

## Article

# Different(ial) Human Use of Coastal Landscapes: Archaeological Contexts, Chronology, and Assemblages of El Teniente Bay (31° S, Chile, South America)

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**Abstract:** Coastal landscapes of the Pacific coast of South America are regarded as bountiful biomes, as they are zones on the fringes of Eastern Boundary Upwelling Ecosystems. Cumulative research shows an almost uninterrupted presence of mobile hunter-fisher-gatherer communities throughout the Holocene in North-Central Chile (29°–32° S). However, local-scale differences reveal the variability that is concealed by this broad characterization. Recent research in El Teniente Bay (31° S) shows few sites and occupations suggestive of low occupational redundancy as well as reduced archaeological assemblages, indicating limited activities in this landscape. However, several occupations date to the middle Holocene, a period when discontinuities in human occupations in response to adverse environmental conditions have been suggested on regional and supraregional scales. The main occupations detected at El Teniente are interpreted as a response to such conditions and in the context of changes in land use. Despite the spottiness of the archaeological record of El Teniente Bay, it is important in terms of its chronology and the differing trends in the use of space in comparison to other areas that have been the focuses of research. This paper addresses the archaeological record of El Teniente Bay and discusses its implications for human land use in the wider area of the coast of North-Central Chile.

**Keywords:** coastal land use; hunter-fisher-gatherers; human–environmental interactions; middle Holocene; subtropical Pacific coast

## 1. Introduction

In studying how human distribution varies across landscapes and how past populations occupied environments, we recognize that generalizations tend to mask diversity. This oversight is problematic in archaeology because researchers tend to focus on sites with more frequent, visible, or conspicuous archaeological records. This bias considerably skews the development of land use models because areas at the bottom of spatial and resource rankings also provide valuable information for understanding human landscapes [1–3]. The less occupied, sporadically visited, transitory, or boundary areas are highly informative

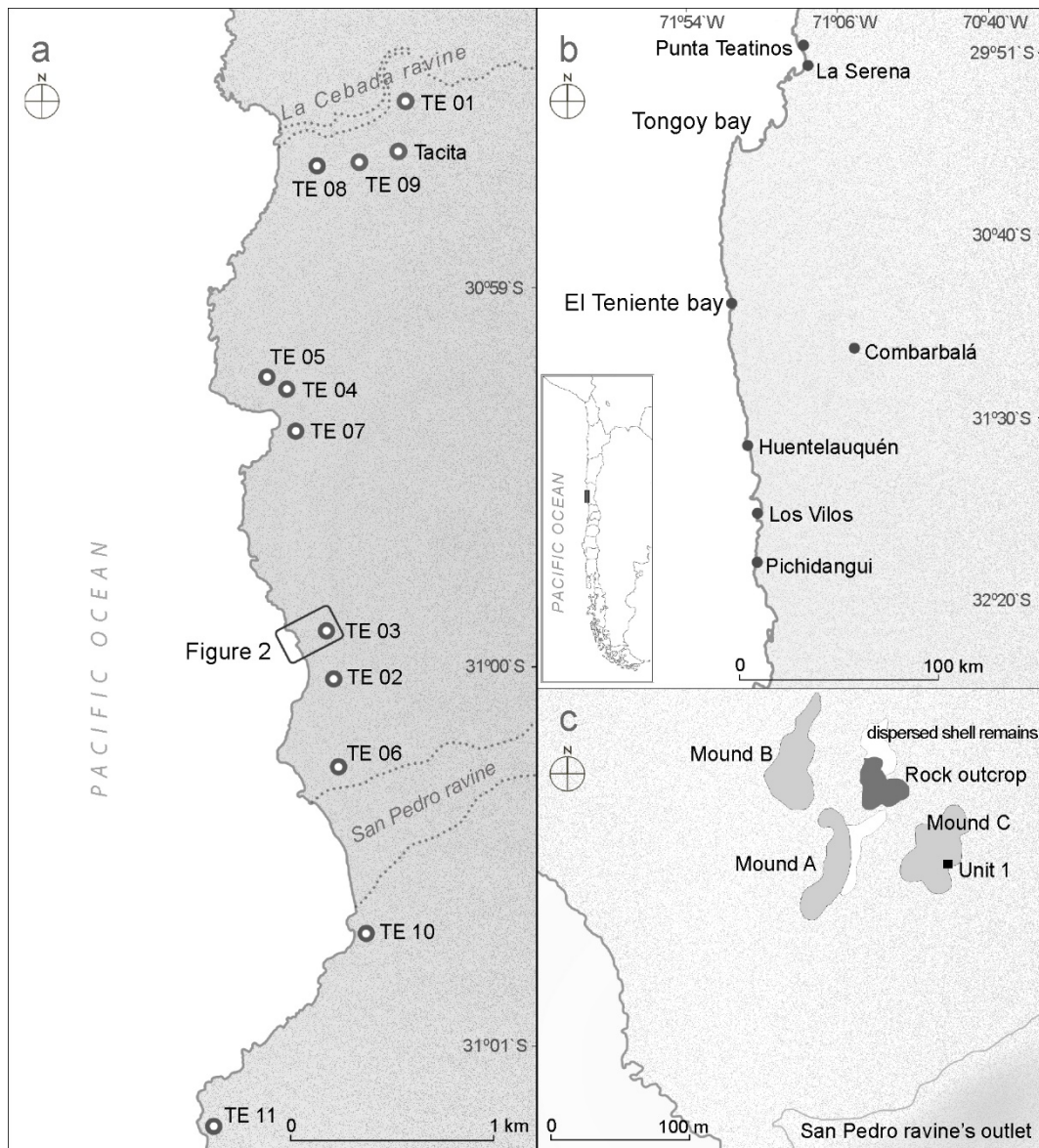
of decisions made in the cultural geography of a large space [4–7]. South American Pacific coastal landscapes are considered highly productive ecosystems because they are fed by the Humboldt Current, which produces highly active upwelling [8,9]. This setting was likely recurrently occupied by hunter-fisher-gatherers who used its resources throughout the Holocene [10–14]. However, these environments not only show geographical variation but also experienced centennial to millennial variability across the Holocene, as indicated by paleoenvironmental reconstructions [15]. Archaeology and earth sciences have the potential to build meaningful scenarios for discussing the relationship between changes in settlement and mobility as a result of changing environmental conditions, such as the deep transitions that occurred during the Middle Holocene [16]. However, such relationships need to be addressed considering degrees of increasingly significant activity leading to plausible explanations of human–environmental interactions [17].

The most researched Pacific Ocean bays of North-Central Chile (29°–32° S) show abundant archaeological records [18,19]. One of the sectors with high frequencies of archaeological records extends from the mouth of the Choapa River (Huentelauquén, 31°37' S) to Pichidangui Bay (32°08' S), particularly around Los Vilos Bay (31°54' S) (Figure 1) [20–22]. This sector has been investigated from the 1950s to the present [23–27]. Extensive spatial coverage of shoreline surveys and a systematic research program have produced over 400 archaeological sites and >150 radiocarbon ages of anthropogenic deposits that allow us to discuss human processes over the last 13,000 years [21,28]. However, the representativeness of the archaeological record in this coastal strip with respect to other coastal areas, especially to the north, remains unknown. The low archaeological signal or discontinuity in human occupations north of the Choapa River mouth suggests high variability in human trajectories, with sectors that were not recurrently occupied throughout the Holocene. We investigate this problem by studying spaces differing in their geographic attributes, environmental conditions, and frequencies of archaeological records. More specifically, we study El Teniente Bay (31° S), which has been mostly overlooked [29,30]. Prior to our studies, only one site had been identified. Its diagnostic materials, namely, lanceolate-stemmed projectile points, denticulates, steep-edge scrapers, and cogged stones, among others, suggest an early Holocene age, considering similarities to diagnostic artifacts of other sites dated in North and North-Central Chile, albeit lacking radiocarbon ages for assessing occupancy trends in the area [13,22,25].

### 1.1. The Archaeological Record of North-Central Chile

The oldest records of the late Pleistocene in the semiarid north are located inland [31] or, despite their proximity to the coast, show evidence of subsistence based on noncoastal resources [32]. However, dated to approximately 12,000 cal BP, archaeological sites concentrated in Los Vilos Bay are notable, showing evidence that the economy shifted to coastal resources, as indicated by the distribution of archaeological records, by differences in types of site camps, and by the abundance of fish, marine mammals and mollusk shells in the archaeofaunal records [22,33]. The high values of the stable isotope  $\delta^{15}\text{N}$  from a human individual dated to approximately 12,000 cal BP confirm diets incorporating marine-derived protein as a staple food [34]. From 9700 cal BP, a decrease in coastal human presence occurred; this period coincided with the beginning of maximum aridity of the Holocene and with a decline in radiocarbon records at regional and supraregional scales [21,35]. As a result, the use of the littoral space was reorganized, with greater differences in types of sites, namely, residential sites and field-processing stations, and the development of more normalized resource-supply strategies between 7600 and 4800 cal BP [18,36,37]. After this period and up to 2300 cal BP, the widespread appearance of shell middens and shell mounds in more locations along the coast mark the peak use of coastal spaces, primarily focused on the collection of a wide variety of littoral resources [38]. In some sectors of the coast, the highest intensity of occupation manifested as cemeteries [39,40]. The last two millennia show striking variability in the use of the coast, with highly varying strategies,

albeit always coordinated with inland occupations, which were more abundant and intense and less mobile than those of hunter-gatherers who had dominated for 10 millennia [41–43].



**Figure 1.** Map of the study area showing the regions and sites discussed in this article: (a) El Teniente Bay; (b) coastal region from 31° to 32° S; (c) Quebrada San Pedro Norte site (TE06) showing the relationship between shell mounds.

