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# FROM THESE BARE BONES

Raw materials and the study of worked osseous objects

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edited by

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## CHAPTER 7

# Osseous Raw Materials in the Vinča Culture

*Selena Vitezović*

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This paper will focus on the analysis of raw and worked osseous materials from several Vinča Culture (Late Neolithic and Chalcolithic) sites from the Central Balkans including the methods of acquiring of raw materials and managing available raw materials for certain types of objects. Variability in the presence of red deer and roe deer antlers suggest that they were probably not collected and worked on every site, raising possibilities that an exchange system for raw materials existed between clustered sites. The existence of such a system suggests differences in economic organization on Vinča Culture sites. The preferences for certain skeletal parts for manufacturing specific objects suggest a high level of technological skills, but also probable symbolic values attributed to certain raw materials.

### *Keywords*

Vinča culture; Late Neolithic; Central Balkans; osseous raw materials.

### **Introduction**

The first exploration of the Vinča Culture began over hundred years ago with excavations on the eponymous site of Vinča – Belo Brdo in the vicinity of Belgrade. Today, hundreds of Vinča Culture sites are known in Serbia alone. Figure 7.1 shows the sites specifically mentioned in the text. Its territory also encompassed eastern parts of modern Croatia and Bosnia on the west and the regions of Oltenia and Transylvania in the east (Garašanin 1979, Srejović 1989).

Beside the large number of sites, often with thick cultural layers and remains of burnt wattle and daub houses, the Vinča Culture is characterized by a very rich and diverse material culture. Ceramic production is especially rich and includes a variety of high quality bowls, pots and cups, anthropomorphic as well as zoomorphic figurines and altars. The flint and ground stone industry also suggest intensive

production and high craft skills. There is also evidence for trade in obsidian and for copper metallurgy.

Then latest absolute dates obtained for Vinča Culture sites fall roughly into the period between 5400 and 4500/4450 cal BC. For Divostin, dates obtained at the Oxford Laboratory lie between 4750–4550 cal. BC and for Vinča-Belo Brdo they cover the period from 5300 to 4500 cal. BC (Borić 2009).

Studies of technology and the economy in general for Vinča Culture sites and materials are not numerous. Apart from the stone industry (Antonović 1992, 2003), little is known about the organization of raw material procurement, organization of production, or use of objects. So far, it has been claimed that craft specialization did not exist in the Vinča Culture as separate workshops and specialized tool-kits have not been encountered (Chapman 1981, 118). However, many questions regarding the economy in the Vinča Culture still need to be explored.

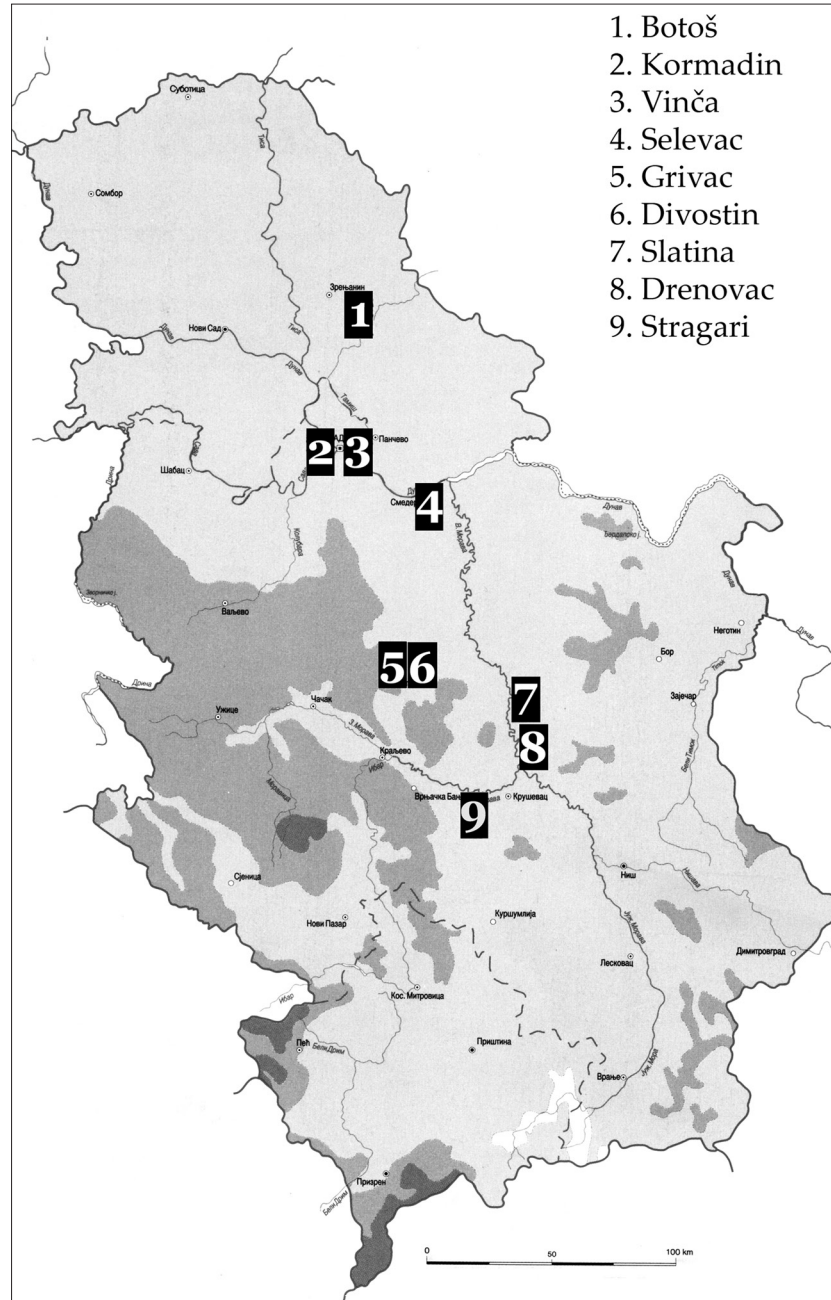


Figure 7.1 Map of Neolithic sites in Serbia mentioned in the text.

### Bone industries from Vinča sites

The bone industry of the Vinča Culture is among the least known segments of its technology. The faunal remains were not carefully collected on older excavations and assemblages of bone objects were published only as short reports or just mentioned in excavation reports; the only work that gave an overall picture on the bone industry in the Neolithic is one written by Bačkalov (1979). Faunal analyses are also rare and restricted to reports on individual sites. As a general trend in

the Vinča culture, there is to be a dominance of domestic fauna on most sites, mainly cattle (*Bos taurus*), with caprines and pigs (*Sus dom.*) in second and third place respectively. However, it seems that on some sites such as Petnica or Opovo, hunting activities were significant. Among wild species, red deer (*Cervus elaphus*) and aurochs (*Bos primigenius*) are followed by wild pigs (*Sus scrofa*), roe deer (*Capreolus capreolus*) and other small game (cf. Greenfield 1986; Bökönyi 1988; Lazić 1989; Legge 1990; Russell 1993).

In this paper data from several settlement sites and also from one of the two known cemeteries will be analyzed (Fig. 7.1). The data on bone tool assemblages from Vinča and Selevac are taken from publications while the partially published data for Divostin were supplemented with the data obtained after the revision, carried out by the author, on material kept today at the National Museum in Kragujevac. All the remaining assemblages were analyzed by the author

(some of them are still unpublished). The difference in the quality of the assemblages is mainly due to different methods of excavation, which consequently lead to uneven quality in the data. Osseous materials are taken in their widest sense (Averbouh 2000, 187; Poplin 2004, 11), thus, encompassing all the animal hard tissue used for making objects i.e. vertebrate bones and teeth, Cervidae antlers, as well as mollusc and turtle shells (Table 7.1).

