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Ancient Hunting Strategies in Southern South America

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Chapter 9
Hunting Techniques Along the Rain Shadow Gradient in North-Central Patagonia, Argentina

Mariana Carballido Calatayud and Pablo Marcelo Fernández

Abstract The forest and the steppe of North-Central Patagonia (Argentina) are contiguous yet contrasting environments that have been connected throughout their peopling history. Human occupation began in the early Holocene, became more regular ca. 3500 years BP, and has increased since 2200–1700 years BP. Beyond this general picture, the nature of the relationship between forest and steppe over time is a matter of debate. To better our understanding of the human use of both environments, where assessed and investigated various hunting techniques employed over the last 3500 years, a central activity for hunter-gatherer societies. First, we modeled hunting techniques combining ecology, size, and behavior of prey, ethnographic, historical, and archaeological data, and the environmental settings (topography and vegetation). Then, we evaluated the models using weapon lithic technology and the zooarchaeological records recovered from archaeological sites located in both the forest (Cholila, Epuyén, and Manso) and the steppe (Piedra Parada area) and dated to the last 3500 years. The analysis showed that in both environments the ungulates of medium to large sizes were the main prey (huemul, *Hippocamelus bisulcus*, and guanaco, *Lama guanicoe*). They were captured near the sites, in hunting events involving few animals. In the forest, small huemul social groups were hunted by 'encounter' technique mainly with bows and arrows. This weapon system would have enabled more recurrent and/or longer stays in the forest. In the steppe, the 'approach' method was the most used technique to hunt guanacos and lesser rheas (choique, *Pterocnemia pennata*). These animals could be captured in high productive wetlands (*mallines*) using mainly throwing weapons, and handheld weapons to a lesser extent. Our results reinforce the idea that by the end of the peopling process of both environments, distinctive traits had developed beyond the existing networks of interaction.

Keywords Hunter gatherer · Bow and arrow · Spears · Andean forest · Steppe

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9.1 Introduction

Patagonia was populated through a slow and heterogeneous process of occupation that prioritized the best-ranked areas according to the resources they offered (Barberena et al. 2015; Borrero 1994–1995; Borrero et al. 2013). Thus, it is not until the Late Holocene that environments traditionally considered marginal, like the arid hinterland, the high plateaus, and the forest, were effectively occupied. Regular human presence in these environments was the result of the gradual demographic expansion throughout the Holocene that reached its maximum at 1000 years cal BP (Pérez et al. 2016). In agreement with this general model, the forest and steppe of North-Central Argentine Patagonia (between latitudes 41° 30′S and 42° 30′S) show an increase in human occupation from 3500 years BP (Bellelli and Guráieb 2019; Fernández et al. 2013).[1] These contiguous environments were inhabited by groups that shared ideological (rock art style), and technological traits (same raw materials, and characteristics of lithic and ceramic technology) (Bellelli et al. 2003, 2006, 2008, 2018; Fernández et al. 2011; Marconetto 2002; Pérez de Micou 2002a; Podestá and Tropea 2010; Podestá et al. 2019). The similarities were attributed to groups that first used forest and steppe complementarity (Bellelli et al. 2003). Later, around 1700 years BP, hunter-gatherer groups occupied the forest more assiduously and/or intensively (Fernández et al. 2013; Fernández and Tessone 2014). This way of inhabiting the forest resulted in specific strategies for its exploitation, and even prompted the emergence of a local rock art style, named as *Modalidad del Ámbito Boscoso Lacustre* [MALB] (Albornoz and Cúneo 2000; Podestá et al. 2007). In the steppe, a similar process is observed where human presence began increasing from 2300 years BP, accompanied by the development of a local rock art variant, and by the use of raw materials from the forest (*Nothofagus* sp. wood, and the *Chusquea culeou* bamboo cane) (Bellelli and Guráieb 2019). Under this new context, the continuity of social networks could explain the evidence of shared cultural traits between the forest and the steppe.

To deepen our knowledge on the human use of these environments, in this paper we developed a comparative study of hunting techniques in the forest and the steppe of North-Central Patagonia. In Argentine Patagonia, the interest on hunting practices is longstanding (Gradin 1959–1960; Vignatti 1947), but only a few decades ago archaeologist started to integrate multiple lines of evidence in the study of this behavior (Belardi and Goñi 2006; Belardi et al. 2013, 2017; Cassiodoro et al. 2014; Goñi et al. 2014, 2016; Miotti et al. 2016; Ratto 1992; Santiago and Salemme 2016). Most of these researches were developed in the steppe, and were focused on guanaco (*Lama guanicoe*) and the role of blinds as part of the technology for hunting (Belardi and Goñi 2006; Belardi et al. 2013, 2017; Cassiodoro et al. 2014; Goñi et al. 2014, 2016; Miotti et al. 2016). In contrast, fewer papers explored techniques employed to hunt in the forest or to obtain other ungulates in this environment (Alunni 2018;

[1] In the study area, the relationship between forest and steppe dates back to the Early and Middle Holocene, before human presence increased in both environments (Bellelli et al. 2018; Fernández et al. 2019).

Borrero 1985; Carballido Calatayud and Fernández 2013; Fernández and Carballido Calatayud 2015; Pérez and Batres 2008; Ratto 2003). However, there are no comparative studies between hunting techniques used in the Andean forest and the steppe. These environments represent the extremes of the strong gradient of precipitations registered in Patagonia (Paruelo et al. 1998), characterized by biotic and abiotic differences that allow us exploring the weight of well-established hunting constraints, such as topography, plant coverage and faunal resource structure (Aschero and Martínez 2001; Binford 2001; Bird et al. 2005; Churchill 1993; Hutchings and Brüchert 1997; Peterson 1998; Shott 1993) to the ways people obtain mobile prey. In the forest, the combined effect of dense vegetation and rough terrain severely limited hunter-gatherer pedestrian mobility, and water and wood availability contrasted with the scarcity of edible plants and large to medium-sized animals. On the contrary, the steppe had abundant large to medium-sized preys, but humans were dependent on the strongly localized water sources and the scarcity of firewood.

To accomplish our objective, we modeled three hunting scenarios based on information about plant coverage and topography; the ethology and the characteristics of the prey, and ethnographical and historical data. Then, the models were tested on archaeological data from sites located in the forest (Manso, Epuyén, and Cholila localities) and steppe (Piedra Parada area), focusing on the lithic point technology and the zooarchaeological assemblages (Fig. 9.1). Finally, we developed a comparative analysis between the forest and steppe hunting techniques.

9.2 Environments

In this study, we focused on the forest and steppe environments located between latitudes 41° 30′S and 42° 30′S, on the eastern slope of the Andes. As we noted before, precipitations decrease from West to East according to the rain shadow effect resulting from the presence of the Andean Cordillera, acting as a barrier for the humid air masses coming from the Pacific Ocean (Paruelo et al. 1998). Because of this steep gradient, the forest occupies a narrow strip of 30–50 km wide on the western side of the Andes. Precipitation ranges between an annual rate of 2000 mm near the border with Chile, to an annual rate of 800/700 mm close to the forest/steppe ecotone. Precipitation is highest in winter and the mean annual temperature ranges from 4 to 8 °C (Marchetti and Prudkin 1982; Paruelo et al. 1998). In the study area, forests cover a glacial modified landscape with deep lakes, V-shaped valleys with low altitude (350–600 m a.s.l.), and moraines and mountain ranges up to 2200 m a.s.l. A mixed forest of *Nothofagus* sp.—and *Austrocedrus chilensis* with grassland patches predominates. Towards the forest-steppe ecotone, *Austrocedrus chilensis* becomes more important (Bernades 1981; Marchetti and Prudkin 1982).

The Piedra Parada area is located on the steppe. There, the principal landform is the drainage system of the Chubut River in its middle course with extremely arid conditions (138 mm annual precipitations). Temperatures range between 17 °C in January to 3 °C in July (Aschero et al. 1983; León et al. 1998). This narrow (3 km

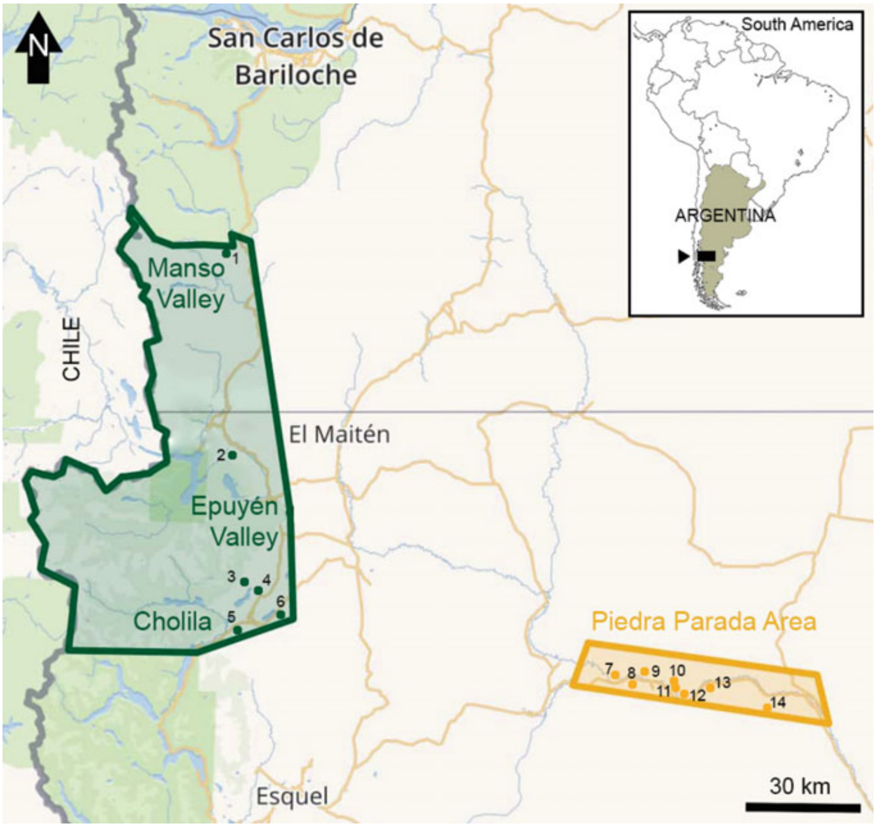

Fig. 9.1 Location of the study areas and archaeological sites analyzed of forest (shaded in green) and steppe (shaded in orange) of North-Central Patagonia (Argentina). Sites references: 1 Paredón Lanfré and Población Anticura, 2 Risco de Azócar 1, 3 Los Guanacos 3, 4 Juncal de Calderón 1, 5 Cerro Pintado, Lili 2, 7 Barda Blanca 4 and 5, 8 Angostura Blanca, 9 Campo Cerda 1 and 2, 10 Campo Moncada 1 and 2, 12 Piedra Parada 11, 13 Campo Nassif 1 and 14 Bajada del Tigre 3 and Mallín Blanco

wide) river valley is located at 400 m a.s.l. and connects with higher sectors (800 m a.s.l.) through canyons. The dominant plant formation is the shrub-steppe but there are very important areas of wetlands (locally known as *mallines*) near the river, as well as shallow lakes and wetlands composed of dense Gramineae grasslands in the highest areas (Aschero et al. 1983; León et al. 1998).

