

# Archaeology of the Península Valdés: Spatial and Temporal Variability in the Human Use of the Landscape and Geological Resources

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**Abstract** The archaeological record of Península Valdés shows this area was intensively used by native hunter-gatherers since at least 5000 years BP to the nineteenth century. These populations located their settlements in sandfields across the littoral zone, primarily on coastal bajadas and low marine terraces near fixed shoals of molluscs. Archaeofaunal studies and stable isotope analyses ( $^{13}\text{C}$  and  $^{15}\text{N}$ ) of human bone samples indicate that they had a terrestrial-marine diet including guanaco meat, land plants, mollusks, fishes and pinnipeds. The old inhabitants of the peninsula profited local rocks and clay minerals to manufacture their artefacts. To lithic technology, they used small pebbles of silica and basalt, big pebbles of riolites and granites, consolidated sandstones and fossil cetacean bones. The basic toolkit comprised knives, end-scrapers, side-scrapers, drills, burins, notches, fishing weights and a variety of projectile points. The big pebbles were used as *manos*, hammer stones and anvils, while sandstones and fossil bones were primarily employed in milling activities. With respect to pottery technology, the abundance and good quality of local clay sources allowed its important development in the final late Holocene. Most vessels present oval or spherical shapes, straight sides and concave bases. All these features are suitable for domestic activities, e.g. preparing, storing and/or cooking food and liquids. These hunter-gatherers did not live isolated from other populations: the presence of foreign rocks and of three ceramic vessels, which might have been manufactured in northwest Patagonia or perhaps central Chile, indicates that they took part in an extensive trading net since at least the late Holocene.

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## 1 Introduction

Radiocarbon record of eastern Patagonia (between the Colorado River and the Strait of Magellan) shows that human beings reached this region *circa* 12,000–11,000 years BP (Borrero and McEwan 1997; Politis et al. 2008). The history of archaeological research shows that until the mid-80s decade the eldest ages had been obtained from sites located in the Patagonian Andes and the central foreland area, while the datations in the Atlantic coast were all younger than 3000 years old (Orquera 1987). This fact might be related to the scarce knowledge about the archaeology of the littoral area as all research work in Patagonia, with rare exceptions, had generally focused on inland ecosystems far from the coast (synthesis in Orquera and Gómez Otero 2007). Consequently, the prevailing conception was that the Atlantic coast was occupied lately by inland hunters that would only reach the coast randomly or seasonally. It was hard to accept, however, that hunter-gatherers in Patagonia would have failed to take advantage, on a regular basis, of an environment that was abundant and diverse in terms of food supplies, which made it favourable for survival as against others (Yesner 1980; Perlman 1980; Bailey and Parkington 1988).

With respect to Península Valdés, the first systematic research began in 1993 and continues to this day framed in a project whose main purpose is to know the temporal and spatial variability in the human–environment relationship in the Northeast area of the province of Chubut, including the marine coast and the lower valley of Chubut river (Gómez Otero 2006; Gómez Otero et al. 1999). Before then, the information available was limited to a few discoveries of isolated artefacts: the study of a multiple burial site and an unpublished summary by Menghin and Bormida (*circa* 1995) of the results of unsystematic archaeological prospections (Gómez Otero et al. 1999). In light of the above, research was now focused, on the one hand, on proving that the ocean and its resources were much more important for hunter-gatherers in the study area than expected; and, on the other, on confirming that the littoral area had been occupied before the late Holocene and that there had been groups that lived all year round, or most of it, in the coastal strip.

In this chapter, we summarize the results of 20 years of archaeological studies in the Península Valdés region, with an emphasis on the human use of landscape (considered yet another resource), rocks, clay minerals and soil components.

## 2 The Península Valdés and Its Advantages for Human Life

The foreland region next to the Patagonian Atlantic coast runs across 2500 km from the Colorado River in the north, to the Strait of Magellan, in the south, 40° S and 52° S (Fig. 1). Generally speaking, it is formed by a series of tertiary-aged plateau—distributed approximately 200 km to the west of the coast—that are disrupted by only seven rivers (the Chubut river among them), that represent the only permanent and significant sources of fresh water. This region is characterized by a relative environmental homogeneity based on low topography, arid climate and xeric vegetation.

In this context, Península Valdés has several advantages for human life. First, it is formed by several types of coasts: the gulf coasts of Golfo San José, Golfo San Matías and Golfo Nuevo; the barrier spits and islands of the Caleta Valdés (Valdés

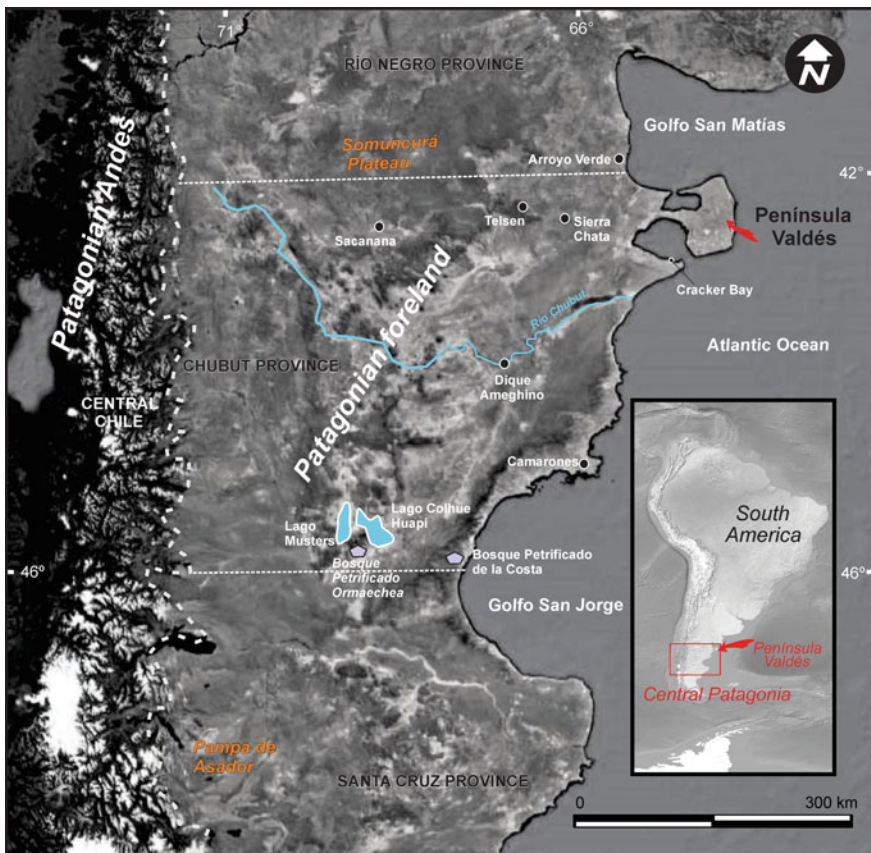


Fig. 1 The Península Valdés region in a regional context

inlet), and the open sea coast between Punta Delgada and Morro Nuevo (Fig. 2). On the other hand, the peninsula may be regarded virtually as an island of semi-circular shape, with a maximum radius of 45 km and no internal geographical

