



Anthropomorphic figurine in ivory from
El Malagón (Cúllar, Granada).
Photo: Miguel A. Blanco de la Rubia.

NOT ONLY BONES. HARD ANIMAL TISSUES AS A SOURCE OF RAW MATERIAL IN 3RD MILLENNIUM BC SOUTH-EASTERN IBERIA

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Abstract:

The aim of this paper is to approach the importance of animals in human technology during the 3rd millennium BC. How important were animals as a source of raw material? Was there a careful selection of their bones? Did ancient beliefs and myths about some species have any influence on that? In order to answer these and others questions we have analysed an assemblage of 599 osseous objects from three south-eastern Iberian sites: Los Millares, El Malagón and Los Castillejos. The discussion includes aspects such as the use of especial raw materials, labor investment, use-wear patterns, as well as curation and maintenance. Some of the objects included in this assemblage may have been considered as really valuable and even prestigious personal belongings.

Keywords: Osseous Materials, Bone Technology, Cultural Traditions, Chalcolithic, Iberian Peninsula.

NO SÓLO HUESOS. TEJIDOS DUROS ANIMALES COMO FUENTE DE MATERIA PRIMA DURANTE EL III MILENIO BC EN EL SUR DE LA PENÍNSULA IBÉRICA

Resumen:

Nuestro principal objetivo es realizar un acercamiento a las conexiones entre humanos y animales durante el III milenio BC. ¿Qué importancia tuvieron ciertas especies animales como fuente de materia prima para los grupos calcolíticos? ¿Había un cuidado especial en la selección de las osamentas? ¿Qué influencia tuvieron determinadas tradiciones o creencias sobre algunas especies en la elección de la materia prima? Para responder a estas y otras cuestiones se han analizado un total de 599 artefactos óseos procedentes de tres yacimientos del sureste ibérico: Los Millares, El Malagón y Los Castillejos. El estudio de los objetos ha puesto de manifiesto una cuidadosa selección de la materia prima, gran esfuerzo y tiempo invertido en la manufactura, elevado grado de desgaste por uso, así como reparaciones y mantenimiento. Estos elementos habrían tenido un gran valor personal y social, otorgando prestigio a sus poseedores y pudiendo haber sido heredados, como una auténtica evocación de los antepasados.

Palabras clave: materias óseas, tecnología ósea, tradiciones culturales, Calcolítico, Península Ibérica.

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1. INTRODUCTION

For thousands of years, humans have created and represented animals in many different ways using ceramics, bones, ivory, textiles and rock art. Animals are precious evidence of how they understood their world and related with it in the past. The use of animals throughout human history has taken many different forms, from being important for human consumption to being employed as companions, burden bearers, in ritual capacities as well as a source to get different kinds of materials: bone, hide, wool, milk or meat (Hill, 2000). Archaeology has traditionally considered animals as utilitarian items, being presented as things to hunt, manipulate, domesticate and consume, but we must take into account that animals were much more than all that and interacted with humans in the past in many other different ways (Russell, 2012).

The main aim of this paper is to make a preliminary approach to how certain animals both domestic and wild were an important source from which hard materials were obtained. These materials (bone, antler, tooth and shell) were systematically used to manufacture a varied range of objects. Another aspect to be considered is the analysis of which possible meanings they might have had in some cultural contexts during the 3rd millennium BC in the Iberian southeast.

In order to approach this general question, as well as others, a worked osseous assemblage from three different Copper Age sites from South-Eastern Iberia, namely Los Millares (Almería), El Malagón (Granada) and Los Castillejos (Granada), has been studied. Particular attention has been given to the determination of the raw material and the microscopic analysis of the artefacts surface, in order to study how these objects were manufactured and then used.

2. BONES: CULTURAL BELIEFS AND THOUGHTS

The selection of the raw material is one of the most important steps when manufacturing osseous artefacts. The importance of the raw material comes represented by specific artefacts that are normally made from the same material even though it might have been scarce and difficult to obtain (McGhee, 1977). For example, in Copper Age Iberia, ivory was

normally associated with a limited number of artefact types, especially ornaments and other symbolic objects, as we will see later. The choice of the raw material is very significant both technically and culturally and relates to various technical and social aspects (Choyke and Bartosiewicz, 2009):

- The availability of the raw material, except those from certain animal species which are dangerous or difficult to hunt, or considered exotic because they come from relatively distant locations (Ashby, 2005).
- Their physical and mechanical properties which set the limits for what they can be used to produce.
- The possible significance or attitude that a society may have had towards a particular species or a specific part of the animal, reinforced through language, sayings, stories, myths and taboos.

Hard materials from animals (bone, horn, tooth, ivory, shell, etc.) for the manufacture of both tools and ornaments have often been considered to be cheap and relatively easy to obtain. However, there is no inherent reason related to the mechanical properties of the raw material in the selection of one or another part of the skeleton to manufacture better tools, although both the artisan and the user may have had a traditional belief in the materials special qualities. In terms of raw materials, there are many potential paths to the same end. From the point of view of their symbolic meaning raw materials are not neutral (Choyke, 2009). In this sense, both craftspeople and users would have had a clear concept of the social meanings imprinted on different materials, sometimes with totemic or magical properties related to some bones of certain animal species (Choyke, 2008:5). These meanings may have been unconscious in some cases, conscious and obvious to contemporaries in others. The meanings may also comprise deliberate representations of a symbolic reality to be shown, especially regarding symbolic objects (Choyke, 2008: 6; 2009).

Thus, it has been suggested that long-term patterns of raw material selection coupled with the beliefs about some animals or parts thereof, are closely related to domestic life in the household, society and its traditions. Within highly traditional societies, maintaining certain traditions of raw material selection was a part of reinforcing social stability which has been termed

“*habitus* and familiarity” (Bourdieu, 1997; Choyke and Daroczi-Szabó, 2010). Breaks in long-term traditional use of certain raw materials may indicate forgetting of basic manufacturing traditions even at the heart of household. Indeed, variation in the selection of particular species and raw materials used to manufacture a particular object may be seen as an indicator of changes in one of the most intimate aspects of society: the domestic sphere (Choyke, 1997, 2006).

We must remember that people living in a particular cultural context may have developed a number of socially-evolved attributes to certain animals, especially to those with a more direct impact on the economy or subsistence either in the domestic or wild sphere. These animal types may be considered ancestral, protective totems, so that items made from their bones may also have special apotropaic powers as amulets (Choyke and Kovats, 2010). Amulets can be organised into two general categories, those that represent animals, and those that are parts of animals (Hill, 2011), which are the only kind of amulet documented at the analyzed worked osseous assemblage. This second type made from bone, skin or tusk of the desired animal would have provided a material link between the person who carried it and the animal (McNiven, 2010).

A number of human qualities are assigned to these animals, normally related to features commonly assigned to specific people according to different kinds of personal identifications such as age, gender, status, location, tribe, clan, etc. Thus, traditions determine who can receive, carry and manipulate these objects. Archaeologically, these kinds of personal amulets are more clearly visible in funerary contexts. In short, these objects can be seen as a way of condensing and representing various symbolic or religious beliefs (Ellis, 2002: 53; Choyke and Kovats, 2010).

One important aspect is that each artefact may acquire many different meanings during its manufacture and use through the hands of one or more individuals and be immersed in one or several activities (Appadurai, 1986; Hoskins, 1998; Gosden and Marshall, 1999). For these reasons, we must consider both the artefacts themselves as well as the “operational chains” together in their own right and social groups, as neither monolithic nor closed units, but as material units that are part of complex and dynamic structures. Thus, both the objects themselves and the various processes they are part of possess the ability to transmit numerous stories about

society and their historical trajectories to a culture-specific audience. In addition, technical traditions may incorporate elements from very varied origin, as some are transmitted between people of the same social groups, while others come from people living and working at some distance away and who are therefore bound by different technical rules (Gosselain, 1998: 208). From this perspective, the same object can transmit different messages about both individual and group identities (age, sex, class, locational, religious, etc.) at the same time (Wiessner, 1983). The maintenance (curation) and continued use of certain objects may have been reflected back on ancestral beliefs or memories and traditions, perhaps in an effort to legitimise status as well as other aspects of social identity (Ashby, 2011: 11).

