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Archaeological studies in the highlands of Salta, Northwestern Argentina, during Middle Holocene: The case of the Pocitos and Pastos Grandes Basins

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ABSTRACT

This comparative article analyses the archaeological diversity in two basins of the Puna of Salta (Pastos Grandes and Pocitos), Northwestern Argentina, during the Middle Holocene and beginning of the Late Holocene. The article adopts an evolutionary ecology theoretical framework. The analysis methods include surveys and excavations of different sectors within both basins, including the study of the archaeological material thereof. This article focuses on four main lines of evidence: the use of space, lithic technology, and archaeofaunal and bioarchaeological assemblages. The results show an intensive, but diversified, use of the region. The archaeological record across the region suggests both similarities and differences between Pastos Grandes, Pocitos and other areas in the Puna region. Furthermore, the archaeological evidence indicates that during the Middle Holocene and the beginning of the Late Holocene important changes occurred concerning different aspects of human settlement in the area.

1. Introduction

The aim of this article is to compare the archaeological diversity in the Pastos Grandes and Pocitos basins, Puna of Salta, Argentina, during the Middle Holocene and beginning of the Late Holocene. Although the analysis is conducted at a meso-scale, its conclusions relate to the study of processes at the macro-scale (Dincauze, 2000), especially when these sites are compared to other archaeological proxies from south-central Andean highlands. The sum total of the archaeological diversity, particularly in its distribution, localization and the characteristics of the registered evidence, is analysed in consideration of the ecological and social particularities of the Puna habitat. At this point it is important to emphasize that the theoretical framework that guides this study is evolutionary ecology (Bird and O'Connell, 2006).

2. Regional setting

2.1. The Pastos Grandes and Pocitos Basins in the context of the Puna

The *Puna* is a high altitude desert with a number of limiting factors for human adaptation such as hypoxia, a heterogeneous distribution of resources, and the risk of fluctuations in the possibilities of obtaining said resources, amongst others (Aldenderfer, 1998; Muscio, 2004). Likewise, the ecological characteristics of this environment generate selective pressures on human adaptations to it, including the social makeup within this habitat, such as group size and organization. In general terms, these selective pressures constitute socio-ecological ones (López, 2008), that change in time and may also produce different responses depending on context (e.g. adaptive or maladaptive). This article analyzes the Middle Holocene and early Late Holocene archaeology of two basins located in the Puna of Salta, Northwestern Argentina: Pastos Grandes y Pocitos-Quirón (Fig. 1).

The Pastos Grandes Basin is fed by ice-melt waters from glaciers that border the area to the north and drains into the Salar [salt flat] of Pastos Grandes. The Pastos Grandes Basin is a typical endorreic Puna basin, with an average altitude of 4000 m asl. This basin has optimal quality sectors apt for human settlement, comprising permanent water source, large *vegas* and high value resources such as camelids. These sectors include high altitude ravines and the extensive *vega* located at the basin bottom (see López, 2008).

In general terms, the Pocitos-Quirón Basin is noted for its extreme aridity, even if it does include scattered *vegas*. Also known as the Salar de Pocitos, this basin is located 60 km west of Pastos Grandes. The salt flat is located at the base of the basin and its height gravitates around the 3800 m asl mark.

2.2. The Middle Holocene in the Puna: theoretical aspects

The Middle Holocene is normally characterized as a drier and warmer period than at present, even more so than the Early

