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1- INTRODUCTION

The aim of this work is to present the main characteristics of the faunal assemblage of Paso Otero 4 site in order to describe zooarchaeological data considering its significance for discussing subsistence models for Pampean region. Paso Otero 4 (PO4) is an open air site located in the middle basin of the Quequén Grande River (Pampean region, Buenos Aires Province, Argentina) (Figure 1).

PO4 was excavated between 2008 and 2010, and a great diversity of archaeological remains was recovered in a surface of ca. 14 m². The archaeological deposit, assigned to Early and Middle Holocene, reached a depth of 6.15 m from level 0 (5.15 m below surface). The archaeological materials were continuously distributed in ca. 1.15 m throughout the Río Salado Member of the Luján Formation (Figure 2).

A variety of zooarchaeological material (ca. 28,000 specimens) such as different faunal remains, including marine shells, bone tools, and a great diversity of faunal species were recovered at the site. The lithic assemblage (ca. 500 artefacts) is composed by tools, pieces of debitage, cores, and ecofacts. Orthoquartzite, followed by chert, and basalt, was the most used raw material in the manufacture of lithic tools.

Finally, it is worth mentioning a remarkable feature found at the base of the archaeological deposit. From a horizontal view, it consists in a semi-circular trait filled with a dark brown sediment, and from a vertical view it is U-shaped feature (see Figure 2). A scarce quantity of archaeological material, mainly concentrated at the top of the feature, was recovered. Although the functionality of this feature is still being discussed the idea that it represents a water wells is the most plausible hypothesis. Three radiocarbon dates from soil organic matter suite the chronology of the feature at ca. 8700-8100 ¹⁴C years BP.

3- MATERIALS AND METHODS

The analyzed sample comprised the total number of bone specimens recovered at the site (N= 28,781), with the exception of microvertebrate remains (less than 1 kg). Taxonomic and anatomical analyses were conducted; then, skeletal part profiles were constructed for guanaco (*Lama guanicoe*), using taxonomic abundance measurements (NISP, MNI, MAU, and %MAU) (Binford 1978; Grayson 1984; Klein and Cruz-Uribe 1984; among others).

To identify human processing in the faunal assemblage, the following variables were considered: thermal alteration (Benett 1999; David 1990), types of fracture (Johnson 1985), and cut marks (Binford 1981; Shipman 1981). Finally, Artiodactyla Index, and Shannon-Wiener Index were performed in order to evaluate changes in the assemblage throughout the archaeological sequence (Grayson 1991; Lyman 2008; Magurran 1988).

4 RESULTS

4.1 Faunal assemblage composition

Considering the species diversity, ca. 48% of the total sample belongs to eggshell fragments, assigned as Rheididae family, although they probably correspond to *Rhea Americana* (greater rhea) (see Table 1). Two of the eggshell fragments were decorated, while two had anthropic perforations (Figure 3), and ca. 18% had thermal alteration. Also, 10,768 specimens (ca. 27%) were undetermined fragments (less than 4 cm) of which ca. 9% were burned. A total of 2572 specimens correspond to Dasipodidae scutes and about 5% of them are burned. Lastly, 124 specimens of marine Gastropoda, and one of a bivalve (*Glycimeris longior*) were identified.

Taking into account the frequency of specimens, excluding the undetermined fragments, scutes, and eggshells, the best represented species is *Lama guanicoe* (guanaco), followed by *Lagostomus maximus* (plains viscacha), *Chaetophractus villosus* (hairy armadillo), *Ozotoceros bezoarticus* (Pampean deer), carnivores (among them, *Dusicyon avus*, the extinct canid), *Rhea americana* (greater Rhea), *Conepatus* sp. (skunk), *Eutatus seguíni* (extinct armadillo), Tinamidae (family of the partridges), *Dolichotis patagonum* (Patagonian hare), and *Lyncodon patagonicus* (Patagonian weasel). Nevertheless, the minimal number of individuals indicates that *Lagostomus maximus* is the most abundant species, followed by *Lama guanicoe*, *Chaetophractus villosus*, carnivores, *Ozotoceros bezoarticus*, *Conepatus* sp., and *Rhea Americana* (see Table 1). Finally it is important to note the presence of a second phalange of *Homo sapiens sapiens*, recovered with the rest of the archaeological materials.

