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Introduction

Since the end of the Pleistocene Epoch, about 11000 years ago, Andean hunters have gone up to the promising but sparse regions of the **Dry Puna** and the **Desert** or **Salt Puna** on the eastern slopes of the Andes and on the southeast margins of the great Andean Plateau (Figure 1). This region now corresponds to the far south of Peru, the north of Chile, and the southwest of Bolivia. In this article, we suggest that the Dry Puna to the north of Lirima was favorable for a settlement pattern based on hunting activities centered in the basins of the puna ecological sectors that are accessible throughout the year. The lack of marked seasonal variation in resource distribution and availability suggests that the Archaic inhabitants of the Dry Puna moved about the landscape in an irregular, acyclical way, rather than following the regular, cyclical pattern of movement associated with transhumant peoples in areas of marked seasonal variation. In contrast, in the Salt Puna, the presence of seasonally complementary hunting and gathering resources and the impossibility of occupying the high puna sector during the winter apparently gave rise to seasonal settlement patterns in accordance with the classic model of transhumance.

After presenting the ecological data for the Dry and Salt Punas and suggesting a tentative paleoclimatic sequence, we review the history of archaeological research in these zones. Much of the previous work in the area has been characterized by the application of general transhumance models without sufficient attention to the special and contrasting features of the two Punas. With this background, we synthesize the archaeological data for the Archaic Period in the Dry and Salt Punas, including our recent research, with particular attention to evidence for seasonal and aseasonal patterns of movement. Finally, we present our "best-fit" models of Archaic adaptations to the Dry Puna and the Salt Puna, not as the final word on the subject, but as a stage in the ongoing process of fitting data to theory--and vice versa--in the highlands of the Andes.

Ecological Sectors and Resources

General Characteristics

The various niches that compose the coast and puna are juxtaposed along an ecological transect uniting these two major ecozones (Figures 1 and 2). Although Hester (1966: 378) states that the drastic zonation noted along the vertical, east-west axis does not occur along the longitudinal, north-south dimension, Troll (1958) recognized sensitive longitudinal variations that permitted him to define different enclaves. Here, we are concerned with Troll's Dry Puna and Desert or Salt Puna zones, the distinctive elements of which we

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discuss in order to establish their exact spatial boundaries within our study area.

According to Troll's definition, the Dry Puna differs from the Normal Puna in that the latter has greater precipitation and the potential for agriculture above 4000 meters. Both punas share a permanent snowline at 5000 m. and the possibility of settlements of herders using pastures near this altitude (Troll 1958: 24). In the Salt Puna, on the other hand, "the limits of agriculture and permanent population" are considerably lower than in either the Dry Puna or the Normal Puna (ibid.).

Troll's ecological map includes all of northern Chile up to the Peruvian border (ca. 18° to 24° south latitude) within the strip of Salt Puna. A careful review of the characteristics of this zone allows us to place the northern edge of the Salt Puna further south, around Lirima (ca. 20° south latitude). The area between Lirima and the Chilean border is better classified as part of the Dry Puna. In this area--but no farther south--there are still relict populations of Aymaras who live year-round above 4000 meters.

From Lirima south to the Puna de Atacama (20° 26° south latitude), in what corresponds to the Salt Puna proper, the drastic conditions of temperature and aridity prohibit year-round occupation of the high sector of the Salt Puna above 4000 meters. These high areas are accessible only in the summer, as locations for seasonal hunting or herding (see Bowman 1924: 244-247, 277-278). To the south of the Puna de Atacama (26° south latitude), in what corresponds to the Semi-Arid North, the upper limit of agriculture descends to 2000 m. in response to the gradual changes associated with increasing latitude (Troll 1958: 24).

Apart from the climatic differences, it is important to note the ecological differences. The Dry Puna offers a rich grassland environment for camelids, as well as for small animals such as birds and rodents; there is a notable absence of edible wild plants. In contrast, the biotic productivity of the Salt Puna is less than that of the Dry Puna, particularly in the extent of the grasslands (Villagrán et al. 1981; Kalin et al. 1982). However, in the oases of the lower sector of the Salt Puna, there are edible wild plants, some of which must be prepared by grinding (e.g., algarrobo, *Prosopis tamarugo*, and chañar, *P. chilensis*). These climatic, floral, and faunal characteristics are due in part to the decrease in rainfall as one moves south. Aspects of the geomorphology along the vertical dimension (east-west) also produce different kinds of environmental enclaves (Figure 2).

Due to the distribution and amount of rainfall, the vegetated strip of the highlands tends to narrow to the south, and the desert margin penetrates further and further into the interior. Thus, in the Dry Puna, the highland vegetation begins at 1500 meters, while in the Salt Puna, it starts at 2600 meters. The incidence of seasonal pasturage dependent on the summer rainfall also increases to the south (Villagrán et al. 1981: 15). Similarly, the gradual lowering of temperature in this direction has an increasing effect in the sectors above 4000 meters; at the latitude of the Salt Puna, temperatures stay below freezing throughout the winter.

Dry Puna

From a morphological perspective, three sectors can be distinguished in the Dry Puna along a vertical (east-west) axis (Figure 2): 1. precordilleran valleys and interfluvial prairies (ca. 2000-3000 m.); 2. cordilleran valleys (ca. 3000-4000 m.); and 3. high puna (ca. 4000-5000 m.). The high puna sector, also known as the **altiplano** or highland plateau, is punctuated by volcanoes and isolated peaks which can reach over 6000 meters in altitude. Moving up this profile, the arid conditions of the coast disappear, to be replaced by gradually increasing rainfall. At the top of the transect, annual precipitation in the high puna averages 300 to 350 millimeters, an amount which defines marginal desert conditions (as opposed to the absolute desert of the two lower sectors).

Associated with these three sectors, Villagrán et al. (1982) distinguish three vegetational zones whose drastic vertical zonation must be emphasized. Distinct plant communities are adapted to the conditions of temperature and humidity of each ecological sector, and some species are endemic to each level. The same situation holds true for reptiles and amphibians (Veloso and Kalin 1982). Many of the animals do not demonstrate seasonal, vertical mobility; on the contrary, they carry out their annual cycle entirely within their level of origin (ibid.). The three vegetational zones overlap but are not entirely coincident with the sectors defined above on morphological grounds.

The three vegetational zones are associated with the sectors in the following way:

a) Precordilleran Valleys and Interfluvial Prairies, (ca. 2000-3000 m.). This zone is associated with the Desert Vegetational Formation[1] characterized by shrubs, columnar and smaller cacti, and several herbaceous plants. Although some of the species present can be used as forage by grazing animals, their restricted coverage today (10%) attracts few animals and herding is very depressed. Nevertheless, the presence of Archaic settlements such as Patapatane Cave (ca. 8000-3500 B.P.) (Santoro and Chacama 1984) demonstrates the previous existence of conditions sufficiently favorable to support hunter-gatherers who ate camelids and rodents.

b) Cordilleran Valleys (ca. 3000-4000 m.). Associated with this zone is the Tolar Vegetational Formation, which presents the greatest plant cover (50%) and includes various exclusive communities. The richness of the evergreen shrubs and shrublets and the cadulifolids (tola, tolilla, or tolar) create tremendous potential for the concentration of guanacos (*Lama guanicoe*), tarucas (*Hippocamelus antisiensis*), and smaller game (rodents and birds). Nevertheless, Early Archaic occupations have not yet been recorded for this zone. Apparently, the early hunter-gatherers preferred less vertically abrupt environments.

c) High Puna (ca. 4000-5000 m.). The High Puna is associated with the Pajonal Vegetational Formation dominated by perennial grasses (*wichu*) growing in clumps or bunches. Interspersed throughout the zone are marshes (*Oxychloe andina* and *Distinchia mucoides*), discontinuous stands of **queñoales** trees (*Polylepis tarapacana*), and hummocks of **llaretales** plants (*Azorella compacta*). As with the earlier vegetational formations, many of the plants are exclusive to this zone; together with the conditions of temperature and altitude, this factor

accounts for the presence of a specialized fauna represented most significantly by the vicuña (*Vicugna vicugna*).[2] Plant cover in the Pajonal Formation averages 26 percent, but this figure can reach 70% in the marshes, around which various animal species can organize a stable life.

Today, herds of vicuña families each have a defined and separate area in the marsh sectors as part of their larger territory. Other animals which live around the marshes include viscachas (*Lagidium viscacha*), doves (*Metropelia ceciliae*), ducks (*Ana flacirotis*), and many other rodents and birds. In the adjacent prairies are the ñandu (*Rhea* sp.) and the puna tinamou (*Tinamotis pentlandii*); the eggs of these birds provide an additional resource for inhabitants of the zone (Lynch 1983).

With their high concentration of easily exploited resources, the high puna marshes appear to have been an efficient and secure environment that provided year-round subsistence for hunter-gatherers without great risk or effort. The value of this habitat is enhanced by the fact that it is the only place humid enough to provide grass for grazing animals throughout the winter (June-September). In the lower levels (precordilleran and cordilleran valley sectors), the pastures dry up during the winter, while the pastures on the slopes above the marshes are both dry and frozen during this season.

In contrast to the abundant animal life of the Dry Puna, edible wild plants are notably scarce. Botanical as well as ethnographic reports point out that in all three sectors, a high percentage of the flora can serve as pasturage but does not provide food directly for humans (Castro et al. 1982; Kalin et al. 1982; Villagrán et al. 1982; van Kessel 1980: 10). The few edible wild plants (cactus fruits and several marsh herbs) are not suitable for grinding and probably provided a secondary, seasonal resource. These botanical facts coincide with the absence of grinding tools such as manos, metates, and mortars among the cultural remains of the Dry Puna; such tools appear only with the beginning of agricultural production in this zone.

The ecological and cultural features of the Dry Puna contrast with the situation in the Salt Puna, where from the Early Archaic Period, seasonal hunting and gathering played an important role in defining the settlement patterns and subsistence activities.

Salt Puna

In the Salt Puna,[3] there are three morphologically defined sectors (see Figure 2): 1. oases and salares (salt basins) (2600-3100 m.); 2. intermediate quebradas etched into the rhyolotic plateau (3100-3850 m.); and 3. high puna (3850-4250 m.). These sectors are distinct from those in the Dry Puna. The first difference is in the vertical distribution of plants, which are concentrated between 3100 and 4380 meters. Below 3100 meters, vegetation is practically non-existent, while plant cover is poorly developed above 4250 meters (Villagrán et al. 1981).

As in the Dry Puna, each ecological level of the Salt Puna has certain endemic plants, many of which are the same species in the two punas. However, the concentration, distribution, and richness of the species associated with the

vegetational formations differs between the two punas (ibid.: 7-8). The following paragraphs summarize the relationships between the vegetational formations (Villagrán et al. 1981) and the sectors defined on morphological grounds for the Salt Puna.

a) Oases and Salares (2600-3100 m.). This zone corresponds to the Salar de Atacama itself. The vegetation consists of widely spaced xerophytic shrubs with about a 2.5% cover (Villagrán et al. 1981: 6). Principal plant associations in this sector include *Accontholippia deserticola* and *Franseria meyenian-Helogyne macrogyne-Helioanthrocereus atacamensis.*

b) Intermediate Quebradas in the Rhyolitic Plateau (3100-3850 m.). The intermediate quebradas have a 43.8% vegetation cover and offer the greatest potential for people and animals. Shrubs, subshrubs, and chamaephytes are notable constituents of the Tolar vegetation of this sector; principal associations include *Fabiana densa-Baccharis-boliviensis* and *Baccharis incarum-Junelia seriphioides-Lampaya medium.*

c) High Puna (3850-4250 m.). Despite the greater precipitation registered in this zone as a result of summer rainfall (200 to 250 mm per year), the high puna sector of the Salt Puna has a low vegetational cover (10%). Tussock grasses available mainly in the summer (December to March) and shrub grasses are the predominant plants. Moving up to the highest levels of this sector, cushion plants join the grasses. Low temperatures inhibit most plant growth during the winter (Villagrán et al. 1981: 6-10).

Given the ecological conditions summarized in the preceding paragraphs, the settlement systems of the Salt Puna must have been organized around the resources concentrated in the quebradras and oases of the salares. Beginning in the Early Archaic Period, archaeological evidence shows an important use of these two sectors, leaving the high puna for seasonally complementary occupations (Núñez 1981). This picture is substantially different from the Dry Puna, where settlements were able to nucleate around the marsh enclaves of the high puna.

The differences noted between the Dry and Salt Punas appear to have been a significant influence in the definition of regional settlement patterns. These differences affected the decisions concerning the type of subsistence activity to be emphasized, the organization of the seasonal mobility circuits, and the choice of ecozone to be used as the center of the settlement system. For the Salt Puna, Núñez (1980b, 1981) used archaeological, climatic, and zoological data to support a hypothetical model of Late Archaic transhumant hunting and gathering; this model involves seasonal movement from the principle settlements in the intermediate quebradas of the rhyolitic plateau down to the Salar de Atacama and up to the high puna (see also Niemeyer and Schiappacasse 1976). In contrast, Santoro (1986; Santoro and Chacama 1983) has suggested a Dry Puna model of less seasonally regulated hunting from central settlements in the high puna.[4]

The differences in ecology and possible settlement patterns are not, however, reflected in the lithic toolkits of the different areas. Schiappacasse and Niemeyer (1975: 55) suggested that the high puna is a unifying cultural factor

across both puna zones of northern Chile, considering "the typological similarity of the lithic material from the Salar de Surire with the material from the more southerly salares" (see Figure 1). The same suggestion has been made in reference to similarities between early points from the Arica puna and the central Andes (Santoro and Chacama 1982; Lynch 1986: 155). We can suggest that the general environmental unity of the Andes (*sensu* Hester 1966) would have motivated early central Andean hunters to explore the southern punas. These hunters surely would have had to adapt their settlement patterns to the particular exigencies of the Dry and Salt Punas, but they would have been able to maintain part of their original technology for some time.

Tentative Paleoclimatic Sequence

If our view of the modern ecology is incomplete, our perspective on past conditions is even more so. It is accepted, in general terms, that while the aridity of the coast has been maintained over many millennia (Craig 1982), the situation in the puna was more dynamic during the Holocene as well as in the late Pleistocene (Craig 1985). The retreat of the Pleistocene glaciers to their present levels would have caused significant changes in Andean ecology, as the changes in temperature regime must have done. These alterations would have been accompanied by the formation of wide highland prairies and a consequent repopulation by plants and animals (ibid.). That this occurred early in the Holocene is indicated by the appearance of hunting camps throughout the Andes at this time.