9.3 Forest and Steppe Preys

In order to build the hunting models, ecology, behavior, abundance, habitat selection, social groups' composition, and anti-predator behavior of animals were considered. The models took into account the main prey that would have been captured primarily for food, as well as for leathers, tendons, feathers, and bones. Ordered by live weight, the largest prey is the guanaco (100–120 kg), the intermediate prey is the huemul (60–100 kg), and the smallest prey is the choique (17–25 kg). Nowadays, the huemul (*Hippocamelus bisulcus*) is a cervid that only inhabits the forest. The guanaco (*Lama guanicoe*), a South American camelid, and the lesser rhea or choique (*Pterocnemia pennata*), a flightless bird, both mainly inhabit the steppe, and are also found in the forest-steppe ecotone (Daciuk 1978; Franklin 1983; Serret 2001).

9.3.1 Guanaco

The guanaco is the largest terrestrial vertebrate of Patagonia and mainly lives in the steppe although it also inhabits the forest in Tierra del Fuego, where it seeks refuge during the winter (Montes et al. 2000; Raedeke 1978). The guanaco's social structure is formed of family groups (7–16 individuals), male groups (20–50 individuals) and solo males (Franklin 1983). The family groups are territorial, and the male defends the essential food resources for the females (Raedeke 1978; Franklin 1983; Merino 1986). Some populations move seasonally or use different altitudes throughout the year. These migrations may be related to the snow cover, the absence of forage in winter or the possibility of improving forage conditions by alternating sites (Franklin 1983; Montes et al. 2000; Ortega and Franklin 1988; Puig et al. 2003). Guanaco anti-predatory behavior is related to the puma (*Puma concolor*), its main threat (Taraborelli et al. 2012). Its defense strategy combines surveillance, flight and alarm vocalizations (Donadio and Buskirk 2006; Taraborelli et al. 2012; Young and Franklin 2004). In family groups, the females remain alert trying to reduce the risk of predation, while the males' surveillance has as main objective to keep other guanacos out of their territory. However, this behavior also works for detecting predators. In non-territorial groups, such as male groups or mixed groups, surveillance is more relaxed, and the main strategy is grouping (Marino 2012; Taraborelli et al. 2012).

9.3.2 Huemul

Huemul ecology and distribution have been affected by habitat loss and hunting pressures since the European colonization (Povilitis 1978; Serret 2001; among others). Nowadays, the huemul is restricted to forested mountain areas of difficult access, but in the past, the forest-steppe ecotone would have been its optimal habitat (Serret

2001). The social structure of this cervid comprises solitary male, female with or without fawn/yearlings, and family groups—up to four individuals (male, female, fawn, and yearling). Additionally, there are transient social forms, such as mixed groups (more than four individuals from both sexes and different ages during the fall/winter), yearling, and pair of yearlings, corresponding to individuals that were expelled from their birth group (Garay et al. 2016; Povilitis 1978; Serret 2001). The family group usually remains in the same area, and its home range is about 3–4 km^2 (Garay et al. 2016; Gill et al. 2008). Most huemul populations move seasonally, downslope in winter (500–800 m a.s.l.) and upslope in summer (1000–1400 m a.s.l., Gill et al. 2008; Povilitis 1978, 1983; Serret 2001), but some remain year-round above 1400 m a.s.l. (Galende et al. 2005). Like the guanaco, the huemul's main predator is the puma. The anti-predator behavior of this cervid is related to its distance with the potential predator (Povilitis 1978). When the huemul detects an observer, it usually remains motionless, looking directly at the intruder. Then, if the distance is less than 34 m, the huemul will make for an abrupt escape. An intermediate distance (77 m average) generates slow and cautious movements to go unnoticed and avoid an attack. If the distance is more than 190 m, the animal simply walks away or cautiously resumes the activity before the alarm. Topographic features will serve to hide it from the intruder's view, but it can also use the vegetation cover to obstruct eye contact. With the arrival of the Europeans with firearms, horses, and dogs, immobility was turned inadequate, and topography and vegetation cover became the best resources for survival (Povilitis 1978). Because of this behavior, the huemul was viewed as an easy target by late nineteenth and early twentieth century travelers (Díaz 2000). However, despite being easy to wound with firearms, huemules can flee at full speed and even with a gunshot wound can cross rivers to distance themselves from the aggressor (Skottsberg 1911). The huemul is a very good swimmer and its dense fur facilitates its flotation. Thus, flight through lakes and waterways is a common tactic of their anti-predatory behavior (Moreno and Pastore 1998; Serret 2001).

9.3.3 Choique

The lesser rhea or choique is a medium-sized flightless bird, endemic to shrub steppes and semi-deserts of Argentine Patagonia and southern Chile. In these arid lands it is patchily distributed in high productivity wetland areas or *mallines* (Bellis et al. 2006; Daciuk 1978). The choique has suffered a marked population decline over recent decades, mainly as a result of livestock production and overhunting (Pedrana et al. 2011). During the reproduction and breeding season, groups of 15–40 individuals are observed, distributed in four types: solo males, females (2–15) with one or two males, large groups of birds less than one-year-old (more than 40) with some 'non-reproductive' adults, and males with its chicks. The male is responsible for hatching the eggs, and with its chicks forms a group that stays together during the summer and the following winter. These families represent the core of the large winter group (more than 100 birds) (Bruning 1974; Daciuk 1978). The speed and ability to stop and suddenly change direction while running are its main defense mechanism (Martella et al. 1995). Hence, the open and flat lands favor the 'watch-and-run' anti-predator strategy (Bruning 1974).

9.4 Hunting Techniques Data from Historical and Ethnographical Sources

Most of the data on hunting techniques utilized in Patagonia in the past were recorded in societies that had already incorporated the horse into their hunting practices (Bourne 1853; Furlong 1912; Musters 1871; Perea 1989; Prichard 1910; among others). In northern Patagonia, the use of the horse for hunting dates back at least to the beginning of the seventeenth century (Florez de León 1992). Prior to this, there is practically no data on pedestrian hunting, except for a brief mention of a member of the Magellan's expedition who in 1520 reached the Atlantic coast of Patagonia (Pigafetta 1874 [1536]). However, in Tierra del Fuego pedestrian hunting practices lasted until the early twentieth century. These activities were depicted in detail by travelers and ethnographers (see reviews in Borrero 2013; Ratto 2003; Santiago and Salemme 2016), and we will use this information to model hunting techniques.[2] Below, we present the data from the historical sources that were viewed ordered by species.

9.4.1 Guanaco

Pigafetta's early mention of a hunting technique pointed out the use of juvenile guanacos as bait to attract adult animals that were killed with bows and arrows by hunters hidden in the bushes (Pigafetta 1874 [1536]: 51). This 'approach' hunting technique (sensu Churchill 1993) contrasts significantly with the eighteenth and nineteenth century chronicles of continental Patagonia. In these sources the tactics are based on the use of horses, generally involving numerous hunters and the use of

[2]In this paper we follow the classification of hunting techniques proposed by Churchill (1993: 16). They comprise disadvantage, that 'includes any technique [also drives animal into a handicapped position in which the weapon was applied] that limits the escape of an animal or exploits an animal naturally disadvantaged to gain time or access so that a weapon can be employed'; ambush that 'involves instances in which hunters wait in hiding, whether behind man-made blinds or natural features, for animals to pass within effective range of their weapons. Drives were considered ambushing if the intent was to force animals past concealed hunters'; approach that 'includes stalking free-moving animals to within effective weapon range. Luring of animals was also included in this category'; pursuit that 'entails chasing an animal to overtake it and place the hunter within effective weapon range or to exhaust and thus disadvantage it. Pursuit may involve domesticated animals such as horses to close the distance between the hunter and prey or dogs to keep the animal moving until exhaustion', and encounter that 'refers to hunting in which animals are taken, either jumped from the bush or spotted in trees, as they are encountered'.

bolas, fire, and dogs ('disadvantage' technique, sensu Churchill 1993). Furthermore, in these hunting events, several types of prey were usually obtained at the same time (guanacos, choiques, foxes, and pumas).

The Yámana canoers observed in the early nineteenth century hunted guanacos using a 'disadvantage' technique (sensu Churchill 1993). In winter, when the animals moved down the slopes toward the seacoast, the deep snow would prevent their escape, thus allowing the hunters and their dogs to surround and kill them easily (Fitz-Roy 1839: 186). At other times of the year, the Yámana hunted guanacos using the 'ambush' technique (sensu Churchill 1993). The hunters hid themselves in the forest paths usually used by these animals and would 'sometimes get them by laying in wait and shooting them with arrows, or by getting into a tree near a track, and spearing them as they pass beneath the branches' (Fitz-Roy 1839: 187). The Selknam, pedestrian hunters, used a similar technique to capture guanacos in the forest, by using dogs and/or beaters to drive the animals toward ambushed archers. Furlong (1912) recorded another variant of the 'ambush' technique in the early twentieth century. The guanacos were rounded up and driven between two lines of hunters, which gradually converged toward a narrow runway where the bowmen's pits were located. Guanacos were slaughtered in the vicinity of the bowmen's pits. Usually, a valley was chosen for the drive, but it could also occur between two small rivers (Furlong 1912:9). Another alternative consisted in driving guanacos through the open lands between patches of dense woods. Hunters often approached them disguised with guanaco skins and gradually drove them to the meadows. As guanacos passed through narrow spaces between the trees, they certainly became an easy prey to the arrows of the concealed hunter (Furlong 1912: 11). Nevertheless, Lothrop (1928: 81) rejected the notion that the Selknam ever came in sufficient numbers to execute the drives and he also wondered how the pits were dug in the frozen ground during the winter. This author describes another variant of the ambush hunting technique during the moving of the residential camp. While women and children followed the bottom of the valleys, some men kept on higher land on either side. They, acting as beaters, startled the guanacos which fled to the heights where the hunters were waiting for them (Lothrop 1928: 81). However, solitary hunting would have been the most frequent strategy for pedestrian hunters ('pursuit' technique, sensu Churchill 1993). A lone hunter could head out in any direction at random. When dogs discovered a trail, they followed it, and the hunter approached the guanaco in a concealed manner, and when at about 20–30 meters shot an arrow toward the animal's neck (Gusinde 1982: 251). In summary, according to these historical and ethnographic records, the guanaco was hunted using the 'ambush', 'disadvantage', and/or 'pursuit' approaches, using bows, arrows and spears, and with the help of dogs and baits.

9.4.2 *Huemul*

The information on huemul hunting techniques in historical and ethnographical sources is scarce. Data was compiled by Norma Díaz (2000: 8–10) and refers almost exclusively to canoers groups in southern Chile, restricting its application in the cases discussed in this paper. In canals and fjords, these groups used a 'disadvantage' technique (sensu Churchill 1993) driving the huemules into the sea and using harpoons for hunting them from their canoes (Bird 1946: 61; Emperaire 1955: 201). Emperaire also points out that when hunted in the mountain, the huemul is cornered with dogs and killed by a blow to the head or beaten with rocks (Emperaire 1955: 201). De Córdova (1788: 340) and Fitz-Roy (1839: 141) also mentioned the use of dogs in hunting huemul. Finally, for the early twentieth century' in the Neuquén province, indigenous people used the lasso to capture huemules (Perea 1989: 40).

