–3 km in diameter, connected to an entrance 1-km long, with poles about 1.15-m tall and arranged at intervals of 15 m and coloured cloth was strung between the poles. After setting up the corral, the hunters drove the vicuña from kilometres away, and when enclosed in the corral the hunters killed the vicuña with slings (*bolos*). These hunts lasted for 4–5 days, during which hundreds of vicuñas were slaughtered (Quiroga, 1929/1895). A similar hunt occurred in the 1840s in Peru is also described – in this case, 122 vicuñas were killed in 5 days (Custred, 1979). The men were

⁴Today *chaku* is the common name for all the techniques for capturing vicuña where herds are driven by humans.

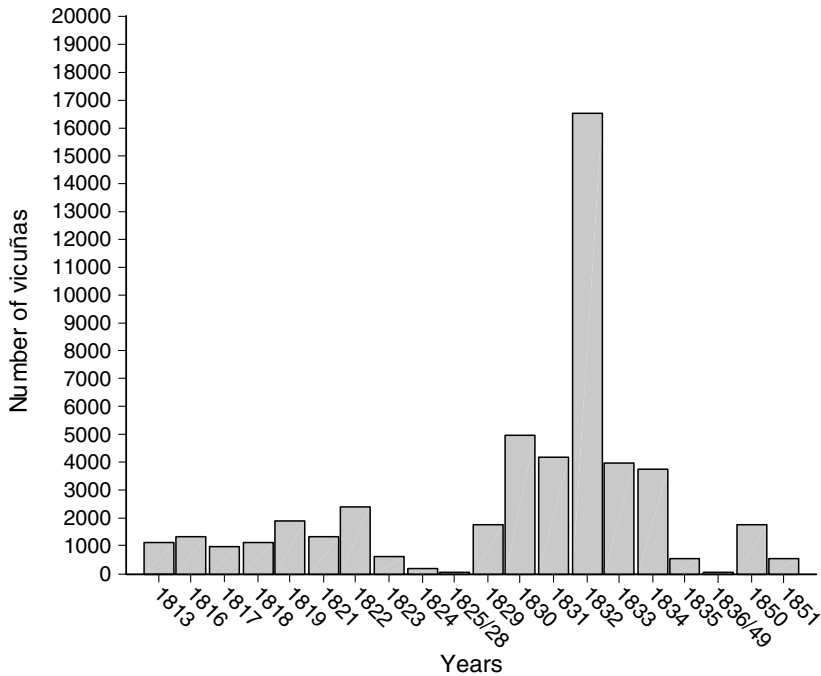


Fig. 2.5 Fibres and skins of vicuña exported in the nineteenth century through Buenos Aires

professional hunters who conducted vicuña hunts every summer. The naturalist Holmberg (1988/1900:11) warned against the future extinction of the species.

At the beginning of the twentieth century, a total of 8,000 vicuñas remained in the former *Gobernación de los Andes*, today the Puna of Jujuy, Salta and Catamarca in Argentina (Holmberg, 1988/1900: 48). Between 1910 and 1916, an average of 147 skins were exported from Buenos Aires (Jaeschke, 1916), an equivalent to 61 vicuñas per year, with vicuña killed in the *chakus* (Davel, 1910). Organised gangs of poachers (“*vicuñeros*”) killed significant numbers of vicuñas until the 1930s (Vitry, 1990), at which stage the Argentinian government issued a decree which temporarily forbade the hunting of vicuña. Bolivia forbade the export of vicuña skins in 1918, and Peru in 1907, based on the requirement to fulfil Simon Bolivar’s decree of 1825 prohibiting the killing of vicuña (Cardozo, 1976). These laws failed to protect vicuña and killing continued to be a common method of gathering fibre; as a consequence, the population of vicuña in the Andes diminished to around 10,000 animals by the middle of the twentieth century (Vilá, 1989).

2.4 Conclusions

Since prehistoric times, the use of the vicuña by people has been common, not only by hunter-gatherers, but also by pastoralists and agriculturalists, who killed vicuña to obtain meat and other by-products (fibres, skins, bones). In Inca times, vicuñas were

exploited using *chakus* or royal hunts; over this period, it appears that exploitation did not have significant impacts on the vicuña population, probably because (1) during the prehistoric period the human population density in the altiplano/Puna was low, compared with other Andean regions and (2) vicuñas were embedded within the symbolic dimension of Puna societies – the ceremonial character of vicuña hunting during the prehistoric period acted as a regulatory system preventing overexploitation.

