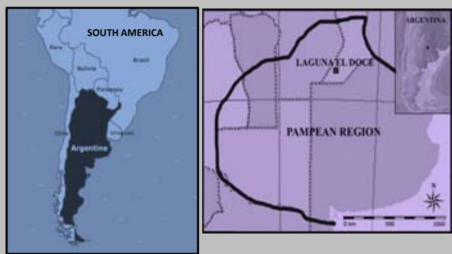
EVIDENCE OF BONE TECHNOLOGY ON THE SANTA FE´S PAMPA LAGOONS.

THE LAGUNA EL DOCE SITE (SANTA FE PROVINCE, ARGENTINA).

Cornaglia Fernández, Jimena
CONICET-CEIA-UNR

Buc, Natacha
CONICET-INAPL

INTRODUCTION



The Laguna El Doce site (LED) **Map* is located in the homonym lagoon, in the Pampa lagoon area of Santa Fe province at 33° 54´ 20´´W and 62° 08´ 43´´ S, in the north-western sector of the Pampean Region.

LED is a surface site, where high quantities of faunal remains, mainly *L. guanicoe,* human bones, pottery fragments, lithic materials and bone tools were found. The site is a deflation basin in a dune environment **Figure*, formed by the action of wind, in a process that last for the past 3.000 years. AMS radiocarbon dates are currently under analysis, in the frame of the research project *"Entornos y sociedades. Construcciones de los paisajes arqueológicos en la Pampa de las Lagunas santafesinas (Depto. Gral. López, Pcia. de Sta. Fe)"* (HUM 2685).

OBJECTIVES

The aim of this work is to make a first approach to bone tools assemblage and discuss their role in hunter-gatherer societies that inhabited the area during Late Holocene. Particularly, we assess bone raw material strategies, considering artifactual design and functionality.

BIBLIOGRAPHY

Borella, F. & N., Buc. 2010 Ópticas y Ópticos. Una aproximación a la tecnología ósea en la Bahía de San Antonio (Río Negro), Argentina. In M. Salemme, F. Santiago, M. Alvarez, E. Piana, M. Vazquez y M.E. Mansur, *Arqueología de Patagonia: una mirada desde el último confín*, Editorial Utopías, Ushuaia: 421-432.

Buc, N. 2010 *Tecnología ósea de los cazadores-recolectores del humedal del Paraná inferior (Bajíos ribereños meridionales)*. PhD Dissertation, FFyL, UBA, MS.

Camps-Fabrer, H. 1966 *Matière et art mobilier dans la préhistoire Nord-Africaine et Saharienne.* Mémoires de CEDARC. Paris.

Cornaglia Fernández, J. 2009 *Zooarqueología del Holoceno tardío en el sur de Santa Fe. El sitio Laguna El Doce*. HUMyAr, UNR, MS.

,Le Moine, G. 1991 *Experimental Analysis of the manufacture and use of bone an antler tools among the Mackenzie Inuit*. PhD Dissertation, Univ. of Calgary, Canada. MS.

Legrand, A. 2007. *Fabrication et utilisation de l'outillage en matières osseuses du Néolithique de Chypre: Khirokitia et Cap Andreas-Kastros.* BAR S1678. Oxbow, Oxford.

Scheinsohn, V. 2010 *Hearts and Bones: Bone Raw Material Exploitation in Tierra del Fuego*, BAR S2094. Oxbow, Oxford.

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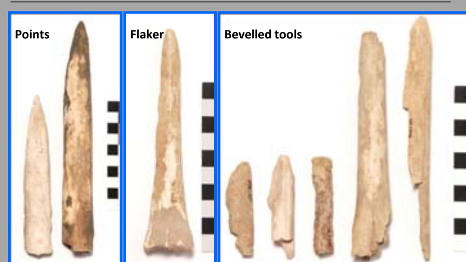
MATERIAL AND METHODOLOGY

For that purpose, we analysed the morphological, physical, metric (*sensu* Scheinsohn 2010) and microscopic structure (Buc 2010) of 18 archaeological bone tools from the LED site.

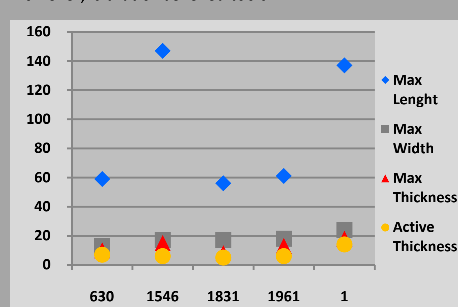
Firstly, artefacts were classified into morpho-functional groups according to both international bibliography (mainly Camps-Fabrer 1966) and the shape of distal ends (Scheinsohn 2010). The physical structure (anatomical and taxonomical identification of units used as raw material) was determined using actual databases. Cut-marks and macroscopic polish were considered in order to distinguish human slaughtering and tear marks caused from those resulting from use and manufacture. Metric structure was established according standard criteria on bone tools analysis (Scheinsohn 2010). Finally, for the microscopic structure we followed criteria initially proposed by Semenov (1964) and developed, among other authors, by Le Moine (1991) and Legrand (2007). An earlier performed database (Buc 2010) was used as comparative relating it with information published by other authors as well. For the analysis we used an inverted metallographic microscope (Olympus MPE3) working at 50x, 100x and 200x.

