Archaeofauna 16 (2007): 169-178

The Signature of a Blacksmith on a Dromedary Bone from Islamic Seville (Spain)

MARTA MORENO-GARCÍA[1], CARLOS M. PIMENTA[1],
PEDRO M. LÓPEZ ALDANA[2] & ANA PAJUELO PANDO[2]

[1] Laboratório de Arqueozoologia, IGESPAR.
Av. da Índia 136, 1300-300 Lisboa, Portugal.
[2] Departamento de Prehistoria y Arqueología, Universidad de Sevilla.
C/ Doña María de Padilla, s/n, 41004 Sevilla, España.

(Received *June 25, 2007*; Revised *July 9, 2007*; Accepted *July 10, 2007*)

ABSTRACT: A review of the archaeological and ethnographical literature has shown that bone anvils were not only manufactured in different geographical regions, extending from Ukraine to the Iberian Peninsula and northern Africa but also that they have been in use from the Hellenistic period until today. Although cattle and equid metapodials appear to be the preferred bones, other parts of the skeleton such as mandibles, humeri, radii, pelves, femora and tibiae were employed too. Here we present a bone anvil fashioned from a dromedary (*Camelus dromedarius*) right radius-ulna recovered from an urban excavation in the city of Seville (Spain), dated to the Taifa-Almoravid Moslem period (11th-12th-centuries). Besides it being the first archaeological bone anvil of this animal species it constitutes a new record to add to the scarce number of camelid remains in the Iberian Peninsula. Detailed observation of its worked surface and ethnographic information allow us to understand how the medieval blacksmith used this anvil.

KEYWORDS: DROMEDARY, BONE ANVIL, AL-ANDALUS, BLACKSMITHS

RESUMEN: La revisión bibliográfica de trabajos arqueológicos y etnográficos muestra como los yunques de hueso no sólo fueron manufacturados en diferentes regiones geográficas, desde Ucrania hasta la Península Ibérica y el norte de África, sino que también fueron utilizados desde el período Helenístico hasta nuestros días. Aunque los metápodos de bóvidos y équidos parecen ser los huesos preferidos, otros elementos anatómicos como mandíbulas, húmeros, radios, pelvis, fémures y tibias, fueron también utilizados. En este artículo presentamos un yunque elaborado a partir del radio-ulna derecho de un dromedario (*Camelus dromedarius*), recuperado en una excavación urbana en Sevilla (España), datado de época Taifa-Almorávide (siglos XI-XII). Además de ser el primer registro arqueológico de yunque óseo de esta especie, constituye un nuevo resto a añadir al escaso número de ejemplares de camélido existente en la Península Ibérica. La observación detallada de la superficie trabajada y la información etnográfica disponible nos permitieron comprender como el herrero medieval utilizó este hueso.

PALABRAS CLAVE: DROMEDARIO, YUNQUE ÓSEO, AL-ANDALUS, HERREROS.

BONE ANVILS: THE STATE OF THE ART

During the last decades of the 20th-century, archaeologists working in south-east France, the Iberian Peninsula, northern Morocco and Ukraine have uncovered a particular kind of bone object fashioned primarily from cattle and horse metapodials. They present one or several faces of the diaphysis whittled down and smoothed in such a way that their original convexity has been transformed into flat and concave surfaces and their cross section has become quadrangular. In addition, they feature parallel rows of tiny triangular-shaped indentations across the longitudinal axis of the diaphysis and multiple fine scratched marks over and underneath them (Figure 1). For a long time their function was by no means certain. While many were simply described as decorated bones (Molinero-Pérez, 1971; Julià *et al*., 1992; Zapater Baselga, 1995; Arnau Basteiro, 1997; Cebolla *et al*., 1997; Castillo *et al*., 1999; Antoñanzas *et al*., 2000) amulets or bone idols (Serrão, 1978; Sá Coixão, 1996) or even archer's wrist-guards (Zozaya, 1995), others were interpreted as func-