3. THE ARCHAEOLOGICAL EVIDENCE

In order to obtain fresh archaeological evidence on the use people gave to animal osseous remains in 3rd millennium Iberia, an assemblage of 590 worked osseous items has been analysed with a focus on the type of raw materials and the deployment of manufacturing techniques. These items come from the Chalcolithic deposits of three sites that represent two different cultural groups in the Iberian South-East. On the one hand, Los Millares group is represented by the eponymous settlement, Los Millares (Santa Fé de Mondújar, Almería) and El Malagón (Cúllar, Granada). On the other hand, the western megalithic group is represented by the site of Los Castillejos (Montefrío, Granada) (Fig. 1).

Known since the last decade of the XIXth century (Siret, 1893), Los Millares is one of the most important sites of Copper Age Western Mediterranean and gives name to the homonymous culture, which developed between c. 3200 and 2200 cal BC in Southeast Spain. Los Millares displays four lines of walls with bastions and 13 small advanced forts, and has an impressive megalithic necropolis outside of the village where objects made from exotic materials (ivory, ostrich egg, etc.) were used as grave goods. The analyzed worked osseous assemblage from Los Millares was unearthed during excavations carried out between 1978 and 1985, which mainly focused on the so called Forts 1 and 5 and some other contexts related to the four lines of wall in the settlement (Arribas Palau and Molina González, 1982, 1984; Arribas Palau *et al.*, 1981, 1983, 1987; Molina González, 1991; Molina González and

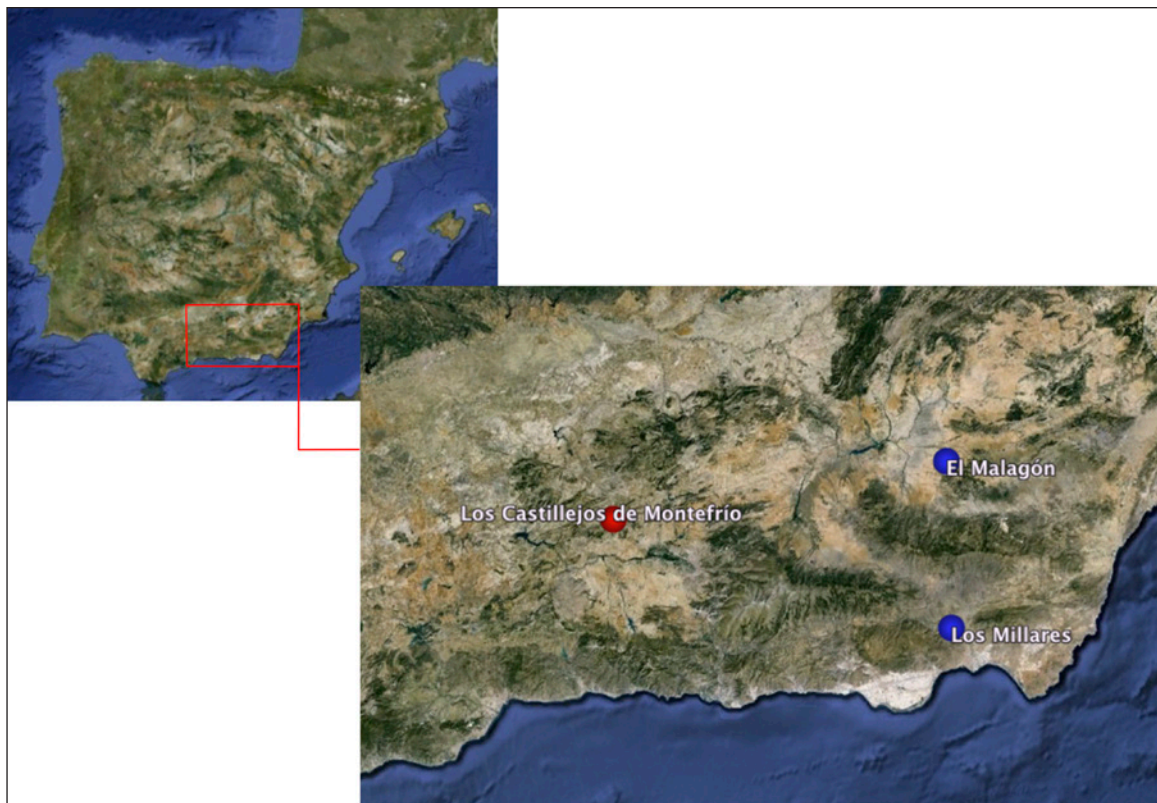


Fig. 1. Location of the sites in southern Iberia: El Malagón, Los Millares and Los Castillejos.

Cámara Serrano, 2005). Most of the osseous objects came to light within areas interpreted as residential and productive, close to the different lines of walls, except a group of eye-idols unearthed at Fort 1 and some shells documented as grave goods.

Three archaeological seasons were undertaken at El Malagón, a Los Millares culture site located in the northern plain of Granada. It is a small, fortified settlement with circular dwellings whose main function was related to the metallurgical production (Arribas Palau, 1977; Arribas Palau *et al.*, 1977a; 1977b; De la Torre Peña *et al.*, 1984; De la Torre Peña and Sáez Pérez, 1986).

The site of Los Castillejos, a good example of the western megalithic group in the province of Granada, displays an occupation spanning from the Early Neolithic to the Early Bronze Age, although Neolithic and Chalcolithic deposits (c. 5400-2200 cal. BC) are the best preserved. We have strictly focused on the bone artefacts unearthed within the Chalcolithic layers, which mainly come from domestic contexts or production areas within the residential area (Arribas Palau and Molina González, 1977, 1978, 1979a; 1979b; Afonso Marrero and Ramos Cordero, 2005; Cámara Serrano *et al.*, 2010).

Zooarchaeological data from previous studies were available for Los Millares (Peters and Driesch, 1990; Navas Guerrero *et al.*, 2005) and Los Castillejos (Uerpmann, 1978; Ziegler, 1990; Riquelme Cantal, 1996), which has been of great importance to analyze the availability of the raw material from which bone objects were made (Tab. 1).

ANIMAL SPECIE	MONTEFRIO	MILLARES
<i>Bos domesticus</i>	30	13
<i>Equus sp.</i>	2	1,5
<i>Capra hircus/Ovis aries</i>	26	46
<i>Sus scropha/Sus domesticus</i>	21	22
<i>Cervus elaphus</i>	17	15
<i>Lepus capensis</i>	0,4	0,6
<i>Linx pardina</i>	0,5	0,05
<i>Corvus sp.</i>	0,1	-
Other wild animals	3	2

Tab. 1. Main animal species documented at Los Castillejos and Los Millares and % based on weight (after Riquelme Cantal, 1996 and Navas *et al.*, 2005).

3.1. RAW MATERIAL ANALYSIS AND MAIN TOOL AND ORNAMENT TYPES

According to our study, bone was the preferred raw material from which objects, especially tools (those elements to produce or acquire other goods), were manufactured at all three settlements (Fig. 2). They are followed by a long distance by red deer antler, mollusk shells and elephant ivory, which, being less abundant must be considered as a really valuable and prestigious material. Mollusk shells were normally used to manufacture ornaments (whose main function was to be shown, having special social and cultural meanings) and other kinds of symbolic items. An excellent example of this is found at Los Millares, where a large assemblage of ornaments made from marine mollusk shells was found (Pl. 1). This could of course be related to the fact that in the 3rd millennium BC the Mediterranean coastline was much closer to the site than it is today, although another factor to take into account would be the type of contexts excavated at this site (Molina González and Cámara Serrano, 2005).

Domestic animals bones were the main source for tool manufacture (Tab. 2). Among them, caprids (*Capra hircus/Ovis aries*) were the most important species, which not only provided bones but also meat, wool and milk. At El Malagón and Los Castillejos, worked caprid bones make up more than 30% of the total analysed tools (88 objects at El Malagón and 48 at Los Castillejos). There seems to be a trend or tradition of using the long bones of caprids, mainly tibiae and metapodials, that began in the Middle/Late Neolithic and increased during the 3rd and 2nd millennia BC (Maicas Ramos, 2007; López Padilla, 2011; Altamirano García, 2013a). According to the tipological analysis, these bones were mainly used to produce pointed tools, normally

by fracturing one of both epiphyses (commonly the *distum*), shaping a pointed end by abrasion, and preserving most of the diaphysis.

