

PREHISTORIC COPPER TOOLS FROM THE TERRITORY OF SERBIA

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Abstract

Around four hundreds prehistoric copper tools and weapons have been recorded in the territory of Serbia so far. They had been in use for a rather long period of time – from the end of the early phase of the Vinča culture until the Middle Bronze Age and some types of these objects even until the very beginning of the Iron Age. The copper alloyed with small quantities of arsenic, lead and tin started to appear already by the end of the Eneolithic indicating the attempts of prehistoric metallurgist to improve technical characteristics of the copper. On the copper tools from the territory of Serbia could be followed the evolution of shapes starting from the specimens, which completely imitated stone tools and which appeared in the beginning of the Early Eneolithic to the completely developed Bronze Age shapes, which confirm that prehistoric metallurgist entirely understood and accepted the advantages offered by metalworking. The analyses of metal composition have been performed on around 50% of prehistoric copper tools. Nevertheless, in spite of all relatively numerous analyses there is still no answer to the question concerning the primitive technology of copper ore processing and the metallurgical process of obtaining copper for the production of copper and sometime later the bronze artifacts.

Keywords: *Copper tools; Eneolithic; Bronze Age; Serbia*

1. Introduction

Around four hundreds prehistoric copper tools and weapons have been recorded in the territory of Serbia so far. There are also decorative objects encountered in a considerably smaller quantity but still relatively abundant although they are not the

topic of this work. The largest quantity of copper jewelry comes from the necropolis in Mokrin near Kikinda dated in the Early Bronze Age. Large number of diverse jewelry pieces – from simple hoops with single coil through necklaces, finger rings, torques to complex multipartite diadems has been found in 312 burials [1]. The copper

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tools and weapons had been in use during rather long period of time – from the end of the early phase of the Vinča culture (end of Vinča-Tordoš phase and Gradac phase) to the Middle Bronze Age. In fact, certain types of weapons like double axes and axes with single cutting edge of Montenegro-Albanian type continued until the beginning of the Iron Age.

The beginnings of metallurgy in the territory of Serbia are closely connected with the rich ore deposits in our country. The territory of the central Balkans was naturally predestined for very early emergence of metallurgy. The rich ore deposits, which were at many places close to the surface ground almost until the modern times and therefore easily available, must have been discovered very early by the Neolithic agricultural population.

There are three main groups of copper ore distinguishable in Serbia: 1. sulphide ores, most widely distributed, that occur in the form of chalcopyrite, chalcocite, covellite, etc; 2. oxide-carbonate ores including mostly cuprite, malachite and azurite and which appear in the zones of oxidation of the sulphide copper ores and mostly near the surface; 3. native copper, which is today exceptionally rare in the sulphide and oxide-carbonate ores and which was most probably exhausted already in the prehistoric period because of the intensive demand for such ore in the earliest copper metallurgy [2]. The copper ore is distributed in our country in 3 metallogenetic zones: 1. Carpatho-Balkan province in Eastern Serbia, 2. Serbian-Macedonian and 3. Dinaric province. (Fig.1). The richest is the first one, the Carpatho-Balkan province where are today the largest copper mines in this part of the world but where has also been discovered the

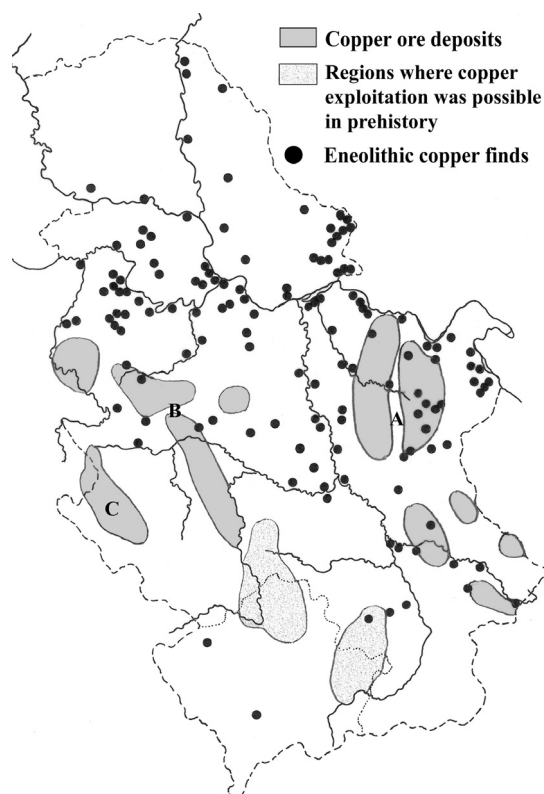


Fig. 1. Prehistoric copper finds and copper-ore deposits in Serbia: A. Carpatho-Balkan province in Eastern Serbia, B. Serbian-Macedonian province and C. Dinaric province [2]