FIGURE 1

Left cattle metacarpal from Beco de São Marçal (Lisbon, Portugal), 14th-15th-centuries. Anterior and posterior faces have been whittled down and fashioned as a bone anvil. Detail of the rows of indentations made by the point chisel. Photo: J.P. Ruas.

tional objects used as polishers, files or sharpeners (Serrão, 1978; Peters, 1986; Briois *et al*., 1995; Cardoso & Varela Gomes, 1996; Rodet-Belarbi *et al*., 2002; Gerrard, 2003) following the work carried out by Semenov (1964) on samples from Graeco-Scythian colonies around the Black Sea.

In his book «*Prehistoric Technology*», this author refers to the occurrence of «*long bones of ox and horse found by the Olbia Expedition of 1947 in layers of the Hellenistic period*» (p.186) that showed the features described above. Based on an experimental study, he concluded that these bones could be «*regarded as tools for the secondary working of stone, that is for the grinding and shaping of architectural details and all kinds of small surfaces*» (p. 189) and not as ornamental or cult objects. «*The scratches running over the surface of the diaphysis were produced by large grains of silica sand used as an abrasive agent with bone rasps*». The transversally aligned small «*triangular holes were designed to receive and contain for a period the sand sprinkled on the surface of the material being worked*» …. «*Cutting the holes was probably done with a claw chisel, well known to Classical masons. The cutting was not done just once, but had to be repeated as the holes were worn off by attrition*» (p. 188). The bone was held with both hands gripping both the proximal and distal epiphyses and moved back and forth against the surface to be smoothed (Semenov, 1964). In spite of all these deductions, Semenov noted in the Introduction to his book that «*such peculiar instruments as the bone rasps from Olbia demand research over a long period of time. Even after a correct identification of function, there will still remain a number of unexplained details*» (p. 6).

The hypothesis that these bones were related to an artisan’s activity gained support after nearly 200 samples were uncovered at al-Basra (northern Morocco) from deposits associated with metal production, where large quantities of metal slag and charcoal, along with possible smelting pits and furnace remains, were found (Benco *et al*., 2002). Thus, these bones displayed iron particles and grains of silica inside the triangular indentations suggesting that they were employed in smoothing or burnishing metal (Benco *et al*., 2002).

Making use of ethnographic information from Catalonia (Spain) Esteban-Nadal (2003) managed to reveal the true function of these bone artefacts. They were used by blacksmiths as anvils to anchor the blade of an iron sickle while it was being cut with a wedge-shaped point chisel to make a serrated edge. Additional ethnographic evidence from other regions in Spain (Aguirre *et al*., 2004) and Portugal (Veiga de Oliveira *et al*., 1976; Moreno-García *et al*., 2006b) attest to the survival of this practice in the Iberian Peninsula until the end of the 20th-century.

The whole process is described in detail in Esteban-Nadal & Carbonell-Roure (2004) and can be summarised as follows. After choosing a dry bone, the blacksmith files down the diaphysis to create a flat working surface. Then with a water-grindstone removes the grooves produced by the iron file. The bone anvil is then ready for use. After cooling down, the tempered blade of the sickle is placed on top of it. The blacksmith proceeds to cut the teeth with the help of a hammer and a wedge-shaped point chisel (Figure 2). The succession of impacts produces a line of close V-shaped marks similar to those observed on the bone surface of the archaeological samples. As the smith chisels the blade, he moves it across the anvil, resulting in parallel rows of indentations. Once the diaphysis is used up, it needs to be prepared again. Thus, it is filed down once more and polished with the water-grindstone. These consecutive actions are responsible for the superimposed scratches visible on the surface. As the bone anvil is re-used previous markings are erased and the working surface becomes thinner until it is no longer usable or breaks as a result of the pressure to which it is subjected.

