

BEYOND STONES: BONE AS RAW MATERIAL FOR TOOLS IN CENTRAL PLATEAU OF SANTA CRUZ, ARGENTINIAN PATAGONIA

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ABSTRACT

The archaeofaunistic studies in Patagonia have focused on the osseous materials to make taphonomic, paleoenvironmental and economic inferences. However, until twenty years ago bone had scarcely been taken into account as a raw material for tool manufacturing. Archaeological excavations developed in the Central Plateau of Santa Cruz province allow us to formulate interpretations about use, decision-making, and the role of bone as raw material in technological chains of tool/ornament manufacturing. This paper presents the variability of tools of the AEP-1 and Maripe Cave sites in two moments: Pleistocene/Holocene transition and middle Holocene. Results indicate a high degree of design for both chronological blocks with human occupations at caves 3 and 13 at Los Toldos Locality in the Central Plateau of Santa Cruz. The standardization of forms and high degree of transformation found in some of these tools allow us to infer a curation strategy. This high degree of transformation was registered in other contexts of this region and for the same moments. Toward the middle Holocene we observe a wider spectrum of taxa in the bones used as raw material for tool and ornament confection.

Key words: Bone technology, Argentina, Patagonia, Central Plateau, Pleistocene/Holocene

Palabras clave: tecnología ósea, Argentina, Patagonia, meseta central, Pleistoceno/Holoceno

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INTRODUCTION AND GOALS

Although the movement and use of rocks and mineral pigments was and continues to be the cause of several archaeological works in the Patagonia regions (Aschero 1975-83; Mansur-Francomme 1983; Franco and Borrero 1996; Aguerre 1997; Nami 2000; Cattáneo 2002; Hermo 2009 among others), Southern Patagonia and the Mesopotamia area of La Plata river basin, the detailed study of bone technology has increased and produced a reconsideration of ideas about technology and circulation of bone tools among hunter-gatherers. Beyond rocks, the presence of bone artifacts in archaeological sites at the Central Plateau of Santa Cruz province is very common. However, in the study area, information about this topic was weak. In this paper we try to deepen the knowledge about bone materials, not only as food waste but also as important technological pieces in the tool production chains. Likewise bones were used as exchange goods, and as items of social communication (Binford 1978; Hayden 1998). When these artifacts appear as curated (Binford 1978), or as formal tools (Andresfky 1991; 1994) they begin to look like a material with specific economic and technological qualities generating technological, social and symbolic implications of these objects (Jackson 1989-90; Scheinsohn 1997; Borella & Buc 2009; Buc & Pérez Jimeno 2010; Miotti & Marchionni 2008; Borrero & Borella 2010; Marani & Cardillo 2010; Paunero et al 2010; Pérez Jimeno et al 2010).

The goal of this paper is to provide new information on the use of bone as raw material for artefacts and the technological changes that may have occurred since the initial population of the Central Plateau region in Santa Cruz. Although the distribution of stone artefacts in the area is always higher than that of bone artifacts, rocks of excellent quality used in the production of lithic artefacts are abundant, which supports the use of this raw material along the entire human occupation of ca 11,000 years. We believe that bone must have been more important among hunter-gatherer societies than archaeologists imagine at the present times. The indifference or lack of interest placed on this issue during previous decades may be based on the great archaeological visibility of lithic materials in Patagonia in the surface as well as in stratigraphic position. The weak preservation of bone generated low archaeological visibility and conservation of these materials.

To explain the artifact variability found in the Central Plateau along the human hunter-gatherer occupation, we considered the theoretical model formulated by Vivian Scheinshon (1997), and the model applied to bone tools of archaeological sites came from the Beagle Channel region, in Tierra del Fuego.

In this paper we present bone tools coming from stratigraphic sites settled in three archaeological localities: AEP-1 in Piedra Museo, Maripe Cave at La Primavera, and Cave 3 and Cave 13, both in Los Toldos. These archaeological localities are located in Deseado Massif, Santa Cruz, Argentina (Figure

1).

The goal is to provide new information about the use of bones as raw material to make artifacts and the possible technological changes since the initial settlement of the region of the Central Plateau of Santa Cruz.