earliest copper mine in Europe – Rudna Glava. Considering the quantity and distribution of the prehistoric copper artifacts it is absolutely certain that ore exploitation during prehistory was equally intensive also in the Serbian-Macedonian and Dinaric province.

2. Beginnings of prehistoric metallurgy

The copper metallurgy in Serbia developed in few phases.

1. Pre-metallurgical phase (6300 – 5000 BC). First phase is actually pre-metallurgical but very important for the first acquaintance

with the metal so it certainly should be taken into account in the archeometallurgical studies. It lasted from the beginning of the Early Neolithic continuing during the entire Vinča culture, i.e. throughout the Late Neolithic and the Early Eneolithic periods. In fact, only the appearance of malachite during the Early Neolithic and at the beginning of the Vinča culture could be identified as pre-metallurgical while the finds of malachite in the later periods could be related to the copper ore processing. The first encounter with the basic raw material in primitive metallurgy, the malachite, is demonstrated in the production of pendants and the use of malachite is related first of all to the affinity for the green-color stones of the bearers of the Early Neolithic cultures in the southeast Europe [3].

2. Production of massive copper tools and weapons (5000 – 4500 BC) of primitive appearance and having models in the stone tools followed immediately after the ‘malachite’ phase. It lasted from the end of the Early to the beginning of the Late Vinča culture (end of Vinča-Tordoš II – Vinča Pločnik I). It is interesting that before this phase and after the ‘malachite’ phase has not been identified the phase of production of small decorative copper artifacts as it is the case in Bulgaria [4]. It is hard to believe that this phase as logical continuation after the acquaintance with malachite as basic ore in the earliest copper metallurgy did not exist in the evolution of the early metallurgy in this area. It is possible that this type of finds because of their fragility and oversensitivity to the acid soil, which is frequent at our sites, did not survive in the Late Neolithic/Early Eneolithic layers in the territory of Serbia.

3. Degradation in copper production during the Vinča culture period (4500 – 4200

BC). It is evident in production of small decorative objects while production of massive tools known in the preceding phase died out completely. During this phase small decorative copper objects of simple shape (hoops, bracelets, wire) have been found very rarely on the Late Vinča sites along with the increased quantity of malachite, which was found mostly in the form of lumps [5]. This phase is partially parallel with the next one - phase 4.

4. The ‘mass’ production of copper tools and weapons from the end of the Early Eneolithic (after 4000 BC). The largest number of the mentioned 400 pieces of copper tools could be attributed to this phase of evolution of the primitive metallurgy in the territory of Serbia. This group includes all axe-adzes, adzes, awls and hammer-axes. It is probable that mentioned tools originate from these areas but it is also possible that they were imported from the neighboring regions.

3. Development of prehistoric copper tools

The earliest copper tools from our territory, these dating from the period of the Middle Vinča culture clearly show that they were made using stone tools as models. The earliest adzes and wedges imitate entirely their stone models even retaining the semicircular cross-section, which is characteristic of the stone tools and completely unusual for the metal implements. The tools are massive and unnecessarily thick because the experience acquired in production of stone tools suggested that greater thickness reduces the possibility of breaking. This causal correlation, however, was no more valid for

the metal tools. The surface of some specimens is coarse indicating still imperfect casting technique but also the possibility that the tool was finally trimmed by grinding as it was the case with stone tools [6].

The hammer-axes of the Pločnik type (Fig. 2) also represent the earliest copper tools from this area. It is not certain whether these objects imitated stone models as this kind of tools was not recorded before their appearance or the process was just the

opposite, i.e. that stone tools imitated metal models what is more probable. The Pločnik hammer-axes represent the original product of these areas and the earliest appearance of the massive copper tools in Europe. This shape existed during rather short period of time in contrast to the other types of copper tools, which remained in use long after the period of their emergence.