Our research with archaeological bone anvils from the Iberian Peninsula has shown their long chronological distribution that extends from the Visigothic period (5th-8th-centuries AD) until the 20th-century, with a special concentration of finds from sites dated to the Islamic period (Moreno-García *et al*., 2005; Moreno-García *et al*., 2006a; Moreno-García *et al*. 2006b). Also, it has been possible to verify that contrary to the standardisation towards the exclusive use of metapodials that there seem to have taken place in more recent times (Esteban-Nadal, 2005), earlier blacksmiths used a variety of bones such as mandibles, humeri, radii, metacarpals, femora, tibiae and metatarsals. Certainly, those are bones that not only provide long-lasting working surfaces, since their diaphyses are thicker and more robust than those of any other long bone, but also that can be easily flattened and smoothed. Finally, as far as species representation is concerned, it is clear that in Iberia as well as in the other geographical regions mentioned above, the use of cattle bones dominates in relation to those of equids (Table 1), suggesting that those were easier to obtain and maybe more abundant too.

FIGURE 2

Blacksmith on his bench cutting the teeth of a serrated sickle. Detail of the edge of the metal sickle where it is clearly visible how each tooth corresponds with a V-shaped indentation on the bone anvil. Note that the sickle is positioned transversally to the bone. Drawing by J. Martí and R. Sala.

In this paper, we describe a bone anvil recovered from Seville (Spain) dated to the 11th-12th-centuries AD that was fashioned from the right radius-ulna of a dromedary (*Camelus dromedarius*). Not only does it represent the first archaeological anvil manufactured from this animal species but also it constitutes a new record to add to the scarce number of dromedary remains that have so far been registered in the Iberian Peninsula (Table 2; Cardoso, 1992; Riquelme-Cantal, 1993; Morales-Muñiz *et al*., 1995; Riquelme-Cantal, 1995; Riquelme- Cantal *et al*., 1997; Fernández-Rodríguez 2003). In addition, it is evidenced that besides their power, meat, milk and skin, the dromedary's bones were considered a useful raw material that was not discarded by medieval Iberian artisans.

SPAIN	Radius	-	-	1
	Metacarpal	10	4	-
	Tibia	1	-	-
	Metatarsal	24	2	-
	Metapodial	3	3	-
	TOTAL	**38**	**9**	**1**
PORTUGAL	Mandible	1	-	-
	Humerus	1	-	-
	Radius	1	3	-
	Metacarpal	26	1*	-
	Tibia	1	2	-
	Metatarsal	19	2	-
	TOTAL	**49**	**8**	-
FRANCE	Mandible	9	-	-
	Radius	6	2	-
	Metacarpal	17	4	-
	Pelvis	-	4	-
	Tibia	3	1	-
	Metatarsal	27	5	-
	Metapodial	8	4	-
	TOTAL	**70**	**20**	-
MOROCCO	Radius	(7)	-	-
	Tibia	(7)	-	-
	Metapodial	178	1	-
	TOTAL	**185**	**1**	-
TUNISIA	Metatarsal	-	-	1
	TOTAL	-	-	**1**
UKRAINE[1]	Metacarpal	4	-	-
	Tibia	1	-	-
	Metatarsal	3	2	-
	TOTAL	**8**	**2**	-
HUNGARY[2]	Radius	-	1	-
	TOTAL	-	**1**	-

TABLE 1

Bone elements and species on which bone anvils have been manufactured in different countries. All chronological periods are summarised together. * Specimen identified as *Equus asinus* (Moreno-García *et al*., 2006). [1] Unpublished data (E. Antipina *pers. comm.*). [2] Unpublished data (L. Bartosiewicz *pers. comm.*).

THE FIND: A DROMEDARY BONE ANVIL

Archaeological context

Archaeological excavations were conducted by one of us (P.L.A.) in C/ San Luís nº 93, next to Plaza del Pumarejo, Seville (Spain) between April and July 2004. The site is located 100 m away from the wall of the city in an area known as the Historical Centre of Seville. However, these quarters were a marginal occupational zone until the construction of the wall in the 12th-century. Their settlers were engaged in agriculture and animal husbandry activities, being the suppliers of the city.