The following sequence of climatic and ecological changes will have to be verified by future fieldwork; we recognize the limitations inherent in inferring these phenomena from paleoclimatic sequences established in other regions. In Table 1, we present a hypothetical paleoclimatic sequence based on the stratigraphy of Hakenasa Cave, where the cultural deposits are interrupted at certain intervals by episodes of natural deposition. We have tentatively correlated the Hakenasa stratigraphy with the paleoclimatic sequence from Quereo, at 31° 55' 30" south latitude, over 1000 km to the south of our study zone (Núñez et al. 1983).

The Hakenasa Cave site has a complete sequence of over two meters of intercalated human and natural deposits spanning the time from the Early Holocene almost to the present. Chronological control of this stratigraphic sequence is provided by three radiocarbon dates from different periods supplemented by relative dating based on diagnostic artifacts. A considerable number of cultural indicators for the Early, Middle, and Late Archaic Periods, the Early Formative Period, the Inca Period, and the Post-Conquest Period were recovered from a one square meter test excavation (Santoro and Dauelsberg ms.).

The persistent reutilization of the Hakenasa site, which ended by almost completely filling the cave, is surely due to its location in a typical high puna enclave of the Dry Puna. Situated at 4000 m., the site is favored by the concentration of resources around a marsh and enriched by the presence of the Cosapilla river. This river, which crosses the marsh, runs from north to south; the Ancopujo quebrada is a tributary of the Cosapilla and represents an expansion of the marsh to the west. The cave is strategically located on the

northwest side of the Ancopujo-Cosapilla junction. This location presents ideal conditions of refuge and resource concentration; game could have been easily trapped between the river and the quebrada.

During the excavations, it was possible to recognize and remove the five stratigraphic complexes that composed the deposit. The strata representing natural (i.e. non-cultural) deposits were easily recognized and removed as units. The cultural strata were excavated in artificial levels not exceeding 10 centimeters, because the uniform composition and characteristics of the sediments did not provide well-differentiated strata within each complex. A total of 25 natural and cultural levels representing 230 cm of deposition were excavated.

Table 1 summarizes the stratigraphic sequence from Hakenasa, with its cultural components, and chronological divisions. The right-hand column shows the paleoclimatic episodes from Quereo, which we believe to be temporally and climatically correlated with the Hakenasa deposits. These data are utilized in the later discussion of the Archaic Period cultural sequence of the Dry and Salt Punas.

History of Research

A little more than forty years ago Junius Bird suggested that the hunter gatherers of northern Chile would have been able to live all along the coast and at the mouths of rivers. Furthermore, he supposed that animals like the guanaco must have been confined to the lower valleys and, for this reason, would have had little possibility of survival after the appearance of hunters (Bird 1943: 183-186). It was implicit in this formulation that in comparison with the coast, the ecological zones of the interior offered sparse resources and few possibilities for human survival.

Even though a solid corpus of ecological, cultural, and palaeoecological data does not yet exist, archaeologists studying the hunter-gatherer societies of Northern Chile have begun to suggest ways in which these groups might have adapted to the high interior zones of the eastern slopes of the Andes and to the eastern margins of the altiplano or high plateau. These zones correspond to the present territories of southern Peru, northern Chile and southwest Bolivia (between approximately 18° and 26° south latitude).

Núñez (1981) has used data from the Atacama puna (a part of the desert puna located between 20° to 26° south latitude) to propose a model of seasonal occupation which he calls "the process of Andeanization".[5] The archaeological and ecological components of this model present unique features which restrict its viability to the Puna of Atacama and perhaps to the rest of the Desert Puna. Santoro (1986) recently pointed out the limits of the Andeanization model in explaining adaptive processes in the Dry Puna region of the far north of Chile and the far south of Peru (18° to 20° south latitude).

A comparative ecological analysis (see above) has permitted us to subdivide the study area into two zones, the Dry Puna and the Desert or Salt Puna. These categories were originally defined by Troll (1958); unfortunately, he did not recognize the presence of dry puna in the study area and instead classified all of the northern Chilean highlands as desert puna. Until recently, most

archaeologists working in the area have followed the same mistaken tendency to consider the study area as a single ecological zone. The differences within and between the two puna zones were discussed in detail in the section on ecological sectors and resources. In general, the Dry Puna is characterized by an enriched environment in comparison with the Salt Puna, due to a greater level of rainfall, while the absence of extreme temperatures during winter reduces the seasonal variation of the available resources. All of these factors favor the development of a rich grassland in the Dry Puna which is not found in the Salt Puna.

Since the pioneering stratigraphic excavations of Ravines (1967, 1972) in the precordilleran sites of Caru and Toquepala, there has been an insistence on a model of long-distance transhumance involving coast-based hunters who moved seasonally into the higher zones. It has been assumed that these incursions were for short periods limited by the presumed inhospitable nature of these zones. A variation of this model emphasizes transhumance by high Andean hunters moving down to the coast (Alvarez 1980: 1029; Dauelsberg 1982: 38).

Much earlier, and independently, Niemeyer and Schiappacasse (1963) were the first in Chile to suggest the elements for a model of regional transhumance.[6] In this context, Schiappacasse and Niemeyer have tried to explain the incidence of highland Andean features on the coast and vice-versa in terms of what Cashdar (1983) calls the "social control of territoriality". Schiappacasse and Niemeyer (1984: 176-177) apply this model in postulating an exchange of territories between highland and lowland groups, so that each group gains direct access to resources located far from their habitat of origin (Schiappacasse and Niemeyer 1984: 176-177).

In the Andes, the transhumance model was suggested by the variety of seasonally complementary resources stepped along both slopes of the Andean cordillera. It was assumed that the hunter-gatherers located their base camps on the coast from May to September and went up to the puna during the summer or "Andean winter".[7] This temporal/spatial distribution was proposed based on the common idea that the puna is inhospitable to humans and other animals during the austral winter (May-September) (Lynch 1967, 1971, 1980).

Local studies have demonstrated limitations or criticized the overall validity of the general model of transhumance (Le Paige 1975; Núñez 1975: 70-71; Núñez et al. 1975). Nevertheless, the concept continues to be used in its fundamental terms, despite the fact that not only has it suffered modifications (Lynch 1980: 4-5, 1981: 223-224), but has also seen the development of opposing theoretical positions (Cardich 1980: 115-121; Rick 1980, 1983).[8]

In this general context, from the perspective of the Central Andes, it has been suggested that the marked seasonal cycles of peripheral areas such as southern Peru and northern Chile would have motivated the development of seasonal transhumance between highlands and lowlands. The available evidence tends to confirm this hypothesis in its general terms, subject to a series of limitations summarized in the following paragraphs.

During the 1970s, various archaeologists pointed out the difficulties in demonstrating archaeologically the patterns of movement between the coast and

the puna. The main problem was the discordance, for comparative purposes, of the coastal material from well-documented excavation contexts and the insufficient information from surface collections at the highland sites. In consequence, it was established that evaluation of the hypothesis of long-distance transhumance required the collection and analysis of new data (Schiappacasse and Niemeyer 1975: 55-56; Núñez 1975: 73; Núñez et al. 1975; Serracino 1975: 17; Niemeyer and Schiappacasse 1977: 116-117). At this time, the hypothesis of limited seasonal movement within the lowlands was first suggested, based on the ample variety of permanent and seasonal resources available within this zone.[9]

Despite the prestigious position acquired by the hypothesis of transhumant circuits within the major ecological zones (i.e., coastal lowlands, highlands), there has also been a tendency to define patterns of high mobility *between* the major zones beginning with the Early Archaic (Núñez and Dillehay 1978: 41-50 and Lámina 3). According to these authors, the restricted, intra-zonal model of transhumance could not have been static during several millennia; they suppose that it would have been preceded by a pattern of long-distance, inter-zonal mobility and followed by more stable residential patterns. This process would have covered the period from 11000 to 4000 years before present. Unfortunately, the Núñez-Dillehay evolutionary model is still far from being corroborated archaeologically, a problem which plagues all of the hypotheses discussed thus far in this article.

In all of the versions of the transhumance model cited above, there is a tendency to underestimate the potential of the highlands to support year-round occupation, especially in the puna zones (True 1975: 114). It is true that plants, animals, and people cannot survive during the winter months in the high puna sector of the Puna de Atacama (Bowman 1924: 244-247, 277-278), but contrary to general belief, such is not the case in the dry puna.

In the following sections, we present a summary of the archaeological evidence available for the Archaic Period in the puna of northern Chile and southern Peru, in order to assess the different intra-zonal patterns of transhumance proposed earlier in this paper for the Dry Puna and the Salt Puna.

Cultural-Chronological Sequence and Setllement Patterns

The following sections present concise descriptions of known sites of the Dry and Salt Punas which were excavated stratigraphically and for which radiocarbon dates are available. These sites are ordered in a sequence that includes the Paleoindian, Early Archaic, Middle Archaic, and Late Archaic Periods. The associated radiocarbon dates are presented in Tables 2 and 7. Table 3 summarizes the information for each site on location, chronological placement, and sample size. Tables 4, 5, and 6 list the diagnostic artifacts for the sites and the periods under discussion.

Paleoindian Periods (12500?-11000 B.P.)

No Paleoindian occupations have yet been found in the Dry Puna or the Salt Puna. Surface remains of extinct Pleistocene fauna have been found, but without associated cultural material (Casamiquela, personal communication cited in

Santoro and Chacama 1982). Nevertheless, we continue to hope that buried or surface evidence of these early inhabitants of the Andes will be discovered around the Pleistocene lakes, which are now salares.[10]

Early Archaic Period (ca. 11000-8000 B.P.)

We have defined two Early Archaic Period patterns, one in the Salt Puna called **Tuina** (Núñez 1983b) and one in the Dry Puna called **Patapatane** (Santoro 1986). These two patterns are somewhat offset chronologically, with the Tuina pattern appearing earlier, before there is any evidence for occupation in the Dry Puna.

Salt Puna (Tuina pattern, 11000-9500/9000 B.P.). This pattern has been recorded in the oases and salares zone in the sites of Tuina and San Lorenzo, and in the intermediate quebrada zone in the Chulqui site (see Table 4). Núñez (1983a) has suggested that these sites represent the beginning of a seasonal transhumance pattern characterized by high mobility. According to this model, low density groups based in the sheltered valleys would have exploited the diverse highland ecozones and even reached the eastern jungle, giving a greater range to the transhumant pattern.

The Tuina 1 shelter, located near Calama at 2800 meters, has a radiocarbon date of 10820 B.P. for Stratum IV, the beginning of occupation (Núñez 1983a). A second date of 9080 B.P. was obtained from this site by the former Columbia University-Universidad del Norte joint mission, but no context is reported (see Tables 2 and 3).

Tuina I artifacts were made of sandstone ["toba desvitrificada"] and local feldsite in small workshops near springs (Figure 3). The rare presence of obsidian artifacts speaks in favor of seasonal movement towards the high puna, the only place in tbe entire Salt Puna zone where obsidian can be found. These movements must have taken place in spring or summer, given the ecological restraints on winter use of the high puna sector.

Based on the archaeological data, we suggest that the paleoclimatic situation[11] was such that the Tuina highlands presented abundant forage and springs that concentrated herbivorous fauna (camelids) and rodents. However, the total quantity was insufficient to support people year-round; we believe that the local resources attracted hunters to the Tuina area for short periods each year (Núñez 1984).

Strata IV (initial occupation) and II of Tuina 1 correspond to the same occupational pattern, given the presence of similar artifacts separated by a micro-deposit of sterile ash (Stratum III). The initial occupants of Tuina (those who deposited Stratum IV) cut a shallow pit into the sterile deposits at the base of the site in order to make the shelter more habitable. Disturbance in Stratum I has contaminated that level with recent deposits, so we do not have reliable information on the final Archaic inhabitants of the site.

The bones recovered from Tuina 1 indicate greater consumption of camelids in the early stages of occupation, while later, the proportion of rodents (e.g., *Lagidium chinchilla*) became important (Núñez 1984).

San Lorenzo Cave is located in one of the dry canyons that descends from the high puna to the oasis of Toconao. Núñez (1983a: 59) obtained two early dates from this site, 10400 and 9960 B.P. A third date of 10280 B.P., run by Spany (1967), lacks published context (see Tables 2 and 3). As at Tuina, San Lorenzo was an occupation located far from the high puna in an area that was propitious for hunting camelids and rodents and collecting wild plants.

The area of occupation at San Lorenzo Cave covered 25 to 30 square meters. Nine levels were detected in 120 cm. of deposition. Strata I, II, and III are late and date after 595 B.P.. Strata IV to IX correspond to the Early Archaic Period; diagnostic cultural materials from these levels are presented in Table 4. The remains from this site tend to show a subsistence regime appropriate to the local environment of shallow quebradas and moderate relief, with habitats better suited to rodents than camelids (Núñez 1984).

Located downstream from the village of Toconce (3,280 m.), Chulqui shelter has preceramic levels (Strata V and VIa) dated to 9590 B.P. (see Tables 2 and 3). A post-Archaic occupation in the upper strata yielded a date of 2130 B.P. (Sinclaire 1985: 75; see Aldunate et al. 1986 for complementary information on Chulqui). The early occupation of Chulqui has remains of *Lama guanicoe*, *Lagidium viscasia*, and edible roots with bulbs that are still collected on the slopes around Toconce. Eighty lithic artifacts were recovered from the early levels (ibid.) (Table 4).

The lithic industry and hunting and gathering elements from Chulqui are comparable to those from Tuina 1 and San Lorenzo. Chulqui would therefore be a late expression of the Tuina settlement pattern (Sinclaire 1985; Núñez 1984). In summary, we would place Tuina within a model of incipient, high mobility transhumance centered around the oases and low quebradas (Tuina and San Lorenzo) and complemented by seasonal incursions into the intermediate quebradas of the rhyolitic plateau (Chulqui) and up to the high puna (presence of obsidian in lower sites). The ephemeral occupation of this last sector has limited the possibilities of finding early sites there, despite the efforts to do so (Niemeyer and Schiappacasse 1968, 1976).

The Tuina pattern (11000-9500/9000 B.P.) is not found in the Dry Puna. We group the earliest remains from that area in our second Early Archaic pattern, which we call Patapatane.

Dry Puna (Patapatane pattern, ca. 9500-8000 B.P.). This pattern has been documented in the following sites: Las Cuevas, Hakenasa, Toquepala, Caru, Patapatane, and Tojo-Tojone. Las Cuevas and Hakenasa are located in the high puna sector, representing a substantial difference from the Tuina pattern in the Salt Puna (Table 3). The other known Patapatane sites are located in the precordilleran and cordilleran valley sectors.

