An Early Holocene task camp (~8.5 ka cal BP) on the coast of the semi-arid north of Chile

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According to current thinking, the peopling of South America involved a coastal as well as an inland exploitation. Here the authors describe a camp that may denote a transition between the two. As indicated by bifacial tools, the investigation shows that people began to move inland and hunt mammals around 8500 cal BP, perhaps in association with a change in the climate.

Keywords: Chile, peopling of South America, coastal, inland, shell midden, bifacies

Introduction

Among current hypotheses about the peopling of America, the model of a coastal route, as an alternative to the 'classic' inland model, is gaining strength (Fladmark 1979; Dixon 2001; Surovell 2003; Erlandson *et al.* 2008). In North America, some archaeological contexts on

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the Pacific coast show evidence suggestive of early littoral and insular adaptations dating to the Pleistocene/Holocene transition and Early Holocene (Rick *et al.* 2003; Bradje & Erlandson 2006; Erlandson *et al.* 2007, 2008, 2009, 2011).

Evidence from coastal South America also tends to support such a hypothesis (Dillehay 2000, 2009). Archaeological research on the South American Pacific coast has revealed some of the earliest human occupation with a strong dependency on coastal resources (Llagostera 1979; Keefer *et al.* 1998; Sandweiss *et al.* 1998). This evidence dates back some 13 000 to 11 000 calendar years BP (cal BP) (Sandweiss 2003) and is well identified in numerous contexts of the South American Pacific coast. Evidence from later settlements (Stothert 1985; Sandweiss *et al.* 1989; Lavallée *et al.* 1999a, 1999b) suggests a sustained occupation of the coast, but less is known about how the inland areas became settled in their turn.

The first human occupation of the coast of north-central Chile throws light on this problem. Recent studies of settlement and subsistence patterns on the southernmost coastal area of dispersion of the Huentelauquén cultural complex (31–32° S), have made it possible to distinguish two settlement modes: in ~13 000–11 000 cal BP, a first occupation pattern along the coastal margin, with emphasis on the exploitation of marine resources (Jackson *et al.* 1999), and a second, later pattern ~11 000–9000 cal BP, with sites oriented facing ravines, showing emphasis on hunting activities and, to a lesser degree, on the gathering of coastal resources (Jackson & Méndez 2005). The latter sites provide temporal continuity, as do other contexts located on the coast of Chile's northern arid zone (Llagostera *et al.* 2000). An analogous situation can be described for coastal Ecuador (Stothert 1985) and Perú (Sandweiss *et al.* 1998), where the littoral archaeological record suggests continuity after the Pleistocene/Holocene transition.

The discovery of several archaeological sites on the southern coast of the semi-arid north of Chile, located near the coastline but adjacent to ravines, show contexts that seem to be part of the second settlement trend. Therefore they can be used to evaluate the regional development of the coastal settlements and their relation to other settlements with a view to revealing the alleged coastal-to-inland movement. Besides their location along the ravines, these sites show an emphasis on bifacial tool production directed to hunting activities. Therefore, they could have functioned as camps oriented to areas where potential prey gathered.

Within the framework of this problem, we carried out a study on one of these sites (LV 531), where there was both bifacial production for lithic projectile point manufacture and evidence for sea mollusk consumption. The archaeological record suggests that the site corresponds to a locality repeatedly occupied with a series of task-specific camps. These are discussed within the frame of the mobility and subsistence patterns of these early human groups.

