Archaeology and human interaction between coastal and inland settings: the Pampean Atlantic coast, Argentina

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Abstract

The results of our archaeological research on the coast of the eastern Pampas (Argentina) related to Middle-Late Holocene hunter-gatherers are presented in this paper. Many authors have put forth two alternative hypotheses to explain coastal occupations. Some of them maintained that littoral and inland archaeological records were produced by the same human societies. Other authors have proposed the existence of coastal cultural groups. The aim of this paper is to discuss the aforementioned hypotheses with a model of space use on the coast. Using evidence from surface and stratified sites, as well as from museum collections, it is proposed that the Pampean marine coast was used by the same inland populations.

1 Introduction

The relationship between coastal and inland archaeological sites is a frequent problem in different parts of the world. For example, this subject is a focus of interest linked with the hunter-gatherers of Patagonia (Borrero 1985; Gómez Otero et al 1998; Miotti 1998), the *cerritos* mound builders of Uruguay (López Mazz & Iriarte Mujica 2000), the pre-ceramic groups of northern Chile (Nuñez 1975), the Fort Walton culture of northwest Florida (White 1999), the Mesolithic of southern Norway (Bang-Andersen 1996), the Neolithic of east Africa (Chami & Kwekason 2003) and the Lapita contexts of the Vanua Levu island in Fiji (Parke 2000). These studies emphasise the analysis of land use, frequently including settlement pattern and site functionality, in connection with resource availability in different ecological zones and seasons. The distribution of coastal lithic raw materials and marine fauna in inland contexts, or vice versa (inland materials and animals at littoral sites), is commonly used to illustrate the interaction between cultural groups from both environments. Furthermore, the similarities in material culture (eg, lithic tools and pottery decorative elements) and human skeletal remains are frequently used to support close relations between coastal and inland societies. With this current paper, we wish to contribute to this general discussion with a case study from the Pampean Atlantic coast of Argentina.

Archaeological interest on the Pampean coast began with Florentino Ameghino's work at the end of the nineteenth and the early twentieth centuries (Ameghino 1889, 1910). The first archaeological studies in littoral zones ignited a heated debate about past human occupation in both the Tertiary period or in modern times (see discussion in Bonomo 2002 and Daino 1979). However, following this period, research was discontinuous and unsystematic. For this reason, the coastal archaeological record plays a secondary role in current regional models (Barrientos 1997; Berón 2004; Crivelli Montero et al 1997; González de Bonaveri 2002; Martínez 1999; Politis 1984; Politis & Madrid 2001) based on the abundant archaeological evidence coming from the plains and the mountain ranges of the Pampean interior. Due to this situation, since 1999 we have investigated coastal environments in the eastern Pampas related to Middle-Late Holocene hunter-gatherers. The results of our research are presented in the following pages.

During the twentieth century, many authors observed the high percentage of local rounded cobbles

reduced by bipolar technique on the Pampean coast and noted a clear contrast with inland settings, where quartzite artefacts made by direct percussion were abundant. The distinction between these two lithic technologies from both ecological zones can be outlined by two main hypotheses. Some researchers have proposed that littoral and inland archaeological records were produced by the same human societies that periodically occupied the coast and utilised local raw materials (de Aparicio 1932; Holmes 1912; Hrdlicka 1912; Outes 1909; Politis 1984). Other authors claim the existence of specific cultural groups living on the coast who primarily exploited marine resources, specifically shellfish, who were separate from the groups inhabiting those sites located inland (Ameghino 1910; Bórmida 1969; Conlazo 1983; Menghín 1963; Vignati 1925). The aim of this paper is to discuss these aforementioned hypotheses in an updated context and propose a model supported by new and relevant data.

This article is divided into three main sections. In the first section we briefly characterise the key environmental elements and the main resources available on the coast. This provides the necessary background for the analysis of human links with the surrounding landscape. In the second section we present a discussion of human use of coastal environments by focusing primarily on lithic materials. Data is presented from surface and buried sites (n=13) detected during systematic survey, as well as material from some museum collections (n=28). In the final section, the results obtained from the Pampean coast are articulated on a broader spatial scale, integrating information generated by other authors from different inland areas of the Pampean Region. An evaluation of territoriality and mobility between coastal and interior contexts is presented through the analysis of the distribution of lithic raw materials.

2 The coastal environment

Located between the Tandilia and Ventania mountain ranges, this study region spans more than 290 km along the Atlantic coast of the Pampean plains and is delimited by the rocky zone of Cabo Corrientes and the mouth of the Quequén Salado River (figure 1). This coastal zone is an heterogeneous environment, since two principal landforms divide the area. The region between Cabo Corrientes and Punta Hermengo consists of a raised coast that is cut with ravines attributed to coastal erosion. From this zone to the Quequén Salado River there is a lower coast with extensive sand accumulation that formed a continuous barrier of dunes. The barrier formed as a consequence of the Middle Holocene global sea-level transgression at 6000 years BP, when extended beaches became exposed and sand availability increased significantly (Isla et al 2001). This dune barrier is up to 3.5 km wide in some localities and is separated into three longitudinal landforms parallel to the shore (Frenguelli 1931). As we illustrate in this paper, human groups could have utilised each of them in different ways in the past. The first zone is classified as a moving dune line with scarce vegetation, which continuously changes its form due to eolian activity. The next zone towards the hinterland consists of semi-fixed dune fields with moderate vegetation. The third zone is composed of a larger region of fixed sandy sediments, which is more stable and heavily vegetated than the middle zone.