Only one archaeological site has been previously described in El Teniente Bay. Systematic collections were performed in a vast lithic workshop associated with a small *Concholepas concholepas* shell midden located 35 m above sea level (masl) and a marine terrace 400 m from the coastline [30]. The researcher indicated that no stratigraphic deposit was found and that more than 1000 artifacts were recorded on the surface, including products of different knapping phases of basalt and quartz tools [30,44]. Bifacial tools included lanceolate stemmed and triangular projectile points, bifaces, and borers, while unifacial tools included end scrapers, side scrapers, denticulates, and planes. These artifacts occur alongside cogged stones and grinding implements. The characteristics of this archaeological context and other regional data led the authors to theorize that these occupations resulted from seasonal mobility between the interior and the coast [29]. This site has not been found again because the description of its location differs among the publications, and

after the initial studies, in 1969, the Pan-American highway that passes nearby underwent major changes.

### 1.2. Study Area, Environment, and Paleoenvironment

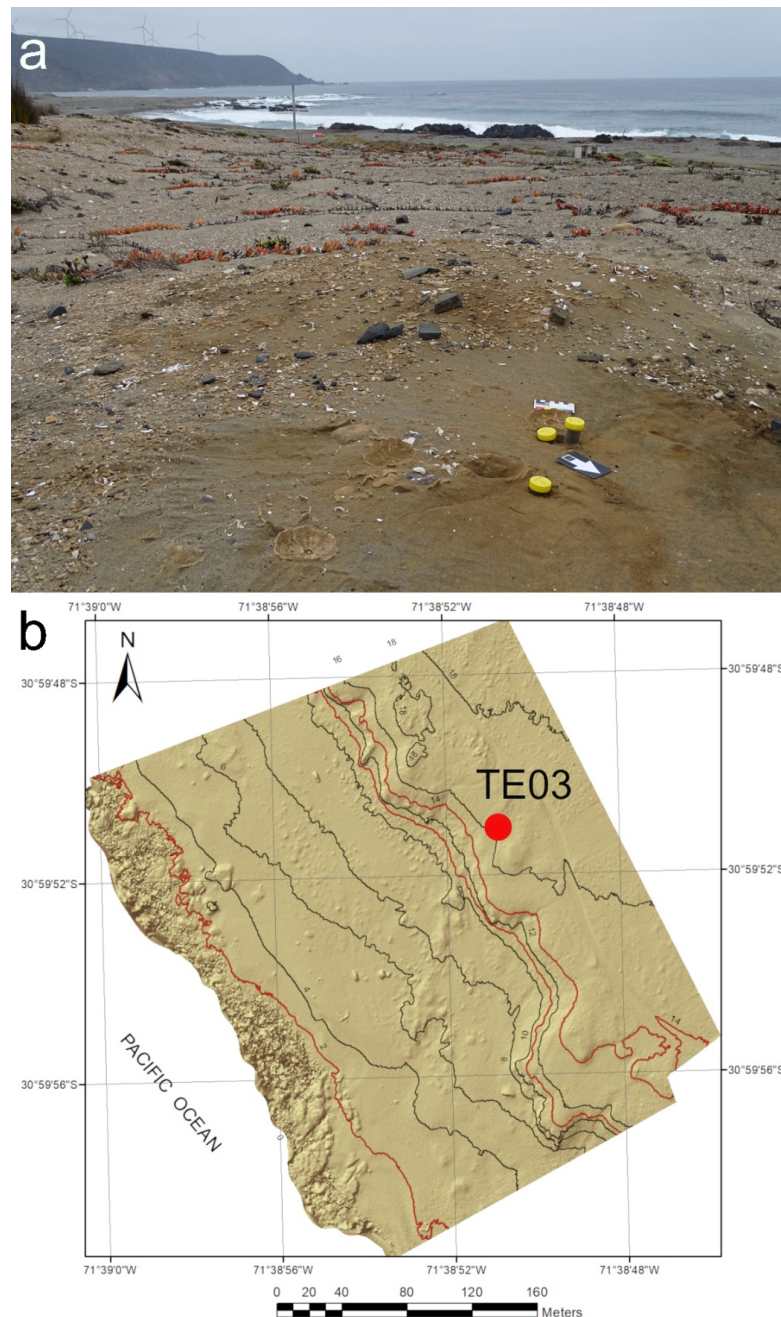
North-Central Chile (29° to 32° S) corresponds to the extreme south of the Atacama Desert and is characterized by a Mediterranean Xeric-Ocean (BSks) climate with very dry summers and rainfall (231 mm/year) concentrated in the winter of the Southern Hemisphere [45]. This climate is controlled by the semipermanent presence of the South Pacific Anticyclone (SPA), whose position during the summer blocks the rain carried by the westerly wind belt [46]. Interannual and multidecade climatic fluctuations are mainly controlled by the El Niño Southern Oscillation (ENSO), which is expressed through warm oceanic phases associated with higher, occasionally torrential, rainfall (El Niño) and dry (La Niña) phases [47,48]. Between 31° and 32° S, the Andes mountain range is located just 90 km from the Pacific Ocean, generating a sector with a steep altitude gradient with significant oceanic influence [45]. The characteristic vegetation in this region is semidesert scrub, which is interrupted by sclerophyllous arborescent scrub in the most protected coastal ravines [49]. The current terrestrial fauna is composed of various species of rodents and canids, such as South American foxes (*Lycalopex*). The marine vertebrate fauna includes pinnipeds, cetaceans, and mustelids, and the coast is brimming with marine birds such as penguins (*Spheniscidae*) [50,51]. Nevertheless, the abundant archaeological records of the even-toed ungulate *Lama guanicoe*, commonly known as guanaco, suggest its presence in the area throughout the Holocene [52].

The transition between the Pleistocene and the Holocene in the area is characterized by changes in precipitation resulting from the southward displacement of the SPA, producing more arid conditions [15,53]. Humidity minima have been detected in sediment cores of coastal swamp forests, which are sensitive to regional changes in winter precipitation, between 7800 and 5700 cal BP (~32° S) [15,53–55]. <sup>18</sup>O alkenone records of seafloor sediment cores (32°45' S) show sea surface temperature maxima between 7500 and 6000 cal BP, consistent with terrestrial records [56]. In turn, the sedimentary and geochemical records of El Cepo Lake in the Andes Mountains (30° S; 2900 masl) also suggest more arid conditions between 9500 and 5700 cal BP than in the current environment, albeit with episodic interruptions [57]. This phase of maximum aridity coincides with a decrease in ENSO activity, as previously identified through records in the tropical Pacific [58]. After 5700 cal BP and markedly between 4200 and 3800 cal BP, humidity increased concurrently with ENSO activity [58–60]. The wettest period of the entire Holocene began approximately 2000 cal BP and reversed during the last 500 years when the current conditions of greater aridity were established [15].

The area of El Teniente corresponds to a bay with northwest exposure spanning from 30°58' to 31°01' S (Figure 1a). A series of Quaternary marine terraces, which characterize the coast of North-Central Chile, are partly preserved in El Teniente and its surroundings [61]. Toward the south, a terrace with an altitude >160 masl stands out, forming an abrupt rocky cliff over the sea, limiting mobility and the potential for occupation. In addition, this sector is distant from the main rivers, the closest of which are the Limarí River, 28 km to the north, and the Choapa River, 82 km to the south. Sectors with optimal dwelling characteristics, such as those with low terraces, relatively long beaches, and semipermanent freshwater, are rare in this area. These conditions, however, are found in El Teniente Bay.

Two east-west-flowing streams (<9 km) empty into El Teniente Bay. The San Pedro ravine has a perennial stream and a wetland connected to the sea. This perennial stream is the source of sands for an imposing dune system with an elevation of 140–160 masl at the center of the bay. Two small terraces are preserved at the center of the bay; in particular, the second terrace emerges from 14 masl (Figure 2). On the exposed top of this terrace, a feature only a few centimeters thick was recorded with semiconsolidated, intact Chilean sea urchins (*Loxechinus albus*) embedded in the sedimentary deposit. The feature was located at the northern limit of an archaeological surface site termed La Terraza

(TE03; 30°59'51" S, 71°38'51" W; see below) exposed at the surface and underlying the archaeological material. An echinoderm test sample from a single individual collected in this feature dated to 7210–7870 cal BP (D-AMS 026715, Table 1). Samples of this species consistently show older ages than those of associated deposits (see below). Therefore, we consider this age with caution because the reservoir effect may have been stronger than that applied in the calibration. These observations suggest that the sea urchins were expelled by the ocean and deposited in an underwater environment at 14 masl and thus may be explained by a tsunami-like event.



**Figure 2.** The La Terraza site: (a) exposed marine terrace and dated sample; (b) DEM of both marine terraces in TE03 indicating the site where the sample was collected for dating (red point). The contour lines are spaced at 2 m, and the main inflections are highlighted in red.

