ARCHAEOZOOLOGICAL RESEARCHES AT THE BEAGLE CHANNEL, ARGENTINA

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Summary

This article presents a brief review of zooarchaeological works conducted at the Tunel VII site (near Ushuaia, north shore of the Beagle Channel, Tierra del Fuego, Argentina). This shell midden, produced by Yamana hunter-fisher-gatherers, was occupied during the last century. A whole occupation unit and its surroundings have been excavated. A principal conclusion is the dependence on sea lions and the increasing importance of other resources such as fish following contact with Europeans.

Some methodological reflections about refitting, rearticulation, marks, and the units employed in zooarchaeology result from a comparison of this work with others.

Résumé

Recherches archéozoologiques dans le Canal Beagle, Argentine.

Cet article présente un bref aperçu des recherches archéozoologiques menées sur le site de Tunel VII (près d'Ushuaia, rive nord du Canal Beagle, Terre de Feu, Argentine). Cet amas coquiller constitué par des chasseurs-pêcheurs-collecteurs a été occupé au cours du siècle dernier. Une unité d'occupation et ses alentours ont été fouillés. L'une des conclusions principales est la dépendance aux lions de mer et l'importance croissante d'autres ressources telles que la pêche à partir du contact avec les Européens.

Quelques réflexions méthodologiques sur les remontages, les articulés, les traces et les unités employées en archéozoologie sont livrées, sur la base de comparaisons entre ce travail et d'autres.

Zusammenfassung

Archäozoologische Untersuchungen am Beagle-Kanal, Argentinien.

Der Beitrag gibt einen kurzen Überblick über zooarchäologische Untersuchungen, die in Tunel VII, am argentinischen Nordufer des Beagle-Kanals (Feuerland, nahe Ushuaia), durchgeführt worden sind. Der Muschelhaufen entstand während des letzten Jahrhunderts durch Aktivitäten der Yamana, einer Jäger-, Fischer, und Sammlergesellschaft. Es wurden eine komplette Okkupationsphase und deren Umfeld ausgegraben. Eine der wichtigsten Ressourcen war der Seelöwe. Nach dem Kontakt mit den Europäern gewannen aber andere Nahrungsquellen, besonders der Fischfang, an Bedeutung.

Key Words

Beagle Channel, Hunter-fisher-gatherers, Ethnoarchaeology, Zooarchaeological Units, Sea lions.

Mots clés

Canal Beagle, Chasseurs-pêcheurs-collecteurs, Ethnoarchéologie, Unités zooarchéologiques, Lions de mer.

Schlüsselworte

Beagle-Kanal, Jäger-Fischer-Sammler-Gesellschaften, Ethnoarchäologie, Zooarchäologie, Seelöwen.

In this paper we present, firstly, a brief outline of the conclusions of the archaeozoological research conducted by a team of archaeologists (Schiavini, 1990; Juan-Muns, 1992, 1996; Estévez, 1996) at Tunel VII, a site located in the northern coast of the Beagle Channel, Argentina since 1989. Secondly, we shall set forth several derived methodological reflections. This work is part of the Spanish-Argentinian project "Archeological contrasting of the ethnographical image of the Magellan-Fuegian canoers of the northern coast of the Beagle Channel" (Vila *et al.*, 1995; Piana *et al.*, 1992).

Tunel VII is a canoer hunter-fisher-shellfish gatherer site. It is the result of several recuperations of what can be understood as an occupational unit and its surroundings (Wünsch, 1996). The sediments that have provided the remains are 50 cm thick. It is, namely, a food refuse accumulation area (from its size we deduce that it is a mussel and other seashell midden), subproducts of lithic origin and thrown away implements. These remains have been covered by a layer of colluvial lime that has been slightly filtered by the vegetation and organic matter. Even though, this type of sedimentation and the applied methodology in the

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excavation site enables us to cut through the palimpsest produced by the refuse accumulation found after successive occupations in more defined subunits (Orquera and Piana, 1992). However, what we want to present in this paper are the analyses of those refuses but as if we were dealing with a longer occupational stage, when calculating i.e. the NMI.

The base of the deposit contains European materials. From this fact and the anthracodendrological and radiometrical analyses, we infer that the whole accumulation is relatively recent and of short duration: it extends from the end of the 18th century until today. This chronology enables us to take the historical and ethnographical information as a contrasting element with the archaeological record. And so, we have the opportunity to compare the conclusions we obtained with a mere archaeological study with other direct data. Thereby, we can test not only the archaeozoological methods such as questioning but, in some cases, the very ethnographical information.