Together with some cultural and technical traditions that might have influenced the usual selection of their bones to manufacture pointed tools, environmental conditions would have been especially favourable to the existence of big herds of sheep/goat, which may have made caprid bones the most abundant and easy to get as raw material (Rodríguez Ariza, 1992). Based on the available archaeozoological data, caprids were one of the most (if not the most), abundant species at these sites reaching a 28% at Los Castillejos (getting slightly increased or reduced in number depending on each phase (Riquelme Cantal, 1996), and a 46% at Los Millares (Peters and Driesch, 1990; Navas Guerrero *et al.*, 2005).

Something similar happened to suids (*Sus scropha/domesticus*), whose presence within the analysed worked bone assemblages reaches 16% at El Malagón (25 items) and 10% at Los Castillejos (16 objects), although it is much more reduced at Los Millares (2 items). On the one hand, it is worth noting that there was a systematic selection of suid fibulae to manufacture specialized and normalized tools at least since the Early Chalcolithic, being one of the most featured objects to the end of the Bronze Age (Maicas Ramos, 2007; Lopez Padilla, 2011; Altamirano García, 2013a). On the other hand, their tusks were systematically used as personal ornaments with a slight modification of their original shape. Based on the faunal analysis, suids make up the third main group within domestic species, reaching more than 20% at Los Castillejos and Los Millares, which gives an idea of how important they were as a source of meat.

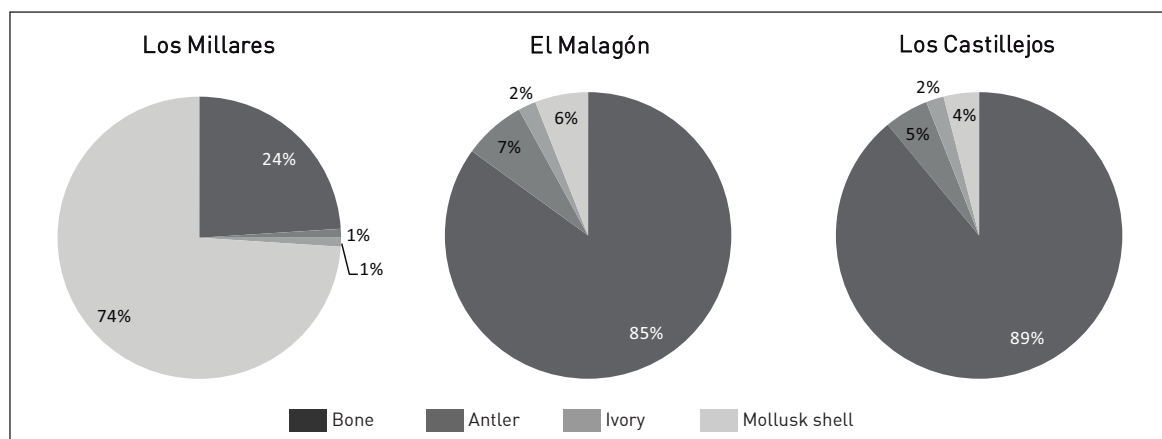


Fig. 2. Raw material used in artifact manufacture from at Los Millares, El Malagón and Los Castillejos.

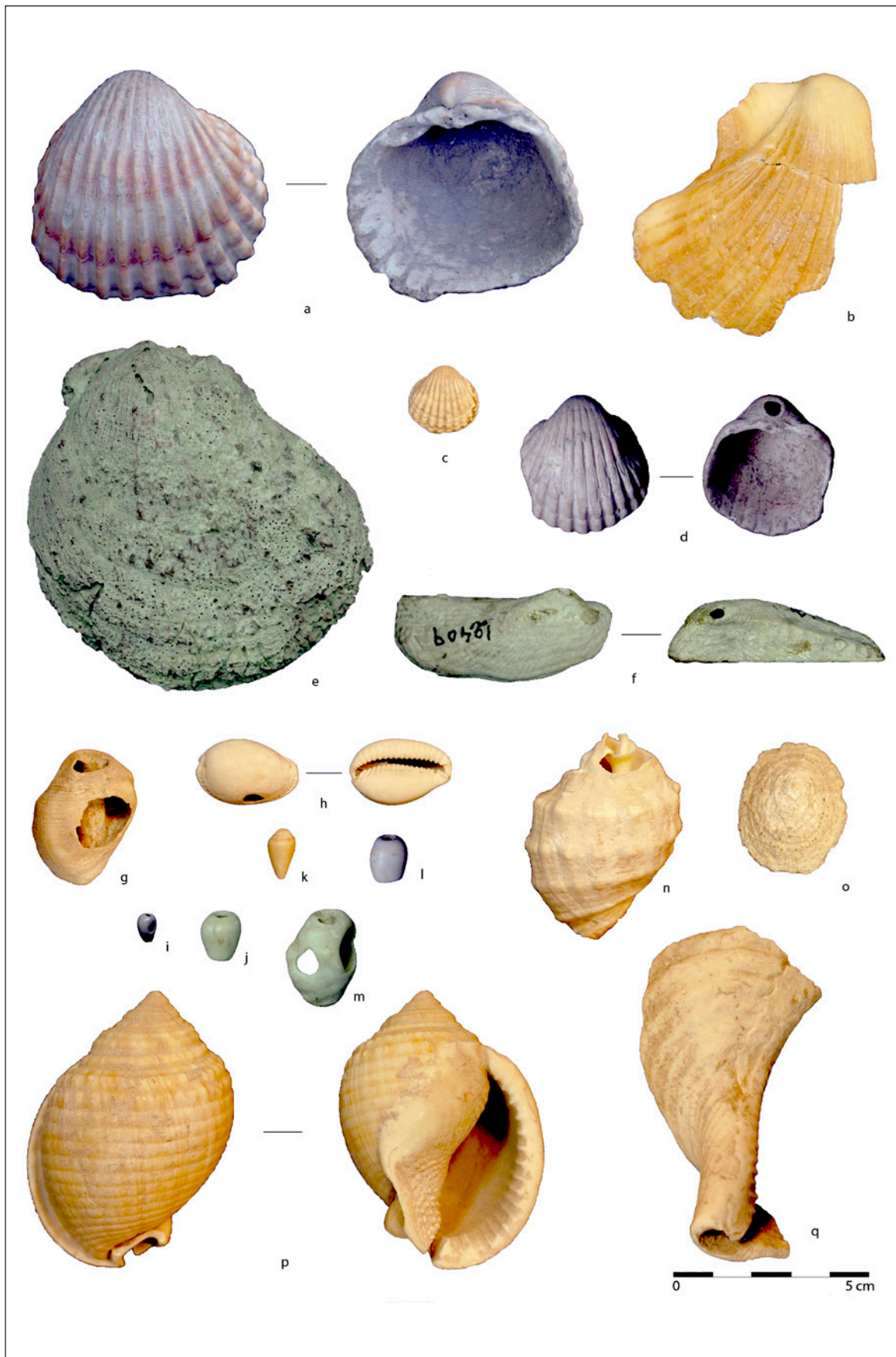


Plate 1. Marine mollusks shells documented in both domestic and funerary contexts at Los Millares. Photo: M. Altamirano.

ANIMAL SPECIE	BONE	MONTEFRIO		MALAGON		MILLARES	
		T	O	T	O	T	O
<i>Bos domesticus</i>	Rib	12		5		9	
	Ulnae			2			
<i>Cervus elaphus</i>	Antler	8		8		3	
	Metapodial	22		15		8	
	Tooth (incisive)		1				
	Phalanx	3		1		7	
	Tibiae	1		2		2	
	Ulnae			2			
<i>Equus sp.</i>	Metapodial	1					
	Phalanx						3
	Ulnae			2			
<i>Capra hircus / Ovis aries</i>	Rib	3		3			
	Tibiae	16		15		3	
	Metapodial	21		22		18	
	Tibiae/Metapodial	8		48		15	
<i>Sus scropha / Sus domesticus</i>	Tusk		1		2		
	Fibulae	14		23		2	
	Methacarpal (3rd)		1				
<i>Lepus capensis</i>	Radius			1			
	Tibiae			6			
	Rib			1			
<i>Elephas sp.</i>	Tusk (ivory)		8		4		1
<i>Linx pardina</i>	Humerus	1					
<i>Others carnivores (canids)</i>	Fibulae	2		1		2	
<i>Birds</i>	Long bone		2		1		3
<i>Undetermined</i>	Tibiae/Metapodial	12		2		26	

Tab. 2. Animal species and their bodily part sused to manufacture both tools (T) and symbolic artefacts (O), documented at the three sites.