Radiocarbon dates from Patapatane pattern sites cluster around 9500 and 8000 B.P., respectively, with no intermediate dates (Table 2). The early part of this pattern consists of the initial levels at Toquepala (Ravines 1967, 1972), Tojo-Tojone (Dauelsberg 1983; Alvarez 1980), and Las Cuevas (Santoro and Chacama 1984). The principal cultural indicators from these sites are listed in Table 5.

Tojo-Tojone (ca. 9500 B.P.) is characterized by thick, lanceolate points. These points have been compared to similar forms that appear 3000 years later on the coast at Camarones, in order to suggest "sierra-valley-coast" transhumant movement. At the same time, "sierra-puna" movements were proposed (Dauelsberg 1983: 14-17). These hypotheses will surely be revised to accord more closely with the dates.

Recent excavations in Tojo-Tojone by Santoro and Dauelsberg (ms.) recovered diagnostic stemmed, triangular points previously unknown from this site (Dauelsberg 1983). These points were found only in the lowest level of the site, which lacked the thick, lanceolate points diagnostic of the overlying Early Archaic strata. The Tojo-Tojone stemmed, triangular points are similar to those from Las Cuevas I (Figure 4, nos. 1 and 2).

In Las Cuevas, the early deposit is buried by a thick layer of sterile clay and large blocks of andesitic rock from the roof of the cave (Santoro and Chacama 1982, 1984). Later deposits found above the sterile clay are not reported here. The early occupation (Las Cuevas I), 20 to 25 cm. thick, was subdivided into three arbitrary levels. The upper level has the greatest concentration of cultural remains and a radiocarbon date of 9270 B.P.. The middle level (9540 B.P.) and lower level represent earlier occupations (see Table 2).

A total of 2227 remains were recovered from Las Cuevas, of which 1771 (79.5%) pertain to the Patapatane pattern strata. The high proportion and diversity of the lithic artifacts stands out; bones and other organic materials are scarce. The rare, miscellaneous elements include red painted rocks without designs and an unfossilized shark tooth, which indicates some kind of contact with the coast (see Table 3 and Figure 4).

Las Cuevas I was a camp located to exploit the resources of an adjacent marsh. The first inhabitants of the site cleared a shallow pit in the cave floor and surrounded it with blocks and slabs broken or fallen from the walls and roof. The overall low density of remains in the Las Cuevas I deposits suggests that the site was occupied for short periods of time at irregular intervals. The high incidence of flakes and other percussion- and pressure-flaking debris indicates that hunting and butchering tools were finished in the cave.

The bones of large and small animals demonstrate in a preliminary way a level of diversified hunting in accordance with the variety of tools found in Las Cuevas I. These remains also suggest specialization in the manipulation of the available resources. Taking into account the location of the site at 4000 meters, in the lower part of the high puna, we suggest that Las Cuevas was a seasonal campsite used during the winter. At this time (May-September), this sector is more hospitable than the rest of the Dry Puna below as well as above Las Cuevas.

The late segment of the Early Archaic Patapatane pattern of the Dry Puna occurs in the lower strata of the Patapatane, Hakenasa, and Caru sites and in the stata immediately underlying the sterile clay layer in Las Cuevas. Caru has a radiocarbon date of 8190 B.P. for this occupation (Ravines 1967: 46), very close to the late Patapatane dates of 8270 B.P. from Las Cuevas and 8160 B.P. from the Patapatane site (see Tables 2, 3, and 5).

The deposit in Patapatane Cave measures 123 cm. deep on average and was divided into 12 arbitrary levels during excavation. The late Patapatane pattern materials (the Patapatane I component) come from the lowest levels, J, K, L, and M, which together vary from 5 to 35 cm. in thickness. Two hundred eighty-four cultural items were recovered, comprising 11.73% of the total excavated sample for the entire sequence. The majority are animal bones; other finds include lithic tools, fragments of the purple mussel *Choromytilus chorus* (one with use wear), red pigment, and a piece of worked sandstone (see Table 5 and Figure 5).

The high proportion of bones (75% of the total remains) in the Patapatane I component indicates a great deal of butchering of selected animal parts brought from the kill sites. The abundant animal bone also suggests that the environment of the precordilleran valley sector where the site is located was less arid than at present and offered better complementary resources. Finishing of stone tools was a secondary activity in the cave, judging by the scarce lithic debris. In light of these data, we can suggest that Patapatane I was a transitory station occupied by hunters who pursued camelids, rodents, and birds. The presence of camelids and rodents in the remains suggest that the site could have been occupied at any season,[12] but the best time would have been during the summer (October to April), when rainfall increases, the pastures florish, and the camelids give birth.

The last site with stratigraphic evidence for the Patapatane pattern is Hakenasa Cave, where a one meter square test pit was excavated in a 123 cm. deep deposit (Santoro and Dauelsberg ms.) (see Tables 1, 2, and 3). The Patapatane pattern remains occurred in the lowest levels of the site, numbered 21 to 24 (Hakenasa I). These levels exhibited a low density of occupation (see Table 5 and Figure 6, nos. 22-25, 29, and 30 for diagnostic artifacts). The few bones recovered suggest a slight predominance of large animals (possibly vicuña or guanaco and deer), complemented by smaller species (birds and rodents).

Hakenasa I was a campsite established to take advantage of the enclosed shelter of the cave and the stable hunting resources of the Ancopujo and Cosapilla marshes. It was probably occupied during the winter, for the same reasons suggested for the Las Cuevas I occupation.

The seasonal use of the prairies and western Andean slopes by modern herders from Cariquima (van Kessel 1980) may provide an analog for Early Archaic hunting patterns. The Cariquimeños reserve the high prairies above 4000 m. for the summer (December-March) and use the lower grasslands between about 3700 and 4000 m. in the winter (June-September).[13] Hakenasa and Las Cuevas, both located in the lower part of the high puna, may represent segments of a similar pattern. Caru, Toquepala, and Patapatane, all in the precordilleran valley sector, and Tojo-Tojone in the cordilleran valley sector, would be the other segments of a Cariquima-like system of seasonal movement.

In the Patapatane pattern, the notable appearance of various hunting stations in the three ecological sectors of the Dry Puna indicates that climatic conditions in this area were favorable for game and people during the Early Archaic Period. However, the available archaeological data for this pattern do not allow us to clarify how the possibilities of the high puna marshes in the winter were

combined with the summer hunting resources of the precordilleran valley sector. If our ecological and ethnographic deductions are correct, it is possible that a pattern of seasonal hunting took place in the highlands of the Dry Puna; winter camps in the high puna would have alternated with more transitory visits to the precordilleran valley sector. Greater complication arises in attempting to explain the presence of *Choromytilus* shells in Patapatane and the shark tooth in Las Cuevas, both of which lie 60 km. in a straight line from the coast. Núñez (1984) has suggested that these coastal elements in the highlands of the Dry Puna correspond to an early expression of a high mobility model of transhumance, like that which he proposed for the Tuina pattern in the Salt Puna but covering a larger area. Unfortunately, the evidence for coastal contact supports a model of exchange between different groups of permanent residents on the coast and in the highlands as strongly as it does a model involving highland hunters moving down to the shore. A more detailed definition of Archaic settlement systems clearly requires the collection of more data on geological, paleoecological, chronological, and cultural aspects of these early occupations.

Middle Archaic Period (ca. 8000-5000 B.P.?)

At the close of the Early Archaic Period, the regular and systematic occupation of the different niches of the Dry and Salt Puna diminished considerably and remained low throughout the Middle Archaic Period, from 8000[14] to around 5000 B.P.. All of the early sites reviewed in the preceding section show a marked decrease in activities and even long periods of abandonment, sometimes punctuated by short, sporadic reoccupations. This "abandonment" of the high altitude ecozones corresponds to the Climatic Optimum, a time marked by a dry, warm climate at Quereo, in north-central Chile (Núñez et al. 1983) (see Table 1). In the highlands of northern Chile, similar alterations in climate may have forced the puna hunters to seek complementary resources on the coast, where, coincidentally, more intense and stable occupations began at this time (e.g., Quiani, Bird 1943; Camarones 14, Niemeyer and Schiappacasse 1977, Schiappacasse and Niemeyer 1984; Camarones Punta Norte, Dauelsberg 1982; Quiani 9, Muñoz and Chacama 1982; see also Willey 1971: 199).

Dry Puna. The scarce evidence of Middle Archaic occupation recovered from Patapatane correspond to levels H and I (Patapatane II). No absolute dates are available for these levels, which are assigned to the Middle Archaic Period because of their stratigraphic position between the Early and Late Archaic components of the site. Artifacts from levels H and I include lanceolate points with small side notches near the base (Figure 5, no. 16) which are similar to Early Archaic points from this area and a bone point which is less elaborate than earlier examples. The faunal remains indicate diversified hunting, with a greater incidence of camelids relative to the smaller animals.

In Hakenasa, levels 15 to 19 are assigned to the Middle Archaic Period (Hakenasa II, see Table 1), again on the basis of stratigraphic position between Early and Late Archaic components. As at Patapatane, no absolute dates are available for the Middle Archaic occupation. Figure 6, nos. 26-28 and 31-33 are diagnostic artifacts for this occupation.

The forms of the tools in both Patapatane and Hakenasa are derived from the earlier traditions, which could indicate that we are dealing with relict

groups of Early Archaic hunters who returned sporadically to the puna habitats. We cannot yet establish whether the base camps of these groups were on the coast or in some niche of the puna that we have not yet located.

Salt Puna. Recent excavations in two sites, Alero Toconce and Alero Chulqui 3, have provided the first radiocarbon dates for the timespan of the Middle Archaic Period in the Salt Puna zone (Aldunate et al. 1986: 7-9) (see Tables 2 and 3). The earliest occupation in Alero Toconce is dated to 7990 B.P.; remains from this component include two triangular (isoceles) points, retouched flake knives, a scraper, and a cobble mano with traces of red pigment. Remains of rodents and camelids indicate utilization of local resources, while the presence of obsidian tools suggests brief incursions into the high puna.[15] In Chulqui 3, the earliest occupation has a date of 7810 B.P., but "the context is poor and there are few diagnostic artifacts" (ibid.: 9).

Late Archaic Period (5500?-4000 B.P.)

The Late Archaic Period witnessed the climax of the Archaic hunters, with an extensive use of a greater diversity of habitats within the highlands. During this period, the tradition of distinct Dry and Salt Puna settlement patterns also intensified.

Dry Puna. The sites of Patapatane (precordilleran valley sector), Puxuma, Piñuta, Guañure, and Tojo-Tojone (cordilleran valley sector), and Hakenasa, Lipiche, and Pukara (high puna sector) document the Late Archaic Period (Santoro and Chacama 1982, 1984; Dauelsberg 1983; Santoro and Dauelsberg ms.). We propose to call this cultural system the Hakenasa pattern, considering that this site is the best representative of the Late Archaic Period of the Dry Puna. Table 6 presents the classification and distribution of the cultural indicators for the Hakenasa pattern.

The ample use of different lithic tool forms indicates patterns of specialized use of the Dry Puna area during the Late Archaic Period. Some forms continue from or are reminiscent of earlier traditions. There is a general reduction in the size of tools, probably reflecting improvements in the technology for carrying out the same tasks as their earlier Archaic ancestors: hunting camelids, rodents, and birds.

The Hakenasa site has a radiocarbon date of 4380 B.P. (Table 1) for the Late Archaic component (Hakenasa III). This component is the climax of occupation at the site, judging by the great variety and quantity of excavated remains (see Table 6 and Figures 7-9). Triangular knives appear (Figure 9, nos. 79-80), along with the first examples of concave-based triangular points. In the Formative Period, these triangular points replace the traditional Archaic lanceolate, ovoid, and stemmed triangular forms. The faunal remains from Hakenasa III indicate a predominance of large over small animals, in a ratio of about two to one.

The technological changes mentioned above apparently formed part of a larger process of socio-cultural change whose indicators--fragments of pottery and a gold disk from a level dated to 2850 B.P.--are superposed on the Late Archaic occupation.[17]

The density of Late Archaic occupation of the site and the abundant presence of chipping debris, instruments such as perforators (for leather), and adornments such as beads indicate that conditions allowed the development of technologies not directly associated with subsistence activities.[18]

A different situation pertains in regard to the shelters and caves distributed in the various quebradas of the cordilleran valley sector, including the sites of Puxuma, Piñuta, Gauñure, and Tojo-Tojone. With the exception of Tojo-Tojone, the Late Archaic components at these sites represent the initial occupation. This situation could indicate an innovation in the adaptive strategy of the Late Archaic hunters, who began intense use of ecological zones that were lightly exploited during the preceding periods, judging from the scarcity of earlier archaeological remains. The traditional locations in the high puna and precordilleran sectors continued to be inhabited, but new areas were also occupied.[19]

Puxuma 1 is part of a series of shelters grouped together in the quebrada of the same name. Two radiocarbon assays on charcoal from the intial occupation level yielded similar dates, 4010 B.P. and 4240 B.P. (see Tables 2 and 3). The scarce remains and diagnostic implements from this Late Archaic occupation are listed in Table 6. The few bones suggest a predominance of large animals relative to small ones. Red and yellow pigments made from iron oxides and black manganese pigment were found in the deposits (Leonardo Figueroa, personal communication); these minerals were probably used during the Late Archaic Period to paint the most deteriorated of the paintings in the cave, which are covered by the thickest patina of dust. (Other, better preserved paintings are probably post-Archaic in date.)

The low density of occupational remains in Puxuma 1 would indicate a temporary hunting camp established to take advantage of the local faunal resources, as part of a larger circuit that included other ecological sectors in the highlands.

Three other shelters of the Puxuma group have traces of rock art and thin lenses of midden that have yet to be excavated. The area also has fieldstone structures of different sizes, with pottery fragments on the surface, but apparently without stratified deposits.

Piñuta, a small cave in the precordilleran sector, has a date of 3750 B.P. for the beginning of occupation (see Tables 2 and 3). As at Puxuma 1, few diagnostic elements are associated with this occupation (see Table 6). The faunal remains show a slight predominance of large animals (camelids) over small species (rodents and birds). Red and yellow pigments also recovered from Piñuta were probably used to paint some of the figures that adorn the cave walls. Santoro and Dauelsberg (1985) have suggested that a line of human figures along the top of the wall corresponds to the Late Archaic Period. The scene appears to represent a pattern of collective hunting in which the game was driven (Santoro and Chacama 1982: lámina 2; Santoro and Dauelsberg 1985).

