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ПРИКАЗИ
REVIEWS

IN MEMORIAM

TRASEOLOGICAL MARKERS ON GROUND STONE CUTTING – IMPLEMENTS FROM LAĐARIŠTE SITE NEAR VRNJAČKA BANJA

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Abstract: *This paper represents a traseological study of edge–ground stone tools based on the assemblage of artifacts from archeological excavations of the Neolithic site of Lađariste , conducted in the period from 1987 until 1990, which is being kept in the Local Heritage Museum in Vrnjačka Banja. Also, analysis includes artifacts of the same category which were collected during a reconnaissance of this site, as well as artifacts obtained by purchase. The aim of this study is to provide data, which would add to the previous knowledge of this tool category on the local level, as well as over a wider area. These data relate to traselogical markers spotted on ground stone tools with cutting edge, obtained: during the production of the very artifact, as well as with its practical use. This analysis gathers all those artifacts which provided minimum indications for this kind of research.*

Key words: *Neolithic, Vinča culture, the site of Lađarište, edge–ground stone tools, traseological analysis, manufacture traces, use–wear traces*

Examination of the prehistoric stone tools on our territory until the eighties of the 20 century was often based only on typological determination of the tool and eventual petrologic classification (Babović 1984; Srejović–Jovanović 1957). Tools, which were previously placed in typological framework, depending on their type and context, were assigned with the function which was not completely accurate or was of broader range, so more important conclusions couldn’t be made from these cognitions. As this practice was abandoned long ago in the world of archaeology due to its many deficiencies, situation required that the changes in the understanding of studies of stone tools occur in domestic archaeology. A new system of analysis of ground stone tools ensued, which implied that the equal amount of attention should be paid to all details on the tools in order to provide as veridical interpretation as possible (Perišić 1984; Antonović 1992, 2003). Functional analysis and tool interpretation are moved into the foreground.

A number of researches were conducted, which previously hadn't found their place in the studies of this category of archaeological material, and those were the researches of manufacture and use–wear traces which were conducted through traseological and tribological analyses (Semenov 1976; Adams 1988, 1989, 2002, 2010; Adams et. al. 2009; Dubreuil 2001, 2004; Pritchard–Parker, Torres 1998; Hardy 1998, Plisson, Lompre 2008; Jahren et al. 1997; Pawlik 2007; Smoor 1976; *In Serbia*: Antonović 1992, 2003, 2006; Živanić 2010; Dimić 2013).

Traseological examinations are based on the analyses of specific traces located on the surface of stone tools (the term "traseological analysis" had been introduced in archaeological science through pioneer works of S. A. Semenov at mid–20th century, and it was very positively accepted by many scientists. *See* Plisson, Lompre 2008; Olausson 1990). These traces are divided into two groups, depending on their appearance: those generated during the tool production and those formed on the tool during its practical use. Essentially, traces represent specific alterations on the tool surface, mostly visible in the form of microflake scars, microfractures, striations and micropolishes (Hardy, Garufi 1998, 177; Plisson, Lompre 2008; Semenov 1976; Olausson 1990 etc.). The intensity of these traces, as well as their depth, width and prevalence depend on petrographic features of the rock from which the tool was made, as well as from the kind of activities and intensity used for conducting these activities.

All ground stone tools, which provided minimum indications for conducting this kind of research, were included in traseological analyses, and the results will be interpreted in two categories. The first, that provides an overview of indicative traces visible on the tool surface that occurred in the process of production and the second one, that provides an overview of specific traces related to tool "continuance", that is its primary use, fragmentation and recycling use. For purposes of this kind of analysis, 30× and 40× geological magnifying glasses were used, as well as 67× optical microscopes with an integrated camera.[1]

Ground stone industry from the site of Lađarište

The site of Lađarište is situated in the central part of the Republic of Serbia on geographical coordinates of 43° 38' North latitude and 20° 55' East longitude. The site is located on the right side of Vrnjačka Banja – Kraljevo highway, 4 km

[1] I owe great gratitude to Milica Stojanovic from the National Museum in Belgrade for enabling me to use the microscope for analyses of use-wear and production traces. The Microscope is Olympus brand name with 67× magnification lens.

away from the modern-day center of Vranjčka Banja, in the village of Vrnjci e (Fig. 1). It occupies a central part of a spacious river valley bounded with three rivers: Zapadna Morava to the north, Južna Morava to the east and south–east and Ibar to the west and southwest. It is surrounded by Goč and the Gledićke mountains, situated on the right bank of the Zapadna Morava river, at an altitude of 220 m.

Fig. 1. The geographical position of Lađarište site near Vrnjačka Banja (modified map downloaded from website www.maphill.com)
Сл. 1. Географски положај локалитета Лађариште код Врњачке Бање (модификована мапа праузета са сајта www.maphill.com)

In the vicinity of the site of Lađariste , settlements of this kind are: Ornice – Makrešani, Trsine – Čačak, Divlje Polje – Ratina, Okruglica – Vitanovac[2]. A distinctive feature of these settlements is that they were founded during the Vinča – Tordoš I phase and Vinča – Tordoš II phase, except Lađarište which was presumably founded during the Gradac phase. The discovered archaeological material and stratigraphy of a narrow examined part chronologically determine site the period of the Gradac phase / Vinča – Pločnik (Borović–Dimić, Stanković 1987, 46–47).

Archaeological excavations on the site of Lađariste were conducted in the period from 1987 until 1990 under the patronage of Basic scientific community of the Kraljevo region and the municipality of Vrnjačka Banja. Research was carried out by the Center for Archaeological Rresearch of the Faculty of Philosophy

[2] In addition to these localities in the nearby vicinity, within a radius of 70 km there is a large number of known Neolithic sites: Konopljara, Vitkovačko Polje, Šljivik-Stragari, Blagotin, Divostin, Grivac, Drenovac, Supska, Crnokalačka Bara and many others (Srejović 1988, 48).

in Belgrade. The manager of the research project was prof. dr D. Srejović, and the field director was dr S. Stanković. In 1987, an area of 28 m² was explored through sondage (sondage A and extension A1), in 1988 area of 35 m² (sondage B and extension Bp), in 1989 area of 24 m² (sondage C) and in 1990 area of 16 m² (sondage D) (*Source of data* – field diary from the excavations of the site of Lađarište s; abbreviations: sA (sondage A), sB (sondage B), sC (sondage C), sD (sondage D), PN (Surface finding), CZ (Crnoglavac collection)). The overall explored area covers 103 m² while it is considered that the locality occupies the area of approximately 4000 m² (The data that the site occupies the area mentioned there is derived from comparison of data obtained by reconnaissance of the wider territory of the site and the location of Obreža where the site of Lađarište is located in the village of Vrnjci).

During four seasons of sondage research on the site of Lađarište, 45 ground stone artifacts were found. The remaining 112 implements were included into the collection through assembling of the surface findings during reconnaissance of the wider field area, as well as through purchase of the assemblage which previously belonged to the artifact–collector M. Crnoglavac (Source of information: Inventory book of the Heritage Museum in Vrnjačka Banja and a verbal information in a conversation with senior curator – archaeologist J. Borović–Dimić).