Table 7.1 The use of various skeletal elements from different species as raw materials.

SITE	LONG BONES	RIBS	OTHER BONES	ANTLERS	TEETH	MOLLUSC
Jakovo – Kormadin						
Large mam.	1	3	–	–	–	–
Medium mam.	3	2	–	–	–	–
Indet. Mam.	7	2	5	–	–	–
<i>Ovis/capra</i>	4	–	–	–	–	–
<i>Sus</i>	–	–	–	–	1	–
<i>Cervus elephus</i>	–	–	–	54	–	–
Cattle	–	–	1	–	–	–
Total	15	7	6	54	1	0
Divostin						
Large mam.	–	1	–	–	–	–
Medium mam.	16	–	–	–	–	–
Indet. Mam.	18	10	5	–	–	–
<i>Ovis/capra</i>	4	–	4	–	–	–
<i>Sus</i>	–	–	–	–	2	–
<i>Cervus elephus</i>	5	–	–	54	–	–
<i>Capreolus</i>	–	–	–	2	–	–
Cattle	–	–	1	–	–	–
Total	43	11	10	56	2	3
Grivac						
Large mam.	3	9	–	–	–	–
Medium mam.	9	3	–	–	–	–
Indet. Mam.	9	–	2	–	–	–
<i>Ovis/capra</i>	–	–	–	–	–	–
<i>Sus</i>	–	–	–	–	2	–
<i>Cervus elephus</i>	–	–	–	5	–	–
<i>Capreolus</i>	2	–	–	–	–	–
Cattle	–	–	1	–	–	–
Total	23	12	3	5	2	0
Slatina–Paraćin						
Large mam.	5	23	3	–	–	–
Medium mam.	8	10	–	–	–	–
Indet. Mam.	9	26	15	–	1	–
<i>Ovis/capra</i>	2	–	–	–	–	–
<i>Sus</i>	–	–	–	–	–	–
<i>Cervus elephus</i>	–	–	–	17	–	–
<i>Capreolus</i>	–	–	–	2	–	–
Total	24	59	18	19	1	0
Drenovac						
Large mam.	1	17	–	–	–	–
Medium mam.	28	26	–	–	–	–
Indet. Mam.	48	78	51	–	1	–
<i>Ovis/capra</i>	10	–	–	–	–	–
<i>Sus</i>	–	–	–	–	4	–
<i>Cervus elephus</i>	–	–	–	48	–	–
<i>Capreolus</i>	1	–	–	6	–	–
Cattle	2	–	–	–	–	–
Total	90	121	51	52	5	3
Stragari						
Large mam.	–	3	1	–	–	–
Medium mam.	1	4	–	–	–	–
Indet. Mam.	5	5	2	–	1	–
<i>Ovis/capra</i>	–	–	–	–	–	–
<i>Sus</i>	–	–	–	–	–	–
<i>Cervus elephus</i>	1	–	–	11	–	–
<i>Capreolus</i>	–	–	–	2	–	–
Total	7	12	3	13	1	0

### Settlements

#### VINČA – BELO BRDO

Vinča – Belo Brdo is the eponymous site for the Vinča culture, situated in the vicinity of Belgrade, 14 km to the south-east, on the right bank of the Danube River. It was first excavated in the early 20th century, from 1908 and in the 1930s. New excavations were carried out in 1978–1981, continued in 1999 and are still in progress.

During M. Vasić's excavations, approximately 1000 objects made of different osseous materials (bone, antler, teeth and mollusc shells) came to light. However, this extraordinary collection was only partially published (Vasić 1936, 157–166; Srejšević and Jovanović 1959; Bačkalov 1979). The number of objects from new excavations is unknown and so far only some shell ornaments have been published (Dimitrijević and Tripković 2002)

Among bone objects, metapodials and ribs from caprine-size animals seem to be the most numerous, used to manufacture a variety of pointed tools, mostly awls. Red deer antlers were also present in large quantities and used to produce a number of different objects – hooks, biserial, uniserial and toggle harpoons, hammers, and various intermediary pieces. Shell objects were also very numerous and the presence of at least three different species of mollusc can be confirmed – *Dentalium*, *Spondylus* and *Glycimeris* used to make beads, bracelets, buttons and other decorative items. Of the objects made from teeth, only several decorative plaques and pendants from boar's tusk can be mentioned. It is not known whether teeth were used to make tools as well.

The variety of objects and sheer number of them shows that the osseous tool and ornament industries were very important at Vinča settlement and also that this site was an important centre on trade routes as, so far, it has richest collection of shell ornaments of any Vinča Culture site known.

#### JAKOVO – KORMADIN

The site of Jakovo Kormadin is situated in Srem, in the vicinity of Belgrade near the modern village of Jakovo. The first excavations were carried out at the beginning of the 20th century, and smaller rescue excavations took place in 1956–1958, when two houses with bucrania were discovered (Jovanović and Glišić 1961). In 2006, several small trenches were excavated and during this campaign about 80 worked pieces of bone and antler were discovered.

This assemblage contained objects made from bones, antler, and one made from boar's tusk. Different skeletal elements, mainly long bones and ribs from medium-sized mammals, were used to make diverse pointed tools. Antlers were exclusively from red deer and were used to manufacture points, picks, axes, punches and intermediary pieces for inserting other tools (sleeves and hafts) (Fig. 7.2). One antler spatula and one wedge also came to light (Vitezović 2010).

Of particular interest was a find of a dozen pieces of antler with traces of working, probably waste, and also approximately

two dozen antler flakes, probably waste as well. Unfortunately, traces from tools were not preserved due to depositional erosion of surfaces. They were found in a semi-subterranean feature so it seems this find represents a workshop area or place where rubbish from such an antler workshop was discarded. Although the presence of workshops or working areas was expected and they are assumed to exist at each Vinča Culture site, this was the first time that one was actually confirmed.

#### SELEVAC

The site of Selevac is situated in the valley of the Velika Morava River in central Serbia, approximately 20 km south from its confluence with the Danube. The modern village of Selevac lies between the towns of Smederevska Palanka and Smederevo and the neolithic settlement was situated about 5 km to the east, on the banks of the Vrbica stream. This settlement was one of the largest Vinča settlements ever discovered, covering an area of almost 53 ha. The cultural layer was 1.5 m thick although sometimes it exceeded 3 m. It was first registered in the 1960s and the first small excavations took place in 1968–1970 and 1973. A larger area was excavated as part of the Selevac Archaeological

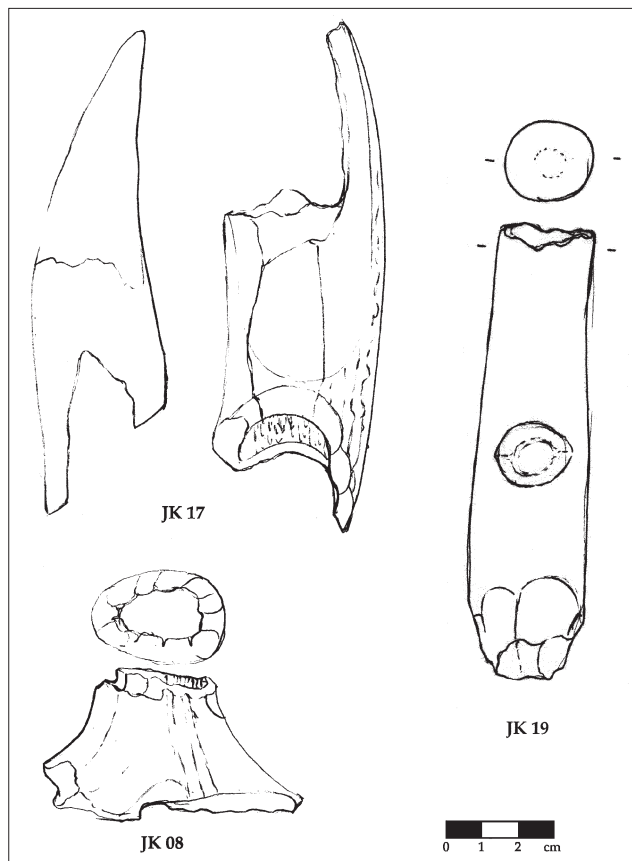


Figure 7.2 Antler artefacts from Jakovo: fragmented axe JK 17, handle JK 08 and fragmented pick JK 19.