**Table 1.** Radiocarbon chronology of El Teniente Bay.

Site	Contextual References	Laboratory Code	Age ( <sup>14</sup> C BP)	Calibrated Date (2σ cal BP)	Material, Taxon
TE03	ES, SU2-inf (5 cm)	D-AMS 026715	7271 ± 38 BP	7210–7870 cal BP	Test, <i>Loxechinus albus</i>
TE06A	ES, SU1-sup	D-AMS 029056	6333 ± 32 BP	6190–6940 cal BP	Test, <i>Loxechinus albus</i>
TE01B	U1, SU1 (65–70 cm)	D-AMS 035209	6333 ± 35 BP	7160–7320 cal BP	Charcoal
TE04	U1, SU1 (5–10 cm)	D-AMS 029057	6327 ± 34 BP	6190–6930 cal BP	Test, <i>Loxechinus albus</i>
TE10	ES, SU1-inf (20 cm)	D-AMS 030131	6167 ± 33 BP	6930–7160 cal BP	Charcoal
TE04	U1, SU1-2 contact	D-AMS 030132	5906 ± 47 BP	6550–6800 cal BP	Charcoal
TE04	U1, SU2 (40–45 cm)	D-AMS 029050	5804 ± 60 BP	6430–6730 cal BP	Charcoal
TE04	U1, SU3 (57 cm)	D-AMS 029051	5776 ± 41 BP	6440–6660 cal BP	Charcoal
TE04	U1, SU1 (20–25 cm)	D-AMS 029049	5742 ± 33 BP	6400–6630 cal BP	Charcoal
TE06C	U1, SU2 (20–30 cm)	D-AMS 030134	5210 ± 32 BP	4860–5460 cal BP	Test, <i>Loxechinus albus</i>
TE06C	U1, SU1 (10–20 cm)	D-AMS 030133	5013 ± 34 BP	4620–5270 cal BP	Shell, <i>Concholepas c.</i>
TE05	U1, SU1 (20–25 cm)	D-AMS 029048	4599 ± 31 BP	5050–5320 cal BP	Charcoal
TE06A	Surface sample	UGAMS 51007	4499 ± 20 BP	4970–5290 cal BP	Bone tool, <i>Lama guanicoe</i>
TE01B	Surface sample	D-AMS 026718	3904 ± 26 BP	3210–3820 cal BP	Charred bone, pinniped
TE01A	ES, SU1 (40 cm)	D-AMS 029055	2939 ± 27 BP	2030–2670 cal BP	Shell, <i>Fissurella sp.</i>
TE01A	U1, SU1 (65–70 cm)	D-AMS 035211	2605 ± 30 BP	2500–2760 cal BP	Charcoal
TE01B	U1, SU1 (40–45 cm)	D-AMS 035210	1784 ± 27 BP	1580–1710 cal BP	Charcoal
TE02	ES, SU1-sup (15 cm)	D-AMS 026716	567 ± 22 BP	510–550 cal BP	Charcoal

U: excavation unit; ES: exposed section; SU: stratigraphic unit; inf: inferior; sup: superior.

### 1.3. Objectives

A total of 11 new sites and 17 radiocarbon dates of an area lacking systematic research, at least since the 1970s, are presented in this study. These data allow us to conduct an updated, albeit preliminary, characterization of the archaeology of El Teniente Bay and to compare the characteristics of the archaeological records with the most studied trajectories south of the Choapa River mouth and other neighboring areas. Although the archaeological sample at El Teniente is in no way comparable to that collected in the southern area, it is a starting point to assess the marked differences in regional coastal archaeological records because >60% of registered sites have been dated in this new area. The comparison of trajectories in human occupations throughout the Holocene shows interesting differences, highlighting the contrast between recurrently used territories and areas with declining archaeological records and even empty sectors.

## 2. Materials and Methods

The distribution of archaeological records was identified based on field-walking surveys along the coastal axis and adjacent ravines between the 5 km separating 30°58'30" S and 31°01'13" S (6.5 linear km). Four sites were selected for test excavations with 1-m<sup>2</sup> units that were laid out either from exposed sections or where surface conditions suggested potentially well-preserved deposits. Three other sites were selected for collecting samples for radiocarbon dating after cleaning the exposed profiles. At each of the sites, stratigraphic units were recognized through changes in sedimentation and in the proportion of mollusk shells and other malacological remains, considered sedimentary particles [62]. The excavations included the three-dimensional positioning of all features, of any evidence >2 cm, and of each sample for radiocarbon dating. Although layering and specific features were key in defining contextual information, the archaeological samples were recovered based on minimum levels of 5 cm, and the sediments were sieved through 2-mm mesh.

Considering the lack of radiocarbon dates in the area, their assessment was a priority. Radiocarbon AMS dates were obtained from the Direct AMS Laboratory, except where noted. All results were corrected for isotopic fractionation with an unreported δ<sup>13</sup>C value measured on the prepared carbon by the accelerator. Charcoal samples were preferred. However, in their absence, marine remains (echinoderm tests, shells, and bones) from single individuals were dated, applying reservoir effect corrections developed for the closest area

with available  $\Delta R$ : the coast of Los Vilos ( $31^{\circ}54'$  S). For ages earlier than 6000 cal BP, a  $\Delta R$  value of  $31 \pm 156$  years was applied ( $N = 3$  dates), and for those later, a  $\Delta R$  value of  $165 \pm 107$  years was considered ( $N = 4$  dates) [63]. The dates were calibrated at  $2\sigma$  with the radiocarbon calibration program Calib 8.1 using the ShCal20 and Marine20 curves and expressing the dates in calibrated years before the present (cal BP) [64–66].

Lithic materials were analyzed, considering technological, metric, and typological attributes [67]. The remains of vertebrate fauna mainly correspond to ichthyological remains and to a few terrestrial and marine mammals and birds. All materials recovered from the excavations were analyzed following regional taxonomic keys [68–71]. The main quantification unit used in the analysis was the number of identified specimens (NISP; Supplementary Materials Table S1) [72,73]. Taphonomic variables, such as the degree of weathering, were analyzed to assess the representativeness of the bone assemblages depending on the depositional environment [74]. The malacological remains, in turn, were quantified from sampling subunits of  $250 \text{ cm}^2$  in some sites using local reference keys and are expressed as the minimum number of individuals (MNI) [75,76].

### 3. Results

#### 3.1. Spatial Distributions of Archaeological Evidence

Field-walking surveys included reconnaissance along the area from La Cebada ravine to the north up to the limit set by the high cliffs abruptly descending to the sea (Figure 1a). After this point, there are no potential flat areas to survey. Our observations were made between the surf zone and, especially, on marine terraces. Although the area covered was small, this area was defined based on the most suitable spaces for setting up camps and performing activities consistent with those observed in coastal areas farther south [20,36,38].

A total of 11 sites were recorded near the coastal axis. They mostly consist of small shell middens exposed on the surface (TE01; TE10; TE11) or profiles exposed by wind erosion (TE04; TE05) or by recent anthropic interventions (TE02). The morphology of some mounds is marked by wind erosion (TE04; TE06). Some sites, such as Las Corvinas 3 (TE07), show an advanced state of deterioration due to the combined action of intense wind erosion and recent anthropic modifications. This last site yielded a preform of geometrically shaped stone (i.e., cogged stone) on the surface, attributed to an early Holocene age in the region [22]. Only one site, Caleta La Cebada (TE08), corresponds to a small rock shelter, and another, Quebrada Locayo (TE09), corresponds to a surface distribution of lithic material on a dune.

#### 3.2. Archaeological Contexts, Stratigraphy, and Chronology

##### 3.2.1. La Cebada (TE01)

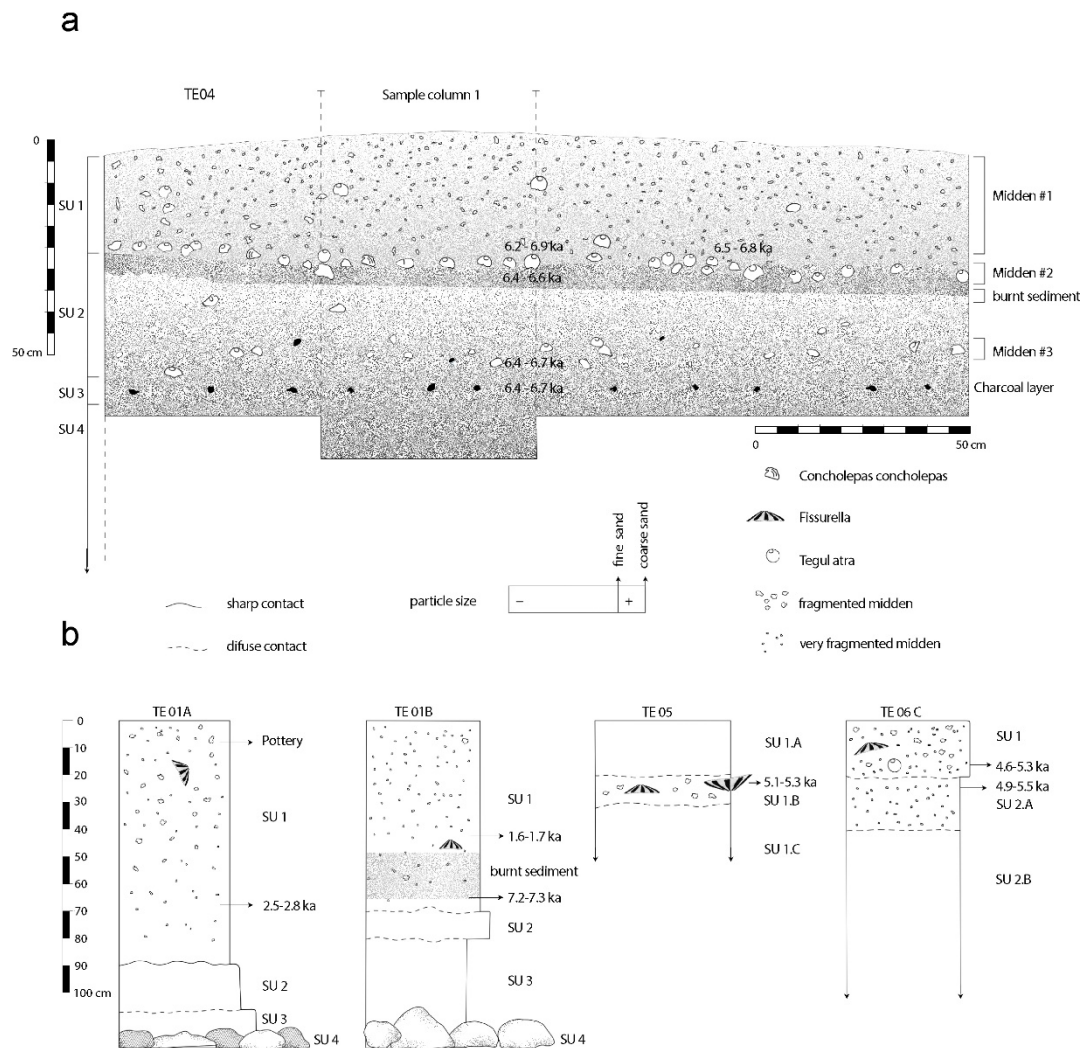
TE01 corresponds to a shell midden located at the base of the dune immediately south of the La Cebada ravine at a linear distance of 650 m from the coastline (Figure 3a). Its surface characteristics differentiate two sectors. Sector A ( $30^{\circ}58'30''$  S;  $71^{\circ}38'33''$  W) corresponds to the lower-elevation area of the site (17 masl), where stratified charcoal-stained (burnt) sediments outcrop for approximately 20 m in association with fragmented and dispersed malacological material, namely, shells, echinoderm tests, and the occasional remains of crustaceans. A sample of *Fissurella* sp. shell in the center (40 cm deep) of an exposed profile yielded an age of 2030–2670 cal BP (D-AMS 029055). A  $1 \text{ m}^2$  excavation unit showed a shell midden deposit stretching along the upper stratigraphic unit (SU1) up to ~90 cm in depth (Figure 4b). A charcoal sample at 70 cm yielded an age of 2500–2760 cal BP (D-AMS 035211), which agrees with the depth of the previous age. Pottery ( $N = 3$  fragments) is recorded from the top to 60 cm of depth. Sector B ( $30^{\circ}58'33,56''$  S;  $71^{\circ}38'32,43''$  W), in turn, corresponds to the higher-elevation area of the site (29 masl) and is recognized by a discrete concentration of malacological and bone material on the surface. A charred pinniped bone sample recorded on the surface showed an age of 3210–3820 cal BP (D-AMS 026718). A  $1 \text{ m}^2$  excavation unit in this sector showed a shell midden deposit extending into the upper stratigraphic unit (SU1) up to ca. 70 cm in depth (Figure 3b). At the base of this

