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L'outillage lithique en contextes ethnoarchéologiques

Lithic Toolkits in Ethnoarchaeological Contexts

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Deep Impact: Stones in Bones. Some Thoughts About the Ethno-Archaeological Contrast. A View from Tierra El Fuego (Extreme South of America)

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Abstract
The archaeological research in recent Yamana settlements on the northern coast of the Beagle Channel is contrasted against the ethnographic information. The analysis of traces left by stone tools and by weapons on bones demonstrates some biases concerning the written information as well as some unexpected hunting strategies. The conclusions extracted point the necessity of a very careful and not conditioned examination of lithic inclusions in bone material.

Résumé
La recherche archéologique sur les sites Yamana de la cote nord du Channel Beagle a été confrontée avec les informations ethnologiques. L’analyse des traces laisses sur la surface des os par des instruments et les armes en pierre ont montrée quelques déviations de l’information écrite et la pratique de estategies de chasse non prevues. Les conclusions nous portent a la nécessité de faire une inspection macroscopique rigeureuse des inclusions de pierre dans les surfaces des osments.

INTRODUCTION
Archaeological research on the northern coast of the Beagle Channel in Tierra del Fuego since 1975 provided a historical sequence from the first settlement on the islands until the XIXth century, after European contact with the called Yamana people (Orquera & Piana, 1999 a).

As a result of two Argentinean and Spaniard research-projects we have analyzed the impact of European exploitation on the marine resources along with the changes in environment over the last 6000 years.(1). We wanted to evaluate the impact of massive industrial exploitation on the native’s resources and it's influence in their catastrophic extinction as an organized society.

During this process we compiled and evaluated extensively the ethnographic and the historical written sources data (Orquera & Piana, 1999b), as well as ethnographic plus graphic and photographic collections deposited in the main ethnographic museums in Europe (London, Paris, Rome, Madrid, Gotteborg, Berlin, Wien and Saint Petersburg (Estévez & Vila 2001). Our first aim during the projects was to contrast the ethnographic resulting image with the archaeological record from some sites of the European contact times. In this process we wanted to gain an objective image of the last moments of the people living in the northern coast of the Beagle Channel and, at the same time, to improve and to test archaeological methods and inference systems (Piana, ea. 1992).

Our field work in two recent settlements (figure 1), Túnel VII and Lanashuaia, covered in both cases the whole surface occupied by a social unit (a hut and its surrounding working area) obtaining therefore a complete set of residues, result of the production and consumption activities done at these places (Estévez & Vila eds. 1995; Piana, ea. 1999). We focused the main effort of our studies on archaeozoological materials (Estévez, 1995, Estévez, ea. 1995; Estévez & Martinez 1998; Estévez, ea. 2001; Juan Muns, 1992; Juan Muns, 1994; Mameli, 2000). As part of our objectives, we stressed the analysis of the faunal record as far as possible trying to develop methods to squeeze the information we can obtain from (Estévez, 1995). A strong correlated study of the whole archaeological information, experimental replications and the analysis of the ancient ecosystem, could offer a quite good image of the systems for obtaining, processing and the distribution of animal resources, as well as the evaluation of the weight in the economy of every animal class. At a first glance the image matches quite well with the overall ethnographic information (Estévez, ea. 1995). Nevertheless some striking and contrasting points arose, especially as we risen the standards of analysis to a higher level, going beyond the simple record of the relative frequency of taxa and elements to the refitting, re-articulation, macroscopic analysis (from 10 to 80x magnification) of icneology on all bones surfaces together with distribution analysis for determining the destination of body parts as well as deposition dynamics and relating this information with the analysis of the production and the use -through usewear analysis- of lithic and bone tools (Terradas ea. 1999; Clemente, 1997 and Piana & Estévez, 1995).

