

ARCHAEOLOGICAL AND ETHNOGRAPHIC INSIGHTS ON THE OCCURRENCE AND USE OF BONE ANVILS IN MALLORCA (BALEARIC ISLANDS, SPAIN)

Información arqueológica y etnográfica sobre el uso de yunques de huesos
en el caso de Mallorca (Islas Baleares, España)

ALEJANDRO VALENZUELA OLIVER* and MARTA MORENO-GARCÍA**

ABSTRACT After most researchers have agreed to interpret the bone anvils as artefacts used by blacksmiths to cut teeth on metal sickles, present lines of enquiry are focused on drawing the geographic and chronological scope of these tools. Following this path, this paper presents the results of archaeological and ethnographic surveys carried out in Mallorca (Balearic Islands, Spain). The new data recorded not only has enabled us to document the presence and temporal scope of the bone anvils on the island, but also, for the first time, the involvement of women in their use.

Key words: Bone Anvils, Mallorca, Ethnography, Women.

SUMARIO Una vez establecido que los yunques de hueso fueron objetos utilizados por los herreros para crear el dentado de las hoces de metal, la investigación actual se ha centrado en trazar el alcance geográfico y cronológico de estas herramientas. Siguiendo este camino, se presentan aquí los resultados arqueológicos y etnográficos de la investigación llevada a cabo en Mallorca (Islas Baleares, España). Los nuevos datos obtenidos no sólo nos permiten documentar la presencia y alcance temporal de los yunques de hueso en la isla, sino también, por primera vez, el papel desempeñado por las mujeres en su uso.

Palabras clave: Yunques en hueso, Mallorca, Etnografía, Mujeres.

* Departament d'Història i Arqueologia, Universitat de Barcelona. avalenzuela@ub.edu

** Instituto de Historia, CCHS-CSIC, Madrid. marta.moreno@cchs.csic.es

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INTRODUCTION

The triangular-shaped marks of the bone anvils have been a very active topic in the archaeological literature over the last decade (Esteban and Carbonell, 2004; Moreno-García *et al.*, 2005; Moreno-García *et al.*, 2006; Moreno-García *et al.*, 2007; Rodet-Belarbi *et al.*, 2007; Gál and Bartosiewicz, 2012; Grau-Sologestoa, 2012; Anderson *et al.*, 2014; Beldiman *et al.*, 2014; Vuković-Bogdanović and Bogdanović, 2016). Having established their ultimate function through ethnographic studies, research is presently focussed on determining the origin, chronological framework, and dispersal patterns of these implements. According to the previous reviews, the temporal and spatial distribution of the bone anvils is very wide, but there are still regional gaps in the data (Moreno-García *et al.*, 2004; Grau-Sologestoa, 2012; Anderson *et al.*, 2014). In some areas, the apparent absence may not be due to a lack of bone anvils, but rather because of a lack of research.

In the last few years, bone anvils have also been identified on islands of the Western Mediterranean such as Sardinia (Grassi, 2016) and Menorca (Valenzuela *et al.*, 2017). Following the line of research initiated in the Balearic Islands, here we attempt to collect all the known bone anvils from Mallorca. In order to do this, worked bone collections housed in the Museum of Mallorca and Manacor were surveyed and the material record of some archaeological sites, especially those that reported worked bone artefacts that could fit with the description of a bone anvil, was reviewed. In addition, some of the ethnographic data available on past craft activities developed in Mallorca were explored, too.

As a result, the new dataset from Mallorca extends the corpus of bone anvils located in this part of the western Mediterranean as well as it enables us to report particular features of their use throughout time. In this regard, the photographic record of a woman working at a blacksmith bench in a small village from Mallorca in the early 20th century constitutes a unique ethnographic testimony of the active role that women may have played in a craft activity that up until now was exclusively related to men.

THE ARCHAEOLOGICAL RECORD OF BONE ANVILS FROM MALLORCA

A total of sixteen new bone anvils coming from museum collections and archaeological sites are here reported. Alcúdia, Palma and Manacor are the three locations of origin (fig. 1), although most of them come from urban interventions carried out in the city of Palma (table 1). Taxonomical and osteological identification was always attempted, although in a few cases, we only had indirect access to the artefacts through the archaeological report (*i.e.*, Can Oleo and Can Serra). Those bone anvils that could be examined by us were photographed and their technological features, such as worked faces and location of the indentations, recorded following the criteria used by Grassi (2016). The anatomical and taxonomic identification of the bone was addressed following Schmid (1972) and only when the element