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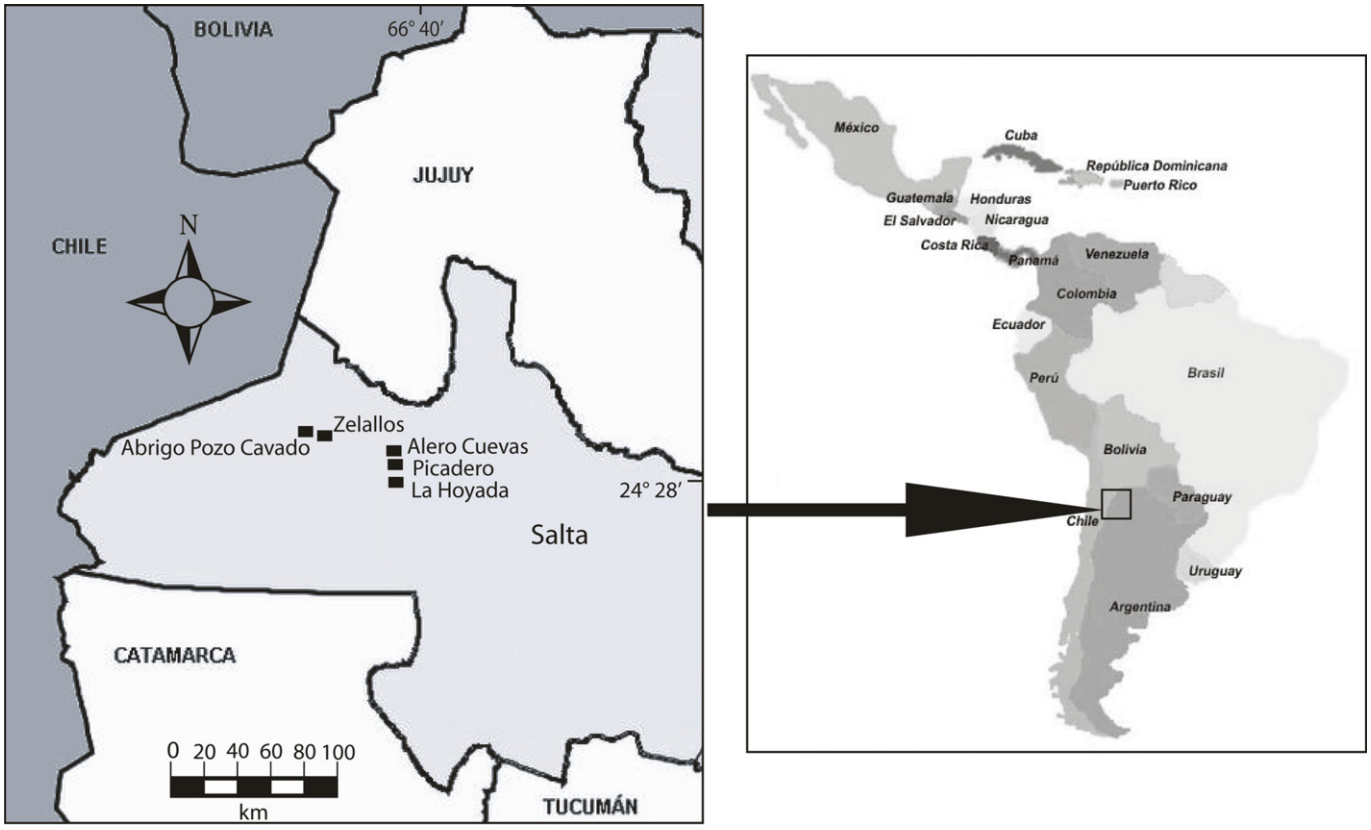


Fig. 1. Principal sites mentioned in the text.

Holocene (see Yacobaccio and Morales, 2005). Because of this it is also known as the Hypsithermal or Altithermal. Nevertheless, the impact of this drier, warmer period was highly variable at the local level given that there were areas at the meso and micro-scale with highly differentiated environmental characteristics (see Yacobaccio and Morales, 2005).

This clear fragmentation of the landscape within the general framework of a very dry and warm climate, determined the concentration of human groups in those sectors that had water and other resources necessary for environmental adaptation. A consequence of this was new socio-ecological pressures that triggered particular human responses to these changes. These conditions can be predicted based on behavioral ecology models such as optimal group size (see Boone, 1992).

Sustained and continued human aggregation through time, in the long term generated population density pressures, against a backdrop of generalized occupation of scarce productive sectors and increased competition for resources. Disaggregation is not always the preferred solution given that in a context of competition for space and resources the possibilities for population dispersal are practically zero. In this respect, researchers have suggested that these processes were more noticeable in the puna during the Middle Holocene and beginning of the Late Holocene (Aschero, 1994; Muscio, 2004; López, 2008).

On the basis of patch selection and risk minimization models (Bird and O'Connell, 2006), it would be expected that in the contexts mentioned above, there would be an increased use of the different sectors in space that offered the most differentiated resources. In other words, there would be a move to intense utilization of other patches as a means of diversifying the use of space to minimize risk, even when some of the selected patches were not the most optimal. Another outcome is the abandonment of sites or areas in the Middle Holocene, which is one of the most pressing research questions. In this respect, a focus of research concerning the Middle Holocene is the study of interrupted archaeological occupation sequences during this period at the various sites of the highlands of Argentina and Chile. This has led investigators such as Núñez and Grosjean (1994) to put forward the concept of an "archaeological silence" during the Middle Holocene in some sectors of the Salar de Atacama, and the formation of "eco-refugia" in which groups congregated under conditions of elevated humidity in respect to the general aridity.

3. Methodology

The method employed in this study includes a distributional analysis of the archaeological data based on the systematic survey and sampling of distinct sectors within both basins. As neither of these areas has previously been the object of systematic study, the distributional methods represent an appropriate approach of the regional archaeological record. The distributional analysis was based in transects with a sampling of 150 km^2 of surface in both areas. This surface represents a sampling of the 10% of the total surface. As result of these systematic archaeological investigations in Pastos Grandes and Pocitos different archaeological sites were recorded in these areas (López, 2008; López et al., 2009). The principal archaeological sites mentioned in this paper are cited in Table 1. The study of the Pocitos Basin started only recently, therefore the information collected from here is preliminary. This data will be expanded through new surveys, excavations and dates.