Study area and palaeoenvironment

The study area is located on the coast of Choapa province (32° S.), at the south end of the semi-arid north of Chile (28–32° S), in the locality known as Pichidangui (Figure 1). The geomorphology of this zone consists of a long sandy beach delimited to the north and south by small peninsulas with rocky coastlines. The coastline shows a varied and abundant marine

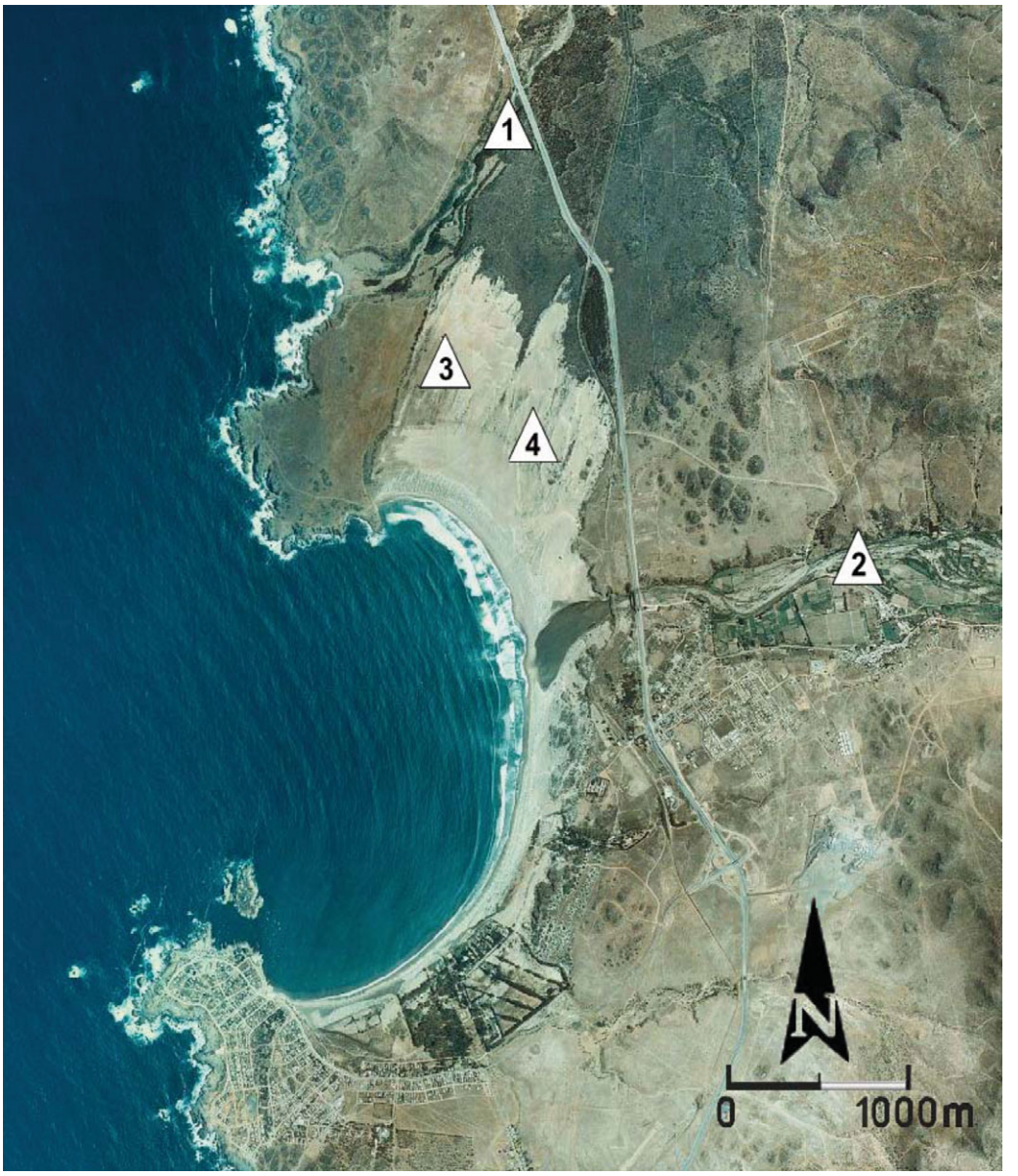

Figure 1. Map of Pichidangui Bay showing the sites mentioned in the text: 1) Palo Colorado stream; 2) Quilimarí stream; 3) LV 547; 4) LV 531.