Almost all examined tools can be related to the Late Neolithic period and the beginning of the Eneolithic, that is, phases Vinča – Gradac, Vinča – Pločnik I and II (According to the analogies with polished stone tools from Neolithic sites of Zapadna Morava valley and Central Serbia).

Almost all categories of tools appear in different typological manifestations. Most numerous are those with cutting–edge (68%), while abrasive tools are less prevalent (8%) (Dimić 2013) (Fig. 2). Material which couldn't be associated with a certain tool group due to its fragmentation is put into a group of indeterminate finds. It should also be noted that the biggest number of tools are the fragmented ones, while there are 56 implements of those completely preserved and partially damaged.

Large presence of edge–cutting tools, especially adzes (51%), indicates a well–developed woodworking crafts. In favor of this, the number of found axes can be added (12%), as well as chisels (4%) which, although not significant, indicates the above–mentioned activity. Lengths of complete, undamaged tools vary. The most numerous of all are tools 80 – 90 mm long, followed by those 100 – 110 mm and 90 – 100 mm long (Fig. 3). It can be presumed that the number of implements with these dimensions was much bigger, according to the remnants

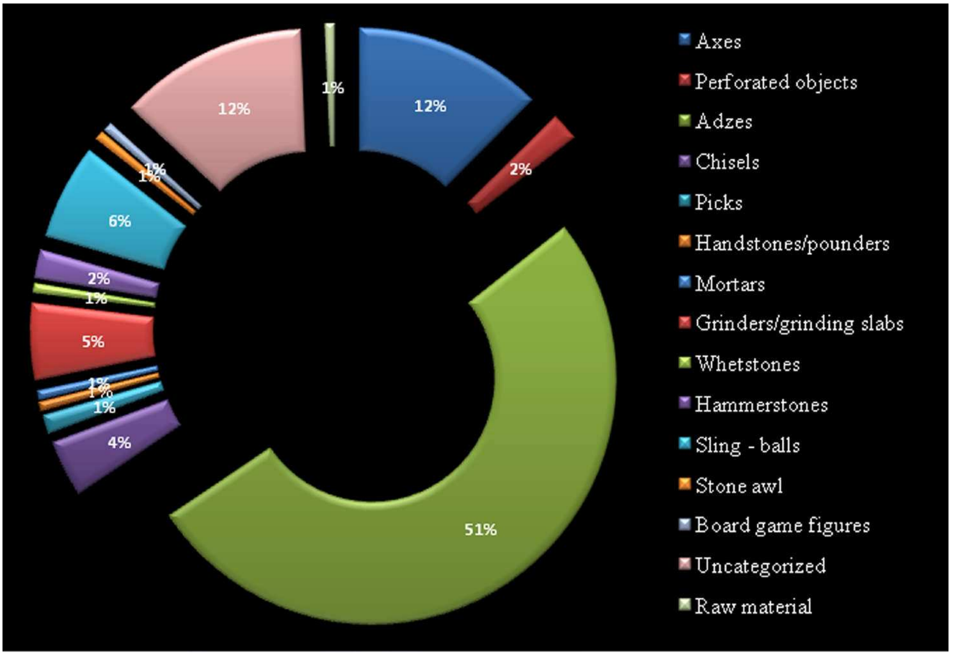

Fig. 2. Graphic representation of ground and abrasive stone tools from Neolithic site of Lađarište

Сл. 2. Графички приказ заступљености глачаног и абразивног каменог оруђа на локалитету Лађариште

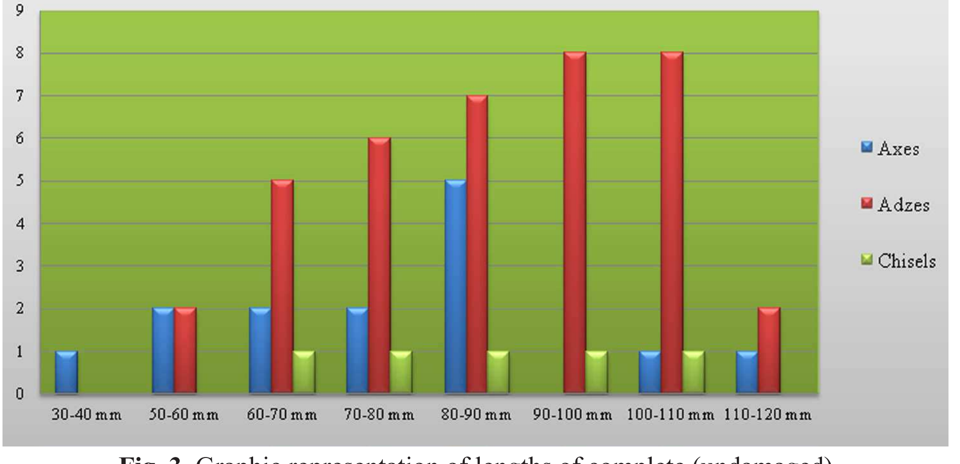

Fig. 3. Graphic representation of lengths of complete (undamaged) axes, adzes and chisels

Сл. 3. Графички приказ дужина комплетних неоштећених секира, тесли и длета

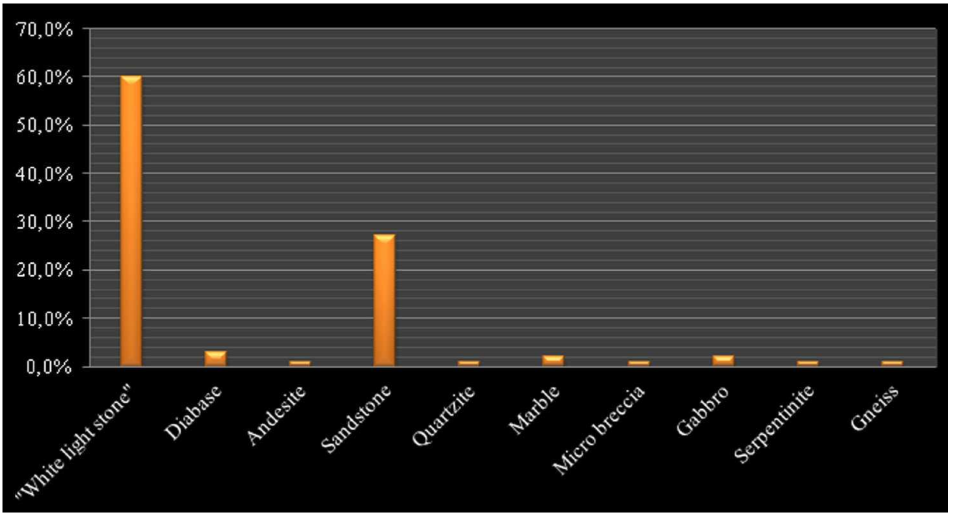

Fig. 4. Graphic representation of raw materials used in tool production
Сл. 4. Графички приказ заступљености камених сировина употребљених за израду глачаног каменог оруђа

of the fragmented artifacts. The location of the damage/fracture of the tool also varies from distal to medial part of the tool, that is from the cutting–edge to the part where the implement is hafted in the handle. In the material of this category the tendency towards recycling use of damaged tools is noticed, which will later be discussed.