In general, resources found on the coast contrast significantly with those of the Pampean plains. For example, the former include lithic resources such as abundant rounded beach-deposited cobbles and pebbles (basalt, andesite, rhyolite, dacite, chert, etc) and various mammals such as seals (*Arctocephalus australis*) and sea lions (*Otaria flavescens*). In addition, shells from marine shellfish were used as containers and for making personal ornaments. Biological information and archaeological contexts of these shellfish do not seem to indicate a clear relation between these molluscs and subsistence (Bonomo 2004). Within the dunal zone, there are terrestrial fauna such as the *tuco-tuco* rodent (*Ctenomys australis*) and the *ñandú* flightless bird (*Rhea americana*). In addition, it is likely that the *guanaco* camelid (*Lama guanicoe*) was also present in the past. It is important to take into account the fact that *Rhea americana* makes its nest on the fixed and semi-fixed dune zone in spring time. Apart from this, in the interior Tandilia Mountain Range there are distinctive localised sources of quartzite and chalcedony (ftanita) (Bayón et al 1999; Messineo 2001) found more than 80 km from the coast under study. Human groups that formed the coastal archaeological record also utilised these hinterland lithic resources.

3 Space use in the Pampean coast

In order to discuss the relationship between past coastal and inland human occupations, it is first necessary to analyse how such groups used the coast. According to our research, we observed tendencies that connect the

dune barrier archaeological contexts with those sites of the adjacent plains. The three different environments (beach, dune, and plains) clearly offered a diversity of natural resources to past human populations. In addition to the distinctions in fauna, flora, and distribution of lithic raw materials, these settings also show distinctive archaeological patterns.

It is important to stress that hunter-gatherers could have discarded some materials on the beach due to activities such as obtaining the coastal cobbles widely spread out on the surface or hunting marine mammals. Such hunting practices have been reported in Post-Hispanic Jesuit documents (Sanchez Labrador [1772] 1936) and have been exhibited in the faunal record of some surface dune sites (Conlazo 1983; de Aparicio 1932; Frenguelli 1920; Hrdlicka 1912; Torres & Ameghino 1913). For example, at Monte Hermoso which is directly adjacent to the study area, the La Olla 1 stratified site contains exceptional evidence that indicates the processing of a great quantities of otariids (MNI=41), including butchery and hide preparation with bone tools made from these sea mammals (Johnson et al 2000). However, remains abandoned in this high energy marine environment would have been destroyed

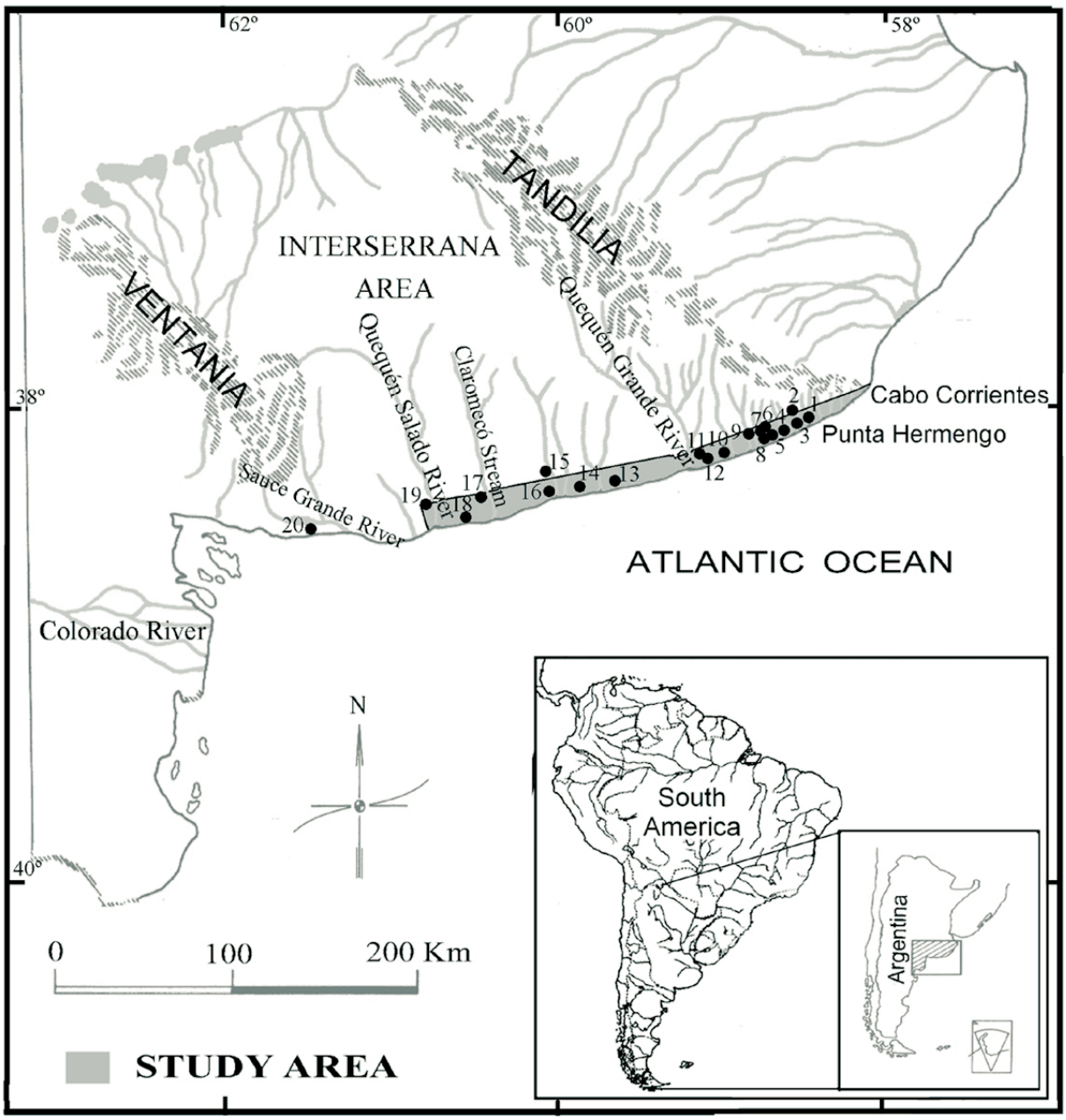

Figure 1 Study area with the archaeological sites and collections mentioned in the text. 1: Mar del Sur (MDS) archaeological site; 2: La Ballenera Lagoon and Stream collections; 3: La Ballenera collection; 4: La Tigra collection; 5: La Eufemia (LEU) site; 6: Bellamar 1(Be1) site; 7: Bellamar 2 (Be2) site; 8: Bellamar 3 (Be3) site; 9: Nutria Mansa Locality [NM1, NM1(sup) and NM2(sup) sites]; 10: Moromar (Mo) site; 11: Arenas Verdes 1 (AV1) site; 12: Arenas Verdes 3 (AV3) site; 13: Estancia Los Médanos collection; 14: Faro Guaraní (FG) site; 15: El Guanaco site; 16: Cristiano Muerto collection; 17: Claromecó collections; 18: Caracolero (Car) site; 19: Cueva del Tigre site; 20: La Olla 1 site

