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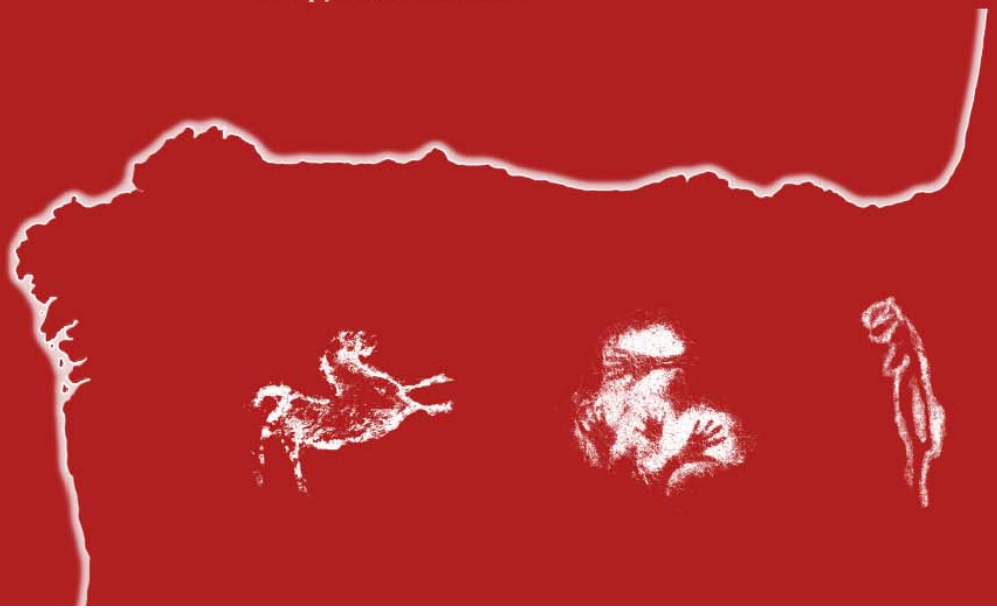
Pensando el Gravetiense: nuevos datos para la región cantábrica en su contexto peninsular y pirenaico

Rethinking the Gravettian: new approaches for the Cantabrian Region in its peninsular and pyrenean contexts



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Cueva de Altamira (Santillana del Mar, Cantabria)

Manos
Cueva de La Fuente de El Salín (Muñorrodero, Cantabria)

Representación femenina
Cueva de Llonín (Peñamellera Alta, Asturias)

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Coordinación
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Bone technology during the Gravettian in Vale Boi (Southwestern Iberian Peninsula): a use-wear approach

Tecnología ósea durante el Gravetiense en Vale Boi (sudoeste de la península ibérica): un enfoque traceológico

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Abstract: In Portugal during the Upper Paleolithic bone industry is very scarce when compared to the Iberian Peninsula or the European scenario. This fact has been explained in three main forms: (1) most deposits are open sites, where preservation was difficult (2) most assemblages belong to old excavations, in which screening was rare and/or (3) techno-cultural choices led hunter-gatherers communities to use other materials, such as lithic or perishable materials (e. g. wood).

During the last decade, the archaeological site of Vale Boi has been one of the most important sites for the chrono-stratigraphic sequence of the Upper Paleolithic in Southwestern Iberia. In what concerns to bone technology, the Upper Pleistocene record present very rich evidence from the Early Gravettian to Solutrean archaeological levels.

In this paper we focus on the Gravettian bone technological patterns, with special attention on use-wear analysis of lithics and bone tools. Thus, this preliminary analysis shows two main aspects: (1) different types of raw materials were used for the production of bone tools, probably directly related to seasonal aspects and (2) specific lithic tools were premeditated select by the hunter-gatherers to work bone raw-material.

Keywords: Upper Paleolithic, bone technology, lithic technology, use-wear analysis.