Project during the period between 1976–1981. (Tringham and Krstić 1990)

Over 1000 bone objects were recovered (1032 in total). Various points represent the dominant class of osseous find material. These points were made from ribs, metapodials, ulnas and other long bones, but also from pig's tusks. Other objects included knives, choppers, burnishers, spatulae, pressure flakers, digging, pressure flakers, decorative items, and also probable preforms and production waste. Apart from different long bones and ribs, astragali, red deer antler and pig's tusks were worked while even segments of cranium, two maxillas and four turtle shells were used. There is no mention of the use of molluscs as a raw material. The percentages of various raw materials are unknown; bone was the dominant material with a small number of worked pig tusk was found. The proportion of red deer antler is unknown. (Russell 1990)

Among the faunal remains, cattle bone (*Bos taurus*) predominates in all horizons and its importance increased over time. Sheep (*Ovis aries*), goat (*Capra hircus*) and domestic pig (*Sus domesticus*) were also present in differing percentages in different building horizons. Red deer was also present and roe deer (*Capreolus capreolus*) in small numbers; both cervid species decline throughout the Selevac sequence (Legge 1990).

#### DIVOSTIN

Divostin is situated near the modern town of Kragujevac in the valley of the Velika Morava River in central Serbia. It was excavated in the 1967–1969 in a joint Yugoslav-American campaign. A large area was excavated with a total of approximately 200 m<sup>2</sup>. The site had layers from Vinča and Starčevo culture, with excellently preserved remains of buildings. A rich portable material culture was also discovered including pottery, figurines, stone, flint, antler and bone tools, shell ornaments and even copper objects (McPherron and Srejović 1988).

Approximately 100 bone objects were recovered from Vinča culture layers. Both flat and long bones were used to manufacture a variety of pointed objects. Several worked astragali were found. Red deer antler pieces were more numerous and were used in the production of different pointed tools, picks, hammers and chisels (Fig. 7.3). Apart from objects made from tines, there was a diversity of artefacts made from the basal and beam segments of the red deer antler rack. Several axes from very large antler racks (Bačkalov 1979), are particularly noteworthy. A number of shell ornaments were also mentioned (McPherron *et al.* 1988).

Domestic animals predominated among the faunal remains (85% domestic and 15% wild) in Vinča layers. Among domestic animals, the most numerous were remains of *Bos taurus* comprising over 70% of all remains, followed by caprine and domestic pig remains (approx. 12% respectively). Among the wild animals, remains of aurochs (*Bos primigenius*) were most numerous (almost 40% of wild fauna, 6% total) followed by wild pig (30%, 5% total) and red deer (25%, 4% total).

Roe deer was only found in small numbers (less than 3% of wild fauna). (Bökönyi 1988).

#### GRIVAC

The site of Grivac is situated 20 km from Kragujevac, on the banks of the Grivac stream. Divostin is situated nearby as well as several other neolithic sites. Grivac has been excavated since the 1950s in several campaigns. A large settlement of the Vinča Culture was discovered there, with four building horizons and also three building horizons of the Starčevo Culture. The site yielded well preserved architectural remains, large quantities of pottery and also a very rich stone industry (Bogdanović 2008). In fact, it was suggested that there had been a large workshop for stone objects at Grivac (Antonović 2003).

As opposed to the stone industry, the bone industry is relatively poor. Although not all the faunal material was collected in every campaign, and only selected objects were collected from older excavations, the total of bone objects is still very low, about 50 artefacts. These finds were made mostly from ribs, metapodials and other long bones. Only a few artefacts made from antler may be attributed to the Vinča layers, and they were, in contrast with Divostin, mainly made from tines with smaller dimensions and less elaborate shaping.

#### SLATINA – PARAĆIN

The site of Slatina is situated at the very entrance to the town of Paraćin, in marshy, salty soil, on the slopes of Kardorđevo hill by the banks of the Crnica river. It was discovered in 1960s. All the excavations carried out at the site have been rescue excavations – first during the work on the Belgrade-Niš highway, in 1985–1986, and later during the building of a factory, between 1997–2003. Several small trenches were excavated, revealing a large settlement of the Vinča Culture spread over 10 ha, with at least three building horizons and possible modest remains of a Starčevo Culture settlement. (Vetnić 1974, 139–40, 149)

About 120 objects of osseous materials were recovered from these excavations; however, this number must have been larger, since bones were not carefully collected in all the trenches. Bone was the dominant raw material; 18 objects were made from red deer antler while only one object was made from tooth. The most common tool type is pointed tools – various awls, made from metapodials and ribs, needles and pins made from bone flakes and different burnishing objects, also made from long bones and ribs (Fig. 7.4). Several punches were present. Other tool types occur in small numbers – projectile points, wedges, chisels, hammers and sleeves. (Vitezović 2007)

Faunal analysis was carried out only on the material from one trench. There was a predominance of domestic animals (approx. 70% of the total faunal sample), with cattle bone being most numerous, followed by skeletal elements from sheep, goats and pigs; of the wild animals, aurochs, red deer, roe deer and wild swine were present (Cvetković 2004).



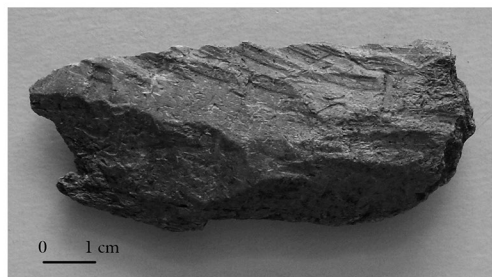
Dvs 054



Dvs 157



Dvs 203



Dvs 207

Figure 7.3 Antler artefacts from Divostin: hammer-axe Dvs 054, handle Dvs 157, manufacture debris Dvs 207 and fragmented tool, probably punch Dvs 203.

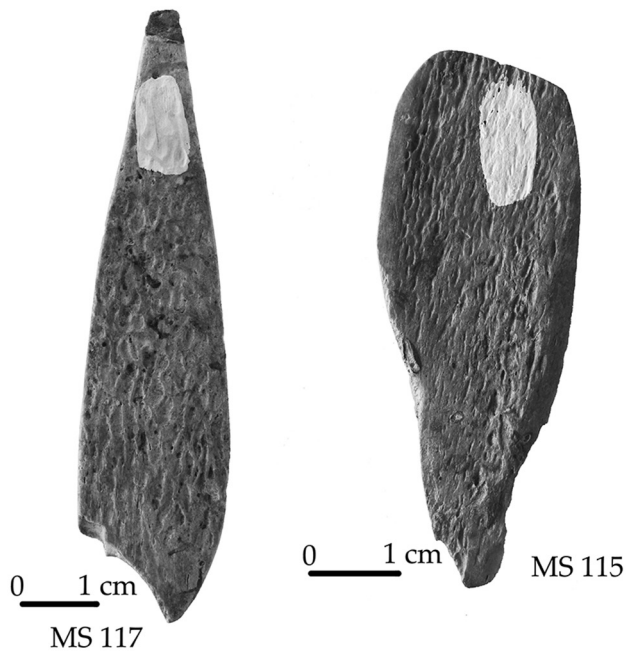


Figure 7.4 Rib artefacts from Slatina: awl-spatula MS 117 and spatula MS 115.