The archaeological data of the Middle Holocene and the early Late Holocene is both diverse and abundant for the study area. A

Table 1
Principal sites mentioned in 4.1.

Type of site	Site	
	Pocitos	Pastos Grandes
Shelter	Abrigo Pozo Cavado	Alero Cuevas
Open air	Pozo Cavado Estructuras. Zelallos 1 y 2, Rodríguez 1 y 2	Picadero, La Hoyada, Quebrada Alta

numerical chronology of these contexts in Pastos Grandes and Pocitos is presented in Table 2. From sampled stratigraphic layers, the radiocarbon dates supplied numerical dates that corroborated the archaeological evidence extracted from them. In the case of surface assemblages, known relative chronology indicators were used such as certain types of projectile points, or standardized artifact morphologies, all which are considered to be time-sensitive (e.g. Jones and Beck, 1992).

On this basis, the possibility of dating some of these objects within archaeological layers and establishing a numerical chronology for them allows correlation of these to artifacts found on the surface. The presence or absence of time-sensitive artifacts is a useful tool in approaching dating problems concerning surface assemblages, always aware of the need to evaluate the different resolution and integrity levels (Fig. 2). In this respect, it is important to note that an approximation of the chronology of a surface site does not in any way imply that all the archaeological deposits on said site correspond to the estimated dates. Even so, these approximations are useful in that they signal out differences between sites which evidence summary discarding of material over thousands of years and sites where this discard of material was limited to certain periods. In this sense, the distributional analysis strongly suggested the need to consider jointly both the information from the surface and stratigraphic layers (e.g. Belardi, 1992).

So as to cover the archaeological diversity of the Middle Holocene and beginning of the Late Holocene in the study area, four principal types of evidence were considered: use of space; lithic technology; zooarchaeology; and bioarchaeology. Each one of these evidence types requires a short but illustrative description relating it in turn to the regional archaeological diversity.

4. Results

4.1. Use of space

A number of archaeological sites in Pastos Grandes and Pocitos with evidence for human occupation were registered during the Middle Holocene and beginning of the Late Holocene. These occupations were found at both in layer and surface contexts, as well as at open air and shelter sites (Table 1).

Previous archaeological studies in the puna demonstrate the recurrent concentration of artifacts on sites considered to be open air camps or large “lithic workshops” of the Middle Holocene (Fernández Distel, 1978; Núñez, 1992, amongst others). Likewise, radiocarbon dates from these concentrations, as in the case of Río Grande, Jujuy, studied by Jorge Fernández (Schobinger, 1988), or at Ramadas, in San Antonio de los Cobres, Puna of Salta, studied by Hernán Muscio (2004), support the hypothesis that many of these sites experienced their main episode of material discard during the Middle Holocene and beginning of the Late Holocene.

In Pastos Grandes, the archaeology, backed by numerical dates for the Middle Holocene, comes primarily from a rockshelter discovered in 2004, known as Alero Cuevas. Excavations at this site revealed a long sequence of human occupation throughout the Early, Middle and Late Holocene (see López, 2008). Layer F2, dated between 5106 BP and 4210 BP (Table 2), is noted for the recurrence of tools with shared morphological, technological and metric characteristics, known as “unifacial lanceolate artifacts”, associated to blade technology (López, 2008).

At Pastos Grandes, the association between unifacial lanceolate artifacts and blade technology is known throughout the whole area, especially at the site of La Hoyada on the boundary with the Salar de Pastos Grandes. This open air site extends for some 200 m over a highly wind-eroded surface of very sparse vegetation. In the case of La Hoyada, there are relative chronology markers such as the presence of a type of time-sensitive artifacts (unifacial lanceolates) and the absence of other artifacts that would indicate some other chronology (e.g. ceramic). The homogeneity of the post-depositional processes acting over the assemblage (including unifacial lanceolate artifacts) in turn suggests a relatively homogenous deposition in chronological terms. These post-depositional processes involve wind

Table 2
Middle Holocene and early Late Holocene radiocarbon dates from the archaeological sites Pastos Grandes and Pocitos, Puna of Salta.

Site	Laboratory	BP Date (non-calibrated)	Calibration 1 sigma BC–AD	Calibration 2 sigma BC–AD	Material
Alero Cuevas AC/C1-F3 Pastos Grandes	AA 71137	6506 ± 58	5530 BC–5370 BC	5610 BC–5340 BC	Bone
Alero Cuevas AC/C2/F3 Pastos Grandes	LP- 1759	6510 ± 80	5540 BC–5370 BC	5620 BC–5320 BC	Charcoal
Alero Cuevas, AC/C7-F2, Pastos Grandes	AA 90383	5106 ± 68	3970 BC–3800 BC	4050 BC–3710 BC	Charcoal
Alero Cuevas AC/C2-F2 Pastos Grandes	LP- 1655	4210 ± 70	2900 BC–2670 BC	2930 BC–2570 BC	Bone
Abrigo Pozo Cavado APC/S1-C4, Pocitos	AA 90384	3884 ± 59	2470 BC–2290 BC	2560 BC–2190 BC	Bone
Agua Dulce Test-pit 1 Human skeleton Pastos Grandes	AA 66545	3738 ± 46	2210 BC–2040 BC	2290 BC–2020 BC	Bone