The applied methodology

The faunal work at Tunel VII followed, namely, two strategies. In the case of minor animal categories (invertebrate and fishes) specific sampling and quantification systems were designed and applied (Juan-Muns, 1995; Orquera and Piana, 1995).

In the study of large vertebrates' remains we followed a sequence that begins by classifying the animals taxonomically (cetaceans, otters, guanacos, rodents and birds). To the classification by skeletal elements followed the mending of bones with postdepositional fractures. Given the sedimentation dynamics this mending was seldom needed. A particular instance of mending is the process of rearticulation of epiphyses which were not welded to the diaphysis. Subsequently, the bones with predepositional fractures, that are fractures with beating marks, were re-assembled. Then we established a biometrical and sexual classification of different elements, and a rehearsal of coupling by metrical and morphological comparison (epiphysation state, anatomical details, morphology of articulatory and muscular insertion surfaces, original positioning of the deposit, etc.) to establish the NMI and a metrical sequence of individuals. Finally, the hypotheses of re-articulation of portions with different degrees of probability are drawn. These hypotheses will assess the possibility that several elements could belong to only one individual. The pursued information is the estimate number of a maximum potential number of anatomical parts and individuals brought to the site.

The study of cortical surfaces is focused on the analyses of two variables. The first stage was to characterize the overall state of its conservation on the material. We chose, above all, the variables that could describe the incidence of the postdepositional factors (specially weathering marks, rounding marks, vermiculations and trampling marks). The second stage aimed to the recognition of the anthropic modifications resulting from the animal processing tasks at the settlement which were microscopically observable. A first differentiating level refers to the type of action: chop marks, traces in the articulations and insertions and traces in other parts covered with thinner tissues. The second level of differentiation hinted at the supposedly used implements: stone tools (no difference has been made between lithic and valve because we needed a more reliable reference pattern), metallic, and heavy-duty stone tools (choppers, axes....). We have also retained the thermoalteration patterns. The thermoaltered portions show a coloring scope which ranges from brown to white.

Faunal assemblage (tab. 1)

The molluscs are the most significant faunal remain on the grounds of size and number of the individuals found. Its contribution has been calculated with an algorithm of statistical verification (Juan-Muns, 1996) according to the volume of a significant sample (500 cm^3) taken for each subunit and the frequency of molluscs (cf. Orquera, 1995) extrapolated from counting the hinges. The most important species is by far the mussel (*Mytilus edulis*). Its average length is about 4 cm; nowadays this size would be considered average or slightly small. Moreover, little ribbed mussel (*Branchidontes* sp.) and two species of limpets (*Patinigera magellanica* and *Patinigera deaurata*) co-occurred in the proportion 1 limpet for 30 mussels. In lesser proportions

Table 1: Relative frequencies of NMI of different animal taxa in Beagle Channel sites: Tunel VII and Lancha Packewaia levels C (dated 455 ± 85 bp) and B (dated 280 ± 85 bp). Taken from Schiavini, 1993.

	Tunel VII	**Lancha Packewaia B and C**	
Otariidae	11.7%	31.4%	25.0%
Camelidae	1.7%	1.2%	12.5%
Phalacrocoracidae	33.3%	31.4%	29.2%
Spheniscidae	28.3%	23.3%	16.7%
Laridae	3.3%	1.2%	0.0%
Procelariidae	11.7%	7.0%	0.0%
Diomedeidae	10.0%	4.7%	16.7%
Fishes	very abundant	rare	rare

there were large mussels (*Aulacomya*), keyhole limpet (*Fissurella*), "acantina" limpets (*Acanthyna*), whelk (*Trophon*) and chitons (*Polyplacophora*). The surroundings of Tunel VII are very adequate for the gathering of these molluscs because parts of the coastline are rocky and wide when the tide is low and it is fairly easy to reach them.