9.4.3 Choique

As reported as early as 1869, 'the arrival of Europeans in South America has very considerably modified the manner of living amongst the Patagonians' (Hutchinson 1869: 321). This statement is reflected by examining historical references to choique hunting. Unlike the guanaco, there are no early accounts prior to the horse being integrated within hunting practices. As we noted, equestrian hunting particularly if it involves several hunters—can result in the simultaneous capture of guanacos and choiques and, occasionally, pumas and foxes. According to Musters' description (1871: 72–73), couples of riders accompanied by dogs spread themselves out in a crescent, lighting fires at intervals to mark their track, eventually forming a circle and narrowing its radius. The game ran from the advancing party, and when the circle was closed and tightened, the animals were attacked with the bolas ('disadvantage' technique, sensu Churchill 1993). Other nineteenth and early twentieth century chroniclers and ethnographers describe this same 'disadvantage' technique of hunting, performed either by indigenous groups or by Creole and European hunters (Bourne 1853:113, D'Orbigny 1839–1843: 193–194; Guinard 1868: 120; Perea 1989; Prichard 1910: 32–33). Musters (1871: 128) also reported two other choiques' hunting techniques by disadvantage, both employed in the winter season. The first one consisted of driving the birds 'into the water, where, their legs getting numbed with cold, they are drifted to the shore by the current, and easily captured, being unable to move'. The second was used in snowy weather, as the eyes of these birds are affected by the glare of the white snow, and their snow-saturated plumage becomes heavier, facilitating their capture.

9.5 Hunting Models

The three following hunting scenarios (Into the forest, Forest-steppe ecotone, and Steppe) were modeled using the information previously outlined about plant coverage, topography, prey's characteristics, and ethnographic and historical data (Aschero and Martínez 2001; Churchill 1993; Marean 1997).

9.5.1 Into the Forest

We proposed hunting models for guanacos and huemuls due to their different characteristics and behavior. For guanacos, we use the information from Tierra del Fuego since there is no data on these animals from the forest of North-Central Patagonia. As guanacos' behavior is spatially and temporally predictable, we proposed the use of an 'ambush' hunting technique. The recurrent use of trails by territorial guanaco family groups would have allowed hunters hidden by the dense vegetation to intercept the animals on their way. Ambush could also have been used to hunt mixed groups of males and females formed during the winter. These large groups could have been located in open sectors of the forest (Borrero 1985: 270). Another variant of an 'ambush' technique could have included driving animals to hunters hidden in the forest. Besides, the 'encounter' hunting technique could have been employed on non-territorial guanacos' social groups, such as male groups. The weapon systems employed for all these hunting techniques would have included throwing weapons, such as spears (with and without thrower), and bows and arrows.

In the forest, the huemul would have been hunted mainly through the 'encounter' technique' because its location is only predictable on a wide spatial scale. During winter, the huemul is found in valleys and areas protected from snow, below 700 m a.s.l, while in summer it is usually found between 1000 and 1200 m a.s.l. Due to the small size of the social groups, hunting events would have yielded few prey. However, during the rutting season the more numerous social groups and the smaller home range would have allowed more animals to be captured. The importance of water bodies on the huemul's anti-predatory behavior would have prompted the use of a 'disadvantage' hunting technique. The animals would be frightened away and, on their way to a lake or river, they would be shot by hidden hunters on the shore. It is expected that, like the guanaco, the huemul was hunted using throwing weapons, facilitated by the use of open areas and the immobilizing anti-predator behavior. Also, the concealment of hunters must have been very important to get the animals within the effective range of weapons. In the case of populations not accustomed to humans, it would have been possible to approach the animal and kill it with handheld weapons or even with heavy items with no archaeological visibility, such as sticks and stones.

9.5.2 Forest-Steppe Ecotone

In the forest-steppe ecotone, only guanacos and huemuls are recorded. These animals would have been captured with the same hunting techniques ('ambush', 'disadvantage', and 'encounter') and the same weapons as those used in the forest, although the reduced vegetation cover would have also facilitated the use of bolas. The main difference with the inner forest is the higher abundance of ungulates. Guanaco family groups are larger than in the forest (Franklin 1983; Merino 1986), while huemules would tend to group in larger numbers as an anti-predation strategy (Frid 1994; Povilitis 1978). In both cases, the risk of loss is expected to decrease due to the greater abundance of prey and the fact that many animals could be obtained by hunting events. The differences in predictability between both ungulate species would be similar to those proposed for the forest, with the guanaco family groups being the easiest to locate.

9.5.3 Steppe

The 'approach' hunting technique (including luring animals such as those mentioned by Pigafetta 1874 [1536]) would have been used to hunt guanacos and choiques in wetlands (*mallines*), where these animals' food resources are concentrated. The 'approach' hunting technique could also have been used to capture male choiques during hatching, which has the additional benefit of collecting the eggs. Another hunting technique that would have been used in the ravines to capture guanacos during their seasonal movement (summer upslope and winter downslope) was through the 'ambush' technique. The guanacos could also have been driven into the ravines at any time of the year. Bounded between the rock walls and with only one escape route, they would have been intercepted by hidden hunters. Before the adoption of the horse, the 'ambush' hunting technique with a drive must have demanded a large number of hunters to catch choiques. Because of the bird's flight pattern—high speed and suddenly change of direction—a narrow circle with many shooters was required to maximize their effectiveness. Besides, and without an association with a specific topography, guanacos and solitary choiques would have been hunted by the 'encounter' technique. All the above techniques would have used throwing weapons, such as spears, bows and arrows, and bolas. In other sectors of Patagonia, ambush in blinds (*parapetos*) was a very frequent technique for the summer guanaco hunting at the high plateaus (Belardi et al. 2017; Flores Coni et al., this volume, Goñi et al. 2016; Lynch et al. 2020; Miotti et al. 2016). Future research on Piedra Parada highlands will allow evaluation of whether this technique took place in the study area.

In all three hunting scenarios we do not rule out the use of dogs as a complement to hunting techniques, although their importance in pre-European times is not clear. The few remains of domestic canids found in the Pampas and Patagonia date from the last thousand years, come almost exclusively from funerary contexts and have been interpreted as individual exchange goods (Acosta et al. 2011; Prates et al. 2010a, b). This scarcity contrasts with historical chronicles that mention the use of numerous dogs for hunting (Bourne 1853; D'Orbigny 1839–1843; Gallardo 1910; Guinard 1868; Musters 1871; Prichard 1910).

9.6 Archaeological Data

The two forest hunting models were assessed using mostly lithic points and bone remains from stratified rock-shelters (Paredón Lanfré, Población Anticura, Risco de Azócar 1, and Cerro Pintado). The open-air surface sites Los Guanacos 3, Juncal de Calderón 1, and Lili 2 only provided one point each. Radiocarbon dates of stratified sites span from 3350 to 280 years BP (Table 9.1). The open-air surface sites are not dated, but have traits like lithic raw material, grinding stones and end scrapers morphology, that suggest they belong to the same period (Bellelli et al. 2003; Carballido Calatayud 2009). Regarding the precipitation gradient, the sites located in sectors with more than 1200 mm of annual precipitation were used to assess the model Into the forest (Paredón Lanfré, Población Anticura, and Risco de Azócar 1). Cerro Pintado and the open-air surface (716 mm annual) were employed to assess both Into the forest and the Forest-steppe ecotone hunting models. The steppe zooarchaeological and lithic points data mostly comes from the stratified rock shelter sites Angostura Blanca, Campo Cerda 1, Piedra Parada 1, Campo Moncada 1, Campo Moncada 2, and Campo Nassif 1, that are dated between 3350 and 450 years BP (Table 9.1). The open-air surface sites Barda Blanca 4 and 5, Campo Cerda 2, Piedra Parada 11, Mallín Blanco, and Bajada del Tigre 3 presented lithic assemblages but no bones.[3] These sites are not dated, but Barda Blanca Médanos, a site near Barda Blanca 4, has a radiocarbon date of 1320 ± 60 years BP (Bellelli and Guráieb 2019). We assume that the open-air sites have occupations within the same time range as the rock shelter sites, although we do not rule out older materials. Archaeological evidence recovered from both types of loci was used to contrast the Steppe hunting model.

Both forest and steppe stratified rock shelter and open-air surface sites have evidence of multiple activities. In rock-shelters, discard and resharpening of lithic points, as well as food consumption and the use of leather, bones, and tendons from preys, were identified (Aschero et al. 1983; Bellelli 1994, 2005; Bellelli et al. 2003; Carballido Calatayud 2009; Carballido Calatayud and Fernández 2013; Fernández 2010; Fernández et al. 2011; Marchione and Bellelli 2013; Onetto 1986–1987; Pérez de Micou 1979–1982, 1987; Podestá et al. 2007). At surface sites, bones were not preserved, and lithic points were reduced in number due to non-archaeological collectors/amateurs' action. Therefore, the interpretation of the activities developed in these types of sites in both environments is limited.

[3] A resident of the Piedra Parada area has a collection of archaeological materials including bolas. Unfortunately, we did not have access to her collection and, although the material was studied decades ago, the results were never reported.

Table 9.1 Chronology of the forest and steppe contexts analyzed

Site	Analysis unit	Chronology (yrs. BP)	Reference
Forest			
Paredón Lanfre (PL)	Single (palimpsest)	330 ± 50 470 ± 70 490 ± 60 790 ± 60 930 ± 60 1030 ± 70 1450 ± 70 1480 ± 70 1500 ± 60 1570 ± 60	Bellelli et al. (2007) and Fernández et al. (2010a, 2013)
Población Anticura (PA)	Historical Times (PA HsT)	280 ± 40 300 ± 50 400 ± 70	Fernández et al. (2010a, 2013)
	Final Late Holocene (PA FLH)	480 ± 70 530 ± 50 550 ± 50 590 ± 50 660 ± 50 690 ± 60 700 ± 60 710 ± 70 810 ± 50 1150 ± 60 1420 ± 70 1550 ± 30	Fernández et al. (2010a, 2013)
	Initial Late Holocene (PA ILH)	2270 ± 80 2530 ± 60 2660 ± 80 2960 ± 25 3180 ± 30 3350 ± 100	Fernández et al. (2010a, 2013)
Risco de Azócar 1 (RA1)	Single (palimpsest)	820 ± 60 1200 + 60 1250 ± 70 1330 ± 70 1600 + 90 1690 ± 60	Podestá et al. (2007)
Cerro Pintado (CP)	Single (palimpsest)	680 ± 60 1100 ± 60 1120 ± 60 1870 ± 80	Bellelli et al. (2003)
Steppe			
Angostura Blanca (AB)	Test pit	450 ± 110 2960 ± 60	Bellelli (2005)

(continued)

Table 9.1 (continued)