Regarding weight, bovids are the main domestic species at Los Castillejos with 30% of the whole faunal assemblage, and the third one (with 13%) at Los Millares, where their bones concentrated within the settlement and not at the forts (Cámara Serrano and Molina González, 2005). Cattle carcasses were used in a more reduced proportion compared to caprids and suids, about 6-7% at each site (12, 9 and 7 tools at Los Castillejos, Los Millares and El Malagón, respectively). Again, we can see a selection of some specific parts of their bones, mainly ribs and ulnae to get elongated blanks. Ribs were especially important, as we can see their systematic selection to manufacture combs during the Early Chalcolithic (Altamirano García, 2014b).

Finally, certain equid bones were also sometimes chosen as raw material although in a very reduced proportion, reaching no more than 1% at Los Castillejos (1 tool) and 2% at Los Millares (3 idols). Apparently, the use of these bones was *a priori* much more restricted for some unknown reasons, either cultural or technical, or even both. Nevertheless, we must also take into account that equids were scarcely represented within the analysed faunal assemblage, being less than 2% at Los Millares and Los Castillejos, which may have conditioned their availability. Given its morphology with a natural pointed end, the second or the third metapodial bone was often selected to manufacture pointed tools. Evidence of this type of artefacts has



Plate 2. Phalanx idols made from red deer (*Cervus elaphus*) from the Los Millares settlement. Photo: M. Altamirano.

come to light at several archaeological sites from the Chalcolitic to the Middle Bronze Age (Maicas Ramos, 2007; López Padilla, 2011; Altamirano García, 2013a). Equid phalanxes were even more important than metapodials, and were usually used as an especial material from which to manufacture symbolic items such as idols, which sometimes display incised eyes and other decorative motives over the surface of the phalanxes, such as the ones found at Los Millares (Siret, 1893; Leisner and Leisner, 1943).

Regarding wild animals, a varied range of species have been documented within the faunistic analysis

at each site, being red deers, wild boars, rabbits, hares and some medium-size birds the most abundant ones (Tab. 1). However, their bones were not as frequently used as those from domestic cattle for tool manufacture (Tab. 2), what sometimes may have been attributed to cultural preferences as well as to a lesser accessibility or availability of their bones, whose origin was normally hunting if we exclude deer sheds. Despite that, red deer (*Cervus elaphus*) was the main source of osseous raw material among wild species, reaching about 11% at Los Millares (20 items) and El Malagón (33 items), and 8% at Los Castillejos (28 items). From their carcasses, mainly

metapodials and antlers were used, although worked phalanxes have also been found. On the one hand, metapodials offered a hard and thick tissue to get elongated blanks from which to create hard pointed tools. On the other hand, antler was less brittle and more resistant to impacts than bone, so it was mainly used for more especial artefacts, such as the impressive hammer-axe tool from Los Castillejos (Altamirano, 2013b). However, red deer phalanxes were also important as blanks from which manufacture the so called "phalanx idols" (Pl. 2), a common type of symbolic artefact within Iberian Chalcolithic groups (Siret and Siret, 1890; Escoriza Mateu, 1990, 1991-92; Maicas Ramos, 2007).

Bones of carnivores were also present among the studied worked osseous assemblages, but they can be considered a very rare and uncommon occurrence. Fibulae (mainly of canids) have been attested at all three sites, although they are not quantitatively important, including only two items at Los Millares and Los Castillejos, and one at El Malagón. However, these bones may have had some qualitative significance as we will see later. These bones were slightly abraded at their distal end to get a point, although they might not have been used as perforating tools due to their extreme brittleness. A further item from Los Castillejos, which can be considered an exception, was manufactured on a *Lynx* humerus.

Species such as rabbit and hare were an important source of meat, although their bones were not appropriated for tool-making, because of their marked brittleness. Nonetheless, we have documented the selection of some hare tibiae at El Malagón, where an assemblage of six tools has been identified.

Elephant ivory could be considered one of the most especial raw materials documented in the Iberian between from the end of the 4th and the beginning of the 2nd millennia BC (Nocete Calvo *et al.*, 2012; García Sanjuán *et al.*, 2013). Based on recent research, most of this ivory seems to have had an Asian origin during the first half of the 3rd millennium, although this trend changed at the end of the millennium when significant amounts of African ivory also arrived into Iberia (Schuhmacher, 2012). According to our results, ivory was mainly used to manufacture symbolic objects with an important personal or social value and meaning, such as the eight V-perforated buttons from Los Castillejos, the three fragments and one anthropomorphic idol from El Malagón, and

one eye-idol from Los Millares. We must point out that the presence of elephant ivory at Los Millares was considerably higher, as others precious ivory objects found during previous excavations showed (Siret, 1893; Leisner and Leisner, 1943).

Long bird bones manipulated to obtain tubular hollow blanks used to make beads were also relatively common, and show a wide distribution in Copper and Bronze Age Iberia (Barciela González, 2006; Maicas Ramos, 2007; López Padilla, 2011; Altamirano García, 2013a). Their presence within the faunal assemblages studied here amounts to around a 2% within the wild animals at the studied sites.

Finally, although having a completely different physical and chemical composition, marine mollusk shells makes up an important source of raw material that must be also taken into account, although they were mainly used as personal ornaments (Tab. 3). Among these shells, *Glycymeris* sp. was the most abundant bivalve and was systematically used as a type of pendant given the presence of a natural (rarely artificial) perforation on their umbo. Nonetheless, we have found evidence showing that at least one specimen from Los Millares was not used as ornament but as tool, probably as an object to keep some kind of liquid substance (Pl. 3). Other types of ornaments, such as discoidal beads, were also commonly made from *Glycymeris* shells.

ANIMAL SPECIE	MILLARES	MALAGÓN	CASTILLEJOS
<i>Cardium</i> sp.	1		
<i>Glycymeris</i> sp.	15	7	3
<i>Cerastoderma</i> sp.	2		
<i>Arca noae</i>	2		
<i>Pecten</i> sp.	1	3	2
<i>Spondylus</i> sp.	2		
<i>Other bivalves</i>	7		7
<i>Cypraea</i> sp.	48	1	
<i>Columbella rustica</i>	2		10
<i>Conus</i> sp.	3		7
<i>Cassis</i> sp.	2		
<i>Other gasteropods</i>	7	1	
<i>Patella</i> sp.	21		
<i>Dentalium</i>	2		

Tab. 3. Species of marine mollusk shells used for ornament-making.

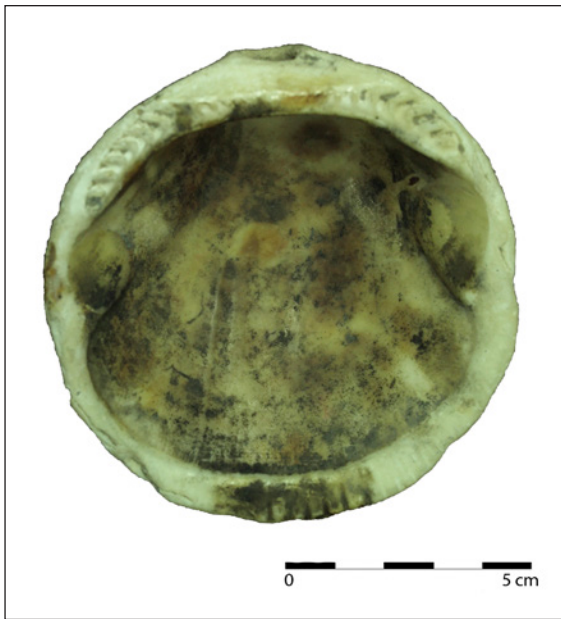


Plate 3. Shell of *Glycymeris glycymeris* used to keep some sort of liquid substance. Photo: M. Altamirano.



Plate 4. Necklace from a funerary context of Los Millares made up of 49 beads made from *Cypraea* shells, 2 beads made from *Conus* shells and 18 discoidal beads made from shell (15) and stone (3). Photo: M. Altamirano.