and littoral fauna favoured by the upwelling of deep waters enriched with the nutrients of the South Pacific. Adjacent is the raised beach and, to the east, a system of transversal dunes of recent origin. These dune-fields border on the slope of an old marine terrace (20–40m asl), upon which is an extended system of wind-flattened dunes, delimited to the north and south respectively by the Palo Colorado and Quilimarí streams. These streams formed ravines that

concentrate shrubs and woodland, constituting natural routes suitable for the movement towards inland valleys and Andean environments, where camelids were abundant.

Climatically, the area corresponds to the transition between the northern hyper-arid zone and central Chile's Mediterranean zone. It is characterised by dry summers and scant precipitation during winter as a result of the almost permanent presence of the South Pacific subtropical anticyclone (Van Husen 1967). Additionally, this zone is highly sensitive to the variations associated with the El Niño Southern Oscillation (ENSO). During El Niño events (negative extreme phases of ENSO), abnormally warm and humid winter atmospheric conditions predominate, whereas abnormally cold and dry atmospheric conditions predominate during positive extreme phases of the La Niña phase (Aceituno 1988).

Investigation

The LV 531 site was discovered and briefly described in the 1960s (Bahamondes 1969). It is located towards the south end of the vast system of palaeodunes and immediately to the north of the lower course of the Quilimarí stream (Figure 1). Its location corresponds to the edge of the coastal cliff of an old marine terrace upon which a system of dunes was deposited. This system was subsequently deflated in a south-west direction due to predominant winds, leaving an elongated hollow in the same direction. Consequently, the site was located over the dune and upon its abandonment it was covered by at least 4.3m of sandy deposits, which later wind deflation re-exposed. The sea shore was located 630m west of the site at the time it was occupied.

Cultural remains exposed by wind blow on the surface were systematically collected using grids covering an area of 48m^2. Next to the deflated area, anthropogenic deposits were identified and a 6m^2 excavation was carried out. Here small accumulations of shells were defined (Figure 2) and the majority excavated separately. All sediments were sieved (4mm sieve).

Faunal remains

The small shell accumulations produced between 8 and 100 specimens of *Mesodesma donacium*, with a total of 968 specimens, plus some gastropods. Left and right counting of valves did not reveal significant differences, which indicates that mollusks were carried as a whole to the site, probably as 'snacks'. Some shell fragments were recorded next to the lithic processing area, constituting a total of 15 specimens (MNI), including *Mesodesma donacium* and the rocky intertidal gastropods: *Concholepas concholepas*, *Tegula atra*, *Fissurella nigra* and *Fissurella maxima*. Mollusks were taxonomically identified based on the descriptions for species in the region (Marincovich 1973; Osorio *et al.* 1979; Guzmán *et al.* 1998). For quantification, some of the criteria proposed by Grayson (1979) were utilised (MNI).

Lithics

The lithic artefacts were primarily recovered during the surface sampling stage. These were classified using the existent typology for the region (Jackson *et al.* 1999). Debitage analysis