Therefore this contrast, at its turn, sets the question back to the standards of archaeozoological work normally used. In that way, analyzing the consequences of this close encounter between Ethnography and Archaelogy we try to increase our knowledge about the last Yamana and at the same time to improve and verify the archaeological (in this case the archaeozoological) methods.
THE EXPLOITATION SYSTEM AFTER THE ETHNOGRAPHIC SOURCES

Animal exploitation strategies by Yamana people were described in detail by ethnographic sources (Orquera y Piana, 1999b). Ethnographic hunting implements are well represented too in the collections of European ethnographic museums. All written and graphic information of Tierra del Fuego canoe Indians draw them as people heavily oriented to coastal resources exploitation, based in collecting mussels, fishing, capturing birds and using harpoons from canoes to hunt sea lions. Since 1624, the drawings by the Nassau Fleet (reported by J.l’Hermite), people are shown using these weapons as well as bows and arrows (figure 2). But the temporary large span of the information sets some problems. A series of contradictions between the different authors arose. It is sometimes possible to resolve some of them analyzing critically every ethnographic source. Some times the bias on the same source or the time span and the development of the extractive practices by Yamana people can be explained. It is possible for instance to notice a change between the chronicles before and after 1869. The frequency of sea lion hunting activities seems to decrease probably due to the overhunting of these animals by Euroamerican fur-hunter ships.

The strong parallel between the first pictures of men with harpoons in the XVIIth Century (in the work of Sebald de Weert, 1646) and the last pictures token at the end of the XIXth by the Mission Scientifique du Cap Horn (Figure 3) demonstrates another bias. There is a continuity in the interest to describe and underline specially men’s hunting activities. All writers resume the use -from canoes or on land- of harpoons for hunting of sea lions, otters or sometimes to kill larger animals (such as dolphins or whales).
This weapon has a single or double toggled-detachable bone point. There are some whole harpoons and many harpoon points. Table 1 compiles the measurements of those noted as “Yamana” and the histogram in figure 4 shows a tendency to a normal length around 26 cm. But there are some exemplars longer than 55 cm. In its ethnographic description Gusinde describes in 1937 (pages 460 and 501-503) that people employed harpoon-points longer than 40 cm to kill larger prey such as whales.

Figure 3.- Picture of Yamana using harpoons: in the XIXth Cent.(left) and in the XVIIth Century.

Figure 4: variability of harpoon length in Yamana ethnographic collections
The harpoon with detachable or toggling point was the most adequate one for hunting pinniped and the use perfectly fitted the hunting on the sea and canoe use for searching and capture.

There are other differences between the earlier and the later sources. The first drawings clearly show the use of bows and arrows whereas after the ethnographic written sources from second half of the XIXth Century (since Lovisato 1883 page 7) their use is not so often mentioned and to beginnings of the XXth Century it is said arrow points were no more manufactured and acquired only through changes with their neighbors Selk’nam of the North. Yamana bows where collected by the Mission Scientifique du Cap Horn in 1883 but are described to bee less strong or efficient than the ones of the northern groups and only seldom used by these human groups to shot birds or guanaco.

We have analyzed 46 bows from Tierra del Fuego in Ethnographic collections. Some bows and arrows are refereed to Yamana people (one in London, three in Paris), but there are also some others (one in London, three in the Vatican, Wien and Berlin and two in Saint Petersburg) that can be attributed to canoe people (some very probably Yamana). There are some tendencies (without statistical significance) to a twofold model it cannot be specifically centered on one or another ethnic group. Most bows are longer than 140 cm but there are others around 124 cm and lastly one no longer than 78 cm. Those bows brought by the French scientific Mission –the ones with most guaranties of exact provenance show this flexibility of the models used by Yamana people.

Most of the points in ethnographic collections are made with European glass but there are still some done with lithic raw material. Despite the ethnographic sources there are some arrows noted Yamana included in the whole within the same holder material with a larger ascription to Tierra del Fuego.

<table>
<thead>
<tr>
<th>Yamana arrows</th>
<th>Length</th>
<th>Shaft diameter</th>
<th>Point length</th>
<th>Point width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>67,00</td>
<td>0.76</td>
<td>2.79</td>
<td>1.50</td>
</tr>
<tr>
<td>std.dev.</td>
<td>3.49</td>
<td>0.10</td>
<td>0.51</td>
<td>0.14</td>
</tr>
<tr>
<td>stand. error</td>
<td>0.44</td>
<td>0.01</td>
<td>0.19</td>
<td>0.05</td>
</tr>
<tr>
<td>variance</td>
<td>12,18</td>
<td>0.01</td>
<td>0.26</td>
<td>0.02</td>
</tr>
<tr>
<td>variab.coef.</td>
<td>0,05</td>
<td>0.13</td>
<td>0.18</td>
<td>0.09</td>
</tr>
<tr>
<td>minimal</td>
<td>57,50</td>
<td>0.60</td>
<td>2.20</td>
<td>1.20</td>
</tr>
<tr>
<td>maximal</td>
<td>84,00</td>
<td>1.00</td>
<td>3.70</td>
<td>1.60</td>
</tr>
<tr>
<td>variability</td>
<td>26,50</td>
<td>0.40</td>
<td>1.50</td>
<td>0.40</td>
</tr>
<tr>
<td>N.</td>
<td>64</td>
<td>51</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2: measurements of Yamana arrows in ethnographic collections