Already from the end of Early Eneolithic we encountered copper tools and weapons

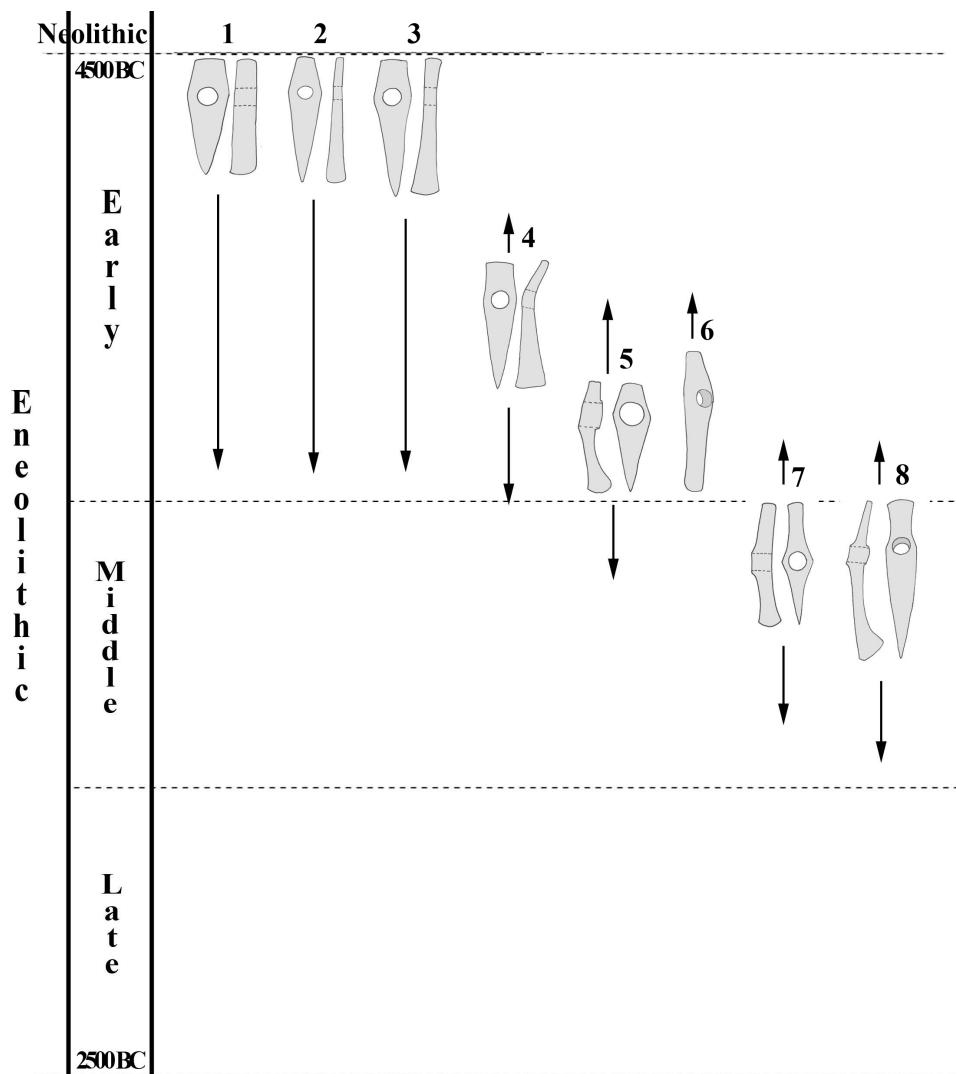


Fig. 2. Eneolithic copper hammeraxe: 1 – 3. Type Pločnik, 4. Type Vidra, 5. Type Gulubinje, 6. Type Čoka, 7. Type Deč, 8. Type Mezőkeresztes.

demonstrating that prehistoric metallurgists completely adopted technological advantages offered by the metal. The copper objects (tools and weapons) reveal that they do not copy any more the stone models when shapes are concerned. The tools and weapons with curved edges and fan-shaped blades had been produced in an attempt to increase the working surface and reduce the tool body, which was of no use. In the course of time

the tools became thinner so the specimens from the end of the Eneolithic are of very small thickness suggesting thorough knowledge of the resilience of metal (Fig. 4). By the end of the Eneolithic there also occurred the copper alloyed intentionally with arsenic, lead and tin.