From the petrographic point of view, the usage of small to fine–grained sedimentary, partially silicified rock hardness 4–6 was prevalent, as well as metamorphic and igneous rock, although present in a smaller percentage than the previous (Fig. 4**).** From sedimentary rocks those recorded there are: "light white stones" (60%) and sandstones (27%) (Dimić 2013). Sandstones are of different granulation, and the most used ones are fine–grained stones. They were used for manufacture of various tool categories, from fine grindstones and whetstones to ground stone cutting–implements. Regarding the "light white stone", microscopic analysis of petrological samples has indicated that these are most likely silicified magnesites of different degree of silification: from those with a powdery structure to very compact, hard pieces with transition to cherts (Analyses of petrologic samples were made by dr. D. Milovanović on Faculty of Mining and Geology in Belgrade). "Light white stone" was exclusively used for the production of tools with cutting–edges, that is axes, adzes and chisels. According to petrological analysis of used rocks, as well as relying on geomorphologic features of this area, a strong assumption can be derived that the exploitation of raw materials was conducted on a local level (Dimić 2013; more about geomorphologic features see in: Miljković, Kovačević 2001; Gočanin 1933; Stevanović 1939).

Production traces on the ground stone cutting–implements

Method or technique of raw material processing depends on two factors: the petrological characteristics of the raw material which is intended for the manufacture of the tool and the shape of the tool. The fact which must be borne in mind is that different types of rocks possess different physical and mechanical features. These specificums vastly dictate the method and techniques of tool processing. This implies that the same technique applied on different kinds of rocks will not give the same result. This is the reason why, at our Neolithic sites, the most commonly used artifacts are those derived from raw materials which have a conchoidal fracture during the impact. This enabled relatively or very precise flakes obtained during the initial processing, or knapping, which would afterwards be transformed by retouching into knives, scrapers and other tools (Antonović 1992, 24). Some of those rocks and minerals are: chert (flint), opal, obsidian and other silicious rocks. They have amorphous structure, conchoidal fracture and no cleavage, which enables easy knapping. The desired product could be obtained by knapping and eventually processed by retouching. Other rocks such as, granite, andesite, gabbro, sandstone etc. have different, grained structure. As a result of that, they were finally formed into tools using several production techniques as pecking, grinding and polishing, since knapping would most commonly cause irregular shapes of flakes, due to irregular fractures (Edmonds 2005, 2). This is the reason why a number of igneous rocks, due to their mechanical features, could be processed by pecking, grinding and finally polishing (Fine–grained igneous rock such as basalt could be processed by knapping).

All of the aforementioned processing techniques leave traces on the tool surface. The problem of determination of all processing steps of ground stone tools lies in the final processing technique of this kind of material – grinding. Grinding technique is based on the final treatment of the object using some abrasive. By grinding a surface of the tool, the traces of the previous treatment often disappear, hence the processing techniques which led to the final shape of the tool could only be presumed. In that matter, findings of tool preforms and semi–finished tools are significant since they indicate several stages of the tool treatment (Fig.

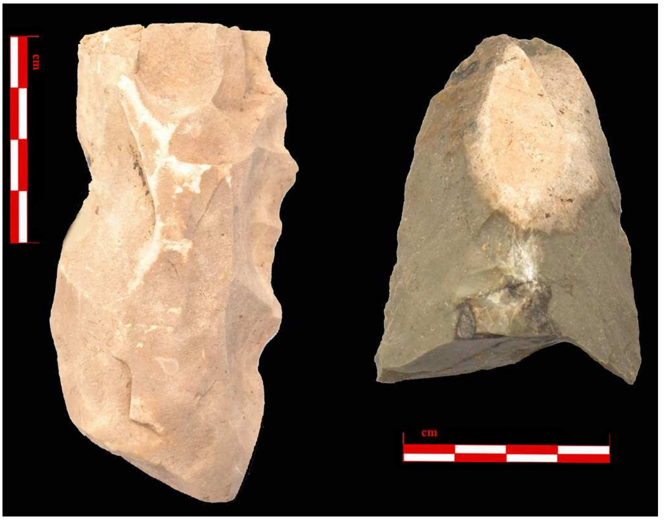

Fig. 5. Representation of semi-finished tools from Lađarište (sB 13 „white light stone“ and sC 6 dacite) Clearly distinctive knapping traces of the dorsal side with a striking platform on the ventral (photo by author)
Сл. 5. Приказ полуфабриката са лађаришта (сВ 13 „лаки бели камен" и сС 6 дацит). Јасно препознатљиви трагови окресивања дорсалне стране са платформом на вентралној (фото: аутор)

5–6)**.** Because of this, together with grinding traces, knapping and retouching or pecking and later subsequent grinding traces could be defined as well. Besides the primary processing, traces occurred after the tool fragmentation could also be defined, that is the traces of recycling processing and use. We should mention that it is not a rare case that the raw material is only treated by grinding if it is found in the shape which is satisfactory or resembles the wanted shape of the tool.

Knapping

As previously mentioned, depending on the raw material which is used, knapping is the first and basic technique used in order to achieve the appropriate shape of the stone tool. It is based on punching a nodule or an already prepared stone nucleus with harder (stone) or softer (antler, bone or wood) hammer, causing forming of larger blanks or smaller flakes and chunks. Blanks or flakes, depending on their size and shape could be used for the manufacture of ground, as well as chipped stone tools with or without subsequent retouch. Knapping can be performed directly or indirectly, it can be conducted by pressure flaking, as

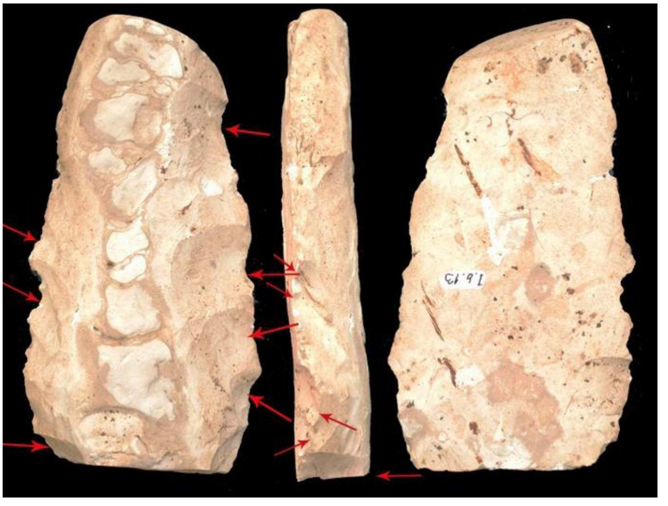

Fig. 6. Preform of the implement from Lađarište. Clearly distinctive knapping traces of the dorsal side, with the platform on the ventral. Total length of implement 120 mm (photo by author)
Сл. 6. Полуфабрикат са Лађаришта. Јасно уочљиви трагови окресивања дорсалне стране са платформом на вентралној. Дужина полуфабриката 120 мм (фото: аутор)

well as by the inverse direct percussion technique (Miller 2007, 57). Knapping is mostly performed in order to strike the flakes of appropriate shape and size of the nodule, intended for further processing, or if the raw material is of appropriate size, in order to perform a necessary reduction, in accordance with the desired shape and type of the tool. In the process of ground stone tool production, depending on the type of the desired tool, knapping of the dorsal side with the platform on ventral is most commonly performed (Antonović 1992, 24). The exceptions are the axes, where we can observe alternate knapping on both sides (zig–zag knapping). Further processing often included a retouch which was used for final treatment of rims and edges. Basically, knapping flew in the direction of thinning tools, and fine and a gradual reduction of its overall mass (Fig.7).