There is no arrowhead standardization neither in shape nor in size. In an arrows group there are arrowheads of different shape, size and made on different raw materials (stone, glass and bone). On the other hand there is a certain uniformity in the shaft length. This is to be expectable because it is the most meaningful variable for it’s function. Surprisingly –and against what it was said by the recent Ethnography- the arrows classified as “Yamana” are not shorter than the classified as “Selk’nam”: differences are not significant. Length measurements display a normal distribution. What may be observed is that the “Selk’nam” ones have a mean diameter (1.3 cm) thicker than the “Yamana” ones (0.7 cm). The arrow points have a very similar form (barbed and tangled triangle) to the points on the tip of the daggers but these are larger (mean of 5,6 cm length and 3 cm. width).

**EXTRACTING ACTIVITIES AS SHOWN IN THE ARCHAEOLOGICAL RECORD.**

The archaeozoological work done in our research projects allowed a general overview of the subsistence’s development since the first settlement on the island (Orquera & Piana, 1999a, Sciavinni, 1993, Estévez, ea. 2001) and a very detailed description of the extracting system in recent times (Estévez, ea. 1995; Estévez & Martinez, 1998).

The archaeological sites of European contact times on the northern coast of the Beagle Channel contained hunting implements, processing tools, as well parts of the prey (Orquera y Piana, 1999b; Clemente, 1997). In fact all the items documented in...
ethnographic collections that could be preserved in the archaeological record and almost all techniques employed in extracting these resources are present or can be induced by Archaeology (Vila & Estévez, 2000 and 2001).

Hunting of sea lions from canoes using harpoons are documented in the archaeological record: L. Orquera found a cervical vertebra from a sea lion containing an embedded point of such a bone harpoon in the site Túnel I (figure 5) reflecting this capturing system, the most adequate to catch these animals. Nevertheless archaeological record shows some minor differences with the ethnographic information for harpoons. European ethnographic museums, for instance, lodge some very big harpoon points, up to 50 cm long, whereas in the archaeological record from our recent sites only some minor detachable points, no longer than 25 cm, have been found.

*Figure 5.* Sealion’s cervical vertebra showing an embedded harpoon point

Archaeology enabled to discard Gusinde’s assessment on the incapability of the Yamana for making bows and lithic arrowheads. On the contrary, lithic remains found i.e. at Túnel VII site proves that a good deal of the lithic production process was stadal flaking, being one of the activities producing the highest quantity of residues (Clemente, 1997; Orquera & Piana, 1995 y Vila, ea. 1995, Terradas, ea. 1999) and oriented toward the production of bifacial elements. Within them, specially triangle arrowheads with barbs and tangle are equivalent in shape and measurements to the ethnographic ones (figure 6).

*Figure 6.* A) Archaeological bifacial points (arrow points in the center line, dagger points bottom line); B) ethnografic arrow point
In Túnel VII within the occupational focus tens of thousands of lithic remains were found correlated to but six hundred pinniped remains (a maximum of 25 individuals) and roughly five thousand bird bones. At Lanashuaia 2019 three-dimensional registered lithic remains match 1158 bone remains. It turns evident that the lithic instrument making is a not negligible activity.

**BONES AND TOOLS: TRACES ON BONES**

Both, instruments and the worked materials (including bones as part of prey's bodies), show traces of their close contacts. Actually, this is not a new issue in the archaeological research. From the beginnings of our discipline, scholars tried to recognize the use of stone implements and their traces on bones. The descriptions by H. Martin (1907) about traces of lithic instruments in bones from middle Paleolithic site of La Quina (in Europe) are a fine example. The paper about the flint points on auroch from Denmark was a first direct proof of hunting techniques in the past (Hartz and Winge, 1906). The findings in 1926 in New Mexico of a Folsom point embedded in a Bison pelvis marked a landmark in the History of the Archaeology of America’s first human settlement. Some years later, the descriptions of wounds on bones made by Noe-Nygaard (1974), allowed the description of hunting systems in Mesolithic of Northern Europe.