The dromedary bone anvil fragment was recovered from a pit (U.E. 111), excavated above the natural levels of the Guadalquivir river terraces. It forms part of a complex of regular shape pits of different sizes (between 60 cm and 120 cm deep), filled with abundant faunal remains (currently under study by A.P.P.) and fragments of storage, cooking and tableware pottery vessels that allowed us to date the bone anvil to the Taifa-Almoravid Moslem period.

Roman period	**Site**	**Number**
Spain	Complutum (Alcalá de Henares, Madrid)*	1
	El Val (Alcalá de Henares, Madrid)*	1
	Cartago Nova (Cartagena, Murcia)*	1
	Cástulo (Jaén)*	1
	Astorga (León) [1]	77
Portugal	Conímbriga [2]	1
	Mértola [3]	1
Islamic period		
Spain	Granada cathedral (Granada)*	1
	C/ Espino (Granada)*	1
	C/ San Miguel (Guadix, Granada)*	5
	Alarcos (Ciudad Real) [4]	2
	C/ San Luís (Seville)	1

TABLE 2

Roman and Islamic Iberian sites where dromedary bones have been recovered. * Morales-Muñiz *et al.* (1995); [1] Fernández-Rodríguez (2003); [2] Cardoso (1992); [3] unpublished; [4] Riquelme-Cantal (1995).

Description

The bone anvil is the medial side of the proximal diaphysis of *Camelus dromedarius* right radius-ulna, from an adult individual. It is 287mm long and is generally well preserved, although it appears longitudinally split along the diaphysis and shows recent breakage at two points on the caudal face (Figure 3). To the naked eye it is evident that this face has been partially whittled down. Thus, the convex surface of the ulna and the upper part of the radius diaphysis has become flat. In addition, regular thin scratch lines running transversally across the diaphysis are clearly visible under the microscope. Twenty-eight semi-parallel and oblique rows of tiny V-shaped indentations are visible across this area while fainter ones, due to scratching over them, are evident at both ends of the whittled surface. The cranial face of the radius has also been partially flattened but no chisel marks occur. In an attempt to create a flat supporting surface the proximal articulation was rudely chopped off.

Observations

Taking into account that only the upper portion of the posterior diaphysis was whittled down and covered with the chisel point marks, it can be concluded that the whole bone surface was not being used as an anvil. The reasons for this are probably twofold: the position of the anvil on the blacksmith bench and the length of a dromedary radius. The ethnographic observations recorded by Veiga de Oliveira *et al*. (1976), Esteban-Nadal (2003) and Aguirre *et al*. (2004) show that in all cases the bone anvil is anchored to the working bench according to its longitudinal axis (Figure 2). Thus, the blade of the sickle is placed transversally across the upper surface of the bone and it is successively moved back towards the operator every time a line of indentations has been completed, producing the sequence of parallel rows that ends up covering the whole surface of the anvil.

The total lengths of two dromedary radii present in the IGESPAR Archaeozoology Lab reference collection are 470 mm and 530 mm, respectively. As shown in Figure 3, the archaeological bone anvil from Seville would have been fashioned from an animal of similar size to the first one. This means that if the blacksmith was going to start cutting the teeth of the sickle blade from the top end of the radius, he would have had to work with both his arms totally stretched. Not only would it have been uncomfortable but also impracticable. In fact, the whittled surface of the posterior face is around 15 cm long, which corresponds approximately with the average size of the working surface available on diaphyses of cattle and equid metapodials. Therefore, it appears that only the proximal half of the radius diaphysis was prepared on both its posterior and anterior faces to be used as an anvil.