Considering the low density of remains in the limited space of the cave, the Late Archaic occupation of Piñuta would correspond to a temporary camp used to exploit the restricted hunting resources of the precordilleran canyon in which the site is located. At Piñuta, there is no clear transition in the artifacts

following the Late Archaic Period, such as occurred at Hakenasa, nor is there a stratigraphic interruption between the Late Archaic and overlying Early Formative strata. However, the presence of ceramics with vegetable temper in the Early Formative levels (radiocarbon dated to 2540 B.P. and 2520 B.P.) shows the culmination of the process of change that took place during the Late Archaic Period.

Guañure seems to represent a shorter-duration, precordilleran campsite. A radiocarbon date of 4380 B.P. (see Tables 2 and 3) on materials associated with red pigment might date poorly-preserved paintings on the walls of this small shelter. Remains recovered in excavation included only flakes, chipping debris, and some large and small animal bones and were probably left by a very reduced group of hunters during an ephemeral visit. This type of occupation was probably part of a larger settlement pattern that consisted of more stable camps complemented by temporary occupations such as Guañure for short-term hunting expeditions.

The upper strata of Tojo-Tojone apparently correspond to another temporary camp from which Late Archaic hunters pursued guanaco and deer and exploited a small quarry of volvanic stone. Dauelsberg (1982: 12) got a radiocarbon date of 3740 B.P. on materials from this site (see Tables 2 and 3), but without cultural associations. In a recent expansion of the excavations, Santoro and Dauelsberg (ms.) recovered a lanceolate point similar to those from Patapatane, a fragment of a convergent-stemmed triangular point, and two fragments of the purple mussel *Choromytilus chorus* (see Table 6).

Finally, the upper-middle strata at Patapatane (levels F and G) document the last example of a Late Archaic camp in the Dry Puna, with a radiocarbon date of 4890 B.P. (Patapatane III) (see Tables 2 and 3). Table 6 lists the diagnostic materials recovered from these levels, along with the remains from the other sites discussed in this section.

As in the other Late Archaic sites from the Dry Puna discussed above, in Patapatane, large animal bones predominate over those from small animals. At this time, Patapatane was probably a seasonal camp intended for the exploitation of the hunting resources of the adjacent prairie. As at Tojo-Tojone, the remains of *Choromytilus chorus* in Patapatane indicate some form of contact with the coast.

Of particular interest is the recovery of rock art from secure, Late Archaic contexts at Patapatane. A large chunk of rock found in the level associated with the date reported above had a design showing three human figures in a row, similar to the rock art at Piñuta.

Remains of two root crops, ulluco or papalisa (*Ullucus tuberosum*) and isaño (*Tropaelum tuberosum*), were recovered in the levels immediately overlying F and G at Patapatane. If these finds are not the result of stratigraphic disturbances, their presence in the late epochs of the hunters is very suggestive as an indicator of the process of change that became more evident in the Formative Period.

The Late Archaic sites of the Dry Puna would seem to represent a more intensive utilization of the different enclaves of the three ecological sectors. By analogy to modern climatic conditions, we can suggest a pattern of seasonal mobility, with winter camps nucleated in the high puna and temporary camps in the lower, precordilleran and cordilleran valley sectors visited during the warm, dry seasons (September-May). The small camps at the base of the quebradas in the cordilleran valley sector deserve special mention; these sites were temporary camps for exploiting very localized resources and may form part of a dense network of camps of different sizes and functions distributed throughout the various sectors. Of course, further methodological as well as fieldwork will be necessary to improve our identification and differentiation of the stable, semi-stable, and transitory sites that would fit our model of Late Archaic adaptation to the Dry Puna.

Salt Puna. The various Late Archaic sites known from this area have led to the recognition of a pattern of specialized seasonal transhumance involving the oasis sector of the Salar de Atacama, the middle course of the Loa river, the intermediate valleys of the rhyolitic plateau, and the high puna (Núñez 1981, 1983a, 1983b) (see Tables 2 and 3). We do not present the diagnostic remains from these Late Archaic Salt Puna sites in tabular form, as we do for the Dry Puna, because the archaeological materials and contexts are extensively published by the excavators and recently reviewed by Núñez (1983a, 1983b). However, we will discuss the important aspects of these sites in the following section; the radiocarbon dates and the site characteristics are included in Tables 2 and 3, respectively.

The Tulán 52 site in a quebrada of the rhyolitic plateau provides an example of a more stable camp, judging by the presence of agglutinated, circular dwellings (Núñez 1983a, 1983b). The inhabitants of this site were sustained by the resources of the quebrada, which connected the high puna with the lower oases. The Late Archaic occupation of Tulán 52 has two dates, 4340 B.P. and 4270 B.P. (see Tables 2 and 3). Midden at this site is dense, and many hearths were found. The houses are circular, semisubterranean, and defined by large, vertical stone slabs. Both the walls and the floors of these structures had pits and niches, interpreted as storage spaces. At a second, nearby site, only midden was found, without any structures. This site, Tulán 51, has a date of 4990 B.P..

Both sites contain abundant bones of adult camelids and rodents and a lithic industry based on large flakes and a more intensive use of obsidian. The high diversity of lanceolate points (Figure 10) accompanies a decrease in stemmed points, in contrast to the situation in the Dry Puna. The Tulán sites also have diverse knives, perforators, scrapers, microliths, and choppers (Núnez 1983b: 176).

Grinding tools are a distinctive element of the Tulán sites that are not found in the Late Archaic Dry Puna. These tools include various kinds of manos and mortars presumably used in the preparation of food and the grinding of pigments; unfortunately, plant remains were not recorded in the excavations (Núnez 1983b: 177).

The intensive use of obsidian demonstrates constant exploitation of high puna resources from summer camps which been established in that sector. The

remains of adult camelids suggest that the habits of semi-sedentary life aided in the specialized hunting of these animals in the base of the quebrada, perhaps by the *chacu* method.[20] Local rodents (*Chinchilla, Ctenomys, Lagidium*) supplemented the diet (Hesse 1982; Núñez 1986).

Groups of structures similar to Tulán 52 have been located lower down, on the shores of the Salar de Atacama at 2500 meters. Similarities in artifacts suggest that hunters from the intermediate quebradas, possibly even from Tulán, used these sites as seasonal camps. The high concentration of rodents, especially *Ctenomys* (Hesse 1982: 203), camelids, and Andean avifauna in the marshes and lakes of the Salar would have stimulated access, giving rise to sites such as Tambillo (Núñez 1986). A cemetery with human skulls associated with mortars was found near this site (ibid.). Although the rodents of the Salar are permanent residents, the avifauna and probably the camelids are only present in the summer, when the *Prosopis* fruits are ripe; these conditions support our hypothesis of seasonal use of the Salar de Atacama by Late Archaic hunters.

Based on these data, Núñez (1980b) proposed a Late Archaic transhumance system for the Salt Puna involving base camps in the Tulán quebrada. During the summer, the inhabitants would have gone to the high puna to get obsidian and to hunt camelids, rodents, and birds concentrated around the small lakes of that sector, occupying sites such as Miscanti and Menique (Niemeyer and Schiappacasse 1976). At the end of the summer, the hunters would have relocated to the mouth of the quebrada on the Salar de Atamcama to collect fruits (e.g., *Prosopis*) and hunt local game at sites such as Tambillo. This system would have allowed the maintenance of more stable camps--such as Tulán--in the quebradas that unite the high puna with the oases of the Salar (Núñez 1981, 1983a, 1983b).

Calarcoco, a site in another intermediate quebrada of the rhyolitic plateau to the east of Toconao, would represent part of a tranhumant system similar to that suggested for Tulán (Núñez 1980b; Serracino and Pereyra 1977). This site is dated to 5120 B.P. (see Tables 2 and 3).

Núñez (1980b; 1981; 1983a; 1983b) has identified a similar circuit based in the quebrada of the Puripica river (3200 m.), in the extreme north of the Atacama basin in an environment richer in resources than Tulán. Located in the intermediate quebrada sector, the Puripica 1 site has a lithic industry (including grinding tools) that shares similarities with Tulán, although Puripica 1 has a notable lack of large flakes, which are replaced by flakes of local basalt. Diagnostic tools include lanceolate points, knives, perforators, microliths, and conical mortars. Dates for Puripica 1 are 4815 B.P. and 4050 B.P. (ibid.) (see Tables 2 and 3). The presence of marine shells in Puripica indicates some form of contact with the coast (Núñez 1981).

Considering the high frequency of knives versus the low proportion of points, Núñez (1981; 1983a; 1983b) has suggested that there was a greater emphasis on butchering and preparation of skins at Puripica 1, accompanied by decreasing hunting. However, this interpretation would only make sense in the context of increasing animal domestication. Hesse (1982: 210) has proposed that the high mortality of juvenile and neonate camelids at Puripica 1 as seen in the faunal remains can be interpreted as the result of pathologies particular to the

breeding of these animals in captivity.[21] The proportions of tool types and the great quantity of juvenile and neonate camelid remains in the site leads us to follow Hesse (1982: 210) in suggesting--as a working hypothesis--that at Puripica we are witnessing an incipient "meat-producing pastoral economy" tied to domestication and breeding of these animals. Furthermore, the unique find of stone blocks with carved images of camelids (Figure 11) may be related to a cult of domestic llamas (Núñez 1983a).

Puripica 1 was probably occupied most frequently in the summer, when camelids give birth. Complementary camps should be located along the quebrada and in the low oases of the Loa river. In this latter area, sites of the Chiu-Chiu Complex apparently fit the category of complementary camps: not only do these sites have radiocarbon dates contemporary with Puripica and the other Late Archaic Salt Puna sites, but the kinds of microliths found in Puripica are also diagnostic elements of the Chiu-Chiu complex (Núñez 1986).

The Chiu-Chiu Complex appears to represent a pattern of transhumance within a more restricted area (Druss 1977). The sites of this Complex are located along the lower course of the Loa river; radiocarbon dates range from 4665 B.P. to 3625 B.P. (Tables 2 and 3). More than 70 sites have been recorded, including transitory stations and more complex, semi-permanent camps. Diagnostic artifacts of the Chiu-Chiu Complex include lanceolate points, symmetrical double points, bifacial knives, microliths with triangular sections, and grinding tools. A wide variety of subsistence remains have been found, such as camelids, rodents, birds, fish, and seeds.

The presence of wool in sites of the Chiu-Chiu Complex indicates incipient domestication of camelids, a process which Druss (1977) interprets as the consquence of a high degree of specialization in the transhumant patterns of hunting and gathering. Various bands would have used the resources intercalated between the middle Loa river and the high sectors, such as the area around Puripica 1.

The semisubterranean circular dwellings, lanceolate points, grinding implements, and microliths common in both Puripica 1 and Chiu-Chiu has allowed Núñez (1986) to suggest that the hunter-gatherer communities occupying these sites established a transhumant pattern involving camelid hunting in the high puna, domestication of llamas in the intermediate quebradas, and maintenance of herds, hunting, and plant gathering in the wetlands of the Loa river, when these resources were not undergoing a period of drought. These proto-pastoralist activities would configure the beginning of a growing regional complexity, if one considers that the presence of marine shells in Puripica 1 and Chiu-Chiu indicates contact with the alternative resource area of the coast (Núñez 1980b; Hesse 1982; Druss 1977).

The Isla Grande and Confluencia sites, located in the middle course of the Loa river, could demonstrate the beginnings of the Puripica-Chiu-Chiu pattern. Isla Grande dates to 6008 B.P., while Confluencia has a date of 5380 B.P. (see Tables 2 and 3). Lanceolate points and grinding implements stand out in the Isla Grande assemblage, where they are associated with abundant plant remains and camelid bones. In Confluencia, stemmed points, lanceolate points, large, wide-bladed lanceolate knives, and triangular knives have been found in association

with semi-subterranean dwellings (Lanning 1968). Núñez (1983a, 1983b) has suggested that these occupations represent an earlier stage in the development of the more efficient transhumant adaptation postulated for Puripica-Chiu-Chiu, involving control of ecological sectors located between the high puna and the middle Loa river. However, we have yet to find evidence that directly relates the Isla Grande and Confluencia sites to occupations in the other sectors of the Salt Puna.

Summary and Discussion

The archaeological information presented in this paper, corresponding to the Early through Late Archaic Period, shows *general* similarities in the industries and socio-cultural processes of adaptation of the hunter-gatherer societies that occupied the Dry Puna and the Salt Puna in southern Peru and northern Chile. The data we have summarized corroborate the suggestion by Schiappacasse and Niemeyer (1975) to the effect that the high altitude zones played a role in the cultural unification of the area.

Nevertheless, studies of the fauna, flora, and other aspects of the environment permit the recognition of different habitats within the two Punas. Based on such information, we have suggested that the southwest limit of the Dry Puna, which Troll (1958) located at the Peru-Chile border, really extends to the vicinity of Lirima in northern Chile. The Salt Puna, meanwhile, stretches from Lirima south to the Puna de Atacama.

In the Dry Puna, the rich foraging environments of the three sectors--precordilleran valleys, cordilleran valleys, and high puna--provided appropriate conditions for a persistent hunting pattern. This area provides constant, if not abundant, game in the form of camelids, rodents, and birds. As there is no marked seasonality of the pasturage in the Dry Puna, a large part of the animals do not move along the vertical profile, but rather tend to concentrate year-round in restricted spaces defined by the availability of water and grass. Swamp enclaves located in the high puna, with stable resources that offer hospitality to animals and men throughout the year, have been presented as central settlement axes. Considering all of these elements, we propose the following model of subsistence and settlement: from early epochs, hunters would have had the high puna swamps as the only secure source of subsistence in the winter (May to September) and as a complementary source during the rest of the year. Following the winter, the summer rains (December to March) reactivate the enclaves all along the vertical profile of the highland Dry Puna zone, offering diverse and dispersed subsistence alternatives which the hunters would have utilized. This model is consistent with the use of the area by modern herders: the swamps low in the high puna (ca. 4000 m.) are reserved for the cold, dry winter, while the enclaves in the lower sectors as well as those higher up in the high puna are occupied during the more humid, warmer summer.

In the Salt Puna, on the other hand, the ecological factors are distinct. There is a marked seasonality of pasturage, obliging the animals to move up and down the vertical profile. In winter, the sectors above 4000 m. become uninhabitable. Thus, the central axis of relatively stable resources is found in the

intermediate quebradas of the rhyolitic plateau, which would have provided the best alternative for winter occupation in the Salt Puna. In the summer, the oases and lower quebradas as well as the high puna enclaves are reactivated and would have provided seasonal alternatives for the Archaic inhabitants of the area.