In the ground stone tool assemblage from Lađarište 50 artifacts (CZ–5, CZ–6, CZ–10, CZ–12, CZ–13, CZ–14, CZ–30, CZ–31, CZ–33, CZ–34, CZ–35, CZ–37, CZ–38, CZ–39, CZ–51, CZ–54, CZ–56, Sa–6, Sa–7, Sb–3, Sb–4, Sb–6, Sb–7, Sb–8, Sb–10, Sb–13, Sc–1, Sc–3, Sc–4, Sc–6, Sc–8, Sc–9, PN–2, PN–10, PN–12, PN–16, PN–20, PN–21, PN–23, PN–26, PN–27, PN–28, PN–30, PN–32, PN–36, PN–37, PN–39, PN–45, PN–48, PN–51) were defined which have knapping traces on their edges, which haven't been completely obliterated by

Fig. 7. Knapping an adze, craftsmen from Langda group,
Irian Jaya region (taken from Pétrequin et Jeunesse 1995, 67)
Сл. 7. Окресивање у изради тесли, занатлија из заједнице Лангда,
регион Irian Jaya (преузето из Pétrequin et Jeunesse 1995, 67)

subsequent grinding. On tools with distinguished knapping traces, knapping was most commonly conducted from the dorsal side, with the platform on ventral. This kind of practice was most commonly used in the production of adzes *(see fig. 5–6).* On the other hand, for production of axes alternate knapping of both sides was used (Fig.8**)** or the axe gained its final form through grinding and polishing, if the found raw material had a suitable shape. That situation is the most obvious on the findings of preforms and semi–finished tools from Lađarište, whose further processing was ceased due to certain reasons. Also, the difference should be made between semi–finished implements and tools whose edges were left without grinding on purpose, such as artifacts CZ–13 on the Fig. 8.

Pecking

Pecking is another technique of raw material reduction which is used for those rocks which due to their petrographic characteristics don't have a conchoidal fracture. Those are coarse–grained rocks whose grains, during the impact, detach from the basic rock mass causing a formation of an irregular dent on that spot (Antonović 1992, 25: In the archaeological literature, this technique is referred

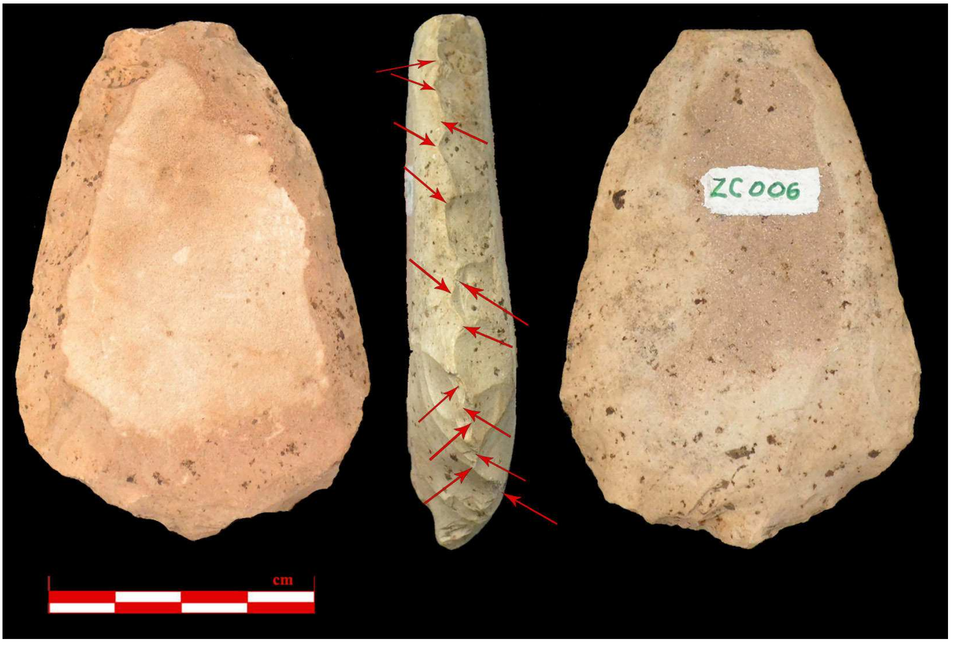

Fig. 8. Stone axe from Lađarište (CZ-13) with distinctive knapping traces and partially grinded dorsal and ventral side. Total length of tool 78 mm (photo by author)

Сл. 8. Камена секира са Лађаришта (ЦЗ-13) са јасно уочљивим траговима окресивања и парцијалног глачања дорсалне и вентралне стране. Дужина 78 мм (фото: аутор)

to as: iskucavanje (Srejović 1969, 97), kuckanje (Babović 1984, 115), „точечная техника – пикетаж"(Semenov 1968, 80), „pecking" (Semenov 1976, 66) „pulverizing, pecking" (Miller 2007: 58–59). Pounding could be conducted with harder or softer hammers, depending on the wanted result, as well as intensity and speed of raw material reduction.

In the ground stone industry from Lađarište, traces of tool surface processing with pecking technique could only be presumed. The cause of this is that all axes and adzes, whose manufacture could be based on this technique, were afterwards severely ground, so the traces of pecking, if there had been any, were completely obliterated from the surface of these implements (implements from Lađarište produced of: diabase, andesite, sandstone, marble, gabbro, serpentinite and gneiss. In contrast to these, implements made of "white light stone" are initially processed exclusively by the knapping technique).

Grinding and polishing

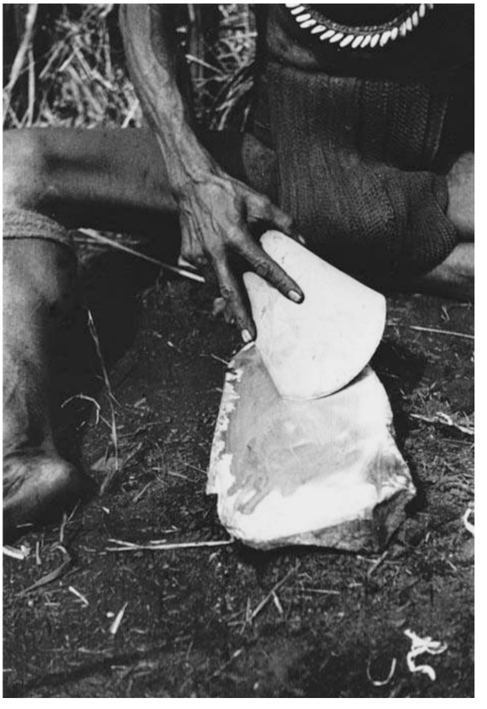

Fig. 9. Grinding of stone axe, Jimi Valley (taken from from Burton 1984, plate 6.3)
Сл. 9. Глачање камене секире, Jimi Valley (преузето из Burton 1984, табла 6.3)

Grinding[3] represents final stone processing, which was used to give a wanted form to a certain tool after knapping or pecking. It was practiced in order to finely reduce uneven surfaces, left after the previous processing, define the edges, as well as sharpen the cutting–edge of the tool which consequently became more durable and resistant to cracking. We could say that this technique, as well as technique of polishing brought out the beauty of the stone, which stepped out to the fore. In contemporary literature, the term "grinding" implies the treatment of the object surface (material) with different kinds of abrasives. It represents a mutual rubbing, that is, friction between two objects, in this case stone tools and abraders which can be of abrasive rock or terracotta, in order to receive smooth tool surface. Most commonly, the abrasion processing included the use of additional abrasives, such as sand, with or without water (Miller 2007, 59) (Fig. 9).