Resumen: El escaso número de útiles en hueso durante el Paleolítico superior portugués difiere enormemente del documentado en el resto de la península ibérica y Europa. Este hecho parece relacionado con tres explicaciones principales: (1) la mayoría de los depósitos son yacimientos

al aire libre, donde la preservación hay sido difícil (2) casi todos los conjuntos pertenecen a excavaciones del siglo XIX –inicios del XX–, en los que el tamiz ha sido poco utilizado y la selección de los materiales era usual, y/o (3) entre las opciones tecno-culturales de los cazadores-recolectores estaba utilizar otros materiales.

El yacimiento arqueológico de Vale Boi parece aportar nuevos datos a este debate. Durante la última década Vale Boi ha sido uno de los yacimientos más importantes con el que poder hacer una reconstrucción crono-estratigráfica del Paleolítico superior en el sudoeste de la península ibérica. Desde el Gravetiense inicial hasta el Solutrense el utillaje óseo está muy presente, y su número es casi el doble del documentado en el resto de yacimientos portugueses de este periodo. En este trabajo nos centramos en los procesos tecnológicos y en el análisis funcional de estas herramientas, con especial atención sobre los resultados obtenidos por el análisis funcional realizado en los útiles líticos y óseos. Este análisis preliminar del conjunto Gravetiense muestra que se utilizaron diferentes tipos de materias primas, probablemente relacionadas con aspectos estacionales.

Palabras clave: Paleolítico superior, tecnología ósea, tecnología lítica, análisis funcional.

Introduction

During the last decade, the archaeological site of Vale Boi has provided important new data for the chrono-stratigraphic reconstruction of the Upper Paleolithic sequence in Southwestern Iberia (Bicho *et al.*, 2010).

The archaeological site of Vale Boi was discovered in 1998 during a survey project *A Ocupação Humana Paleolítica do Algarve* between 1996-2000, directed by Nuno F. Bicho from the University of Algarve, Portugal. The site is located near Cabo São Vicente, South-western Algarve and present a rich diachronic sequence from the Early Gravettian (c.28ka) to the Late Neolithic (c.6ka) (for more context details *vide* Marreiros *et al.,* in this volume) (fig. 1).

In Portugal, during the Upper Paleolithic, bone industry is very scarce in the archaeological record when compared with other archaeological sites located in Cantabria or Southern France. One reason for this situation may be due to the older methods of archaeological excavation, housing and sorting of materials. It is known that sometimes artifacts were selected during field work and then again in the museums where they were deposited, where smaller fragments and splinters (of bone or stone) were discarded (Marks *et al,* 1994). This situations lead to bias in the faunal assemblages, already identified by others authors (Manne, 2010). A third reason is likely that techno-cultural patterns could lead to a conscious choice of the hunter-gatherer groups for another raw material such as wood or stone. This means less time and energy consuming to acquire and shorter production time than bone or antler (Évora 2008, Évora *in press*). The bone preservation issue is unlikely in the case of Vale Boi, since faunal remains are very well preserved (Manne, 2010; Regala, 2011), where hard animal technology is commonly present from the Early Gravettian to Solutrean times. Thus, these data may help to better understand, in the future, the bone tool technology in southern Iberia.

According to the *chaîne-opératoire* concept, the main objective is: (1) to reconstruct the reduction sequence of bone technology (2) identify which raw material was used (i.e. antler or bone) and (3) from which species was recovered.

Figure 1. Vale Boi geographical location.

Use-wear analysis is recently seen as an important approach to understand activities and resources exploitation by prehistoric communities in order to elucidate about their technological, cultural and social dynamics (Gibaja, 2002). Bone and lithic tools represent highly valid evidence for prehistoric technology on which macro and micro wear techniques have been applied during the last decade (Keely, 1980; Van Gijn, 2008).

In this paper, we use macro and micro-wear approaches to the analyses of bone and lithic tools. The aim is to understand how bone and antler were worked and what kind of lithic tools were used during the procution process.

Methodology

Experimental test

The use of experimental programs has always been an important tool for use-wear observations. The replication of production processes led to elucidation of diagnostic traits between different tools, worked material and use processes.