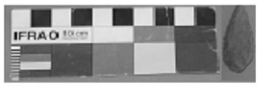
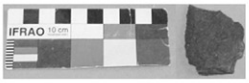
Type of artifact	Pocitos	Pastos Grandes	Other loci in the Argentine Puna	Examples
Lanceolate unstemmed points with parallel or subparallel edges, elongated and with a convex base	Present, although fragmented. Surface contexts.	Less elongated variants with an average length of 6cm. In layer dated to 6500BP from Alero Cuevas.	In Catamarca, defined as the Peñas de la Cruz A 'type', with straight or subparallel edges and an average length of 10cm. Clearly elongated and dated to between 7300 and 6080BP (Martínez 2003). Variants present in Susques, Jujuy (Hoguin 2011)	
Small lanceolate points, convex base and maximum length of not more than 4cm.	Present in layer (3884 BP) and on surface.	Present in layer (4210 BP).	In Catamarca, defined as Peñas de la Cruz E 'type' (Hocsman 2006), found in Inca Cueva 7, Jujuy. Also registered from Ramadas in San Antonio de los Cobres (Cardillo 2009, Muscio 2004)). Present in considerable quantities in transition contexts (c. 4000 BP).	
Lanceolate unstemmed points with parallel or subparallel edges and notched base.	Present, although fragmented. Surface contexts.	Absent to date.	In Catamarca, defined as the Quebrada Seca C 'type' (Martínez 2003).	
Points with outlined peduncle, convex base and resharpening	Present in layer 3884 BP.	Absent to date.	A similar type of point is present at the site of Quebrada Seca 3 as well as in Chaschuil, in the Puna of Catamarca. Also noted in Peñas Chicas 1.3 possibly known as Quebrada Seca F 'type' (Hocsman 2006). Seems to be a common type of artifact in contexts that chart the transition to pastoralist economies.	
Points with prominent peduncle and barb.	Present with short peduncle and straight base.	One example noted, lanceolate with outlined peduncle.	In Catamarca, defined as Quebrada Seca B 'type', dated to the Middle Holocene. Also noted as a local variant in Punta de la Peña C, characterized by a prominent peduncle and barb (Hocsman 2006).	
Unifacial lanceolate artifact made using blades	Present in low frequency.	High frequency in layer dated between 5106 and 4210 BP, and in surface contexts.	Present in some areas of the Puna de Jujuy, especially in Salinas Grandes where it was denominated as "industria saladillense" [Saladillense Industry] (Fernández Distel 1978). Also noted in Ramadas (Muscio 2004). Very scarce or absent from the Puna de Catamarca.	

Fig. 2. Comparison of time-sensitive artifacts from Pocitos, Pastos Grandes and other sites in the Argentine Puna.

erosion, which acts, wearing down the edge of the artifacts. Also notable is the homogeneity of the patina on them.

A trait common to all these large open air artifact concentrations tends to be the predominance of local raw material. This can seen at La Hoyada, but also at other similar open air sites, such as Picadero, located in the low, raised areas that surround the main vega.

In the ravine sector of Pastos Grandes, including the site of Alero Cuevas and other such as Quebrada Alta, there is a palimpsest of archaeological material from different moments in the Holocene. Amongst the artifacts collected from the surface are unifacial lanceolates, but also ceramic and other material common to other periods. Because of this, Quebrada Alta may be considered a "place of persistent use" (*sensu* Schlanger, 1992) along the Holocene, the same can be said for Alero Cuevas. On the other hand, sites such as La Hoyada seem to have a larger amount of archaeological discard over a shorter period of time (between the Middle Holocene and beginning of the Late Holocene).

A recent discovery in Pocitos was the site of Abrigo Pozo Cavado (López et al., 2009). This site is located northwest of the Salar de Pocitos, in Pozo Cavado, a wide valley surrounded by hills arranged on a west–east bearing. A test-pit excavation on the site yielded a first date for the area. Layer 4, a context of interest to this article, was dated to 3884 BP (see Table 2).

Opposite Abrigo Pozo Cavado, amongst the hills surrounding the salt flat there is evidence for stone structures that might originally have been used by hunters to view their prey (*parapetos,* cited in Table 1 as Pozo Cavado Estructuras). The association between Middle Holocene artifacts (e.g. a number of projectile point types) and these structures permit the advance of studies concerning the use of space by human populations at this time. Nevertheless, as

with any surface context, the possibility that these structures were reused at a later date must be considered.