Careful observation of the distal end of this bone fragment shows that it was chopped off at this point. When did this happen? Was this done

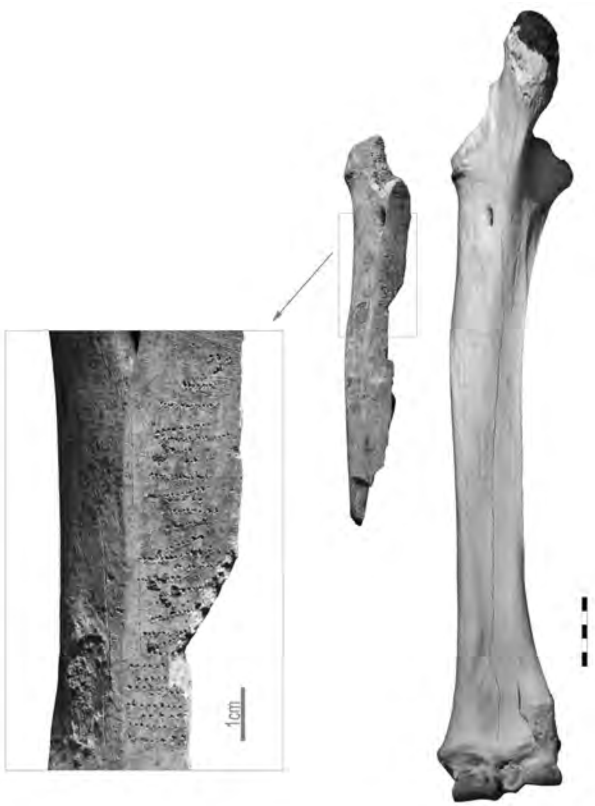

FIGURE 3

Bone anvil fashioned from a right dromedary (*Camelus dromedarius*) radius-ulna from Seville (Spain), Taifa-Almoravid period (11th-12th-centuries). On the right, complete right dromedary radius-ulna from the IGESPAR Archaeozoology Lab reference collection (CIPA nº 1784). Detail of the posterior surface and the rows of V-shaped indentations. Photo: J.P. Ruas.

with the intention of shortening the bone to fashion the anvil? Was it already butchered when it reached the blacksmith? Or was it cut after discarding the anvil? These questions are difficult to answer. Morales-Muñiz *et al*. (1995) note that the two radius fragments recovered from Almohad levels in the excavation of San Miguel street, Guadix (Granada, Spain) exhibit saw-marks, hinting at some industrial activity. Thus, as a working hypothesis it may be suggested that the chop marks visible on the radius from Seville were not produced after throwing away the anvil, but most probably were intentionally done in the process of manipulating this robust bone to make use of it.

A large number of bone anvils recorded in the bibliography and analysed by us (Moreno-García *et al*., 2005; Moreno-García *et al*., 2006a; Moreno-García *et al*., 2006b) correspond to fragments of diaphysis, proximal or distal halves of long bones that result after exhaustive use of the anvil. Whittling down the surface every time it is covered by rows of indentations diminishes the thickness of the cortical bone, increasing its fragility so that it eventually breaks under the pressure of new chisel point impacts (Figure 1). That does not seem to have occurred to the bone anvil from Seville. The longitudinal fracture along the diaphysis reveals a thick layer of cortical bone on both its anterior and posterior faces so it could have continued to serve as an anvil for quite some time.

A CULTURAL PRACTICE STILL IN USE

Thanks to contacts established with other researchers interested in bone anvils, we managed to know that in the city of Béja, north-west of Tunis, in the foothills of Djebel Acheul, a French team of ethno-archaeologists recorded the production of a bone anvil fashioned from a dromedary metatarsal by the local blacksmith in the summer 2005 (fig. 5 in Rodet-Belarbi *et al*., 2007). Hence, this attests not only to the survival of bone anvils in rural economies today where serrated sickles are still in use but also to the preference for robust bones such as those of the legs of dromedaries (where the species occurs) to manufacture them.

In several interviews conducted with old blacksmiths in Trás-os-Montes, Northern Portugal, we were informed that the most valued quality in a bone for its use as an anvil was its toughness. For that reason, metapodials from mature bulls, cows, horses and asses were always favoured by local artisans. These were animals highly priced for their power before mechanization of agriculture occurred in rural Iberia in the mid 20th-century. Their bones were readily available after their working lives had finished and they were culled or died naturally.