To support our observations about the archaeological material we made experimental work using unretouched and retouched lithic tools made of flint, on red deer antler and on

mammal long bones. We observed the same pattern of *stria* left on the bone surface and also the same microwave and bumps patterns left by the lithic tools (d'Érrico e*t al.,* 1984). When analyzing the *stria* left on the surface of the archaeological artifact we should look at some specific characteristics such as section, depth, density (smooth, medium, heavy), dimension (long or short) and orientation regarding the long axis of the artifact (parallel or longitudinal, oblique, transversal or perpendicular) (Averbouh, 2000).

Regarding lithic tools, we used several different types of tools with and without retouch (e.g. flakes, blades, burins, side scrapers and end-scrapers) in bone and antler remains on different use processes (scrape, cut and scratch).

Hard animal materials, such as bone and antler, make high level of macro modification in lithic tool edges. From a macro perspective, during scraping the lithic tool presents a high chipping edge, characterized by negatives with ledge termination or even a total edge loss. Micro-wear approach shows bright polish strict to the edge, with high degree of rounding, associated with some *stria* that indicates the longitudinal movement between the lithic surface and the worked material.

The use of splintered pieces reveal a very effective work, it is easy and quick and produces some bone strips that may be used to make other tools. The direct percussion in bone has made chipping wedges, and in some cases total edge lost. From micro-wear observations we see bright polished areas associated with some *stria*. However, this seems not to be the case of anther. The use of splintered pieces on antler present few traces, unlike flakes or blades that show high modified edges during scrape and cut processing. In fact, splintered pieces are more effective only during the final phases of antler processing, especially to split small pieces.

Use-wear analysis

Both bone and lithic tools were analyzed using macro and micro-wear approaches. Regarding to modifications on bone surface we focused our observations on bone surface modifications made during the production, use activities and also to post-depositional processes (taphonomical modifications). The analysis was carried out with the use of magnifications lens (10-40x) and not just under the naked eye (Blumenshine *et al,* 1996; Dominguez-Rodrigo *et al,* 2009; Évora, 2008) otherwise some important features would be missed. The bone surface analysis methodology was done based on the previous works of several investigators, namely d'Errico *et al*. (1984, 1985, 1986a, 1986b, 1993), Semenov (1985), Knetch (1991), Lyman (1994), Maigrot (1997), Bertrand (1999), Averbouh (2000) and Goutas (2005).

Use-wear analysis on lithic assemblage aimed to: (1) determine the preservation level of the tools (2) approach to lithic functions and (3) elucidate about what activities were carried out during the Human occupation at the archaeological site of Vale Boi, shedding light on the site function during the Gravettian. The analysis was carried out using macro (10-90x) and micro (50-400x) approaches.

Bone tool assemblage

The Gravettian bone assemblage of Vale Boi is currently under analysis, integrated in a wider project of the study of South Iberian bone tool technology. The main raw-material chosen for the production of this bone collection in Vale Boi was antler and mammal bone. None of the

artefacts found so far was made of ivory or other osseous material. Antler remains are not a raw-material found in all its morphological structure, instead there are some small knapped fragments which may indicate that the antler used here was collected in the wild and not caught by hunting of male red deer. This is somehow corroborated by the faunal analysis conducted by T. Manne (2010). We can see in table. 1 the summary of the most hunted species in Vale Boi. These are the rabbit, red deer and horse. The fact that the faunal sample has high frequencies of fetal and/or neonate red deer and horse, indicates that the female red deer was the more frequently hunted than the male red deer. This pattern likely means that hunter-gatherers were hunting red deer herds in late spring (Manne, 2010).