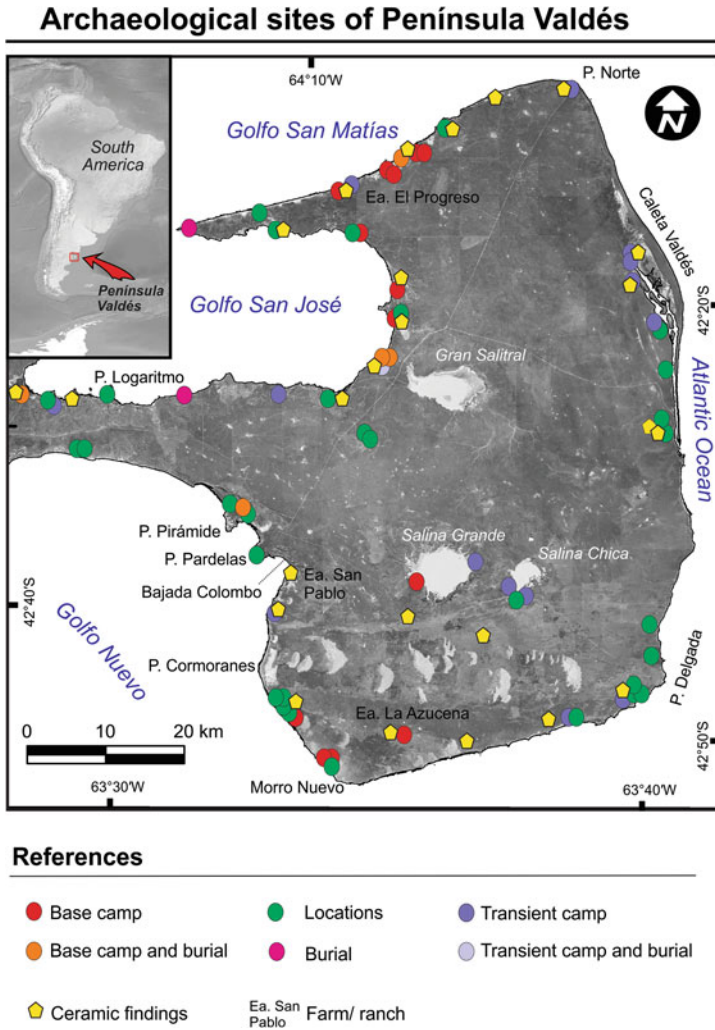


Fig. 2 Site spatial distribution and ceramic findings in the Península Valdés

barriers. This allows for quick access to any point and fast connection between coasts (Gómez Otero et al. 1999) (Fig. 2). Topography does not rise above more than 110 m a.s.l. and access to the ocean is possible and easy in areas with wide littoral *bajadas* or downward slopes (see Chapter “[Late Cenozoic Landforms and Landscape Evolution of Península Valdés](#)”), low topography or through *cañadones* or gullies whose heads are several kilometres inland (Súnico 1996). In addition, the neogene deposits of the Gaiman and Puerto Madryn Formations (see Chapter “[Geology of Península Valdés](#)”) show cavities and small overhangs that may have been used in the past as shelter for both animals and humans and that were in fact used as burial sites (Outes 1915). Moreover, the sandy environments that discontinuously run over the coastal perimeter covering a large portion of the southern area of the peninsula (Súnico 1996; see Chapters “[Late Cenozoic Landforms and Landscape Evolution of Península Valdés](#)” and “[Groundwater Resources of Península Valdés](#)”) also provide shelter as well as an adequate surface for settlement. What distinguishes it from other arid Atlantic littoral sectors is the permanent fresh water supply through several springs available in the Salina Grande and Salina Chica, both located in the central area of the peninsula (Fig. 2; see Chapter “[Groundwater Resources of Península Valdés](#)”). This water supply is supplemented by other reservoirs such as sandbanks and temporary small lakes that retain water after the short yet stormy rains present in the area (see Chapter “[Groundwater Resources of Península Valdés](#)”).

Bathymetry near the coast presents a smooth relief; during ordinary low tides, large intertidal areas remain exposed, some with wave-cut platforms (informally called *restingas*) that enable the development of shoals of molluscs and other invertebrates. Moreover, there is a 6-hour difference between tides from the Golfo San José and the Golfo Nuevo, and this increases the possibilities for daily extraction of intertidal resources in each gulf. In addition, the Península Valdés is influenced by the tidal fronts (i.e. Península Valdés tidal front; Acha et al. 2004) a mechanism that determines the existence of high coastal productivity, especially in spring and summer.

The Península Valdés also features rocks and minerals suitable for different technologies (Fig. 3). There are raw materials of good quality for flaking, such as basalts and silicas, available in the gravels of the *Rodados Patagónicos deposits* and in the Pleistocene–Holocene gravel beach ridges (see Chapters “[Geology of Península Valdés](#)” and “[Late Cenozoic Landforms and Landscape Evolution of Península Valdés](#)”). Sandstones flat boulders from the Puerto Madryn Formation and cetacean fossilized bones are also present, which may be used as devices for grinding. Finally, clay minerals suitable for pottery technology are available in soil argillic horizons (Bouza et al. 2007; Schuster 2014; see Chapters “[Geology of Península Valdés](#)” and “[Soil-Geomorphology Relationships and Pedogenic Processes in Península Valdés](#)”).

With regard to weather conditions, the low altitude and, especially, insularity provide the area with undoubtedly oceanic properties (see Chapter “[The Climate of Península Valdés Within a Regional Frame](#)”). The mean annual precipitation values in the Península Valdés area are within the 100–300 mm/a, with some years of very



**Fig. 3** Lithic and mineral resources. **a** Flat boulders of the Puerto Madryn Formation; **b** small and medium-sized gravels from beach ridges; **c** Pleistocene big gravels from the Caleta Valdés area; **d** clay source available in temporary small ponds

low precipitation (about 50 mm) and other with exceptionally high values (>500 mm) (see Chapter “[Miocene Marine Transgressions: Paleoenvironments and Paleobiodiversity](#)”). By way of comparison, in other coastal region of central Patagonian, mean annual values range from 100 to 180 mm.

As for vegetation, there is an association between shrub steppe and grass steppe (see Chapter “[Vegetation of Península Valdés: Priority Sites for Conservation](#)”), which means there is an abundance of firewood and good pastures for *guanaco*, the largest herbivore in the area and the main prey of hunter-gatherers in Patagonia. In areas where aridization and over-exploitation have had a lesser impact, woody species are abundant, with good caloric potential (up to 700 °C; see Bouza et al. 2007). Primary woody species are *molle* (*Schinus* sp.), the two kinds of *algarrobo* (*Prosopis alpacato* and *P. denudens*), the *jume* (*Suaeda divaricata*), the *quilembay* (*Chuquiraga avellanadae*), the *mata sebo* (*Monttea aphylla*) and the *piquillín* (*Condalia microphylla*). *Quilembay* was also used to send smoke signals (Jardín Botánico de la Patagonia Extraandina 2002). The most important edible vegetation includes *macachín* tubers (*Arjona tuberosa*), *piquillín* berries, *algarrobo* pods, as well as fruits and leaves from cactaceae of the *Opuntia* and *Maihueniopsis* genus. In addition, several species were and still are used for their medicinal or therapeutic properties, including *molle*, *barilla* (*Larrea divaricata*), *quilembay*, *matasebo*, *botón de oro* (*Grindellia chiloensis*) and *carqueja* (*Bacharis crispa*) (Jardín Botánico de la Patagonia Argentina 2002).

As far as zoogeography is concerned, the Península Valdés region is one of the largest zoological parks in the world. Primary terrestrial vertebrates are *guanaco*, rheididae (*Pterocnemia pennata* or *choique*), dasipodidae or *armadillos* (*Zaedyus* sp. and *Chaetophractus* sp.), lagomorphs (*Dolichotis australis* or *maras*), and, to a lesser extent, canidae and felidae (see Chapter “[Animal Diversity, Distribution and Conservation](#)”). Marine fauna stands out for the diversity and abundance of molluscs, fish, seabirds and mammals. The variety of molluscs is higher than in the rest of the Patagonian Atlantic coast because two malacological provinces converge: the Argentine Province, which runs from Río de Janeiro to 42° parallel S, and the Magellan Province, which runs from such parallel to the province of Tierra del Fuego and the south of Chile (Escofet et al. 1978). This means that the richest gulfs in terms of malacofauna are the Golfo San Matías and the Golfo San José (Fig. 2). As for fish, there are species from rocky shores and from gravelly and sandy beaches (Cousseau and Perrotta 2000). In the case of seabirds and marine mammals valuable for human consumption, there are cormorants (*Phalacrocorax* spp.), Magellanic penguins (*Spheniscus magellanicus*), South American sea lions (*Otaria flavescens*), sea elephants (*Mirounga leonina*) and several cetaceans, primarily the southern right whale (*Eubalaena australis*). There are no current records of South American fur seals (*Arctocephalus australis*). Cormorants, penguins and pinnipeds are grouped in fixed and irregularly scattered colonies (Carrara 1952). Sea lions and cormorants remain in the area all year round; sea elephants and penguins—albeit migratory—are stable during their time of residence, i.e. spring–summer. Colonies that are closest to each other are in the Golfo San Matías. From the seventeenth century to mid-twentieth century, they were exploited by foreign and local *loberos* or sea lion hunters (Crespo and Pedraza 1991).