Site	Analysis unit	Chronology (yrs. BP)	Reference
Campo Cerda 1 (CCe1)	Unit 2-3 (CCe1 2-3)	580 ± 60	Bellelli (1994)
	Unit 5 (CCe1 5)	1715 ± 70 1870 ± 50 1910 ± 80 2050 ± 110 2850 ± 50	Bellelli (1994) and Bellelli (2000–2002)
Piedra Parada 1 (PP1)	Single (palimpsest)	1330 ± 50	Pérez de Micou (1979–1982)
Campo Moncada 2 (CM2)	Unit 0-2b (CM2 0-2b)	780 ± 60 860 ± 80	Nacuzzi (1987)
	Unit 2c (CM2 2c)	1750 ± 80 3350 ± 90	Pérez de Micou (1987) and Pérez de Micou (2002b)
Campo Nassif 1 (CN1)	Single (palimpsest)	480 ± 75	Onetto (1986–1987)

9.7 Analytical Methods

9.7.1 Lithic Points

The analysis of the lithic points included metric (length, width, thickness, weight, angles, etc.) and technical variables, such as the shape and direction of the flakes and their extension on the faces of the piece (Aschero 1975, 1983). Also, the points were evaluated in search of resharpening (reactivation without change of function) and/or recycling (a change in function) evidence. The minimal number of points was calculated by considering the section represented (body, stem, or base), the existence of refittings, and the raw material (Carballido Calatayud and Fernández 2013). Each fragment analyzed belonged to a different piece, 91 lithic points in total. The lithic points functional assignment followed the model developed by Ratto (1994, 2003), based on ethnographic and archaeological information from Southern Patagonia. This model takes into account (a) the reinforcement surface, (b) the aerodynamics, (c) the penetration, and (d) the hafting (Ratto 1994, 2003). The first (a) includes the ratio between the maximum thickness and the width in that same sector (MT/W) and the toughness of the rock.[4] The MT/W values range from 1 to 0 and form an ordinal scale: 1 to 0.8 very high, 0.79 to 0.6 high, 0.59 to 0.4 medium, 0.39 to 0.2 low, and

[4]The raw material identification was based on macroscopic comparison with rocks determined by petrographic thin sections (Carballido Calatayud 1999, 2009). These identifications considered the color, brightness, texture, type, and size of the crystals included and the presence of other heterogeneities like impurities, fissures or alterations. To overcome the lack of specific studies on the toughness of the analyzed points' raw materials, values calculated for Patagonian rocks of comparable origin and characteristics were used (Banegas et al. 2014; Ratto and Nestiero 1994).

0.19 to 0 very low. The second (b) combines the cross-section of the piece, body contour and the length and width of the body, to create a qualitative classification of point aerodynamics (perfect, normal, imperfect and non-aerodynamic). The third (c) considers the tip section (> or < 1 mm^2) and angle (> or < 45°). The fourth (d) combines width, length, and thickness of the stem or base (Banegas et al. 2014; Ratto 1994, 2003, 2013). According to the model, an arrow point has low MT/W ratio, low or medium toughness, perfect or normal aerodynamic, tip section ≤ 1 mm^2, tip angle ≤ 45°, and ≤ 10 mm stem or base width. A spear point has medium, high or very high MT/W ratio, high toughness, imperfect or non-aerodynamic, tip section between >1 and ≤ 1.5 mm^2, tip angle ≥ 45°, and ≥ 10 mm stem or base width. Hand-held point has low MT/W ratio, low or medium toughness, non-aerodynamic, tip section between >1 and ≤ 1.5 mm^2, tip angle ≥ 45°, and ≥ 10 mm stem or base width (Ratto 2003, 2013).

As shown by previous studies, the best sample to evaluate the model is complete, not resharpened and/or not recycled points (Banegas et al. 2014; González-José and Charlin 2012; Shott 1997). One limitation to estimate the penetration variable is the breakage or slight modification of the very fragile tip even in the non-resharpened or non-recycled points (Banegas et al. 2014; Fernández and Carballido Calatayud 2015). In the fragmented points, we measured all possible variables to be identified and fragments were assigned functionally if at least three of the model variables could be calculated. Finally, aerodynamics and penetration could not be measured in the Campo Nassif 1 sample (steppe). Those variables were not taken into account 20 years ago, when these projectile points were analyzed for the first time. Because they are currently missing, we were not able to re-analyze the assemblage.

Also, because of its relevance, we plotted the stem or base width to explore differences and similarities between points of each environment. The stem/base width is key to distinguishing between weapons systems because of its direct link to the type of hafting (Thomas 1978; Ratto 1991, 2003; Shott 1997). Indeed, it is insusceptible to the resharpening effects (Banegas et al. 2014; Franco et al. 2009; Ratto 1991; Shott 1997). Here, we follow Patagonian ethnographic data that shows a 10 mm width of the stem or base is an adequate limit to discriminate between arrows vs. spearheads or handheld points (Ratto 1991; Ratto and Marconetto 2011).

9.7.2 Bone Assemblages

The detailed methodology of the zooarchaeological analysis and the complete data of the faunal assemblages recovered from each site can be found in the following published works for the forest data (Andrade and Fernández 2017; Fernández 2008; Fernández and Fernández 2019) and for the steppe data (Fernández 2008, 2010). Based on this information, we considered the estimated number of preys represented in each archaeological context, the age of individuals, the skeletal parts profiles, and the butchery evidence (cut and percussion marks) as relevant data to contrast hunting technique models. Osteology manuals (Altamirano Enciso 1983; Pacheco Torres et al. 1986) and comparative skeletal collections housed at the *Instituto Nacional de Antropología y Pensamiento Latinoamericano* (INAPL, Buenos Aires, Argentina) were used for the anatomical and taxonomic identification. We employed the NISP (number of identified specimens) and the MNI (minimum number of individuals) to quantify the species representation. Here, the MNI considers both the side of paired bones (left or right) and the epiphyseal fusion stages. Both measures (NISP and MNI) are estimates of taxonomic abundances and do not represent the actual number of prey hunted in the past (Lyman 2019). It is used as a very rough proxy to differentiate contexts with few animals represented (estimated) and those with a large number of preys (categorized as massive hunting, see Borrero 2013 and Santiago and Salemme 2016 for the discussion of this topic in Patagonia). Age estimates were based on epiphyseal fusion following guanacos Kaufmann (2009) and huemuls Fernández (2010) studies. These authors identified a group of early fused bones (newborns, 0–12 months) and a late fused group (adults to senile, 36–48 months), generating an approximate age structure.

Anatomical diversity was estimated by MNE (minimal number of elements), calculated following the Mengoni Goñalons (1999) procedure: counting bone diagnostic zones, considering diaphyseal fragments, and long bones and symmetrical elements of the skeleton. Minimal anatomical units (MAU) were calculated based on MNE, and the anatomical abundance was presented through %MAU graphs. Bone modifications were initially examined with the naked eye, followed by inspection under a 10x hand lens. To resolve questions about particular specimens, a binocular zoom magnifier up to 16x, was used. The analysis took into account the influence of the general taphonomic process (Lyman 1994) and regional accumulation and preservation characteristics (Borrero 2001; Borrero and Muñoz 1999; Fernández and Forlano 2009; Fernández et al. 2010b).

9.8 Results

9.8.1 Lithic Points

The forest sample comprises 44 points, highly fragmented so that only nine are complete (Table 9.2, Fig. 9.2). We applied the functional assignment model to complete ($N = 9$), almost complete[5] (one ear lost, $N = 2$), and one fragmented point. Two arrowheads, two spearheads, and one handheld point (Table 9.3) were identified. The remaining ($N = 7$) was classified as ambiguous because they combine attributes of two or three types of weapons (Table 9.3). In four cases, the non-assignment is due to resharpening or recycling that modified the body-size relationships (Table 9.3). At the steppe sites, 47 points were recovered, and only a third of them are complete ($N = 16$, Table 9.2; Fig. 9.3). We applied the functional assignment model to seven

[5] We considered fragmented points if we can measure three of the four functional assignment model's variables.

Table 9.2 Details of the lithic points from the forest and steppe contexts

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
Forest	PL	S(P)	PL 220	Silex	Bs	–	–	–	–	16	–	–
	PL	S(P)	PL 297	Silex	C	Rs	17.5	10	3	5	1.5	50
	PL	S(P)	PL 235	Silex	C	Rc	31	15	3.5	7	1	52
	PL	S(P)	PL 180	Silex	Bd frg (Tl)	–	–	–	–	–	–	–
	PL	S(P)	PL 260	Obsidian	Bd frg (Tl)	Rs	–	–	–	–	–	–
	PL	S(P)	PL 337bis	Silex	Bd frg	–	–	–	–	–	–	–
	PL	S(P)	PL 495	Silex	St or Bs	–	–	–	–	7	–	–
	PL	S(P)	PL 514	Translucid Silex	Bd (Tb)	–	–	–	–	–	–	–
	PA	HsT	PA 2	Indeterminate	St + Bd frg	–	–	–	–	7	–	–
	PA	HsT	PA 908	Translucid Silex	C	–	24	12	3	6.5	1	46
	PA	HsT	PA 909	Silex	Bd frg	–	–	–	–	–	1.5	58
	PA	HsT	PA 9	Silex	Bd (Tl)	–	–	–	–	–	–	–
	PA	HsT	PA 100	Translucid Silex	C	Rs	12.5	10	3	9	2	59

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	PA	HsT	PA 29	Translucid Silex	AC (Tl)	–	–	–	–	7.5	–	–
	PA	HsT	PA 36	Silex	Bd frg	–	–	–	–	–	1.5	61
	PA	HsT	PA 974	Basalt	C	Rs	16	10.5	3	6.5	0.5	43
	PA	HsT	PA 43	Silex	St frg	–	–	–	–	–	–	–
	PA	HsT	PA 25	Translucid Silex	C	–	11	9	1.5	5	1.5	61
	PA	HsT	PA 889	Translucid Silex	St frg	–	–	–	–	–	–	–
	RA1	S(P)	RA1 148	Silex	AC (Tl)	–	–	–	–	8.5	–	–
	RA1	S(P)	RA1 166	Silex	C (Tb)	Rc	20	14	3.5	7.5	–	–
	RA1	S(P)	RA1 161	Silex	C (Tb)	Rs	39.5	19	7.5	13	–	–
	CP	S(P)	CP 2	Silex	Bd frg	–	–	–	–	–	1.5	43
	CP	S(P)	CP 3	Silex	Bd frg (Tl)	–	–	–	–	–	–	–
	CP	S(P)	CP 112	Indeterminate	St + Bd frg	–	–	–	–	7	–	–

