Close to the bone: current studies in bone technologies

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INTRODUCTION

Studies of worked osseous materials were neglected for a long time, but in the past two decades they are on the rise. In recent years, numerous methodological and theoretical innovations were introduced and the quantity and quality of publications increased, including numerous individual articles, PhD thesis, monographs. Particularly important were several conferences and thematic sessions held in Europe, North America and Asia, devoted to the problems of worked bone. As a result, several edited volumes appeared, with high quality and diverse papers – for example, those edited by H. Luik et al. (2005), Ch. Gates-St-Pierre and R. Walker (2007), A. Legrand-Pineau & I. Sidéra et al. (2010), J. Baron and B. Kufel-Diakowska (2011), F. Lang (2013), A. Choyke and S. O'Connor (2013), Mărgărit et al 2014, to mention just a few.

Osseous materials began to be recognized as an important part of the archaeological finds first by the French school, and the most important theoretical and methodological work was done by French researchers. The most significant was the work by H. Camps-Fabrer, who initiated a large research program on bone industry, *La Commission de Nomenclature sure l'Industrie de l'Os Prehistorique*, later continued by other researchers. Work organized by M. Patou-Mathis on the *industrie osseuse peu élaboré* should also be mentioned. However, the most important role in spreading and promoting the research on bone artefacts and its importance in the past few decades has been that of the Worked bone research group (WBRG), formed almost 30 years ago, and one of the official working groups of the International Council for Archaeozoology (ICAZ) since 2000. The main role of the WBRG is to improve communication between individuals studying worked animal hard tissues (especially bone, antler, and ivory) with a special emphasis on archaeological finds. A broad diachronic and multi-disciplinary approach is emphasized in order to promote the exchange of ideas concerning attitudes towards and procurement of raw materials, technology, and cognitive aspects of bone working.

Since the first meeting, held in London in 1997, eight other meetings took place and in 2014 Belgrade was the host of the jubilee 10th Meeting of the WBRG (for more information, see www.wbrg.net).

Over sixty oral and poster presentations were held during the five conference days, contributed by 100 authors. Thirty-nine papers were selected for this volume, and I. Riddler, the organiser of the very first meeting in London, also contributed a paper with N. Trzaska-Nartowski.

Selected papers encompass the wide chronological and geographical range – from the Mesolithic period to the 18th century AD, from South America to the Eurasia and South Africa. Selected case studies do not simply present interesting archaeological material, but they also cover a wide range of topics – methodological issues, in particular traceological investigations, reconstructions of technological procedures, problems related to the interpretation of functions, problems of the identification of workshops, and also symbolic use of osseous raw materials in both prehistoric and historic times. Papers are organised by alphabetical order, since the topics overlap and it was not possible to create distinctive thematic groups.

Such a variety in topics, as well as an increasing number of researchers focusing on studies of osseous raw materials, clearly shows that these studies have an important potential to contribute to the more general archaeological studies. Osseous artefacts are no longer disregarded, but are slowly gaining more and more space and are slowly taking place alongside with lithic industries and other classes of raw materials. However, there is still much work to be done, and bone tool studies still have to show all the potential they have.

Last but not least, I would like to thank all the people who helped during the conference and afterwards, during the preparation of the book. Special thanks to all the colleagues from the Institute of Archaeology and to all the colleagues and staff from the National museum in Belgrade, which generously offered the room for the conference and also helped with the lovely post-conference excursion to the Lepenski Vir. I would also like to thank for the hospitality to Dragan Janković, curator of the City museum, who welcomed us at the site of Vinča-Belo Brdo, and to dr Mira Ružić, who welcomed us at the Archaeological collection of the Faculty of Philosophy.

Finally, special thanks to the reviewers, who helped to enhance the scientific value of this volume.

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Selena Vitezović

LATE ROMAN BONE ANVILS FROM VIMINACIUM

Sonja Vuković – Bogdanović
Ivan Bogdanović

Abstract: Among faunal material from the Roman city of Viminacium, two peculiarly marked cattle bones, a mandible and a distal metatarsal bone, were noted. The surfaces of the bones were covered with regular rows of triangular marks – a characteristic use wear marks which, according to recent ethnographic studies, identify bones used as anvils to create teeth on blades of iron sickles. Based on the context of the find it was possible to date both finds back to the late Roman period, i.e. to the 4th century AD. It is notable that a large number of known bone anvils date back from the Middle ages to the modern times and that they are mostly found in the western Mediterranean region. As the Roman period bone anvils were only recorded in the north-western coast of the Black sea, and there is a single find in Southern Italy, specimens from Viminacium certainly complement these finds in Europe. In this paper we will discuss the process of making and utilizing Viminacium bone anvils: from the butchers' to the blacksmiths'.