as a result of a low burying probability. This intrinsic characteristic of the beach record limits the analysis of the coastal human occupations. Thus, the study presented here probably represents only a fraction of the ecological zones where Pampean foragers used and discarded their material culture.

Surface sites widely extended across the dune line contain mostly lithic material and are located in blow-out depressions overlying sediments consolidated by calcium carbonate. Artefact visibility and collection had been facilitated, among other reasons, by the continuous exposure of high densities of archaeological material over the ground surface. Many tens of thousands of artefacts have been collected from the coastal dunes by previous researchers and by amateur selective recovery. Many of them constitute important museum or private collections (97 collections have been recorded). Even so, during our survey on the dune barrier we detected lithic materials in 70% of the 61 sample units that were carried out.

Before analysing the dune record, it is necessary to discuss its chronology, even though the absence of stratified sites and consequent lack of organic remains make this a difficult task. Politis (1984) attributed these coastal surface contexts to the Late Holocene, based on the findings of diagnostic artefacts, such as small triangular projectile points and pottery, as well as on its close relation with the present shoreline. However, recent geological and paleoenvironmental studies (Aguirre & Whatley 1995; Isla 1995; Weiler 1994) indicate that the altitude of the sea-level stabilised between 6000–5000 years BP, following the Middle Holocene Marine Transgression. It was at that moment that formation of the dune barrier began. This evidence implies that some of littoral archaeological sites could correspond to the Middle Holocene following this global sea-level transgression. Therefore, it is possible to suggest that these coastal spaces were not available for human populations before Middle Holocene times.

Sites on the moving dune zone are related to workshop activities, consisting of an abundance of cores and flakes produced by bipolar reduction of rounded cobbles. Sites MDS, Mo, AV3, LEU, Be1, Be2, Be3, FG and Car are examples of these coastal workshops (see table 1). Unifacial flake tools with minor retouch confined to the edges, anvils, hammers, and nodules of these coastal raw materials were also recorded, as well as a few tools and flakes manufactured from quartzite and chalcedony. According to our analyses, places located within the dune line sector were used for conducting specific tasks. More specifically, such activities included the reduction of local cobbles to produce tools with minimal modification as an expedient technological strategy (*sensu* Binford 1979). In addition, the cultural groups could also have exploited marine fauna and terrestrial animals that inhabited this arid ecological zone. However except for *ñandu* eggshells, faunal remains have not been recovered during our investigations in this dune zone. The abundance of *ñandú* eggshells found in some of these contexts suggests that some of them were occupied in spring time.

Moving more than 800 metres inland, we noted a progressive increase in the use of lithic resources transported from the mountain ranges. The type of raw material used is variable in different zones of the dune line. There is a pronounced contrast in raw materials used and in lithic tools discarded in some sectors such as at the AV1 and AV3 sites (table 1) located in the same sample unit. Beach cobbles predominate in workshops, such as AV3, which is located near the beach. In addition, there is a very low proportion of

Site	Flake Tools		Hammer/anvil		Cores		Flakes		Total
	C	I	C	I	C	I	C	I	
MDS	8	1	0	0	62	0	141	13	225
Mo	3	0	1	0	212	0	72	7	295
AV1	1	12	0	0	10	1	16	55	95
AV3	0	0	1	0	48	0	461	0	510
LEU	4	0	0	0	21	0	112	38	175
Be1	5	4	1	1	77	0	1018	26	1132
Be2	4	1	2	1	14	0	50	2	74
Be3	4	14	7	1	366	0	669	164	1225
FG	2	0	0	0	43	0	75	2	122
Car	0	1	0	0	4	0	80	17	102
Total	31	33	12	3	857	1	2694	324	3955

Table 1 Lithic artefacts classified by their coastal or inland raw material provenience. C=coastal raw materials and I=inland raw materials

tools as compared to the quantity of flakes and cores recorded at these sites. In contrast to the rest of the workshop sites, sites from the interior of the dune barrier (eg, AV1) are dominated by quartzite originating from the Tandilia Mountain Range and tools are found much more abundantly than cores. In addition, the prevalence of raw material from distant locations indicates that alternative activities aside from tool-making were carried out (see discussion of related topics in Carr 1994; Henry 1989). For example, such sites may have been temporary camps.

Very few of the coastal sites were linked with multiple activities. In general, grinding stones and pottery are scarce in the dune line record. However, we recorded some collections that had an abundance of inland raw materials as well as a few mortars, mills, hand stones and ceramics. These sites are located mainly in the internal dune zone consolidated by herbaceous vegetation (see similar observations in Politis 1984: 310). Mortars and mills are heavy tools with long use life, little transportability, and are frequently re-used by subsequent occupations of the same site (Adams 1999; Camilli 1989; Wright 1994). The predominance of distant raw materials and the presence of materials related to domestic tasks in the interior semi-fixed and fixed dunes suggest more generalised activities at these places than in the sites located in the moving dune zone. Examples of such site types were found in the collections recovered from the banks of the creeks of Cristiano Muerto (MLP- Museo de La Plata collection), La Ballenera (MLP) and in the Estancia Los Médanos (Bosch collection), where multiple activities took place during occupation in the Late Holocene (see table 2). Another example comes from the archaeological assemblages with grinding stones and pottery from the inferior course of Sauce Grande River reported by Austral (1965).