The tools produced in largest quantities in the Copper Age in central and southeastern Europe are the axe-adzes. This universal

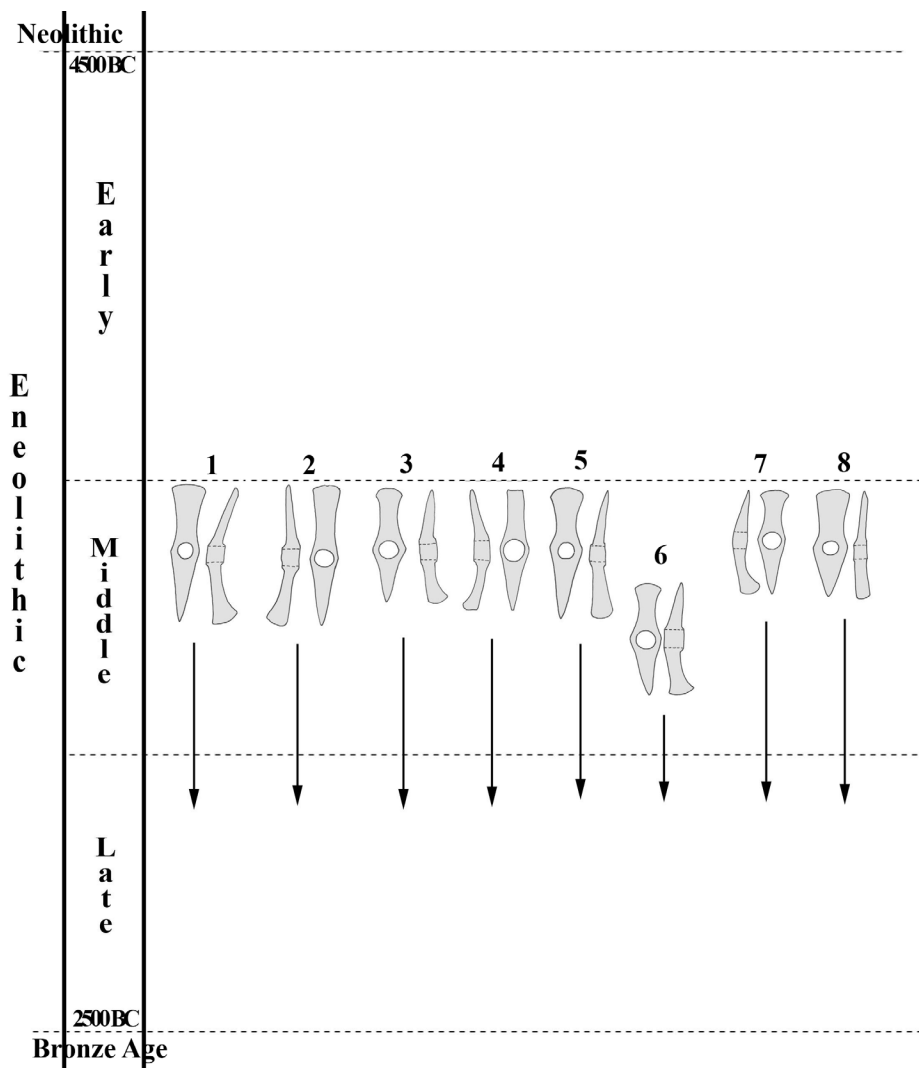


Fig. 3. Eneolithic copper axe-adzes: 1. Type Jászladány, 2. Type Jászladány, variant Ruma, 3. Type Jászladány, variant Barice, 4. Type Jászladány, variant Donji Milanovac, 5. Type Jászladány, variant Šabac, 6. Type Tîrgu Ocna, 7. Type Ariușt, 8. Type Kladari.

shape existed until the end of the Cooper Age and was also used in the beginning of the Bronze Age when finally the prehistoric masters decided on more advanced tool shapes of smaller weight for production of

which the smaller quantities of metal were necessary. The axe-adzes already demonstrate an elaborate metal form, elegantly curved shape impossible to achieve in stone, so these axes could be considered as