layer, at 55 cm depth, charcoal-stained (burnt) sediments were dated to 7160–7320 cal BP (D-AMS 035209). At a depth of 45 cm, above the upper contact of this stratigraphic feature, radiocarbon dating yielded an age of 1580–1710 cal BP (D-AMS 035210). At the highest part of the site, one manufactured bedrock mortar was recorded on a rocky outcrop jutting out of the dune.



**Figure 3.** Images of the selected sites in El Teniente Bay: (a) La Cebada (TE01A); (b) La Cebada (TE01B), (c) Las Corvinas 1 (TE04); (d) Las Corvinas 2 (TE05); (e) mound A and (f) mound C of the Quebrada San Pedro Norte site (TE06).





**Figure 4.** Stratigraphic sections of the sites in El Teniente Bay: (a) northeast profile of Las Corvinas 1 (TE04); (b) schematic profiles of La Cebada (TE01A, TE01B), Las Corvinas 2 (TE05) and Quebrada San Pedro Norte (TE06C). SU: stratigraphic unit; ka: thousands of years before the present.

### 3.2.2. El Pulpo (TE02)

The site (30°00'01" S, 71°38'47" W) corresponds to a small shell midden located on a rocky outcrop on the lower marine terrace. Evidence of current artisanal fishing activities is observed. Extensive removal of sediments resulting from recent space-conditioning activities exposed a 60-cm-thick profile with a highly charcoal-stained deposit characterized by abundant whole and fragmented mollusk valves, lithic material, and stone fragments. Burnt potsherds were recorded in association with a charcoal sample in the upper section of the deposit, which yielded an age of 510–550 cal BP (D-AMS 026716).

### 3.2.3. La Terraza (TE03)

The site corresponds to an ~6500 m<sup>2</sup> surface distribution of lithic material derived from local knapping of cobbles and malacological remains, including mainly limpets (*Fissurella*) and black sea snails (*Tegula atra*), as well as locos or Chilean abalones (*Concholepas concholepas*) to a lesser degree. The material extends over a north-to-south linear dispersion running parallel to the seashore. Only in the northernmost sector was archaeological material observed overlaying the *Loxechinus albus* naturally deposited layer separated by ~5 cm of sterile sands between them. There are no radiocarbon dates for this assemblage because

the archaeological material was markedly affected by erosion, but the 7210–7870 cal BP date of the underlying deposit provides a maximum age.

#### 3.2.4. Las Corvinas 1 (TE04)

The site (30°59'15" S, 71°38'56" W) is a small shell mound in a small dune system deposited on the second marine terrace. The excavated section shows a varying medium-to-coarse semicompact sand deposit with diffuse contacts between all its stratigraphic units (Figure 3c). The base of the deposit shows a coarse sand unit (SU5) underlying a very coarse sand and gravel unit (SU4), both not associated with archaeological material (Figure 4a). Above this unit, a coarse sand unit with charcoal-stained sediments and charcoal particles arranged horizontally at intermediate frequency (SU3) was dated to 6440–6660 cal BP (D-AMS 029051). On top of this unit, the overlying SU2 is characterized by coarse, massive sands occasionally containing whole shells at a low frequency, among which *Tegula atra* dominates. At the base of this SU, we recorded a shell midden (#3) dated to 6430–6730 cal BP (D-AMS 029050), and at its top, it shows a distinctive burning event with highly charcoal-stained sediments dated to 6400–6630 cal BP (D-AMS 029049). SU1, in turn, is the largest unit and corresponds to a medium-coarse sand deposit containing highly fragmented shells at intermediate frequency (shell midden #1). At the base of this unit, a second shell midden is dominated by a high proportion of *Tegula atra* and with a low level of fragmentation. This SU yielded two ages at the top of shell midden #2: one age assessed in an isolated charcoal speckle of 6550–6800 cal BP (D-AMS 030132) and another in a sample of tests of *Loxechinus albus* of 6190–6930 cal BP (D-AMS 029057). Only the charcoal sample differs from the rest of the sequence, but this is the only sample collected outside sampling column 1 (Figure 4a). In summary, the chronological ranges of this site show a series of overlying occupations with overlap between all their ages between ca. 6400 and 6700 cal BP.

#### 3.2.5. Las Corvinas 2 (TE05)

The site (30°59'14" S, 71°38'59" W) corresponds to a stratified shell midden recorded at 110 m from the previous site. A 1 m<sup>2</sup> excavation unit adjacent to an exposed profile showed a very discrete shell midden deposit on a stratigraphic unit of coarse sands concentrated at depths ranging from 20 to 30 cm (Figures 3d and 4b). A charcoal sample was collected for dating, yielding an age of 5050–5320 cal BP (D-AMS 029048).

#### 3.2.6. Quebrada San Pedro Norte (TE06)

The site corresponds to a series of shell mounds arranged around a rocky outcrop forming a high promontory associated with an intermediate space without malacological evidence, albeit with scattered lithic material (Figure 1c). This site is located on the second marine terrace, immediately north of the mouth of the San Pedro stream. It is the largest site recorded in our survey of El Teniente Bay. Two mounds stand out for their size, morphology, and height: TE06A (31°16'00" S, 71°38'49" W; Figure 3e) and TE06C (31°00'15" S, 71°38'46" W; Figure 3f). A sample of sea urchins from the top of mound A (13 masl) dated to 6190–6940 cal BP (D-AMS 029056). A *Lama guanicoe* metacarpal bone awl was recorded on the surface. Bone awls are tools characteristic of these contexts [77]. Radiocarbon dating of a fragment of this specimen yielded an age of 4970–5290 cal BP (UGAMS 51007;  $\delta^{13}\text{C} = -17.26\text{‰}$ ), which suggests that these are multicomponent sites. Mound TE06B, in turn, is longer and narrower and shows clear signs of deflation. Mound TE06C is smaller and shows probable signs of illegal excavations in one part. To characterize the deposit, mound TE06C was selected because it is the farthest from the effect of coastal winds and potentially the one with the most intact stratigraphic deposits. A 1 m<sup>2</sup> excavation unit showed a shell midden deposit stretching from the upper stratigraphic unit (SU1) to the highest section of the underlying unit (SU2.A). Two shell dates were obtained: one of 4620–5270 cal BP (D-AMS 030133) at the base of SU1 and another of 4860–5460 cal BP

(D-AMS 030134) at the top of SU2. These ages are in good agreement with the depth at which they were recorded.

### 3.2.7. Quebrada San Pedro Sur (TE10)

The site (31°00'41" S; 70°38'41" W) corresponds to a shell midden running parallel to the San Pedro stream south of the mouth. This site contains fragmented valves of several species, predominantly *Tegula atra*, at different concentrations. From an exposed profile of ca. 20 cm, a charcoal sample was collected near the base, dating to 6930–7160 cal BP (D-AMS 030131).