In general terms, for climatic reasons there is a noticable decrease in the foraging capacity of the Salt Puna relative to the Dry Puna, resulting in a lesser availability of game. However, the faunal resources of the Salt Puna are complemented by the seasonal production of algarrobo and tamarugal fruits in the oases and lower quebradas and some edible roots and bulbs in the intermediate quebradas; these floral resources are not present in the Dry Puna.

Chronologically, considering the entire region (Salt and Dry Punas), four periods are defined; the second of these, the Early Archaic Period, consists of two areally distinct and chronologically offset patterns (Figure 9). As yet, no evidence has been found for the earliest, PaleoIndian period, which would date before 11000 B.P..

The second period in our sequence, and the earliest for which we have evidence, is the Early Archaic Period. In the Salt Puna, this period is characterized by the Tuina pattern, dating between 11000 and 9000 years ago. The Tuina hunter-gatherers established their camps in the lower sector of the Salt Puna, in the oases and lower quebradas (Tuina 1 and San Lorenzo sites), with seasonal occupations higher up in the intermediate quebradas of the rhyolitic plateau (Chulqui 1). These people must also have made brief incursions in the summer into the high puna sector over 4000 meters, in order to hunt and to obtain obsidian. This settlement system model remains an hypothesis, but one that currently provides the best fit to the available data. An earlier model (Núñez and Dillehay 1978) proposed a pattern of incipient, high mobility transhumance for this area, involving both slopes of the Andes from the Pacific coast to the eastern lowlands. However, the available archaeological evidence only documents activities restricted to the highland enclaves of the Salt Puna, with some sort of limited contact with the coast.

In contrast, the Early Archaic Patapatane pattern of the Dry Puna (9500 to 8000 B.P.) includes two sites in the high puna sector (Las Cuevas I and Hakenasa I), in addition to sites in the precordilleran (Tojo-Tojone) and cordilleran valley (Toquepala, Caru, and Patapatane I) sectors, suggesting that more regular patterns of settlement in the highest sectors began in this period. Such a pattern would have been favored by the ecological conditions and would probably have involved seasonal movement. According to our model for the Early Archaic Dry Puna, after winter hunting in the high puna sector, the groups would have dispersed themselves along the profile of the Dry Puna in the different enclaves reactivated by the summer rains. Because the high puna continues to offer resources throughout the year, and because of the variety of enclaves available during the summer in the lower sectors of the Dry Puna, we suggest that the movements of the hunter-gatherer groups were not strongly regulated by environmental conditions and that socio-cultural factors therefore played a significant role in defining the choice of settlement pattern.

As we have seen, the environmental conditions, settlement patterns, and chronology of the Early Archaic Period in the Dry and Salt Punas, as well as the models we have derived from these data, are sufficiently distinct to support our definition of two different cultural patterns for these areas.

For the Middle Archaic Period (8000 to 6000 B.P.), few remains have been found, and the Early Archaic sites show a general abandonment. At the same time, occupation of the coast increases notably. Although the causes of this phenomenon have not yet been explained, the high altitude habitats could have undergone severe alterations, to judge by the deposits of volcanic ash that cover the Early Archaic sites in southern Peru (Ravines 1967, 1972), northern Chile (Núñez 1983a, 1983b), and northwestern Argentina (Fernández Distel 1974). The environmental perturbations that would have accompnied the increased volcanic activity evidenced by these deposits would have forced the high altitude hunters to look for new resource zones in the lowlands, leaving the traditional highland enclaves for seasonal occupations that were much less stable than in the preceding period.

The Late Archaic Period is better documented both in the Dry Puna and in the Salt Puna, which show a more intense reoccupation and specialization in hunting and gathering activities. The data are more eloquent in the Salt Puna, where the toolkits and the other remains show a specialized use of the resources located along the transect stretching from the middle course of the Loa river through the Salar de Atacama and the intermediate valleys to the high puna. We believe that the archaeological remains demonstrate that these resource zones were integrated into seasonal, transhumant circuits. These circuits were associated with a growing development of semi-permanent camps of semi-subterranean stone dwellings located in open spaces on terraces next to the quebradas, indicating a decreasing dependence on the availability of caves and natural shelters. The direction of these developments was reinforced by an apparent local process of camelid domestication.

For the Dry Puna, the Late Archaic archaeological data are less clear. The occupation of the traditional high puna and precordilleran sector sites continued (Hakenasa III, Patapatane III) and new sites were founded in these sectors (Pukara, Lipiche). Camps were also established in the cordilleran valleys (Puxuma, Piñuta, Guañure). Based on these data and the ecological conditions, we assume that the general model of Dry Puna occupation maintained certain parameters first defined during the Early Archaic Patapatane pattern: the use of winter camps in the high puna swamp enclaves and the potential for choice of summer camps at different levels through purely sociocultural factors, given that game can be found in all three sectors of the Dry Puna during the summer.

We recognize that the models which we present to account for the Archaic Period occupations of the Dry and Salt Punas of northern Chile and southern Peru are still hypothetical, and that much research will be required to test them. Nevertheless, it is our hope that this review of the ecological conditions and the archaeological data for the area are sufficient to point out the previously under-recognized differences in environment and Archaic adaptions within and between the two Punas, and to stimulate further testing of these and alternative models of Archaic settlement and subsistence patterns.

Endnotes

1. Villagrán et al. (1982) use the terms "pre-puna", "puna", and "high puna" to refer to the three floral-ecological levels of the Dry Puna zone; however, we have chosen to use the alternate terms which are current in the archaeological literature.

2. Given the gregarious herding behavior of the vicuña and its limited distribution within high altitude puna environments, it is not surprising that Franklin (1974, 1982), Rick (1980) and others have emphasized the economic importance of this animal in the lives of prehistoric Andean hunters.

3. The Salt Puna is also known as the Puna Atacameña and as the Desert Puna.

4. These models are discussed further in the section on cultural-chronological sequences and settlement patterns.

5. The new research (Núñez 1981) involves stratigraphic excavation of highland sites and represents an advance in relation to interpretations suggested by Le Paige (e.g., 1970) and based on surface collections (see the critical evaluations in Montané 1972; Núñez 1980a; Lynch 1974). The new work has allowed the development of a more secure chronological and contextual perspective for the zone.

6. Santoro (1986) has recently emphasized the quality of the data (inverted mortars, explained by comparison to the Kusedika of California) used in the interpretation of this settlement pattern (Niemayer and Shiappacasse 1963: 142-143; Davis 1963).

7. In the Andean highlands, the austral summer (December to May) is characterized not only by warmer temperatures but also by the annual rainy season. For this reason, the inhabitants of the highlands refer to this time as the "Andean winter" or "Bolivian winter".

8. See Lynch (1981) for a history of the concept of transhumance.

9. This working hypothesis has led to the proposal of various transhumant circuits, such as: the Tiliviche-Pampa del Tamarugal and adjacent coast circuit (Núñez and Moragas 1977-1978; the coast-Quebrada Camarones circuit (Shiappacasse and Niemeyer 1984); the high puna-quebrada-Puna de Atacama oasis circuit (Núñez 1980b, 1981); the Quebrada Tarapacá-Pampa del Tamarugal-Pisagua circuit (Núñez et al. 1975; True and Crew 1980: 78; True and Gildersleeve 1980: 57); and the circuits of the dry puna in Arica (Santoro and Chacama 1984).

10. Examples of these former Pleistocene lakes include the Salar de Surire in the Dry Puna (Craig 1985) and the Salar de Punta Negra in the Salt Puna (Lynch 1986).

11. The post-glacial (ca. 10000-8200 B.P.) lacustrine deposits from the Cordillera Real and Tres Cruces in the Bolivian altiplano indicate a dry, warming climate for that area (Graff-Meir 1977). On the other hand, the Quereo sequence shows a cold and rainy climate during the same time period (Núñez 1983a: 56). Our

study zone lies between these two areas, so we cannot be sure which climatic condition likely prevailed.

12. Rodents do not migrate and can be captured at any season (Pearson 1948). Guanacos display two kinds of territorial behavior: some migrate seasonally and others remain in one place, such as the precordilleran valley sector (Franklin 1975).

13. A similar pattern, involving the use of marshes during the winter dry season combined with movement to lower pastures during the summer rainy season has been described for the locality of Espinar, in the highlands of Areqipa, Peru (Orlove 1977: 91).

14. In the Salt Puna, the latest date for the Early Archaic Tuina pattern is around 9000 B.P., while the earliest Middle Archaic date is about 8000 B.P.. During this millenium, while the transition from Early to Middle Archaic took place, we do not know what (if anything) was happening in the Salt Puna. In the Dry Puna, the final dates for the Patapatane pattern are contemporary with the earliest Salt Puna dates for Middle Archaic components, but no radiocarbon dates are available from Middle Archaic components in the Dry Puna.

15. It is likely that the seasonally extreme conditions of the high puna sector of the Salt Puna prevented any sort of stable occupation of that area during the Archaic Period. This general condition, and specifically the lack of known Middle Archaic sites in the high puna, argue against the inhabitants of Alero Toconce acquiring their obsidian through exchange with other groups based in the high puna where this resource is found and therefore supports the idea of brief incursions into the high puna by the Alero Toconce hunters.

17. Both the ceramics and the concave-based triangular points are comparable to those found at the Formative site of Huancarani in southwest Bolivia (Walter 1966: figure 7a; Ponce Sanginés 1970: 23, 44, and figure 16). The concave-based triangular points from Ichuña in southern Peru are also similar (Menghin and Schroeder 1957: 44), but the excavators were not able to determine whether the context was Archaic or Formative.

18. The development of complex technologies (cordage) is recorded in the Early Archaic occupation of the Inca Cueva site (ca. 9500 B.P.), located in a precordilleran quebrada in the Puna de Jujuy area in northwest Argentina (Aschrero 1985). A small fragment of cordage was also found in Aragón (ca. 8000 B.P.) in the Pampa Tamarugal, to the west of the Salt Puna zone of northern Chile (Núñez and Zlatar 1980).

19. Here, we are referring to the sites of Pukara and Lipiche, which are currently being studied (Santoro ms.) and are not reported in this article.

20. The *chacu* method involves capturing camelids by driving them into restricted areas such as large stone corrals. This method allows the hunters to select which animals they wish to slaughter more easily than under normal, field hunting conditions and could account for the predominance of adult bones in the Tulán site.

21. Writing of the Puripica sample of camelid bones, Hesse (1982: 210) points out that, in accordance with Wing (1972, 1977) and Wheeler Pires Ferreira (1975; Wheeler Pires Ferreira et al. 1976), "two factors seem to be responsible for the increased juvenile fraction of the harvest profile. The first is economic. Young animals are culled from the herd by pastoralists as they reach mature body weight to maximize the use of available pastorage. The second is a matter of disease. Novoa and Wheeler (n.d.) point out that the unsanitary conditions usually accompanying corralling encourages enterotoxemia, an afflication that takes a substantial proportion of the young. . .Since 50-60% of the large camelids at Puripica 1 were harvested before they reached age-stage 1 [one year old], it seems reasonable to conclude that this evidence implies domestication."

Note

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Table 1. Sequence from Hakenasa Cave, Dry Puna, and proposed paleoclimatic sequence based on correlation with the Quereo site (Núñez et al. 1983).

Level	Complex	Period	C^{14}	Cultural Indicators	Tentative Paleoclimatic Sequence
1	V	Inca/			
2	V	Local			
3	V	Development			
4	IV	Early	2840±200	initial pottery, basal notched triang. points, gold ornament	
5	IV	Formative			
6	IV				
7	III	Late		variety of small hunting tools: lanceolate, rhomboidal, triang. points, bead ornaments, rock art	warm and dry Sub-Boreal (3500-2500)
8	III	Archaic			
9	III		4380±120		
10	III				
11	III				
12	III				
13	--	no human		water-lain gravel & clay	cooler and wetter Atlantic (5500-3500?)
14	--	occupation			
15	II	Middle	ca. 5500?	scarce remains of short occupations	warmer and dryer Boreal--Climatic Optimum (6500-5500)
16	II	Archaic?			
17	II				
18	II		ca. 7000		
19	II				
20	--	no human	ca. 7500?	water-lain gravel & clay	wetter and cooler Pre-Boreal (8000-7500)
21	--	occupation	ca. 8000		
22	I	Early		few artifacts: rhomboidal point with contracting stem	wetter and cooler Younger Dryas (10000-8000)
23	I	Archaic	8340±300		
24	I				

Table 2. Uncorrected radiocarbon dates from archaeological sites in the Dry Puna and the Salt Puna.

Dry Puna

Site	Reference	Lab	Years B.C.	Absolute Date	Sample
Toquepala	Ravines 1972	Y 1325	7630	9580±160	charcoal
Tojo-Tojone	Dauelsberg 1983	Gak 7958	7630	9580±1950*	charcoal
Las Cuevas	Santoro and Chacama 1982	I-12835	7590	9540±160	charcoal
Toquepala	Ravines 1972	Y 1372	7540	9490±140	charcoal
Hakenasa	Santoro 1986	I-13287	6390	8340±300	charcoal
Las Cuevas	Santoro and Chacama 1984	I-13128	6320	8270±250	charcoal
Caru	Ravines 1967	Hv 1087	6240	8190±130	charcoal
Patapatane	Santoro and Chacama 1984	I-12837	6210	8160±160	charcoal
Patapatane	Santoro and Chacama 1984	I-12838	2940	4890±130	charcoal
Hakenasa	Santoro 1986	I-13230	2430	4380±120	charcoal
Guañure	Santoro and Chacama 1982	I-11873	2380	4330±105	charcoal
Puxuma	Santoro and Chacama 1982	I-11872	2290	4240± 95	charcoal
Puxuma 1	Santoro and Chacama 1982	I-11645	2060	4010±100	charcoal

*This date was run on a composite sample of a small amount of material from the earliest level and a larger sample from a later level. Because of this deliberate mixing, the author cites a 3-sigma standard deviation, cited here (Dauelsberg 1983).

Table 2, continued.