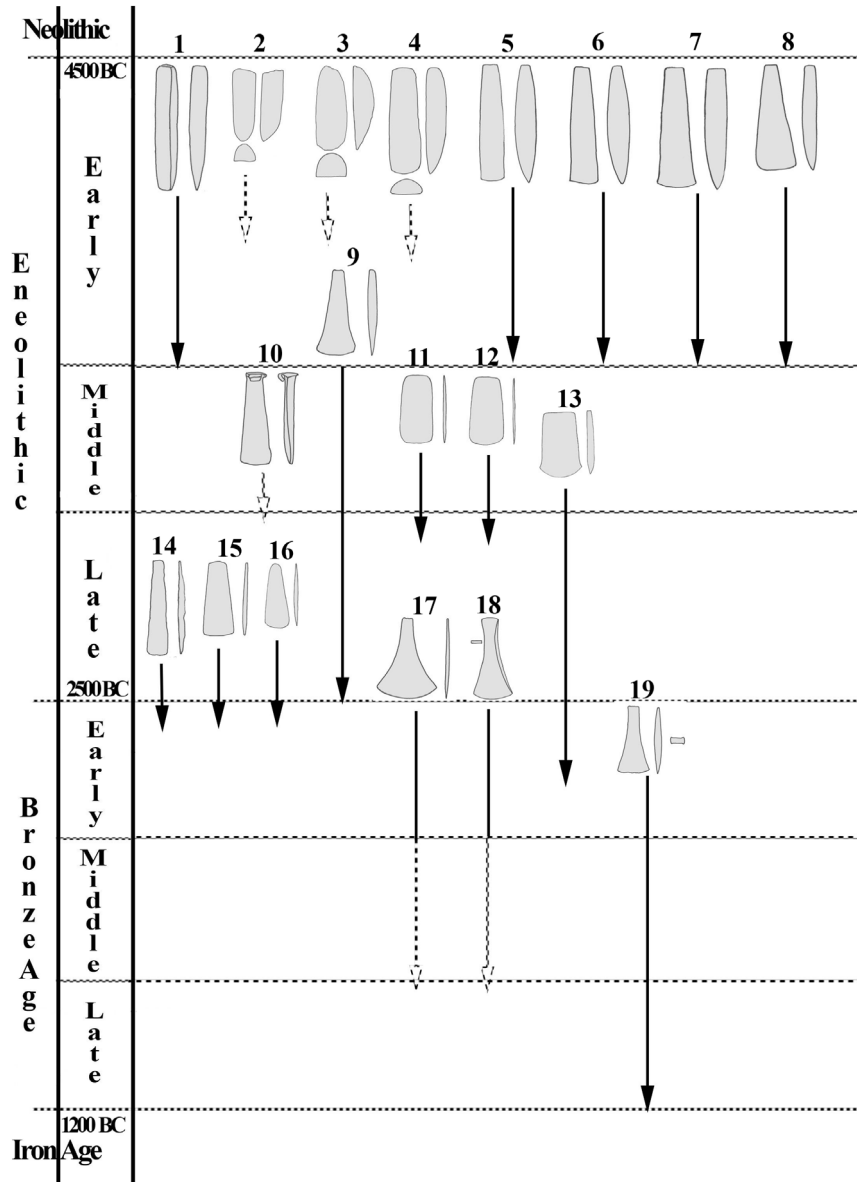


Fig. 4. Eneolithic and Early Bronze Age copper flat axes and adzes: 1 – 2. Wedges, 3 – 7. Massive axes (3-4. Type Belovode, 5-7. Type Pločnik), 8 – 19. Adzes (8. Type Pločnik, 9. Type with fan-like expanded blade, 10. Type Veliki Gaj, 11-12. Type Ponikve, 13. Type Altheim, 14-16. Narrow-body adzes, 17. Fan-like adzes – variant Leget, 18. Fan-like adzes – variant Dobanovci, 19. Adzes with rounded edges).

first authentic metal tools in contrast to the previously discussed hammer-axes. They were cast from two longitudinal pieces and that resulted in constant asymmetry of this implement.