[3] One of the problems which should be considered is the question of terminology, when discussing ground and abrasive stone tools. It seems that general division to ground and abrasive stone tools doesn't always define which group of tools is in question, especially if we compare domestic literature and the one from the West. The main problem seems to be etymological. In most cases, scientists from the West, when using the term "ground stone tools" (*glačane kamene alatke*), imply to abrasive tools, querns, grinders, whetstones etc., that is tools used for grinding and not tools which have been ground in technological sense. (Adams 1989; Ebeling 2002; Runnels 1981). On the other hand, in domestic literature, the same term implies the ground stone tools, in the sense of production, while "grinding stone tools" or "abrasive stone tools*" (abrazivno kameno orudje)* are tools with abrasive features (Perišić 1984; Antonović 2003). Finally, the term "polished stone tools" is used in western literature for ground stone tools, which is not entirely appropriate, since it reflects a special technique of grinding which can, but doesn't have to be used on the object, and that is polishing.

Besides grinding, for the finest material processing (in this case stone) polishing technique was also used, implying treatment of material surface with polishers such as wood, leather and fabric. Such polishers were significantly softer than the processing objects, so they couldn't endanger their already ground surface. However, polishers did take off the finest remaining irregularities and particles, which gave the additional beauty to the processed object, as well as a significant improvement of mechanical characteristics.

Tool processing by the grinding technique is, at the same time, the most exhausting and it demands a lot of effort and time. Speed and intensity of this raw material reduction technique depends on several factors: raw material which is being processed, the pressure force of processing object against the grinding slab, as well as the speed and intensity of alternate movements of object on the grinding slab. Grinding is always conducted by abrasives of more hardness than the raw materials which are processed. Therefore, in most cases, there are clearly visible traces of grinding on objects and the manner in which the object was held and the course of grinding can be presumed (Antonović 1992, 25; Adams et al. 2009). Traces are often in the shape of shallow furrows which are usually located throughout the whole surface of the stone tool (Fig. 10–11). Depending on the raw material, traces can be in the shape of regular, parallel lines, but also short, less

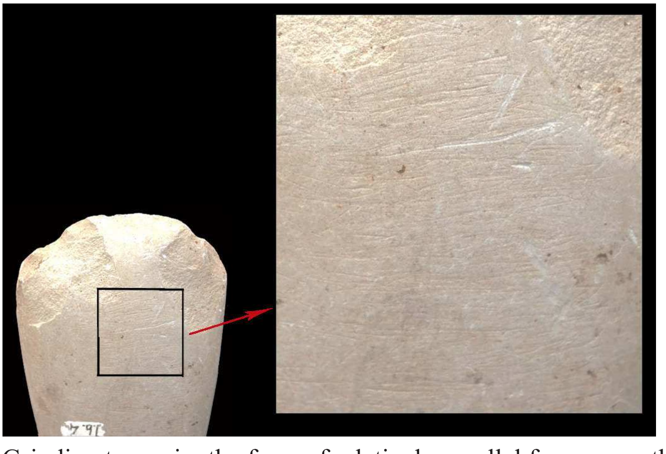

Fig. 10. Grinding traces in the form of relatively parallel furrows on the stone axe surface, closer to the distal end. Lađarište Site, PN-44, Marly sandstone, Total length 78 mm 109 mm, Dimension of magnified segment 25×25 mm, right – look under magnification 10× (photo by author)

Сл. 10. Трагови глачања у виду релативно паралелних бразди на површини камене секире, ближе дисталном крају. Локалитет Лађариште, ПН-44, лапоровити пешчар, дужина 109 мм, димензије увећаног дела 25×25 мм, десно – поглед под увећањем 10× (фото: аутор)

Fig. 11. 1) Grinding traces on dorsal side of the „adze“ under a 20× magnification. Traces are distributed over the entire tool surface and it is clearly visible that they are formed by rectilinear grinding movements into 2 directions intersecting and almost forming a right angle; 2) „Adze“ CZ-14 from Lađarište macro. Length of the fragment is 76 mm (photo by author)

Сл. 11. 1) Трагови глачања на дорсалној страни „тесле” под увећањем од 20×. Трагови се простиру преко целе површине дорсалне стране алатке и јасно је уочљиво да су формирани праволинијским глачањем у два правца, тако да се трагови секу готово под правим углом; 2) „Тесла” ЦЗ – 14 са Лађаришта макрофотографија, дужина фрагмента 76 мм (фото: аутор)

regular heterogenic traces can be visible. Most commonly, the entire surface of the tool is ground, but it is not rare that the tool is only partially ground. Intensity and regularity of grinding traces on the object are directly conditioned by the fineness of the abrasive, which is used during grinding, as well as by the type of raw material, that is, the type of object in the process of grinding. In some cases, grinding was conducted to that extent and with very fine abrasives (polishers) that the furrows almost completely vanished from the tool surface. From the aspect of the final product, it can be concluded that the amount of invested effort and time, as well as the kind or fineness of the abrasive which is used, can be put in direct proportion with the intensity of certain implement's grinding level and its gloss. According to that, our aesthetic perception of the quality of treatment is directly related to the technical characteristics and functional quality of a certain implement.

Use–wear traces on the ground stone cutting–implements

Each tool used in the past, carries certain characteristic traces depending on the function it previously had. First attempts to, beside the typological classification, determine the function of the tool based on the traces of processing and use visible on them, occurred in the Soviet Union by S. Semenov. His work "Pervobitnaя tehnika", published in 1957, is still widely quoted among contemporary experts. Afterwards, in 1964, this work was published in England as well, and presented a foundation for all later research, when functional tool determination, based on traseology is in question (Semenov 1957, 1976). His defined parameters of distribution and formation of the traces on certain types of stone tools are still used today. Beside Semenov, experimental use of stone tools and their analysis, somewhat later, was also conducted by Keeley (Keeley 1980), then Adams (abrasive stone tools production Adams 1988, 1989, 2002, 2010), followed by many other archaeologists as well (*e. g.* Pritchard–Parker, Torres 1998; Dubreuil 2004; Lunardi 2008). Traseological study of ground stone cutting–implements from Lađarište, will be based on comparative analysis of traces defined on tools from this site, with traces on tools from other sites, conducted by abovementioned archaeologists (Semenov 1976; Lunardi 2008; Pritchard–Parker, Torres 1998; Pawlik 2007; Smoor 1976; Hardy 1998; Donnart 2010; Jahren et.al. 1997; Pawlik 2007; Smoor 1976; Dubreuil 2004. In Serbia: Perišić 1984; Antonović 1992; Živanić 2010).