Apstrakt: Među faunalnim nalazima iz rimskog grada Viminacijuma, pronađene su i dve neobične kosti govečeta – mandibula i distalna metatarzalna kost. Površine kostiju pokrivene su tragovima u obliku pravilnih trouglastih redova, što je karakterističan trag upotrebe koji je, prema recentnim etnografskim studijama, identifikovan kao trag koji ostavljaju zupci sečiva gvozdenih srpova. Na osnovu konteksta nalaza, bilo je moguće datovati ih u kasnoantički period, tačnije u 4. vek nove ere. Treba napomenuti da veliki broj poznatih koštanih nakovanja potiče iz perioda od srednjeg veka do modernog doba i da su uglavnom pronađeni u zapadnom Mediteranu. Budući da su nakovnji iz rimske epohe dokumentovani samo na severozapadnoj obali Crnog mora, i da postoji samo jedan nalaz iz južne Italije, primerci sa Viminacijuma doprinose proučavanju ovakvih nalaza u Evropi. U ovom radu raspravljaće se i o procesu izrade i upotrebe koštanih nakovanja sa Viminacijuma - od kasapnice do kovačnice.

INTRODUCTION

This paper is devoted to two bone anvils which were discovered during the recent excavation of the Viminacium amphitheatre. Finds of bone anvils are very important, as they summarize our knowledge on bone working, metallurgy and agriculture. The function of similar bones in the past gave rise to different misled interpretations, from the assumption that they were tools for polishing wood and stone (Semenov 1964), to those about the unknown Getic writing system (Boroneanţ 2005). However, recent ethnographic studies that were initially made by M. Esteban Nadal (2003), and later by other authors, too (Esteban-Nadal and Carbonell Roure 2004, Aguirre et al. 2004) resolved the function of those tools. They identified them as anvils that were used as a base for manufacturing saw-teeth on blades of iron sickles by hammer and chisel.

The earliest appearance of bone anvils is related to the Hellenistic period and comes from the site of Olbia in Ukraine and from Greco-Scythian sites Neapolis and Thanagoria (Semenov 1964: 186) and also from Getic settlements (Arnăut 2007). Along with Viminacium there are only few sites from Roman period with reported bone anvils. In the city of Histria (Romania) within the 2nd–3rd century AD deposits, 40 specimens of bone anvils were discovered (Beldiman et al. 2011b), while 4 bone anvils were found during the excavations of the site Ostrov-Durostorum (Romania) (Beldiman et al. 2011a). At the site of Chitila (Romania), that is related to Getic autochthonous population, 13 anvils were discovered (Beldiman et al. 2011b, Boroneanţ 2005). There is also a single find of a bone anvil from the site of Pantanello (Gál 2010: 9) in Sothern Italy, which has been dated between the early 2nd century BC to the beginning of the 1st century AD (Gál and Bartosiewicz 2012).Within the western Mediterranean region (Iberian peninsula, France, North Africa) numerous finds of bone anvils have been detected, dating back from the 5th to the 20th century AD (Grau-Sologestoa 2012, Poplin 2007, Poplin 2013, Rodet-Belarbi et al. 2007 and references therein). Bone anvils were also found in early medieval deposits in Hungary (Gál et al. 2010).

The appearance of anvils and specific use wear marks did not change through all these periods. The majority of anvils were made of ungulate long bones, usually metapodials, but there are also examples of usage of other bones, such as mandibles (Grau-Sologestoa 2012) or even red deer antlers (Beldiman et al. 2011a). Metapodial shafts were usually first flattened by file before usage and then smoothed. In the course of serration, the blacksmith would move the sickle on the anvil (*figs. 5, 6*). Once a bone was covered with rows of dents, it could be flattened and smoothed again, in order to be reused.

ARCHAEOLOGICAL BACKGROUND OF VIMINACIUM FINDS

Viminacium is located near Kostolac in Eastern Serbia, on the right bank of the Mlava River, close to its confluence with the Danube River (*fig. 1*). Initially it was a legionary fortress. Along the fortress, which was built

Fig. 1: The location of Viminacium.

during the 1st century AD, a city developed. Viminacium was the capital of the province of *Moesia Superior*, while in the late Roman period it was the capital of the province of *Moesia Prima*(Mirković 1968: 56–73, Поповић 1968).