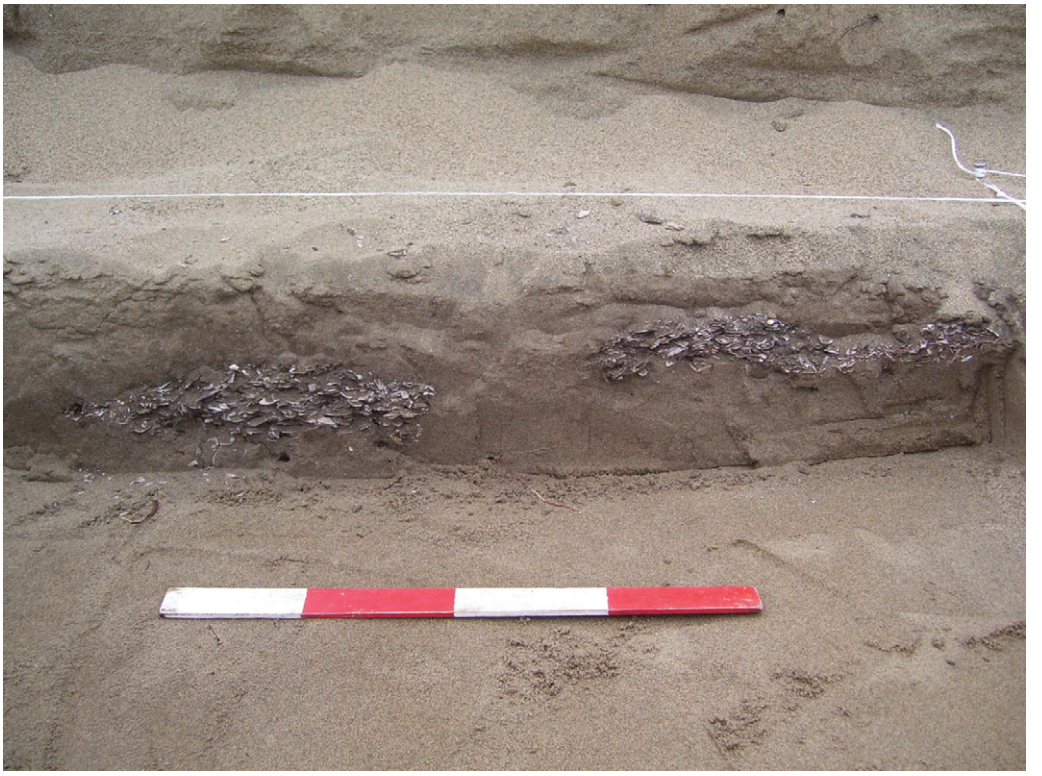

Figure 2. Detail of the shell middens at LV 531.

was used to identify the types of instruments manufactured and the stages in the reduction sequence. Raw material identification was based on previous regional sampling carried out along ravines (Galarce 2004), making it possible to distinguish local from exotic rocks.

The lithic assemblage recovered during the surface sampling is represented by two polyhedral cores reutilised as planes and three flakes with marginal retouch. Additionally, a pentagonal 'cogged stone' characteristic of the Huentelauquén complex had been previously collected by Bahamondes (1969) at the site, along with several bifacial blanks, stemmed lanceolate projectile points (Figure 3), bifacial knives, scrapers, planes, grinding stones on ovoidal pebbles and spear-thrower hook. Some scrapers and knives were also made, which were discarded once utilised, as well as some grinding stones, probably associated with the processing of pigments or vegetables.

The debitage comprised a total of 2578 pieces of which only 53.6% (1373) were complete (yielding platform). They consist of bifacial thinning debitage (81%), retouch debitage (3%) and core by-products, basically flakes, without intentional edge-modifications (16%). This evidence clearly implies that the main activity on the site was the production of bifacial blanks, which are represented by the initial and intermediate stages of their reduction process (thinning flakes), with a predominance of large and medium-sized debitage, and a low presence of retouched flakes (Figure 4).