RESULTS



Morpho-functional Groups	n	Taxa	Bone
Point	4	*L. guanicoe*-Artiodactyla	radioulna-femora-splinter-metapodial
Flaker	1	*L. guanicoe*	metacarpal
Bevelled Tool	5	*L. guanicoe*-Artiodactyla	metapodial-splinter
Spatula Tool	2	*L. guanicoe*-Artiodactyla	scapula-splinter
Manufacture by-products	4	*L. guanicoe*	metacarpal-splinter
undetermined	2	*L. guanicoe*-Artiodacyla	metapodial-splinter

Following Camps-Fabrer (1966) and Scheinsohn (2010), the sample was classified in: flakers, points, spatula and bevelled tools **Figures & Table*. Some fragments could not be assigned to any group according to bibliography and were refer as "undetermined". Finally, number of bones have sawing or other marks that suggest they are manufacture by-products or artefacts scantly manufactured. Most abundant morpho-functional group, however, is that of bevelled tools.



Despite a great variety of *L. guanicoe* bones are present in the bone tools assemblage, bevelled tools show high bone raw material selectivity, being all made on metapodials **Figure & Table*. In the metric structure, these artefacts show a strong homogeneity in those variables that are not affected by artifactual reactivation, as maximum width and thickness, and apical thickness **Graphic*.

Given the importance of post-depositional processes to microscopic analysis, it is important to mention that the sample comes from a surface recovery in a lagoon environment; so most fragments were near the water. Some bone tools show damages produced by non-human taphonomic agents like weathering, root etching, rodents´ marks, and manganese and calcium concentrations. Some of these damages represent a problem to microscopic analysis because they modify, erase or obscure use-wear. For that reason, we only considered microscopic patterns and no isolated marks. Some pieces could not be analyzed because of calcium carbonate concentrations, so in future examinations we planned a careful of them.

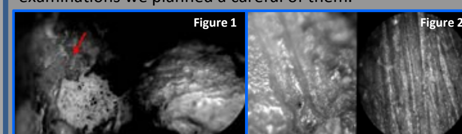


Figure 1. **LED 550: Arrow shows transversal, deep, short striation, 50X. SAO 22: microscopic pattern recorded in all archaeological flakers of San Antonio Oeste, 50X.**
Figure 2. **LED 630: Longitudinal V-shaped striations, 120X. Experimental traces after abrading bone with sandpaper, 100X.**

Microscopic analysis on spatula tools and points only showed rounded and homogeneous surfaces or post-depositional alteration. Therefore, no use identification could be made.

The flaker (LED 550) shows transversal, parallel, short and deep striations similar to those recorded in all flakers recovered from another archaeological site (San Antonio Oeste, *cf.* Borella & Buc 2010) **Figure 1*.

In bevelled tools, on the other hand, we found macro and microscopic patterns that suggest standardized strategies in use. Use-wear is located exclusively in apical ends: it is formed by parallel, straight, wide and V-shaped, longitudinal striations. In two cases, longitudinal work on lithic material could be proposed since this pattern is generally identified with work of angular grains abrasives, as lithic material (see Buc 2010 for examples and discussion) **Figure 2*.

DISCUSSION AND CONCLUSION

Above mentioned results show, in the physical structure of bone tools assemblage, the dominance of *L. guanicoe* over others taxa. In effect, despite other species are in the zooarchaeological record, this one formed the subsistence base of hunter-gatherer societies under study (Cornaglia Fernández 2009). Among *L. guanicoe*, unlike the archaeofaunal assemblage, it is also remarkable the predominance of metapodials as bone raw material.

As far as the morpho-functional variety, points, spatula tools and flakers are composed by few artifacts. In contrast, bevelled tools are abundant and show high standardization in metric, physic and microscopic structures. In this morpho-functional group, not only *L. guanicoe* metapodials were selected, but, as metrical structure indicates, a certain metric range was preferred, maintaining the original geometry of bones after manufacture.

Finally, lithic use-wear patterns were recorded in flakers and spatula tools´ cases. Therefore, considering the absence of lithic local quarries, we suggest that bone and rock material would have been complexly intertwined in the technological strategies of LED hunter-gatherer societies.

In summary, this paper is just a first approach to the technologicale picture of Santa Fe Pampa lagoons area, during Late Holocene. In the zooarchaeological aspect, it also provides a global understanding of the *L. guanicoe* exploitation which not only was an important food resource but also its bones were used in the manufacture of tools.