We have used the evolutionary model proposed by Scheinshon (1997) as theoretical background, and contrast technological bone information has been taken from the archaeological context of the Central Plateau of South Patagonia (Argentina).

MATERIAL AND METHODS

We consider two temporal blocks to segment the samples: Pleistocene/Holocene transition and Early Holocene (13- 8 ka BP) coinciding with the human exploration and colonization phase and Middle Holocene (7, 9 – 3,5 ka BP) as the moment in which Patagonian societies consolidated their territories (Borrero 1990; Miotti 1989-98; Miotti y Salemme 1999).

The sample comprises 27 tools: four of them correspond to the first temporal block, while twenty-three come from mid Holocene layers (table 1). All of them come from specific stratigraphic location in each site. In all cases they were recorded with 3-D coordinates.

In this opportunity we present only those formal tools, but in Piedra Museo and La Primavera there are many informal artifacts which are not used in this study because they are part of Laura Marchionni PhD thesis, now under development.

The artifacts studied were examined by eye and low magnification (10 to 30 X)

The most abundant tools correspond to camelids, and the species with the highest distribution in the sites are the guanaco (N=7) (*Lama guanicoe*), and 1 piece assigned to camelid indet. There are ten (10) tools manufactured from long mammal bones. Some of them could correspond to camelids, but these pieces do not show the taxonomic diagnostic attributes to be referred to level genus or species.

Two (2) tools belong to canids and 7 to medium-sized birds (i.e. wild geese, swans, Anatidae). No tools on bones belonging to flightless birds were recorded. This point is important because long bones of rehidadae have good characteristics to manufacture tools, and specimens of these flightless birds were found in archaeological sites as remains of food. However, they did not appear transformed in tools in any contexts analyzed.

ENVIRONMENT AND ARCHAEOLOGICAL LOCALITIES

Patagonia, which seems to be homogeneous, actually comprises a wide spectrum of environments and resources- two main biomes are defined as woodland, in the Andean region, and steppe in the Extra-

Andean region. It is assumed that there were also significant regional ecological differences in the past. The studied area (Figure 1) is the major and continuous steppe stretch. However, the central plateau of Santa Cruz province is an independent geologic block with a specific environment. Such physiographic structure is a volcanic plate known as Nesocratón Del Deseado, or Deseado Massif (Di Giusto et al. 1980, Panza 1994).

Toward the west, the basaltic plateau is crosscut by deep ravines, which toward the east dwindle to ephemeral shallow creeks; interior drainage basins (bajos) and lagoons are very frequent; volcanic cones and tuff formations produce a hilly landscape rather than a monotonous plateau, typical of the Patagonian steppe.

THE LOCALITIES

Los Toldos

Las Cuevas ravine, at Los Toldos ranch, southwards from the middle course of the river Deseado (Figure 1). The two caves considered for analysis are located in this ravine, which contains twelve additional caves and some rock-shelters. This place is very rich in archaeological remains, many of which were found in the numerous caves and rock-shelters.

The landscape in this locality is composed of volcanic plateaus which are cut by temporary river courses that determine levels from 450 m.a.s.l to 600 m.a.s.l. in the highest plateaus and hills.

Cave 3 is located on the southern margin of the stream. It is 20 m wide and 22 m deep, with heights that decrease from 6 m at the entrance to 1.5 m in the deepest part of the cave. It is divided into two chambers. The cave structure and the archaeological remains suggest that the site must have featured multiple activities, with long occupational sequence (12 layers) dated between 12.6 ka BP and 4.5 ka BP. The walls and roof of the cave are rock art (paintings) (Cardich 1987)

The quantitative faunal analysis is the most detailed in the locality (Miotti 1998: Chapter 7). Rock art is mainly expressed by hand negatives, which would constitute the oldest “Style of Negatives” (Cardich 1987; Carden 2008).

Despite the fact that the guanaco remains are predominant in the Pleistocene/Holocene Transition as well as in the Holocene, *Lama gracilis*, *Hippidion saldiasi* and bird remains were also identified. The high percentage of guanaco (*Lama guanicoe*) in the Casapedrense and Patagoniense occupations, middle and late Holocene respectively, shows an increasing tendency towards the specialization in the capture of this animal (Miotti 1989-98). We do not deem it necessary to illustrate the relations between rock art and archaeofauna in this cave through tables and graphics since it is an extreme case in which the representation of animals or their parts is completely lacking in the paintings, whereas the total NISP for all the identified species and genus includes 3,523 specimens.