Bone anvils were discovered within the Viminacium amphitheatre, which was situated in the north-eastern corner of the ancient city area, approximately 50 m away from the north-western corner of the legionary fortress (*fig. 2*). Based on previous archaeological excavations, it can be assumed that the amphitheatre was built at the beginning of the 2nd century AD and that it was used until the end of the 3rd or early 4th century AD (Nikolić and Bogdanović 2012). Both anvils belong to the layer that dates back to the middle and second half of the 4th century AD. At that time, the amphitheatre was abandoned, buried and not in use anymore, while in the late 4th century AD, a necropolis was set in this area (Nikolić and Bogdanović 2012: 44, Vuković and Bogdanović 2013: 254–255).

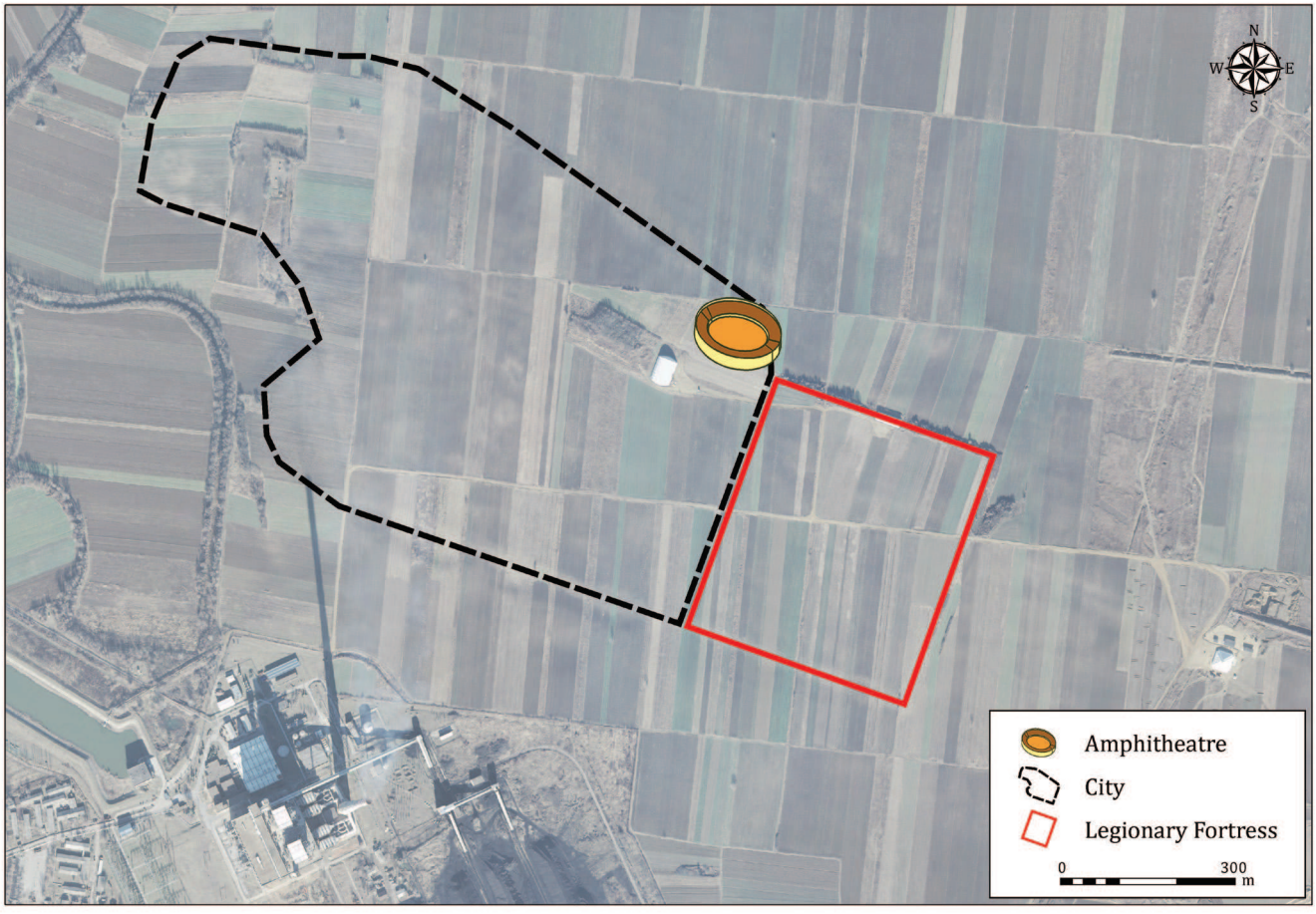

Fig. 2: Viminacium, the location of the amphitheatre.