Among marine gastropod mollusks, *Cypraea* sp., *Collumbela rustica* and *Conus* sp. were the most abundant as raw material. They were used as beads that may have been sewn to clothes or as part of more complex necklaces or bracelets (Pl. 4). *Patellae* shells were also numerous at Los Millares, although no evidences of their use as ornaments has been observed. Thus, it could mean that they were just gathered as

seafood, then consumed and discarded. However, nearly 50% of their shells came to light inside burials, what may change this interpretation. On the one hand, they were just part of the grave goods, as other marine shells. On the other hand, they might have been consumed there as part of funerary feasts and then just discarded inside the tomb. Whatever the case, they must have had some kind of symbolic meaning given their presence inside the burials.

According to all this data, it is important to highlight that there was a careful selection of the raw material. We have confirmed the use of only certain bones (one or two) from each animal species that can undoubtedly be related to both technical and cultural reasons with some kinds of traditional beliefs associated with certain animals and bodily parts (Choyke, 2006; Altamirano García, 2013a).

3.2. SPECIFIC BONES FOR PARTICULAR OBJECTS: A CAREFUL SELECTION

Despite the fact that at least part of the analysed osseous assemblage was manufactured with easily accessible bones from domestic animals, deep cultural and technical traditions can be observed behind the selection of certain specific materials to manufacture particular types of objects. The close relationship between humans and domestic animals may have influence on why to select a specific kind of bone in order to manufacture a specific type of object (Armstrong, 2010). Obviously, the *savoir faire* of the craftsman and his/her knowledge and experience would have also wisely taken into account the technical and physical properties of each kind of material. Nonetheless, not only some domestic animals may have had especial meanings for people in the past, but also wild animals would have been perceived according to social beliefs (Manning and Serpell, 1994; Choyke, 2008; Ingold, 2000; Russell, 2010).

Within the three assemblages studied here, two types of domestic animal bones were especially appreciated by the Chalcolithic communities in south-eastern Iberia. These tool types were closely linked to certain domestic activities, as they use to appear at domestic contexts. On the one hand, caprid tibia was by far one of the most employed long bones (Maicas Ramos, 2007; López Padilla, 2011; Altamirano García, 2013a). These bones were used to manufacture a very specialized and standardised type of artefact,

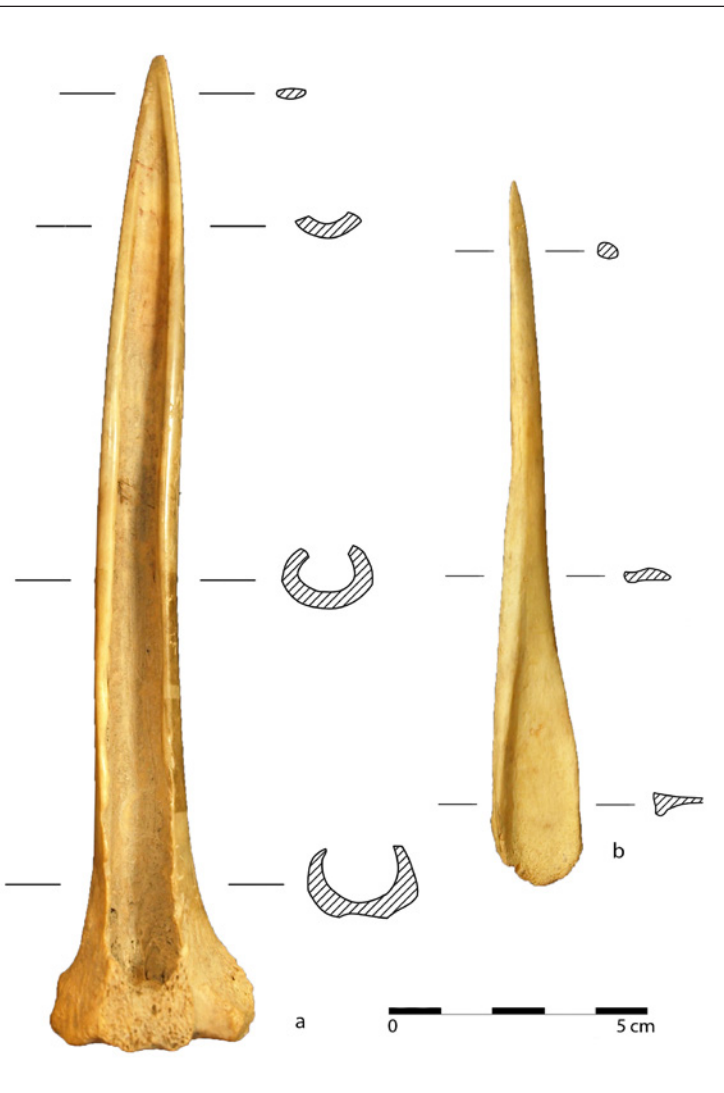


Plate 5. Epiphyseal-based point on caprid tibia (a) and pointed suid fibula (b) from El Malagón. Photo: M. Altamirano.

the so called epiphyseal-based points, which appeared during the Early Chalcolithic, later becoming one of the most characteristic objects among Argaric and La Mancha Bronze Age communities (Pl. 5a) (López Padilla, 2011; Altamirano García, 2013a). On the other hand, pig and wild boar fibulae (Pl. 5b), were among the most featured bones since the Early Copper Age, used mainly as pointed tools once one of both epiphyses were obliterated (commonly the *distum*). Again, a normalized production can be observed.

Why were these bones used to make those specific tool types? Was that decision only influenced by technical reasons? Was it just a question of style or were there other factors at play? As far as we can infer from the archaeological record, deep cultural and manufac-

turing traditions underlie these choices. These tools spread out over different areas of southern Iberia, and their shape and manufacturing process was exactly the same. Furthermore, the epiphyseal-based points and the pointed suid fibulae found at Bronze Age sites were made using the same methods and techniques and, probably, used for the same function. Thus, it seems fair to assume that strong cultural traditions underlie osseous tool-making, with tools sometimes displaying clear evidence of having been in use for long periods of time, perhaps actively curated (they were constantly re-sharpened so that their original length got notably reduced) and kept ready for use. That might be directly related to the existence of especial links between the owner and the artefact, as well as with the animal.

Apart from tools, ornaments and some other symbolic items can provide valuable information about the importance of the raw material and their possible meanings. Within the three osseous assemblages studied here, we have focused on four types of non-tools objects: eye idols, ivory buttons, bone combs and bird bone beads. The study of this particular subset of objects suggests that some raw materials may have had a real and even powerful meaning among Chalcolithic societies; people must have associated specific properties or beliefs to specific animals and/or part of their bodily parts.

Anthropomorphic and eye idols are one of the most remarkable expressions of the Chalcolithic symbolic world in southern Iberia. Made from stone or osseous materials and having different typologies, they are a real window into how people understood certain aspect of their worldviews (Hurtado Pérez, 2010). Although these idols were sometimes manufactured on elongated blanks from long bones, many of them were made from elephant ivory, which surely added value to the object as well as prestige to its owner/owners (Pl. 6). Despite most Chalcolithic individuals probably never having seen a real elephant, ivory may have been considered a prestigious and exotic raw material given its distant origin either from Asia or Africa. The bright surface of most ivory objects suggests how meaningful these artefacts must have been (Pl. 7). The technical features of the anthropomorphic ivory idols suggest what great skills artisans must have had, a know-how probably associated with the introduction of the first metal tools in southern Iberia. It seems that these artisans knew exactly how to give the most beautiful appearance to the final object, integrating the natural structural markings of the tusk into the decoration.



Plate 6. Eyed idols made from long mammal bones (a-d) and elephant ivory (e) from the Forts I and V of Los Millares. Photo: M. Altamirano.



Plate 7. Detailed picture of the incised motifs of the ivory eye idol from Los Millares. Photo: M. Altamirano.

As an example, we may take the anthropomorphic idol from El Malagón (Cúllar, Granada), a well-known site pertaining to the Los Millares culture. Found during illegal excavation at the site and later recovered (Arribas Palau, 1977), this object is made from elephant ivory and displays a wide range of features that make it unique and special, being one of the biggest pieces of worked ivory found to date in Southern Iberia (Pl. 8). Despite the fact that the head is missing, we may have an approximate idea about how it looked thanks to some contemporary parallels such as the anthropomorphic idols from Marroquies Altos (Jaén) or Valencina de la Concepción (Seville) (Fernández Gómez and Oliva Alonso, 1980). Based on the available stratigraphic information, we know that this ivory idol was found inside dwelling F of El Malagón (Phase III: c. 2650-2400 cal BC), in the most recent inhabitation layers, lying over the destruction layers that were found in it. It seems that it would have been abandoned here for some unknown reasons, although it might have been in use for many years before being discarded. This idol was made from a big piece of elephant ivory, probably from the central part of the tusk. The microscopic analysis of its surface suggests that it was then carefully carved by using thin metal awls to give shape to the different bodily parts, and finished by abrading the surface with a fine-grain abrasive.