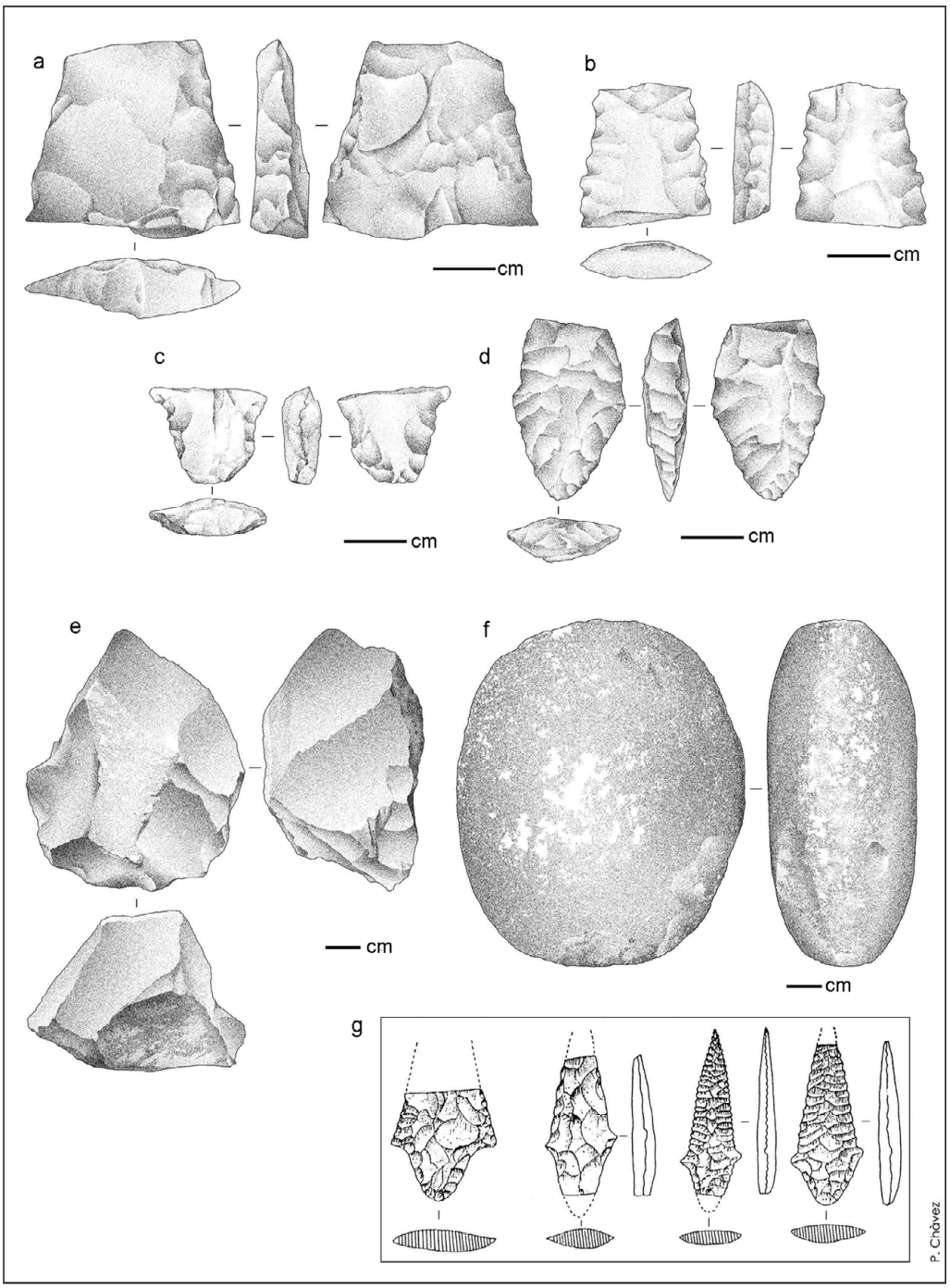

Figure 3. Principal artefacts recovered by surface collection and excavation at LV 531.