The archaeological record of the Pampean plains contrasts with this coastal evidence for several reasons. In the adjacent plains, there are extensive sites with large lithic assemblages, mainly composed of quartzite artefacts. Moreover, tools with retouch are also prevalent and in greater quantities than cores. In addition, edge retouched tools display an important diversity. The shortage of grinding tools (n=16) observed in collections and sites from the dunes is in contrast to the great number (n=137) found at places in the plains near the coast (figure 2). Furthermore, large quartzite cores (n=16; 5900 g maximum weight) with an important potential for reduction were found in the plains (figure 3) and were absent in the dune line where there were few quartzite cores (n=4), which were small and generally exhausted. This diversity of

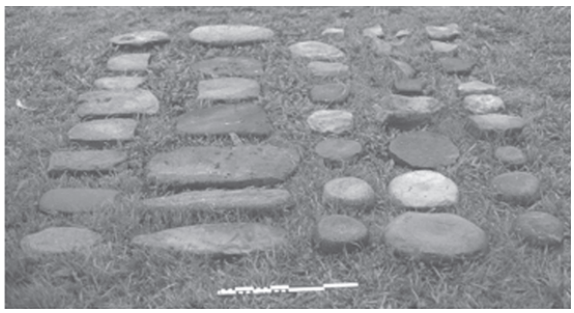

Figure 2 Mortars and millstones from the plains near the coast. The scale is 40 cm

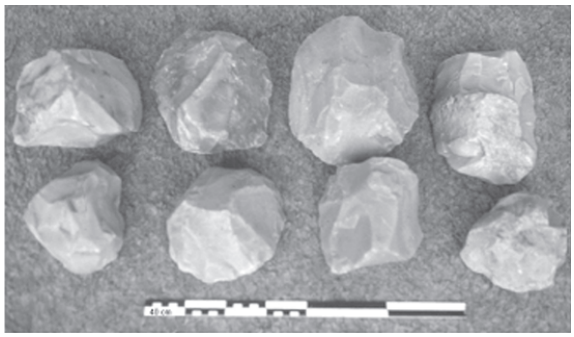

Figure 3 Large quartzite cores from the plains near the coast (surroundings of Nutria Mansa Stream). The scale is 40 cm

Assemblages	Coastal raw materials	Inland raw materials	Grinding stones	Pottery	Large quartzite cores
Internal dune line					
La Ballenera collection	5	21	2	52	0
Estancia Los Médanos collection	-	-	3	16	0
Cristiano Muerto collection	22	135	4	166	0
Plains near the coast					
La Ballenera Lagoon and Stream collections	-	-	25	0	1
NM1 site	180	1418	6	0	0
NM1(sup) site	37	86	6	0	4
NM2(sup) site	107	760	17	3	4
Claromecó collections	-	-	54	465	3

Table 2 Artefact assemblages found in the internal dune line and in the plains near the coast

artefacts, added to the greater proportion of transported raw materials (from distances between 100 and 160 km), suggests that these were multiple activity sites and potentially residential camps. In the few sites where faunal remains were preserved, *Lama guanicoe* is the predominant resource. Marine resources such as mollusc shells, white shark teeth and otariid bones were also recovered although in very low frequencies. Part of this lithic and faunal evidence has been recorded in different lower stream courses. Examples include: La Ballenera (Estancia La Ballenera Chica, Estancia El Caracol and Calderana collections), Nutria Mansa (sites of the Nutria Mansa Locality and Mina and Ibargoyen collections) and Claromecó (Bancur, Massigoge and Museo Aníbal Paz collections) (table 2). The Cueva del Tigre surface site on the Quequén Salado River (Madrid et al 2002) and the El Guanaco surface site on the Cristiano Muerto stream (Flegenheimer et al 2000) could also be classified as sites of this type.

The differences between the activities carried out in the dune line and in the adjacent plains bring together other distinctions, such as the duration and frequency of the occupations. This is associated with the alternative strategies used for lithic material procurement (Kuhn 1995). With regard to these strategies, the procedures exhibited in the workshop sites from the dune line are different compared with those of the camps on the adjacent plains. Small tools with an important degree of modification, some exhausted cores, large unifacial and bifacial preforms and debris made of inland raw materials constituted part of the artefacts recovered on the workshop sites. Such artefacts are scarce, have short dimensions and no cortex. The advanced state of reduction shown by these materials allows us to infer that the development of activities linked with the preparation, use and maintenance of tools within a curate technological strategy (*sensu* Binford 1979) took place there. Within this strategy, tools were manufactured in anticipation of use in places located outside the dune line.

A strategy of having a lithic toolkit prepared prior to its use consists in the provisioning of individuals with toolkits made up of a limited number of elements (Kuhn 1995). This strategy produces a low number of by-products. In this way, it is predictable that non-local raw materials may appear in the shape of tools and very few artefacts without retouch (ie cores, blanks and debitage). The toolkits were generally composed of multifunctional, flexible, versatile and maintainable tools, and also elements for their manufacture (flakes or some cores already reduced and hammerstones). These tools should display resharpening and reactivation traces (Kuhn 1995; Nelson 1991).

In summary, quartzite artefacts of dune workshops reflected the material remains of a strategy of provisioning individuals (*sensu* Kuhn 1995). Double convergent side-scrapers of quartzite with extended edges, more elaborated designs and more advanced states of reduction than other tools were found on surface sites. Functional microwear studies (Landini et al 2000) indicate that side-scrapers from different Pampean sites are multifunctional tools, utilised for a wide range of activities like cutting and scraping different types of materials. The large preforms recovered on the coast are easily transportable objects that can be modified for their use. The finding of these preforms and little exhausted cores implies that at least some elements for tool manufacturing were transported to the coast. This, along with the multifunctional side-scrapers manufactured in quartzite and the low frequency of debitage of this rock, would indicate that some of the quartzite artefacts discarded on the coast were part of individual toolkits (see Kuhn 1995; Nelson 1991). Part of the quartzite tools were totally elaborated outside the dune line or transported to the coast with an advanced state of sharpening, whereas in the littoral zone they were maintained or repaired according to requirements at specific times.