The fine conservation of the archaeological record enabled us to extract other remains of marine invertebrates which were consumed in the analyzed occupational unit, such as false king crab, and king crab in lesser numbers as well as sea urchin spikes and plates (*Pseudoechinus* sp.). However, it is difficult to extrapolate a total amount in this case. fishing activity is attested by the following remains. Two species of rock fishes were identified: *Patagonotothen tessellata* and *Patagonotothen magellanica*. These are coastal species which live the year round in the algae or the rocks and pebbles of the shore. Nowadays in the Beagle Channel they are found only in summer. A great number of individuals from the family *Clupeidae* (probably *Sprattus fuegensis*) were recovered. In summer time the species of this family enter the Channel in shoals and attract along its predators. Other pelagic species such as the Tailed hake (*Macruronus magellanicus*) also appear in the Channel following the shoals of Clupeids. The remains belonging to the *Gempylidae* family (probably *Thyrsites atun*) are very rare. One must especially note the absence of the patagonian blenny (*Eleginops maclovinus*) in the archaeological record. This pelagic species is very abundant in the Channel, but it only approaches the shore to go up the rivers. The fact that the nearest important rivers are not close could partially explain their absence in this site. The *Nototheniidae* could be fished from the canoes tied up to an algae belt or, in some cases, could be gathered in the coastal rocks when the tide was low. Sardines and henks fishing was probably done during the stranding episodes of these species, which occurs in summer and can be very impressive; therefore little effort could be very profitable.

The great bulk of ichthyoid remains entails that these Yamana people had a notable dedication to fishing, the specimens being captured either with rod or when stranded. In many cases, even portions of connected rachis and scales accumulations have been preserved, especially next to hearths.

The bird species brought by the Tunel VII inhabitants were mainly cormorants (*Phalacrocorax albiventer, P. magellanicus* and probably *P. olivaceus*). Of lesser importance were the penguins (*Spheniscus magellanicus* and *Eudyptes crestatus*), the albatrosses (*Diomedea* cf. *chrysostoma*), the southern fulmar (*Fulmarus* cf. *glacialoides*), the giant petrel (*Macronectes giganteus*), the kelp gulls (*Larus dominicanus*) and, in lesser number the "chimango" (*Milvago chimango*), the steamer ducks (*Tachyeres* sp.), the upland goose (*Chloephaga* sp.) and an undetermined Fringillidae. The relative profusion of petrels and albatrosses could be related to a very precise selection of the bones of these species for tool and decorative objects manufacturing. Perhaps they were not brought to the settlement to be consumed, even though they were still covered with flesh (cf. Piana and Estévez, 1995). The presence of aquatic birds prevails over the presence of terrestrial birds. The huge amount of bird remains points to the existence of very effective and productive hunting systems. Keeping in mind that the two most frequent birds (cormorants and penguins) usually nest in groups we could hint that they took them from the nests. To hunt other species they would have used other hunting techniques. The presence of arrowheads among the lithic inventory may be related to these techniques. The bodies of the birds were carried in one piece to the settlement and they were butchered there as indicated by the study of butchering striations, the skeletal representation, the re-assemblage and the location of the remains in the excavation.

The faunal record includes two species of rodents (*Akodon xantherhinus* and *A. longipilis*). From their skeletal representation, location and degree of connection, we should discard the possibility that they could have been brought to the site by humans. And, hence, we consider them penecontemporaneous intrusions into the deposit.

The only terrestrial mammal is the guanaco (*Lama guanicoe*). Nevertheless, only very concrete parts were found. The long bones (tibia and humerus) were fractured for the purpose of marrow extraction, whereas certain portions (distal radius-ulna and carpals) were not disarticulated.

Remains from a *Mysticeti* (of a right whale size) and from a dolphin (Fitzroy's dolphin or *Lagonorhynus obscurus*) were also found. These were very specific parts of the axial skeleton (fragments of vertebra, small fragments of long bones, bits of flat bones and fragments of spongeous tissues). Some show linear traces from stone tools. There are also traces of blunt beating, supposedly to split longwards the vertebrated bodies into segments.

The pinnipeds (*Arctocephalus australis* and in lesser degree *Otaria flavescens*) are the group we shall refer to hereby. They are the best represented mammals on the grounds of the number of remains found. Schiavini (1990) analyzed the groups of growth rings (DCL) on their teeth and determined that the season of death of the animals was in May and in December. He also suggested the exploitation of the marginal population of the Antarctic confluence area. The existence of used harpoon heads, the type of fractures on the scapula and proximal humerus, attributable to

the impact of those tools, together with the composition of the game (young males above all) suggests hunting from the canoes as the main procurement strategy. It is coherent with the ethnographical references. We cannot completely discard hunting at an occasional sea lion rockery but we should regard it as a very sporadic alternative. The presence of every part of the skeleton proves that entire individuals were brought to the settlement. However, the different individuals are best represented by the axial skeleton. The most important loss of skeletal elements affects the appendicular short bones (carpals, tarsals, metapodiums, and phalanges) and the first two vertebrae (atlas and axis). This latter phenomenon could be related to a highly fractured skull. The head is well represented, even though we only have small fragments from the occipital and jaws. The study of traces' location enables us to partially reconstruct the butchering process. The animals were cut open from the belly. Sometimes, they were previously skinned and for this purpose the skin from the paws was cut by the second line of the tarsals and the first of the carpals. This process coincides with the general ethnographical data about the procurement and processing of this type of animals. We cannot be sure that within the occupational unit there was an inhomogeneous spatial scattering of the remains, even though there seems to be certain tendencies towards a special location of the rear members. From the biting and rodent marks observed on bones we deduced the presence of the domestic dog which is not represented in the osteological assemblage, but mentioned in ethnographical sources.