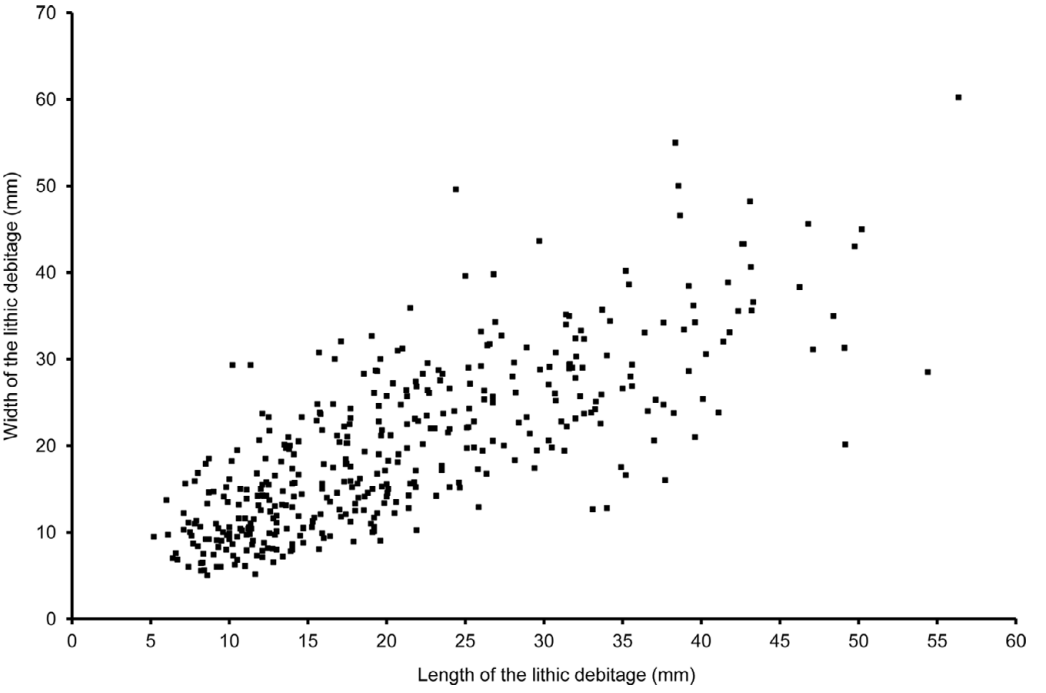

Figure 4. Length-width relationship of lithic debitage.

The dominance of bifacial debitage, whose particular characteristics indicate thinning phases, suggests the occurrence of intermediate stages in the bifacial elaboration process. Pre-elaborated blanks of local-raw material were brought to the site. The scarce presence of retouched debitage suggests that the great majority of these preforms were meant to be versatile implements (Kelly 1988; Nelson 1991), serving a variety of functions, although the great majority must have eventually ended up as lanceolate projectile points in other localities considering the conspicuous regional occurrence of this type at the Huentelauquén sites.

Local lithic sources such as silicified tuffs and rhyolites (99.65%) dominate the assemblage. These are accessible at the Palo Colorado ravine, no farther than 400m from the site (Galarce 2004). Non-local raw materials comprised only 0.35% of the sample. Among them, the nearest known source, Grauvaca Arcosica, (0.19%) is located in the Chalinga river valley, 75km inland, and the nearest source for quartz (0.19%) is Cuesta de Cristales, located 40km inland. The latter corresponds to an area where several Huentelauquén complex sites have been recorded (Jackson 1998; Méndez *et al.* 2010). The grinding stones were made of granite.

Context and chronology of LV 531

Material observed on the surface and in the stratigraphy suggests a certain spatial organisation of the settlement: a mollusk consuming/discarding area and an adjacent lithic production/discarding area, both clearly differentiated. Deflation affected primarily the area

Table 1. Summary of ^{14}C ages at LV 531.

Lab. code	^{14}C age (BP)	1σ calibrated range (cal BP)	2σ calibrated range (cal BP)	Midpoint (cal BP)	Material dated
CAMS 144812	7780±35	8542–8455	8584–8426	8499	Charcoal
CAMS 144818	7880±25	8633–8559	8713–8524	8599	Charcoal
CAMS 144653	8125±30	9077–8799	9119–8778	9001	Shell*

*Mesodesma donacium.

with lithics, while the area with the small shell middens remained stratigraphically intact. Differences in depth and the stratigraphic superimposing of some of the shell middens suggested more than one occupational event within the site.