(*Dry Puna*)

Site	Reference	Lab	Years B.C.	Absolute Date	Sample
Piñuta	Santoro and Chacama 1982	I-11832	1800	3750±140	charcoal
Tojo-Tojone	Dauelsberg 1983	Gak 7959	1790	3740±130	charcoal
Hakenasa	Santoro 1986	I-13229	900	2850±200	charcoal
Piñuta	Santoro and Chacama 1982	I-12834	590	2540±180	charcoal
Piñuta	Santoro and	I-12833	570	2520± 90	charcoal

Salt Puna

Site	Reference	Lab	Years B.C.	Absolute Date	Sample
Tuina	Núñez 1983a	SI-3112	8870	10820±630	charcoal
San Lorenzo 1	Núñez 1983a	N-3423	8450	10400±130	charcoal
San Lorenzo	Spahni	Hv-299	8330	10280±120	charcoal
San Lorenzo 1	Núñez 1983a	N-242	8010	9960±125	charcoal
Chulqui 1	Sinclaire 1985	Beta 6845	7640	9590± 60	charcoal
Tuina	Núñez 1983a	N-3424	7130	9080±130	charcoal
Toconce/ Confluencia	Aldunate et al. 1986	Beta 1995	6040	7990±125	charcoal
Chulqui 3	Aldunate et al. 1986	Beta 7324	5230	7180± 80	charcoal
Isla Grande	Lanning 1968	not given	4058	6008±130	charcoal
Chulqui 4	Aldunate et al. 1986	Beta 7323	3780	5730± 90	charcoal

Table 2, continued.

(*Salt Puna*)

Site	Reference	Lab	Years B.C.	Absolute Date	Sample
Confluencia	Lanning 1968	not given	3430	5380±130	charcoal
Calarcoco	Serracino and Pereyra 1977	not given	3170	5120*	bone collagen
Tulán 51	Núñez 1981	N-2486	3040	4990±110	charcoal
Puripica	Núñez 1981	SI-3113	2865	4815± 70	charcoal
Chiu-Chiu**	Druss 1977	I-5173	2715	4665±110	charcoal
Kalina/ Los Morteros	Aldunate et al. 1986	Beta 12977	2420	4370±220	charcoal
Tulán 52	Núñez 1981	N-2487	2390	4340± 95	charcoal
Tulán 52	Núñez 1981	N-2488	2320	4270± 80	charcoal
Calarcoco	Serracino 1975	not given	2170	4120±170	collagen & apatite
Puripica	Núñez 1981	CN-2360	2100	4050± 95	charcoal
Kalina/ Los Morteros	Aldunate et al. 1986	Beta 6844	2000	3950± 50	charcoal
Chiu-Chiu***	Druss 1977	I-7016	1675	3625± 85	charcoal

*No standard deviation was reported for this date.
**This is the earliest of a series of dates from this cultural complex, which consists of seventy sites.
***This is the latest date for the Chiu-Chiu complex.

Table 3. Summary data on Archaic sites from the Dry Puna and the Salt Puna.

Dry Puna

Site	Habitat	Elevation (masl)	Archaic Period Early	Middle	Late	Sample	Site Type
Caru	pre-cordill.	2500	x	-	-	n.d.*	small shelter
Patapatane	pre-cordill.	2600	x	x	x	5 m^2	cave
Toquepala	pre-cordill.	2800	x	?	x	n.d.	big cave
Tojo-Tojone	pre-cordill.	3500	x	-	x	3 m^2	small shelter
Guañure	cordill. valley	3600	-	-	x	2 m^2	2 small shelters
Puxuma	cordill. valley	3600	-	-	x	3 m^2	4 small shelters
Piñuta	cordill. valley	3600	-	-	x	4 m^2	small shelter
Las Cuevas	high puna	4000	x	-	-	6 m^2	small cave
Hakenasa	high puna	4000	x	?	x	1 m^2	small cave
Pukara	high puna	4000	-	-	x	1.5 m^2	2 small shelters
Lipiche	high puna	4400	-	-	x	2 m^2	several caves

Salt Puna

Site	Habitat	Elevation (masl)	Archaic Period Early	Middle	Late	Sample	Site Type
Isla Grande	oasis & quebrada	2300	-	-	x	n.d.	n.d.
Chiu-Chiu	lower oasis	2300	-	-	x	n.d.	70 small camps
Confluencia	oasis & quebrada	2500	-	-	x	n.d.	n.d.

*n.d.=no data available

Table 3, continued.

(*Salt Puna*)

Site	Habitat	Elevation (masl)	Archaic Period Early	Middle	Late	Sample	Site Type
Calarcoco	oasis & quebrada	2500	-	-	x	n.d.	open camp, 21 stone wall rms
San Lorenzo	oasis & quebrada	2500	x	-	-	n.d.	small shelter
Tambillo	oasis & quebrada	2500	-	-	x	n.d.	open camp
Tuina	oasis & quebrada	2800	x	-	-	n.d.	small shelter
Tulán 51	interm. quebrada	2925	-	-	x	4 m^2	open refuse
Tulán 52	interm. quebrada	2925	-	-	x	4 m^2	open camp, 30 stone wall rms
Kalina/ Los Morteros	interm. quebrada	3100	-	-	x	n.d.	24 stone wall rooms
Puripica	interm. quebrada	3200	-	-	x	n.d.	40-50 stone wall rooms
Toconce/ Confluencia	interm. quebrada	3200	-	x	-	5.5 m^2	small cave
Chulqui	interm. quebrada	3280	x	x	x	n.d.	several caves

Table 4. Diagnostic artifacts and features of the Salt Puna Early Archaic Tuina Pattern.

	Sites		
	Tuina	San Lorenzo	Chulqui
POINTS			
triangular, round-based	x	-	-
SCRAPERS			
high dorsal spine	x	x	x
low dorsal spine	x	-	-
thin scraping tool	x	-	-
discoidal	x	-	-
with one concave margin	-	x	-
FLAKES			
blades	x	-	-
unmodified used	x	-	-
retouched triangular	-	x	x
OTHER			
cores ("yunques")	x	-	-
pumice with striations	-	x	-
camelid bones	x	x	x
camelid wool	-	x	-
L. chinchilla	x	x	-
L. viscacia	-	-	x
digging stick fragment	-	x	-
bulb/tuber of wild plants	-	x	x

Table 5. Diagnostic artifacts and features of the Dry Puna Early Archaic Patapatane Pattern.

	Sites					
	Toquepala	Tojo-Tojone	Las Cuevas	Caru	Patapatane	Hakenasa
POINTS						
Lanceolate points						
-double point	x	x	-	-	-	-
-rounded base	x	x	-	-	-	-
-serrated w/side barbs	x	x	-	-	3	-
Triangular points						
-parallel stem	x	x	2	-	-	-
-contracting stem	-	-	1	-	-	2
-long stem	x	-	-	-	-	-
-isosceles	-	-	1	-	-	-
Rhomboidal						
-with wide stem	x	-	-	-	-	-
-with side barbs	-	-	-	x	3	-
KNIVES (retouched)						
-wide lanceolate	-	-	-	-	1	-
-narrow lanceolate, high section	-	x	-	-	1	-
-lanceolate: round base	-	-	1	-	-	2
-lanceolate: monofacial, rectilinear base	-	-	1	-	-	-
-triangular blade	-	-	2	-	-	-
-ovoid blade	-	-	2	-	-	-
KNIVES (unretouched with wear)						
-semicircular flake blade	-	-	-	-	1	1
-unmodified used flakes	-	-	x	-	-	-
SCRAPERS						
-high dorsal spine	-	-	-	-	-	1
-semicircular, low dorsal spine	-	-	2	-	-	1
OTHER						
-*Choromytilus*: used fragments	-	-	-	x	x	-
-bone chipping tool	-	-	-	x	1	-
-red pigment	x	-	x	x	x	-

Table 6. Diagnostic artifacts and features of the Dry Puna Late Archaic Hakenasa Pattern.

	Sites				
	Hakenasa	Puxuma	Piñuta	Tojo-Tojone	Patapatane
POINTS					
Rhomboidal	1	1	-	-	1
Pentagonal with side barbs	3	-	-	-	-
Triangular (small)					
-serrated, with rounded or contracting stem	5	-	-	x	-
-wide stem	4	-	-	-	-
-isoceles	-	1	-	-	-
-base barbs	3	-	1	-	-
-long blade, with contracting stem	-	1	-	-	-
Lanceolate					
-long narrow blade	-	-	1	-	-
-medium narrow blade	2	-	1	-	-
-large wide blade	1	-	-	-	-
-medium wide blade, bi-point	-	-	-	-	1
-medium wide blade, round base	4	-	1	-	1
-small bi-point	-	1	-	-	-
-slight round stem	1	-	-	-	-
-slight long stem	-	-	-	-	1
-rectilinear to slightly convex base	2	-	-	-	-
-base barbs	1	-	-	-	-
-slight side and base barbs	-	-	1	-	-
-slight stem and side barbs	-	-	-	-	1
KNIVES					
Lanceolate					
-large wide blade	-	-	-	-	1
-medium wide blade, round ends	6	2	1	-	-
-foliate, medium wide base	4	1	1	-	1
-ovoid	3	-	2	-	3
-semicircular	4	-	-	-	1
-triangular	2	-	-	-	-
-pentagonal	-	-	1	-	-
-long triangular	-	1	-	-	-

Table 6, continued.

	Sites				
	Hakenasa	Puxuma	Piñuta	Tojo-Tojone	Patapatane
SCRAPERS					
-small, discoidal	2	-	-	-	-
OTHER					
-perforator	-	1	-	-	-
-bone chipping tools	-	1	-	1	-
-*Choromytilus* shell	-	-	-	x	x
-bead ornament	1	1	-	-	-
-pigments	-	x	x	-	x

Table 7. Summary chart of the Dry Puna and Salt Puna Archaic Period cultural--chronological sequence.

Years B.P.	Period	*Dry Puna*		Salt Puna	
		Settlement Pattern	Cultural Pattern	Settlement Pattern	Cultural Pattern
2000	Transition Formative				
4000					
	Late	semi-permanent camps, specialized hunting,	*Hakenasa*	transhumant hunting/gathering, semi-perm.	*Puripica*
	Archaic	poss. domestic.		camps, domestic.	*Tulán*
6000					
	Middle Archaic				
8000					
	Early	semi-transhumant hunters, nucleated around puna zones	*Patapatane*		
10000				high aseasonal mobility, hunting/gathering	
			Tuina?		*Tuina*
	Archaic				
11000					
	Paleo-Indian		?		?
12000					

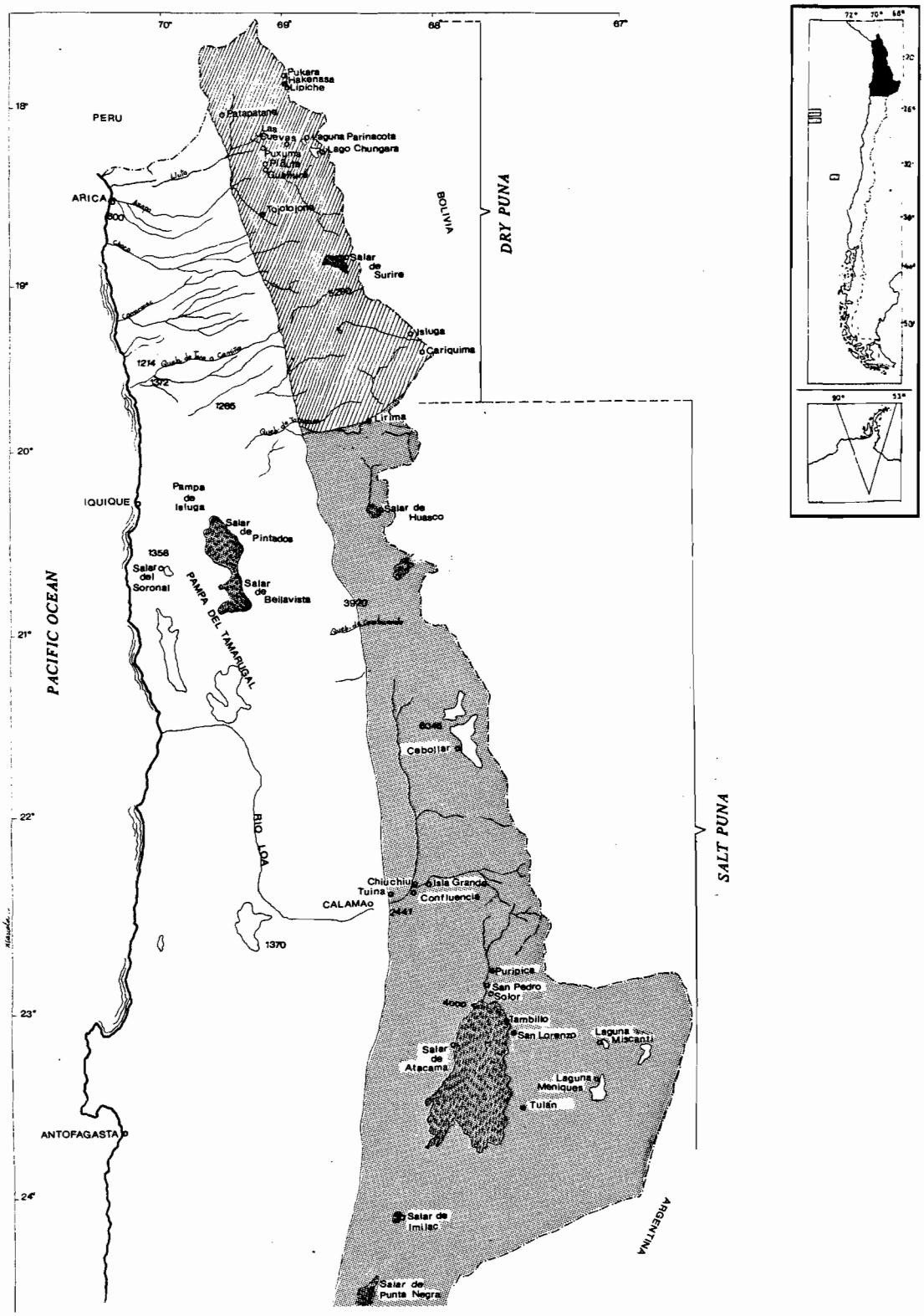

Figure 1. Map of the study area, northern Chile, showing the Salt Puna and the Dry Puna zones, major geographic features, and the location of Archaic Period sites mentioned in the text.