At Pocitos, aside of these sectors of Pozo Cavado, open air archaeological concentrations were found at Zelallos, and Rodríguez 1 and 2. The former are found in the low, raised areas that surround the present *vega* with seasonal water and the fossil peat paleo-vegas. On these sites, the archaeological assemblages were aceramic, with time-sensitive artifacts from the Middle Holocene. The latter sites are located on the northeastern margin of the Salar de Pocitos, it includes Middle Holocene lanceolate points, and in a similar manner to Zelallos there is a distinct lack of ceramics. In turn, this would suggest a similar chronology for these contexts. The future excavation of Perfil Zelallos site in the paleo-vega is important because this site presents pre-ceramic archaeological information in layer.

In synthesis, both Pastos Grandes and Pocitos show a heterogeneous distribution and concentration of the archaeological record from the Middle Holocene in their different sectors. Therefore, the evidence suggests a diversified, but intense, use of space by human populations that occupied both areas during the Middle Holocene and the start of the Late Holocene.

4.2. Lithic technology

Projectile points make up the typical relative chronology or time-sensitive diagnostic artifact type (Jones and Beck, 1992). Nevertheless, there are other artifacts such as unifacial lanceolates, which constitute a particular type which is useful for comparative purposes. Fig. 2 summarizes the similarities and differences between time-sensitive artifacts in the study area and in other areas of the argentine Puna.

In Pastos Grandes, the lithic technology informs on important cultural changes between the Middle Holocene and beginning of the Late Holocene. The proliferation of unifacial lanceolate artifacts, made using blade technology, throughout the area both in archaeological layers and as surface material represents a notable change within the archaeological database. The association between unifacial lanceolate artifacts and blade cores is registered in Layer F2 at the Alero Cuevas site, dated between 5106 BP and 4210 BP, and this pattern is repeated across the whole area, but especially in open air sites such as La Hoyada.

These artifacts present standard forms, elongated with long, parallel or sub-parallel borders and edges, they generally have a specific retouch on the proximal side, probably related to reducing the bulb for better hafting (López, 2008). The area registered more than 100 artifacts of this type. Both the blade cores and the unifacial lanceolate artifacts were made from local raw material, usually andesite, sourced to the site of Picadero. A hypothesis suggests that in contexts of major socio-ecological pressure this technology was useful for fulfilling distinct tasks, principally as implements to processing of resources given the greater energetic demand required. Indeed, similar to the "Saladillense Industry" of Salinas Grandes, Jujuy, the possibility that some of these artifacts were used for hunting (Fernández Distel, 1978) is not discarded. At a regional level, unifacial lanceolate artifacts were also uncovered at both from archaeological layers and on the surface of the Ramadas site in San Antonio de los Cobres, dated to 5210 BP, some 60 km northeast of Pastos Grandes (Muscio, 2004). On the other hand, it is scarce or practically absent in Antofagasta de la Sierra, Catamarca, located south of the Puna de Salta.

Pocitos displays similarities, but also notable differences with other areas of the Argentinean Puna. The presence of distinct types of lanceolate projectile points with and without peduncle is a strong cultural indicator of the transmission of cultural information at a wide regional scale (Fig. 2). Equally, it is interesting to note the similarities between the archaeological material from Pocitos and Antofagasta de la Sierra (Catamarca). These similarities are much less significant when Antofagasta de la Sierra is compared to Pastos Grandes. The almost nonexistent presence of unifacial lanceolate artifacts in Antofagasta de la Sierra, a type which is very common to Pastos Grandes, has been mentioned. Nevertheless, Pocitos also has evidence for unifacial lanceolate artifacts and blade technology, yet the total number of these type-artifacts is limited (only 2), and of these, only the example from Zelallos clearly follows the type from Pastos Grandes.

The similarities between Pocitos and Pastos Grandes lie in the use of the obsidian source of Quirón, located in the basin of the Salar de Pocitos. This raw material is the most common in both areas, although its frequency varies throughout the Holocene (López, 2008).

However, the differences outweigh the similarities in the lithic assemblage of these two basins. For example, the high presence of a grey veined obsidian at the site of Abrigo Pozo Cavado (3884 BP). This obsidian represents 30% of implements and work flakes in the assemblage. A projectile point with outlined peduncle, convex base and resharpening was made from this raw material (Fig. 2). The source of this obsidian is unknown, but it has also been found at archaeological sites in the Quebrada de Tulán, Chile (Cecilia Mercuri, personal communication). This material is absent from the layer dated to the end of the Middle Holocene and beginning of the Late Holocene at the site of Alero Cuevas. In Pastos Grandes this grey obsidian is only present in a low frequency in contexts of the Early and Late Holocene.

In summary, Pocitos has a high variability of projectile points chronologically belonging to the Middle Holocene with similarities between some of these and other points from distant areas such as Antofagasta de la Sierra, in the Puna de Catamarca. At Pastos Grandes, this variability is less for Middle Holocene contexts, with a greater prevalence of unifacial lanceolate artifacts and a few bifacial lanceolate points. Similarly, the differential use of some raw materials in contexts from the beginning of the Late Holocene, such as the grey obsidian, suggests new questions concerning the role that these two areas might have played in a regional context. Future analysis, including more systematic survey and sampling of distinct sectors, will be necessary for to analyze the regional variability in lithic technology.