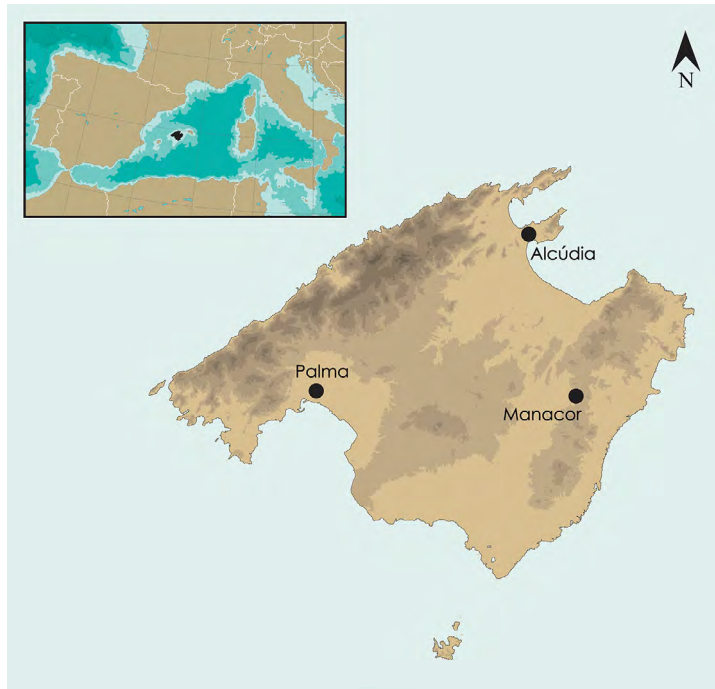


Fig. 1.—Map of Mallorca with the location of the areas where bone anvils have been found.

TABLE 1
ARCHAEOLOGICAL CONTEXT AND IDENTIFICATION OF THE BONE ANVILS OF MALLORCA

#	Reference	Site	Chronology	Taxon	Element
1	C616/03/065	Alcúdia, Pollentia	Roman?	<i>Bos taurus</i>	Metacarpus
2	802/723	Alcúdia, Pollentia	Roman?	<i>Bos taurus</i>	Metacarpus
3	E23/242/57	Palma, St. Domingo	Islamic, 12th-13th c. AD	<i>Bos taurus</i>	Metatarsus
4	E23/15/16	Palma, St. Domingo	18th c. AD	<i>Equus</i> sp.	Tibia
5	E23/15/17	Palma, St. Domingo	18th c. AD	<i>Equus</i> sp.	Metatarsus
6	E23/15/18	Palma, St. Domingo	18th c. AD	Large-size mammal	Femur
7	E23/234/195	Palma, St. Domingo	Islamic, 10th-13th c. AD	<i>Bos taurus</i>	Metatarsus
8	DA08/23/153-28	Palma, St. Miquel	Islamic, 12th-13th c. AD	<i>Equus</i> sp.	Metatarsus
9	6245-2-2	Manacor, c\ Estrella	Post-medieval, 16th-17th c. AD	cf. <i>Equus</i> sp.	Femur
10	6254-18	Manacor, c\ Estrella	Post-medieval, 16th-17th c. AD	<i>Equus</i> sp.	Metatarsus
11	6174-63	Manacor, c\ Estrella	Post-medieval?	<i>Equus</i> sp.	Metacarpus
12	6254-17	Manacor, c\ Estrella	Post-medieval, 16th-17th c. AD	<i>Equus</i> sp.	Metatarsus
13	CO'01-305	Palma, Can Oleo	Islamic, 11th c. AD	<i>Bos taurus</i>	Radius
14	DA10/11-416	Palma, Can Serra	Islamic, 10th-13th c. AD	<i>Equus</i> sp.	Metacarpus
15	DA10/11-10	Palma, Can Serra	Islamic, 10th-13th c. AD	<i>Equus</i> sp.	Metapodial
16	5046/Pou32/97	Palma, Sa Gerreria	Feudal, 14th c. AD	<i>Bos taurus</i>	Metacarpus

retained clear diagnostic features. In all the cases, the date of the tool was based on the associated material culture of the context.

The collection housed in the Museum of Mallorca consisted of two bone anvils (#1-2; see table 1) recovered in the Roman city of *Pollentia* (Alcúdia) and five more from excavations at the archaeological site of Sant Domingo in Palma (#3-7; see table 1).

The city of *Pollentia* was founded in the early 1st c. BC when the Romans colonized the island but the site has a spanning occupation until the Islamic period (Riera *et al.*, 1999). Given its significance several archaeological interventions have taken place since the early 20th century (Tarradell *et al.*, 1978; Orfila, 2000). The two bone anvils come from the old excavations and unfortunately their original archaeological context is unknown. Since the old excavations were focused on the

Roman levels they could represent the oldest bone anvils found in the island but their medieval origin can neither be totally excluded.

The bone anvils from Sant Domingo were retrieved from an urban excavation carried out in an area close to the convent erected by the order of the Dominicans in the 13th-14th centuries. The archaeological site consisted of different pits and contexts spanning from the Islamic period to the 18th century (Torres, 2005). Two of the bone anvils (#3 and #7) were found in pits filled during the late Islamic period (12th-13th centuries), and the other three (#4-6) were found together in a context dated in the 18th century (E-23-15).