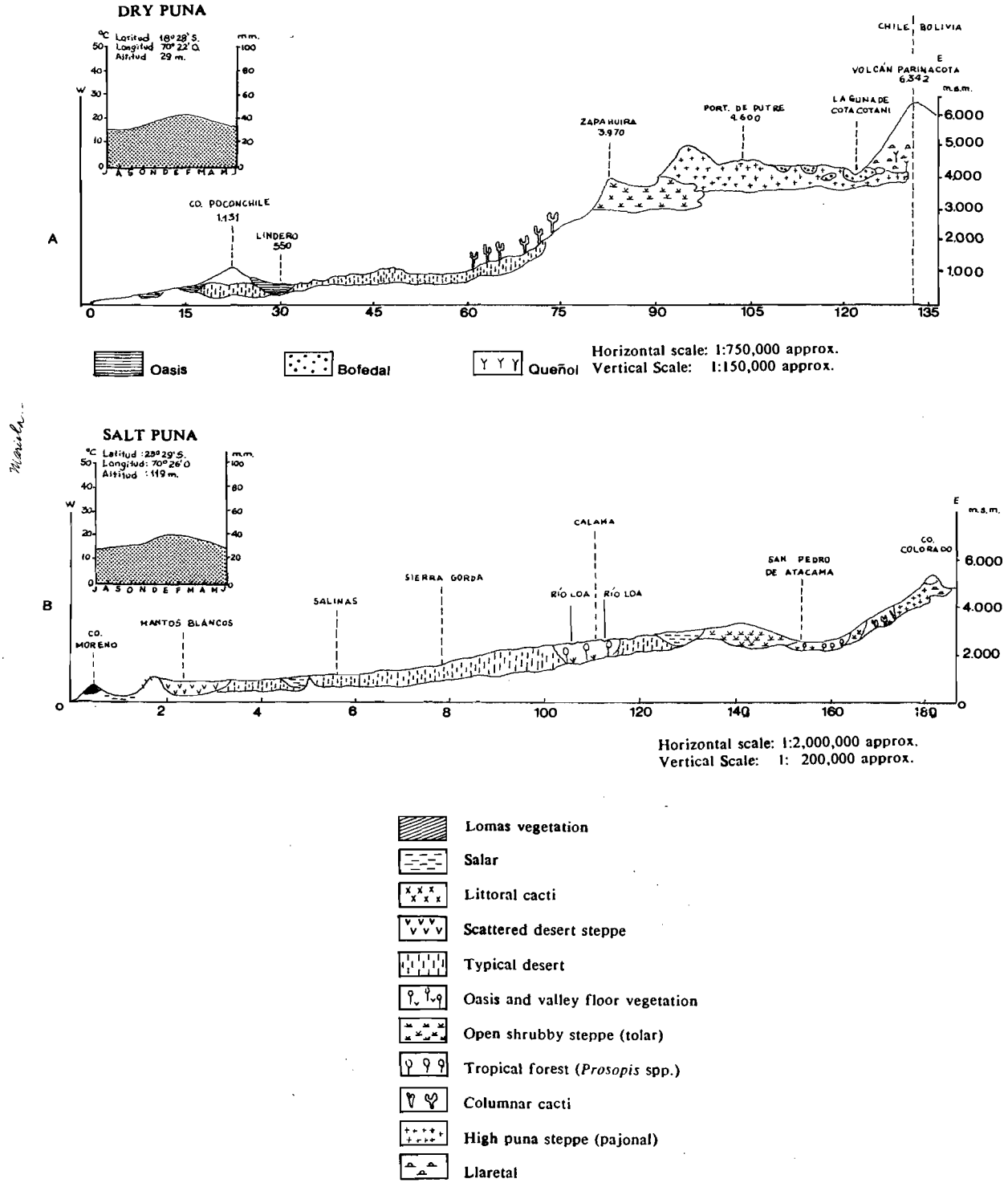

Figure 2. East-west ecological transects across typical sections of Dry Puna (A) and Salt Puna (B).

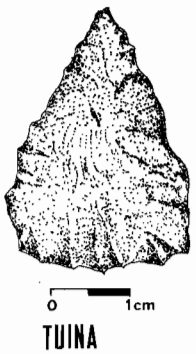

Figure 3. Early Archaic Period Tuina pattern point from the Tuina site, Salt Puna zone.

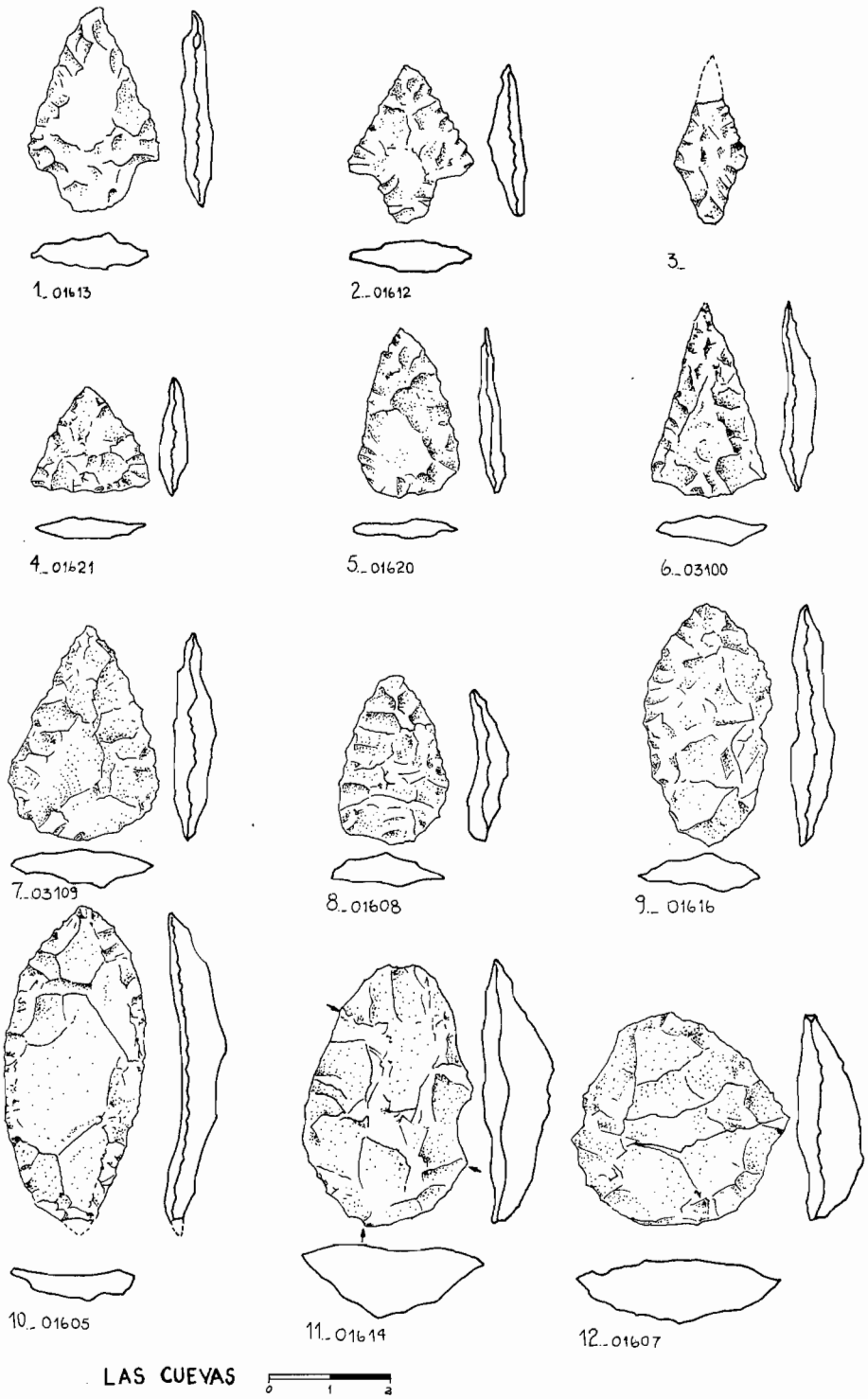

Figure 4. Early Archaic Period Patapatane pattern lithic artifacts from the Las Cuevas site, Dry Puna zone.

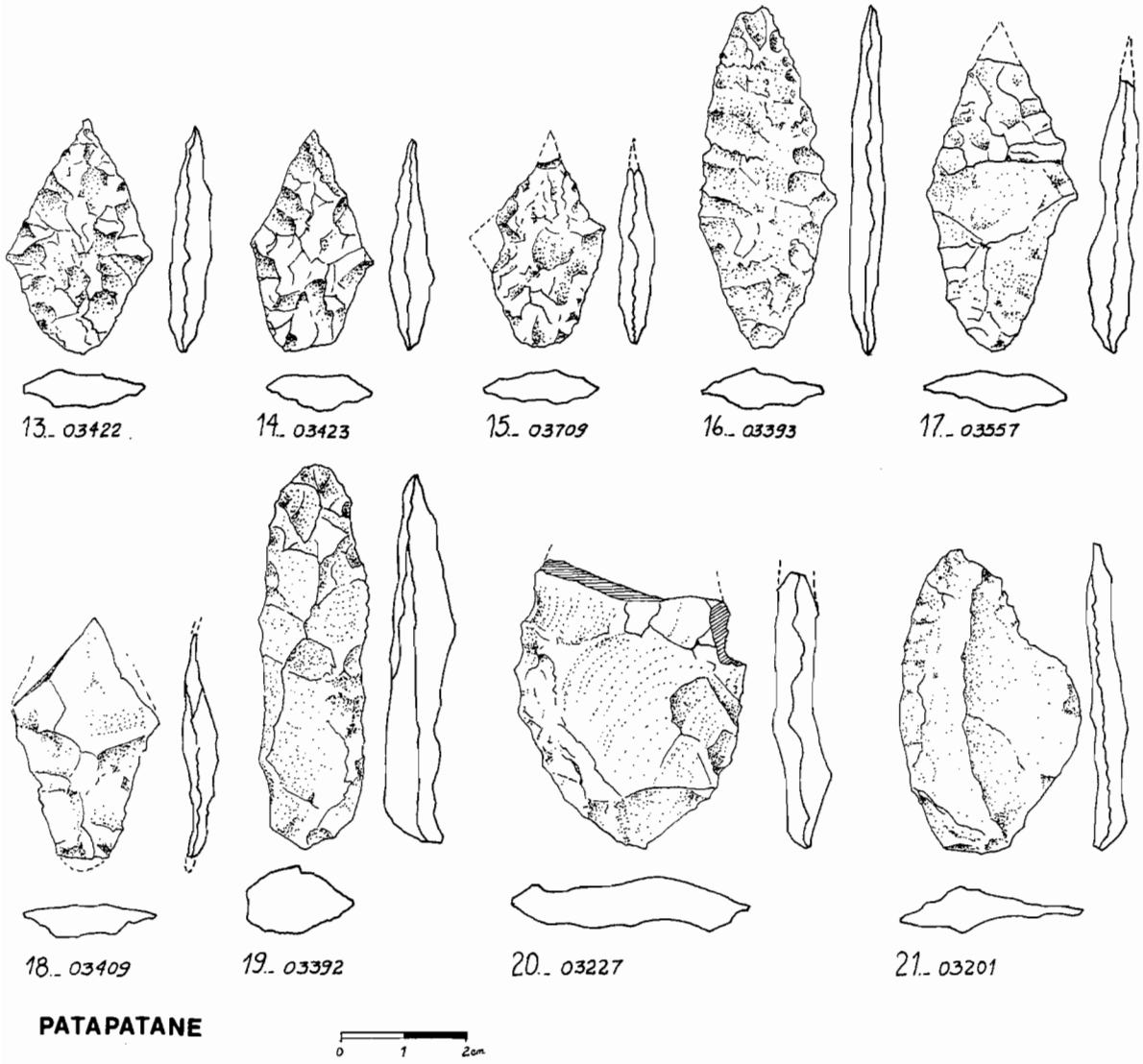

Figure 5. Early Archaic Period Patapatane lithic artifacts from the Patapatane I component of the Patapatane site, Dry Puna zone. *Note*: No. 16 is a Middle Archaic Period point from the Patapatane II component.

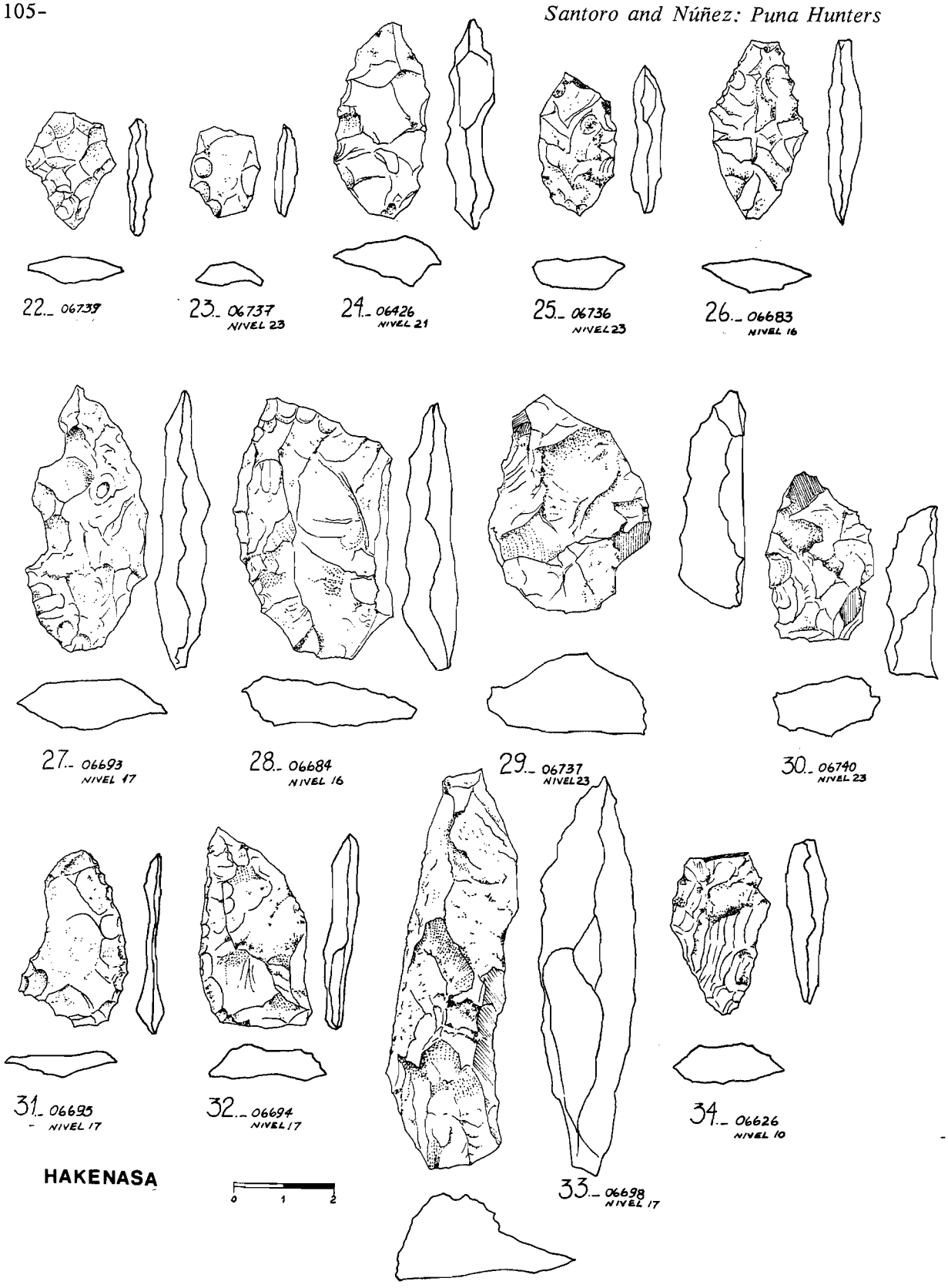

Figure 6. Archaic Period lithic artifacts from the Dry Puna Hakenasa site. Hakenasa I, Early Archaic Period: Nos. 22-25, 29, 30. Hakenasa II, Middle Archaic Period: Nos. 26-28, 31-33. Hakenasa III, Late Archaic Period: No. 34.