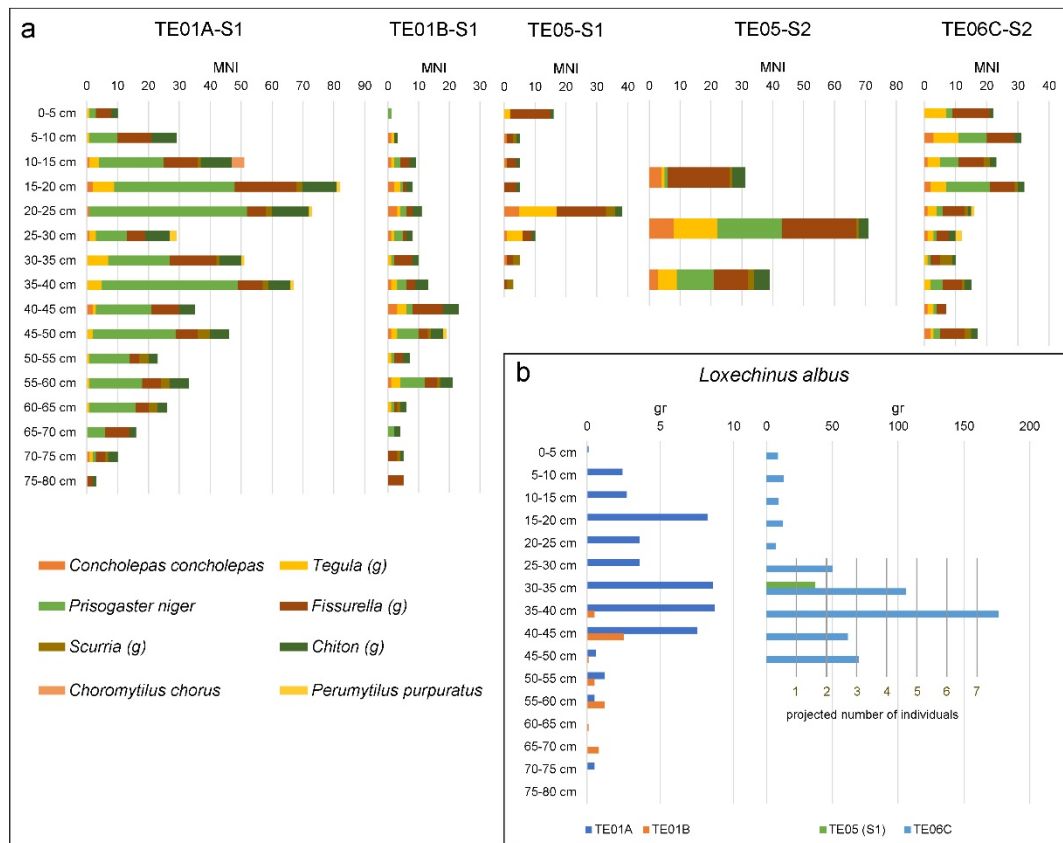
## 3.3. The Archaeological Assemblages

### 3.3.1. The Malacological Assemblages

The marine invertebrate species represented at the El Teniente bay sites serve as an indirect measure to characterize the potential richness of this environment. The intertidal species observed in the assemblages are the following mollusks: *Concholepas concholepas*; *Tegula atra* and *T. tridentata*; *Prisogaster niger*; *Fissurella maxima*, *F. crassa*, *F. nigra*, *F. costata*, *F. latimarginata*, *F. bridgesii*, *F. cumingi* and *F. picta*; *Acanthina monodon*; *Scurria ceciliana*, *S. parasitica*, and *S. scurria*; *Crepidula* sp.; *Chiton latus* and *C. granosus*; *Acanthopleura echinata*; *Choromytilus chorus*; and *Perumytilus purpuratus* (Table S1). In addition to these mollusks, the echinoderm *Loxechinus albus* and the crustacean *Homalaspis plana* are also identified. Although reported sites are shell middens, the frequencies of mollusk shells show relatively small assemblages when compared to coastal sites where denser and larger assemblages have been reported at other latitudes [14,34,78–81]. This excludes perhaps the lower sector of the La Cebada site (TE01A), where the largest sample was quantified (Figure 5a). However, this sample is dominated by the small gastropod *Prisogaster niger*, which was likely carried in algae such as *Lessonia nigrescens* [76], thus leaving no visible remnants on the site. The second most important taxon is *Fissurella crassa*, a medium- to small-sized limpet. A similar situation is observed at the Quebrada San Pedro Norte site (TE06C), where in addition to the previous two taxa, *F. costata* also dominated. At this site, *Fissurella* individuals were exceptionally small. Despite being present in most sites, *Loxechinus albus* played a minor role in all, except in samples from depths between 25 and 50 cm of the Quebrada San Pedro Norte site (TE06C) (Figure 5b). Estimates of the number of individuals represented based on mass showed projections between 2 and 7 individuals for each level based on previous experiments [79].

The particularly small sizes of the mollusks at El Teniente Bay sites contrast with the sizes of specimens observed at other coastal sites. For example, the mean length of *Concholepas concholepas* shells at El Teniente, although based on a few cases (N = 20), is 68.9 mm (sd. 19.7). When compared with the size ranges of individuals from archaeological sites located on the Los Vilos coast, this value falls below the averages reported for five sites dating between 12,000 and 6000 cal BP, which range from 72.2 to 94.9 mm (N = 330) [82].

The evaluation of the role of malacological resources over time shows that deposits of middle Holocene ages show either charcoal-stained features with very low or no association with shells (i.e., SU3 of TE04; base of the SU1 of TE01B) or shell middens with low frequencies of invertebrates (i.e., shell midden #3 of TE04; SU1. B of TE05; TE06C). Only shell midden #2 of the Las Corvinas 1 site (TE04) showed a high frequency of *Tegula atra*, which, however, was not quantified. In turn, the most recent deposits, represented by SU1 at La Cebada (sectors TE01A and TE01B) dated to post 2800 cal BP, indicate an increase in both the frequencies of invertebrates by excavation level and the thickness of the deposits and the extension of the site, which suggests a more relevant role of intertidal resource gathering.



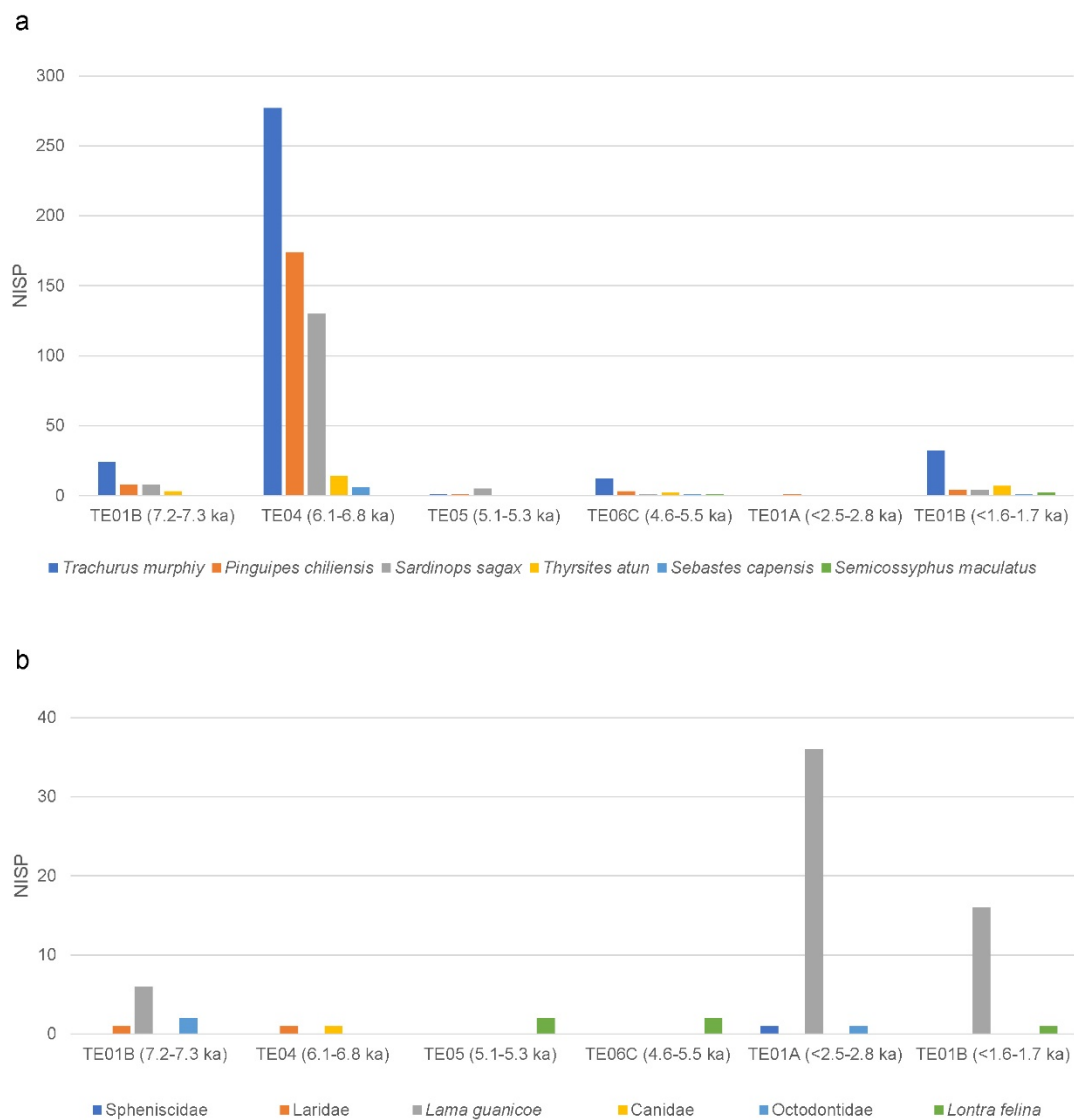
**Figure 5.** Malacological assemblages of the studied sites: (a) MNI of the main taxa of the malacological assemblages of the La Cebada (TE01A, TE01B), Las Corvinas 2 (TE05) and Quebrada San Pedro Norte (TE06) sites; (g) genus with more than one species; S: sample; (b) mass of *Loxechinus albus* (gr) and projected MNI represented in the assemblages, divided between samples with less than one individual per level and samples with more than one individual per level.