### 3 Creation of Predictive Models for Settlement and Diet

In the absence of archaeological background, at an early stage of the research, a preliminary model was designed applicable to the last 5000 years which proposed that the Península Valdés was occupied all year round by highly mobile hunter-gatherers whose diet was based on *guanacos* and sea lions (Gómez Otero et al. 1999). These hunters possibly moved, on a regular basis, alongside the coastal perimeter with short incursions into the centre of the peninsula for water supply from the Salina Grande and Salina Chica. On the basis of a high supply and of lithic raw material from gravels, record of expedient artefacts (sensu Binford 1979) was expected, especially throughout the coastal area, where there is more availability of gravels (Gómez Otero et al. 1999).

Later, as research moved forwards and by way of heuristic tools, some models were designed derived from the “*Optimal Foraging Theory*” (Bettinger 1991; Winterhalder and Smith 1992, inter alia). In this research, the Diet Breadth Model was applied, as well as models that analyse the settlement system in connection with the costs of searching and handling the food: the *Patch Choice Model* and the *Central Place Model* (Bettinger 1991: pp 83–90). The *Diet Breadth Model* assumes that a prey will be chosen if the net energy it provides is higher or at least equal to the energy spent during foraging (Winterhalder and Smith 1992; Bettinger 1991). As for the choice of the best place to settle in, the *Central Place Model* claims that the hierarchization of diet elements—including fresh water—will vary based on the distance between resources and the place where they are searched, secured and brought from. For its part, the *Patch Choice Model* proposes that the highest ranked patch or parcel type will produce the best return per unit of foraging time (the sum of all search and handling time in the patch). But, when patches of that kind are widely spaced, time spent in travels between them may cause overall rate of energetic return to be suboptimal.

By applying these theoretical tools, another predictive model was designed applicable to the entire northern coast of the Chubut province (Fig. 1). This model proposed that the human use of landscape was subject to three variables: (a) the coastal productivity, (b) the relation between the resource supply offered by the marine environment and its adjacent terrestrial environment and (c) the fresh water availability (Gómez Otero 2006).

In terms of coastal productivity, not all types of coasts that make up the Península Valdés region feature the same oceanographic and topographic characteristics (see Chapter “[Late Cenozoic Landforms and Landscape Evolution of Península Valdés](#)”). Moreover, the influence of marine fronts is also uneven. If closeness to the Peninsula Valdés tidal front is considered, as well as the circulation of marine waters in the distribution of nutrients, the most productive coast is that located between Punta Norte and Punta Delgada and the least productive is that of the Golfo Nuevo, because the anticyclonic turns of its current prevent the intrusion of nutrient-rich water from such front (see Chapter “[The Climate of Península](#)”).



Valdés Within a Regional Frame”). The coasts of San Matías and San José Gulfs are somewhere in the middle (Gómez Otero 2006).

In addition to coastal productivity, the relative value and nutritious performance of adjacent terrestrial communities were considered which, in turn, vary on the basis of latitude and topography (Yesner 1980; Jones 1991). According to the respective energy performance as well as the easiness to search and secure preys, it was proposed that the optimal, annual average diet was possibly sustained on a relatively even combination of two preys—pinnipeds and *guanacos*—supplemented with mollusc consumption (Gómez Otero 2006). This average diet may have been seasonally reinforced with other types of food by reason of annual variations in resource availability and the nutritional needs of hunter-gatherers. Thus, *choiques*, small vertebrates (fish, birds, mammals) from the marine and terrestrial ecosystems, eggs and plants may have been incorporated to the basic diet throughout the year.

If *guanacos* and South American sea lions were the two most valuable preys and molluscs served as a daily dietary supplement, the highest ranking parcels would have been those offering the three types of resources. Since *guanacos* and molluscs have a wide and relatively even distribution throughout the coastal strip, parcel selection should have been determined by *Otaria* settlement distribution that is linear and discontinuous. In this regard, the coast of the Golfo San Matías features the highest number of sea lion colonies (Carrara 1952; Crespo and Pedraza 1991). However, fresh water availability, a critical resource in the Atlantic coast, should also be considered. Therefore, there are three possible options: one, a central settlement in the parcels that provided primary basic diet resources: sea lions, *guanacos* and molluscs; two, settling near permanent fresh water sources in the Salina Grande and Salina Chica; and three, choosing a location equidistant from both types of resources.

In sum, based on the three basic restrictions and the application of Optimal Foraging Theory models, the following hierarchy of landscape-use intensity was proposed, in a decreasing order, taking into account the different coastal sectors: Golfo San Matías, Golfo San José, Valdés inlet, Golfo Nuevo and the open sea coast between Punta Delgada and Morro Nuevo (Gómez Otero 2006).

## 4 Findings

### 4.1 The Use of the Landscape

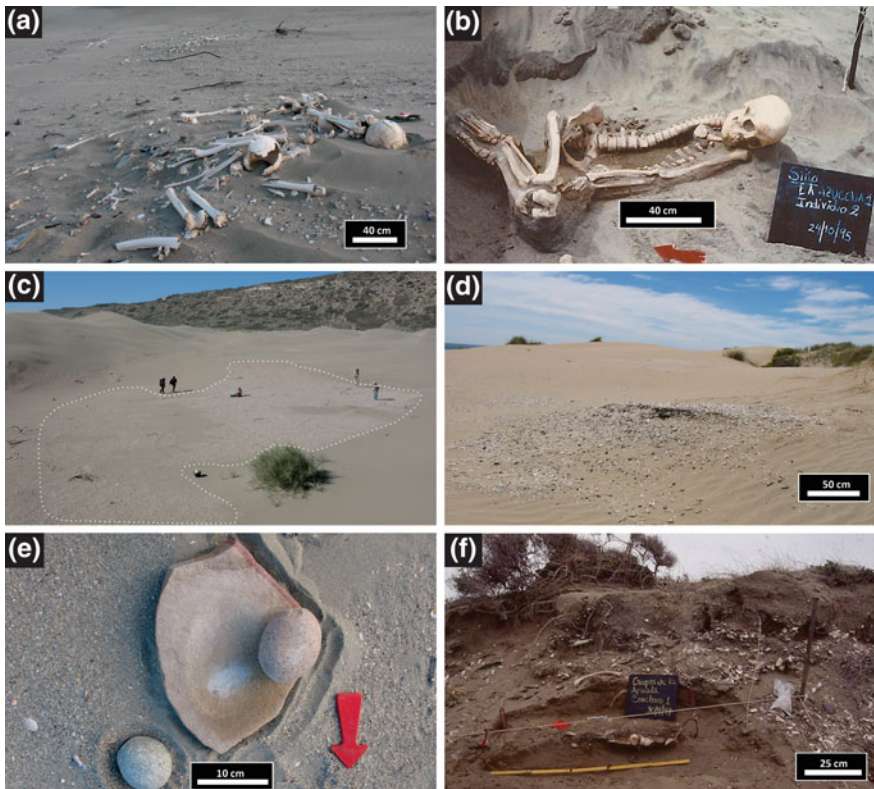
The chronological record shows that hunter-gatherers used the Peninsula at least since the middle Holocene: one site in Punta Pardelas and another one in Punta Cormoranes (Fig. 2) indicated a conventional radiocarbon age of 5580  $^{14}\text{C}$  BP and 4340  $^{14}\text{C}$  BP, respectively (Gómez Otero 2006). An additional three dating studies performed in sites located in adjacent coast areas support such evidence: 7400 years  $^{14}\text{C}$  BP at the mouth of the Arroyo Verde (41° 54' S, Fig. 1, and 5500  $^{14}\text{C}$  BP and

5390  $^{14}\text{C}$  BP at Cracker Bay (42° 55' S, Fig. 1; Gómez Otero et al. 2013a). This period matches the maximum marine transgression of the middle Holocene, that is, the sea level was above the current level (Weiler 1998; see Chapters “Climatic, Tectonic, Eustatic and Volcanic Controls on the Stratigraphic Record of Península Valdés” and “Late Cenozoic Landforms and Landscape Evolution of Península Valdés”). The number of sites considerably increases in the late Holocene (after 3200 BP) and abruptly decreases after the *Equestrian Period* (seventeenth–eighteenth centuries) when horse adoption promoted that mobility circuits changed and moved further from the coast (Gómez Otero 2007). At this time, in 1779, the Spanish Crown established a military settlement in the Península Valdés, occupying the Golfo San José and the Salina Grande area. This had a high impact on the social and economic system of hunter-gatherers (Bianchi Vilelli and Buscaglia 2015).