#### DRENOVAC

The site of Drenovac–Turska česma is situated 8 km south of the town of Paraćin, on the slopes above a terrace of the Velika Morava River. A large Neolithic settlement, covering about 30 ha, was discovered in the 1960s and the first excavations were carried out in 1968–1971. Fourteen trenches were excavated, revealing a multi-layer site of the Vinča Culture and a settlement of the Early Neolithic Vinča Culture with rich remains of houses and artefacts (Vetnić 1974, 125–139, 149). From 2004, new on-going excavations got underway that are still in progress. Trench no. 15 revealed at least four building horizons of the Vinča Culture and a Starčevo Culture settlement.

Almost 400 bone objects were recovered from all these excavations, most of them from the trench 15, excavated in 2004–2006, when all the bones were carefully collected. Bone represents the dominant osseous raw material. Ribs are the most numerous skeletal elements, followed by long bones. Other skeletal elements were poorly represented (several astragali and a few unidentified flat bones) (Fig. 7.5). A relatively high ratio of ribs on both Drenovac and Slatina is probably the result of careful collecting, since these artefacts are less conspicuous than those objects made from long bones. Worked antler occurs in relatively large numbers, and, beside the red deer antlers, several artefacts made from roe deer antlers should be mentioned. Teeth artefacts were not numerous, and the occurrence of shells is particularly

interesting, as the presence of shells has not been noted before in areas outside the Danube valley.

Artefacts made from osseous materials from Drenovac reveal a well developed industry, with objects of standardized shapes and mode of production. Different pointed tools dominate including awls, needles, heavy points, but also polishing tools (different types and subtypes of spatulas and scrapers, including combined awls-spatulas) and punching tools (punches, hammers and hammer-axes). Also a variety of other intermediary pieces and objects of special use were discovered – sleeves and handles, used astragali, bone rods, probably used as spindles, etc., as well as pieces of jewellery and manufacture debris. (Vitezović 2007).

#### STRAGARI

The site of Šljivik – Stragari is situated near the village of Stragari, in the vicinity of the town of Trstenik. The neolithic site was located on the gentle slopes surrounded by a meander of the Riljačka River which flows into the Zapadna Morava River 7 km downstream. Several trenches were excavated in the 1980s, revealing at least two horizons from the Early Vinča Culture, and there was also a layer with mixed Vinča and Starčevo Culture material.

Approximately forty objects made from osseous materials from the 1988–1989 campaigns were at my disposal for the study. Faunal remains were carefully collected and the low number of osseous artefacts is due to unfavourable preservation conditions (high soil acidity). Bone, red and roe deer antlers were represented and there was also one tooth artefact. However, there were no shell objects discovered. This small collection consisted of awls, spatulas, picks, chisels, objects with worked surfaces, as well two particularly nicely shaped objects classified into the group of objects of special use. They were perhaps used as spindles of some sort for producing spun fibres. The few fragments of antler with traces of shaping represent manufacturing waste.

#### Cemeteries

Grave finds from the Vinča Culture are extremely rare and the total number of graves discovered so far is very low; only one small intramural cemetery at Gomolava and one extramural cemetery at Botoš have been discovered. Botoš yielded interesting information on the use of some objects made from osseous materials.

#### BOTOŠ – ŽIVANIĆA DOLJA

The site Botoš near Zrenjanin (in Banat) was discovered in the 1920s and M. Grbić excavated 18 graves from an already destroyed cemetery. There was one double grave and three separate skulls as well as grouped ceramics (cenotaphs or offerings). Grave goods consisted of pottery, various stone tools as well as personal ornaments – among others *Spondylus* and *Glycimeris* bracelets and large biconical beads made from



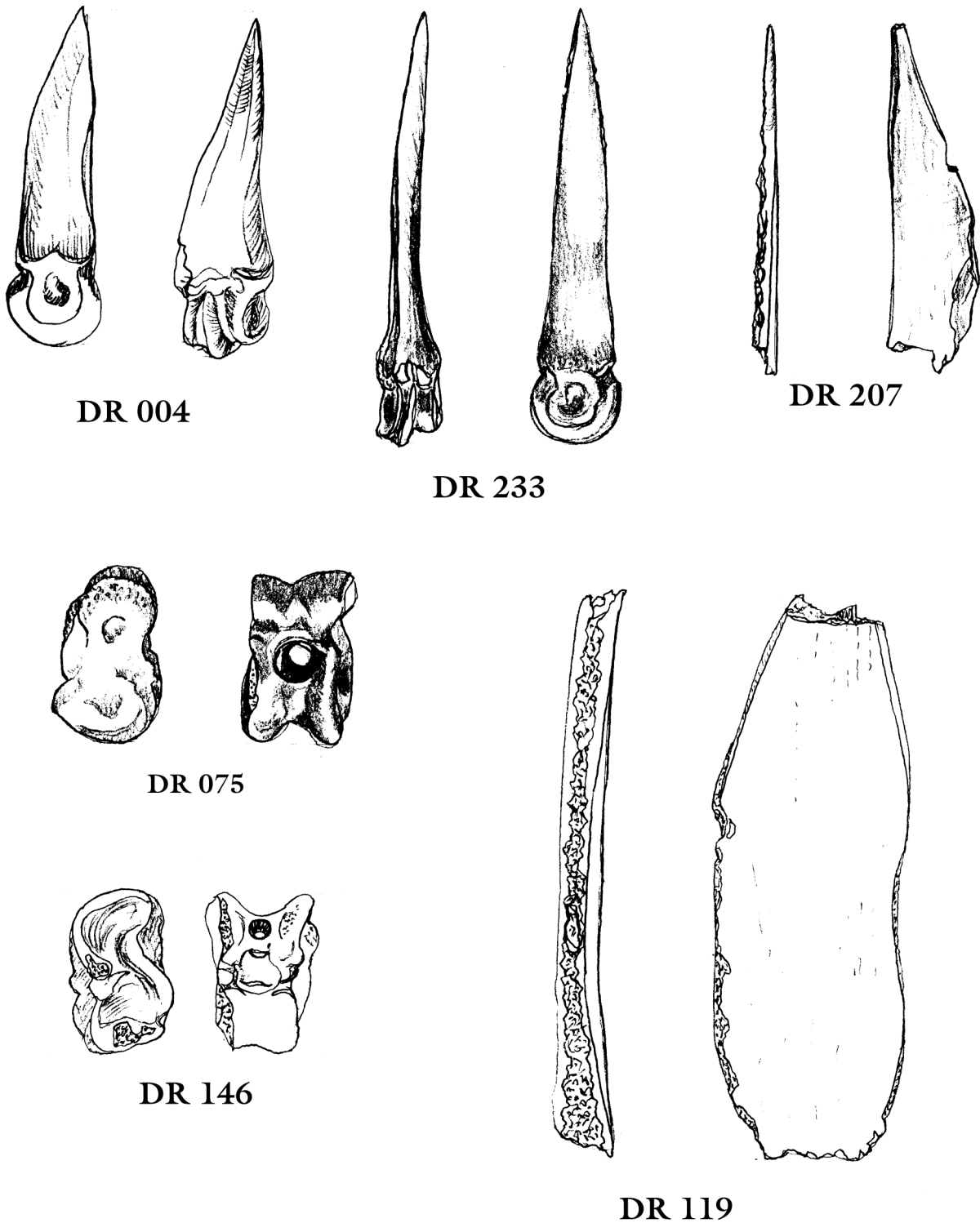


Figure 7.5 Use of bones at Drenovac: metapodial awls Dr 004 and 233, rib awl Dr 207, rib spatula Dr 119 and perforated astragals with traces of use Dr 075 and 146.

shells (at least 45 beads and nine bracelets). Based on the stylistic characteristics of the ceramic material, the cemetery is dated to the Early Vinča Culture. (Marinković 2002, 2010)

## Osseous raw materials

### Bones

The prevailing raw material among the bones, were metapodials and ribs. Metapodials as well as ribs from caprines or other medium size mammals were most represented. Metapodials (from cattle) or ribs from large animals are less common in this assemblage while some long bones were almost never used – ulnas or fibulas, for example. Also, other flat bones (for example, scapula) occur only rarely in a worked form (Fig. 7.6, Table 7.1).