The composition of the faunal assemblage

Considering the NMI, the importance of the cetacean in weight and Kcal. dominates the faunal assemblage (Estévez, 1996; Juan-Muns, 1996). Nevertheless we have to keep in mind that only some parts were found and, hence we deduce that the cetacean was not entirely consumed there, and that some of the bone remains were brought only to be used as raw material. This disminishes greatly the real importance of the cetaceans in the staple diet.

We saw the importance of the pinnipeds as an essential dietary supplement and calories source. Respectively molluscs, fish, birds and guanaco were of lower nutritional value.

Due to the low NMI, we should discard the possibility that pinnipeds (in a 14 *Arctocephalus* to 1 *Otaria* proportion) were a readily available source of food. In this occupational unit and along the sequence of re-occupations, all the parts of the skeleton were brought to the site in an even proportion. And, hence, this excludes a specialized differential procurement behavior. However the final study concludes that there are hardly any paired elements, especially from the largest individuals. The individuals were only represented by different portions of the skeleton and, moreover, only a few parts of both sides were found even though rearticulations of portions of the members or of the axial skeleton (pair of ribs or vertebra, forearms, thigh, paws...) are frequent.

This fact suggests that this type of animals was shared and distributed outside the occupational unit. This is a differentiating element from fish and from most of the birds. To sum up, its importance as a relative dietary contribution should be divided by a divisor higher than two.

Finally we need to discuss the viability of this system. It is difficult to think of a regular exploitation of this type within a closed system. The dependence on molluscs as the main dietary staple asks for a certain mobility because even though the molluscs of deeper zones could regenerate the regularly exploited intertideal population, this would take time and, thus, sets a limit to the exploitation.

The continuity of other resources cannot be explained without assuming that they would have to regenerate in a place far from the daily fishing and hunting range of the *Yámana* (Schiavini, 1990). It is not possible, either, that there were stable locations of big sea lions rockeries or penguin nesting places in the Channel where they could have been easily overexploited. Therefore we have to assume that there was an energy flux from peripheral areas into the Channel. In this case we have the rich periantarctic zone and other islands which stand out of the reach of the *Yámana* and which were used as a reserve for any type of marine resource that they exploited: cetacean, as the clearest instance, but also sea otters, penguins and other aquatic birds, and some types of fish.

Regarding the fish species that live permanently in the Channel, the type of exploitation to which they were exposed did not represent a real threat to their regeneration. Moreover the poor dietary contribution would avoid any stimulus to the development of a more intensive exploitation technology.

As far as terrestrial mammals is concerned only the guanaco was hunted. The existence of a possible 'reserve' area at the foot of the mountain chain, between the coast the *Yámana* sailed and the regularly exploited areas by the northern pedestrial hunters will be enough to make up the losses. In this respect we have to keep in mind that the insular limitations were compensated by other phenomena such as the harsh and difficult terrain of southern Tierra del Fuego, and by the absence of natural predators of the guanaco in the island.

To sum up we can say that the observed subsistential system was ensured because the regeneration power

brought about by the external flux was far above the exploitation technological possibilities developed by the Beagle Channel settlers.

However, the comparison of this faunal spectrum with those obtained from sites of slightly older chronologies evidences the relative importance of the sea lion which was far more important than that of the fish in these other sites. (tab. 1).

And hence what this shows is that the extraction strategy of the canoers could have changed in the latest year due to the European impact (Schiavini, 1990; Orquera and Plana, 1992; Juan-Muns, 1996).

This confirms one of the hypotheses on which the mentioned project and the excavation at Tunel VII was laid. That is to say the historical information (collected by our research project) suggesting that the intense sea lion hunting carried out by the white man could have profited from the mentioned external flux to such an extent that could have obliged the aborigines to modify their exploitation activities of the marine resources. The current studies on other sites will contribute to get rid of the incidence of the location variables, thus, enhancing this thesis.