Site distribution shows that most of them are concentrated in the coastal zone, especially in the coastal *bajadas* near fixed banks of molluscs. Sites were also recorded in the *bajadas* of the Salina Grande and Salina Chica and on the edge of cliffs, although these were not frequent (Fig. 2). As for topographic conditions, the highest archaeological density was observed in dunefields (52%), mainly in the coastal perimeter, followed in degree of importance by Holocene beach ridges (16%), coastal pediments (13%), the *salinas*' margins (7%) and around the banks of temporary pans (4%).

A diversity of sites were registered which included different functions and duration (sensu Binford 1980) such as base and transient camps, “locations” or special purpose occupations and human burials (Fig. 4). The preservation and visibility of the archaeological record is often irregular because of the highly dynamic environment that has unfolded since the Pleistocene–Holocene transition. First, the earliest coastal sites might have been submerged or destroyed due to early middle Holocene sea level variations. Second, as most sites are currently on the surface of a sandy environment, they are impacted by aeolian and water erosion as well as by other post-depositional processes, which include modern human activities. In these sites, all remains are widespread and mingled, forming palimpsests. The presence of thin and isolated, stratified *concheros* or *shellmiddens* in dunes and *bajadas* was also established. However, no high or big shell middens have yet been found.

With regard to the current height above sea level, sites located between 6 and 10 m a.s.l. prevail, which means parcels close to marine resources were chosen. Sites recorded between 11 and 20 m a.s.l. were also numerous. The relation between the sea level height and the functionality of occupations was explored, verifying that all sites located above 20 m a.s.l. were used for restricted activities (lithic quarrying, mollusc consumption or burials) while those located below 20 m a.s.l. were base camps and transient camps. This would be related to the type and time duration of the activities performed. But, in some cases the location of sites might be also correlated to sea level changes: the latest sites are situated at lower levels, while those from the middle Holocene are above 10 m, in line with a higher sea level than the current one at that time (Weiler 1998, see Chapter “Late Cenozoic Landforms and Landscape Evolution of Península Valdés”). As to the distance from



**Fig. 4** Site diversity of the Península Valdés region. **a, b** Burial sites; **c, d** shellmiddens; **e** isolate findings; **f** stratified hearth

the high water line, sites were concentrated in a strip located within less than one hundred meters from the ocean. An exception was found in the Caleta Valdés (with a peak between 350 and 500 m far away from the coast) which might be the consequence of the decrease in the sea level after the mid-Holocene maximum transgression (see Chapter “Late Cenozoic Landforms and Landscape Evolution of Península Valdés”), which would have increased the distance between the original site location and the ocean.

As to fresh water, as it was mentioned above, the archaeological record shows few sites (most of them transient camps), in the area of the Salina Grande and Salina Chica and isolated materials around temporary pans associated to small to medium closed basins (Fig. 2; see Chapter “Late Cenozoic Landforms and Landscape Evolution of Península Valdés”). This supports evidence that the human populations that occupied the Peninsula chose to settle in parcels that ensured the acquisition of fixed and predictable marine resources. From those parcels, they travelled to the *salinas* in search of water and salt. Since 20 km run from the different coasts to the *salinas*, the groups that fetched water must have stayed at

least one night outside the base camp; during that time, they probably hunted and consumed the terrestrial resources located in the surrounding area. Evidences of this are the scattered projectile points, *bolos* and knives found in different sites. Ceramic vessels were also found, whose presence suggests these vessels were used to transport or store water in late Holocene times. Before that, leather water skin, choique eggs, bladders and/or stomachs were probably used, although no evidence of these manufactures has been still registered in this area.

Nevertheless, basic water needs in the coastal area might have been satisfied by the use of rainwater found in sandbanks (see Chapter “[Groundwater Resources of Península Valdés](#)”) In this regard, D’Orbigny (1999: pp 289–290) documented that in the Northern Patagonian coast water could be removed from sandbanks and that this water had a much better quality than that from drillings. Therefore, coastal dunefields might have offered not only adequate surfaces for settlement but also minimum fresh water supply.

Site concentration was observed in parcels near fixed shoals of molluscs from which there was easy access to both evenly distributed and scattered resources such as *guanacos*, small terrestrial vertebrates, fish and plants, and resources located in patches, such as pinnipeds, seabirds and stranded cetaceans. This might have ensured a minimum daily supply of minerals, vitamins, proteins and carbohydrates. In sum, the best option might have been to settle base camps in strategic locations that made it possible to forage without high costs in terms of searching and securing basic resources for an optimal diet.

As to the comparison between coastal sectors, results supported partially the preliminary model, because the highest archaeological density and richness were found in the coast of the Golfo San Matías, followed in a decreasing order by the Golfo San José and the Golfo Nuevo. But, against the preliminary expectations, the Caleta Valdés area and the open sea between Punta Delgada and Morro Nuevo, which are precisely the one that receives greater influence from the *Península Valdés tidal front*, showed the lesser archaeological density. Therefore, landscape occupation intensity might have been primarily determined by the relation between supply of terrestrial and marine resources and, secondly, by permanent fresh water supply and coastal productivity.

## 4.2 The Diet

The diet was explored through archaeofaunal and taphonomic studies and  $^{13}\text{C}$  and  $^{15}\text{N}$  stable isotope analyses in human collagen and apatite (Gómez Otero et al. 2000; Gómez Otero 2007). Archaeofaunistic and taphonomic studies were carried out following the methods of Behrensmeyer (1978), Mengoni Goñalons (1988), and Lyman (1994); isotope analyses were performed according to Van der Merwe (1992), Ambrose (1993), and Koch et al. (1997).

The results showed that since the middle Holocene up to the introduction of horses (late seventeenth century to early eighteenth century), food consumption by

hunter-gatherers who occupied the Península Valdés comprised a wide array of terrestrial and marine resources (Gómez Otero 2006). Nevertheless, the isotopic values obtained from five human individuals discovered in the Peninsula indicated that marine preys with high trophic levels—pinnipeds—had greater relevance in food consumption than in other sectors of the Northern Chubut Province coast (Gómez Otero 2007). As it was mentioned above, during the equestrian period, diet became essentially terrestrial, due to the changes in the hunter-gatherers mobility after horse adoption.

Based on the comparison between the optimal diet preliminary model and archaeological records, both discrepancies and coincidences were observed. First, the two resources ranking on top of the food hierarchy—*guanacos* and sea lions—lacked representation in all archaeofaunal sites and samples. Second, there remains of *guanaco* in 57% of the samples and of pinnipeds in 27% (Gómez Otero 2006). This is an indication that the *guanaco* had more significance in food consumption than pinnipeds. Both types of prey are represented by all parts of the skeleton, which indicates they were hunted in the vicinity and were taken in whole pieces to the camps. Several indicators of seasonal zooarchaeological features, such as the estimation of both prey individuals' age and the observation of thin sections of adult pinniped canine teeth, show that *guanaco* hunting took place all year round and pinniped hunting occurred during the summer season until early autumn. Pinniped bones were primarily concentrated at sites on the coasts of the Golfo San Matías, Punta Delgada (open sea) and Golfo Nuevo (Punta Pirámide and Bajada Colombo, Fig. 2). It is worth noting that sea lion colonies are found along these coasts nowadays, which suggests that such colonies already existed and were exploited when native peoples occupied the area.

As regards molluscs—the resource ranking second in the optimal diet model—remains were found in all archaeofaunal sites and samples. Moreover, 58% of samples solely comprised molluscs (Gómez Otero 2006). Prevailing taxa are ribbed mussels (*Aulacomya atra*) and limpets of the *Patella* genus, followed by small gastropods like *Buccinanops* spp. and *Trophon* spp. Mollusc valves were also used in the making of *beads*, spoons and *containers*. From these findings it follows that molluscs were a regularly exploited resource both as food and as raw material.

As far as *choique* is concerned—ranking third in the proposed hierarchy—and contrary to expectations, only one bone specimen was found in a site of the Golfo San Matías. This finding concurs with the scarce archaeological records of remains of this prey across Patagonia. However, there are plenty of sites with *choique* eggshells—some of them burnt—that show the local hunter-gatherers ate these large-sized eggs, which are available by the middle of spring and might have represented an abundant, nutritious, energetic and easy-to-obtain food source.