Other bone anvils from Palma were identified among the faunal remains recovered in urban excavations of the city. This is the case, for example, of Sa Gerreria that was excavated as a result of an urban renewal plan of the historical centre (Estarellas



Fig. 2.—Some of the bone anvils recovered from Mallorca: A) *Pollentia* (C616/03/065), B); Palma (E23/242/57); C) Palma (E23715/17); D) Palma (E23/15/18); E) Palma (E23/15/16); F) Palma (E23/234/195). See Table 1 for full reference. All scales 1 cm.

and Merino, 2006). The district of Sa Gerreria gets its name from its medieval and modern craft specialization in pottery making (Barceló and Rosselló-Bordoy, 1996). The single bone anvil (#16) was found inside a medieval cesspit filled in the 14th century (Pou-32). The bone anvil from Sant Miquel (#8) was recovered in a ground-levelling stratum (SU 153) of a sector (II-A) of buildings related to the Islamic occupation of the city (Munar and Cardona, 2012). In the case of Can Oleo, the single bone anvil (#13) comes from a dump layer (SU 305) dated to the early Islamic period (11th century) that was located in the central courtyard of a manor house in the city centre (Riera *et al.*, 2011). Finally, the archaeological excavation of Can Serra provided other two bone anvils (#14-15), both from ground levelling strata (SU 10 and 416) dated also to the Islamic period (Rivas, 2010). These last artefacts were initially identified by Damià Ramis but not published.

The collection of the Museum of Manacor furnished the artefacts from an archaeological excavation (Carrer Estrella) in the city centre of this locality (Micol and Salas, 2012). Three of the bone anvils were found in postmedieval deposits dated between the 16th-17th centuries (#9, #10, and #12) and another one in a context not as clear as the other three, but probably also of postmedieval chronology.

RESULTS

The bone anvils presented here comprise the first evidence of this type of worked bone tool in the island of Mallorca, fulfilling an important geographic gap in the Balearic Islands (Valenzuela *et al.*, 2017).

As mentioned above, it is likely that the first bone anvils in Mallorca could derive from the Roman period, mostly since one of these artefacts from the nearby island of Menorca has been recently 14C dated between the 1st and 3rd century AD (Valenzuela *et al.*, 2017). However, this assumption remains open until local samples are discovered in a reliable Roman stratified context or the specimens from *Pollentia* are directly radiocarbon dated.

Almost all the findings from Mallorca are dated between 11th-18th centuries AD, being the Islamic period (10th-13th c. AD) the best represented (fig. 3). This remarkable concentration of bone anvils in the Islamic period has also been pointed out for the Iberian Peninsula (Moreno-García *et al.*, 2006). At this stage of the research, it is difficult to understand if such result has any historical meaning or on the contrary, if it is simply the consequence of an archaeological bias (*i.e.*, more medieval than postmedieval sites have been excavated).

Regarding the anatomical parts used, all the identified bone anvils were made from the diaphysis of long bones. In particular, twelve were fashioned from metapodials (75%), two from femora, one from a tibia and one from a radius. Contrary to the standardization towards the exclusive use of metapodials that has been observed in late medieval sites from the Iberian Peninsula (Esteban, 2003; Moreno-García *et al.*, 2007; Grau-Sologestoa, 2012), the record from Mallorca appears to show that different skeletal elements were being used (fig. 4). A similar

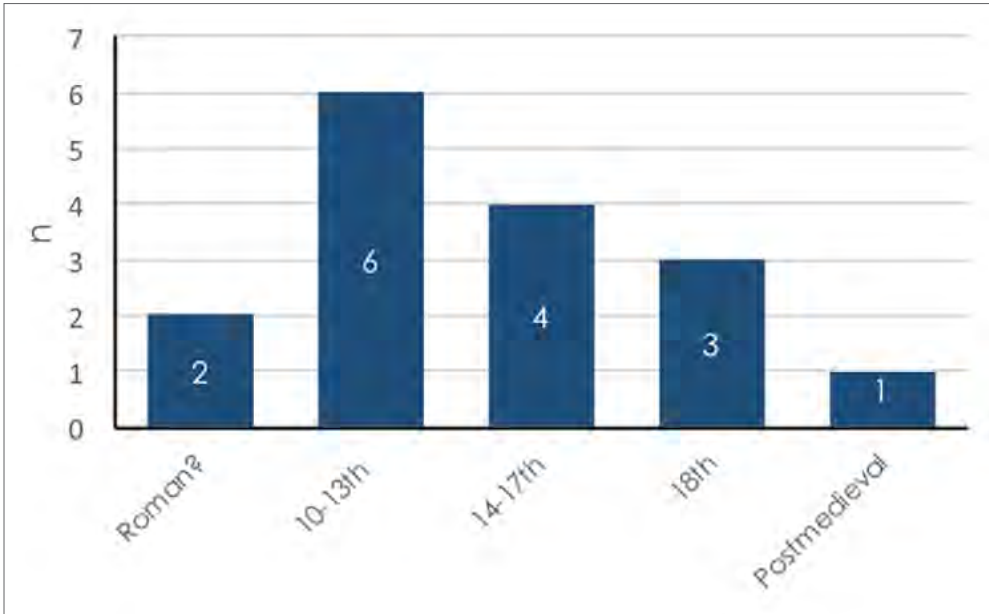


Fig. 3.—Frequency of bone anvils recorded for each period in Mallorca.