Table 1
NISP values of Vale Boi mammalian and avian fauna (adapted from Manne 2010)

Mammals	Gravettian		Solutrean		Magdalenian	
	NISP	%NISP	NISP	%NISP	NISP	%NISP
Bos primigenius	20	0.58	74	1.54	4	0.55
Equus caballus	115	3.33	574	11.97	42	5.78
Equus sp.	15	0.43	47	0.98		
Cervus elaphus	472	13.65	1533	31.96	186	25.58
Capra/Ovis	4	0.12	7	0.15		
Sus scrofa	1	0.03	2	0.04		
Vulpes vulpes	9	0.26	4	0.08	6	0.83
Canis lupus	2	0.06	4	0.08		
Ursus arctos	2	0.06				
Lynx pardina	11	0.32	5	0.10	2	0.28
Oryctolagus cuniculus	2803	81.08	2540	52.96	487	66.99
Cetacea	1	0.03				
Aves						
Aquila chrysaetos	1	0.02				
small sized bird	1	0.02				
medium sized bird	2	0.06	3	0.06		
large sized bird	1	0.02				
Totals	**3457**		**4796**		**727**	

Mammal bone was frequently used in the production of bone tools, including projectile points. In addition, some red deer metacarpals were found with percussion marks made with a wedge. Nevertheless, the faunal sample is highly fragmented and most bone tools present the same pattern.

The analysis of the bone surface shows that some of the artefacts were manufactured with a retouched lithic tool like a retouched blade or a scraper, but a few others were scraped using an unretouched lithic tool like a burin or unretouched blade or flake. The retouched lithic tool leaves some characteristic *stria* on the bone surface: longitudinal and parallel to the artefact longitudinal axis, very pronounced and sometimes deep, and sometimes with fine parallel and longitudinal *stria* inside. It is found, occasionally, a microwave pattern (d'Errico *et al.*, 1984; Évora, 2008) (fig. 2) inside the *stria* due to the contact made by the lithic tool and bone surface. This *stria* are found mostly on the entire surface or instead concentrated in the center of the tool when the artefact has other kind of *stigmata* resulted from its function (these last ones are usually present at the ends of the artefact).

Figure 2. Microwave pattern in an artefact from Vale Boi. 30X (photo M. Évora).

Another kind of *stigmata* is found on the bone surface left by the used of unretouched lithic tools during manufacture. These *stria* are longitudinal and parallel between themselves and also to the longitudinal axis of the artefact, but they are fine and don't appear in sets (like the previous ones), also not so deep. We found them all over the artefact surface, or concentrated more in the central part when the function *stigmata* are present. They leave a pattern of bumps on the bone surface (d'Errico *et al.*, 1984; Évora, 2008) (fig. 3).

Figure 3. Bumps pattern in an artefact from Vale Boi. 40X (photo M. Évora).

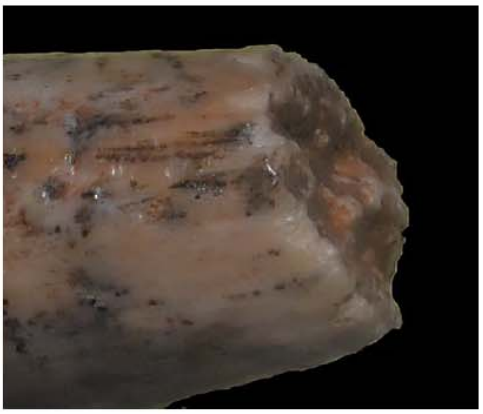

Figure 4. Saw fracture in an artefact from Vale Boi. 20X (photo M. Évora).

Another kind of stigmate (Provenzano, 2004) found on the Gravettian bone tools sample was made by abrasion: these *stria* are somewhat different in the way that they are present on the bone surface, i.e. they are not parallel to each other, but random and appear in circles all over the bone surface or just in some locations, mainly on the active part of the artefact, but this can also mean traces of functionality or use. Other type of *stria* that appears randomly on the surface are those resulting from trampling or *charriage à sec*, so one should look for taphonomic surface modifications when analysing bone surface artefacts because this type of *stria* can also be seen on the other bones from the same faunal sample.