Two charcoal samples and one shell sample from the stratified deposits were radiocarbon dated by AMS. Ages were calibrated with the OxCal version 4.1 program (Bronk Ramsey 2009) with curve ShCal04. The radiocarbon dates (Table 1) calibrated at 1σ suggest three independent occupations. However, at 95.4% certainty, a statistical overlap is observed between the two youngest (on charcoal). The ^{14}C date for the shell must also be considered somewhat younger than that shown, taking into account the reservoir effect for the Early Holocene estimated in 911±278 yr (400 + DR = 511±278) for these latitudes (Vargas *et al.* 2009). Chronological differences at the site are thus minimal, suggesting short-term occupational events within a limited period, coincident with the onset of the most arid pulse recorded for the region around 8600–6000 cal BP (Maldonado & Villagrán 2006; Maldonado *et al.* 2010).

Discussion and conclusions

The characteristics of this site tend to confirm the settlement pattern proposed for the second phase of the Huentelauquén complex (11 000–9000 cal BP), where settlements were oriented towards ravines, and the beginning of a more active coastal-inland interaction (Jackson & Méndez 2005). Chronological data at LV 531 suggests this phase should be extended at least to 8500 cal BP. Although during this period there is still use of marine resources, the emphasis shifted towards terrestrial game, as suggested by a greater production of bifacial projectile points. In this respect, the site is an example of the transition from an essentially coastal adaptation to a mixed economy, within a clear temporal frame.

A similar situation was observed at another site within the same locality. Surface sampling (48m^2) at LV 547, located in the Palo Colorado ravine, showed a dominance of bifacial thinning debitage (58.37%), 100% on local raw materials. The assemblage also comprises expedient instruments on flakes, Huentelauquén-type projectile point fragments in extra-local raw materials (red silica and quartz crystal), as well as some grinding instruments linked to sea mollusk remains. Camelid bone remains have been recorded in the periphery of the site, suggesting probable butchering activities in the proximity of the settlement.

Both sites (LV 531 and 547) can be regarded as 'task camps' reflecting a conspicuous mobility type, where small-sized groups integrated littoral spaces/resources with a wider

geographical setting including intermediate valleys and Andean environments. In this scenario, the supply and transport of bifacial instruments as versatile instruments became an essential technological requirement.

Unlike the earliest phase of the Huentelauquén complex (13 000–11 000 cal BP) (Jackson & Méndez 2005), for this time-span it has thus far been impossible to identify residential camps that could function as foci for task camps. This is crucial to fully understand the settlement pattern and mobility system. It may be that the Huentelauquén type-site, located some 70km north, fulfilled this function. Unlike the sites described above, this more extensive location, dated between 10 500 and 8900 cal BP, yielded a vast array of materials, including 'cogged stones' and other instruments characteristic of the complex, and human burials (Llagostera *et al.* 2000).

Palaeoclimatic studies based on fossil pollen and sediments in the neighbouring region infer a series of changes in humidity at the end of the Pleistocene and the beginning of the Holocene. Relatively humid conditions have been recorded around 13 000 and again around 10 600–9600 cal BP, and drier periods have been identified between 9600–9000 and 8600–6000 cal BP, the latter one being the driest phases recorded during the Holocene (Villagrán & Varela 1990; Maldonado & Villagrán 2006; Maldonado *et al.* 2009, 2010). A similar scenario has been confirmed for the Early Holocene on the basis of soil studies in the wider region (Veit 1996). But the available regional evidence suggests that post-Pleistocene sea-level variations have not been significant (Ortega 2006).

The shift towards a wider variety of environments between 11 000 and 8500 cal BP could have resulted from a need to explore other territories to set up social relationships with other inland groups or to incorporate a greater environmental diversity.

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