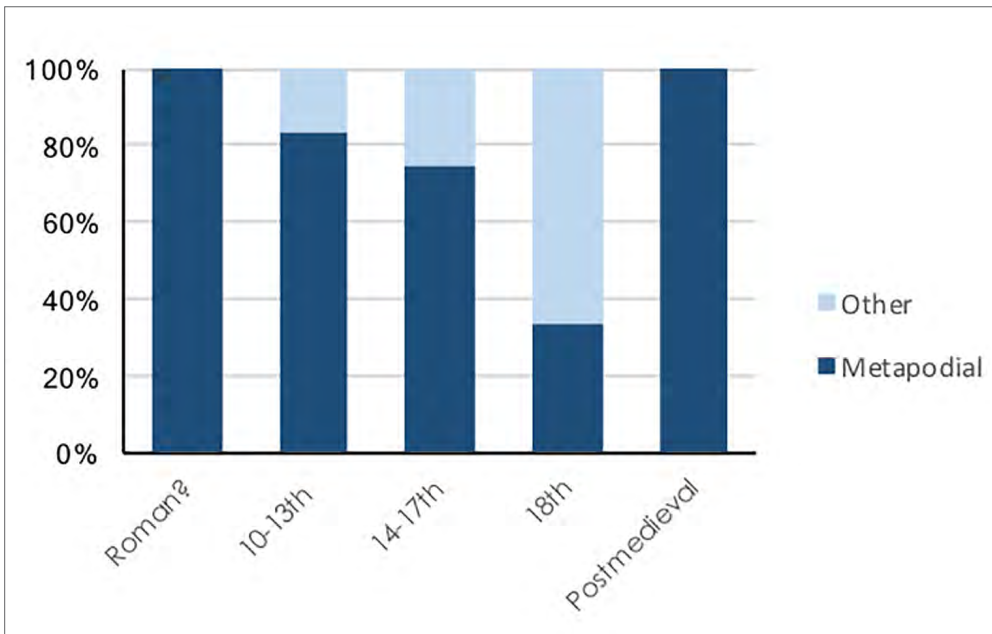


Fig. 4.—Anatomical parts selected for the manufacture of the bone anvils in Mallorca through time.

trend has also been noted in the assemblage of postmedieval bone anvils recovered in Sardinia (Grassi, 2016).

In terms of species, the same taxa commonly used in the Iberian Peninsula —cattle and equid bones— are preferred (fig. 5). However, while in the peninsular late medieval period there is a cattle-dominated pattern (e.g., Moreno-García *et al.*, 2006; Grau-Sologestoa, 2012; Anderson *et al.*, 2014) contemporary bone anvils from Mallorca were mainly fashioned from equid bones (69.2%). Interestingly, once again the record of bone anvils from Sardinia mirrors this trend as Grassi (2016) notes the clear predominance of anvils fashioned from the diaphysis of long bones (i.e., metapodials, tibiae, radii) of horses in 16th-18th c. AD Sassari. Although the ultimate reasons are still unclear, such predilection has been related to either a greater availability of bones of equids compared to those of cattle in this Mediterranean island or to a specific preference of the local blacksmiths (Grassi, 2016:136).

The state of preservation, modifications during manufacturing and use of the present record of equid bone anvils from Mallorca prevented us to specifically ascertain their identification as horse, donkey or mule.

DISCUSSION

Despite the limited dataset, the archaeological record of bone anvils from Mallorca offers, as a socio-economical proxy, some elements worth discussing. Taking into account the taxonomical identifications represented along the chronological