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	CP	S(P)	CP 9	Translucid Silex	St + Bd frg	Rs	–	–	–	6	–	–
	CP	S(P)	CP 17	Silex	St + Bd frg	Rs	–	–	–	8.5	–	–
	CP	S(P)	CP 28	Translucid Silex	Bd frg	–	–	–	–	–	–	–
	CP	S(P)	CP 48	Indeterminate	Bd frg	Rs	–	–	–	–	–	–
	CP	S(P)	CP 66	Translucid Silex	Bd frg (Tl)	Rc	–	–	–	–	–	–
	CP	S(P)	CP 84	Obsidian	Bs	–	–	–	–	13	–	–
	CP	S(P)	CP 121	Translucid Silex	Bd frg	–	–	–	–	–	1	38
	CP	S(P)	CP 122	Indeterminate	Bd frg (Tl)	–	–	–	–	–	–	–
	CP	S(P)	CP 143	Silex	St + Bd frg	–	–	–	–	8.5	–	–
	CP	S(P)	CP 144	Translucid Silex	Bd frg	–	–	–	–	–	1	40
	CP	S(P)	CP 145	Silex	Bd frg (Tb)	Rs	–	–	–	–	–	–
	CP	S(P)	CP 150	Translucid Silex	Bd frg	–	–	–	–	–	1	36

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	CP	S(P)	CP 258	Silex	Bs	–	–	–	–	12	–	–
	CP	S(P)	CP 219	Silex	Bd frg	–	–	–	–	–	1	36
	CP	S(P)	CP 273	Translucid Silex	St	–	–	–	–	6	–	–
	CP	S(P)	CP 247	Translucid Silex	Bd frg	–	–	–	–	–	1	39
	LG3	S	LG3 2	Basalt	C	Rs	35	18	6	15.5	1.5	49
	JC1	S	JC1 4	Limolite	Bd frg	–	–	–	–	–	–	–
	Ll2	S	LL2 1	Silex	St frg+ Bd frg (Tl)	–	–	–	–	–	–	–
Steppe	AB	TP	AB 260	Limolite	Bd (Tl)	–	–	15	4.5	–	–	–
	AB	TP	AB 255	Silex	Bd (Tl)	–	–	16	4	–	–	–
	AB	TP	AB	Translucent silex	C	Rs	29	14	3	8	1	30
	CCe1	U 2-3	CCe1 77	Silex	AC (Tl)	Rc	27	19	6	13.5	–	–
	CCe1	U 2-3	CCe1 63	Silex	AC (Tl)	–	19	10.5	2.5	4	–	–
	CCe1	U 2-3	CCe1 1	Limolite	AC (Tl)	Rc & Rs	48	27	6	15	–	–

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	CCe1	U 2-3	CCe1 62	Translucent silex	AC (Tl)	Rc & Rs	20	11	2	7	–	–
	PP1	S(P)	PP1 10	Limolite	C	Rc	29	15	3	8	1	30
	CM1	S	CM1 1	Silex	Bd frg	–	–	–	–	–	–	–
	CM2	U 0-2b	CM2 826	Limolite	C	Rs	56.5	30	9	19	1.5	50
	CM2	U 0-2b	CM2 126	Limolite	C (Tb)	Rc & Rs	26	20.5	7	15	–	–
	CM2	U 0-2b	CM2 98	Limolite	AC (1 El and Tb)	Rs	33	–	7	16	–	–
	CM2	U 0-2b	CM2 64	Translucid Silex	St + Bd	–	–	–	–	12	–	–
	CM2	U 0-2b	CM2 234	Andesite	Bs + Bd frg	–	–	–	–	15	–	–
	CM2	U 0-2b	CM2 235	Tuff	Bd frg	–	–	–	–	–	–	–
	CM2	U 0-2b	CM2 102	Limolite	AC (Tl)	Rc & Rs	29	27	6	12	–	–
	CM2	U 0-2b	CM2 797	Limolite	St + Bd frg	Rc & Rs	–	–	–	16	–	–

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	CM2	U 0-2b	CM2 4/101	Tuff	C (Tb)	Rc & Rs	25	19	5.5	14	–	–
	CM2	U 0-2b	CM2 799	Obsidian	Bd frg	–	–	–	–	–	1	39
	CM2	U 0-2b	CM2 384	Rhyolite	C (Tb)	Rc & Rs	22	17	6	14.5	–	–
	CM2	U 0-2b	CM2 124	Tuff	St + Bd	–	–	25.5	6	13.5	–	–
	CM2	U 0-2b	CM2 811	Limolite	Bs + Bd	–	–	32	9	21	–	–
	CM2	U 2c	CM2 367	Silex	Bs + Bd	–	–	21	13	18	–	–
	CN1	S(P)	CN1 29b	Translucent silex	St + Bd	Rs	–	20	7.5	14.5	–	–
	CN1	S(P)	CN1 166	Tuff	C	–	27	22	5	13	n/d	n/d
	CN1	S(P)	CN1 157b	Obsidian	Bd frg	–	–	–	–	–	n/d	n/d
	CN1	S(P)	CN1 27b	Limolite	C	Rs	55	37	9	14	n/d	n/d
	CN1	S(P)	CN1 53	Rhyolite	Bd (Tl)	–	–	–	–	–	–	–

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	CN1	S(P)	CN1 910	Indeterminate	Bd (Tl)	Rc	–	–	–	–	–	–
	CN1	S(P)	CN1 121	Limolite	C	Rs	51	21	6	14	n/d	n/d
	CN1	S(P)	CN1 43	Translucent silex	C	–	26	15	3	6	n/d	n/d
	CN1	S(P)	CN1 257	Silex	AC (1 El)	–	28.5	13.5	4	7	n/d	n/d
	CN1	S(P)	CN1 28	Limolite	C	–	33	18	6	17	n/d	n/d
	CN1	S(P)	CN1 30	Translucent silex	C	–	38.5	22	6	18	n/d	n/d
	CN1	S(P)	CN1 31	Limolite	C	Rs	18	9	3	8	n/d	n/d
	CN1	S(P)	CN1 2	Rhyolite	C	–	31	11	2.5	7	n/d	n/d
	CN1	S(P)	CN1 192	Indeterminate	Bd (Tl)	–	–	–	–	–	–	–
	CN1	S(P)	CN1 113	Limolite	St frg	–	–	–	–	7	–	–
	BB4	S	SUP A2/1	Silex	C	Rs	27	16	5	13	2	48
	BB4	S	SUP 21/15 1	Limolite	Bs	Rs	–	–	–	15	–	–

(continued)

Table 9.2 (continued)

Environment	Site	Analysis unit	Item code	Raw Material	Part	Resharpening/recycled	Length	Width	Thickness	Stem or base width	Tip section	Tip angle (degree)
	BB4	S	SUP 13	Silex	AC (Tl)	Rs	45.5	33	7	18	–	–
	BB5	S	SUP 1	Silex	AC (Tl)	Rs	42	23	7	16.5	–	–
	CCe2	S	U177/1	Translucent silex	AC (1 El)	–	40	23	6	15	1.5	40
	CCe2	S	U177/2	Silex	Bd frg (Tl)	–	–	25	5	–	–	–
	PP11	S	PP11 1	Translucent silex	C	Rs	53	25	8	13.5	1	41
	MB	S	MB 1	Translucent silex	Bs	–	–	–	–	19	–	–
	BT3	S	BT3 37/1	Silex	AC (1 El)	Rs	44	17.5	6	12.5	1.5	38

Note All dimensions in mm
References
Sites: PL: Paredón Lanfré; PA: Población Anticura; RA1: Risco de Azócar 1; LG3: Los Guanacos 3; JC1: Juncal de Calderón 1; Ll2: Lili 2; AB: Angostura Blanca; CCe1: Campo Cerda 1; PP1: Piedra Parada 1; CM1: Campo Moncada 1; CM2: Campo Moncada 2; CN1: Campo Nassif 1; BB4: Barda Blanca 4; BB5: Barda Blanca 5; CCe2: Campo Cerda 2; PP11: Piedra Parada 11; MB: Mallín Blanco; BT3: Bajada del Tigre 3
AC: Almost complete; Bd: Body; Bs: Base; C: Complete; El: Ear lost; Frg: Fragment; n/d: No data; Rc: Recycled; Rs: Resharpened; St: Stem; Tb: Tip blunt; Tl: Tip lost
Analysis Units: HsT: Historical times; S: Single; S(P): Single (Palimpsest); TP: Test Pit; U 0-2b: Unit 0-2b; U2c: Unit 2c; U 2-3: Unit 2-3; U 5: Unit 5

Fig. 9.2 Lithic points from the forest. Body fragments (A, B), stem (C), base (D), recycled point (E), resharpened points (F, G), stemmed points (H, I, J), unstemmed point (K, L)

complete and ten almost complete points (three with one ear lost and seven with tip lost, Table 9.3). As already noted, we had to rule out eight complete points from the CN1 site because of the lack of aerodynamics and penetration data. Also, CM2 384 was not considered as its intense resharpening and reactivation prevented aerodynamics calculations. From the 17 points analyzed, four arrows and seven handheld points were identified (Table 9.3). The six remaining were classified as ambiguous and all of them have body-size relationships modified by resharpening or recycling (Table 9.3). Therefore, due to the model's requirements and both samples characteristics (high fragmentation, re-sharpening, and recycling) we could only assign 11% of the points recovered to the forest and 23% to the steppe. At the forest sites, the three types of weapons are represented in similar proportions while at the steppe handheld points are more frequent than arrows, and spears were not clearly identified.

To partially avoid the effects of fragmentation, resharpening, and recycling, we measured the width of the stem or base in both samples ($N = 58$, 64% of total points). From the forest sites, we tallied 21 complete and fragmented points (48% of the total

Table 9.3 Metric variables and functional assignment of lithic points from forest and steppe contexts

Environment	Site	Analysis unit	Item code	Rc/Rs	Reinforcement surface		AE	Penetration		Hafting	Functional assignment
					MT/W	T		Tip section	Tip angle (degree)		
Forest	Complete										
	PL	S(P)	PL 297	Rs	H	L	N	1.5	50	5	Ambiguous
	PL	S(P)	PL 235	Rc	M	L	NA	1	52	7	Ambiguous
	PA	HsT	PA 908	–	M	L	NA	1	46	6.5	Ambiguous
	PA	HsT	PA 100	Rs	M	L	N	2	59	9	Ambiguous
	PA	HsT	PA 974	Rs	M	M	N	0.5	43	6.5	Arrow
	PA	HsT	PA 25	–	L	L	N	1.5	61	5	Ambiguous
	RA1	S(P)	RA1 166	Rc	H	L	NA	– *	– *	7.5	Ambiguous
	RA1	S(P)	RA1 161	Rs	VH	L	NA	– *	– *	13	Spear
	LG3	S	LG3 2	Rs	L	M	NA	1.5	49	14	Hand-held point
	Almost Complete (tip lost)										
	PA	HsT	PA 29	–	–	L	NA	–	–	7.5	Ambiguous
	RA1	S(P)	RA1 148	–	–	L	N	–	–	8.5	Arrow
	Body										
	PA	HsT	PA 36	–	–	L	NA	1.5	61	–	Spear
Steppe	Complete										
	AB	TP	AB	Rs	M	L	N	1	30	8	Arrow

(continued)

Table 9.3 (continued)