4.3. Zooarchaeology

Archaeofaunal assemblages from Pastos Grandes and Pocitos were analyzed, and weathering did not greatly affect the samples (Fig. 3). The weathering profiles show a low exposition to physical and chemical agents and a fast burial. These profiles could be products of some behavioral pattern in the discard and burial. However, it is too early for behavioral interpretations about of similarities and differences between sites.

At Pastos Grandes, the archaeofaunal data is mainly from the site of Alero Cuevas. In Layers F3 and F2, from Middle Holocene and beginning of Late Holocene contexts, taxonomic diversity is low. Camelids predominate over all the other taxa (Table 3).

In Layer F3 (6500 BP), at the Family level camelids represent 94.18% NISP of the total assemblage. *Chinchillidae* were also found at a low percentage (5.42%). Osteometrically, two camelid specimens were observed divided according to size: one small, near to the size of modern-day vicuñas (*Vicugna vicugna*), and another, larger one closer to the size of modern-day guanacos (*Lama guanicoe*; see López, 2008). On the basis of age profiles, amongst those specimens where it was possible to determine bone fusion, fused bones predominated (61.72%) over the non-fused individuals (38.27%).

In Layer F2 (dated to the end of the Middle Holocene), the camelid assemblage represents 94.78% of the NISP, of the taxon

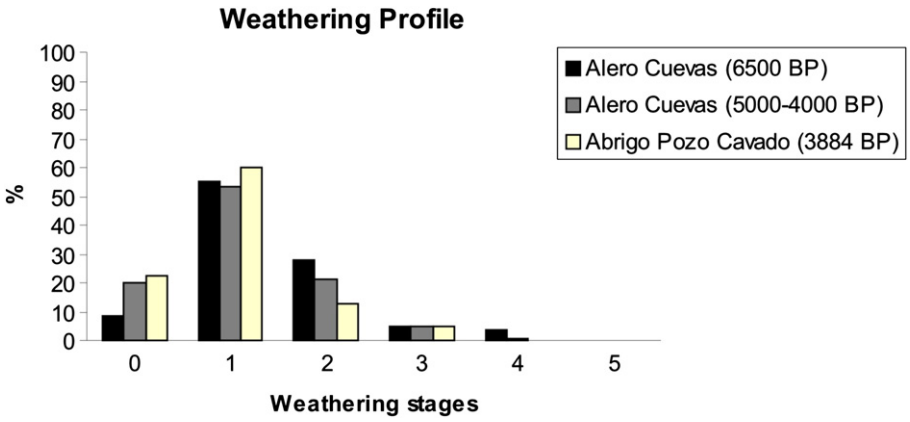


Fig. 3. Weathering stages of archaeofaunal assemblages (Behrensmeyer, 1978), from Pastos Grandes and Pocitos.

identified at the family level. There is evidence of a major concentration in Layer F2 in respect to Layer F3. However, these differences are minimal, indicating that the camelid resource was fundamental throughout the whole of the Middle Holocene. This is a pattern that is replicated across the whole of the sequence. During the Early and Late Holocene, camelids are also significantly represented in respect to other taxa (see López, 2008). *Chinchillidae* represent only 5.21% of the NISP of Layer F2.

Osteometrically, a range of smaller animals similar in size to vicuñas (*Vicugna vicugna*) were detected. Also found was a camelid larger in size than present-day guanacos (*L. guanicoe*) and similar in size to llamas (*Lama glama*; for more details see López, 2008). Although the evidence to date does not irrevocably signal the presence of llamas or camelids in the process of domestication, it is nevertheless an important piece of evidence from which further research could elucidate the processes of change in this economic niche, changes which are paralleled across the puna at this particular time period (see Yacobaccio, 2001). In marked difference to Layer F3, there are more non-fused (60.55%) than fused (39.44%) specimens.

At Pocitos, a sample from Layer 4 at the site of Abrigo Pozo Cavado, dated to 3884 BP, was studied. A preliminary analysis shows a complete predominance of camelids at the Family level (100%). Including specimens at the Order level, 96.6% of the assemblage corresponds to artiodactyls and camelids. Given the absence of cervids, it is probable that the majority of these specimens are camelids. The remaining 3.4% corresponds to fragments of a very small rodent, possibly of taphonomic origin. At present, an exhaustive analysis of these rodents has not been made, but contextual indicators including marks on camelid bones or layers of rodents in pits, reinforce the idea that its origin is taphonomic (see Pardiñas, 1999).