### 3.3.2. The Ichthyoarchaeological Assemblages

The samples studied in the five assemblages of El Teniente Bay totaled 2403 ichthyological remains, of which only 30.05% (NISP = 722) were identified both anatomically and taxonomically (Table S1). In addition, 9.49% of the remains of bones and vertebrae could only be identified anatomically, and 60.47% are considered minimal fragments, as expected for skeletal remains of fish [83]. The following species were identified: *Pinguipes chiliensis* (NISP = 191; %NISP = 26.45%), *Sebastes capensis* (NISP=8; %NISP = 1.1%), and *Semicossyphus maculatus* (NISP = 3; %NISP = 0.42%), which inhabit neritic-benthic zones, and *Trachurus murphyi* (NISP = 346; %NISP = 48.2%), *Thyrsites atun* (NISP = 26; %NISP = 3.6%), and *Sardinops sagax* (NISP = 148; %NISP = 20.5%), which occupy pelagic zones ranging from 10 to 150 m in depth. The sample is mainly represented by the postcranial segment (63.43%); however, the high density of the supraoccipital crest of *T. murphyi* (NISP = 195; accounting for 27% of the total) increased the preservation of elements of the cranial segment [71]. In this regard, the sample exhibits a variable degree of weathering (stage 1 = 0.42%; stage 2 = 66.84%; stage 3 = 32.74%), with a higher representation of lower stages in sites with more remains (e.g., TE04), which suggests that the sample is dependent on preservation [74].

The sites with the highest representation of fish skeletal remains were Las Corvinas 1 (TE04) and the upper sector of La Cebada (TE01B) (Figure 6a). The first site produced 798 bone fragments, 601 of which were taxonomically and anatomically identified. In addition, five species were identified, the most frequent of which was *Trachurus murphyi*, accounting for 35% of all specimens identified, followed by *Pinguipes chiliensis* (%NISP = 22%) and *Sardinops sagax* (%NISP = 16%). The amount of recorded remains suggests a strong focus on fishing between 6400 and 6700 cal BP, whereas the habitat requirements of the represented

species indicate that this activity occurred at different depths. In the upper sector of La Cebada (TE01B), the total number of analyzed fragments was 120, 93 of which were identified taxonomically and anatomically. As in the previous site, five species were identified, with *Trachurus murphyi* prevailing widely (%NISP = 46%). In this case, the distribution of the remains shows that they are associated with both the deposit dated to 7160–7320 cal BP and the deposit dated after 1580–1710 cal BP, suggesting that no major changes occurred between these two intervals. Sclerochronological studies performed on samples of *Trachurus murphyi* farther north of the study area (24°55' S) suggest that this resource was consistently collected during the summer months, in line with its seasonal movement toward the pelagic zone [84,85].



**Figure 6.** Animal bone assemblages of the studied sites: (a) ichthyoarchaeological assemblages identified to the species level (NISP); (b) tetrapod assemblages identified to the genus and species levels (NISP).

The other three studied samples exhibited low frequencies of ichthyoarchaeological remains. The excavation at Quebrada San Pedro Norte (TE06C) identified only 20 taxonomic and anatomical fragments, albeit representing all species recorded at sites in El Teniente Bay, except for *S. sagax*. In turn, in Las Corvinas 2 (TE05), seven fragments were quantified, five of which correspond to *S. sagax*. Finally, in the lower sector of La Cebada (TE01A), only one caudal vertebra of *P. chilensis* was recorded.

### 3.3.3. Tetrapods

The analysis of tetrapod bone material from El Teniente Bay consists of a small sample of 172 remains (Table S1). This sample includes remains of seabirds, such as Spheniscidae (penguin) and Laridae (seagulls); marine mammals, including *Lontra felina* (marine otter); and land mammals, such as *Lama guanicoe* (guanaco) and canids and rodents, including *Octodon degus* (common degu), in addition to fragments identified with a lower specific resolution. In taphonomic terms, the sample exhibits a very low degree of weathering (stage 0 = 79.07%; stage 1 = 8.72%; stage 2 = 10.47%; stage 3 = 1.74%), which suggests that this sample is representative of the materials deposited in the sampled units [74]. Combustion features are present in 13.37% of specimens, whereas traces of human activity are found in <4% of specimens.

In contrast to the fish, the tetrapod remains were concentrated in the La Cebada site, with 75 bone elements recovered in the lower sector (TE01A) and 64 bone elements in the upper sector (TE01B) (Figure 6b). Most of the fragments are derived from SU1, indicating that these assemblages are related to occupations dated after 2500–2760 cal BP. In both excavated units, *Lama guanicoe* predominated (TE01A: NISP = 36, %NISP = 48%; TE01B: NISP = 22, %NISP = 34.4%), followed by indeterminate mammalian remains, indicating a marked focus on terrestrial resources. Marine mammals and birds are highly underrepresented, although the presence of penguins stands out. The other sites produced very few skeletal remains (TE05: NISP = 15; TE04: NISP = 6; TE06C: NISP = 5). They are generally characterized by remains identified in general taxonomic groups except for the presence of *Lontra felina* in two of them.

The high presence of guanaco remains with intentional anthropic alterations (fractures and artifacts) is considered relevant, which contrasts with the very low to null presence of marine mammals, except for a few remains of *Lontra felina*. Although these sites are located on the coastline, the bone assemblages do not reflect a marked consumption of coastal resources, excluding invertebrates and fish in some sites. Terrestrial fauna, such as guanaco, provided hunter-gatherer groups with not only nutrients but also a good source of raw materials for tool manufacturing.

### 3.3.4. The Lithic Assemblages

Local toolstones in El Teniente Bay are mainly available as basalt cobbles on the beach and as an andesite outcrop with mid-to-coarse knappable material. The lithic material is unevenly distributed among the study sites. However, this material is largely dominated by unmodified lithic flakes (N = 296; 91.93%) and angular clasts (N = 19; 5.9%). The largest assemblage was recorded in Quebrada San Pedro Norte (TE06C) and includes a total of 141 specimens, 91 of which (64.54%) correspond to flakes (minimum number of extractions), as indicated by the presence of the striking platform. Lithic cores (1.42%) and angular clasts (7.8%) are underrepresented. The sample from La Cebada consists of 37 pieces excavated in the lower sector (TE01A) and 114 in the upper sector (TE01B), of which 23 (62.16%) and 63 (55.26%) units represent flakes, respectively. Last, the lithic assemblages of Las Corvinas 1 and 2 (TE04 and TE05) are very small because, although they consist of 15 units each, they account for only 6 and 8 flakes, respectively. In the assemblage of El Teniente Bay, almost no tool classes were observed, except for a projectile point preform, the distal tip of a biface, a retouched lithic flake at La Cebada (TE01B), and another retouched flake at Quebrada San Pedro Norte (TE06C). Surveys of the surfaces at this last site identified the presence of some lithic cores in the intermediate sector between the rocky outcrop and the mounds and a bored stone preform in mound A. The lithic material recorded at El Teniente Bay is stylistically nondistinctive, except for the preform of a geometrically shaped stone observed at Las Corvinas 3 (TE07), suggestive of an early Holocene age.

In temporal terms, the most notable comparison can be made between the middle Holocene deposits of Quebrada San Pedro Norte (TE06C) and the late Holocene deposits of La Cebada (TE01A and TE01B) because these assemblages are relatively equivalent. The first site predominantly showed evidence of andesite (79.12%), flakes with flat striking plat-

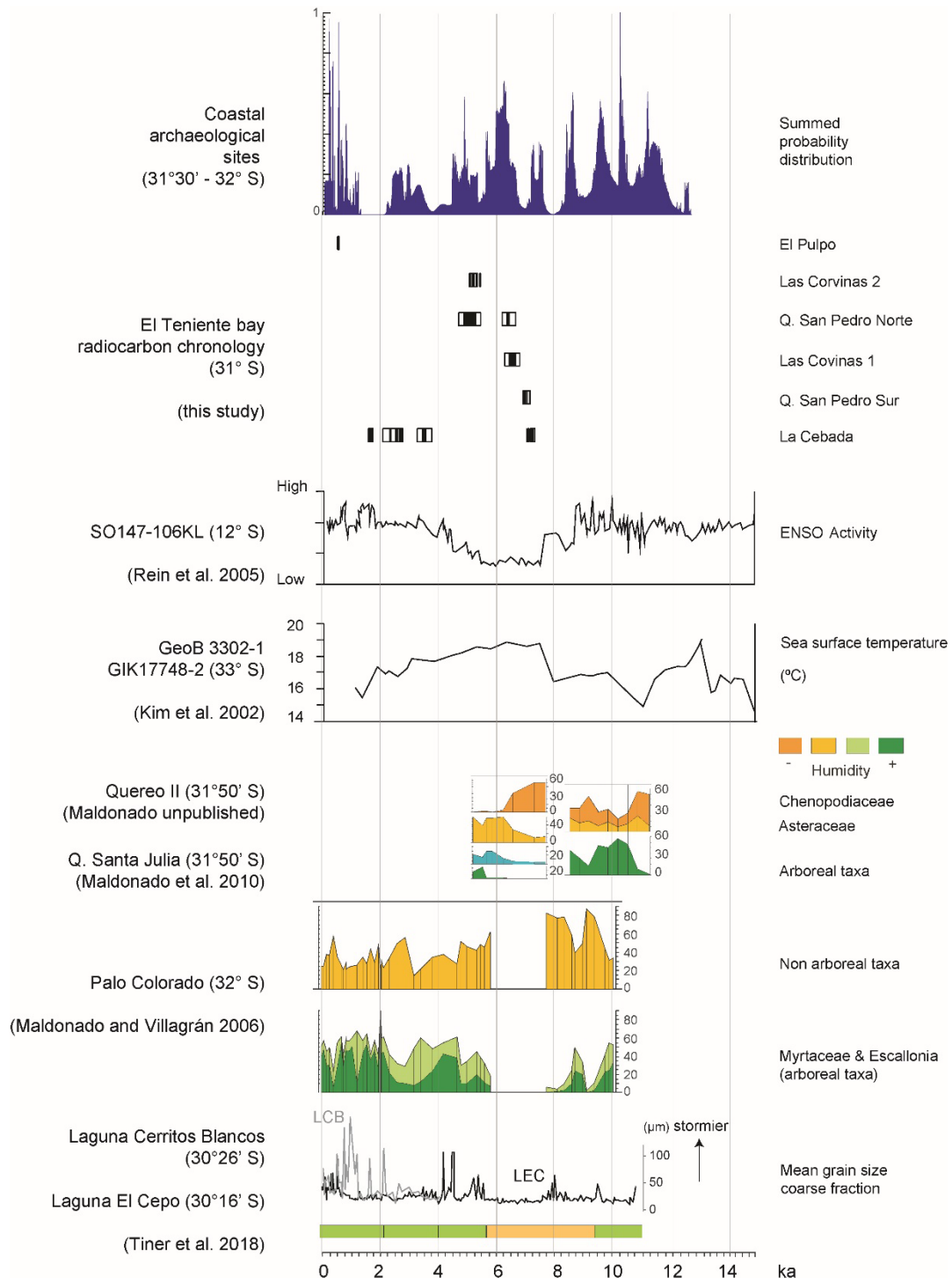
forms (80.22%), dominant cortex-free remnants (90.11%), and attributes of hard-hammer percussion (95.6%). In turn, in the most recent samples, andesite (26.97%), quartz (28.09%), and siliceous toolstones (32.58%) are similarly represented, flakes with flat striking platforms (85.39%) prevail, similar to cortex-free evidence (95.40%), and hard-hammer percussion (6.74%) yielding to soft-hammer percussion (22.09%). Although both assemblages can be characterized as markedly informal and not particularly diagnostic, the greater variability in some attributes of the later assemblage suggests that more diverse activities were likely.