As for other skeletal elements, astragali, exclusively cattle and caprines, were selected with, perhaps, some phalanges. Although modified astragali are known in the Neolithic of the Near East and Asia Minor (cf. Martin and Russell 1996, 211, with references), such artefacts are otherwise unknown in

the Starčevo Culture and they appear in the Balkans with the Vinča Culture (Vitezović 2011a). Vinča astragali were most likely used as burnishing tools (and perhaps had some role in the fibre-making processes – cf. Vitezović 2007, 98–100), unlike those from Near East which are supposed to be gaming pieces (Martin and Russell 1996, 211).

Some bones such as cranial bones were never worked, except for a few expedient tools from mandibles or maxillas. Some worked cranial bones are reported from Selevac (Russell 1990). Mandible tools exist on some neolithic sites in other parts of Europe (for example, Chalain in France; Maigrot 2003, 24). In the Balkans area they have been noted in the Chalcolithic Period (a few pieces were found at Bubanj; Vitezović 2011b).

Metapodials were probably carefully removed during the butchering and stored for later use. Ribs were also removed during the butchering process, while some bones, for example flakes from large long bones, probably represent kitchen waste – bones were broken to extract marrow and after that the pieces were put aside for further use. Bones were taken from freshly killed animals, and not from occasionally found carcasses, as suggested by absence of carnivore gnawing or other depositional traces beneath the marks of shaping and use.

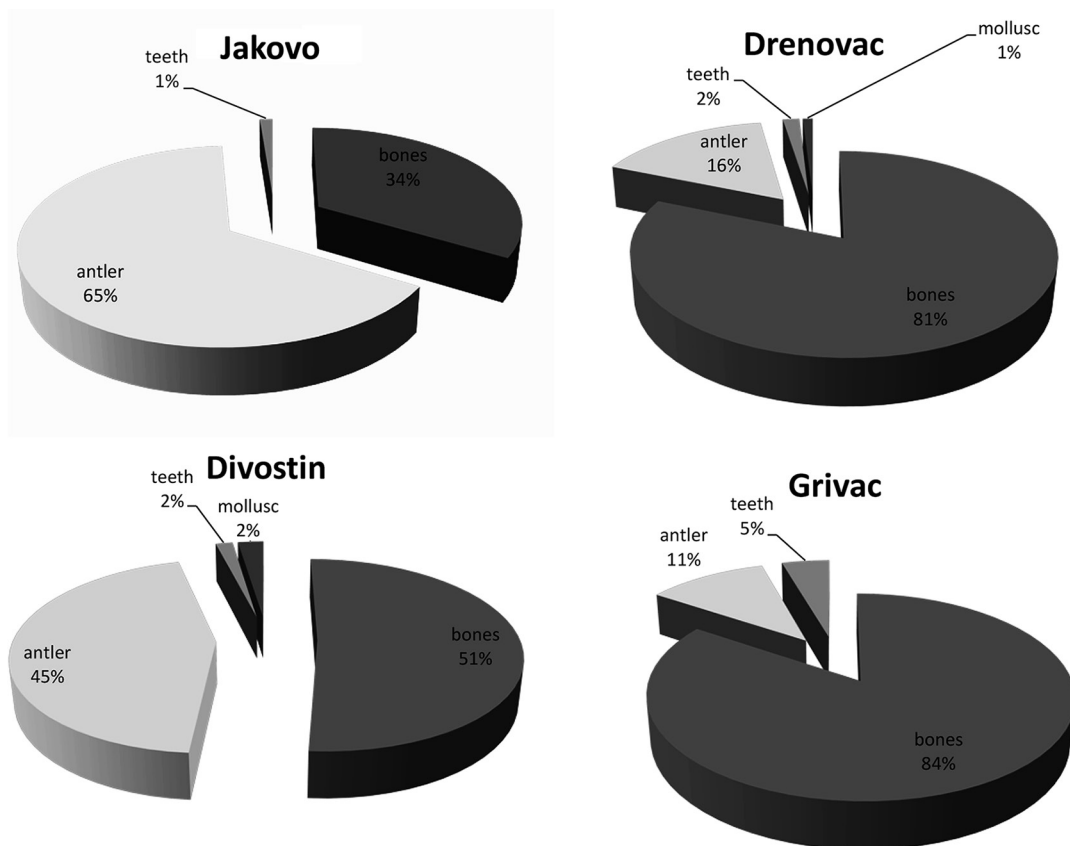


Figure 7.6 Ratio of different osseous raw materials at Jakovo, Divostin, Grivac and Drenovac.

Bone for working was also carefully selected from particular species. The dominance of bones from medium-sized animals is not consistent with the dominance of cattle in the faunal record. However, there were probably enough bones from medium-sized animals, although the bones may have been stored after killing the animal for later use. The apparent avoidance of pig bones perhaps suggests cultural other than practical reasons (pig bones are not particularly suitable because most skeletal elements possess a torque). It should be noted that, pig bones are present in faunal record, so this is not related to butchering and depositional practices. Pig's bones were also absent in Starčevo Culture assemblages, but a few pieces were noted in Chalcolithic Period assemblages (on Bubanj; cf. Vitezović 2011b).

In comparison with assemblages of the Early and Middle Neolithic Starčevo Culture there is a decline in the use of cattle and bones from other large mammals and the greater ratio of caprine and bones from other small and medium-sized animals in the Vinča Culture material. Several tool types were made from cattle metapodials on Starčevo Culture sites and were preferred or even the exclusive choice for some culturally very specific artefact types – spatulas-spoons with elongated handles and recipient and projectile points (Vitezović 2011a). Large mammal bones (from cattle, red deer) were also used for different tools, for example, rib scrapers and decorative items from long bone diaphysis segments. It is noteworthy that the ratio of cattle rose from the Early to Late Neolithic although the use of its bones as raw materials declined. In addition, Starčevo items made from these bones fall into the category of highly valued, long used and often repaired objects (Class 1 in the manufacturing continuum; cf. Choyke 1997).

The mode of using bones is more or less uniform on different Vinča sites. Only the Drenovac and Slatina assemblages have a higher ratio of objects made from ribs (as a result of the carefully collected fauna) and Selevac is the only site with greater diversity in skeletal elements (including scapulae, cranial bones and higher ratio of teeth used in a variety of ways) (see also Table 7.1).

Bones were mainly used for a variety of tools and weapons, but could also be used for decorative objects such as amulets, plaques or belt hooks. Lots of diverse objects were made from bones – from awls, needles and spatulae, wedges, as well as hooks and objects with a special use. Often, the advantage of natural traits was used completely – the rounded half of the distal epiphysis of the metapodial was used as a handle; the abrasive surface of the spongiosa was used for rib spatulas and scrapers, the prominent surfaces of astragali were used for polishing.

### ***Antlers***

The antlers that were used were predominantly from red deer. Judging by those antlers where the basal part was preserved, mostly shed, gathered antlers were used. As for the other

antler fragments, the calcified inner structure suggests that they were shed as well while traces of rodent teeth and other depositional traces, found on some specimens, suggest that they were collected. Only a few worked pieces of antlers from Divostin were unshed. Therefore, the method of acquiring antlers was completely different than the method of acquiring bones – while bones were secondary products obtained during the butchering of a killed animal, antlers were collected in the woods, perhaps along with some other raw materials, for example, wood (consequently, red deer *were not* killed for their antlers). On Neolithic lake-dwelling sites in Switzerland, it was possible to correlate the use of antlers with the practice of hunting red deer – antlers decreased in size due to over-hunting in periods when hunting was more important (Schibler 2001). However, on Vinča sites, it was possible only to note that at the site where antler use dominates, Divostin, cattle comprised about 80% of the total faunal assemblage, and red deer only 4% (cf. Bökönyi 1988). Lack of data did not permit any diachronic patterns to be established.