As put forwards in the preliminary model, minor vertebrates such as fish, birds and small mammals were scarce in archaeofaunal sets. Among the samples containing remains of fish, taxonomic diversity was observed but with a very few individuals per species. The largest variety was found in the coast of the Golfo San Matías: skates, bluefish (*Pomatomus saltatrix*), *mero* (*Acanthistius patachonicus*), Argentine seabass (*Acanthistius brasiliensis*), Argentine hake (*Merluccius hubbsi*),

Patagonian blenny, (*Eleginops maclovinus*), Argentinian sandperch (*Pseudopercis semifasciata*) and Brazilian sandperch (*Pinguipes brasilianus*).

With respect to marine birds, Magellanic penguins and cormorants are predominant and, like fish, they are represented by a very low number of individuals. As for terrestrial birds, no taxon was identified.

The archaeofaunal record of minor terrestrial mammals is also scarce. The more abundant ones are *armadillos* (*Zaedyus* sp. and *Chaetophractus* sp.) and small rodents (Cricetidae and Ctenomyidae). *Armadillos* are mainly represented by the plates in the shell, which might have been used as a container. As for rodents, the absence of marks of human processing suggests that, in most cases, their presence is due to natural causes. It was also determined the presence of skunk bones (*Conepatus* sp.) in one site of the Golfo San Matías. An interesting fact is the finding of cetaceans remains, recorded on surface sites in certain coastal areas of the Golfo San José, Golfo San Matías and Golfo Nuevo (Fig. 2), where whales and dolphins currently tend to strand. This allows us to infer that there was an opportunistic use of these animals with extremely high caloric content.

Finally, and contrary to the hypothesis of the preliminary optimal diet model,  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  isotope analyses of human bone remains show that plants had much more significance in the diet of these hunter-gatherers than originally expected (Gómez Otero 2007). In all individuals examined, type  $\text{C}_3$  or CAM photosynthetic pathways plants were present. In Península Valdés  $\text{C}_3$  plants are the majority, while the CAM plants are represented by cactus of *Maihueniopsis* and *Opuntia* genus. Likewise, fatty acids gas chromatography studies and  $^{13}\text{C}$  stable isotope analyses of organic waste in pottery potsherds indicate the presence of plants in all of them (Gómez Otero et al. 2015).

With regard to the technological record, in some cases it endorses the results of archaeofaunal and isotope studies and in other it contradicts them (see Lithic and Pottery Technologies, infra). Coincidences include the higher degree of energy used to make artefacts for hunting and processing *guanaco* prey, such as projectile tips, *bolas*, knives and scrapers. No tool was found which might have been related to pinniped hunting. Another consistency would be the presence of milling and pottery artefacts in late Holocene sites, which contributes evidence to the isotope record of  $\text{C}_3$  and CAM plant consumption. These tools may have enabled a more efficient and intensive exploitation of plants, especially calorie-rich carob tree (*algarrobo*) pods, which can be transformed into flour. Nevertheless, milling stones may have also been used to process meat (for example, to extract *charqui*) and fish products. Furthermore, the existence of fishing-related technology—lithic weights and a wooden hook—is inconsistent with the low record of fish remains in the area (Gómez Otero et al. 2015). It should be considered, however, that this lack of fish bones might be due to post-depositional factors, as indicated by actualistic studies in the area (Gómez Otero et al. 2015). The low number of fish and the high ichthyological diversity observed in several samples suggest that weights were mostly used in lines or fishing rods rather than in nets. However, caution should also be taken in the case of the technological record: on the one hand, no special technology is necessary to gather molluscs; on the other, it was possible to hunt

pinnipeds in the Atlantic coast on land with a simple cudgel, or their pups captured after causing a stampede in breeding colonies; finally, there may have been technology in organic materials which was not preserved.

## 5 The Use of Rocks and Minerals

### 5.1 *The Lithic Technology*

To assess the ways in which hunter-gatherers that settled in the Península Valdés made use of rocks, the regional structure of lithic resources (Ericson 1984) was investigated first. This made it possible to discuss supply strategies based on mobility and the use of space, technological choices and also the preferences or restrictions involved in rock selection (Nelson 1991). The methodology consisted in counting and characterizing the *nodules* lithology collected by one person for a pre-defined period of time (Franco and Borrero 1999). Then, a lithological identification of the hand sample was performed, as well as an analysis of thin sections of natural and archaeological samples. Finally, for each sample, the percentage of rock of good to excellent quality for flaking purposes was estimated.

According to the geological information available (see Chapter “[Geology of Península Valdés](#)”) the local supply of hard rocks consists mainly of Pliocene–Holocene gravels. The rock samples allowed for verification that the nodules potentially used for flaking were located in the San Miguel Formation (Haller 1981), in the Caleta Valdés Formation (Rovereto 1921), and in *the Rodados Patagónicos* (Fidalgo and Riggi 1970). This prevents relating the origin of the banks to a specific geological formation. Except for the San Miguel Formation, which arose after the maximum Holocene transgression, all other formations in the coast area already existed before the beginning of human occupation in the area about at least 7400 years BP (Gómez Otero 2006).

The systematic sampling of gravels helped to determine the presence of ten lithological varieties, where basalts prevail (56%), followed by siliceous rocks (18%) and riolites (15%). As for the properties of each raw material for flaked stone technology, basalts are of good to excellent quality, siliceous rocks are of good quality and rhyolites are regular quality rocks. Beach ridges and berms associated to present-day beaches (see Chapter “[Late Cenozoic Landforms and Landscape Evolution of Península Valdés](#)”) are the landforms that feature the greatest percentage of raw materials with qualities ranging from good to very good: 94 and 72%, respectively (Banegas et al. 2015). In contrast, the quality of spit barrier nodules is regular for *flaking* but acceptable for *percussion*.

As in the rest of Patagonia, the lithic record is the most abundant of the entire archaeological record and features the greatest spatial and temporal distribution in the Peninsula: 97.8% of the 94 archaeological sites documented include stone artefacts (Gómez Otero 2006; Gómez Otero et al. 2013b). However, the artefact

density among samples turned out to be variable and would apparently be related to the duration and form of spatial occupation, the site functionality and/or the occurrence of postdepositional processes as well (Goye et al. 2015). In this respect, taphonomic observations in mobile dunes showed that small lithic artefacts (<50 mm) tend to be displaced or buried in the sand substrate within very short periods of time (even minutes) depending on the speed and intensity of the wind. As to inferred activities, by way of example, the inexistence or little presence of lithic artefacts in *shell middens* might be related to specific and short-lived activities such as in situ gathering and consumption of molluscs (Goye et al. 2015). On the other hand, the existence of locations with medium to high artefact density and richness might be related to craftwork, tool manufacture or repair and/or the processing of fauna and vegetal resources (Gómez Otero 2006).

To the present day, the technological record of 17 archaeological sites have been studied ( $n = 2526$  lithic artefacts) and analysed through morphological and technical variables following the Aschero method (1975–1983) and the Aschero and Hocsman method (2004) (Gómez Otero et al. 1999; Banegas and Goye 2015; Banegas et al. 2015). For lithological determinations, different specialized analyses were conducted: thin section petrography, geochemical analyses of obsidians (Gómez Otero and Stern 2005) and fossil wood observation through Scanning Electron Microscope (SEM) and Dispersive X-ray Analysis (EDAX) (Banegas et al. 2015).

The results showed the intensive use of local raw materials for different purposes (Gómez Otero 2006; Gómez Otero et al. 1999; Banegas and Goye 2015; Banegas et al. 2015). Good quality medium basalt gravels (31%) and siliceous rocks (35%) were selected for *flaking*; large porphyritic and granitic rocks were used as hammer stones, anvils and milling hand stones (i.e. *manos*); small and flat pebbles from different rocks were used as stone weights for fishing; consolidated sandstones of Puerto Madryn Formation were used as blank for *metates* (milling flat stones) and leather scrapers; and cetacean fossil bones were used as *manos*. Evidence was found that large gravels from Caleta Valdés were moved to other places in the Península Valdés region (Fig. 2).