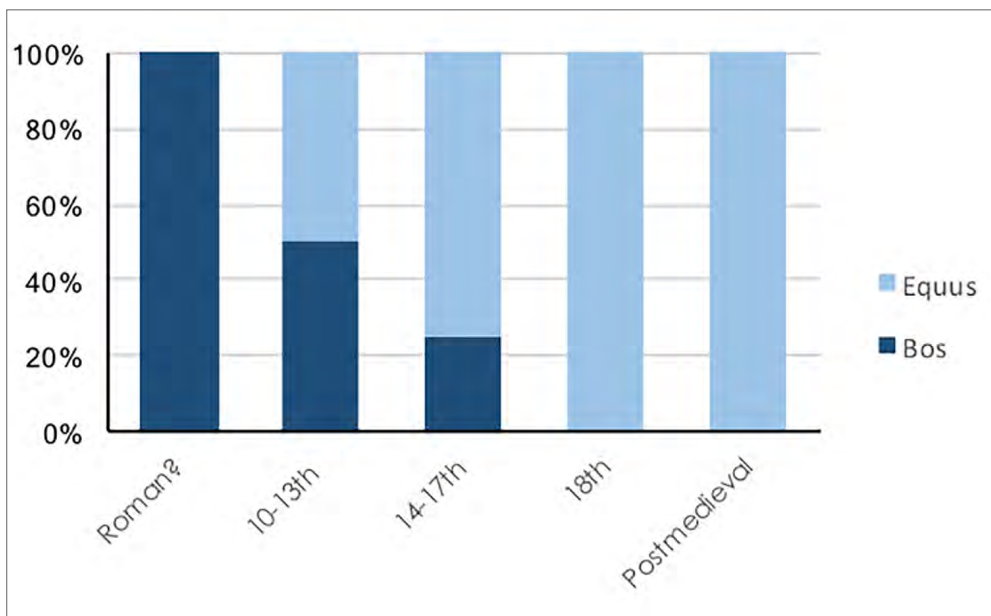


Fig. 5.—Temporal variation on the proportion of cattle and equid bone anvils in Mallorca.

sequence, there is a progressive drop-off of cattle bone anvils over time (fig. 5). Assuming that the bone anvils from *Pollentia* (#1-2) date from the Roman period and the undated artefact from Manacor (#11) is at least post-medieval, it appears that this substitution process between cattle and equid bone anvils begins in the Islamic period (10th-13th c. AD) to end in the 18th c. AD. This downward trend for cattle bones seems to correlate well with the relative importance of the horse against the ox in the agricultural systems of some parts of Europe from the 12th c. AD onwards (Clutton-Brock, 1992). Factors that led to this changeover have been associated to technological innovations introduced in livestock keeping since the early medieval period. These involved not only developments in harnessing, shoeing and breeding, but also refinements in plough and vehicle design (Spruyette, 1983; Langdon, 1984, 1986).

The predominance of horses in medieval traction, however, was by no means a foregone conclusion. As Langdon (1986) pointed out, there were several limiting factors to their use, in particular their expense maintenance and suitability in certain environmental conditions. This is primarily the case of the Balearic Islands where the arid conditions of the soils and terrain hindered to take the horse as the main agent of power traction, at least for the general peasantry. Even so, this does not necessarily prevent to adopt other equids as alternative choices. In the Mediterranean, for example, the use of the donkey and the mule has always been favoured above the horse for their cheaper cost and multipurpose role (Mitchell, 2018). But, when were these equids extensively used for ploughing, harrowing, seeding and other field jobs in western part of the Mediterranean?

In the eastern regions of the Iberian Peninsula, this point in time has been established by documentary evidence in the 16th c. AD (Ardit, 1993), being mules the main animals used for traction by the 17th c. AD (Sales, 1991; Moreno-Claverías, 2000-2001). In other areas such as Sicily, however, the key role played by donkeys and mules in the social and economic development of the island started in earlier medieval times (Dalli, 2005).

In the case of Mallorca, we rely on some documentary evidence to address this issue. When Muslim populations arrived at the island, they brought with them very specific farming systems that combined the intensive irrigation of small areas and an extensive pastoralism of the arid zones (Glick, 1995; Kirchner, 2009). Donkeys and mules featured prominently in intensive crop production, especially as a result of the introduction of irrigation techniques such as *norias* that in Mallorca have been donkey-powered until today (Royle, 2001). In the livestock accounts of that moment the abundance of horses and mules on the island is frequently mentioned as well as it is their high value in the oriental market (Soto and Mas, 2015). It has even been proposed that the central district of Mallorca was specialized in breeding mules at that time (Poveda, 1985). The Christian feudal conquest in 1229 led to a deep rupture with the former land-use pattern by granting greater weight to crops like grains, olive groves, and vineyards (Tello *et al.*, 2018). Throughout the following centuries, the landscape of Mallorca sustained continuous changes towards a capitalist agriculture organized by large olive oil-exportations until the 18th-19th c. AD (Tello

et al., 2018). The role played by donkeys and mules not only was essential in the crushing of the olives through equid-driven millstones, but also in the transportation of the oil from the mountains (where c. 95% of the oil was produced) to the port of Ciutat de Mallorca from which it was exported (Manera, 2001). This increased involvement over time of donkeys and mules in the production and transportation of products possibly triggered the greater availability and therefore frequency of equid bones in the blacksmiths of the island.