On the other hand, behind the dune line a strategy of provisioning of places was followed (*sensu* Kuhn 1995). As seen in the lower segments of some streams such as La Ballenera, Nutria Mansa and Claromecó (table 2), numerous materials were manufactured by pecking, polishing and/or abrasion (eg, milling stones). The presence of these items, added to the large quartzite cores, shows the transport of substantial volumes of previously prepared rocks coming from inland (principally from the Tandilia Mountain Range). These quartzite cores with minimal modification were arranged in places where this rock is not locally available, providing the site raw material for future use, as it was identified for the middle course of the Quequén Grande River by Martínez (1999; Martínez & Mackie 2003/4). Thus, these heavy milling stones and quartzite flake cores can be considered site furniture that is generally not transported once a site is abandoned. The cores would accumulate in certain sectors of the landscape that were regularly used by the occupants

of the sites, forming secondary and anthropic raw material deposits (Binford 1979; Martínez 1999; Nelson 1991; Webb 1993).

With regard to occupation time, some distinctions between the different environments are observed. In comparison with the dune zone next to the shore, in the internal part of the dune line, there were some temporal or residential camps that indicate longer occupations than in the workshop sites. In the case of camps located in the plains near the coast, in addition to longer periods of occupation, the evidence (larger assemblages, large quartzite cores and millstones) indicates a greater occupational redundancy with respect to the sites on the dune line. However, some limited and more temporary activities occurred in the moving dune zone next to the beach. In these sites, locally available rocks were not intensively exploited. The variability in dune location indicates that reoccupation at such sites was not frequent throughout the annual cycles. These materials could be associated with short episodes of isolated occupations or with the aggregation of different workshops in the long term (see Camilli 1989).

This summary characterises the archaeological record found on the moving dune zone, internal fixed dunes, and plains. It has been our aim to demonstrate that the differences between the accumulated materials through time in different environments indicate recurrent forms of interaction between human populations and certain sectors of the landscape. According to the topographic location of sites, variations in rock use, as well as in the amount and diversity of discarded artefacts can be recognised. This indicates the development of variable activities during occupations with different duration, which brought together different strategies for supplying lithic materials. These spatial tendencies in the archaeological record of this study area can be outlined as in figure 4.

As has been illustrated, few archaeological sites associated with the tasks developed in base camps have been detected in the dune line. This is an aspect of vital importance for the discussion of the relationship between the Pampean Atlantic coast and the inland. It indicates that the annual circuit of residential movements of hunter-gatherers that produced coastal sites did not frequently include the littoral dunes. The fact that most of the contexts found on the dune line are sites of limited activities does not support the hypothesis of populations permanently settled in the coastal environment with a subsistence based on the intensive utilisation of marine shellfish. In addition, other elements contradict this idea, as will be discussed next.

4 Coast-inland relation

The distribution of coastal products, such as rounded cobbles and marine shellfish, is not limited to the coast. These elements obtained in the marine littoral are frequently found in interior sites from different Pampean areas from the Late Pleistocene to the Late Holocene. This geographic and temporal distribution shows that these elements circulated widely around the Pampean landscape, demonstrating important ties between the Atlantic shore and the inland. In addition, the presence of inland lithic raw material in the coastal workshops indicates that the mountain ranges were included within the lithic supply areas of human groups that occupied

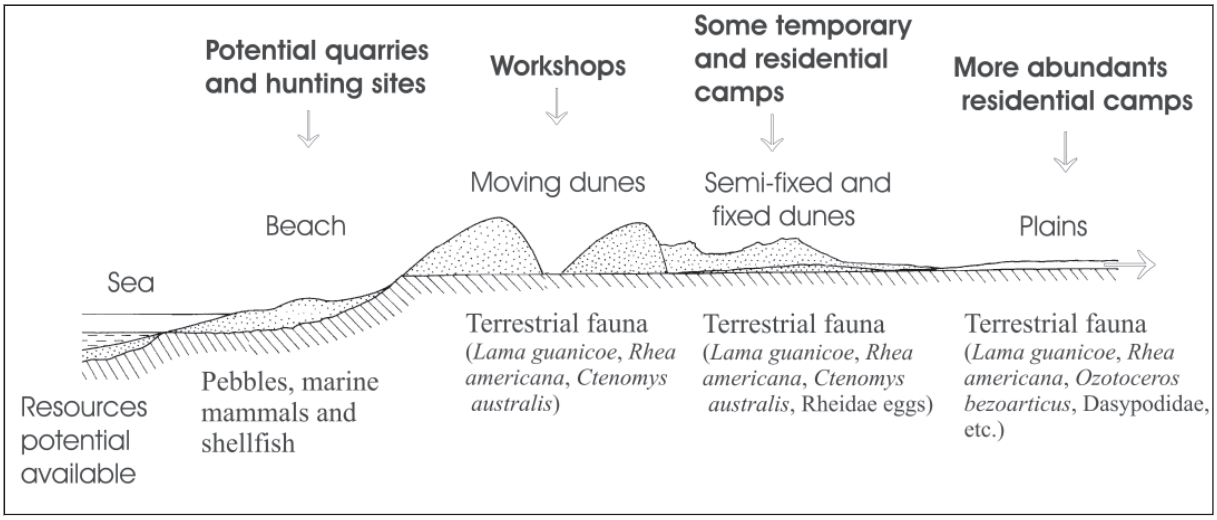

Figure 4 Model of space use in the Pampean coast

the coast. Besides, the bipolar procedure is not an exclusive coastal technique, as it was previously supposed (eg, Ameghino 1910; Bórmida 1969); it was also observed in many inland sites. Rather than differentiating coastal and hinterland human populations, these facts support the use of the different environments of the Pampean Region by the same cultural groups. Similar patterns found in the material culture and human bones of coastal and interior settings further supports this idea. The morphology and manufacture techniques of flake tools and *bola* stones in addition to the manufacture and decoration of pottery show parallels between both environments. The physical characteristics of human bones and the objects included in ritual burial contexts show a clear affinity between the populations that occupied the coast and the inland. The isotopic studies ($\delta^{13}C$) of human bones found in the marine coast and in the plains (Flegenheimer et al 2000; Barrientos 1997; Politis & Barrientos 1999) suggest a similar diet based on products of continental origin possibly complemented with marine resources (see discussion of these similar patterns in Bonomo 2004).