Considering the radiocarbon dates, the geoarchaeological data, and the exclusive presence of some taxa and material culture, the sequence was divided into two portions: the upper and the lower levels: the former goes from the top of the archaeological deposit until the 4 m depth while the latter from the 4 m depth to the bottom of the deposit. In the upper levels the marine Gastropoda are assembled (ca. 94%), as well as mostly of the rests of *Conepatus* sp. (ca. 90%), and the majority of *Lama guanicoe* remains (ca. 78%). *Ozotoceros bezoarticus*, and *Lagostomus maximus* have similar frequencies in both components. *Homo sapiens sapiens* and *Glycimeris longior* are only in these levels. In the lower levels, there is a higher representation of *Rhea americana* (ca. 75%), Felidae (ca. 89%), Canidae (ca. 88%), *Dolichotis patagonum* (ca. 83%), and *Chaetophractus villosus* (ca. 63%). Lastly, *Eutatus seguíni*, *Lyncodon patagonicus*, and *Dusicyon avus* are only represented in these levels. Moreover, bone artifacts were mostly found in this part of the sequence (see below).

It is worth mentioning that *Eutatus seguíni* is a giant extinct armadillo commonly found at the Pleistocene. The presence of these remains is important to discuss the survivorship of this species into the Holocene (Gutiérrez et al. 2010b).

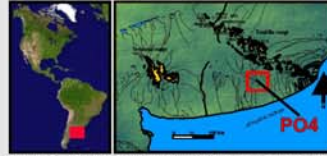


Figure 1. Location of the Paso Otero 4 archaeological site.

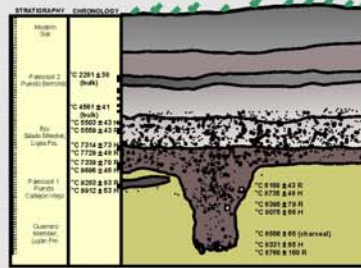


Figure 2. Radiocarbon dates and stratigraphic profile from Paso Otero 4 site.

Taxa	NISP	MNI	B
Undetermined (less than 4 cm)	10768	NA	
Marine Gastropoda	124	NA	
<i>Glycimeris longior</i>	1	1	
Vertebrates	8	NA	
Medium mammals	29	NA	
Archaeofauna	229	NA	
Carnivora	29	2	X
Canidae	61	2	X
Felidae	9	3	X
Tinamidae	6	1	
Rheidae (eggshells)	13741	NA	X
<i>Rhea americana</i>	27	2	X
<i>Lama guanicoe</i>	572	7	X
<i>Ozotoceros bezoarticus</i>	135	4	X
<i>Lagostomus maximus</i>	281	10	X
<i>Dolichotis patagonum</i>	3	1	
<i>Conepatus</i> sp.	21	3	X
<i>Dusicyon avus</i>	1	1	
<i>Lyncodon patagonicus</i>	1	1	
Dasipodidae (scutes)	2162	NA	X
<i>Chaetophractus villosus</i> (scutes)	420	NA	X
<i>Chaetophractus villosus</i>	178	6	X
<i>Eutatus seguíni</i>	15	2	X
<i>Homo sapiens sapiens</i>	1	1	
Total	28781		

Table 1. Species diversity from PO4 site. NISP: minimum number of specimens. MNI: minimal number of individuals. B: butchering, pointed with an X when it was present.



Figure 4. Eggshell fragments with anthropic perforations (left), and decorated (right).

4.2. Butchering and bone tools

Those taxa which presented evidence of human butchering were Canidae, Felidae, *Rhea americana*, *Lama guanicoe*, *Ozotoceros bezoarticus*, *Lagostomus maximus*, *Conepatus* sp., *Chaetophractus villosus*, and *Eutatus seguíni*. From the total assemblage, ca. 8% of the specimens had cut marks. From these, ca. 42% corresponded to filleting, ca. 20% to disarticulation, ca. 14% to skinning, and ca. 24% could not be assigned to any of these types. Besides, ca. 8% of the bones presented anthropic fractures, and ca. 3% had thermal alteration. Finally, 5 bone tools were identified, 4 of them made from guanaco long bones, and 1 of them on Artiodactyl bone (probably guanaco, too) (Figure 6).