Antlers were probably stored for later use after being collected. Such a cache has not yet been discovered on these sites, however, we may assume that all the antler pieces found in a site were either meant to be worked or were production waste (antlers without traces of use were noted at Drenovac, Slatina and Jakovo). Bones occur on most of the sites in higher proportions, however, there are no indications that antlers were rare. On the contrary, flakes from antler recovered at Jakovo and at Drenovac and the very technique of whittling, not an economic way to deal with this material, suggest that they were abundant.

The difference in antler ratios between sites is particularly interesting – certain Vinča Culture sites have a very rich and varied antler industry, whilst on other sites antlers occur in small numbers and consist of simple, not particularly elaborated tools. Certain differences in percentages of antlers between sites may be explained in two ways – one is that they were not present in the part of the site that was excavated and the other is that they were not present in equal proportions on every site. Pairs of sites with large and poor proportions of antlers can be mentioned, for instance Grivac *vs.* Divostin (Fig. 7.6) or, to a certain extent, Slatina *vs.* Drenovac (see also Table 7.1). The difference between these two pairs of sites is not only in terms of the total number of pieces recovered but Divostin and Drenovac have clearly elaborate bone industries. Here are found certain “standard” shapes including masterpieces, in terms of the labour invested, and also flakes from production waste, which suggests that the objects were made at the site. Jakovo and Vinča do not represent such a pair, although they lie relatively close to each other, as their territories did not overlap. Several other Vinča Culture sites on the territory of Belgrade (i.e. Banjica and Žarkovo, to mention the excavated ones), unfortunately do not have bone industries that are sufficiently well preserved to suggest patterns of production of antler objects in this area.

Close clustering of Vinča Culture sites already suggested the possibility of economic specialization within sites in individual regions and the distribution of osseous raw materials confirmed this suggestion. It may be assumed that not all, but only one or more sites within one region, were specialized in the collection and working of antlers, and perhaps also specialized in tasks related to antler tools (such as wood-working).

In the Mesolithic Period, antler was the dominant raw material (cf. bone industry from Vlasac in the Iron Gates; Bačkalov 1979). If we compare materials from Vinča sites with Starčevo sites, a similar pattern of sites with richer and poorer antler industries emerges. In the Starčevo Culture, although the richest antler industry was discovered in the Iron Gates region in eastern Serbia, other sites with large proportions of objects made from domestic animals also had significant antler industries – for example the eponymous site of Starčevo-Grad and Divostin, where continuity in exploitation of antlers in both the Starčevo and Vinča Culture horizons may be observed (Vitezović 2011a).

All parts of the antlers were used – the basal part, the beam and all the tines (Fig. 7.3). Antlers may be used in their natural form or this form may be slightly worked or curated, or an antler can be considerably reworked. As with bones, the natural characteristics of the antler were clearly known to prehistoric craftspeople and exploited well – antlers were mainly used as punching or large cutting tools such as punches or axes, and their natural shape was exploited to produce T-shaped sleeves and other types of intermediary pieces for inserting other parts of various tools. This is consistent with their natural properties for absorbing shock. Also, the spongiosa of antlers was used for its abrasive qualities in a similar manner to the spongiosa in ribs. In addition to these, several carefully made, unusual objects may be mentioned, such as the toggle harpoon from Divostin.

Worked roe deer antlers reveal a completely different picture. They occur rarely and, when it was possible to determine, they came from killed animals. They were mainly used as *ad hoc*, expedient tools, although there are a few carefully made pieces (e.g. Dr 023; Vitezović 2007, table xxxvi). Roe deer antlers are smaller in dimensions and less resilient than those of red deer (for physical and mechanical properties of antler, cf. Suter 1981, Christensen 2004) but roe deer is also not represented in large numbers in the faunal remains (cf. Bökönyi 1988; Legge 1990). Minimal use of their antlers was, therefore, the consequence of both their inadequate qualities, and their relative scarcity, i.e. this was more a technological than cultural choice.

### Teeth

Teeth were used only occasionally for making objects (Fig. 7.6, Table 7.1). Except for several scrapers made from boar's tusk and one needle made from non-identified tooth found at Drenovac, all the other teeth objects were non utilitarian.

Only boar's tusks were regularly used for making tools but occur in relatively small numbers. Boar's tusks represent a much more common raw material in the Mesolithic Period (Bačkalov 1979). Their use declined from the time of the Starčevo Culture (Vitezović 2011a).

More common are various decorative objects made from diverse teeth, although they also occur in relatively low numbers. Carnivore and red deer canines seem to have been preferred, although even perforated cattle molars may be found. Perhaps the most interesting discovery is a stray find from the vicinity of the site of Pločnik, near Prokuplje, in south-eastern Serbia, which consists of 33 perforated red deer canines, with traces of a green colour, probably from contact with malachite. These objects were found with several hundred *Spondylus* beads and may represent grave goods from a disturbed Vinča cemetery (or perhaps a hoard). These finds may be attributed to the Vinča Culture with certainty on the basis of their technological features (the shape and method of perforating teeth, compared to the techniques used on other Vinča Culture sites).

The limited number of these decorative items does not permit broader comparison with neighbouring sites. This low number is probably linked to the fact that the cemeteries are almost completely unknown. These objects were generally used for a long time, often repaired and the finds from the settlements are mainly just broken, discarded pieces (cf. also Choyke 2009).

### Mollusc shells

At least three mollusc species have been identified so far – *Dentalium*, *Spondylus* and *Glycimeris* shells. Judging from the drawing, even *Cardium* shell may have been present at Vinča – Belo Brdo (Srejović and Jovanović 1959, fig. 17: 35). They were used for production of a variety of objects including beads, bracelets, pendants, decorative plaques and buttons. Often they are found broken while some of the *Spondylus* bracelets seem to have been repaired – after breaking, one or more perforations were added and the objects were turned into a pendant or clothing ornament. All this suggests that they were worn for a long time and not lightly discarded. The grave finds from Botoš suggest that shell ornaments were worn as personal and highly treasured decorative ornaments and perhaps also seen as symbols of rank.

The richest collection of shell objects, as mentioned above, was discovered at Vinča – Belo Brdo. However, one must keep in mind that this site also has the largest excavated area. Shell objects may have been equally important on other sites as well. In fact, the recent discovery of *Spondylus* ornaments at the site of Drenovac in the Morava valley (Vitezović 2007), shows that the distribution of shells is not restricted to the Danube valley. With careful collection of material and sieving, future excavations will probably yield even more shell pieces. This shows that the routes for trading

and exchange were far more complex than previously thought and this also challenges the over simplistic view of the centre and periphery in Vinča culture, with the eponymous site as the only or the largest centre. *Spondylus* trade and exchange within Vinča culture is only a part of a large network spread throughout prehistoric Europe (cf. Sэфѣriadѣs 1995), and careful mapping of sites with such findings may help in reconstructing the trade routes.

### Osseous and other raw materials in Vinča culture

Very often bone industries are regarded as *ad hoc* use of kitchen waste, something unimportant in the daily life of the community, something that was easily made, easily discarded and not as valued as, for example, carefully made polished stone tools. Closer examination of the bone industry in Vinča culture, however, reveals a planned, well developed bone technology. Mechanisms of acquiring and managing osseous raw materials provide significant insight into the ways raw materials in general were managed as well as some of the cultural connections between humans and animals.