Following the arrival of the Spanish *conquistadores*, the opening of a world market for vicuña fibre changed the scenario; to fulfil the demands for fibre and skin, high rates of hunting led to a rapid decline in the population of vicuña. The *Reales Ordenes* and other documents clearly show that obtaining the fibre invariably involved the killing of animals. Initial warnings about a decline in vicuña population were issued in 1557 and 1590, only a few years after the Spanish arrival to the Andes.

The export of vicuña fibres and skins from the port of Buenos Aires provides a valuable record of the exploitation of this species over time; during the period 1663–1853, the average number of vicuñas killed per year was approximately 8,250 (Fig. 2.6). By this reckoning, over a period of 190 years the skins of approximately 1.5 million vicuña were supplied to European markets. Figure 2.6 shows a decreasing trend in vicuña export that could reflect the declining size of the vicuña population.

The proposals put forward by the Spanish to restrict the killing of vicuña failed. Even at the beginning of the twentieth century, the proposals to set up breeding reserves (Davel, 1910) or the temporary cessation of hunting did not allow the population to recover. The vicuña population continued decreasing, and only imple-



Fig. 2.6 Vicuña fibre and skin exported from the port of Buenos Aires (1663–1853). Log 8 is equal to 8,000 individuals

mentation of international treaties restricting trade allowed the population to recover (see Chaps. 3 and 5).

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References

- Acarette (1943/1663) *Viaje al Río de la Plata y al Perú*. Alfer and Vays Editores, Buenos Aires
- Acosta J (1962/1590) *Historia natural y moral de las Indias*. Fondo de Cultura Económica, México
- Allen TFH, Tainter JA, Hoekstra TW (2003) *Supply-side sustainability*. Columbia University Press, New York, NY.
- Bertonio L (1984/1612) *Vocabulario de la Lengua Aymara*. CERES/IFEAMUSEF, Cochabamba.
- Cardozo A (1976) *Legislación internacional sobre camélidos Sudamericanos*. Instituto Colombiano Agropecuario, Bogotá.
- Chicchón A (2000) Fauna en la subsistencia de los Tsimane, Reserva de la Biosfera Estación Biológica del Beni, Bolivia. In: Herrera-MacBryde O, Dallmeier F, MacBryde B, Comiskey JA, Miranda C (eds) *Biodiversity, Conservation and Management in the Region of the Beni Biological Station Biosphere Reserve, Bolivia*. SI/MAB Series 4, Washington, pp. 365–383.
- Cieza de León P (1959/1553) In: von Hagen VW (ed) *The Incas*. University of Oklahoma Press, Norman.
- Conti VE (1993) El Norte argentino y el espacio andino en siglo XIX. In: Universidad Nacional de Jujuy (eds), *Jujuy en la historia*. Unju, Jujuy, pp. 63–76
- Conti VE (2002) *Exportaciones y Mercados*. Salta 1813–1853. Paper presented at IX Jornadas Interescuelas/Departamentos de Historia, Universidad Nacional de Córdoba (nd).
- Custred G (1979) *Hunting technologies in Andean cultures*. *Journal de la Société des Américanistes* LXVI:7–19.
- D’Altroy T (2003) *The Incas*. Blackwell, Oxford.
- Davel D (1910) *Vicuñas, llamas y guanacos*. *Boletín del Ministerio de Agricultura* XII: 59–69.
- Dedenbach-Salazar Sáenz S (1990) *Uso y crianza de los camélidos en la Época Incaica*. *Bonner Amerikanistische Studien*, Bonn.
- Documentos para la Historia del Virreynato del Río de la Plata* (1913) Tomo III. Facultad de Filosofía y Letras, Buenos Aires
- Elkin DC (1996) *Arqueozoología de Quebrada Seca 3: indicadores de subsistencia humana temprana en la Puna Meridional Argentina*. PhD Thesis. Universidad de Buenos Aires, Buenos Aires
- Gallardo F, Yacobaccio H (2005) Wild or domesticated? Camelids in early formative rock art of the Atacama Desert (Northern Chile). *Latin American Archaeology* 16: 15–130.
- Garcilaso de la Vega I (1980/1609) *Comentarios reales*. Editorial Plus Ultra, Buenos Aires.
- Hitchcock RK (1995) Centralization, resource depletion, and coercive conservation among the Tyua of the Northeastern Kalahari. *Human Ecology* 23: 169–198.
- Holmberg EA (1988/1900) *Viaje a la gobernación de los Andes (Puna de Atacama)*. Universidad Nacional de Jujuy, San Salvador de Jujuy.
- Jaesche JE (1916) *Llama, vicuña y guanaco*. Thesis, Facultad de Ciencias Económicas, Universidad de Buenos Aires
- Langer ED, Conti VE (1991) Circuitos comerciales tradicionales y cambio económico en los andes centromeridionales (1830–1930). *Desarrollo Económico* 31: 91–111.
- Loring S (1997) On the trail to the Caribou House: Some reflections on INNE Caribou Hunters in Northern Ntessinan (Labrador). In: Jackson LJ, Thacker PT (eds) *Caribou and Reindeer Hunters of the Northern Hemisphere*. Avebury, Aldershot, pp 185–220.
- Millones L (1975) *Economía y ritual en los Condesuyos de Arequipa: Pastores y tejedores del Siglo XIX*. *Allpanchis* VIII: 45–66.