#### 4. Discussion

Recent archaeological studies have revealed a series of intermittent human occupations at El Teniente Bay starting at 7200 cal BP. These settlements are located on two marine terraces: a lower terrace and an intermediate terrace. The terraces of the region have been dated directly and based on the archaeological sites deposited on them [34,86,87]. They provide a frame of reference to identify areas of archaeological activity based on ancient coastlines suitable for resource procurement [88]. The maximum marine transgression, dated to approximately 6600 cal BP, resulting from the sea-level rise through the Tongoy Estuary, 80 km north of El Teniente, indicates a sea level 3 m above the current level [87]. This Holocene highstand explains the presence of human occupations during the middle Holocene in the upper sector of the La Cebada site (TE01B), 650 m from the coast, and in sites located on the intermediate terrace (TE04, TE05, TE06C, and TE10). Earlier sites, although originally expected, have not been recorded. Their preservation, especially for those closest to ancient shorelines, is less likely since they may have been affected by sea-level rise. Early Holocene sites have been systematically recorded in a 40 to 60 masl terrace particularly present around the area of Los Vilos and not as featured at El Teniente Bay [34]. Sites with human occupations of the late Holocene are minorly represented and have been recorded only in the lower sector of the La Cebada site (TE01A) and on the lower terrace (TE02) at the center of the bay.

The human occupations of El Teniente Bay, at four of the six dated sites, are markedly found between 7200 and 6200 cal BP, and a fifth site appears a millennium later. The period of the first occupation detected coincides with the most arid interval in the region based on the sedimentary pollen records of swamp forests, showing a domain of nonarborescent taxa, a proxy for aridity, as well as stratigraphic sections indicating that some coastal ravines practically dried out for almost two millennia (Figure 7) [53,54,59]. These conditions are associated with a low frequency of mountain storms, which is typical of La Niña-like conditions [57]. Low El Niño activity, such as that observed in offshore records dated from 7800 to 4200 cal BP, is associated with decreased rainfall at these latitudes [48,58]. These conditions are unfavorable for the reproduction of terrestrial resources in subtropical semiarid areas of the Andes and have been acknowledged as drivers for the reconfiguration of land use by hunter-gatherers, who shifted their movements in response to adverse environmental conditions [21,35]. However, El Niño years negatively affect some aspects of marine primary productivity [89]; hence, their suppression can be favorable, as observed with modern climatic conditions in the area (arid) that have been seen to promote an increase in coastal marine primary productivity [90]. The sudden appearance of sites in El Teniente Bay can be understood within the framework of these processes of change in space use during the most arid intervals. Push factors or stressful situations have been recognized as driving forces for short-distance movements, as would be expected among broad subsistence foragers [91]. These movements are likely to have produced successful as well as failed outcomes in the occupations of new areas as a result of exploration [92]. Whether the earliest occupations detected in El Teniente Bay are actually the initial occupations cannot be ascertained because the information is still very preliminary. However, the occupation trajectory of this area contrasts with those of the better-known coastal areas, where a more permanent use has been interpreted [19,20]. The differences in the El Teniente Bay record from other records in the region, such as that south of the Choapa River mouth,

show an apparent spatiotemporal disconnection, suggesting changes in space use in both areas during the middle Holocene.



**Figure 7.** Summary of archaeological chronologies of North-Central Chile and main paleoenvironmental records discussed in this study.

To evaluate these differences, the distribution of archaeological records was explored in one degree of latitudinal separation (from 31° to 32° S) along the coastal axis centered at the Choapa River mouth (31°37' S). This area shows differences in landscape-level processes that need to be taken into consideration, chiefly a higher exposure to prevailing winds



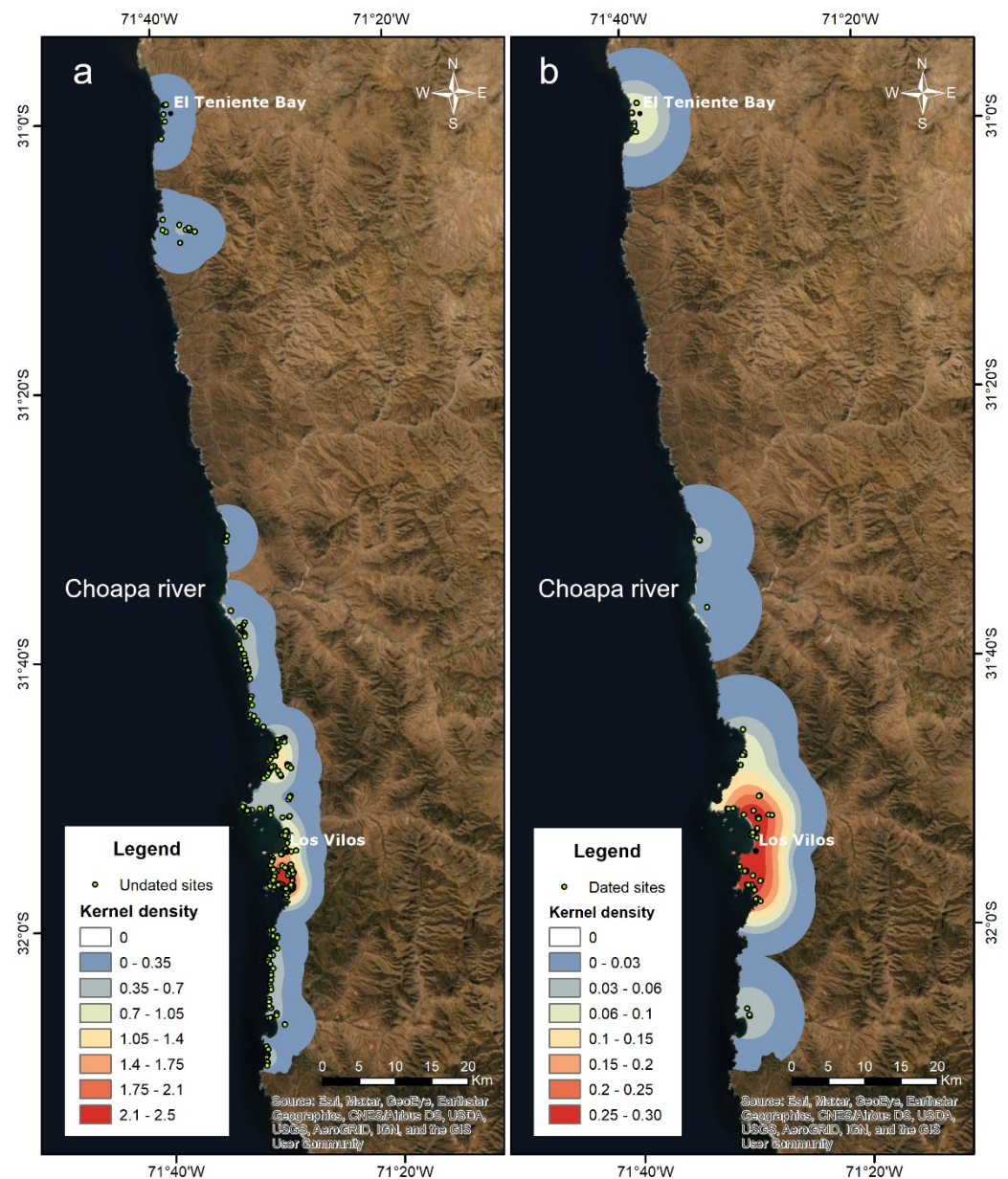
in the north, which may lead to a higher impact in the preservation of the archaeological record, including sediment deposition, stratigraphic integrity, and palimpsests at a site level and higher weathering at the assemblage level, particularly affecting organic material. This information adds to the cumulative effect of long-term research programs south of Choapa River mouth outlined above, which together considerably bias our knowledge. That considered, archaeological records show marked differences in dated and undated sites between the north and south of the river outlet (Figure 8). This is also true when considering the density of sites in the coastal area (Table 2). The archaeological finds are noticeably concentrated from the Choapa River mouth (Huentelauquén, 31°37' S) to the south of Pichidangui Bay (32°08' S). This area comprises high-productivity bays, abundant fresh water supply in permanent and intermittent courses, and more habitable space. Hence, occupations extended repeatedly, although with varying degrees of intensity, for more than 12,000 years (Figure 7). The patterns of land use were variable, as was the appropriation of resources, as indicated by the changes in settlement size, occupational redundancy, camp planning, assemblage variability, and the characteristics of site features [20,22,34,36,38,53,93,94]. Conversely, north of the Choapa River mouth, the coast becomes more rectilinear and less rugged, as fewer ravines and no permanent watercourses are available. The upper marine terrace meets the sea, forming a steep coastal cliff and leaving less space for long and wide beaches. This combination results in few sheltered bays and low access conditions, which promote isolation of the limited areas suitable for gathering and habitation. Reports of archaeological sites in this space are limited, and their records are highly variable. Isolated finds on the highest terrace (>160 masl) and occasional shell midden lenses near the coast have been observed in the area of Punta Sierra (31°06' S) [95]. However, our sporadic surveys in the areas of Costa Dorada (31°04' S) and Puerto Oscuro (31°25' S) failed to show a relevant presence of archaeological remains. Farther south, at Agua Dulce Bay (31° 31' S), two sites with middle Holocene occupations are known, but these sites are just 10 km north of the Choapa River [96,97]. Furthermore, an independent assessment confirms the uneven distribution of records of shell middens deposited along the shoreline from 29° to 32° S [98]. Accordingly, the zone of El Teniente Bay can be considered an isolated point within an area of declining coastal archaeological records. Farther north, large sectors lack systematic surveys, although coastal records abound in Tongoy Bay (30°18' S) and Punta Teatinos (29°49' S) [18,37,81]. These findings suggest that on a scale of hundreds of km, the intensity of space use varies considerably.