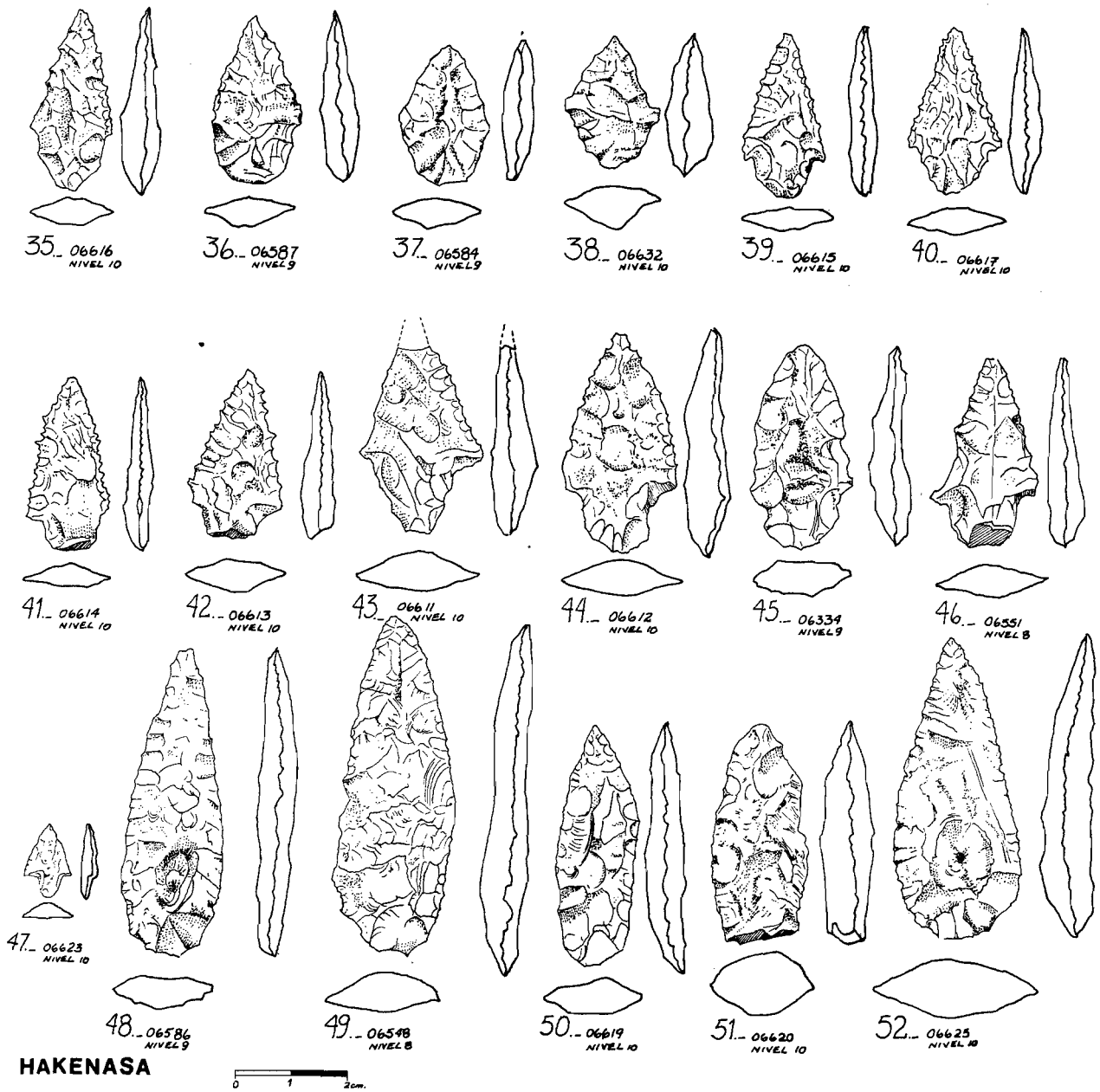

Figure 7. Late Archaic Period Hakenasa pattern lithic artifacts from the Hakenasa III component of the Hakenasa site, Dry Puna zone.

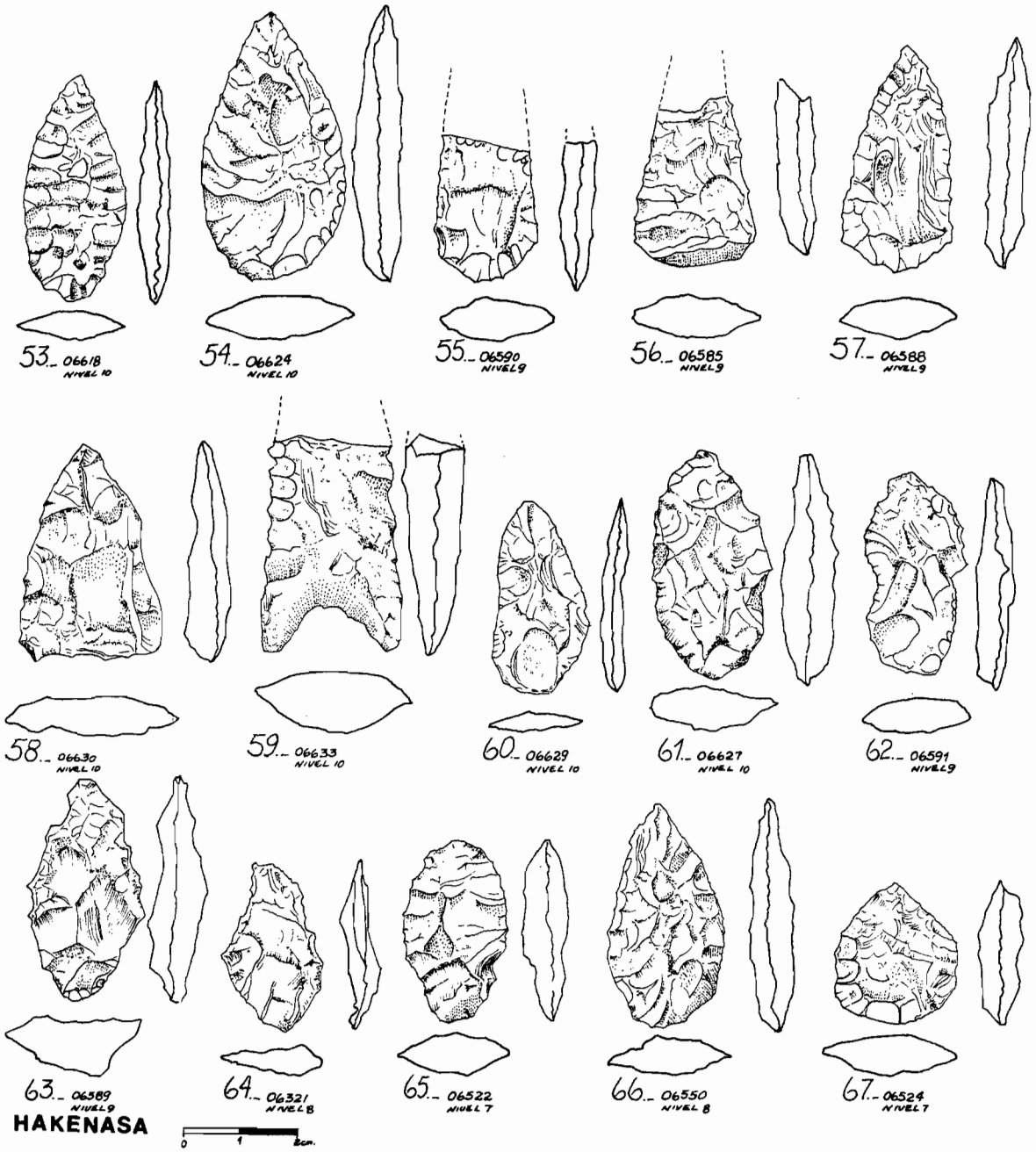

Figure 8. Late Archaic Period Hakenasa pattern lithic artifacts from the Hakenasa III component of the Hakenasa site, Dry Puna zone.

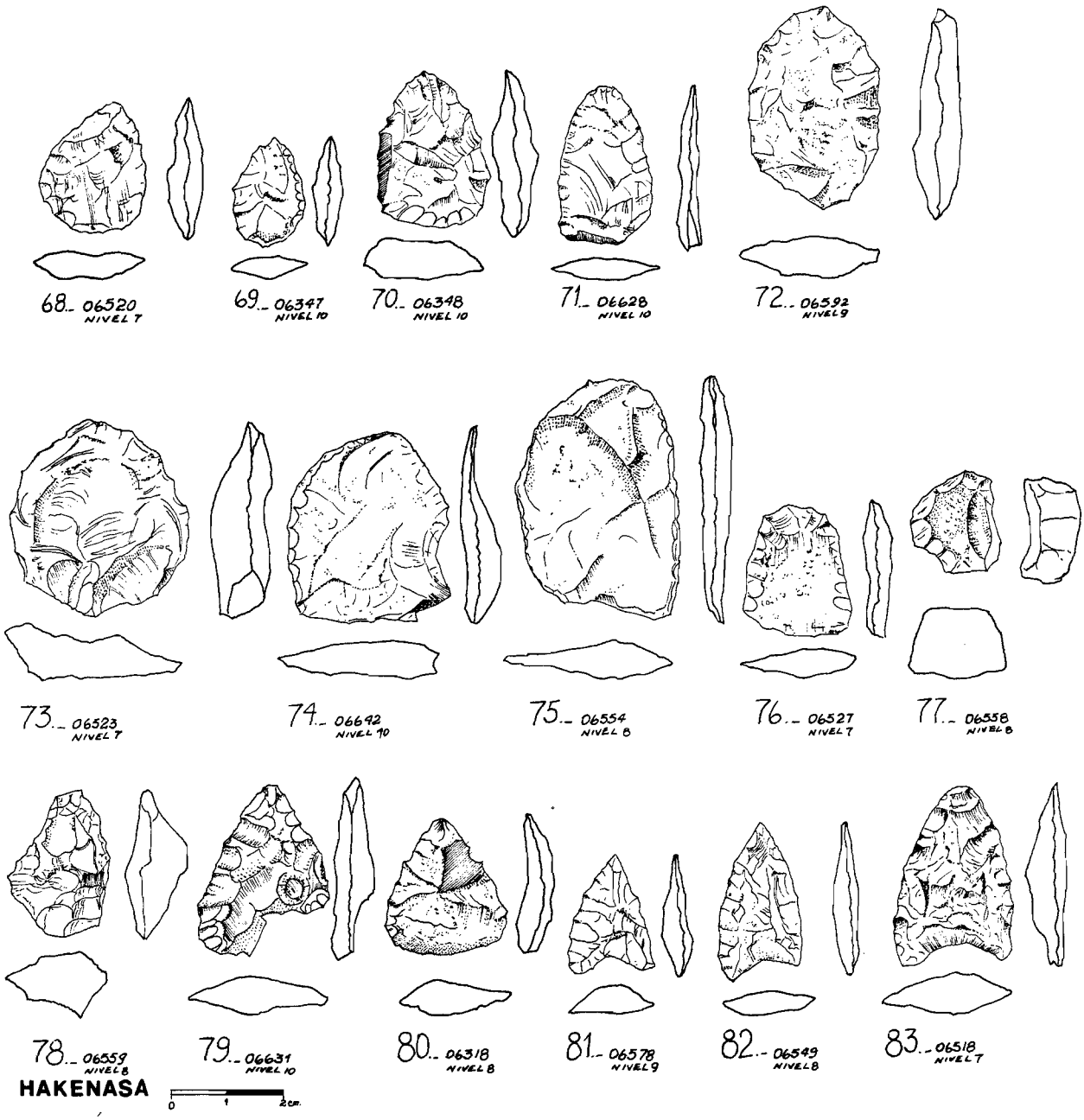

Figure 9. Late Archaic Period Hakenasa pattern lithic artifacts from the Hakenasa III component of the Hakenasa site, Dry Puna zone.

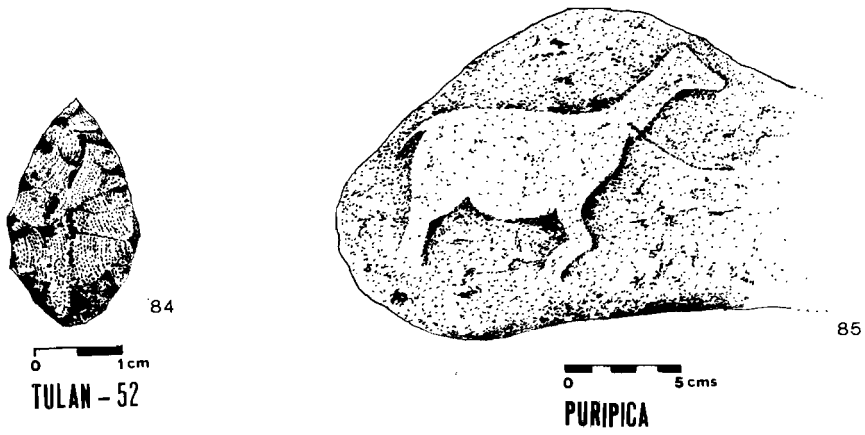

Figure 10 (left). Late Archaic Period Tulán pattern lanceolate point, from the Tulán 52 site, Salt Puna zone.
Figure 11 (right). Stone block with a carved camelid image, from the Late Archaic Period Puripica site, Salt Puna zone.