Methodological reflections

The presumptions

The study of pinnipeds remains has enabled us to ponder over the methodology. These reflections go beyond the specific archaeozoological description of this site. We thought that it would be interesting to explain some of the aspects related to this zoological group in fine detail on the grounds of their specific importance within the food spectrum of the site inhabitants, and secondly because of its importance in other archaeological cases. To follow this reflection we shall take the excellent work published by Lyman (1991, 1992) as reference. We will specially refer to Seal Rock site on the coast of Oregon. We have chosen this work because we analyzed macroscopically the cortical surfaces and we followed an analysis methodology which is more compatible than the one used in other works (cf. Legoupil, 1989; Cruz Uribe and Klein, 1994). The problem with this work is that it does not quantify the thoracic remains which, according to his other study (Lyman *et al.*, 1992), have an outermost economical importance.

First of all we would like to insist on the adequateness of Tunel VII for our purpose because most of bones show an optimal overall conservation state of the cortical surface. Almost all bones do not have traces of prolonged weather exposure. Some of the bones only in some specific zones show traces of a longer exposure and these coincide with their position on the top of stratigraphic subunits. These traces are concentrated, above all, on large bones and on ribs that because of their size and shape it took them longer to be buried. Ribs and skull fragments are in this case the pieces that because of their size and frailty were more exposed to postdepositional fractures.

The scarce rounding traces are associated to those caused by longer weather exposure. Some traces on pebbles from the bottom of the deposit are very intense and could be attributed to a prominent rounding caused by the water on the beach. In this case these would be bones from animals that died of natural death and, consequently, the remains could be redeposited on the shore by the sea.

The vermiculations, regardless of being fairly unusual in the assemblage, are not generalized and they do not obstruct either the observation of the cortical surface. Moreover, the trampling traces are limited to a meagre number of remains and its distinction from other anthropic marks is quite simple. These are isolated, desorganized marks and, at a macroscopical level, they can be discriminated by means of the morphology of the striations internal channel.

All these features of the cortical surface enable us to obtain a coherent conclusion with the rapid formation of the deposit that have highlighted the geoarchaeological studies.

Exploitation systems

Once we state the excellent preservation of the material, any chance of an intense differential taphonomic loss is discarded. This fact is also suggested by the abundance of elements from young and baby individuals. The remains are slightly fragmented and there are only a few remains that could not be wholly identified. Then we deduced that the identified remains definitely correspond to the deposited ones.

The predominance of non-adult and female animals over male adults set us in front of a different panorama than the one Lyman had for Seal Rock. According to Lyman, this approach concerned the exploitation of a sea lion reproduction rockery, which is a very different case from the one we propose for Tunel VII.

Clark and Lyman (in Lyman, 1991: 239) also pinpointed the lack of proofs regarding navigation means in that settlement, even though some implements that Clark (p. 211) interprets as harpoons heads (an inadequate weapon for terrestrial hunting) to hunt otters were found, and regardless of the fact that some of the species are nowadays difficult to recuperate in the coast (p. 237). This also differs from the evidences we have for Tunel VII.

Even though the anatomy of the *Arctocephalus* and *Eumetopias jubatus* is morphologically similar (fact that would establish a similar utility index), the size of the for-

Table 2: Skeletal part frequencies in Tunel VII site calculated in different units and counting bones with two types of marks. CR-*cranium*, AX-*axis*, AT-*atlas*, MD-*mandibula*, SC-*scapula*, HM-*humerus*, RD-*radius*, UL- *ulna*, PL-*pelvis*, FM-*femur*, TB-*tibia*, FB-*fibula*, TA-*talus*, CL-*calcaneus*

	NISP		NME		NISP:NME	NMI	MAU	NISP	CUT marks	CHOP marks
	left	right	left	right						
CR	51							51	10	5
AX	11		11			11	11	28	25	6
AT	13		11			11		11	8	0
MD	16	12	14	10	1.1	24	12	13	7	0
SC	10	10	8	8	1.2	16	8	20	14	0
HM	22	21	12	10	1.9	22	11	43	20	2
RD	20	20	11	12	1.7	23	11.5	40	16	0
UL	14	26	9	17	1.5	26	13	40	16	2
PL	17	32	12	19	1.6	27	15.5	49	21	2
FM	21	25	12	15	1.7	27	13.5	46	19	0
TB	12	7	7	5	1.6	12	6	19	7	2
FB	4	8	4	5	1.3	9	4.5	12	9	4
AS	6	5	6	5	1	11	5.5	11	6	0
TA	7	3	7	3	1	10	5	10	10	2

mer is not even the half of the latter and its weight is almost a tenth. This implies a completely different processing. In our case the animals were transported in one piece, whereas in the other case they suggest that they were butchered before being transported.