Plate 8. Anthropomorphic ivory idol from El Malagón. Photo: M. Altamirano.

A remarkable assemblage of osseous eye idols was documented at the so-called Forts I and V of Los Millares (c. 2600-2300 cal BC). One of them, made from elephant ivory, displays clear evidence of curation and a bright worn surface resulting from persistent handling and use. On its lower end it also shows a perforation that could be explained by its use as a pendant or perhaps by its reutilization in some other way (Pl. 9).

The most remarkable aspect of these anthropomorphic representations is their common motifs, normally displaying big eyes, eyebrows, some sort of facial tattoos and hair, sometimes in the form of complex hairstyles. The real meaning remains largely unknown, but they could have acted as religious objects, representations of any particular divinity, protective items... and most of them have come to light in domestic context (or at least in a context that were so interpreted). Whatever the case may be, they must be considered as very especial objects according to their careful manufacture and high degree of use, and may have been in use during long time periods.



Plate 9. Perforation on the lower end of the ivory eye idol from Los Millares. Photo: M. Altamirano.

Together with the idols, it is worth mentioning the rich and varied assemblage of ivory artefacts recently found at Valencina de la Concepción, where several luxurious and unique objects were used as grave goods inside some of the most monumental tombs and where an “ivory workshop” has been identified (Nocete Calvo *et al.*, 2012; García Sanjuán *et al.*, 2013). The study of the Valencina evidence suggests, first, that ivory was probably linked to the existence of specialized artisans, second, that it was mainly used to manufacture symbolic artefacts, which goes some way into showing how precious and special this raw material was within Chalcolithic groups, and third, that it was probably exhibited as an indicator of prestige and status.

In general, it is difficult to know the exact meaning and value that ivory objects may have had in comparison with other materials. However, given that only precious items displaying significant investments of both labor and skill were made from this raw material (idols, pendants, beads, V-perforated buttons, etc.), it seems likely that they worked as prominent symbols of cultural identity and social status. The microscopic analysis of their surfaces shows how extremely worn their surfaces often were, which provides an idea of how valued and cherished they may have been by their owners. Furthermore, many Chalcolithic ivory objects have been found in funerary contexts as grave goods (for example the profusely decorated ivory comb from Los Millares tomb XII or

the various Valencina de la Concepción items), which lends further support to the idea of their deep relevance as symbol of social status and prestige.

Continuing with these ideas, a second object type studied here is buttons, which seem to appear first during the Middle Copper Age, greatly increasing in numbers throughout the 3rd millennium BC, although some have also been discovered in Early Bronze Age contexts (Fonseca Ferrandis, 1988; Altamirano García, 2013a; Czebreszuk, 2014). It is worth noting that, with the exception of one specimen made from red deer antler (Pl. 10d), all the V-perforated buttons studied here (all found at Los Castillejos), were also made from ivory (Pl. 10 and 11). Most of the ivory V-perforated buttons from Los Castillejos were repaired several times when the perforations broke and newer ones were made suggesting a clear will to keep them ready-to-use. This is further underlined by their extremely worn surfaces (which suggest that intense usage over long periods would have considerably altered the original aspect of the raw material) and the repeated curation on their lower faces to repair the perforations when they broke (Pl. 12). This button assemblage is associated with the various bell-beaker layers at Los Castillejos first appearing at around c. 2600 cal BC in association with circular dwellings with mud walls and the first “maritime style” bell-beaker pottery, copper arrowheads and some wrist-guards. However, some V-perforated buttons came to light in the Late Chalcolithic levels of the site, sometimes having a bigger size, and associated with stouter dwellings showing stone foundations and an increase of metal artefacts as well as “Cienpозuelos Style” bell-beaker pottery (2400-2200 cal BC). All of them were found in domestic contexts and not in tombs (Arribas Palau and Molina González, 1979a; Cámara Serrano *et al.*, 2010).

Another example of how important the selection of the raw material was could also be seen in the bone comb assemblage from the Early Chalcolithic levels at Los Castillejos (Phases 16b-17: c. 3300-3000 cal BC). In southern Iberia, combs are found since the Neolithic, although their presence increased in the Copper Age (Castro Cured, 1998). This type of artefact is normally associated with body grooming and personal image, but they may also have had some significance as prestige goods, especially when a valuable raw material (such as antler or ivory) was used in their manufacture (Provenzano, 2001). Raw material analysis has shown that all five combs found at



Plate 10. V-pertorated button assemblage from Los Castillejos made from ivory (a-c, e-h) and red deer antler (d). Photo: M. Altamirano.



Plate 11. V-perforated ivory button with incised decorations from the Late Chalcolithic deposits from Los Castillejos. Photo: M. Altamirano.



Plate 12. Extremely worn surface and curation evidences on the lower face of an ivory button from Los Castillejos. Note the several repairs of the perforations. Photo: M. Altamirano.

Los Castillejos were made on split cattle ribs, which could have been related to certain special beliefs about bovids, as well as to some others technical and cultural reasons (Altamirano, 2014a; 2014b). Regarding their manufacture, they were all made using the same methods, procedures and techniques. Furthermore, the five combs have a similar morphology, with a trapezoid-shaped upper part and a variable number of teeth on the opposite end. This uniformity in both shape and manufacture must be directly related to specific cultural traditions the details of which cannot be ascertained. It is worth noting that one of the two combs that came to light in the so called Burial 40 at the megalithic necropolis of Los Millares was also made from cattle rib and displayed exactly the same manufacturing features and shape that the already mentioned assem-

blage from Montefrío. This fact, together with the presence of other items of material culture, proofs the connections between different culturas areas in southern Iberia.

One of the most interesting aspects of these artefacts is that they were in use for a long time and were curated repeatedly in order to maintain them in a ready-to-use condition. Although traditionally called combs, there are several hypothesis related to their possible function: to comb and clean hair, pottery production, textile activities, etc... (Castro Curel, 1998). Traditionally, the lack of traceological studies has been a major obstacle to understand their real function. Thanks to the traceological analysis carried out, and based on information obtained through SEM examination, we have an approximate idea of what their real function was. The presence of several parallel grooves covering the surface of each tooth suggests, based on parallels with some ethnographic combs, that they were mainly use for combing human hair (Pl. 13). The combination of dirt, dust and grease in the hair, together with repeatedly using a dry comb in order to clean the hair mechanically, produces such grooves on the surface of the teeth. They are produced by the action of combing the hair several times a day, everyday over many years (Choyke and Kováts, 2010). Similar marks to those described above have been documented on several ethnographic combs from Central and Western Europe. These combs were used daily through several generations by all the family members to have their hair combed (Choyke, 2006, 2009; Choyke and Kováts, 2010).

Thus, it is reasonable to assume that the archaeological combs studied here may have been used in similar ways perhaps by all the members of an extended family group in order to clean and comb their hair. We must point out that the narrow space between teeth would have been very useful for cleaning hair and removing lice eggs, etc... However, since no experimentation has been undertaken yet, we must not discard the hypothesis of these objects being used as weaving combs. These combs could well have been highly-valued objects, intimately connected to biographies of particular family groups. At the very least, they were used for a full generation; even more, they were carefully curated when needed instead of being discarded. This fact may be related to the construction of memory, adding more personal value to those objects that