Since the 50ths., Semenov’s (Semenov 1981) work developing use-wear analysis offered the archaeologist the possibility to recognize directly the cinematic of lithic instruments and the sort of materials they worked on. Such approaches have become increasingly common, until now. nevertheless, not so often a closer approach between the two types of information may be seen, and even less frequent is to have the possibility to contrast both of them with detailed information on a living system. As results of our analysis we found a very high percentage and intensity of working marks—butchering, cut, slicing—on most bone’s surfaces of birds and pinnipedia.

Some of these marks denote a very heavy work on the animal carcasses. During the excavation of Lanashuaia (1995-1996) we were able to document directly the cutting up of a Minke whale by the chop-marks placed at the proximal end of its ribs found in the deposit base. Within these cut-marks we could observe (just at naked eye) the presence of small chips detached from the edge of a lithic tool. These micro flakes intruded in the bone while hard chopping (figure 7). Some remarkable chop marks placed on the vertebra’s articulating surface of a killing whale from Túnel VII produced “piece of pie” like fragments of the corpus vertebralis.

![Figure 7.- A) Minke whale rib’s proximal end showing B) embbeded stone chips.](image)

In a first analysis of the remains belonging to those recent site’s collections, we also found a proximal end of an ulna collapsed by the strike of a sharp object, producing a lenticular hole of 18.4 mm wide and 5.7 mm high (figure 8). Even though aware of it, at first it was not possible to attribute it to a concrete cause but, leaded by shape and size of the hole, we considered the possibility that it could be caused by the striking of an harpoon point as the ones documented in the site.
But most traces are very slight. That forced us to a closer look using macroscopic devices. During the macroscopic analysis of the Túnel VII bone collections, remains of a shell's edge were found embedded in the external side of a cormorant rib. These remains have to be product while processing the bird because they are inside anthropic cutting marks.

Finally the macroscopic analysis yielded a totally unexpected indication. It was an inlaying lithic small piece in the lateral left portion of a thoracic vertebra of a juvenile pinniped (*Arctocephalus australis*) (Figure 9). This deep incrustation was not associated to any cut mark and displayed a lenticular section matching that of an arrowhead or a dagger point. This stone inclusion could only bee produced by a heavy stroke done by a tipped stone point but its reduced size (3.4 x 1.8 mm) and the not conclusive image of the X rays did not allow to specify nor to be sure about the tip of weapon. On the basis of the Ethnography the most probable way to cause this kind of injury was the use of dagger to kill sea lions on the mainland. The chop must be very heavy to embed the point to that deep. This moved us to review macroscopically all bones again to look closer to possible inclusions.

Meanwhile another thoracic vertebra of a young sea lion from a new site, Ajej (a rescue excavation no far from Ushuaia to the East dated from 1400 14C AP), that showed a big stone inclusion, could be examined. In this case there was no possible doubt: a very strong arrow stroke produced the penetration all-through the whole *corpus vertebrais* of a triangular-shaped arrow point identical to those found in the other mentioned recent sites. X ray analysis corroborated the naked eye inspection. The inlaying fragment with a perfect triangle shape and lenticular section measure 14.34 mm long, 7.9 mm wide and 2.65 mm of thickness (figure 10). The blow was heavy enough to traverse crashing the dorsal part of the bone, the point emerging at the *canalis vertebraelis*. This piece leads to the certainty of the hunting of pinniped with bows and arrows. A hard arrow shot, that went into its belly, pierced the body and went trough the vertebra to the medullar channel, killed the sea lion. Both, arrow trajectory and the projectile penetration capability, lead to infer that the animal had being wounded on land while lying on a side (Piana ea. 2001).
Finally, J.E. Moreno and A.Castro, researchers of the Museo de la Plata, kindly showed an equivalent case though from Cabo Blanco, coastal Patagonia. It is a guanaco (*Lama guanicoe*) vertebra with a hard arrow impact in the upper side portion of the corpus. The impact has to have being very strong because the inlaying arrowhead portion is in three pieces.

Taking such evidences into account, we conducted a new macroscopic inspection of all bone material of Túnel VII site, finding another much smaller inlaying lithic piece in the external portion of a sea lion rib.