The main skeletal elements used were metapodials, ribs and red deer antler, followed by other long bones and in much lower percentages other flat and short bones, teeth, roe deer antlers and mollusc shells. Caprines and other medium-sized ungulates are dominant in tool assemblages, followed by cattle and other large ungulates, while bones from pigs and other animal species seem to have been avoided.

Used osseous materials reflect the situation encountered in the faunal material only up to certain extent. Skeletal elements found in the faunal remains in large quantities, however, are not the most commonly used for tool or ornament manufacture. It appears that caprine bones were often chosen, although cattle prevail in the faunal samples on most sites. Also, although pigs were relatively numerous, and probably some of the unidentified ribs and long bone flakes may be from domestic or wild pig, the use of their skeletal elements is not confirmed with certainty, except for the tusks.

A general model for the acquisition and use of osseous materials may be proposed here. Osseous materials in the Vinča Culture were obtained as products from husbandry and hunting, through selective collecting and through exchange.

Bones were the most common and easiest to obtain; they were also used in large quantities on all sites, although careful choice of the most appropriate and/or most desired skeletal elements may be observed (the preference for bones from ungulates, especially of smaller size). Antlers were acquired in the vicinity of the settlement, probably collected with some other raw materials, and exchanged on a small scale as raw materials or finished products. Probably within certain area there was some sort of settlement specialization in antler collection and working.

Teeth worked for decorative purposes were obtained through hunting (or slaughter of large domestic boars) while shells were obtained through some kind of exchange network whose mechanisms are not known (starting with whatever other goods were in circulation).

Contemporary sites in surrounding areas reveal similar patterns of raw material use with a dominance of bone followed by antler. This situation is, for example, evident on Early Vinča sites in Romania (Beldiman 2007). In the osseous industry from Late Neolithic/Chalcolithic period from Karanovo (Bulgaria), metapodials were the most common skeletal element used, although there is a somewhat greater variety in use of long bones (ulnae, tibiae, etc.), followed by ribs, antlers and the occasional use of scapulas, mandibles and other bones (Lang 2005).

In the central Balkans, antlers occur in greater percentages than in the southern Balkans (BYR Macedonia, Greece), where the ratio of worked antler is lower (cf. Smoor 1976; Stratouli 1998). However, they were not as important as, for example, in the Mesolithic period (Bačkalov 1979) or on contemporary sites elsewhere in Central Europe (Schibler 1980).

Osseous materials were mainly used for everyday tools – from small household tools such as awls, needles, perforators, spatulae, burnishers and scrapers, to large tools for activities in the field such as hammers, axes, picks. They were also used for making weapons, mainly fishing and hunting equipment. A variety of fish hooks and harpoons are known, although these do not occur in large quantities. All these osseous materials were used in such a manner that their natural physical and mechanical properties, i.e. their shapes, as well as their resistance to shocks, etc., were well exploited. The preferred choice of metapodials and ribs is mainly due to the characteristics of bones themselves. A nice, but thin and sharply pointed, tool can be most easily obtained from smaller bones and the distal or proximal epiphysis can be used conveniently as a handle. Judging from intensive traces of use visible on most of the rib artefacts, the spongiosa was utilised for scraping and burnishing processes.

Finally, osseous raw materials, mainly shells and teeth, were also valued for making decorative objects, although bones and antler could be used as well. Their main qualities were most likely their white colour (cf. Luik 2007; Vitezović, 2012) and the specific animal species from which they originated. Personal ornaments were made almost exclusively from osseous materials, stone and copper, and most often they were white or green in colour. Stone beads were made from various white rocks (such as marble and limestone, cf. McPherron *et al.* 1988) and resemble or imitate shell beads. However, these raw materials were not considered adequate for making human and animal figurative representations. Figurative representations made from osseous materials are completely absent, which is all the more striking when one considers the rich and diverse clay figurative representations found on Vinča Culture sites.



Such a choice of raw materials for personal ornaments must have been cultural. The colour must have been important and also the origin of certain raw materials – teeth came mainly from wild, hunted animals, shells came from exotic, distant places and stones and copper came from some place outside the settlement – it is, therefore, the outer sphere (beyond the confines of the settlement, the wild habitat – *sensu* Hodder 1990) that gave them certain value or meaning. As figurines were mainly linked with the domestic sphere, this may also explain the avoidance of bones or stone in the manufacture of figurines.

## Conclusion

The osseous materials industry in the Vinča Culture was based on the use of bones from domestic animals and there were strict rules for the choice of both species and skeletal element. The natural properties of bone were well exploited and uniform techniques of manufacture reveal a well developed industry. The use of antlers, and especially differences in the antler-bone ratios between some of the sites, suggest the possibility of specialization on a regional level. Teeth, especially those from wild animals, as well as shells obtained through exchange, were valued raw materials, used for decorative items. The particular cultural value of different osseous raw materials may be observed in the patterns of their use – cattle bones were less important than in previous periods, although their significance in the everyday economy was growing. Pig bones were generally not chosen for manufacturing, and osseous materials in general were considered inappropriate for producing figurative representations but not only appropriate, but preferred for making personal ornaments.

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## Bibliography

- Antonović, D. (1992) *Predmeti od glačanog kamena iz Vinče. (The Ground Stone Industry from Vinča)*. Beograd, Univerzitet u Beogradu, Filozofski fakultet, Centar za arheološka istraživanja.
- Antonović, D. (2003) *Neolitska industrija glačanog kamena (Neolithic Ground Stone Industry in Serbia)*. Beograd, Arheološki Institut.
- Averbouh, A. (2000) *Technologie de la Matière Osseuse Travaillée et Implications Paléolithiques*. Unpublished doctoral thesis, Université de Paris I.
- Bačkalov, A. (1979) *Predmeti od kosti i roga u predneolitu i neolitu Srbije. (Bone and Antler Objects in the Pre-Neolithic and Neolithic of Serbia)*. Beograd, Savez arheoloških društava Jugoslavije.
- Beldiman, C. (2007) *Industria Materiilor Dure Animale în Preistoria României. Resurse naturale, comunități umane și tehnologie din paleoliticul superior până în neoliticul timpuriu*. București, Asociația Română de Arheologie, Studii de Preistorie, Supplementum 2, Editura Pro Universitaria.
- Bogdanović, M. (2008) *Grivac. Settlements of Starčevo and Vinča Culture*. Kragujevac, Center for Scientific Research of Serbian Academy of Sciences.
- Bökönyi, S. (1988) Neolithic fauna of Divostin. In A. McPherron, and D. Srejović, (eds), *Divostin and the Neolithic of Central Serbia*, 419–445. Pittsburgh, University of Pittsburgh.
- Borić, D. (2009) Absolute dating of metallurgical innovations in the Vinča Culture of the Balkans. In T. K. Kienlin and B. W. Roberts (eds), *Metals and Societies. Studies in honour of Barbara S. Ottaway*, 191–245. Universitätsforschungen zur prähistorischen Archäologie. Bonn, Habelt.
- Chapman, J. (1981) *The Vinča Culture of South-East Europe. Studies in chronology, economy and society*. Oxford, British Archaeological Report S117.
- Choyke, A. (1997) The bone manufacturing continuum. *Anthropozoologica* 25–26, 65–72.
- Choyke, A. (2009) Grandmother's awl: individual and collective memory through material culture. In I. Barbiera, A. Choyke and J. Rasson (eds), *Materializing Memory: archaeological material culture and the semantics of the past*, 21–40. Oxford, Archaeopress (British Archaeological Report S1977).
- Christensen, M. (2004) Fiches caractères morphologiques, histologiques et mécaniques des matières dures d'origine animale. In D. Ramseyer (ed.), *Matières et Techniques. Fiches de la commission de nomenclature sur l'industrie de l'os préhistorique XI*, 17–27. Paris, CNRS.
- Dimitrijević, V. and Tripković, B. (2002) New *Spondylus* findings at Vinča-Belo Brdo 1998–2001 campaigns and the regional approach to problem. *Starinar* LII, 48–62.
- Garašanin, M. (1979) *Praistorija na tlu SR Srbije*. Beograd, Srpska književna zadruga.
- Greenfield, H. (1986) *Paleoeconomy of the Central Balkans (Serbia): a zooarchaeological perspective on the Late Neolithic and Bronze Age (c. 4500–1000 B.C.)*. Oxford, British Archaeological Report S304.
- Hodder, I. (1990) *The Domestication of Europe*. Oxford, Basil Blackwell.
- Jovanović, B. and Glišić, J. (1961) Eneolitsko naselje na Kormadinu kod Jakova (Station énéolithique dans la localité de Kormadin près de Jakovo). *Starinar n. s. II*, 113–139.
- Lang, F. (2005) Knochen- und Geweihobjekte. In S. Hiller und V. Nikolov (eds), *Karanovo, Die Ausgrabungen im Nordsüd-Schnitt, 1993–1999, Band IV.1*, 263–374. Wien, Phoibos Verlag, Archäologisches Institut der Universität Salzburg und Archäologisches Institut mit Museum der Bulgarischen Akademie der Wissenschaften, Sofia.