The preserved fragments found so far are mostly mesial parts of the artefacts, and this makes it difficult to take conclusions on the function of some utensils, but there are some bone points and fragments of bone tools that broke up during its use. This was observed through the kind of fractures that are mostly oblique, and tongue and saw shaped (Bertrand, 1999; Pétillon, 2006) (figs. 4 and 5).

Figure 5. Tongue fracture in an artefact from Vale Boi. 15X (photo M. Évora).

Lithic use-wear analysis

Gravettian lithic assemblage at Vale Boi is mostly composed by chert, quartz and greywacke (Bicho *et al.,* 2010). Quartz and Greywacke technology was used with three main objectives: (1) bipolar retouch (2) grease rendering technique for bone exploitation, evident by the numerous quantities of greywacke anvils, quartz fire-cracks and splintered pieces, and (3) flake debitage resulting in pieces with simple retouch, such as side-scrapers, notches and denticulates. Although quite simple, the chert reduction sequence presents different patterns. Flakes present an important role in the chert technology, and were used for two main strategies: (1) simple retouched tools and (2) carinated end-scrapers and burins that were used as cores for bladelet production (Marreiros *et al.,* 2012).

Use-wear analysis shows that during Gravettian at Vale Boi, lithic tools were used on high diversity of materials (Gibaja & Bicho, 2006). On the other hand, wear traces are only present in one of the pieces edges, and that the selected edge was used just for working on one kind of material. Thus, tools were not reused, and this may be related to the expedite technology and availability of raw material.

It is assumed that such diversity may be related to residential campsites, where hunter-gatherers used their tools on the exploitation of different resources. The most represented materials are wood, undefined soft material (e.g. fresh meat or hide), but also flakes used to cut woody plants, hard animal material (e.g. bone and antler) and projectiles (fig. 6).

Such diversity of activities and materials are correlated with a specific lithic tool, chosen by hunter-gatherers during the Gravettian in Vale Boi (Bicho *et al.,* 2010; Marreiros *et al* in this volume).

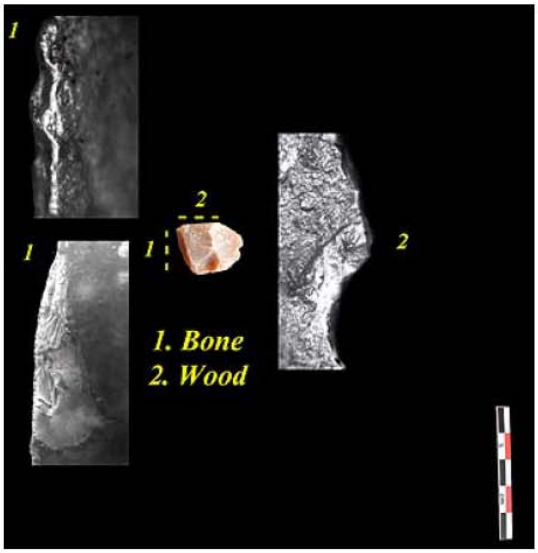

Figure 6. Flakes used to cut bone and wood (photo J. Gibaja).

Work on hard animal material, such as bone or antler, is associated to splintered pieces used as wedges for two main tasks: splitting animal bones for marrow rendering process (fig. 7) and (2) *chaîne opératoire* reduction sequences (fig. 8).

Bone tool sharpening seems that was made by flakes without retouch, where is evident the presence of bone wear traces in a restricted area.

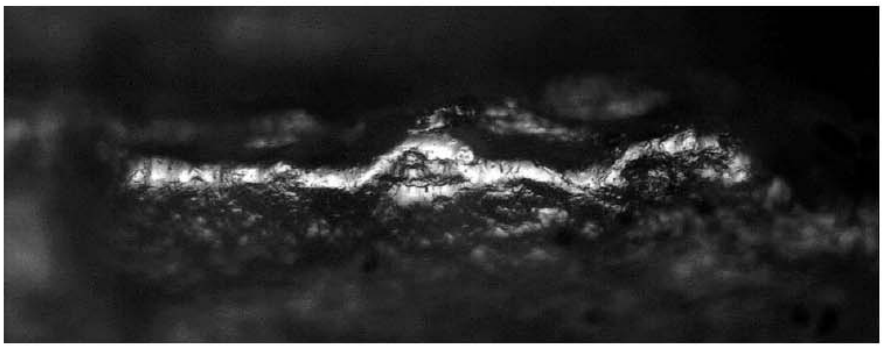

Figure 7. Flake used in scraping bone. 200X (photo J. Gibaja).