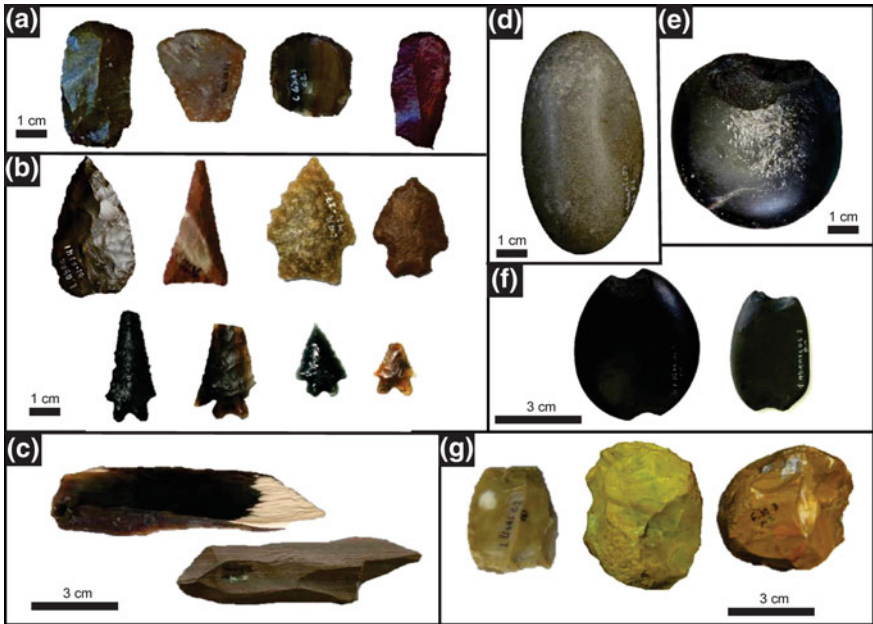
Two lithic reduction techniques were evenly used: direct percussion and *bipolar flaking*, mainly applied to thinning the smallest basalt nodules (Banegas and Goye 2015). In line with this, there is an abundance of *bipolar cores*, followed by *multidirectional extraction cores*, and third by cores with one or two extractions. Prevailing flaked products include *flakes*, although every site presented blades in very variable proportions (between 3 and 33%) (Gómez Otero et al. 1999; Gómez Otero and Stern 2005; Banegas and Goye 2015). Given the abundance and wide distribution of lithologies adequate for different types of artefacts, it is inferred that the supply of these local rocks might have been direct and might have implied low collecting costs. This might have resulted in the predominance of expedient artefacts (Binford 1979).



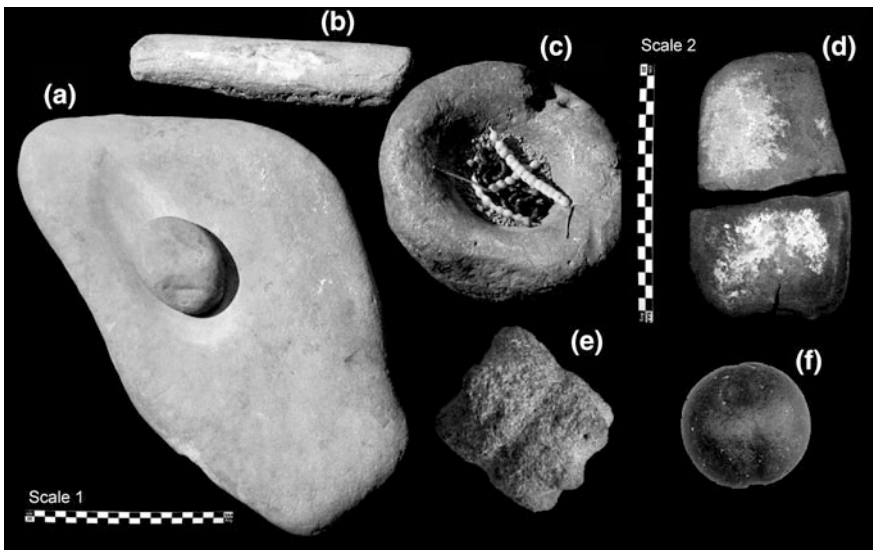
In addition to local rocks, allochthonous raw materials were used, but not frequently (Gómez Otero 2006; Gómez Otero et al. 1999; Banegas et al. 2015). Six varieties of obsidian stand out. Three derive from known sources: Telsen-Sierra Chata I (T/SCI), Sacanana I (SI), and Pampa del Asador I (PDAI)—the former two are located 180 and 330 km west, respectively, from the beginning of the Istmo Carlos Ameghino, and the latter is about 800 km south, in the central-northern portion of the Province of Santa Cruz (Gómez Otero and Stern 2005; Fig. 1). Other excellent quality rocks for flaking which also come from other regions are chalcodones and xylopals or fossil wood rocks. The former are found as veins associated with the Marifil Formation (Jurassic) (Malvicini and Llambías 1974) which outcrops at the border of the Province of Río Negro, 100 km west from the Istmo Carlos Ameghino (Haller et al. 2001; Massafferro and Haller 2000; see Chapter “Geology of Península Valdés”). Moreover, the petrified woods closest to the Península Valdés are located 150 km south west from it, in the area of Dique Ameghino (Fig. 1). Farther locations should also be considered, such as the “*Bosque Petrificado de la Costa*” (Petrified Coast Woods), located in Golfo San Jorge, 450 km south, and the “*Bosque Petrificado Ormaechea*” (Ormaechea Petrified Woods), near the Lago Musters and Lago Colhue Huapi (Fig. 1; Banegas et al. 2014). Furthermore, hematites, olivine and vesicular basalts, granites, slates and porphyritic rocks were also found. Porphyritic rocks are available in the volcanic outcrops of the Marifil Formation less than 100 km north, west and south of the Península Valdés region, while the rest of the rocks may be obtained from the west and north, in the Somuncurá plateau, within radiuses ranging from 100 to 300 km (Fig. 1). As expected, the implementation of curated technological strategies (Binford 1979) for obsidians and chalcodones was also determined (Gómez Otero and Stern 2005; Banegas and Goye 2015).

A high degree of artefact diversity was observed, which is indicative of the development of extraction and maintenance activities related to hunting and flaking, and also to meat, leather and vegetable processing. The flaked stone tools found include knives, end-scrapers, side-scrapers, denticulates, drills, burins, gouges, notches, fishing weights, and a variety of projectile points (Fig. 5). Ground stone artefacts are represented by *bolas* with and without equatorial groove, star-shaped maces, mortars, and milling hand stones. Moreover, large pebbles were used as hammer stones, hand stones and anvils (Fig. 6). It is worth noting that heavy and very large tools were left at various settlements as site furniture. In several base camps, the simultaneous presence of milling and ceramic tools was observed, which indicates plants and other foods processing and consumption in situ (Gómez Otero 2006; Gómez Otero et al. 2015).

By the final late Holocene (after 2000 BP), a gradual increase in the selection of non-local rocks was evidenced, probably related to the intensification of social and economic interaction which consisted in the exchange of objects, raw materials, designs and information (Gómez Otero 2006). A study on the morphometric variability of projectile points revealed similarities among designs recorded both in northern and southern Patagonia (Gómez Otero et al. 2011).