**Table 2.** Comparing geographic features and archaeological data on the coast between 31° and 32° S.

	North of Choapa River Mouth	South of Choapa River Mouth
Major ravines of intermittent discharge	4	9
Permanent streams	0	4
Coastal area (<150 masl)	130 km <sup>2</sup>	219 km <sup>2</sup>
Dated archaeological sites (<150 masl)	9	46
Total archaeological sites (<150 masl)	19	276
Dated site density	0.07 site/km <sup>2</sup>	0.21 site/km <sup>2</sup>
Total site density	0.15 site/km <sup>2</sup>	1.26 site/km <sup>2</sup>

Chronologically, between 12,000 and 5300 cal BP, North-Central Chile shows variable patterns of space occupation by mobile hunter-gatherers who developed diverse strategies for the use of marine, coastal, and land resources with periods of increased intensity and occupation and periods of abandonment for long or seasonal intervals [22,33,36,93]. However, from 5300 cal BP, the coast was more intensely occupied by mobile hunter-gatherers who exploited shoreline resources and left behind a greater frequency of shell middens and some shell mounds, both south of the Choapa River mouth (31°37' S to 32°08' S) and around the Elqui River mouth (30°18' S to 29°49' S) in high spatial ranking zones [38,81]. The archaeological sites of El Teniente Bay, in turn, show discrete occupations, with low occupation redundancy on a millennial scale because shell middens do not show

overlapping deposits, as is common south of the Choapa River mouth [36,94]. Lithic materials are scarce at the sites, which is observed not only in the excavated units but also in the surveyed surfaces. There are only records of knapping activities and not of discarded tools, which suggests that these sites were probably not residential and that they functioned in association with other locations. Although we cannot rule out some of them, as surface assemblages may have been subjected to the illegal collection of archaeological material, the paucity of lithic material ultimately indicates low-intensity, transient occupations. Ceramics, frequent in sites of North-Central Chile during the last 2000 years, in turn, are almost nonexistent in this area, reaffirming the low presence of late human occupations in the zone [99].



**Figure 8.** Density of coastal archaeological records from 31° to 32° S: (a) undated sites; (b) dated sites.

The assemblages most represented at El Teniente Bay sites were zooarchaeological assemblages. However, mollusks play a minor role, as shown by the quantified samples. Their presence indicates a slight increase in harvesting activities toward the late Holocene, but this increase could mask other activities, such as algae harvesting [100]. Additionally,

the sizes of key mollusk specimens in the subsistence of coastal foragers are strikingly smaller than those of other, better-known coastal areas [82,101]. The presence of fish was, nevertheless, only notable at one site, representing a limited chronological range (6100 to 6800 cal BP). Fish from both neritic-benthic and pelagic zones are recorded, which suggests differential management of fishing techniques. Although this differential management is expected in areas where fishing was more prevalent, such as Taltal (24°55' S), where *Trachurus murphyi* prevails considerably from 7500 to 5000 cal BP [102], the known records closest to our study area show differential trends. For example, the ichthyoarchaeological assemblage of the Punta Ñagué site (12,000 to 9200 cal BP, 31°51' S) differs from those studied in El Teniente Bay because only four of the species recorded appear in Punta Ñagué and only represent values ranging from 4.3% to 0.3% (%NISP) [33]. Similarly, the fish assemblage of the Punta Teatinos site (5500 to 500 cal BP, 29°49' S) also differed from those of El Teniente Bay. Although they share several taxa, Punta Teatinos shows higher species diversity and a clear predominance of *Trachurus murphyi*, followed by *Genypterus* sp., which is not found at El Teniente [103].

Conversely, tetrapod remains in El Teniente Bay are found at low frequencies and do not meet the expectation of a use targeting coastal or marine resources. Among the archaeofaunal assemblages, *Lama guanicoe* stands out because of its increased significance in the deposits of the last 2500 years. On a regional scale, it has been proposed that after 3500 cal BP, hunter-gatherers shifted their economic practices, preferentially focusing on terrestrial resources over coastal and marine resources, a change that was particularly accentuated in the last 2000 years [18,37,39,104]. The decreased number of sites within this chronological range in El Teniente Bay, the increased representativeness of *Lama guanicoe* remains, and the appearance of bedrock mortars are consistent with this regional process.

## 5. Conclusions

Humans have a long and varied history of using coastal areas [105]. Shorelines have often been perceived as a Garden of Eden, where resources are highly predictable and abundant [106–108]. In some cases, they have been characterized as favorable buffer zones to successfully cope with seasonal risk conditions [109]. Even shorelines where resources are concentrated frequently witness band nucleation, an element very typical of ethnographic coastal foragers, thus generating vast and prolific archaeological deposits [110,111]. However, coastal environments are heterogeneous, even under ideal conditions, such as eastern boundary upwelling ecosystems, where there is a high potential for coastal human adaptation. The findings at El Teniente Bay and their comparison with surrounding spaces show how environmental heterogeneity enables different human responses and occupation trajectories. This situation has also been observed in other coastal areas of the Pacific, such as some Central Chile areas, where a low use of coastal resources has been described [112]. The analysis of stable isotopes  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  on human bones from the central coast showed limited dependence on coastal resources of both mobile hunter-gatherers (2780–2950 to 1880–2000 cal BP) and farmers (1180–1350 to 800–930 cal BP and later), even though their remains were buried in coastal sites (33°05' S to 33°46' S) [112,113]. This limited dependence contrasts with data from the Los Rieles site (31°56' S; Los Vilos), south of the Choapa River, where individuals dated between 11330–11880 and 4580–5050 cal BP showed high degrees of marine protein intake; the earliest ages correspond to those with the highest  $\delta^{15}\text{N}$  values [34]. These variations observed on local and regional scales, therefore, require the study of coastal spaces with contrasting conditions and trajectories to understand the multiple ways of inhabiting the coast over time.

The distribution of coastal archaeological records of North-Central Chile shows profound differences. Well-known areas such as the Elqui River mouth (30°18' S to 29°49' S) and the coast south of the Choapa River mouth (31°37' S to 32°08' S) are hotspots for archaeological evidence of long occupation trajectories. The richness of their archaeological records and the time range of their occupation suggest that these coastal environments were attractive locations recurrently inhabited by populations on a millennial scale. However, an

examination of less archaeologically explored areas suggests a more diverse and complex scenario. The coast was not uninterruptedly occupied, neither spatiotemporally nor in ways that these environments may be inhabited. Thus, the observations at El Teniente Bay are characterized by small shell middens, low occupation redundancy, and archaeological assemblages that do not show that human groups were adapted to maritime, or even coastal, environments. Although the chronological distribution of El Teniente Bay occupation is difficult to compare with the variable, almost permanent human presence detected in other sectors, this discontinuous character highlights differences in human land use. Less occupied areas, or those only visited on an episodic basis, reveal decisions that shape the cultural geography of a larger space. The spaces showing declining archaeological records and even the empty spaces separated effectively occupied areas, thus forming territories with long trajectories. Between the Elqui River mouth and the area south of the Choapa River, vast coastal spaces were scarcely incorporated into the more frequent movements of hunter-gatherers throughout the Holocene. One of these spaces is El Teniente Bay, where occupations appear for the first time during the most arid interval and the period during which the patterns of movement and space use shifted, as previously postulated. The marked presence in El Teniente at this time could indicate a search for new spaces in times of environmental stress; however, these spaces did not show significant occupation after this period.

Investigating low-ranking spaces, although it may be less attractive in terms of the characteristics of archaeological sites and the sizes of their assemblages, helps in increasing diversity and therefore building a more accurate image of land use across time. This perspective can only be achieved by long-term research projects that are focused on highlighting both the centers and peripheries of human occupations. Although we consider the results achieved in El Teniente Bay to be illustrative of such variability and to have the potential to reveal exceptional trends, they are preliminary in that they cannot match the coverage, sampling intensity, and variety of analyses conducted over the years of research south of the Choapa River mouth. These results, albeit preliminary, encourage an enlargement of the search to other neglected zones that may provide more comprehensive perspectives of coastal land uses of the Pacific.

**Supplementary Materials:** The following are available online at <https://www.mdpi.com/article/10.3390/land10060577/s1>, Table S1: Archaeofaunal records of El Teniente Bay.

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