In addition, the non-standardized selection of anatomical parts for the manufacture of the bone anvils may have had its origin in the local scale of this craft activity. However, further research on the archaeological context of these bone anvils is needed in order to get a deeper perception of the social and economic implications that the introduction of this technological innovation entailed for the Balearic Islands.

THE ETHNOGRAPHIC EVIDENCE AND THE ROLE OF WOMEN IN THE USE OF BONE ANVILS

Since the goal of any archaeological research is not only the study of the tool, but the human being behind it, it is important to survey any possible source of information that can provide insights on those aspects that leave little, if any, imprint in the material record. From this perspective, ethnographic studies have proved to be crucial in determining the function of many archaeological worked bone artefacts among which are bone anvils (Esteban and Carbonell, 2004; Aguirre *et al.*, 2004; Moreno-García *et al.*, 2005; Anderson *et al.*, 2014). In this case, ethnographic records from the Iberian Peninsula enabled to establish the process of manufacture and use of these tools in the context of blacksmith's workshops. Furthermore, interviews carried out with elderly artisans from northern Portugal allowed to gain some knowledge on the seasonal character of this activity. At the organizational level, it was discovered that making the serrated edge of metal sickles does not require a high skilled process but one for which it is necessary to have good sight. In fact, this task was frequently delegated to young apprentices¹.

Following the long-term research carried out by one of us (MM-G) on this topic, a surprising piece of information that provides evidence of the unnoticed involvement of women in this activity was recently found. It is a photograph taken by Josep Pons Frau in the village of Sineu, Mallorca, published by Llompart *et al.* (1990) in the volume entitled *Mallorca: Photographic and ethnographic images*. This book compiles the photographic record registered by Josep Pons Frau on rural Mallorca and the way of living by its locals in the early 20th century.

1. These interviews were carried out by Marta Moreno-García and Carlos Pimenta (LARC, DGPC, Portugal) in the summer of 2010 in the localities of Vila Chã da Ribeira, Vimioso (Bragança) and Genisio (Miranda do Douro).

In the chapter dedicated to the cutlers it is noted that one of their tasks was to cut the teeth of the sickles (Llompert *et al.*, 1990:172-173) and that this activity was performed by women as shown by the illustrations presented in pages 174 and 175 (fig. 6). In these two pictures one can see a woman sat at a blacksmith bench of similar characteristics to those described in other Iberian localities (Esteban and Carbonell, 2004; Aguirre *et al.*, 2004), using an equid metapodial as an anvil (fig. 6). With her right hand she holds the hammer ready to hit the chisel kept by her left hand and which in turn, is placed on the edge of the blade. In a later work, further details on the identity of this woman were provided (Joanaina Bernat Campins, 1874-1947) as well as interviews with her relatives along with other cutler's artisans of Mallorca that confirmed the task of cutting the teeth of the sickles was performed mainly by women (Ramis, 1992).

As such it is the first and only evidence of women taking part in the manufacture of metal tools we are aware of, attesting to the silent but ubiquitous role women played in past rural societies. From this perspective, it alerts us to the need of keeping an open mind when interpreting the archaeological record in social terms. In self-sufficient societies that lived on the exploitation of agricultural and livestock resources, men and women represented complementary working forces, with learnt skills ready to be used whenever necessary in order to guarantee their survival. After tempering the blade of metal sickles in the local forge, putting in the saw teeth required patience, precision and good sight, all qualities that any member of the community, independently of their sex and age, could have had.

Finally, this testimony confirms that bone anvils fashioned from equids were still used in Mallorca at the beginning of the last century.

IN CONCLUSION

Bone anvils are curious artefacts that remained ignored in the archaeological literature for a long time. Once their function was recognized (Esteban, 2003) their occurrence appears to have been widespread not only geographically but also on a temporal scale. Here, we have reported on the bone anvils found in the island of Mallorca, discussing the prevalence of equid bones in their manufacture and their extended use up until the first decades of the 20th century. However, one more time it has been the ethnographic record to provide evidence for an aspect that up until now was completely invisible: the role played by women in artisanal activities that traditionally have been identify as the work of men. We look forward to find parallels to this situation and encourage colleagues to explore closely local and regional ethnographic and historical sources. We can assure you that the feedback is highly rewarding!



Fig. 6.—A woman making the teeth on a sickle blade by striking the blade with a hammer and chisel.
After Llompart *et al.*, 1990:175.