If the skeletal representation pattern were conditioned by the exploitation and processing strategy or logistic, as it has been suggested in many occasions also for terrestrial mammals, there should be a very different representation of the skeletal parts in both sites.

However, we observe that the differences in skeletal representation between the otters of Seal Rock and those of Tunel VII almost do not exist (tab. 2). The only significative differences lay on relative number of skulls and, to a certain extent, tibiae (fig.1). The former has a greater number of remains at Tunel VII because, undoubtedly, the suffered fragmentation is also greater.

The author also suggests that the big size of the *Eumetopias jubatus* has provoked a more intense processing than the other smaller pinnipeds (*Phoca vitulina*; p. 230). This is because the large animals had to be rather segmented in order to facilitate the transport, and hence this will be translated into a higher dismembering marks frequency. Therefore we should expect that the marks frequency at Tunel VII would be also lower that of the *Eumetopias jubatus* at Seals Rock.

Again, the comparison of this data with those from Tunel VII produced a negative result. The percentage of

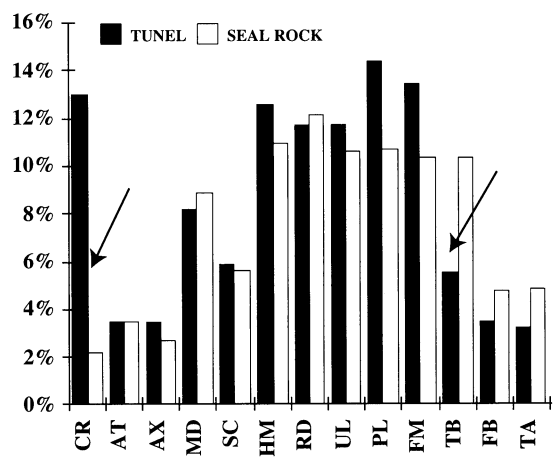

Fig. 1: Histogram of the skeletal parts representation at Tunel VII and Seals Rock showing the significative differences. For captions, see tab. 2.

bones with dismembering marks is almost identical (48%) (Lyman, 1992: tab. 1).

Moreover, judging from his figures (Lyman, 1991: fig. 6.23) the filleting and dismembering at Tunel VII had left more intense and a greater number of marks in the bones. There are i.e. filleting longitudinal striations that do not appear in the drawings of Seal Rock.

If the anatomical morphology were the basic determining factor of the concrete processing system we could

expect some traces to be located in similar disposition. This is not always so in our examples because we can establish statistically significant differences at the frequency level of the different parts of the skeleton with striations or of the location of the striations in the same bones.

The atlas and the femur are prone to have marks at Seal Rock. It is not so with jaws, scapula and fibula which usually have more marks at Tunel VII (fig. 2).

A count of the location frequencies of the striations by establishing 8 quadrants in the bones (front and back part of the proximal and distal epiphysis and diaphysis) entails significant differences (fig. 3). At Seal Rock the femur is more often found marked in the front part of the proximal diaphysis, the radius in the front part of the distal epiphysis, the jaws in the vestibular part of the ascendent branch and the tibia in the front part of the diaphysis. At Tunel VII we have a slightly greater number of marks on the back part of the femur distal diaphysis, the back part of the radius proximal epiphysis, the lingual part of the jaws branch, and the back part of the tibia distal epiphysis.

Summing up, we can affirm that these patterns do not only answer to a mere bio-economical determining factor.

This is the reason why, regardless of the statistical difficulties when applying models such as the MGUI (Binford 1978, 1981), and the difficulties that its application in archaeological sites implies on the grounds of the differential conservation brought about by these taphonomic factors (cf., i.e. Davidson and Estévez, 1989; Lyman *et al.*, 1992), this type of rates should be used as a contrasting element to open for different explicative hypotheses, other than as an universal.