Environment	Site	Analysis unit	Item code	Rc/Rs	Reinforcement surface		AE	Penetration		Hafting	Functional assignment
					MT/W	T		Tip section	Tip angle (degree)		
	PP1	S(P)	PP1 10	Rc	L	M	N	1	30	8	Arrow
	CM2	U 0-2b	CM2 826	Rs	L	M	NA	1.5	50	19	Hand-held point
	CM2	U 0-2b	CM2 126	Rc & Rs	L	M	N	– *	– *	15	Ambiguous
	CM2	U 0-2b	CM2 4/101	Rc & Rs	L	M	NA	– *	– *	14	Hand-held point
	BB4	S	BB4 SUP A2/1	Rs	L	L	P	2	48	13	Ambiguous
	PP11	S	PP11 1	Rs	L	L	NA	1	41	13.5	Ambiguous
	Almost Complete (one ear lost)										
	CM2	U 0-2b	CM2 98	Rs	L	M	NA	– *	– *	16	Hand-held point
	CCe2	S	U177/1	–	L	L	I	1.5	40	15	Hand-held point
	BT3	S	BT3 37/1	Rs	L	L	I	1.5	38	12.5	Ambiguous
	Almost Complete (tip lost)										
	CCe1	U 2-3	CCe1 77	Rc	L	L	N	–	–	13.5	Ambiguous

(continued)

Table 9.3 (continued)

Environment	Site	Analysis unit	Item code	Rc/Rs	Reinforcement surface		AE	Penetration		Hafting	Functional assignment
					MT/W	T		Tip section	Tip angle (degree)		
	CCe1	U 2-3	CCe1 63	–	L	L	N	–	–	4	Arrow
	CCe1	U 2-3	CCe1 1	Rc & Rs	L	M	NA	–	–	15	Hand-held point
	CCe1	U 2-3	CCe1 62	Rc & Rs	L	L	N	–	–	7	Arrow
	CM2	U 0-2b	CM2 102	Rc & Rs	VL	M	N	–	–	12	Ambiguous
	BB4	S	SUP 13	Rs	VL	L	NA	–	–	18	Hand-held point
	BB5	S	SUP 1	Rs	L	L	NA	–	–	16.5	Hand-held point

Note All dimensions in mm
*Tip blunt
References
Rs/Rc: Rc: Recycled; Rs: Resharpened
AE: Aerodynamics. P: Perfect; N: Normal, NP: non-perfect; NA: non-aerodynamic
MT/W: Ratio maximum thickness and width (data source in Table 9.2) in ordinal scale: VH: Very high; H: High; M: Medium; L: Low; VL: Very low
T: Toughness in ordinal scale: L: Low; M: Medium
Sites and Analysis Units Codes from Table 9.2

Fig. 9.3 Lithic points from the steppe. Fragmented points: base + body (A), base (B), stem + body (C), body (D), recycled points (E, G), resharpened points (F, H), unstemmed point (I), stemmed point (J, K, L). In the point L the sinew employed for hafting can be observed

forest sample) recording a minimum value of five mm and a maximum of 16 mm, with a median of 7.5 mm (Table 9.4 and Fig. 9.4). Using the criteria of $\leq$ 10 mm stem or base width for differentiating arrowheads from other weapons, we identified 16 arrows and five points belonging to spears or handheld weapon types. The stem or base width allows the identification of a more considerable proportion of cases (48% vs. 13%) than the functional assignment model and shows arrows' predominance among the points from the forest. Additionally, to explore the width and hafting type association we plotted separately stemmed and unstemmed points (Fig. 9.4). The former (N = 16) have a stem width ranging 5–9 mm, a median of 7 mm, and one

Table 9.4 Descriptive statistics of the points from the forest and steppe contexts

	Forest	Steppe
N	21	37
Min	5	4
Max	16	21
Sum	180.5	490
Mean	8.595238	13.24324
Standard error	0.6819257	0.6930645
Variance	9.765476	17.77252
Standard deviation	3.124976	4.215747
Median	7.5	14
25 percentil	6.5	10
75 percentil	10.5	16
Skewness	1.103165	−0.4739096
Kurtosis	0.2019807	−0.5151156
Geometric mean	8.128661	12.43294
Coefficient of variation	36.35706	31.83319

Note All dimensions in mm

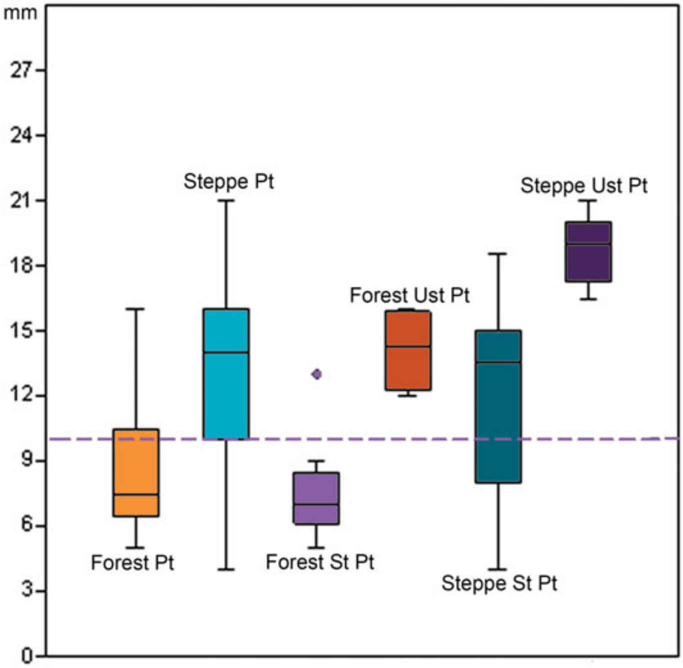

Fig. 9.4 Stem and base width of lithic points. References: Forest Pt and Steppe Pt: total samples from forest and steppe. Forest St Pt and Steppe Ust Pt: forest stemmed and unstemmed points. Steppe St Pt and Steppe Ust Pt: steppe stemmed and unstemmed points

outlier of 13 mm. The four unstemmed points possess bases between 12 and 16 mm, with a median of 14.25 mm (Fig. 9.4). As the Kruskal-Wallis test for equal medians shows, there is a significant difference between sample medians of stemmed and unstemmed forest points (H (χ^2) = 8.306, $p = 0.003778$), so it can be said that they belong to different populations. In the steppe sample, we could measure 37 complete and fragmented points (79% of steppe sample). In this assemblage, the stem or base width ranged between 4 and 21 mm, with a median of 14 mm (Table 9.4 and Fig. 9.4). Twenty nine points are wider than 10 mm, showing that arrows are not so frequent. On the other hand, the stemmed points are more common ($N = 32$) and less wide (4–18.5 mm, median 13.5 mm) than the five unstemmed points recognized (16.5–21 mm, median 18.5 mm). As seen for the forest sample, stemmed and unstemmed points from the steppe belong to two different populations (Kruskal-Wallis test, H (χ^2) = 11.25, $p = 0.0007689$).

9.8.2 Zooarchaeology

At the forest sites, 525 huemul and 17 guanaco bones were recovered, with a minimum number of 14 and two individuals, respectively (Table 9.5). The NISP

Table 9.5 Number of specimens identified (NISP) and minimum number of individuals (MNI) of huemul (*Hippocamelus bisulcus*), guanaco (*Lama guanicoe*), and lesser rhea (*Rhea* sp.) by analyzed unit Sites and Analysis Units Codes from Table 9.2

	Hippocamelus bisulcus		*Lama guanicoe*		*Rhea* sp.	
	NISP	MNI	NISP	MNI	NISP	MNI
Forest						
PL	22	1	–	–	–	–
PA HsT	208	5	–	–	–	–
PA FLH	115	2	1	1	–	–
PA ILH	49	2	–	–	–	–
RA1	20	1	–	–	–	–
CP	111	3	16	1	–	–
Subtotal	525	14	17	2	–	–
Steppe						
CCe1 2-3	–	–	243	4	42	2
CCe1 5	–	–	305	4	9	2
PP1	–	–	273	6	5	1
CM2 0-2b	–	–	167	2	8	1
CM2 2c	–	–	83	3	7	1
CN1	–	–	119	3	7	1
Subtotal	–	–	1190	22	78	8

variability between sites is influenced by bone preservation. The lowest values are observed at sites located on flood plains (PL and RA1), which have more intense geomorphological dynamics than sites situated on valley slopes (PA and CP). Furthermore, on these sites, sedimentation is associated with chronological resolution and bone preservation, as it can be seen from the comparison between CP palimpsest (NISP = 127), and PA's three occupation periods (NISP: 373). In the same way, guanaco bones are recorded in PA FLH and CP while huemul is present in all units studied (Table 9.5). The ungulates' representation is linked to the huemul and guanaco's spatial distribution. Cerro Pintado (CP), located near the forest-steppe ecotone, has evidence of in situ guanaco consumption (Fernández 2010). On the contrary, the only guanaco bone recovered inside the forest—a metapodial distal fragment from PA FLH unit—would have been transported to the site still attached to the skin (Fernández and Carballido Calatayud 2015). The MNI per analysis unit is low, except in PA HsT (Table 9.5). Although this may be explained by poor preservation, no massive accumulations have been identified, even in the units with the best preserved bones. Huemul fawns were recorded in PA HsT (two individuals), PA FLH, and PL units (one individual in each), but the absence of fawn in other units may be due to the preservation conditions already indicated. The bias against the representation of the youngest individuals affected by taphonomic processes was observed in other ungulate study case (González et al. 2012). Diversity of skeletal parts is conditioned by the size of the bone assemblage; hence it does not make sense to evaluate this in NISP <50 assemblages. The bone assemblages >100 huemul specimens (PA HsT, PA FLH, and CP), have elements of the entire skeleton, although the appendicular skeleton predominates (Fig. 9.5). This suggests that animals were brought back to the site relatively whole, and that they were hunted in nearby areas. The cut and percussion marks are related to different stages of the huemul's slaughter sequence, the most important being marrow extraction from long bones. Also, the first steps of the reduction of huemul carcasses took place in CP. In this site, guanaco bones indicate long bones marrow extraction (Carballido Calatayud and Fernández 2013; Fernández and Carballido Calatayud 2015).

At the steppe sites, 1190 guanaco and 78 lesser rhea bones were recovered, with a minimum number of 22 and eight individuals, respectively (Table 9.5). The guanaco's NISP varies less sharply than for the forest sites, probably due to the very similar micro-environment bone deposition at the steppe sites. Based on the bone fusion timings, newborns (up to 12 months) and adults (over 36–48 months) were identified in all assemblages except in CCe1 2-3, with no newborns. This data supports the predation on guanaco family groups. The guanaco skeletal parts in assemblages with NISP >100 (all contexts except CM2 2c) suggest that animals entered relatively complete into the sites (Fig. 9.6), and were hunted in the surroundings. The diversity of skeletal parts (Fig. 9.6), the percentage of specimens with butchering marks (from 20 to 59% NISP, median 38%), the more relative importance of cut marks, and the high amount of intentionally broken bones indicate that the bone assemblages represent the final stage of processing the guanacos' carcasses (Fernández 2008, 2010).