Cave 13 is located on the left margin of Las Cuevas Canyon. The excavated area in the cave is slightly significant (12,37 m²), especially if compared with the large total surface (100 m wide and 7 m deep). Some anthropomorphic figures and a hand negative can be observed next to the excavations. Along the rest of the cave, remains of red paint can be found, but no patterns could be distinguished because of the poor preservation of the paintings.

The human occupations belong to the Middle Holocene. In both components, Casapedrense and Patagoniense, the guanaco was the species selected as a basic resource by the hunters, but in the latest moments, small birds (Passeriforms; Phalacrocorax sp.), armadillo (*Zaedyus pichyi*) and red fox [*Canis (Pseudalopex) culpaeus*, term used in previous works (Miotti 1989-98; 2008)] nowadays *Lycalopex culpaeus* could have been used as complementary resources (Table 2 and Figure 8). The analysis of these remains, together with those from the lithic materials, the presence of a post hole and several hearth remains, allowed us to infer the secondary processing of prey, their consumption and the manufacturing of lithic and bone instruments, which means that the site could have functioned as a locus of multiple activities.

Piedra Museo is located at 120 km in the Southeast of Los Toldos (Figure 1). Several open-air sites and rockshelters have been found in this locality, which is situated in the Central Plateau, across the Zanjón Elornia, which flows to Laguna Grande. The excavations were carried out in the AEP-1 rockshelter, which is an enclosed basin, a real topographic trap for hunting animals by ambush (Miotti 1995; Miotti et al 1999).

AEP-1 features two main archaeological contexts, the oldest one dated between 12.8 – 9.2 ka BP, and the most recent settlement ca 7.6 ka BP, on average. The excavated area is about 47 m², representing 80% of the surface under the rockshelter.

Six stratigraphic units were defined, based on the sedimentological characteristics (texture, color, structures, granulometry, and limits). The preservation of bones, the spatial distribution, and bone modifications in each layer also contributed to separate this deposit. It is an edaphic profile where there is a noticeable unconformity only between Unit 1 and 2, but the other limits are imperceptible and gradual (Zárate et al. 2000).

AEP-1 is the first site in the Extra-andean Patagonian region of Argentina where fluted lithic points, referred to as fishtail points (FTP), were found in the oldest major component, associated with a high resolution faunal assemblage (extinct and living species) and bone tools. Radiocarbon analyses by means of the AMS method have dated the earliest human occupations of the site between 13 and 11 ka BP.

At 0.70 cm above the oldest archaeological component of AEP-1, another context was recorded with

hearth, remains of living autochthonous fauna and lithic artefacts similar to those of Fell III late Toldense Industry, and Regional level Rio Pinturas I, all of them assigned to the Early Holocene (Miotti 1995; Miotti et al 1999; Cattáneo 2002).

The paintings and carvings of the rock-shelters of the Piedra Museo outcrop have been detailed in several previous works (see Carden 2008). There is a high amount of animal tracks carved over the horizontal surface of some boulders within the rock-shelters. Among these, the bird tracks are the most abundant, followed by guanaco, felid and horse tracks. However, main subsistence resource since Pleistocene to Middle Holocene was the guanaco (*Lama guanicoe*); rheids (like ostrich), birds, and small/medium sized mammals were complementary resources.

La Primavera

Maripe Cave is located in the cliff bottom of La Primavera valley, which is one of the stream tributaries of Zanjones Blanco and Rojo basin. Along this wetland (10 km in length) several rock-shelters open on both sides of the valley. La Primavera integrates same fluvial basin where Piedra Museo is located, at 70 km west of it, and ca. 500 m.a.s.l. (Figure 1)

Maripe is a big cave (ca. 22 X 26 m) and excavations began in 2003 (Miotti et al 2007)

The Cave experienced several human occupations along the Pleistocene/Holocene transition towards the middle Holocene 9.5 ka BP to 3.2 ka BP (Miotti et al 2007). In this site, as well as in the previous localities, guanaco seems to have been the main faunal resource exploited.