VIMINACIUM BONE ANVILS

The first anvil represents an almost complete horizontal beam of a right cattle mandible (*fig. 3*). It is 222 mm long and 87 mm wide. On both outer and inner flats there are ca. 40 rows of small marks in the shape of triangles with V-shaped cross section. The length of the base of triangular marks is 1.5–2mm and the length of rows varies between 8 and 28 mm. The majority of the rows run parallel to each other, while there are some that cross and run in various directions. The basal rim of this mandible in one of its part is smoothed down.

The second anvil was made of a distal cattle metatarsus (*fig. 4*) and its preserved length is 114 mm, while it is 35 mm wide. The tool is not complete: on the proximal part there is an old breakage, while the lateral condylus was broken in the course of excavations. The anterior and posterior sides of the diaphysis of this metatarsal bone had been whittled down and smoothed prior to its usage. On both the anterior and posterior sides there are rows of triangle dents with V-shaped cross section: 6 on the anterior and 12 on the posterior side. The dents are 1.5–2 mm long, and the rows are ca. 20 mm in length and they follow the entire width of the bone. There are rows which are mutually parallel, but there are also the ones that cross others. Shallow differently oriented scratches that vary in size have also been noted on both wider sides of this bone. Those marks sometimes run over the incisions, while sometimes incisions also run over them.

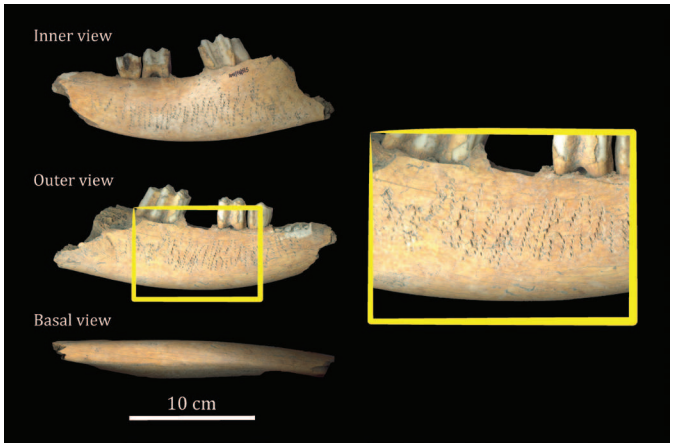

Fig. 3: The Viminacium bone anvil made of a right cattle mandibule.

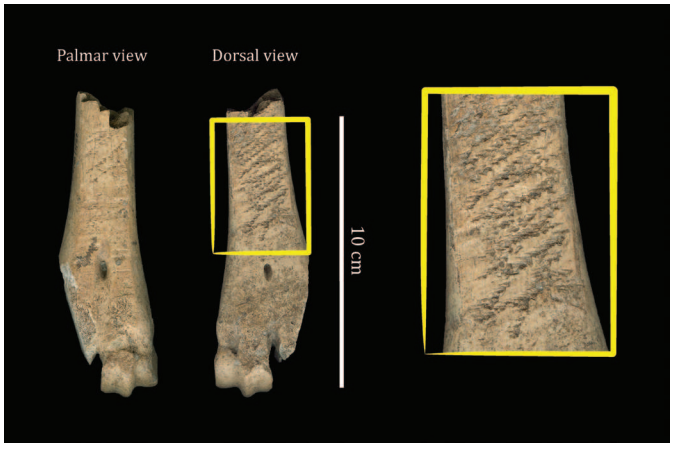

Fig. 4: The Viminacium bone anvil made of a distal cattle metatarsus.

DISCUSSION

The two bones from Viminacium that were used as anvils have different features (*figs. 3, 4*). While the metatarsal bone had been flattened prior to its usage, the mandible outer and inner sides had not been previously prepared. This is probably due to the fact that the mandible has more or less flat sides in contrast to the metatarsus which has a convex shaft. The smoothed part of the mandible basal rim represents either use wear marks left by the blacksmith's grip on the anvil while working, or traces of bone smoothing for the purpose of easier maintenance of the anvil. Both anvils had two active sides. Rows of triangular dents that run across both sides of those bones represent typical use wear marks for bone anvils formed during shaping of sickle teeth (*figs. 5, 6*). Scratches on metatarsal diaphysis that run across and beneath the rows of dents indicate that this anvil was smoothed down again and reused. Since intensive reusing of anvils during reshaping usually produces breaking of the shaft of the bone (Beldiman et al. 2011b: 180) we suggest that this anvil could have been broken in the course of its usage. The metatarsal anvil represents a typical tool of its kind that suggests specialization of the blacksmith.