Such similarities in material culture allow us to analyse the interaction between coast and inland from phenomena such as mobility and territoriality of hunter-gatherers (Casimir 1992; Geneste 1991; Kelly 1992). Recently, both aspects have been compared with ethnographic models generated from the territorial behaviour of the Selk'nam of Tierra del Fuego and the Nukak of the Amazonian tropical forest (Politis & Bonomo 1999; Politis et al 2003). In this section, some of the ideas raised in these works are discussed in more detail.

The distribution of raw materials in different sectors of the Pampean landscape can be used to approach these aspects of mobility and the territories of Pre-Hispanic human groups. From the lithic raw material data generated by our work and other studies on inland Pampean sites (Acosta et al 1988; Bayón et al 2002; Crivelli Montero et al 1997; Eugenio & Aldazabal 1987–88; González de Bonaveri 2002; Madrid & Politis 1991; Madrid & Salemme 1991; Madrid et al 2002; Martínez 1999; Mazzanti 2002; Mazzanti & Quintana 2001; Politis 1984), the frequency of artefacts produced from quartzite and coastal cobbles were registered and summarised in figures 5 and 6. These figures illustrate that most of the occupations containing coastal cobbles were recorded as far as 70 km from the coast.

The proportions of coastal cobbles and quartzite of many Pampean sites in relation to distances from the coast can be observed in figures 5 and 6. The

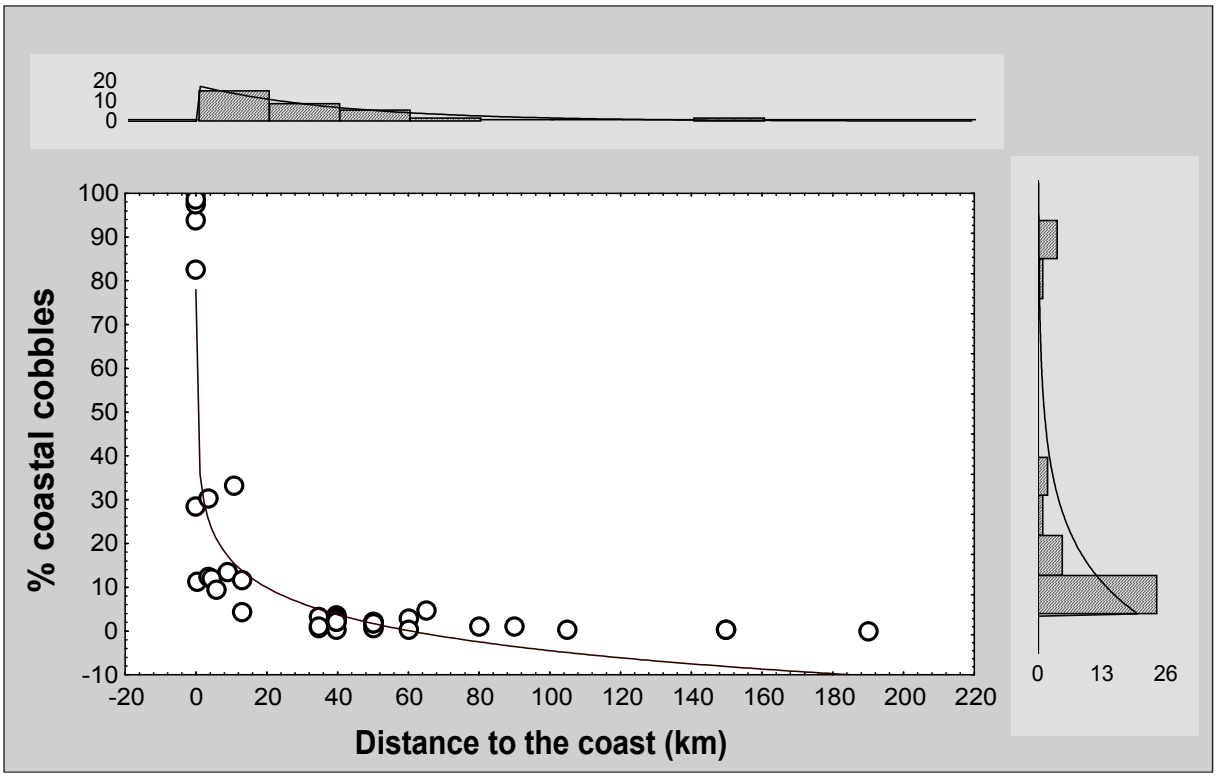

Figure 5 Scatter-plot with histograms of the proportion of coastal cobbles versus distance to the marine shore for 37 archaeological sites from the Pampean Region