The most frequently found shape in the territory of Serbia is the axe of Jászladány type and the variants of this type. A total of 163 specimens of this type and its variants have been found so far. It is interesting that just one of them was found in the archaeological layer while all the other are chance finds or they were found in the hoards and could have been dated only typologically. Within the Jászladány type five more variants of this type of axe-adzes have been recorded in the territory of Serbia. All these variants maintained the basic characteristics of the Jászladány type and differences could be noticed only on the basis of small deviations from the basic characteristics (Fig. 3). There are also other types of the axe-adzes (Čepin, Tîrgu Ocna, Ariușt and Kladari) and the later specimens are of more advanced shape and confirm good knowledge of the prehistoric metallurgist about the advantages of metal.

The hammer-axes although in much smaller quantity were produced alongside the axe-adzes but they were nothing like the earliest specimens from Pločnik (Fig. 2). They also have elegantly curved shape and bear witness to the excellent knowledge about the advantage of metal over stone. The battle-axes of Mezőkeresztes type probably show in a best way how important the copper was for the Eneolithic communities of the southeast Europe. There is little likelihood that this type of objects was used as weapons in a true sense of the word judging by the size and first of all the weight, which always exceeds 3 kg, but it is more probable that

they were the symbols of status.

The adzes and wedges as primarily working implements show in a best way the evolution of copper tools from the stone models to authentic metal tools. Since the emergence of the earliest copper tools there were used the tools whose appearance disclosed the stone model – simple form and considerable thickness of the tool. The earliest shapes, those imitating exactly the stone forms were to remain in use only for a short period of time. Somewhat later types also of ‘Stone Age’ appearance but showing tendency towards fan-like expanding of the blade were in use parallel with more elegant and more elaborate forms until the beginning of the Bronze Age (Fig. 4). The analyses of metal composition of the later specimens from the beginning of the Bronze Age reveal that copper was already intentionally alloyed. However, parallel with these massive tools there appeared the authentic metal tools – adzes of small thickness with narrow butts and fan-shaped cutting edges in order to achieve largest possible working surface. In the beginning they were produced of the pure copper while specimens from the beginning of the Bronze Age were made of the alloyed copper.

The improving of shapes also continued when the axes with single cutting edge are concerned. The axe-adzes definitely fell out of use in the beginning of the Bronze Age and were replaced with more elaborate axes with single blade. This tool appeared during the Late Copper Age and was of relatively awkward shape. The blade was of the same width as the rest of the axe body and the segment with shaft-hole could not be distinguished from the body mass. However, in the course of time the axes with single cutting edge got the more elegant shape. The

cutting edge expanded in fan-like blade, the body, which has no working function was reduced to the size and thickness guaranteeing that the tool would not break and the shaft-hole was clearly distinguished from the axe body. The shaft-hole on later types is more prominent than on the earlier

specimens and got the shape of tubular extension at the end of the axe (Fig. 5). The evolution of shape was going together with alloying of copper with arsenic, lead and tin already by the end of the Copper Age thus indicating the attempts of prehistoric metallurgists to improve technical qualities