Figure 3. Stratigraphic profile and U-shaped feature.



Figure 6. Bones tools from PO4



Figure 7. *Eutatus seguíni* bone elements from PO4

4.3. Elements from *Eutatus seguíni*

Fifteen elements of giant extinct armadillo (*Eutatus seguíni*) were recovered. They represent a minimal number of 2 individuals (Figure 7). From the 15 elements, 7 had cut marks that indicate consumption. Two attempts to date bones assigned to this species failed due to the lack of collagen preservation and the proposed Early Holocene chronology (ca. 9700 and 7700 years BP) is inferred from their contextual and stratigraphic position.

5 DISCUSSION AND CONCLUSIONS

The evidence presented suggests that butchering and consumption of faunal resources, as well as maintenance of lithic tools and final reduction stages of manufacture were carried out at PO4 site (Gutiérrez et al., 2010b). Faunal assemblage is characterized by great species diversity. Eleven species were determined, as well as 1 genus, 3 families, and other broader taxonomic classifications. At least 9 of them were consumed, and 2 (*Lama guanicoe* and *Rhea americana*) were used for elaborating bone tools and also as support (eggshell) for geometric engravings.

Taking into account the separation between the two levels some differences can be noted. The lower levels correspond to the Early Holocene (ca. 9700 and 7700). From the above mentioned animal species, only three are recorded in this section of the deposit: *Eutatus seguíni*, *Dusicyon avus* (extinct) and *Lyncodon patagonicus*. In general terms, these evidences in conjunction with paleoenvironmental proxy-data obtained from these levels (Early Holocene) are in accordance with arid-semiarid conditions (Gutiérrez et al. 2010a). Moreover, greater faunal diversity is observed and data indicate that subsistence strategies would be more diversified.

The upper levels are assigned to the Middle Holocene (ca. 4.600 and 5.600). The marine shells are mostly concentrated in this unit, as well as *Glycimeris longior* (marine bivalve), that is the only species which is absent in the lower unit, along with *Homo sapiens sapiens*. At this moment, the subsistence strategy observed is more artiodactyla oriented, and the species diversity is a bit lower.

On the base of other sites from the Pampean region, two of the authors (Martínez and Gutiérrez 2004) had proposed a subsistence model considering chronological divisions. These authors propound the following subsistence strategies: a generalized regional economy for Pleistocene-Early Holocene, specialized regional economies for Middle Holocene, and diversification and intensification of areal economies for Late Holocene. Taking into consideration this model, the faunal data from PO4 site support it for the Early Holocene, but only partially for the Middle Holocene. Although for the latter subsistence is more oriented to artiodactyla than in previous moments, still an important faunal diversity is present and most of them are small preys.

Finally, PO4 site contributes with new archaeological evidence in different aspects: survival of extinct fauna, subsistence strategies, and new data for Middle Holocene, a period scarcely represented in the Pampean region. New analyses (e.g.; microvertebrate data) will permit testing the ideas proposed here.

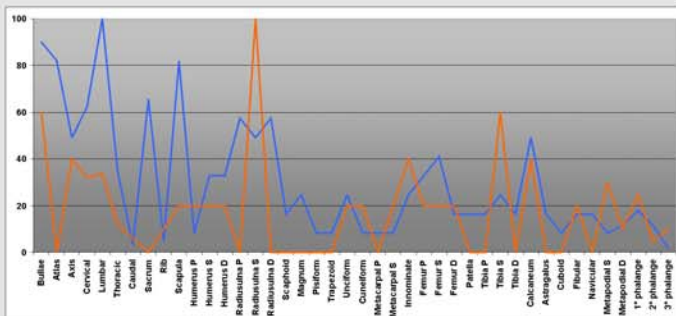


Figure 5. Guanaco %MAU for both upper (blue line) and lower (orange line)