The sample is not good enough for an osteometric study. Nevertheless, it is expected that future fieldwork will allow the distinguishing of interspecies variability within the camelid sample. This is important because the sample is from a chronological context where changes related to the domestication of camelids would be detected, such as have been found at the site of Alero Cuevas, and at other sites including Inca Cueva 7, Alero Unquillar and Huachichocana III in Jujuy (Yacobaccio, 2001), or at Puripica 1 and Tulán 52 in Northern Chile (Núñez, 1992). Yacobaccio (2001) has stated that during the Middle Holocene there was an intensified use of camelids at the regional level which triggered domestication. The age profiles for Layer 4 of test-pit 1 at Abrigo Pozo Cavado are similar to that of Layer F2 from the Alero Cuevas site in that there is a predominance of non-fused (77.2%) over fused specimens (22.7%).

Table 3
NISP and NISP % of archaeofaunal assemblages identified to the level of family.

Taxonomy	Alero Cuevas Layer F3 (6500 BP) Pastos Grandes		Alero Cuevas Layer F2 (4200 BP) Pastos Grandes		Abrigo Pozo Cavado Layer 4 (3884 BP) Pocitos	
	NISP	NISP %	NISP	NISP %	NISP	NISP %
Camelidae	243	94.18	327	94.78	125	100
Chinchillidae	14	5.42	18	5.21	–	–
Others	1	0.38	–	–	–	–

4.4. Bioarchaeology

At the moment, the only bioarchaeological find in the study area comes from the boundary with the Salar de Pastos Grandes. It is mentioned here as it is very important for the chronological context of the end of the Middle Holocene and the beginning of the Late Holocene, dated to 3738 BP (see Table 2).

The find corresponds to a human skeleton associated to archaeological material. This archaeological material is distinctive, comprising a circular lithic object with polished edges and sides with a central orifice of anthropic origin. The disposition of the human remains and their discovery at an open air site are also singular.

The distribution of the skeletal parts did not follow a particular pattern, given that these were dispersed without observing any anatomical order other than the bones themselves being spatially circumscribed (for more details see López and Miranda, 2008). All the parts of a single skeleton, excepting the skull, were recovered, including the long bones and all articulating bones.

For the moment, given that this is the only individual thus recovered, it is not possible to clearly determine the reason for the absence of the skull. There are antecedents for this in other bioarchaeological finds from the Andean highlands, indicating that during the Early Holocene and through to the Late Holocene there was a practice of removing skulls (see Yacobaccio, 2001).

As well, various skeletal parts such as the ribs, vertebra and the long bones show distinct anthropic marks such as cuts, crushing and impact negatives. However, the most significant find is the presence of an obsidian artifact encrusted in the right radius. A highly probable hypothesis is that these anthropic marks are the result of violence against the individual. Taking this into consideration, although it cannot be certain that these traumas caused the

death of the individual, it is equally certain that the anthropic marks are *perimortem*; that is to say that they occurred at the moment of death, or near to the time of death.

With respect to the circular object recovered beside the bones, its function cannot be established with certainty, but is very likely to have been an ornamental object without utilitarian function. The raw material of which this object is composed is found approximately 100 km distant at the Salar de Pastos Grandes.

Finally, it is important to note that significance of this find for the study of diet at the end of the Middle Holocene and beginning of the Late Holocene. The δ13C values are −16.8, indicating a mixed C_3 and C_4 diet. The high levels of C_4 could indicate the direct consumption of these plants, or indirectly through the consumption of camelids. This second possibility is more likely, given that for this time period plants high in C_4 such as maize did not contribute significantly to the diet of these groups and there is no evidence of alternative wild C_4 plants that could be consumed. Therefore it is likely that the presence of C_4 is as a consequence of the high consumption of camelids reflected in the archaeofaunal study. Also, it is not possible to discard consumption of different plants as *Opuntia* sp. that must be taken into account due to its high-profitability (Muscio, 2004).

5. Discussion and conclusions

From the perspective of human behavioral ecology models, a diversified, but intense use of different landscape sectors as well as a process of human aggregation is suggested. However, investigation of the archaeological diversity in the study areas suggests concepts of the regional variability of these same processes.

In this sense, Pastos Grandes presents a distinct archaeological landscape and use of space during the Middle Holocene and beginning of the Late Holocene. The high discard rate of archaeological material during this period is evident both within layers and at the surface level. Of particular note is the high frequency of discarded tools of a certain type known as lanceolate unifacial artifacts (López, 2008). The recurrent discard of a certain artifact type through the whole basin, and the technological change that is represented by blade technology, represents a distinctive archaeological background for the Middle Holocene and beginning of the Late Holocene. The recurrence of lanceolate unifacial artifacts in these chronological contexts contrasts with the scarcity of chronologically diagnostic artifacts from the Early Holocene from across the whole basin, except from Layer F4 at Alero Cuevas. Because of this, these archaeological characteristics probably reflect a rise of certain mechanisms of cultural transmission as frequency-dependent biases (Boyd and Richerson, 1985), that permitted the expansion and maintenance of certain artifact types and complex techniques (e.g. blade technology).