It is not surprising that in regions such as northern Africa, where dromedaries are common animals used for transportation, their bones are not considered a waste resource but are utilised as raw material for artefact or tool making. Since traditional cultivation techniques are still practiced in this geographical area more bone anvils, not only fashioned from dromedary bones but from the most common domesticates (*i.e.*, cattle and equids), will surely turn up. Thus, ethnographical research among these traditional rural communities appears to be a priority before ancient technological solutions are lost forever.

NEW THOUGHTS ON IBERIAN DROMEDARY REMAINS

Dromedary bones recovered from Iberian Islamic sites appear to be less common than those found from the Roman period. Further, their geographical distribution is concentrated in Andalusian urban centres (Table 2). According to Morales-Muñiz *et al*. (1995: 373) the cut marks and traces of fire they show may indicate regular use of dromedary meat during this period, in contrast to what is recorded on Roman sites. However, since Andalusian culinary treatises consider dromedary meat among the toughest (Díaz-García, 1973) they propose its consumption «*could have had ritual connotations in affirming the Muslim condition of Andalusians*» (Morales-Muñiz *et al*., 1995: 373).

The bone anvil from Seville indicates that perhaps some of the butchery marks displayed in those remains from Granada and Guadix (Table 2) are not exclusively related to meat consumption but to bone use. Even nowadays it is possible to find a variety of objects from necklaces (Ayalon & Sorek, 1999) to carved pieces such as chess figures and dice (Christian Küchelmann *pers. comm*.) made from pieces of camel bone that are on sale in countries where dromedaries and Bactrian camels exist. The transformation they have suffered prevents in many cases its straight identification.

Craft activities were largely developed in medieval al-Andalus so it is to be expected that artisans made use of dromedary bones whenever available. Not only its size but its qualities for carving were no doubt appreciated. Presumably, as the number of Islamic sites excavated in Iberia improves so will the record of dromedary remains. Faunal assemblages from rubbish deposits located in 'industrial' quarters of urban centres deserve special attention. It will be there that discarded remains from different crafts will evidence the comprehensive use of all sorts of animal bones made by local artisans, even by activities so unrelated to this material as that of blacksmiths!

ACKNOWLEDGEMENTS

We are very grateful to Ekaterina Antipina (Institute of Archaeology of Russian Academy of Sciences) for sharing with us data on old and recent unpublished bone anvils from Ukraine and to Milena Stancheva (Veliko Turnovo University, Bulgaria) for sending us Russian references. Isabelle Rodet-Belarbi and Montserrat Esteban Nadal are acknowledged for sharing with us their work on bone anvils in France and Spain. Thanks to José Antonio Riquelme (University of Granada, Spain) and Laszlo Bartosiewicz (Institute of Archaeological Sciences, Budapest, Hungary) for references to unpublished material and to Carlos Fernández Rodríguez (University of León, Spain) for information on the dromedary bones from Astorga (León). Finally, we are thankful to Etan Ayalon (Eretz Israel Museum, Tel Aviv), Alice Choyke (Aquincum Museum, Hungary) and Christian Küchelmann (Knochenarbeit, Germany) for providing useful information on worked camel bones. Simon Davis is acknowledged for correcting the English.

REFERENCES

AGUIRRE, A.; ETXEBERRIA, F. & HERRASTI, L. 2004: El yunque de hueso para afilar la hoz metálica dentada. *Munibe* 56: 113-121.

ANTOÑANZAS, A.; CASTILLO, P. & GARRIDO, J. 2000: La Ermita de los Stos. Mártires o Casa Santa (Calahorra, La Rioja): una cárcel romana? *Kalakorikos* 5: 13-28.

ARNAU BASTEIRO, E. 1997: Noticia de la actuación arqueológica en el solar de la que fue casa del Tinte de Benavente. *Brigecio. Revista de Estudios de Benavente y sus tierras* 7: 91-104.