Some traces, specially on ribs, were first interpreted as cut marks produced by slicing heavily a lithic knife on the side of the rib (figure 11) although clearly different from the more usual and normal cut, defleshing and slicing marks because their hardness, angle, location and isolation. They can be now better explained as the result of such arrow’s impacts. During the reexamination of traces we observed some other lithic inclusions but associated to normal cut marks.
Leaded by the previously mentioned arrowhead imbedded in vertebrae, and judging from the hole’s size, shape and direction of the bone collapsing in the ulna described before, the wound is now regarded as a possible trace of an arrow shot. In short, there are evidences that in Tierra del Fuego pinniped were not only hunted in the way described by the ethnographic data but also, at least occasionally, with bows and arrows. Even though traces of this activity were previously seen, it was not until the Ajej findings that they could be regarded as traces of arrowhead impacts.

Still is to be supported that the majority of the pinniped hunting along the recent and ethnographic documented period had to be hunted in the sea, from canoes and with detachable points harpoons. Nevertheless, besides the hunting of females and puppies in occasional rookeries documented by age and sex profiles in the archaeozoological record (i.e., Túnel VII), other sea lions were opportunistic and occasionally hunted on land with different weapons. This turns meaningful while characterizing a general exploitation strategy of the prey resources: the ethnographic information leads to a normative way of hunting while the archaeological one proofs a more flexible behavior including opportunistic hunt by means not specialized for such a hunt. Actually, a sea lion hunting with bow and arrows from land is an activity with but few chances of success. It is not probable (and so is mentioned in the written sources) the existence of lasting rookeries within the maguellian-fueguian channels having the human predators easy access to them by canoes. Hypothetically, such rookeries would neither exist in pre European times (Schiavini 1993). More still, bows and arrows had fewer possibilities of successful hunting when compared with harpoon. Unless hitting a sharp and mortar arrow shot, the wounded prey may escape into the sea with no moving restriction such as a harpoon handle and sink with the lungs fill up of water out of the hunter access. This turns in the lost of the prey and effort invested in the arrow. Nevertheless, if this sort of hunting was done frequently enough to leave archaeological evidence, the expectable success could not be irrelevant. Such probability of success leads to consider that the skill on the using of bows and its efficiency by the Yamana had to be higher than the one upcoming from the ethnographic sources.

In many cases the extraction techniques had been deduced extrapolating and inferring from the sex and age composition of the faunal remains and its representation of skeletal portions and topographic location of the sites (cf. Lyman, 1994). In the discussed case the sex and age composition, the skeletal representation, the extrapolation from the hunting instruments and topographic location jointly with all the archaeological context leaded us to consider a hunting system based on the use of canoes and harpoons and now this picture is complemented with a non neglectable opportunistic sea lion predation.

CONCLUSIONS

The possibility of documenting deep impacts would enable to verify, in other cases, techniques and strategies used for catching animal resources and sometimes the raw materials or instruments used for each activity. It has to be kept in mind that not all the macroscopically identifiable anthropic traces refer necessarily butchering or processing the prey. If we pretend to make more reliable archaeozoological analysis, we most emphasize the macro and microanalysis of the bone surfaces. In that way it would be possible to identify small remains of the instrument that originated the modifications observed and so certainly associate activities with instruments. Moreover, only the macroscopic analysis will enable to know the existing variability in the type of traces present in the archaeological record as well as its recurrence, intensity, orientation and location.
Analysis of marks on bones demonstrates that some unexpected and not specialized hunting techniques were usually employed on occasional close encounters between people and pinnipedia. Switching from very specialized hunting and maritime oriented to opportunistic behavior was normal. Contrasting ethnography and archaeology driven to a high analysis level has demonstrated that ethnographic information is biased: social and historically. It must therefore be contrasted more than though before. Direct induction from ethnography or from logical assumptions—even in very clear and apparently obvious cases of well-documented weapons as impressive as our harpoons do not always conform with reality and that archaeozoological studies must be done to the highest detail (including detailed macroscopic analysis) before inducing general hunting techniques.

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NOTES
(1) “Archeological Contrast of the ethnographic Image of the Magellan-Fuegian Canoers in the Northern Coast of the Beagle Channel” between 1987-1994, was a joint project of the Argentinian and Spanish Research Councils (Vila & Estévez eds., 1995) and "Marine Resources at the Beagle Channel Region prior to the Industrial Exploitation: An Archeological Evaluation" was an European Union Joint research project (1994-1998) coordinated from CSIC-Barcelona.