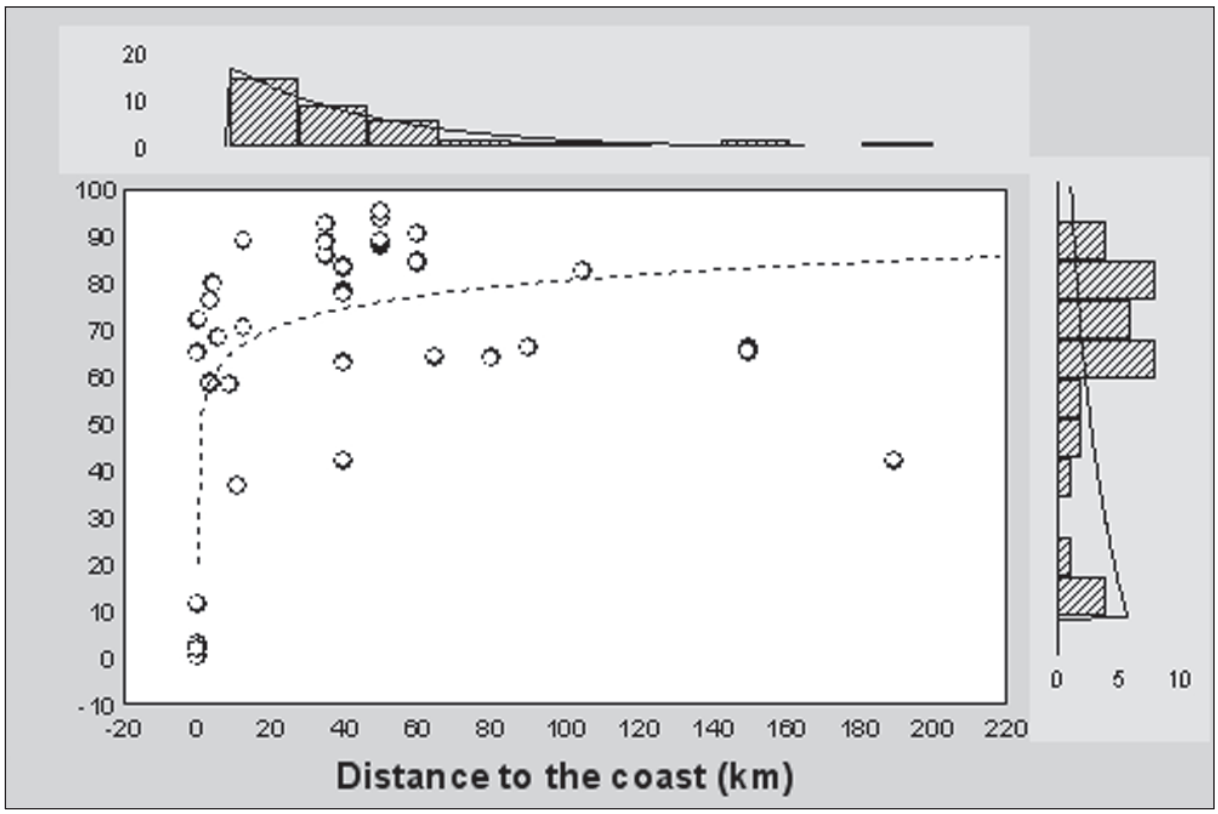

Figure 6 Scatter-plot with histograms of the proportion of quartzite versus distance to the marine shore for 36 archaeological sites from the Pampean Region

Spearman R correlation test shows that the quantities of cobbles co-vary in a negative and significant way with the distance (R_s=-0.869 $p<0.05$), so that both variables are interdependent. Figure 5 illustrates that the use of rounded cobbles is very intense in most of the dune line sites (between 100 and 80 per cent). Once outside the dune line, cobbles diminish markedly and are replaced by quartzite in the plain contexts (see figure 6). Most of the sites placed a few kilometres away from the coast display a low proportion of cobbles. Outside the dune line, up to 13 km from the shore, sites that have percentages of coastal rocks between 9 and 14 per cent predominate. However, other interior sites located from 3.5 to 11 km from the coastline seem to show a different situation since they present significant quantities of cobbles (around 30 per cent of the assemblage). From a distance of 35 km, it can be observed that the use of coastal rocks decreases remarkably and shows very low values, generally below 5 per cent. However, in general, quartzite maintains greater values up to 40 per cent in the plains, while in the dune line they undergo an abrupt reduction, which is tied to the rounded cobbles supply zone where they are very abundant (figure 6).

As has been previously proposed (Politis et al 2003), the distribution of coastal raw materials shows two 'steps' that mark a sharp reduction in the frequency of cobble artefacts in relation to the distances from the coast (figure 5). The first step would represent the *in situ* exploitation of the rounded cobbles from natural deposits. For this reason, the density of coastal lithic remains in the workshops of the dune line is high. The other step would represent the limit of the area covered from camps situated outside the dune line, that is, the provisioning zone of raw materials within daily foraging trips (Binford 1980; Kelly 1983, 1992). These sites, located in the second point of inflection, are situated between 0.4 and 13 km from the coast. In general, these distances would be expected for the radius of resource exploitation from hunter-gatherers' camps (Brooks 1989–90).

A third step cannot be clearly identified as regards to the proportions of rounded cobbles. If a steep diminution of cobbles had been manifested, this could have been associated with territories' boundary zones indicating some differences in the access to the coastal resources. Outside the plain next to the coast, the proportion of cobbles is oriented in a parallel form to the x-axis. The figure 5 does not display clear alterations at greater distances than 13 km; that is to say, marked discontinuities that could be associated with territorial

limits. Therefore, there is no evidence to support the existence of restricted access to marine resources. Nevertheless, advance this discussion it is necessary to know the amounts of cobbles between 15 and 30 km of the coast, where there is no evidence. Another aspect to emphasise is that the amount of sites with coastal cobbles diminishes remarkably in those located more than 70 km from the coast. This could indicate a change in the intensity of the exploitation of these coastal products.

The way in which people moved through this region is another subject to consider. As previously mentioned, differences in site functionality, occupation durations and lithic supply strategies can be observed, based on the evidence of different site use in various environments of the study area. These aspects, along with the spatial distribution of cobbles, are excellent proxies to evaluate the patterns of mobility that connected heterogeneous sectors of the coast and the interior. The recurrent location of camps in the lower segments of rivers and streams is an interesting starting point for the discussion of mobility strategies. The significant proportions of coastal cobbles in some of these contexts indicate that this lithic resource was included within their radii of daily exploitation. The camps established in places near the coast were motivated, among other causes, by the possibility of acquiring locally available resources, like the nodules.