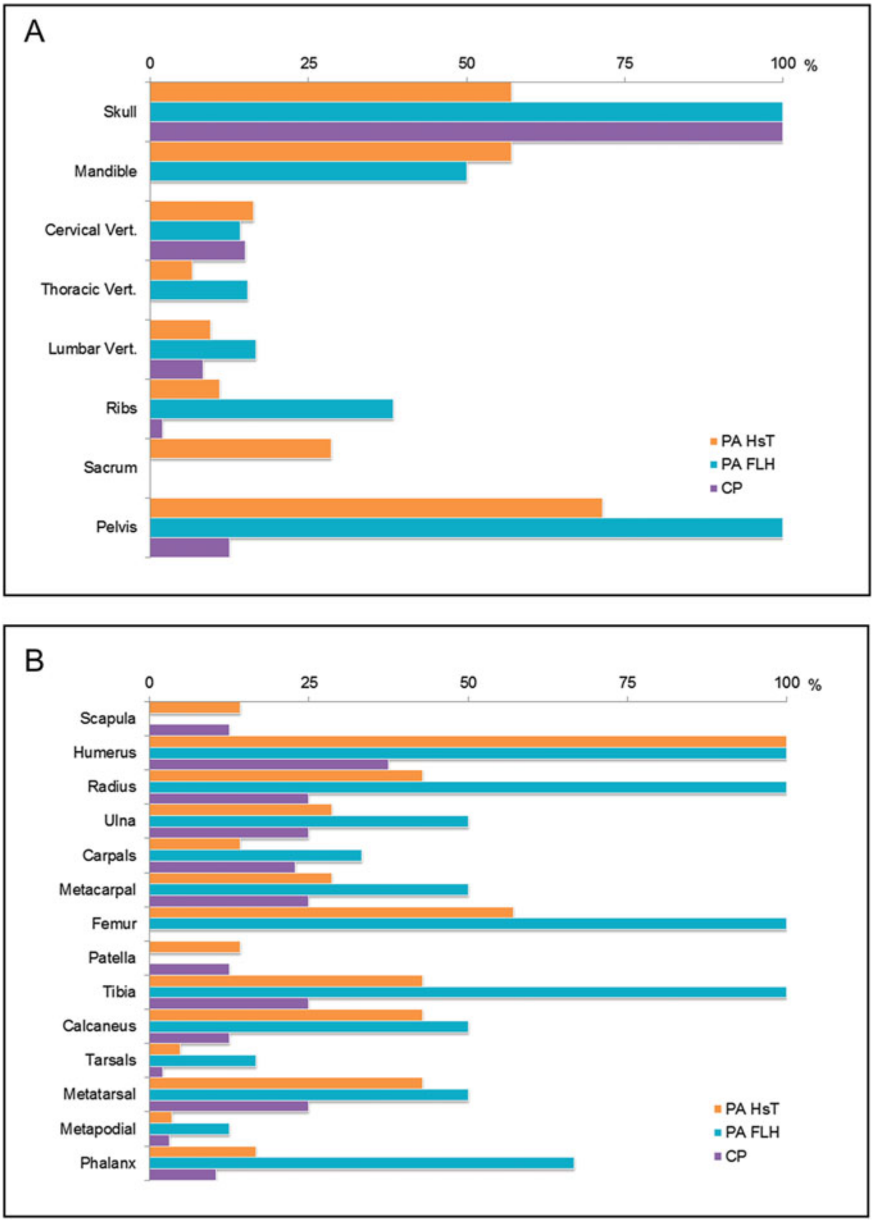

Fig. 9.5 Huemul skeletal part profiles (%MAU). **a** axial, **b** appendicular. Only analysis units with NISP >100 are charted

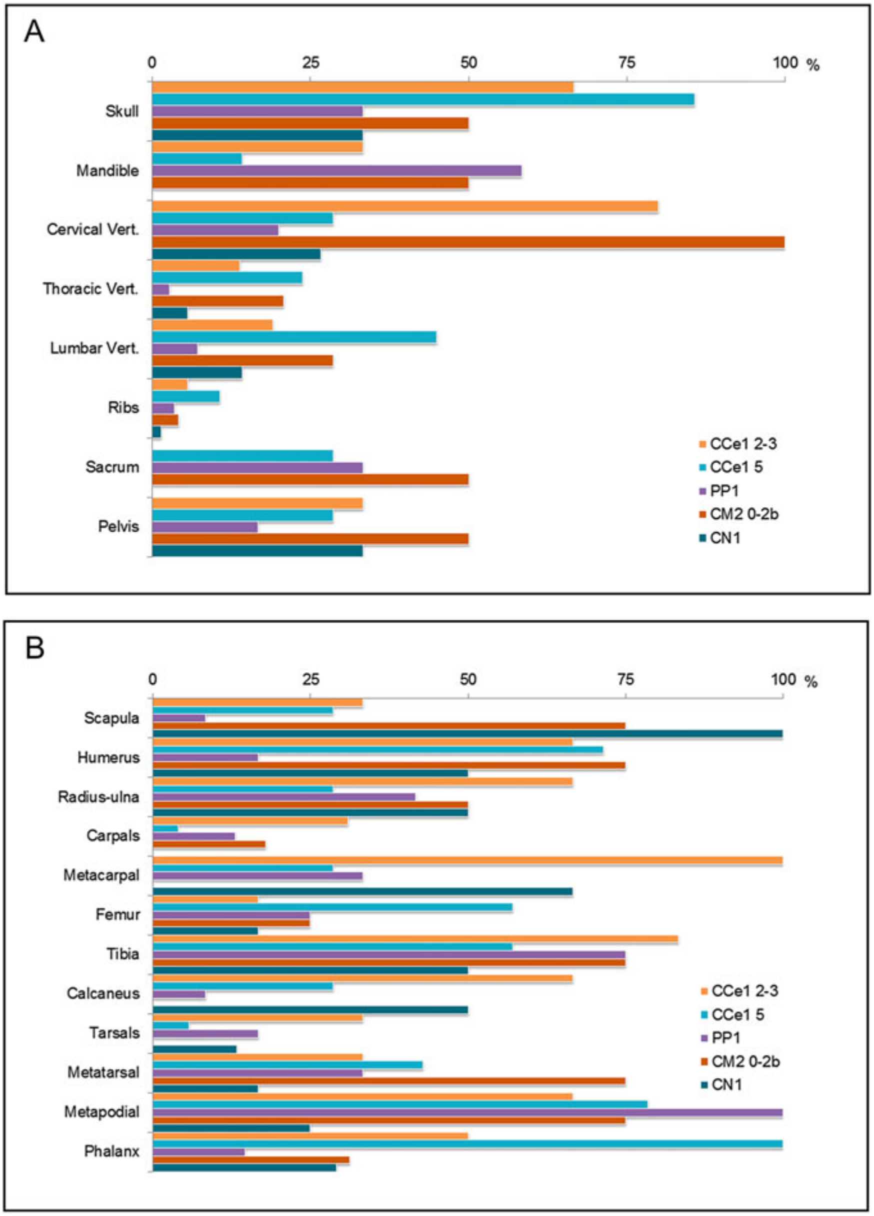

Fig. 9.6 Guanaco skeletal part profiles (%MAU). **a** axial, **b** appendicular

Small amount and low variety of choique elements in Piedra Parada assemblages (Table 9.5 and Fig. 9.7) are common to most contexts from the Patagonia and Pampa regions, and their meaning has been the subject of intense debate (Belardi 1999; Cruz

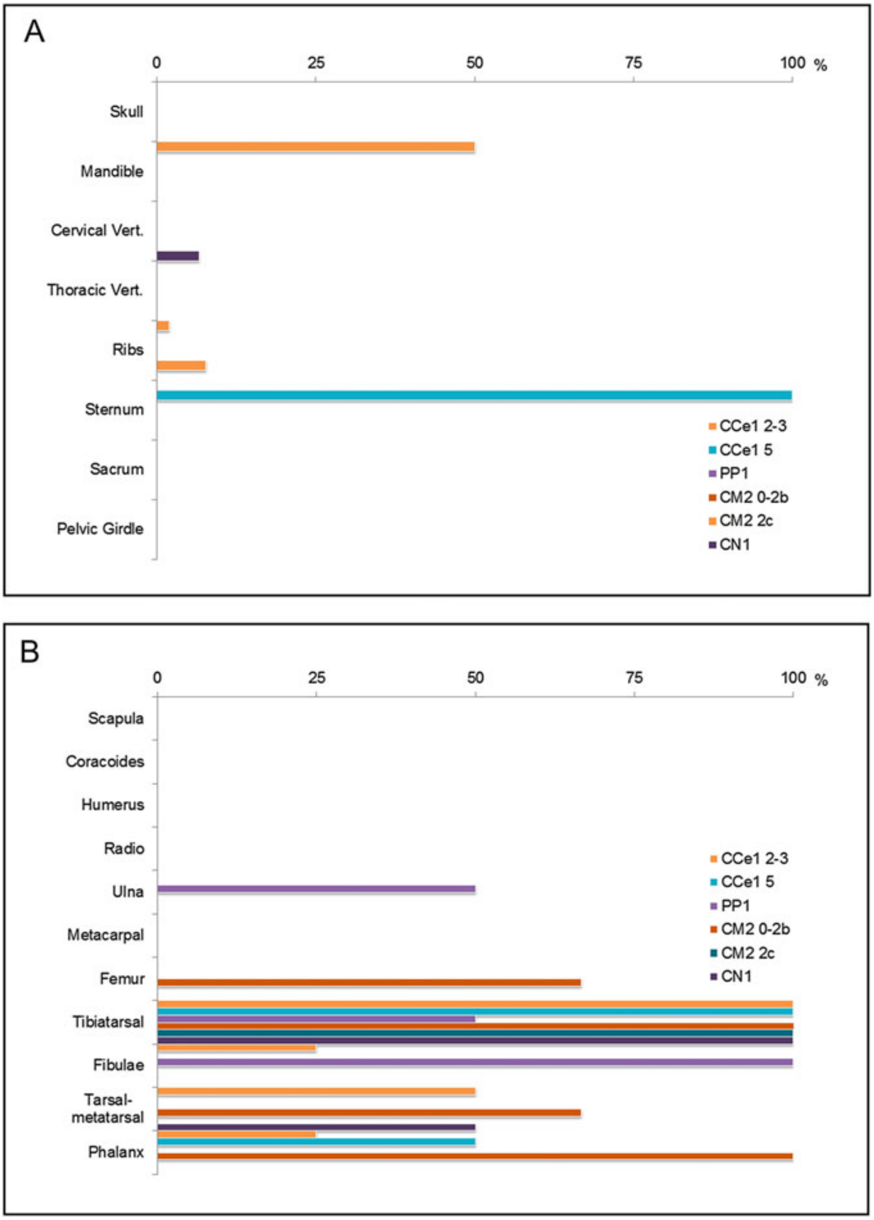

Fig. 9.7 Lesser rhea skeletal part profiles (%MAU). **a** axial, **b** appendicular

and Elkin 2003; Fernández 2000; Fernández et al. 2001; Frontini and Picasso 2010; Miotti and Salemme 1999; Moreno 2018; among others). The scarcity of choique remains was attributed to the difficulties of hunting them before the introduction of the horse (Fernández 2000, 2008, 2010; Giardina 2006). But the almost exclusive representation of the hind limbs has been interpreted as a result of the differential preservation linked to bone mineral density (Cruz and Elkin 2003; Fernández et al. 2001) and its relationship with attritional processes such as carnivore activity and weathering (Belardi 1999; Cruz 1999, 2007, 2015; Cruz and Muñoz 2020). This pattern could also show selective human transport determined by the economic anatomy of these birds (Giardina 2006) as well as by the distribution of non-food products such as leather, feathers, and tendons (Fernández 2008, 2010). Hence, this lack of consensus strongly limits the use of skeletal part profiles as the only source for discussing the selective transport of these birds. In the Piedra Parada case, the combination of skeletal parts and butchering marks informs on the products used, mainly bone marrow and meat, tendons and bones employed as raw material (Fernández 2008). Egg-shell fragments associated with all the bone assemblages were also recovered, indicating their consumption.[6] Finally, only adults are identified except one juvenile element (determined by its size) recovered in the CCe1 5 unit.