**Fig. 5** The flaked stone tools founded in Península Valdés. **a** End-scrapers; **b** projectile points (scale 1 for **a** and **b**); **c** retouched knives; **d** hammer stone; **e** anvil; **f** stone weights for fishing; and **g** cores (scale 2 for **c**–**g**)



**Fig. 6** Grinding and chipping tools founded in Península Valdés. **a** *Metate* or milling flat stone; **b** *mano* made of a cetacean fossil bone; **c** milling mortar; **d** star-shaped maces; and **e** *bola*

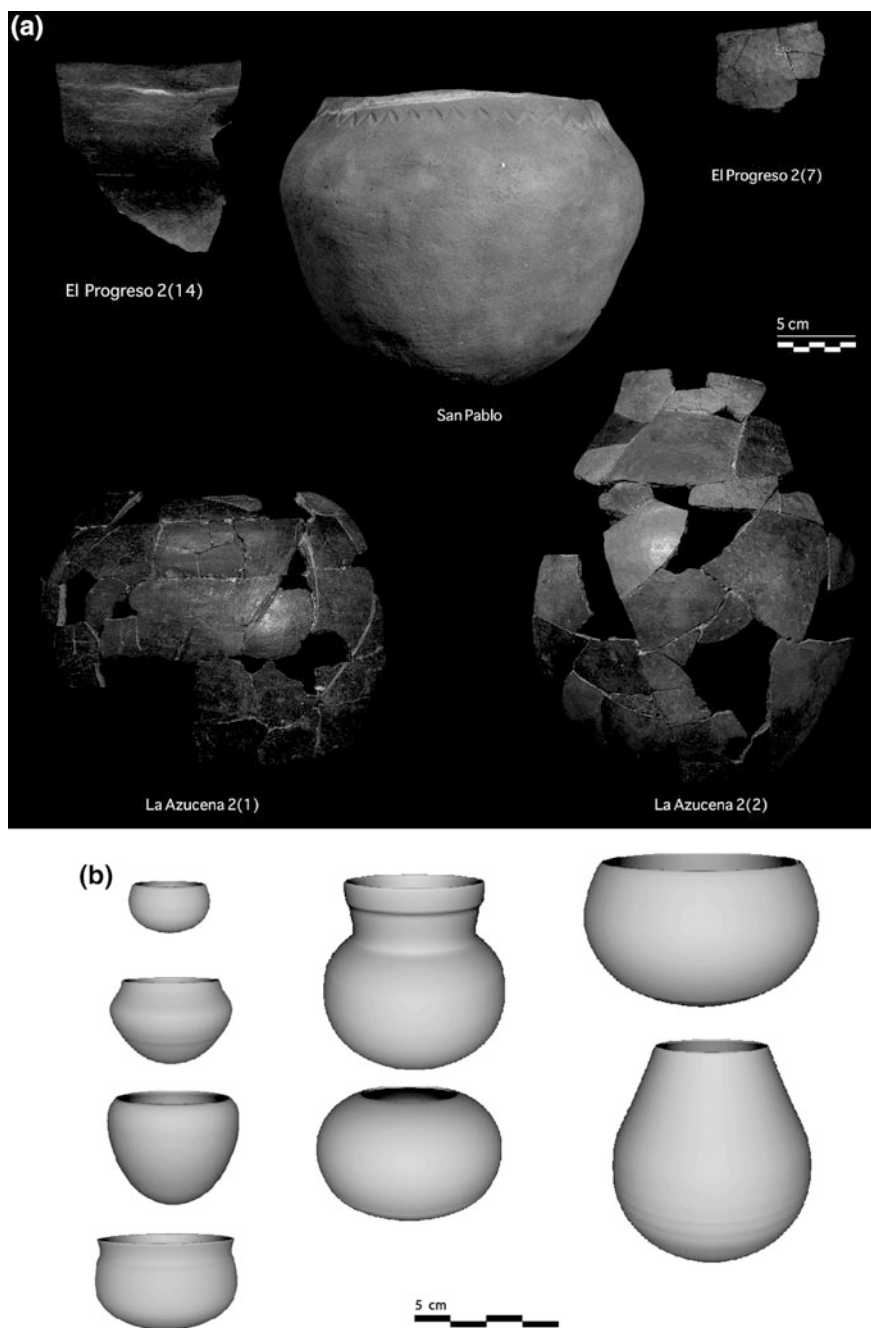
## 5.2 *The Pottery Technology*

The pottery record in Península Valdés has been one of the most researched across Argentine Patagonia since 1998: to date, over 1289 potsherds have been analysed from 36 archaeological sites (Gómez Otero et al. 1998; Schuster and Gómez Otero 2009; Schuster 2014), most of which would have served as base camps for hunter-gatherer groups) (Gómez Otero 2006) (Fig. 7). Radiocarbon dating shows that pottery technology probably developed in the Peninsula at least 900 years <sup>14</sup>C BP (Gómez Otero et al. 2013b), that is, during the final late Holocene.

Several analytical techniques were applied in pottery study: macroscopic and microscopic analyses (petrography), X-ray diffraction, 3-D digital reconstructions and X-ray images (see *infra*). Furthermore, organic remains adhered to or absorbed by the pores of ceramic pieces were examined through different physical and chemical analyses: isotope analyses and gas chromatography. With regard to the selection of raw materials for pottery production, microscopic analyses and X-ray diffraction showed much resemblance in the mineralogical associations of pastes and soils of the Peninsula (Bouza et al. 2007). In decreasing order of abundance, the following were identified: illite, interstratified illite-smectites, quartz, plagioclase, potassium feldspar, acid vulcanite, opaque minerals (Bouza et al. 2007; Schuster 2009, 2014, 2015) (Fig. 7). Calcitic-clay aggregates and the fine material of the ceramic matrix probably derived from soils with soil horizons rich in clay (Btk), so the calcareous material and sand grains of the pastes would constitute natural anti-plastics (Bouza et al. 2007). These features indicate that pottery technology had a local development, which is to be expected given the abundance, wide distribution and accessibility to several sources of clay materials (Fig. 3), in addition to the availability—albeit more restricted—of other indispensable resources such as firewood and fresh water.

As to the manufacture of pieces, macroscopic studies determined that the most frequent primary technique to raise the body of the pieces was ring building (Schuster 2014) while X-ray analyses indicated that in some cases pinching was used (Schuster and Banegas 2010; Schuster et al. 2013).

As far as morphology is concerned, in addition to a single, entire vessel, the form of twelve vessels was partially reconstructed (Schuster 2014). A wide prevalence of ovaloid or spheroid pieces was observed, with simple shapes, straight sides and concave bases (Fig. 7). Most of these features favoured heat transmission (Rice 1987; Skibo 1992; Orton et al. 1997); therefore, they were possibly fit for domestic tasks such as cooking food. With less frequency, compound-shaped vessels were discovered that feature sides with external reinforcement, necks and/or handles (Schuster 2014). As to mouth opening, while closed or restricted mouths prevail, there are also open-mouthed or unrestricted-mouthed vessels whose diameter does not generally exceed 16 cm. This trend probably indicates openings that, on the one hand, enabled easy access to their content while food was being mixed or stirred and that, on the other hand, made it difficult for content to rapidly evaporate,



**Fig. 7** Pottery founded in Península Valdés. **a** Ceramic archaeological vessels reconstructed; **b** 3-D reconstructed models of potsherd

especially liquids. This would have shortened cooking time and reduced firewood consumption while performing such tasks.

Another study involved 3-D digital reconstructions that secured not only three-dimensional models but also the opportunity to calculate volume or capacity, as well as the weight of reconstructed pieces (Fig. 7; Schuster and Quinto Sánchez 2016). This is the first time ever this technique is applied in the study of pottery of hunter-gatherers from Patagonia. Based on the data obtained, it was determined that the ceramic set is represented by ceramic pieces whose capacity (or gross volume) ranges from 0.21 to 10.87, with a mean of 3.2 L. The relationship between size and capacity or volume makes it possible to put forwards certain considerations related to the “movement” or “mobility” of pieces while performing several tasks or giving them different uses in the past. Empty container weight estimation (or paste emptiness) also makes it possible to put forwards and explore the transportability of pottery among mobile hunter-gatherer societies such as those considered here. Based on the proposal by Sopena Vicién (2006), most of the ceramic set under study in the Península Valdés consists of highly “dynamic” pieces because their weight and volume are below 0.50 kg and 2.57 L, respectively (Schuster and Quinto Sánchez 2016).

With respect to decoration, in the set being analysed, decorated vessels or potsherds are scarce, although several execution techniques were identified: incisions, light *engobe*, and red and black painting (Schuster 2014; Fig. 7). While decorated pottery can be used for several domestic purposes, its use is expected in activities that do not involve cooking, such as serving or consuming, since these pieces require more work (Rye 1981). However, paint coating or *engobe* on the sides serves an important functional purpose as it increases resistance to breaks and/or fractures and, also, waterproofs pieces avoiding the loss of liquids by evaporation through pores (e.g. Rice 1987; Rye 1981).