ASSUMPTIONS

In the following chart we have summarized the main characteristics and variables involved in the theoretical model presented above. Based on the theoretical expectations we intend to answer when and where the technological changes could have occurred regarding the use of bone as raw material in the region. On the other hand, in the Central Plateau of Santa Cruz, good and excellent raw materials are abundant and varied (Cattáneo 2002; Hermo 2008; Miotti 1995; 2008; Hermo and Miotti 2011). The location in this massif of archaeological sites discussed here, suggests that the raw materials for the fabrication of artifacts was not a problem to hunter-gatherer societies. In this sense, the use of bone tools would be not related to lack good rocks in the region (Binford 1993). We should relate it to other causes, like the better conditions of plasticity of bone in the tools production to work leathers, skins, and fibers (Musters 1979).

Bone modifications related with butchering are not considered here, as they were presented in previous

papers (Miotti and Salemmé 2005; Miotti and Marchionni 2009, i.p.; Marchionni et al 2010)

<i>Evolutionary states of raw material use</i>	<i>Experimentation</i>	<i>Exploitation</i>	<i>Abandonment</i>
<i>Characteristics</i>			
<i>Design diversity</i>	high	low	this raw material falls into disuse
<i>Standard basic design</i>	low standardization and high morphological and metrical variability	high standardization and low morphological and metrical variability	possible causes: replacement of raw material with better ones
<i>Raw material diversity</i>	high	low	Incorporation of new raw material but lack of adjustment with new technologies
<i>Diversity of techniques</i>	high competition among techniques	low without techniques competition	extinction of human population

ARCHAEOLOGICAL TOOLS IN THE PATAGONIAN CENTRAL PLATEAU

According to the intensity of modification (design), in order to achieve a specific shape or size we have identified a continuum similar to formal and informal lithic tools (Choyke 2001; Choyke and Bartosiewicz 2001), practical and prestige tools (Hayden 1998), and those expeditive/curated (Binford 1978). The analyzed sample of bone tools can see summarized in tables 1 and 2, and in the graph 1.

<i>Archaeological sites and localities</i>	Piedra Museo AEP-1 rockshelter	La Primavera Maripe Cave	Los Toldos		TOTAL tools
			Cave 3	Cave 13	
<i>Chronological blocks</i>					
13 – 7.8 Ka BP	1	-	3	-	4
7.7 – 3.2 Ka BP	4	12	5	2	23
TOTAL	5	12	8	2	27

Table 1: Distribution of tools analyzed and expressed by chronological and geographical scales

Table 2: in file attached

Graph 1: bone tools of Late Pleistocene (temporal block 1) and Middle Holocene (temporal block 2) at Central Plateau of Santa Cruz province.

Bone Tools from Pleistocene/Holocene transition and Early Holocene

In the first temporal block, which corresponds to human occupations between 11.5 – 8.5 Ka BP, four bone tools were recorded (table 2). They were assigned to awls morphological group (Chauvier and Rigaud 2005; Fano et al 2005) and come from the lowest stratigraphic levels of the AEP-1 rock-shelter, Piedra Museo Locality, and Cave 3 of Los Toldos. The awls were made on cortical tissue of long bones belonging to mammals and camelids (Figures 3 and 4). The pieces were not decorated. Original bone elements show high modification by abrasion and polish, and in this sense, the applied design corresponds to the technologic category of formal tool. For Scheinsohn (1997), the artefact belongs to PUNCAM, (point on bone camelid). For this category we assume that the awl of Piedra Museo was made on long bone of some certain camelid species, but the fittest group would be that of large sized mammal.

Figure 2: Awl made on a metapodial camelid from stratigraphic unit (SU) 5 Piedra Museo AEP-1 (ca. 11 ka BP): a) photo; b) scheme

Figure 3: a and b) awls in long bone mammal, Cave 3, Los Toldos; c) awl on a *Lama guanicoe* (guanaco) distal tibia from Toldense component of Cave 3, Los Toldos, ca. 10-9 ka BP (from Miotti 1998:123)

Bone Tools from Middle Holocene

During the second temporal block (7.7 – 3.2 ka BP), morphological groups increased, and artifactual variability intra-group increased likewise.