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REFERENCES

- AGUIRRE, A., ETXEBERRIA, F. and HERRASTI, L. (2004): "El yunque de hueso para afilar la hoz metálica dentada", *Munibe* 56, pp. 113-121.
- ANDERSON, P., RODET-BELARBI, I. and MORENO-GARCÍA, M. (2014): "Sickles with teeth and bone anvils", *Exploring and explaining diversity in agricultural technology* (A. van Gijn, J. Whittaker and P.C. Anderson, eds.), Oxbow Books, pp.118-125.
- ARDIT, M. (1993): *Els homes i la terra del País Valencià (segles XVI-XVIII)*, Ed. Curial, Barcelona.
- BARCELÓ, M. and ROSSELLÓ-BORDOY, G. (1996): *Terrissa. Dades documentals per a l'estudi de la ceràmica mallorquina del segle XV*, Canon, Barcelona.
- BELDIMAN, C., RUSU-BOLINDET, V., SZTANCS, D. M. and BĂDESCU, A. (2014): "Bone Artefacts From Histria", *Materiale și cercetări arheologice (serie nouă)* X, pp. 221-241.
- BULLIET, R. W. (1975): *The Camel and the wheel*, Harvard University Press, Cambridge.
- CLUTTON-BROCK, J. (1992): *Horse power. A history of the horse and donkey in human societies*, Harvard University Press, Cambridge Massachusetts.
- DALLI, C. (2005): "The rise and fall of the donkey: the Central Mediterranean islands", Available at <<https://www.soas.ac.uk/history/conferences/previous/donkey-conference---collected-papers-from-previous-conferences/file98157.pdf>> Accessed 23 March 2018.
- ESTARELLAS, M. M. and MERINO, J. (2006): "Instal·lacions artesanals i industrials a Sa Gerreria de Palma (segles XV-XX)", *I Jornades de Patrimoni Industrial a les Illes Balears*, Fundació Endesa, Palma, pp. 145-152.
- ESTEBAN, M. (2003): "Ossos de ferrer mil·lenaris", *II Congrés d'Història d'Alcanar*, Ajuntament d'Alcanar, pp. 111-120.
- ESTEBAN, M. and CARBONELL, E. (2004): "Saw-toothed sickles and on bone anvils: a medieval technique from Spain", *Antiquity* 78:301, pp. 637-646.
- GLICK, T.F. (1995): *From Muslim Fortress to Christian Castle: social and cultural change in medieval Spain*, Manchester University Press, Manchester.
- GÁL, E. and BARTOSIEWICZ, L. (2012): "A radiocarbon-dated bone anvil from the chora of Metaponte, southern Italy", *Antiquity* 86:331. URL: <http://antiquity.ac.uk/projgall/gal331/>
- GRAU-SOLOGESTOA, I. (2012): "Agriculture and ironwork in the Middle Ages: new evidence of bone anvils in Spain", *Munibe Antropologia-Arkeologia* 63, pp. 305-319.
- GRASSI, E. (2016): "Bone anvils from the city of Sassari (16th-18th centuries AD)", *Close to the bone: current studies in bone technologies* (S. Vitezović, ed.), Institute of Archaeology, Belgrade, pp.133-139.