- Lazić, M. (1989) Fauna of mammals from the Neolithic settlements in Serbia. In D. Srejšović, (ed.) *The Neolithic of Serbia. Archaeological research 1948–1988*. Belgrade, University of Belgrade, Faculty of Philosophy, Centre for Archaeological Research.
- Legge, A. J. (1990) Animals, economy, environment. In R. Tringham, and D. Krstić, (eds), *Selevac: a Neolithic village in Yugoslavia*, 215–242. Los Angeles, Institute of Archaeology, University of Los Angeles (Monumenta Archaeologica 15).
- Marinković, S. (2002) *Vinčanska Kultura na području Srednjeg Banata*. Zrenjanin, Narodni muzej Zrenjanin.
- Marinković, S. (2010) Arheološki materijal sa lokaliteta Živanićeva Dolja iz zbirke Narodnog muzeja u Zrenjaninu – vinčanska kultura (The archaeological finds of the site Živanićeva Dolja from the collection of the National Museum of Zrenjanin – Vinča culture), *Rad Muzeja Vojvodine* 52, 21–36.
- Maigrot, Y. (2003) *Étude Technologique et Fonctionnelle de l'Outillage en Matières Dures Animales. La station 4 de Chalain (Néolithique final, Jura, France)*. Unpublished doctoral thesis. Université de Paris I
- Martin, L. and Russell, N. (1996) Surface material: animal bone and worked bone. In I. Hodder (ed.), *On the Surface: Çatalhöyük 1993–95*, 199–214. Cambridge and London, McDonald Institute for Archaeological Research and British Institute of Archaeology at Ankara.
- McPherron, A., Razon, J. and Galdikas, B. (1988) Other artifact categories. In A. McPherron and D. Srejšović, (eds), *Divostin and the Neolithic of Central Serbia*, 325–343. Pittsburgh, University of Pittsburgh.
- McPherron, A. and Srejšović, D. (eds) (1998) *Divostin and the Neolithic of Central Serbia*. Pittsburgh, University of Pittsburgh.
- Poplin, F. (2004) Fiche éléments de nomenclature anatomique relative aux matières dures d'origine animale. In D. Ramseyer (ed.), *Matières et Techniques. Fiches de la commission de nomenclature sur l'industrie de l'os préhistorique* XI, 11–15. Paris: CNRS.
- Russell, N. (1990) The bone tools. In R. Tringham, and D. Krstić, (eds), *Selevac: A Neolithic village in Yugoslavia*, 521–548. Los Angeles, Institute of Archaeology, University of Los Angeles (Monumenta Archaeologica 15).
- Russell, N. (1993) *Hunting, Herding and Feasting: human use of animals in Neolithic southeast Europe*. Unpublished PhD thesis, University of California, Berkeley.
- Schibler, J. (1980) *Typologische Untersuchungen der Cortailodzeitlichen Knochenartefakte. Die Neolithischen. Ufersiedlungen von Twann*. 17. Bern, Staatlicher Lerhmittelverlag
- Schibler, J. (2001) Red deer antler: exploitation and raw material management in neolithic lake dwelling sites from Zürich, Switzerland. In H. Buitenhuis and W. Prummel (eds), *Animals and Man in the Past. Essays in honour of Dr. A. T. Clason Emeritus Professor of Archaeozoology*, 82–94. Groningen, ARC-Publicatie 41, Rijksuniversiteit Groningen.
- Séfériadès, M. L. (1995) 1995b *Spondylus Gaederopus*: The earliest European long distance exchange system – A symbolic and structural archaeological approach to Neolithic societies. *Poročilo o Raziskovanju Paleolitika, Neolitika in Eneolitika v Sloveniji* 22, 238–46.
- Smoor, B. (1976) Bone tools. In M. Gimbutas (ed.), *Neolithic Macedonia. As reflected by excavation at Anza, Southeast Yugoslavia*, 189–197. Los Angeles, University of Los Angeles.
- Srejšović, D. (ed.) (1989) *The Neolithic of Serbia. Archaeological Research 1948–1988*. Beograd, University of Belgrade, Faculty of Philosophy, Centre for Archaeological Research.
- Srejšović, D. and Jovanović, B. 1959. Orude i oružje od kosti i nakit iz Vinče. (Ustensiles et armes en os et parures de Vinča). *Starinar* n. s. IX–X, 181–190.
- Stratouli G. (1988) *Knochenartefakte aus dem Neolithikum und Chalkolithikum Nordgriechenlands*. Bonn, Rudolf Habelt.
- Suter, P. (1981) *Die Hirschgeweihartefakte der Corailod-Schichten. Die Neolithischen Ufersiedlungen von Twann* 15. Bern, Staatlicher Lerhmittelverlag.
- Tringham, R. and Krstić, D. 1990. Introduction: the Selevac Archaeological Project. In R. Tringham, and D. Krstić, (eds), *Selevac: A Neolithic village in Yugoslavia*, 1–12. Los Angeles, Institute of Archaeology, University of Los Angeles (Monumenta Archaeologica 15).
- Vasić, M. (1936) *Preistoriska Vinča IV*. Državna štamparija, Beograd.
- Vetnić, S. (1974) Počeci rada na ispitivanju kulture prvih zemljoradnika u srednjem Pomoravlju. *Počeci Ranih Zemljoradničkih Kultura u Vojvodini i Srpskom Podunavlju. Materijali X, Simpozijum praiistorijske sekcije SADJ*, 123–163. Beograd, Savez arheoloških društava Jugoslavije.
- Vitezović, S. (2007) *Koštana industrija u neolitu srednjeg Pomoravlja*. Unpublished masters (magistar) thesis, Faculty of Philosophy, University of Belgrade.
- Vitezović, S. (2010) Neolitska koštana industrija sa lokaliteta Kormadin u Jakovu (iskopavanja 2008. godine). *Godišnjak Muzeja Grada Beograda* LVII.
- Vitezović, S. (2011a) *Koštana industrija u starijem i srednjem Neolitu centralnog Balkana (Bone industry in the Early and Middle Neolithic in the Central Balkans)*. Unpublished PhD thesis, Faculty of Philosophy, University of Belgrade.
- Vitezović, S. (2011b) Koštana industrija sa Bubnja – preliminarni rezultati (The bone industry from Bubnja). *Paper Abstracts. XXXIV Annual meeting of the Serbian Archaeological Society, held in Kraljevo, 26–28. 05.2011*.
- Vitezović, S. (2012) The White Beauty – Starčevo culture jewellery. *Documenta Praehistorica XXXI*, 91–203