The skeletal representation and the processing that produces it can, as in the case of Tunel VII, be due to a combination not only of effort minimization factors but to processes linked to social reproduction. It could also be

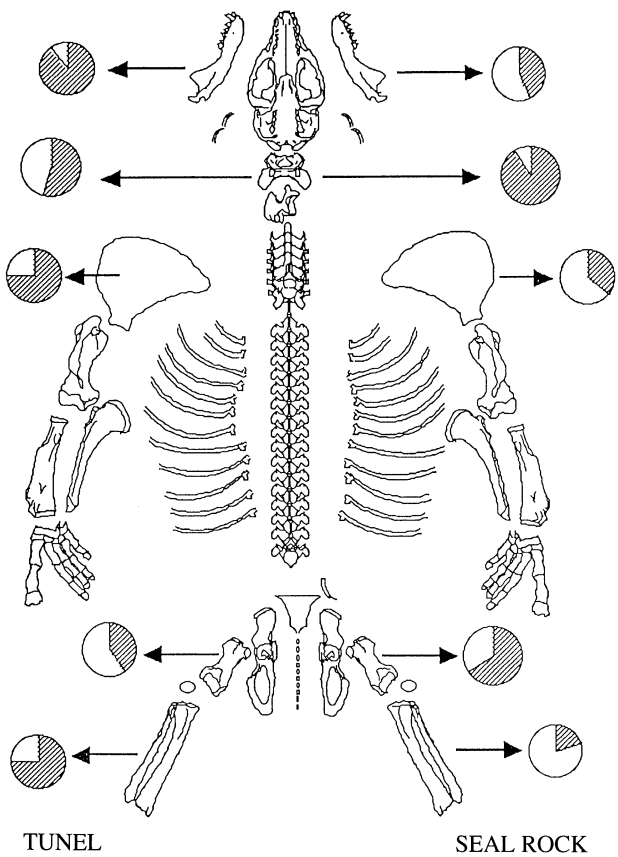

Fig. 2: Significative differences in marks on bones representation between Tunel VII and Seals Rock.

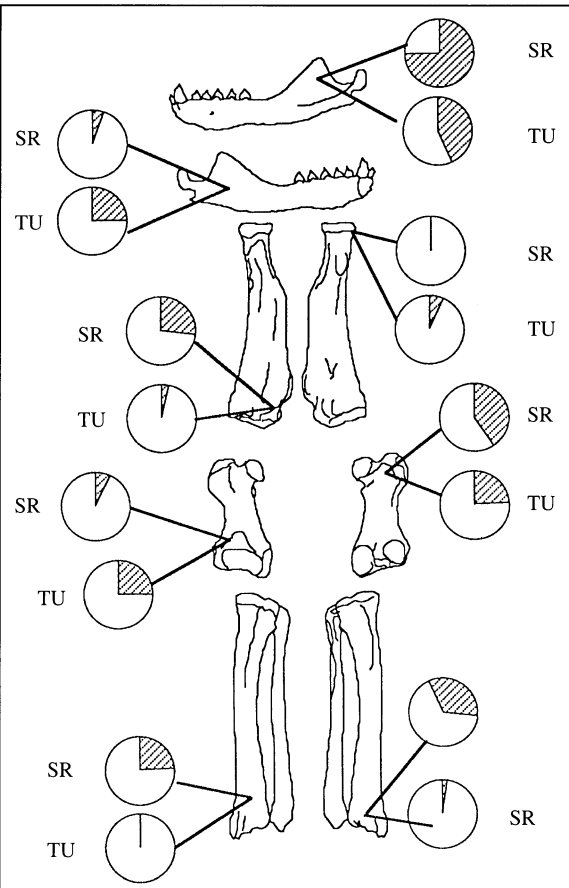

Fig. 3: Significative differences in frequencies on localisation of butchering marks on sea lions bones from Tunel VII (TU) and Seals Rock (SR).

possible, at least theoretically, to identify patterns of individual behaviors whenever the palimsest could be accurately segmented. However, in order to identify these patterns we should go further into the analysis, otherwise, if we only relied on the NISP or on the MNE of the different skeletal parts we could get the idea that at Tunel VII there are several whole individuals that have been transported, butchered and entirely consumed at the site leaving behind a very balanced representation of the different parts of the skeleton.

However, it is when we delve into the rearticulation that we notice the lack of couplings and connections. In our case, this can be well explained with the pieces redistribution to other social units or with the displacement of its consumption to other places, following a non-repeated pattern that with time produces a complementary spectrum.

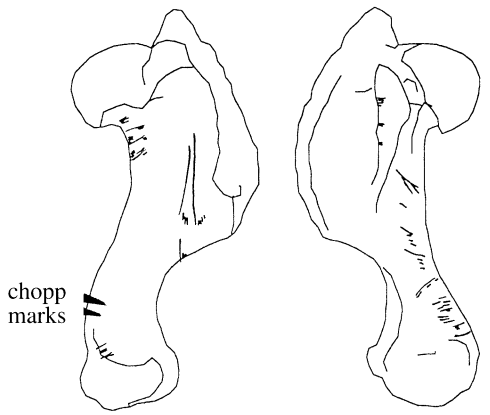

Fig. 4: Example of mixture of butchering, filleting and chopp marks on a humerus from Tunel VII site.