- KIRCHNER, H. (2009): "Original design, tribal management and modifications in medieval hydraulic systems in the Balearic Islands (Spain)", *World Archaeology* 41:1, pp. 151-168.
- LANGDON, J. (1984): "Horse hauling: a revolution in vehicle transport in the 12th and 13th centuries", *Past and Present* 103, pp. 37-66.
- LANGDON, J. (1986): *Horses, Oxen and technological innovation*, Cambridge University Press, Cambridge.
- LLOMPART, G., MULET, M. J. and RAMIS, A. (1990): *Mallorca, imatge fotogràfica i etnogràfica: l'arxiu de Josep Pons Frau*, Ajuntament de Palma, Palma.
- MANERA, C. (2001): *Història ecològica a les Balears. Estudis sobre l'energia, economia i medi ambient*, Lleonard Muntaner, Palma.
- MICOL, A. and SALAS, M. (2012): "Seguiment arqueològic en el centre de Manacor. Evidències de la trama urbana des d'època islàmica", *IV Jornades d'Arqueologia de les Illes Balears (Eivissa, 1 i 2 d'octubre, 2010)* (M. Riera, ed.), Arqueologia i Cultura SL, Vessants, Eivissa. pp 187-191.
- MITCHELL, P. (2018): *The donkey in human history: an archaeological perspective*, Oxford University Press, Oxford.
- MORENO-CLAVERÍAS, B. (2000-2001): "La ramaderia, el bestiar de treball i de transport en les economies familiars pageses. El Penedès (1670-1690)", *Estudis d'Història Agrària* 14, pp. 141-147.
- MORENO-GARCÍA, M., ESTEBAN NADAL, M., PIMENTA, C. M., LÓPEZ GILA, M. D. and MORALES MUÑIZ, A. (2004): "Los yunques en hueso en la Península Ibérica: estado de la cuestión", *Actas do IV Congresso de Arqueologia Peninsular* (N. Ferreira Bicho, ed.), Universidade do Algarve, Faro, pp. 247-262.
- MORENO-GARCÍA, M., PIMENTA, C. M. and RUAS, J. P. (2005): "Safras em osso para picar foichinas de gume serrilhado ... a sua longa história!", *Revista Portuguesa de Arqueologia* 8, pp. 571-627.
- MORENO-GARCÍA, M., PIMENTA, C. M., GONÇALVES, M. J. and PIRES, A. (2006): "Evidência arqueozoológica de um ofício num Arrabalde da Silves islâmica: ossos, foices e ferreiros", *III Encontro de Arqueologia do Algarve. Museu Municipal de Arqueologia. Câmara Municipal de Silves, Silves, 20-22 Outubro de 2005*, pp. 299-310.
- MORENO-GARCÍA, M., PIMENTA, C. M., LÓPEZ, P. and PAJUELO, A. (2007): "The signature of a blacksmith on a dromedary bone from Islamic Seville (Spain)", *Archaeofauna* 16, pp. 193-202.
- MUNAR, S. and CARDONA, F. (2012): "Resultats preliminars de la intervenció arqueològica realitzada a l'edifici del carrer Sant Miquel n. 10-12 (Palma de Mallorca), Estudi antropològic de dos enterraments romans", *IV Jornades d'Arqueologia de les Illes Balears* (M. Riera, ed.), Arqueologia i Cultura SL, Vessants, Eivissa, pp. 105-114.
- ORFILA, M. (ed.) (2000): *El fòrum de Pollentia: memòria de les campanyes d'excavacions realitzades entre els anys 1996 i 1999*, Ayuntamiento de Alcúdia, Alcúdia.
- POVEDA, À. (1985): "Algunes hipòtesis sobre l'economia agrària del juz' de Jijnû-Bytra a Mayûrqa segons la toponímia àrab i berber", *Estudi General* 5, pp. 265-273.
- RAMIS, A. (1992): *Els trinxeters de Mallorca, Estudi etnològic*, Govern Balear, Palma de Mallorca.
- RIERA, M., ORFILA, M. and CAU, M. A. (1999): "Els últims segles de Pollentia", *Bolletí de la Societat Arqueològica Lul·liana* 55, pp. 335-346.
- RIERA, M., JOFRE, C. and JUNCOSA, E. (2011): "Un conjunt ceràmic del segle XV del Palau de Can Oleo de Palma de Mallorca (Illes Balears)", *Actes del IV Congrés d'Arqueologia Medieval i Moderna a Catalunya*, vol. 1, Ajuntament de Tarragona, Tarragona, pp. 571-585.
- RIVAS, M. J. (2010): *Memoria final de la intervenció preventiva mediante excavación arqueològica en Can Serra (Plaça Quadrado, Carrer Gerreria i Bosc, Palma, Islas Baleares)*, Consell Insular de Mallorca, Unpublished technical report.
- PIMENTA, C. M. (2007): "Des aiguisoirs/polissoirs aux enclumes en os: l'historiographie des os piquetés", *Archéologie Médiévale* 37, pp. 157-167.
- ROYLE, S. (2001): *A geography of islands.*, Routledge, London.

- SALES, N. (1991): *Mules, ramblers i fires (s. XVIII-XIX)*, Centre de Lectura, Reus.
- SCHMID, E. (1972): *Atlas of animal bones for prehistorians, archaeologists and quaternary geologists*, Elsevier Publishing Company, New York.
- SOTO, R. and MAS, A. (2015): "Feudal colonisation and socio-ecological transition in Mayûrqa (Muslim Majorca) in the thirteenth century", *Continuity and Change* 30:3, pp. 341-366.
- SPRUYETTE, J. (1983): *Early Harness Systems: Experimental Studies: A contribution to the History of the Horse*, Hyperion Books.
- TARRADELL, M., ARRIBAS, A. and ROSSELLÓ-BORDOY, G. (1978): *Historia de Alcúdia: Prehistoria y Antigüedad*, Ayuntamiento de Alcúdia, Alcúdia.
- TELLO, E., JOVER, G., MURRAY, I., FULLANA, O. and SOTO, R. (2018): From feudal colonization to agrarian capitalism in Mallorca: Peasant endurance under the rise and fall of large estates (1229-1900), *Journal of agrarian change* 18:3, pp. 483-516.
- TORRES, F. (2005): *Memòria de la intervenció arqueològica del carrer de Sant Domingo, 10*, Consell Insular de Mallorca, unpublished technical report.
- VALENZUELA, A., CAU, M. Á. and LEÓN, M. J. (2017): "Broadening the Scope of Bone Anvils: Direct AMS 14 C Dating from the Island of Menorca (Western Mediterranean)", *Radiocarbon* 59:1, pp. 61-67.
- VUKOVIĆ-BOGDANOVIĆ, S. and BOGDANOVIĆ, I. (2016): "Late Roman Bone Anvils From Viminacium", *Close to the bone: current studies in bone technologies* (S. Vitezović, ed.), Institute of Archaeology, Belgrade, pp. 66-70.