Bone raw material increased with the incorporation of bones of canids and birds. However, guanaco bones showed high levels of use in the production of tools and ornaments.

Figure 4: a and b) formal spear point from SU 2 at Piedra Museo AEP-1; b) decorative engraving on a face of a double bevel spear point. Made on mammal long bone from Maripe Cave (ca. 8.3 – 7.5 ka BP). In this case it could be assigned to the bone technology of the first temporal block.

Figure 5: a and b) scheme and photo of a retoucher or “detachée par rupture après entaillage au flanc due burin” (Chauvier et Rigaud 2005: 237) made on a *Lama guanicoe* metapodial from SU 2 at Piedra Museo AEP-1 (ca 7.5 ka BP)

Figure 6: a, c, d, and e) fragments decorated with engravings of parallel lines on mammal diaphyses; b) tube/bead or mouthpiece? decorated with decorative pattern of parallel lines engraving made on bird diaphysis from Maripe Cave

Figure 7: fragment of decorated tube made on bird diaphysis, from Casapedrense Component Cave 13, Los Toldos. (Miotti 1998: 155)

Figure 8: tool (core of beads?) made on *Cannis (P.) culpaeus* (red fox) proximal epiphysis femur, from Casapedrense Component 13 Cave Los Toldos. (Miotti 1998: 155)

Figure 9: a, b) awls made on mammal long bones from Maripe Cave; c) awl made on *Cannis (P.) culpaeus* (red fox) from Piedra Museo AEP-1 (ca. 7.5 ka BP)

Figure 10: retouchers (practice tools) made on guanaco radius- ulna (a), metapodials (b and c), and tibia (d) from Maripe cave

DISCUSSION AND CONCLUSION

- 1- Since the beginning of occupations in late Pleistocene of Central Plateau, bone as raw material was handled to make formal tools, adequate for different uses. Examples of this are the Los Toldos and Piedra Museo awls. This high standardization continues in middle Holocene contexts in Los Toldos, in La Primavera and in Piedra Museo.
- 2- Decorative design adds value to the tools, as it implies longer production times on the part of craftsmen. Although such additional effort would not have a direct bearing on the efficiency of such tools, it can be interpreted as a social phenomenon that would bring together craftsmen and their tools in a sort of parental relationship of belonging and / or prestige (Hayden 1998). Examples of these are the tubes and fragments of mammal and bird bones, diaphysis with a pattern of parallel engraved lines.
- 3- On the basis of the evidence of the three archaeological localities, we can infer that the stage of experimentation in the raw material bone is not present in the Central Plateau contexts, as it was the original expectation within the evolutionary model. Therefore, and considering the formal and technical similarities of the design of bone fragments and tubes on diaphysis found in diverse paleoindian contexts of America (ca 11.6 - 10 Ka BP) (Dansie and Jerrems 2005; Jackson 1989-90; Johnson 2005; Johnson *et al.*, 2000; Paunero *et al.*, 2010) and the presence in these sites of Patagonia, one tends to think that this similarity could be the result of an extended knowledge of bone as raw

material. Likewise, ends are common both during the Pleistocene ends already widely was expressed and in New World contexts. (ca. 11.6 ka BP). Hence, we can infer that the sophisticated knowledge of bone use as a raw material (stage of exploitation in Scheinsohn 1997) was already in place among Old and New World hunter-gatherers of the Pleistocene.

In summary:

Stage Experimentation: it doesn't appear in archaeological localities in the Central Plateau region represented with technological defined characteristics in the evolutionary model formulated for the Southern Patagonia sub-region (Scheinsohn 1997). All bony raw material from archaeological contexts allow us to infer a deep knowledge of faunal resources as subsistence, technology and symbolic good of exchange. Use bone in technological task was an efficient use, since the first human occupations in the area.

We found a pattern of standardized techniques, designs and use of certain bones to produce tools in the Pleistocene /Holocene transition and early Holocene, as well as in the Middle Holocene. This finding is good indicator to infer that the societies would be practicing a full use of the different varieties of bone from the beginning of the Patagonian settlement.

Bone was used for its intrinsic qualities and for specific aims and not as raw material of replacement or alternative raw material with reference to another raw material like stone.

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