9.9 Contrasting the Models

The analysis of the lithic and bone assemblages allows testing our hypothesis regarding the hunting practices carried out in North-Central Patagonia forest and steppe during the last 3500 years. We proposed two general models for guanaco and huemul hunting in the forest, Into the forest and Forest-steppe ecotone. Evidence of guanaco exploitation was only recorded in CP, the forest site closest to the ecotone. It is difficult to interpret the technique used for hunting guanacos due to the small number of bone specimens recovered at CP (NISP = 16, MNI = 1). Both models proposed the capture of guanacos through ambush on trails, or over mixed guanaco groups at open sectors of the forest, or by the encounter of non-territorial groups. Although we cannot establish the technique used for hunting the guanaco, this animal appears to have been exploited opportunistically, in the sense of Jaksić (1989). That is, a species is hunted in the same proportion as it is available over time and space. By contrast to Tierra del Fuego, there is no record of this species inhabiting the forest of continental Patagonia, and currently, guanacos have been observed about 15–20 km from CP, toward the steppe. On the other hand, all the forest archaeological sites provided evidence of huemul exploitation. The skeletal parts profiles showed that animals were brought back relatively whole to the sites, and that huemul was hunted in the nearby area. Even though dense vegetation and its influence on human mobility should encourage selective transport, there was no evidence of that. The low MNI per

[6] In the CCe1 site, one choique egg-shell fragment presents an engraved geometric motif (Bellelli 1994).

assemblage suggest hunters predated on solitary animals and/or small social groups of huemul. There was no data to support the exploitation of large social groups like those that occur during the rutting season. Additionally, the record of fawns suggests the predation over family groups or females with their yearling. Both ‘encounter’ and ‘disadvantage’ hunting techniques, proposed by Into the forest model could have taken place. We consider the first technique, that refers to hunting in which animals are taken as they are encountered (Churchill 1993), as the most probably used. We founded this assumption on the low density and the spatial distribution of huemul, only predictable in a coarse-grained scale. However, the employment of the ‘disadvantage’ technique cannot be discarded, especially at the sites placed near river shores (Paredón Lanfré, Risco de Azócar 1, and Cerro Pintado).

Following the functional assignment model, the presence of arrowheads, spear-heads, and handheld points was identified in fairly similar proportions. However, as we have already pointed out, the requirements of the model limit its application to samples with significant fragmentation, resharpening, and reactivation, such as those discussed here. The study of the stem/base width confirmed the presence of these types but indicated the arrows’ predominance and that only 24% of the stems/bases were spears or perhaps handheld points. The dominance of the bow and arrow for hunting in the forest can be explained by the advantages it offers (Bergman et al. 1988; Tomka 2013). It allows a greater effective range, increases stealth by avoiding or delaying prey alert (Cattelain 1997; Hames 1979; Hughes 1998), and allows for more shooting positions and requires less space to be operated (Bergman et al. 1988; Yu 2006). Bows and arrows also allow for several shots in a brief period of time (Hughes 1998; Shott 1993) with projectiles that are easily transported (Bergman et al. 1988; Greaves 1997; Hughes 1998) and are convenient for search situations that can be prolonged due to the dispersal of the prey (Churchill 1993).

In the steppe, zooarchaeological information suggests the concurrent exploitation of guanacos and choiques in the same place. In the Piedra Parada area, herbivore’s food resources are concentrated in the *mallines*, the most likely locations for hunting territorial guanaco family groups by approaching. The guanaco age classes support these social groups’ predation, and the anatomical data shows the absence of selective transport. The latter suggests that guanacos were hunted in the nearby vicinity of the rock-shelters. Indeed, *mallines* and temporary lagoons are located between the Chubut River and the slopes where the studied archaeological sites can be found. These wetlands are also the habitat of the choiques, also captured by approach hunting techniques. The remains of this flightless bird are present in all bone assemblages, indicating that they were repeatedly selected as prey. This hunting technique could also have been used to capture hatching males, a hypothesis partially founded on the eggshells recorded in all archaeological sites. Nevertheless, the low abundance of choique is probably showing the challenge of its pedestrian capture.

The ‘approach’ hunting technique, as well the other techniques proposed by the Steppe hunting model, involves the use of throwing weapons, such as spears and bows and arrows to hunt guanacos and choiques.[7] The functional assignment model applied allowed us to recognize four arrows and seven handheld points. The absence of spears, whose use has been widely recorded in the steppe environment of Patagonia, is noteworthy (Banegas et al. 2014; Cardillo and Alberti 2015; González-José and Charlin 2012; Lynch et al. 2020; Ratto 1994; among others). It is possible that throwing weapons are masked among the handheld points due to resharpening and recycling. All but one of these points have modified body proportions, a key trait discriminating them from spears. Furthermore, handheld weapons have been recorded in other steppe archaeological contexts, but they never represent the most abundant type (Banegas et al. 2014; González-José and Charlin 2012; Ratto 1994). Consequently, in this case we believe their frequency is overestimated. Beyond its frequency, the presence of a handheld point with unmodified body size indicates the use of a hunting technique with a thrusting weapon. Just as functional assignment results showed, the stem/base width data establishes the prevalence of spears and/or handheld weapons (78%) over arrows.

9.10 Hunting Techniques Comparison

Our assessment of the proposed hunting models indicates that the main prey were the huemul and guanaco, the only medium to large sized ungulates available in the interior of continental Patagonia. These animals, as well as the choique, were captured in hunting events where few individuals were obtained nearby the archaeological sites. In both the forest and the steppe, the main weapons employed were the bow and arrow, and the spear. The most important determinants in the selection of prey and methods of capture were the animals' spatial distribution and abundance. In the forest, hunting was focused on huemul small social groups, and in the steppe, it was centered on guanaco family groups. We consider that in the forest, the most likely used hunting technique was 'encounter' (huemul) while the 'approach' technique (guanaco and choique) was the most utilized in the steppe.

As in other regions of Patagonia, in both environments we observed the coexistence of diverse types of weapons (Banegas et al. 2014; Cardillo and Alberti 2015; González-José and Charlin 2012; Lynch et al. 2020; Ratto 1994). However, we detected a significant difference in the relative frequency of arrows—determined by the width of the stem—in each environment: in the forest, they represent 76% of the sample assemblage and in the steppe, 22%. We previously pointed out the advantages of the bow and arrow. We think these benefits are more significant in the forest, where the weapons used for hunting must compensate for the scarcity/dispersion of prey and the density of vegetation. Indeed, the forest cover adversely impacts traffic, prey sighting and the hunter's stealth. Thus, bow and arrow technology allowed more efficient hunting in places where other weapon systems had limited performance. At

[7] As we pointed out, *bolas* were recovered in the area and could have been used for hunting on foot or horseback.

this point, we can question if the widespread employment of the bow and arrow made it possible to occupy the forest of North-Central Patagonia in an assiduous and/or more permanent way. In the study area, we observed a convergence in the chronology of arrowheads (the last 1800 years BP, Table 9.1) and this pattern of forest use. It is not possible to determine whether the variation in weapons accompanied the change in forest usage by human groups over time because of the absence of lithic points in the only earlier context analyzed (PA ILH, Table 9.1).

In the Piedra Parada area, arrowheads are not only less frequent but come from two contexts dated to the final late Holocene[8] (CCe1 2-3 and CN1, 580–480 years BP, Table 9.1). In the steppe, the reasons we invoked to explain the predominance of arrows in the forest are less significant. The guanaco is more abundant and predictable than the huemul, and the steppe vegetation does not limit the use of different weapon systems. Likewise, the use of spears precedes the adoption of the bow and arrow. When the latter appeared, they were employed alongside preexisting weapon systems, but the arrowhead points never exceeded one-third of the point assemblages (Banegas et al. 2014; Cardillo and Alberti 2015; González-José and Charlin 2012; Lynch et al. 2020; Ratto 1994). This suggests the bow and arrow did not represent a substantial advantage over the weapon systems in use.

Besides, the study of the hafting section dimensions revealed that the forest points are smaller than the steppe ones (Fig. 9.4). In the case of the stemmed points, we attributed the difference to the prevalent use of bow and arrow in the forest (Kruskal-Wallis test, H $(\chi^2) = 14.48, p = 0.0001354$). However, differences between unstemmed points from each environment cannot be attributed to the propulsion system (Kruskal-Wallis test, H $(\chi^2) = 6$, $p = 0.0139$). All the bases are larger than 10 mm, and therefore assignable to spears or handheld weapons. Consequently, the difference in size between forest and steppe unstemmed points could be due to variations in the availability of raw materials, the use of different hunting techniques, or the influence of cultural decisions, or all these combined.

9.11 Final Words

Here, we proposed to deepen our knowledge of the human use of forest and steppe of North-Central Patagonia in the last 3500 years. The comparative study of hunting techniques, allowed us to recreate how hunter-gatherers combined technology and social practices to obtain their main staples in each environment. The modeling of three hunting scenarios provided us with the opportunity to assess constraints on hunting practices, like topography, vegetation cover and faunal resources structure. It also allowed us to understand the decisions taken regarding these conditions. For example, hunting with bows and arrows to ensure ungulate supply would have been a

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[8] Another arrowhead comes from the AB archaeological site, dated between 2900 and 450 years BP (Table 9.1). This point is not attributed to a provenance level precluding its precise chronological assignment.

key decision to enable longer and more recurrent stays in the forest. Conversely, the bow and arrow did not seem to represent an advantage for the exploitation of steppe resources. There, guanacos and choiques were already being hunted with weapons whose efficiency had been established long ago. Another distinctive element is the narrower width of the hafting section in the forest points. In the stemmed points, this would be an effect of the most widely used weapon system in the forest. However, this reason cannot be invoked in the case of the unstemmed points. This characteristic, along with the hunting practices and the local rock art style, represents distinctive features of the forest inhabitants of the study area during the final Late Holocene. We are aware that new evidence could broaden our knowledge on these societies. The ongoing research programs in both study areas will improve this picture, especially in the steppe, with the addition of the bolas to widen our understanding of hunting technique. Equally, more extensive research in higher altitude sectors could provide information about techniques currently still unrecorded, like the use of blinds or the development of massive hunting events.

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