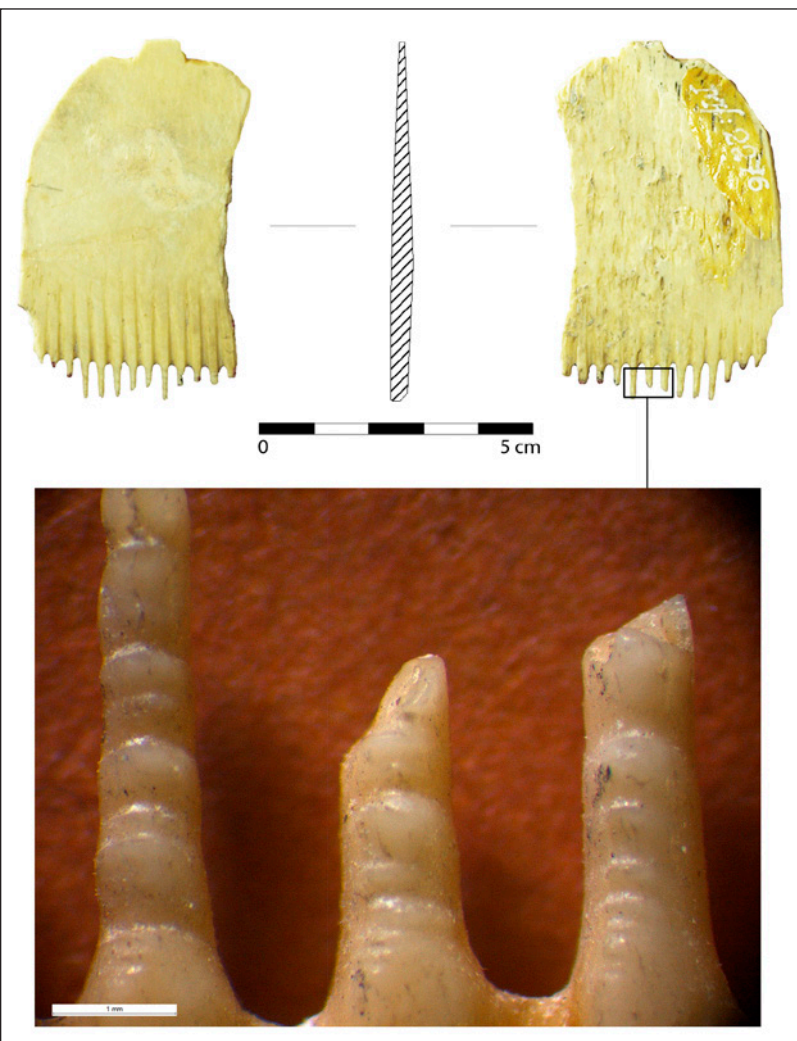


Plate 13. Use wear on the teeth of a comb made from a splitted cattle rib from the Early Copper Age from Los Castillejos. Photo: M. Altamirano.

may have been passed down from parents to children or even from grandparents to grandchildren (Ashby, 2011; Choyke, 2009).

Finally, based on the archaeological evidence from these three sites, some other animal species or at least part of them would have had an especial meaning within these societies. For example, both long bird bones and hare tibiae were common types of raw material at El Malagón in order to manufacture two very well-defined types of artefacts. On the one hand, long bones mostly from ansar-size birds were systematically used to obtain small segments by sawing their diaphysis with a metal tool. These tubular blanks were subsequently slightly modified by abrading their edges and used as beads. The microscopic analysis has shown an intense wear of their surfaces due to persistent use (Pl. 14).

On the other hand, pointed tools made from hare tibiae makes up an endemic type of artefacts found within the worked osseous assemblage of El Malagón, although it as also been found at other sites

from the Spanish Southeast (Maicas Ramos, 2007). In this case, there must have been some kind of connection with this animal; not only were these tibiae used for its technical properties but some cultural reasons or beliefs about them would have influenced those decisions (Pl. 15a). All of them came to light inside different dwellings of the settlement, but it has not been possible to carry out their functional study and give a hypothesis about their function.

Despite being barely used, canid fibulae must have been considered a very especial type of raw material. Mainly for cultural reasons, carnivorous animals were not commonly consumed, but some of their bones may have been really valuable as raw materials for tool or ornament-making, such as canines or claws, especially those coming from dangerous animals or especies difficult to hunt. Among the analysed assemblage, only five worked fibulae from an indeterminate carnivore (probably canid) have been documented, one from El Malagón and two both from Los Castillejos and Los Millares, all

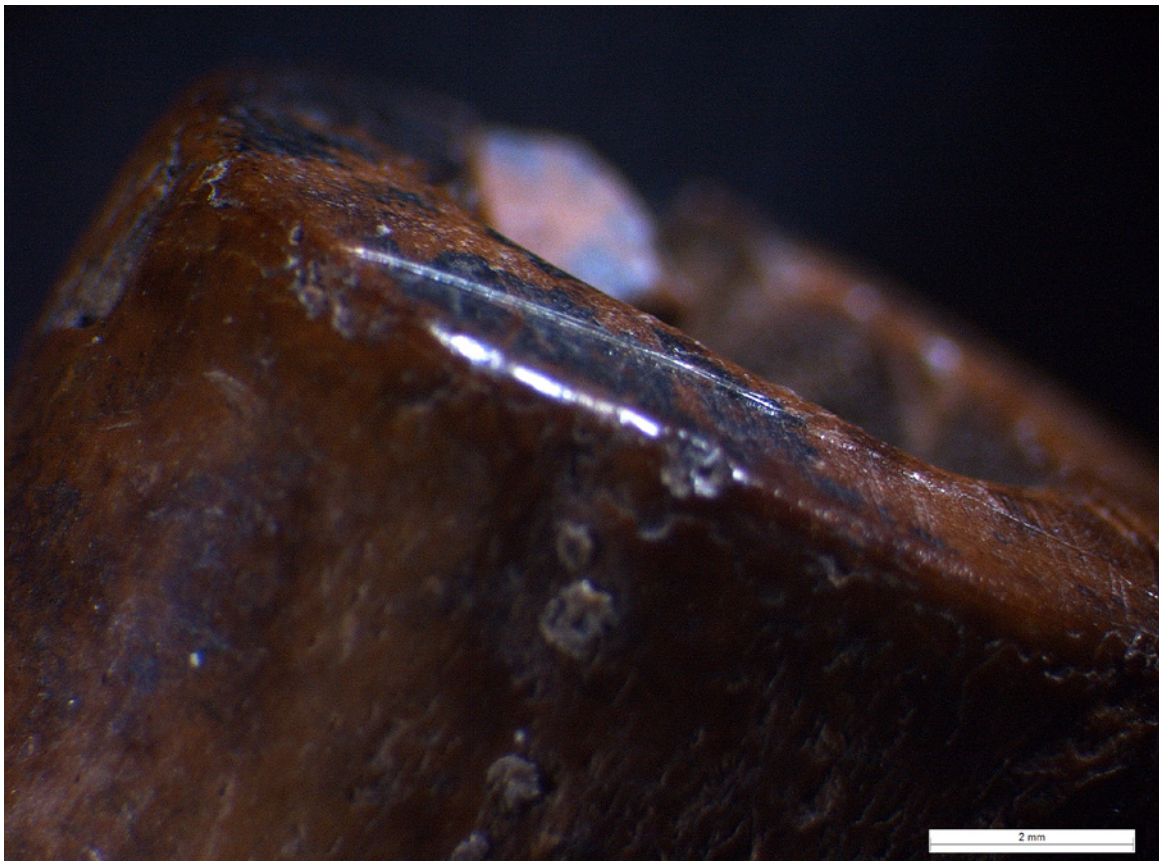


Plate 14. Extremely worn surface and sawing marks on a tubular bone bead from El Malagón. Photo: M. Altamirano.

4. DISCUSSION

Hard animal materials (bone, antler, ivory, mollusks shell, etc.) must be considered precious and important raw sources from which to manufacture artefacts embedded in both daily life activities as well as the symbolic sphere in the past (Choyke, 2006). Technical and physical properties such as shape, brittleness, toughness and availability of each material have been assumed to be the main criteria used in deciding whether to make a particular artefact from bone, ivory or antler. Despite these criteria being important, it is also possible that these materials were characterised by deeply symbolic attributes and meanings (McGhee, 1977).

Taking into account the results of the raw material analysis together with the archaeofaunistic data from the three sites studied here, it can be noted that the most common raw materials from which manufacture a major number of tools were those bones coming from domestic cattle, especially from caprids (30-50% of tools) and those species that were the most abundant according to the faunal analysis from Los Millares and Los Castillejos. Moreover, mainly those bones of their limbs (tibiae, fibulae, metapodials and phalanges) were more frequently used as a raw source for tool-making (Fig. 3). Those bones provided hard and long blanks from which manufacture hard tools and, what is more, they came from those bodily parts with less quantity of meat. Thus, they would have been just taken from the animal without being previously cooked, what would have deeply altered their chemical and mechanical properties because of the heat and making the osseous structure more brittle and breakable.