Quantification units

The example of Tunel VII gives way to another question which is the MAU use. The MNI calculation resulting after the symetrization is very close to the MNE because there exists only a few coupled pieces. If we take into account the rearticulations, the obtained MNI rises even above the MNE of the involved parts. I.e. the MNE of the atlas equals 12 which is the same as for the axis MNE. However, if we try to re-articulate them, the obtained MNI would be about 20. If we take the manubrium, the MNI can be calculated as 12 but when the whole sternum is rearticulated the MNI reaches 30.

We think that this data is essential for the assessment of the economic importance of every species and of its social dealing. The implementation of animal frequency calculation systems based on the skeletal representation and its transformation by the MAU (Binford, 1978, 1981) distorts to a greater extent our perceptions about the relative importance that every activity could have had within the social organization. The lateralization and the discrimination of individuals and the rearticulation are of paramount importance in the assessment of a MNI that could be closer to the real MNI. Furthermore, together with the evaluation of the spatial scattering of skeletal elements, we managed to get some conclusions about the social organization.

Anthropic traces

Another of the encompassing problems is the interpretation and quantification of anthropic traces.

As opposed to what seems to happen at the sites studied by Lyman, at Tunel VII the distinction between dismembering and filleting marks is unclear. Many of the remains show portions with complex marks (fig. 4). If we analyze these marks separately we could attribute each type of mark to one of these working processes, but it seems that in most of the cases we should assume that they are all the results of a single process. Thereby at Tunel VII these working processes (dismembering and filleting) were parts of a continuous working process. This conclusion will agree with the fact that, thanks to the canoe and the small size of the *Arctocephalus,* they could easily transport the whole body to the processing and consumption site.

In long bones and in the skull we also observed modifications caused by heavy-duty objects (chopp marks and percussion pits). This entails that for the dismembering tasks they used heavy-duty tools such as choppers, axes and percussors.

Some of the filleting longitudinal marks in the diaphysis could have been interpreted as the result of either the wish to store the meat or the wish to fracture the diaphysis following the modelling that Binford (1981) proposed. In our case, we do know, thanks to the ethnographical information collected that the former practice was not carried out among the inhabitants of Beagle Channel and that the latter neither makes any sense in the case of the pinnipeds nor was ever practiced.

The anthropic marks, then, are usually found combined so that they can reflect a steady working process which ranged from butchering, dismembering, the removal of the meat from the bone to even the type of acquisition (projectile impact marks). It is for this reason that it is very difficult and sometimes impossible to count separately these types of processes. The same happens when we have to establish if the bone has been firstly dismembered and then defleshed or vice versa. It is fairly possible that this type of information stems from the extrinsic characters such as the relative location of the remains.

Conclusion

Having dealt with all the points, we consider necessary to go further on the study of the palimpsest, and we should carry out a context analysis. In the case of Tunel VII the existence of distribution of large animals among the different social units must be confirmed by means of a detailed analysis of the zooarchaeological evidence obtained from synchronic occupation units. These units could be found within a wider area of the immediate excavated zone.

If this distribution system would have existed, it would be an essential social articulation element for the economical structure: the institutionalized sharing compensates the sporadic events of pinnipeds hunting.

It would also entail the existence of rapid interaction mechanisms between the *Yámana* family nucleus, which were, on the other hand, highly economically self-sufficient. Then we could archaeologically prove one of the basic thesis for the understanding of these societies (Vila and Argelés, 1993): the thesis of the social structure of the hunter-gatherer-fisher is the mechanism that ensures the continuity and the viability of the base of the economical system.

As a final conclusion we should develop the methodological implications that we have pinpointed. Firstly the spatially restricted sampling cannot bring to light social articulation forms of paramount economical importance. Secondly, the representation of the different skeletal parts, the frequency and disposition of the butchering/filleting marks is not necessarily a direct function of the anatomical economy.

The restricted study to the normal MNI or to the MAU can end up being far from the actual number of represented individuals if it is not made acute by means of coupling and re-assemblage.

Paradoxically, a high MNI (taking into account age, sex, coupling and rearticulation...) that is close to the real number of dead animals can over valet the actual relative importance of the species of animals that have been shared as opposed to those entirely consumed. In order to avoid this over valuation we should take into account the representation of the different skeletal parts (weighted with the NISP, MNE or with the MAU). In each case, then, we ought to play with the interaction of the different counting methods if we want to get closer to the economic and social signification of the different types of used units.

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