AYALON, A. & SOREK, C. 1999: *Bare bones. Ancient artifacts from animal bones.* Tel Aviv.

BENCO, N. L.; ETTAHIRI, A. & LOYET, M. 2002: Worked bone tools: linking metal artisans and animal processors in medieval Islamic Morocco. *Antiquity* 76: 447-457.

BRIOIS, F.; POPLIN, F. & RODET-BELARBI, I. 1995: Aiguisoirs, polissoirs médiévaux en os (XI^{e}-XIV^{e} S.) dans le sud-ouest de la France. *Archéologie du Midi médiéval* 15: 197-213.

CARDOSO, J.L. 1992: Un camelídeo de Conimbriga. *Conimbriga* 31: 181-187.

CARDOSO, J.L. & VARELA GOMES, M. 1996: Contributo para o estudo das faunas encontradas no poço-cisterna de Silves (séculos XV-XVI). *Xelb* 3: 207-268.

CASTILLO, P.; GARRIDO, J. & ANTOÑANZAS, A. 1999: Informe de la intervención arqueológica en la Ermita de los Santos Mártires o «Casa Santa» (Calahorra, La Rioja). *Iberia*: 2: 47-86.

CEBOLLA, J.L.; ROYO, J.I. & REY, J. 1997: *La arqueología urbana en Calatayud. Datos para una síntesis.* Ayuntamiento de Calatayud, Centro de Estudios Bilbitanos, Calatayud - Zaragoza.

DÍAZ-GARCÍA, A. 1973: Un tratado nazarí sobre alimentos: al-Kalam 'Alà L-Agdiya de Al-Arbuli. Edición, traducción y estudio, con glosarios (II). *Cuadernos de Estudios Medievales* 10-11: 5-91.

ESTEBAN-NADAL, M. 2003: Ossos de ferrer mil.lenaris. In: *Actes del II Congrés d'Història d'Alcanar. 1,2 i 3 de desembre de 2000*: 111-120. Alcanar. Ajuntament d'Alcanar.

ESTEBAN-NADAL, M. 2005: Huesos de vaca: yunques de herrero. *Butlletí Arqueològic de Tarragona*. Època V 27: 221-250.

ESTEBAN-NADAL, M. & CARBONELL-ROURE, E. 2004: Saw-toothed sickles and bone anvils: a medieval technique from Spain. *Antiquity* 78: 637-646.

FERNÁNDEZ-RODRÍGUEZ, C. 2003: *Ganadería, caza y animales de compañía en la Galicia Romana: estudio arqueozoológico.* Brigantium 15, A Coruña.

GERRARD, C. 2003: *Paisaje y Señorío: la Casa Conventual de Ambel (Zaragoza). Arqueología, arquitectura e historia de las Órdenes militares del Temple y del Hospital.* CSIC "Institución Fernando el Católico". Centro de Estudios Borjanos. Excma. Diputación de Zaragoza, Zaragoza.

JULIÀ, M.; LÁZARO, P.; LORENCIO, C.; LORIENTE, A.; OLIVER, A.; PLENS, M. & PUIG, F. 1992: Estratigrafia andalusina i elements associats a aquest període, sense diferenciació de les fases califals i taifes.

Elements indicatius d'activitats socio-econòmiques. In: Loriente, A. & Oliver, A. (eds): *L'Antic Portal de la Magdalena*: 129. Monografies d'Arqueologia Urbana; 4. La Paeria Ajuntament de Lleida. Lleida.

MOLINERO-PÉREZ, A. 1971: *Aportaciones de las excavaciones y hallazgos casuales (1941-1959) al Museo Arqueológico de Segovia.* Excavaciones Arqueológicas en España 72. Ministerio de Educación y Ciencia, Madrid.

MORALES-MUÑIZ, A.; RIQUELME-CANTAL, J.A. & LIESAU VON LETTOW-VORBECK, C. 1995: Dromedaries in antiquity: Iberia and beyond. *Antiquity* 69: 368-375.