Axes

In older literature, the term axes encompassed all tools with a cutting–edge at the distal end. Most commonly, they are typologically classified under the following terms: tang–shaped, wedge–shaped, cylindrical axes, then axes shaped in a form of cobbler mold, battle axes hammer–axes etc. There are also subtypes in a form of big cylindrical, flattened cylindrical and trapezoidal axes (*see* Srejović, Jovanović 1957, 261–263, Babović 1984, 114; Perišić 1984, 64).

The term depended on the shape of the tool, while the function wasn't necessarily taken into consideration. In recent studies, beside typological classification, the attention was primarily directed to the function of the tool. Hence, a big number of tools typologically characterized as axes until that moment, actually had a function of adzes.

The term axe was used to denote all tools whose basic purpose was to fell trees, split the cut wood and process it. These are tools with distal ends formed into fine, most commonly arch–shaped cutting–edge placed in the plane of symmetry of the tool, while the proximal end is usually less processed and formed into a poll (Semenov 1976, 125–129; Antonović 2003, 53). Shaped axe was attached in a certain way to a handle, with the cutting–edge running parallel or nearly parallel to the long axis of the shaft (Fig.12).

Fig. 12. Photo of a recent hafted steel axe (left), and replicas of prehistoric hafted axes (right)

Сл. 12. Фотографија савремене секире са држаљом (лево) и реплике праисторијке секире са држаљом (десно)

Based on the traces of use, Semenov clearly separates axes from adzes (Semenov 1976, 126–130). Observing through the prism of his analysis, the axes are characterized by microstriations that are furrows and ridges, placed diagonally along the surface of the cutting–edge and distal part of the tool. They are equally visible on the ventral and dorsal side, with the widest part at the impact area of the very cutting edge, while gradually narrowing and vanishing at the upper parts of the distal part of the tool (Semenov 1976, 129; Lunardi 2008).

On the Lađarište site, there are 20 axes (CZ–br: 12/13/37/58, PN–br: 7/8/9/10/11/12/13/15/37/38/39/ 44/45/55, sA–br. 3/9) typologically determined, from which 6 samples are fragmented. Traseological analyses of 10 axes point to markers, characteristic for this kind of tool. Lengths of whole axes vary from 60 mm to 120 mm, a somewhat more numerous are those approximately 90 mm long (see Fig. 3). Axes from Lađarište site are mostly made of "light white stone" and different types of sandstone, with individual samples made of gabbro, serpentinite, dacite and cipolin (marble with mica). Fragmented pieces are mostly made of "light white stone", and the position of the fracture/damage varies from cutting edge to medial part of the tool. Damages are visible from both dorsal and ventral sides, somewhat more on the lateral parts of distal end that at the middle.

Parameters of forming and distribution of traces are tested on the ground stone axes assemblage from Lađarište. From 20 typologically determined axes, entire 10 axes were submitted to microscopic analysis. The remaining 10 axes were not microscopically analyzed, due to the lack of big part of the cutting–edge or due to mechanical damage formed during the use of the tool. All 10 microscopically analyzed axes show the same pattern of distribution of traces, same as stone axes analyzed by different authors (Semenov 1976; Lunardi 2008; Pritchard–Parker, Torres 1998; Pawlik 2007; Smoor 1976; Hardy 1998; Donnart 2010; Jahren et.al. 1997; Pawlik 2007; Smoor 1976; Dubreuil 2004. In Serbia: Perišić 1984; Antonović 1992; Živanić 2010). Traces are the widest at the very cutting–edge/impact surface and they are placed diagonally throughout the distal part of the tool. They occur in the shape of microstriations, inclined towards the cutting edge axis and spreading in many directions, which is a logical consequence considering the function of the tool and the manner in which it is used (Fig. 13–14). Microstratiations are always followed by micropolish, which is most visible on the very cutting edge and the surface between the furrows.

Adzes

The term adzes is used to denote all tools with a cutting edge, whose basic function is adzing and gouging of wood. Contrary to axes, adzes have asymmetrical shape, with a cutting edge outside the symmetry plane. The object is attached to a handle with the cutting–edge running transversely to the long axes

Fig. 13. 1) Axe (sA-9), total length of tool 57 mm, macrophoto, Lađarište site; 2) microphoto of the cutting-edge on dorsal side under 35× magnification; 3) microphoto of the cutting edge on the ventral side under 40× magnification. Use-wear traces occur in the shape of microstriations, inclined towards the cutting-edge axis (photo by author)

Сл. 13. 1) Секира (сА – 9) дужина алатке 57 мм, макрофотографија, локалитет Лађариште; 2) микрофотографија сечице на дорсалној страни под увећањем 35×; 3) микрофотографија сечице на вентралној страни под увећањем 40×. Трагови употребе су уочљиви у виду микрострија (бразди) искошених у односу на праву сечице (фото: аутор)

of the haft (Semenov 1976, 126, Antonović 2003, 54) (Fig. 15). Traces of use occurred on adzes are characterized by fine furrows parallel to the long axes of the tool. Often, they are placed on the dorsal side, but most commonly on the middle of the cutting–edge, while few of them are on the ventral side, but significantly shorter and smaller (Semenov 1976: 126; Lunardi 2008; Pawlik 2007). Furrows, just like those on axes, are the widest on the cutting–edge. Followed by polished surround surface, they most probably occurred as a result of hard friction and pressure of the material which the tool cuts.

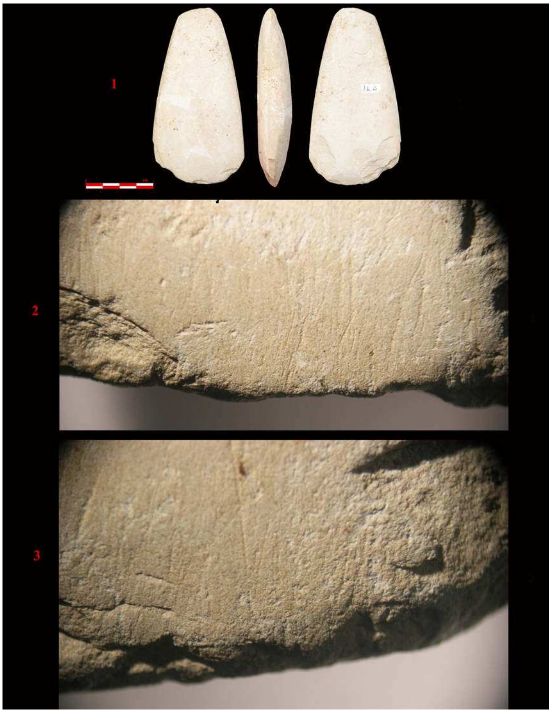

Fig. 14. 1) Axe (PN-44), total length of tool 109 mm, macrophoto, Lađarište site; 2) microphoto of the cutting-edge on dorsal side under 20× magnification; 3) 25×. Use-wear traces occur in the shape of microstriations, inclined towards the cutting-edge axis (photo by author)