These mechanisms might have facilitated the transfer of adaptive information, especially in contexts of risk (see Fitzhugh, 2001; Muscio, 2004). This alludes to cultural adaptations, which in itself do not preclude the possibility of maladaptive practices that would have been selected out and obviated in the long term (Boyd and Richerson, 1985).

The archaeological evidence shows important changes from the Middle Holocene onwards. At Pastos Grandes, the archaeofaunal assemblage and the lithic technology present a good example of this. In the archaeofaunal assemblage, osteometric and age profile changes of the Alero Cuevas site, can be understood from the perspective of two hypothesis which in no way should be considered contradictory: population pressure over resources (see Broughton, 1999); and the domestication of camelids (Yacobaccio, 2001). In a context of spatial constriction and the growth of size of the human groups, domestication may be considered an adaptive response.

For their part, changes in lithic technology may be interpreted as the need to increase the efficiency and/or minimize risk, using standardized technologies, which are easily replaced, multifunctional and economic in respects to raw material and with high potential of edge use (Nelson, 1991). Even if the costs of manufacture and learning are high, under elevated socio-ecological pressures and high risk contexts, this technology would be adaptive.

Pocitos has a greater variability than Pastos Grandes within its lithic database for the Middle Holocene and beginning of the Late Holocene, indicating a greater intensity to the processes of cultural interaction vis-à-vis other regions, such as the Puna de Catamarca. Amongst the differences with Pastos Grandes, it is important to mention not only those aspects relating to artifact characteristics but also to the use of raw material (e.g. the high presence of grey obsidian at Abrigo Pozo Cavado, possibly from a non-local source).

The environmental differences between Pocitos and Pastos Grandes may in part explain these processes. At Pastos Grandes, the permanent availability of water from glacial melt, and the concomitant offering of a wide gamut of geo-environmental resources such as ravines and the basin bottom *vegas*, contrasts with the salt flat landscape of Pocitos, which is in general terms significantly more arid.

Although the local environmental dynamics at play in these distinct areas during the Middle Holocene are unknown, it is probable that Pastos Grandes could have supported larger local groups as well as more stable residential occupation. By way of contrast, Pocitos might well have functioned as an open area for movement and circulation of people and cultural information. The differences in the lithic material might thus be explained by the divergent forms of use of regional space, underlined by a latent competition for space and resources. Nevertheless, it is also possible a low residential mobility in specific sectors of Pocitos as Zelallos. During Middle Holocene and early Late Holocene, the human groups could be concentrated in these sectors. Therefore it is important a future excavation of contexts in layer with pre-ceramic information in open air archaeological concentrations (e.g. Zelallos, Pocitos).

Cardillo (2009), using morphometric techniques, proposed that the incremental regional variability in the design of projectile points towards the end of the Middle Holocene came about as a consequence of competition at the design level related to competition for resources. Also, the possibility that artifacts such as the lanceolate unifaces might have acted as indicators of territorial identity, that they belonged to particular spaces and groups, such as has been mooted by Morrow (1987) for some blade artifacts, has not been discarded. If these artifacts also encompassed a symbolic role as markers of belonging, then they would be expected to occur in contexts of competition. More bioarchaeological evidence will be crucial in addressing this problem. As such, the human remains from Salar de Pastos Grandes are a starting point for the study of process of competition and conflict, particularly given the anthropic marks probably related to physical violence. Likewise, it is important to make clear that this does not equate competition with conflict, although it is possible that competition can ultimately dissolve into conflict.

The recurrent and intense use of sub-optimal environments such as Pocitos during the Middle Holocene and the beginning of the Late Holocene could also be indicating population density pressures. As a hypothesis it is believed that in these contexts there would be competition for land and resources which would be expressed indirectly in the regional archaeological record regarding the following indicators: the compositional changes of the subsistence base (for example presence of domesticated camelids); the

variability in the regional lithic assemblage with marked similarities and differences; and the intensive occupation and diversity of distinct spaces, including sub-optimal places such as Pocitos.

Alternatively, the regional archaeological variability at the local scale does not seem to conform to any single model or hypothesis. In this sense, the models presented should not be made to 'fit' directly into the archaeological evidence. On the other hand, they are tools for thinking about problems and for suggesting hypothesis that need to be proven. In this respect, continuing investigations will sustain, refute or reformulate some of the proposed hypotheses.

In conclusion, the length and breadth of the Argentine Puna and the north of Chile is marked by the concentrated discarding of diverse archaeological material during the Middle Holocene (see Núñez, 1992; Aschero, 1994; Muscio, 2004; Yacobaccio and Morales, 2005, amongst others). The Puna of Salta shows shared archaeological indicators at a large scale, although it also shows differences. These differences are expressed mainly at the meso and micro-scale. Because of this, the archaeological data from Pocitos and Pastos Grandes advances the study of change during the Middle Holocene at a local scale, while at the same time contributing comparatively to the study of regional variability at the macro-scale (the south-central

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