Petrographic studies also show that some vessels could have been made outside the Península Valdés. Three pieces feature an abundant proportion of mica (muscovite and biotite) in their paste and they stand out from the rest because of the finish on the surface (e.g. intense polishing, red paint, incised decoration and/or scraping) and certain morphological features (e.g. reinforced lips). Furthermore, there are other pieces whose paste composition does not feature elements that are probably allochthonous such as mica but, nevertheless, show potentially extra-regional morphological features, such as handles or neck vessels (Schuster 2014, 2015). These vessels may have entered the Península Valdés region after being made and decorated in another production location, although, for now, it is not possible to rule out their local production based on replication or imitation of foreign techniques and designs (Schuster 2015). In this regard, as Gómez Otero (2006) puts forwards, for the last 1000 years—when pottery was probably adopted in the region—interethnic contact and the existence of extensive exchange networks outside the Patagonian region intensified. Therefore, if in the study area several objects were found that possibly come from the Cuyo area, the Northwestern area of Argentina and central Chile (Gómez Otero 2006) some ceramic vessels with different morphology and decoration from the rest of the set—as well as non-local

aggregates in the paste—are very likely to have reached Península Valdés through some kind of mechanism of exchange or circulation of goods, products and ideas. This fits with the lithic technological studies, which demonstrated the higher record of foreign rocks for late Holocene times.

On the basis of isotopic and chromatographic studies (Gómez Otero et al. 2014) on both local and probably allochthonous pieces, the presence of processed and/or preserved food remains was identified. The results obtained allowed for estimation of the following trend: there is presence of vegetables in all cases, followed by terrestrial proteins and fat and, to a lesser extent, marine proteins and fat. Some of this marine fat would correspond to fish. With regard to a possible link between morphological and technological features of ceramic vessels and the type of food identified through physical and chemical analyses, no association could be demonstrated (Schuster 2014; Gómez Otero et al. 2015). This suggests that no given form was selected to process different types of food.

Based on the general morphology of ceramic vessels, the data retrieved from isotopic and chromatographic studies, and from the ethnographic compilation of different cooking techniques, most of these types of food was possibly processed through boiling. Thus, stews or soups were probably cooked, made with vegetables only, or with meat from terrestrial mammals (e.g. *guanaco*) or sea fish, although fat from fatty pinnipeds or fish may have been removed or stored (Gómez Otero et al. 2014).

## 6 Synthesis and Conclusion

The archaeological record of the Península Valdés shows that this area was intensively used by native hunter-gatherers since at least the mid-Holocene to the nineteenth century. These populations located their settlements in sandfields across the littoral zone, primarily on coastal *bajadas* and low marine terraces near fixed shoals of molluscs. In the coast environment, they could obtain a variety of vital resources such as marine and terrestrial food, good quality rock nodules for flaking and other uses, clay minerals for pottery technology, and also a minimal fresh water reserve in the dunes. Mobility patterns included short trips to diverse resource supply sources: fresh water and salt in the Salina Grande and Salina Chica and big pebbles in the Caleta Valdés area.

It follows from the archaeofaunal, isotope and technological information that the *guanaco*, a variety of molluscs, and plants may have been the most systematically consumed resources in the study area within the time frame under analysis. Pinniped consumption, albeit frequent, was probably neither systematic nor intense, except in specific cases. The basic diet—namely, *guanacos*, molluscs and plants—apparently contributed all the necessary protein, vitamin, mineral and carbohydrate requirements for adequate nutrition, but not lipids. Lipids may have been provided by other resources: pinnipeds, *armadillos*, some fatty fish, cetaceans and rhea eggs. Moreover, marine birds may have contributed linoleic acid. Some fat may have

been stored as a strategy to withstand seasonal shortages. This might have been favoured by salt availability in the two *salinas* of the Península Valdés. In sum, when the native peoples occupied the area, the abundance and diversity of food may have allowed them to live by a varied, complete diet in terms of basic nutrients. As a result, ancient populations probably did not face a risk of death by starvation or food stress situations, as evidenced by health and nutritional studies (Gómez Otero and Novellino 2011).

As regards lithic technology, these hunter-gatherers used mainly rocks that were locally available through pebbles, consolidated sandstones and fossil cetacean bones. For flaking technology, they selected basalt and silica nodules and applied two reduction techniques: direct and bipolar percussion. The basic toolkit comprised knives, end-scrapers, side-scrapers, denticulates, drills, burins, gouges, notches, fishing weights, and a variety of projectile points. To make side-scrapers and projectile points, they selected best quality rocks, some of them allochthonous, like chalcedonies and xilopals. The big pebbles of Caleta Valdés were used as *manos*, hammer stones and anvils, while sandstones and fossil bones were primarily employed in milling activities. With regard to pottery technology, the abundance and good quality of local clay sources allowed its important development in the final late Holocene. The native populations manufactured vessels with generalised or multifunctional purposes, since most of their technical and morphological variables were probably fit to serve a wide range of domestic activities, e.g. preparing, storing and/or cooking food and liquids (Schuster 2014). Based on the foregoing, it was probably unnecessary to make many ceramic pieces because each could be used for several, different purposes. In addition, specialised analyses made it possible to identify food remains in all samples analysed which would support the hypothesis that pottery technology in the study area was probably related to domestic activities (Schuster 2014; Schuster and Gómez Otero 2009). Specifically, the discovery of vegetables in all samples examined supports the hypothesis that, in the area, pottery was adopted as a technological strategy to leverage their consumption more intensively (Gómez Otero 2006). This technology, which would have been functional to the lifestyle of hunter-gatherers, probably favoured an improvement in the sanitary and preservation conditions of food, as well as a broader variety of options to prepare and consume several animal and vegetable resources available in the area (Gómez Otero 2006).

These hunter-gatherers did not live isolated from other populations: the presence of foreign rocks (obsidians, slates, hematite, xilopals, chalcedonies, vesicular basalts), and of three ceramic vessels, which might have been manufactured in northwest Patagonia or perhaps central Chile, indicate that they took part in an extensive trading net since at least the late Holocene. Local native inhabitants could exchange shells, dry molluscs, dry fish, fat from marine mammals and cetacean fossil bones. This trade would have comprised not only raw materials and goods, but methods, designs, ritual practices and information, among others. To sum up, the favourable environmental conditions of Península Valdés were beneficial to

human life since at least the middle Hocolene and population growth for thousands of years, until 1779 when the Spanish Crown occupied the San José Gulf and the Salina Grande area. And then, another history began.

## 7 Perspectives and Future Work

Although the knowledge of the Península Valdés archaeology has improved remarkably in the last 20 years, further research needs to be done. The agenda involves the extension of the different studies that have just been made and also new analyses. Further work needs to explore the spatial and temporal cultural diversity, as well as the range of the social relationships and trade nets these populations sustained inside and outside the Patagonia region. In addition, new DNA studies in human skeletal remains,  $^{18}\text{O}$  isotope analysis in fresh water sources, mass spectrometry to determine the origin of organic residues in ceramics, identification of phytoliths and fatty acids recovered in grinding tools and actualistic studies are necessary.

New survey studies and analytical techniques will allow us to improve the understanding of the way of life and cultural changes of the hunter-gatherer populations that occupied the Northern coast of Patagonia since at least the middle Holocene.

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## Glossary

Bead	A small piece of glass, stone, shell or similar material that is threaded with others to make a necklace or rosary or sewn on to fabric
Bipolar core	Core smashed by bipolar reduction or percussion, likely by placing it on a stone anvil or floor and chipping it with a hammer stone



Bola	Weighted ball of stone which are either grooved or pierced for fastening to rawhide thongs and used for hunting. Usually consists in two or more lobular or pear-shaped stones attached each other with long thongs
Conchero (“shellmidden” in English)	A mound of domestic waste consisting mainly of shells, common at prehistoric sites. They can be of different size and height
Container	An object for holding or transporting something
Core	A piece of flint from which flakes or blades has been removed by direct or bipolar percussion
Curated technological strategies	Strategies applied in order to preserve tools life. Tools are carried from place to place, maintained, reused and sometimes recycled into other tool forms. These strategies are expected when good quality raw materials are scarce
Engobe	Clay diluted in water and sometimes mixed with minerals pigments. It is used in pottery decoration
Expedient artefacts	Tools made and used in response to an immediate need and not maintained for future use. This kind of artefacts is expected when lithic raw material is abundant
Flake	A piece of hard stone chipped off for use as a tool by prehistoric humans
Flaking	Action of extracting flakes from a nodule. Bipolar flaking: action of extracting flakes
Multidirectional extraction core	Core chipped in all its faces
Nodule	Piece of stone used as raw material for lithic technology
Potsherd	A broken piece of ceramic material, especially one found on an archaeological site.

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