Metapodial bones were the most frequent raw material used for making bone anvils in Roman times, as well as in other periods. The Pantanello anvil (Gál 2010: 9) was also made of cattle metapodial and majority of bone anvils from the Roman sites in Romania (Beldiman et al.

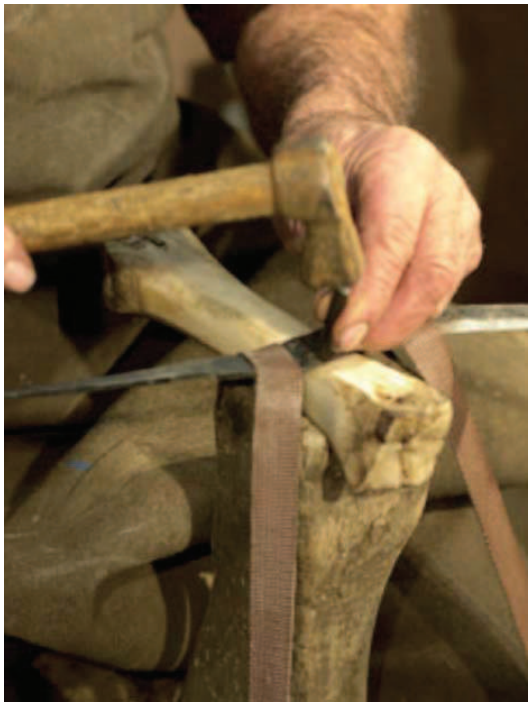

Fig. 5: Blacksmith pinking the sickle using a bone anvil, after Esteban-Nadal & Carbonell Roure (2004: fig. 12).

Fig. 6: Detail of the process of cutting teeth into a sickle. It is clearly visible how each tooth corresponds to a V-shaped indentation on the bone anvil, after Esteban-Nadal & Carbonell Roure (2004: fig. 13).

Fig. 7: Depiction of Roman soldiers during reaping of cereals on Trajan`s Column in Rome (Scene CX), after Coarelli (1999: Tav. 133).

2011b) were made of cattle metapodials, too. Mandibles were used as anvils less frequently and similar anvils made of this bone are known from medieval sites in France, Portugal and Marocco (Grau-Sologestoa 2012). Mandibles and metapodial bones usually fall within primary butchery waste (O'Connor 1993), so there is a possibility that they were intentionally segregated at this stage of butchery to be used in blacksmiths workshops as anvils.

CONCLUSION

The discovery of the bone anvils from Viminacium is a unique finding within the territory of Central Balkans. These tools are not well known among archaeologists and we argue that there are probably more anvils hidden in the faunal material of other Roman and late Roman sites across Europe. As bone anvils were used during shaping serrated teeth of iron sickles, they are an indirect proof of the existence of these agricultural tools mentioned by Columella (*De re rustica* II.20.3, Poplin 2013b). Sickles (*falx messoria*) of different types (White 1967: 72–85, 205–210) have been found on numerous localities throughout the Roman Empire, as well as within the provinces on the territory of Serbia (Поповић 1988: 82–86, Чолаков 2010: 51–56). According to ancient written sources (Varro, *De re rustica* I.49–50,Columella, *De re rustica* II.20), depictions on Roman monuments (Поповић 1988: 83, White 1967: 84–85) and ethnographic data (Esteban-Nadal 2003), it is known that sickles were mostly utilized by soldiers and civilians in the reaping of cereals (*fig. 7*).

Viminacium is located in the fertile plains of Stig, where Roman agricultural activities have been attested (Spasić-Đurić 2009: 44–45, Ilić 2012: 14–15, Живановић 2013: 24–25). Several late Roman *villae rusticae* that represent a key for landownership and agricultural production have already been archaeologically confirmed in the vicinity of this city (Jovičić 2011: 30–43, 60–67, Jovičić 2012). Tools and other finds related to agriculture have been discovered in Viminacium area, as well within other Late Roman sites in Serbia (Поповић 1988, Живановић 2013: 57–83, Ilić 2012). The finds of bone anvils certainly complement the picture of developed agriculture in this region. Their presence also suggests the existence of blacksmith workshops, which have not yet been discovered in the area of Viminacium.

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