- Millones, L. and R.P. Schaedel (1980). Plumas para el sol: comentario a un documento sobre cazadores y cotos de caza en el antiguo Peru. *Boletín del Instituto Francés de Estudios Andinos*, IX, 59–88.
- Morris C, von Hagen A. (1993) *The Inca Empire and its Andean origins*. Abbeville, New York, NY.
- Murra JV (1978) *La organización económica del Estado Inca. Siglo XXI*, México.
- Nelson RK (1982) A conservation ethic and environment: The Koyukon of Alaska. In: Williams NM, Hunn ES (eds) *Resource Managers: North American and Australian Hunter-Gatherers*. Australian Institute of Aboriginal Studies, Canberra, pp.211–228.
- Nielsen A (1996) Demografía y cambio social en la Quebrada de Humahuaca (Jujuy, Argentina) 700–1535 d.C. *Relaciones de la Sociedad Argentina de Antropología XXI*: 307–354.
- Núñez L (2005) La naturaleza de la expansión Aldeana durante el formativo tardío en la cuenca de Atacama. *Chungara* 37: 165–193.
- Palomeque S (1989) La circulación mercantil en las provincias del interior, 1800–1810. *Anuario del IHES IV*: 131–241.
- Palomeque S (1994) Intercambios mercantiles y participación indígena en la “Puna de Jujuy” a fines del período colonial. *Andes* 6: 13–48.
- Quiroga A (1929/1895) La caza de vicuñas. *Revista de la Universidad de Buenos Aires VI*: 268–272.
- Rock D (1985) *Argentina 1516–1987. From Spanish colonization to the Falklands War*. University of California, Berkeley.
- Semanario de Agricultura, Industria y Comercio* (1805) Number 142, pp.282–287, 311–312, 319. Kraft, Buenos Aires
- Spalding K (1982) Exploitation as an economic System: The state and the extraction of surplus in Colonial Peru. In: Collier GA, Rosaldo RI, Wirth JD (eds) *The Inca and Aztec States 1400–1800*. Academic, New York, NY, pp.321–342.
- Tchernov E (1993) From sedentism to domestication – a preliminary view for the southern Levant. In: Clason A, Payne S, Uerpmann H-P (eds) *Skeletons in her Cupboard*. Oxbow Monographs 34, Oxbow books, Oxford, pp.189–217.
- Vilá B (1989) Paisaje con vicuña. *Ciencia Hoy* 1: 46–55.
- Villalobos S (1981) *Comercio y contrabando en el Río de la Plata y Chile*. Eudeba, Buenos Aires.
- Vitry RG (1990) Bandidos y vicuñeros de la Puna. *Todo es Historia* 279: 6–25.
- Walton W (1811) An historical and descriptive account of the four species of Peruvian sheep, called Careros de la Tierra; to which are added, particulars respecting the domestication of the two wild species, and the experiments hitherto made by the Spaniards, to cross the respective breeds, to improve their wools, Longman, Hurst, Rees, Orme, and Brown, London.
- Wheeler JC (1985) De la Chasse a L'Élevage. In: Lavallée D (ed) *Telarmachay. Chasseurs et pasteurs préhistoriques des Andes I*. CNRS, Paris, pp.61–79.
- Woodroffe R, Thirgood S, Rabinowitz A (2005) *People and Wildlife. Conflict or Coexistence?* Cambridge University press, Cambridge.
- Yacobaccio HD (2004) Social dimension of camelid domestication in the southern Andes. *Anthropozoologica* 39: 237–247.