Сл. 14. 1) Секира (ПН-44), дужина 109 мм, макрофотографија, локалитет Лађариште; 2) микрофотографија дорсалне стране сечице под увећањем 20×; 3) и под увећањем од 25×. Трагови употребе су уочљиви у виду микрострија (бразди) искошених у односу на праву сечице (фото: аутор)

In ground stone material from the site of Lađarište , there are 82 adzes (CZ–no.:5/6/7/10/11/14/30/31/32/33/34/35/36/38/39/40/41/45/46/47/48/49/54/57; PN–no.:16/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/40/41/46/47/48/49/50/52/53/54 /56; sA–no.: 4/5/7/10/11/12; sB–no.: 2/3/4/5/6/7/8/9/10/12/13; sC–no.:1/2/3/4/7/9/10) typologically determined, that is 51 % of all tools found. Same as axes, they are made mostly of "light white stone" and sandstone. The quality of "light white stone" varies and the best preserved samples of adzes are those made of strong silicified pieces of raw materials. The size of entire adzes vary from 60 mm to 120 mm. Differences in size are somewhat less expressed that at axes and it could be said that one degree of uniformity is visible. A bit higher percentage of occurrence has adzes from 90 mm to 110 mm long (see Fig. 3).

Fig. 15. Photo of recent hafted steel adze (left), replica of prehistoric hafted adze (right)
Сл. 15. Фотографија савремене тесле са држаљом (лево), реплика праисторијске тесле са држаљом (десно)

A great number of adzes is fragmented so that no microscopic analysis could be conducted on them. Around 30 adzes are microscopically analyzed while on 10 of them microphotography was conducted. Use–wear traces are clearly visible on all analyzed tools and they are mostly matched with traces formation patterns analyzed by Semenov and other authors (Fig. 16–18). Significant number of tools show homogenous trace structure, while on some miscellaneous traces could also be seen which will be discussed later.

Chisels

Chisels are tools whose functional use in wood processing is: chiseling, gouging, shaping. One of the things which distinguish chisels from other tools is that they are often not used alone, like axes and adzes, but accompanied by hammers or some other implement with the function of pounder. Like axes and adzes, chisels also belong to a group of tools with a cutting–edge, but they are different from them because of their smaller dimensions (Antonović 2003, 55). Chisels can be similar or of the same shape as two before–mentioned groups of implements, although ,what places them in different category is the length of the

Fig. 16. 1) Adze produced from “light white stone“, Lađarište (CZ br. 5), total length of tool 71 mm; 2) microphoto of the cutting-edge on the dorsal side under 35× magnification; 3) microphoto of the cutting-edge on ventral side under 20× magnification. Use-wear traces occur in the shape of parallel furrows, perpendicular to the cutting-edge axis (photo by author)

Сл. 16. 1) Тесла израђена од „лаког белог камена”, Лађариште (ЦЗ – 5), дужина 71 мм; 2) микрофотографија дорсалне стране сечице под увећањем од 35×; 3) микрофотографија вентралне стране сечице под увећањем од 20×. Трагови употребе су уочљиви у виду паралелних бразди које се простиру под правим углом у односу на праву сечице (фото: аутор)

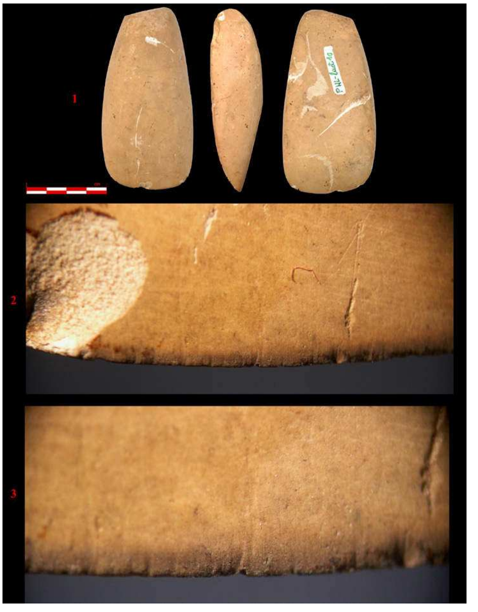

Fig. 17. 1) Adze produced from “light white stone“, Lađarište (PN br. 50), total length of the tool 93 mm; 2) microphoto of the cutting-edge on the dorsal side under 20× magnification 3) microphoto of the cutting-edge on the dorsal side under 40× magnification. Use-wear traces occur in the shape of parallel furrows, perpendicular to the cutting-edge axis (photo by author)

Сл. 17. 1) Тесла израђена од „лаког белог камена”, Лађариште (ПН – 50), дужина 93 мм; 2) микрофотографија дорсалне стране сечице под увећањем од 20×; 3) микрофотографија дорсалне стране сечице под увећањем од 40×. Трагови употребе су уочљиви у виду паралелних бразди које се простиру под правим углом у односу на праву сечице (фото: аутор)

cutting–edge which is not bigger that 25 mm. According to the interpretation of D. Antonović, it seems probable that some implements were used both as adzes and chisels according to the type of work) (Fig. 19).

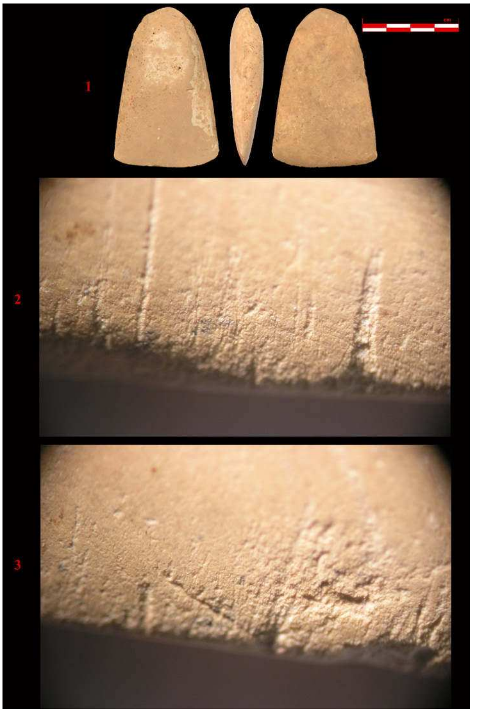

Fig. 18. 1) Adze produced from "light white stone", Lađarište (sB br. 4), total length of tool 65 mm; 2-3) microphoto of the cutting-edge on dorsal side under 20× magnification. Use-wear traces occur in the shape of parallel furrows, perpendicular to the cutting-edge axis (photo by author)

Сл. 18. 1) Тесла израђена од „лаког белог камена", Лађариште (сВ -4), дужина 65 мм; 2-3) микрофотографија дорсалне стране сечице под увећањем од 20×. Трагови употребе су уочљиви у виду паралелних бразди које се простиру под правим углом у односу на праву сечице (фото: аутор)