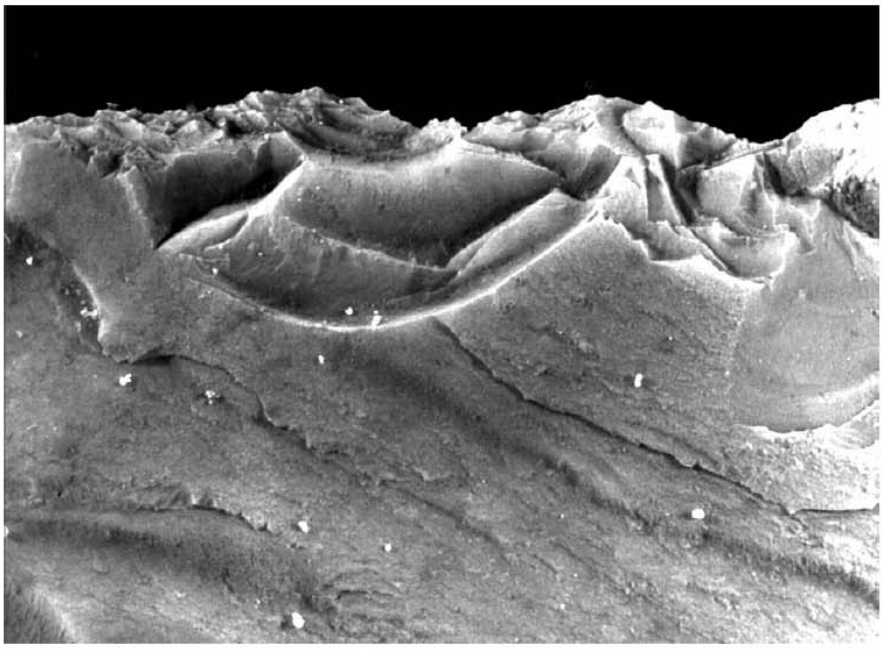

Figure 8. Splintered piece used on hard animal material. 35X (photo J. Gibaja).

Figure 9. Splintered piece inserted in a red deer phalange, Vale Boi (photo N. Bicho).

Conclusion

The archaeological record of Vale Boi presents a rich and well-preserved bone assemblage, which may help to explain stylistic, cultural and territorial markers among hunter-gatherers during the Upper Pleistocene in Southern Iberia peninsula. Since this study is still ongoing we cannot yet make more accurate inferences about the *chaîne opératoire* taken by prehistoric hunter-gatherers to produce their bone tools industry and hunting equipment. We are, however, able to present some preliminary ideas on the topic. Our analysis shows that there are no specific lithic tools used on the manufacture of bone and antler tools for daily activities (like awls) and for hunting activities (like spear points). Flakes, mainly without retouched, were used in an opportunistic way on hard animal material industry. One of the most interesting aspects from the Southern Iberia Gravettian is the high percentage of splintered pieces in lithic assemblages (de la Peña, 2011; Gibaja *et al.,* 2007; Marreiros *et al.,* 2012). Splintered pieces have been argued to be related to two different tasks: (1) bipolar reduction and (2) as wedges for bone or antler fracturing. In the case of Vale Boi use-wear analysis shows that such tools present traces of hard animal material working, which may be related to reduction sequence during tools production of grease rendering processing (Manne & Bicho 2009), tested by the presence of a splintered piece insert in a red deer phalange (fig. 9).

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