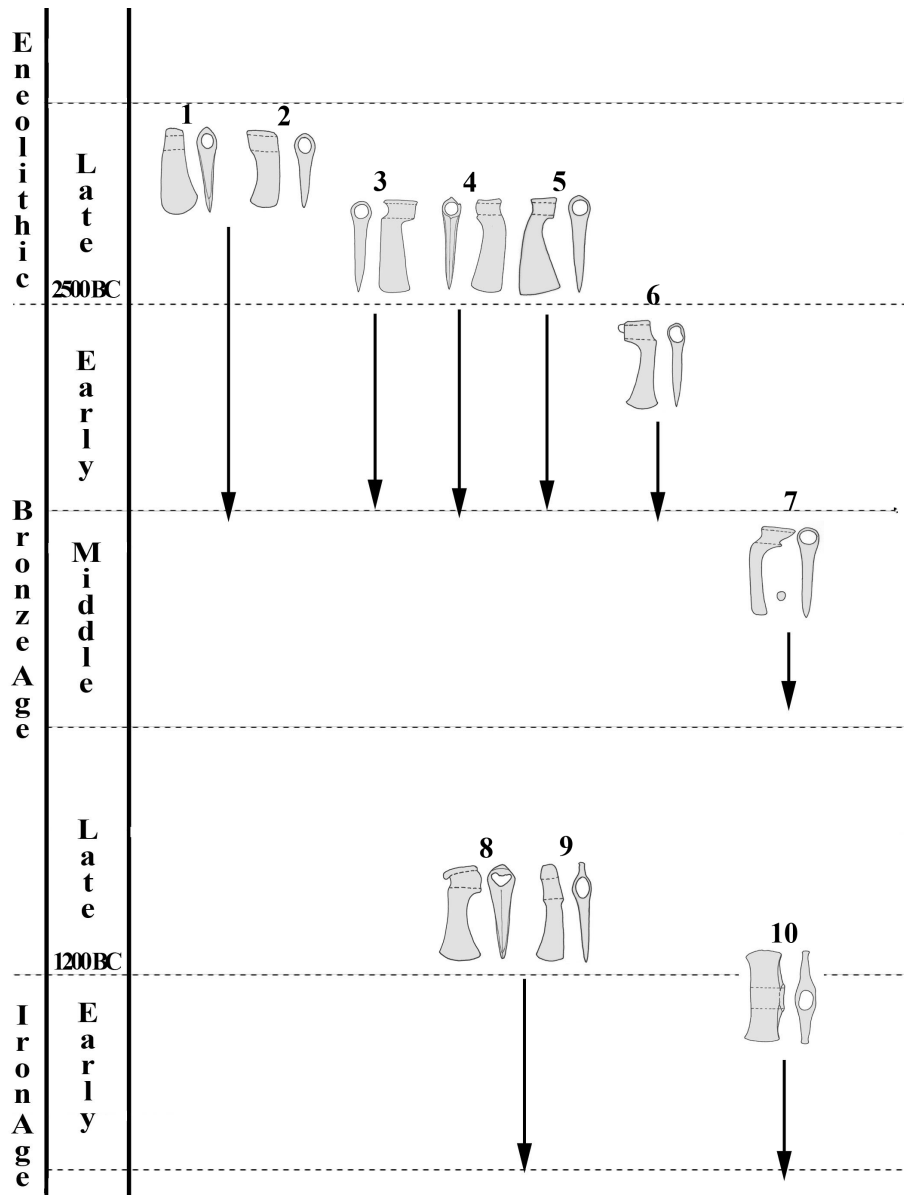


Fig. 5. Late Eneolithic and Bronze Age copper axes: 1. Type Baniabic, 2. Type Lozane, 3. Type Izvoarele, 4. Type Jasika 5. Type Baranda, 6. Type Sokobanja, 7. Type Borač, 8 – 9. Montenegro-Albanian type, 10. Double-axe.

of copper. The experimenting with addition of the mentioned metals has been also encountered in the adzes from the end of the Copper Age. The proportion of tin was up to 10%, of arsenic up to as much as 7.8% while the percentage of lead was smaller and does not exceed 4.7%.

In the end of the Bronze Age the copper artifacts definitely went out of use because of the advanced technology of production of more sophisticated bronze tools and weapons evident first of all in production of hollow-cast axes – celts. The analyses of the latest ‘copper’ tools, i.e. the tools resembling in shape the earlier objects of copper reveal that some of these artifacts were produced also of bronze. Generally, bronze as metal, which was much more easily cast enabled the prehistoric metallurgists to produce hollow-cast objects for which considerably less quantity of metal was necessary.

4. Conclusion

When the metal analyses are concerned they have been performed on around 50% of prehistoric copper artifacts. Most of them were, however, performed half a century ago, in the 1950s, and they provided just the chemical composition of the metal objects [7]. The more recent analyses were carried out in the end of 1980s and the purpose of those investigations was to compare the ores from today known prehistoric and modern mines with the metal objects in order to determine where from the ore had been taken for the production of copper artifacts [8]. These investigations as well as the earlier ones did not deal with the analysis of technological process applied in production of the studied objects.

Therefore, despite all relatively numerous

analyses there is for the time being no answer to the question concerning the primitive technology of copper ore processing and the metallurgical process of obtaining the metal for production of copper and later also bronze artifacts. Most of the copper tools found in Serbia are chance finds. Their cultural attribution is determined only on the basis of typology and technology of manufacture. As the technology of manufacture remained, as we already said, mostly uninvestigated we still use almost exclusively the typological determination of the metal material. Therefore, it is not possible to identify potential workshops and centers for production of copper objects. The study of copper objects from the territory of Serbia, first of all the technology of their production is an open field and as I assume a challenge for the archeometallurgists. This should be one of the main and priority objectives in the future archeometallurgical investigations.

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