Regarding wild animals, only red deer bones were more frequently used as raw source (Fig. 3). Again, this specie is one of the most abundant among the wild ones documented at each site, what together with the fact of providing long, thick bones, would have strongly conditioned the systematic choice of its bones for tool-making. Mainly phalanges and metapodials, as well as antler, were the main bodily parts from which both tools and some ornaments were manufactured.

In principle, these facts suggest that the majority the domestic equipment was manufactured from easily available bones, that is to say, those from domesti-



Plate 15. Pointed hare tibia (a) and carnivorous fibula (b) from El Malagón. Photo: M. Altamirano.

five discovered in domestic contexts (Pl. 15b). These fibulae would not have been a very resistant tool due to their thin cortical wall, so their function may have been related to personal uses instead to perforation of other materials. That is what the usewear over their proximal ends seem to indicate, maybe in connection with clothe processing. It is true that their manufacture was extremely simple, making the most of their natural pointed morphology, so in order to finish the tool just very little abrasion was needed. However, due to their scarcity, the special raw material they were made from and their usewear, these pointed fibulae must be considered especial objects. Furthermore, some of them have been found as grave goods, although dating to the Bronze Age (Altamirano Garcia, 2011, 2013a).

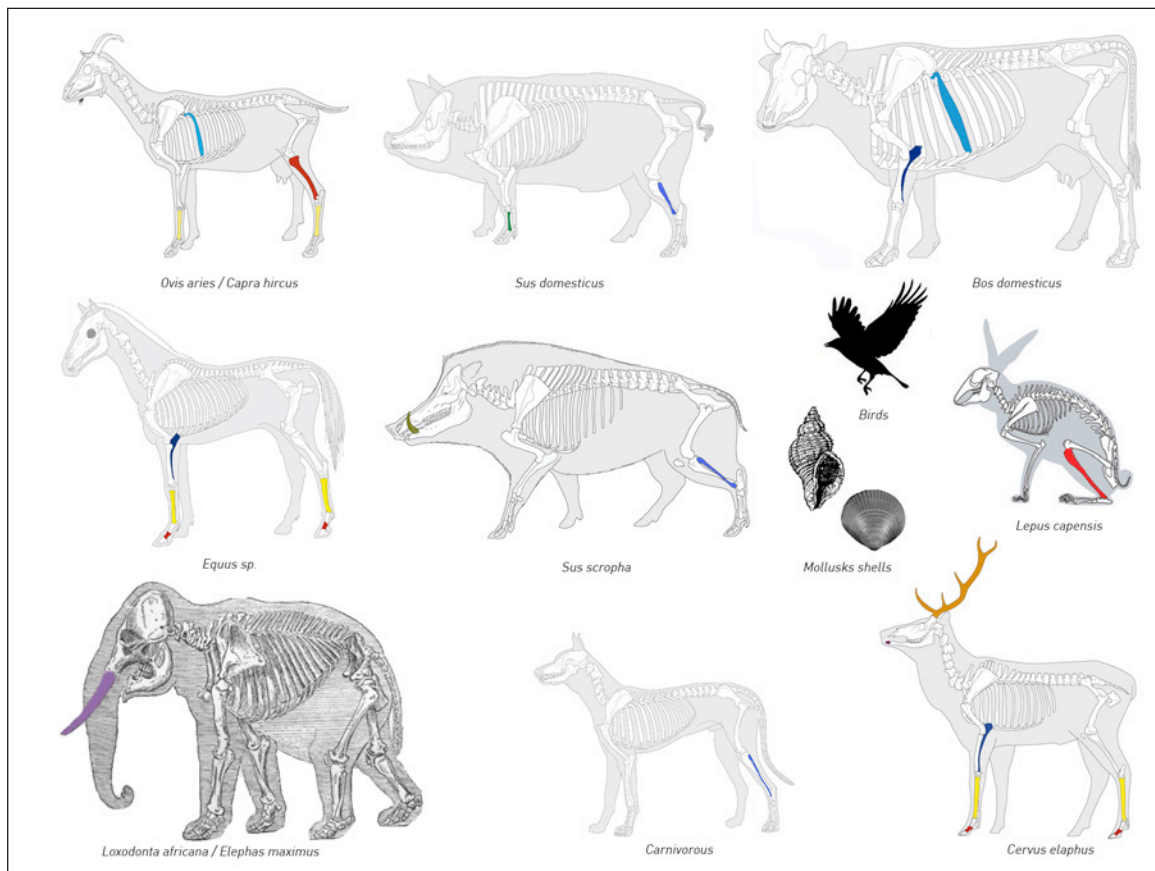


Fig. 3. Bodily parts used for tool and ornament-making from the main animal species during the Chalcolithic in southern Iberia.

cated species. However, our research suggests that behind the choice of specific materials were not only technical reasons, but also some kind of cultural and social beliefs, such as, for example, the idea of sharing some animal properties when using or carrying items made from their hard tissues (Choyke, 2008: 5; Choyke and Kovats, 2010).

Some types of tools and ornaments may give us some insight on how important was the fact of selecting a specific raw material for each type of artefact. The question is, why? There may have been some sort of especial relationship between each social group and either some materials or animal species, either domestic or wild, that, together with others technical reasons and cultural traditions, could explain the systematic selection of specific bones (always from the same species) to manufacture the same type of object, whether tool or ornament (Fig. 4).

It is worth noting that, apart from that possible tradition of a frequent selection of just a small range of bones for tool-manufacturing, there was also a clear

intention of choosing some types of materials that could be considered prestigious and exotic to manufacture specific types of objects. These artefacts were mostly ornaments and symbolic items, such as idols. Based on our results, both elephant ivory and marine mollusk shells may have been considered this way and normally used to make those type of objects, which must have been precious and valuable. The technical study has shown how these items were normally carefully crafted, their manufacture involving an important investment of both time and effort. Evidence of curation is also commonly observed on these artefacts, suggesting a clear will to maintain them in use for long periods of time (Altamirano García, 2013a).

For instance, the high degree of use evidenced by the totally worn surfaces of the V-perforated buttons, together with the special raw material with which they were manufactured and the evidence for repeated curation, gives us an approximate idea about how precious these objects were. Based on all this evidence, some of the buttons may have been handed down over generations and served as impor-



Fig. 4. Most common normalized types of artefacts documented at all three sites. These osseous objects were systematically made from the same bone and always from the same animal "species". Photo: M. Altamirano.

tant markers of some kind of social identity connected to Bell-beaker society beyond the boundaries of Los Castillejos. The inheritance of these and other objects would have made them extremely special and valuable for their owners, making them a materialization of the memory of the ancestors.

It is increasingly clear that unlike most ceramic, textile and leather artefacts, both osseous tools and ornaments may have easily outlasted their owners, being transmitted from generation to generation. They would have act as links between the living and the dead. Thus, certain objects became important and meaningful to people who used them as a source of social authentication and social value within the context of various personal and family identities (Choyke, 2001; 2006, 2009; Choyke and Kováts, 2010: 22; Choyke and Daroczi-Szabó, 2010: 245).

Human life is inextricably associated with the material world. Portable objects such as clothing, ornaments, food or tools are fully involved in many kinds of everyday activities. At the same time, people use objects, both consciously and unconsciously to transmit information about themselves and their place(s) within both their narrow social unit and outside it to various target audiences of different scales. When used or carried for a long time in the domestic sphere or in the settlement in general, or during travels beyond that sphere, whether for trade or war missions, these special items tend to be closely associated with the memory of the person or people who were specially close to them (Choyke and Daroczi-Szabó, 2010: 242).

Finally, it is worth noting that some artefacts are widely documented within different cultural areas, such as Los Millares culture or the megalithic group in the Granada province. That suggests that connections as well as the continuous exchange of both people and ideas took place across regions. Epyphiseal-based points from caprid tibiae are a good example, displaying similar technical, morphological and functional features. Eye-idols and their intrinsic characteristics also reflect common links related to deep beliefs and how people understood their world. These idols have been documented in many parts of Iberia, which suggest the existence of common traits within the symbolic world of Chalcolithic groups (religious, magic, etc.) (Bueno Ramírez, 2010; Hurtado Pérez, 2010; Maicas Ramos, 2010; Pascual Benito, 2010; Vera Rodríguez *et al.*, 2010).

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