MORENO-GARCÍA, M.; ESTEBAN-NADAL, M.; PIMENTA, C.M.; LÓPEZ-GILA, M.D. & MORALES-MUÑIZ, A. 2006a: Los yunques en hueso en la Península Ibérica: estado de la cuestión. In: *Animais na Pré-história e Arqueologia da Península Ibérica. Actas do IV Congresso de Arqueologia Peninsular* 3: 247-262. Universidade do Algarve, Faro, 14-19 Setembro de 2004. Promontoria Monográfica.

MORENO-GARCÍA, M.; PIMENTA, C.; GONÇALVES, M.J. & PIRES, A. 2006b: Evidência arqueozoológica de um oficio na Silves islâmica: ossos, foices e ferreiros. In: *Actas do III Encontro de Arqueologia do Algarve* 6: 281-292. Silves, 20-22 Outubro 2005. Xelb.

MORENO-GARCÍA, M.; PIMENTA, C.M. & RUAS, J.P. 2005: Safras em osso para picar foicinhas de gume serrilhado ... a sua longa história! *Revista Portuguesa de Arqueologia* 8: 571-627.

PETERS, B.G. 1986: *Le travail aux os dans les etats antiques sur la cote septentrionale de la Mer Noire*. Nauka, Moscow.

RIQUELME-CANTAL, J.A. 1993: El dromedario en Al-Andalus: estado de la cuestión a través de los últimos descubrimientos arqueológicos en la provincia de Granada. In: *Actas IV Congreso de Arqueología Medieval Española* III: 657-661. Alicante.

RIQUELME-CANTAL, J.A. 1995: *Informe preliminar sobre la fauna recuperada en el yacimiento medieval de Alarcos (Ciudad Real).* Unpublished report.

RIQUELME-CANTAL, J.A.; LIESAU VON LETTOW-VORBECK, C. & MORALES-MUÑIZ, A. 1997: Archäozoologische Funde von Dromedaren auf der Iberischen Halbinsel. *Anthropozoologica* 25-26: 539-543.

RODET-BELARBI, I.; ESTEBAN-NADAL, M.; FOREST, V.; MORENO-GARCÍA, M. & PIMENTA, C. 2007: Des aiguisoirs/polissoirs aux enclumes en os: l'historiographie des os piquetés. *Archéologie Médiévale* 37.

RODET-BELARBI, I.; FOREST, V.; GARDEL, M.E. & GUINOUVEZ, O. 2002: Aiguisoirs-Polissoirs médiévaux en os (VII-XIV e s.). Nouvelles données. *Archéologie du Midi médiéval* 20: 149-153.

SÁ COIXÃO, A.D.N. 1996: *Carta Arqueológica do Concelho de Vila Nova de Foz Côa.* Câmara Municipal de Vila Nova de Foz Côa, Vila Nova de Foz Côa.

SEMENOV, S.A. 1964: *Prehistoric Technology.* Cory Adams & Nackay, London.

SERRÃO, E.D.C. 1978: Limitações do método comparativo na interpretação funcional dos testemunhos arqueológicos. Alguns exemplos. In: *Actas das III Jornadas Arqueológicas da Associação dos Arqueólogos Portugueses* I: 13-31. Lisboa.

VEIGA DE OLIVEIRA, E.; GALHANO, F. & PEREIRA, B. 1976: *Alfaia agrícola portuguesa.* Instituto Nacional de Investigação Científica. Centro de Estudos de Etnologia, Lisboa.

ZAPATER BASELGA, M.A. 1995: Pequeños objetos de piedra, hueso y vidrio del Castillo de Alcañiz. *Al-Qannis* 3-4: 217-219.

ZOZAYA, J. (ed.) 1995: *Alarcos. El fiel de la balanza.* Servicio de Publicaciones de la Junta de Comunidades de Castilla-La Mancha, Toledo.