There are distinctions between contexts located near and far from the coast that could relate to different mobility strategies. The low proportion of coastal raw materials observed beyond 35 km of the coast contrast with most of the sites next to the marine littoral. The low percentage of rounded cobbles in the interior contexts located far away from the coast may indicate that these rocks would have been transported from other sites, representing a single fraction of the set originally obtained in the supply zone. Another alternative is that this proportion of cobbles is the product of the acquisition and transport of reduced amounts of coastal raw materials by small groups. These groups would have exploited the coast for rock supply (eg, nodules, blanks or tools) and for the utilisation of its faunal resources. Then, the combination of the two mobility strategies described (daily moves or logistic trips) could be one way to explain why greater volumes of cobbles transported to the sites were located from the dune line to 13 km inland as opposed to those located more than 35 km from the coast.

In the archaeological record, there are some characteristics linked with logistic mobility. This paper shows that most of the dune line sites were locations for specific activities. Artefacts made from non-local rocks (eg, quartzite) found in the workshop sites would be derived from material transferred from other places, like residential camps. With the transportation of artefacts produced from mountain range raw materials, individuals anticipated the need that could arise throughout their landscape movements by a curated technological strategy. This evidence could be related to logistic displacements of some members of the camps for the development of specific tasks linked with particular coastal resources (Binford 1980; Carr 1994; Kelly 1983; Koldehoff 1987).

Considering logistic mobility as a possible strategy for coastal use, some of the workshop sites can be considered as the product of activities conducted by a small number of individuals. These individuals would have taken advantage of the lithic resources that were not available in the hinterland that was exploited on a daily basis, but were within the logistically used space. The beach cobbles were reduced to obtain blanks and tools in the dune line. Later, these products acquired along with some nodules without modification would have been transferred to the camps. The transportation of blanks and tools outside the workshops could explain the relatively low proportion of flakes in relation to cores, as observed in some of the coastal contexts (see table 1). Other tasks developed outside the base camps by special purpose groups, like the search, capture and processing of prey, require the provisioning of individuals with tools for such aims which can demand a considerable degree of elaboration (Binford 1980; Camilli 1989). On the coast, the bola stones and the triangular projectile points related to hunting activities would represent these elements. In summary, the coastal lithic resources would have been exploited mainly from residential camps located in the inner plains. In this way, in the strategies of maritime littoral exploitation, the Pampean hunter-gatherers would have carried out logistical trips or daily movements as small groups of individuals rather than establishing the entire group in coastal base camps.

5 Conclusion

The Pre-Hispanic hunter-gatherers that occupied the Pampean inland and coast utilised the natural resources in both sectors. The activities carried out

by these populations in the marine coast generated the archaeological contexts of the study area dune line. The numerous collections and sites recorded in this environment indicate that a great quantity of artefacts was discarded in the dune line. This dense coastal record can be associated with a frequent use of coastal raw materials and indicates that these human groups habitually and regularly used beach gravels where available. Although this lithic resource has been a secondary raw material in the Pampean Region, in coastal sites, the manufacture of artefacts from beach gravels was very common. The utilisation of this resource was concentrated mainly in areas where there are natural deposits of rounded cobble and areas near the coast located outside the dune line which allowed the daily exploitation of these sources. Altogether, the wide distribution of cobble deposits, their relative abundance, their expedient use and the short distance of transport, in addition to the presence of flake-tools in littoral sites, strongly suggest that the supplying of coastal raw material was an activity carried out along with activities such as *ñandú* egg harvesting and the hunting of terrestrial or marine mammals. At the regional level, quartzite predominates widely in relation to beach cobble use, except in coastal workshop sites. Even though the proportions of cobbles diminish noticeably in the inner plains, it is important to remember that most of the occupations which contain lithics manufactured from both cobbles and quartzite have a geographic extension that do not exceed 70 km from the coast. This could suggest some type of boundary in the complementary use of products from coastal and inland environments although with varying degrees of importance.

The evidence discussed above, jointly with the material culture similarities, supports the hypothesis that the Pampean marine coast was used by the same inland populations (de Aparicio 1932; Holmes 1912; Hrdlicka 1912; Outes 1909; Politis 1984). These human groups included the Atlantic coast within the annual circuits of mobility. In this paper, a general model for the interaction between both environments is presented. Other variants can be explored in future research. When the Pampean hunter-gatherers were in the plains and in the mountain ranges, they hunted continental fauna, mainly guanaco and deer, and procured quartzite as their main resources. These same groups also inhabited the coast. However, in the dune line, they did not usually establish base camps. In other words, residential movements towards this zone were not frequent.

Nevertheless, in order to exploit the lithic and faunal resources of the coast, these human groups principally located their residential camps in the plains behind the dune line. These sites demonstrate the simultaneous exploitation of resources of the coast and the interior. They show an economy focused on continental mammals (*Lama guanicoe*) and in the use of quartzite, which is associated with cobbles knapped by bipolar technique and the sporadic use of marine fauna. The scarce presence of otariid remains found in sites of the adjacent plains to the coast does not support the view that there was systematic hunting of these mammals but rather occasional exploitation. Furthermore, this could indicate that the processing of these mammals was restricted to the coastal sector. These camps were supplied with rocks transported from the mountain ranges and occupied for long periods of as well as repeated occupations through time. From these domestic spaces, the coastal resources were exploited by daily moves; although logistic trips could also take place from distant sectors. In the coastal landscape, specific tasks using bipolar reduction of local rounded cobbles for obtaining blanks and tools were developed, part of which were transported towards the inner plains. These activities generated the workshops of the dune line during brief occupational events. In conclusion, these workshop sites do not show a complete record of the material culture of coastal human societies. They represent a part of the settlement system of the Pre-Hispanic hunter-gatherers who also occupied the Pampean plains and mountain ranges throughout the Middle and Late Holocene.

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