Use–wear traces on chisels are the same as on adzes, except that beside the traces on the cutting–edge, chisels also have damages or micropolished surfaces on the poll, occurring due to intense pounding of the hammer (Fig. 20) or intense pressure by the haft (hafting could be performed with its long axis continuous with long axis of the handle). It is not rare that miscellaneous use–wear traces appear, as a consequence of using chisels as a wedge, when splitting the piece of the wood into two parts. During that activity, due to heavy friction and big amount of pressure on the material, characteristic furrows occur on the surface, following the direction of penetration of the chisel/wedge through the wood. These traces can be concentrated on the smaller location, but they can also occur on the entire implement surface, as in case of chisel from Lađarište

Fig. 19. Photo of a recent hafted steel chisel (left), and Neolithic chisel form Lađarište (right)

Сл. 19. Фотографија савременог длета (лево) и неолитског длета са Лађаришта (десно)

Fig. 20. 1) Chisel (PN br. 17) Lađarište site, total length of tool 60 mm; 2) Use-wear traces visible on poll and dorsal side of the cutting edge 12×, 3) 20×, 4) 25×. 5) poll, proximal end 10×; Use-wear traces occur in the shape of parallel furrows, perpendicular and inclined towards the cutting-edge axis (photo by author)

Сл. 20. 1) Длето (ПН – 17), локалитет Лађариште, дужина 60 мм; 2) Трагови употребе уочљиви на темену и дорсалној страни сечице под увећањем 12×; 3) 20×; 4) 25×; 5) теме, проксимални крај под увећањем 10×; Трагови употребе су уочљиви у виду паралелних бразди које се простиру искошено и под правим углом у односу на праву сечице (фото: аутор)

(sA no.13). On the site of Lađarište, 6 mostly fragmented chisles were recorded, made of „light white stone“ and sandstone (CZ no.8/9, Pn no.2/17, sA no.13, sB no.14). Chisels were possibly employed for carpentry like grooving, carving or smoothing wood decoration, as well as for making ornaments.

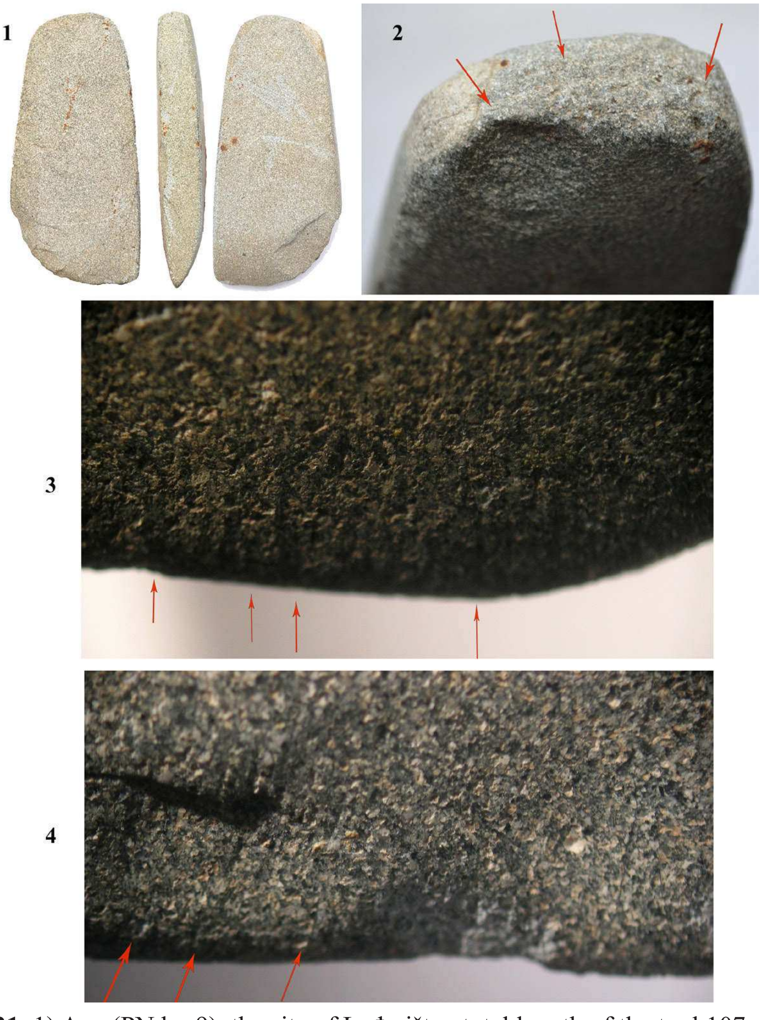

Fig. 21. 1) Axe (PN br. 9), the site of Lađarište , total length of the tool 107 mm; 2) photo of the poll with visible damages; 3) microphoto of the cutting-edge on the dorsal side under 15× magnification; 4) microphoto of the cutting-edge on the ventral side under 20× magnification. Miscellaneous use-wear traces are visible on the implement. Use-wear traces occur in the shape of parallel furrows, perpendicular and inclined towards the cutting-edge axis (photo by author)

Сл. 21. 1) Секира (ПН – 9) локалитет Лађариште, дужина 107 мм; 2) фотографија темена са уочљивим оштећењима; 3) микрофотографија дорсалне стране сечице под увећањем од 15×; 4) микрофотографија вентралне стране сечице под увећањем од 20×. На алатки су уочени мешовити трагови. Трагови употребе су уочљиви у виду паралелних бразди које се простиру искошено и под правим углом у односу на праву сечице (фото: аутор).

Recycling use

One more occurrence detected on the site of Lađarište are miscellaneous traces on the ground stone tools. Axes and adzes appeared which, beside traces of primary use, contained traces characteristic ofother group of implements. Best examples of this are: axe PN no. 9[4] (Fig. 21) and adze CZ no. 14 (*see* Fig. 11) which were secondarily used most probably as wedges; and adzes CZ no. 35 and sC no. 2, which were reshaped by knapping after the damage and had a function of a scraper (wedges are tools used for wood splitting, such as trunks and chunks. Today, metal and wooden wedges of different dimensions are used, so we can presume that stone wedges in Younger Stone Age played a role of those made of metal. They are primarily used alongside wedges carved of wood) (Fig. 22). A similar example is adze sC no.9, with an attempt of restoration and reforming of the cutting–edge after the damage, but that was stopped due to certain reasons. A aery interesting tool is also the tool (sB no. 8) which was made on thin flake with a remaining of the cortex (Fig. 23). It belongs to the group of the cutting–implements, made with the knapping and retouching technique, after which it was partially ground. The cortex is clearly visible on the dorsal side of the implement, as well as traces of grinding. No traces of use have been detected. According to morphological features, it can be classified as an adze. However, the small thickness of the tool should be taken into consideration, since it would undoubtedly lead to the fragmentation of the very tool when used in woodworking. Thus, there are several possibilities: the tool was attached to the haft in a special way so the weak points of the tool are compensted, or the tool had some other function, which was not related to woodworking activities, such as leather scrapers etc. It is also possible that the craftsman gave up from further processing at one moment, realizing that the tool doesn't possess potential or mechanical characteristics (reed as capability), necessary for certain operations.

Following the reduction processes of this kind (reduction through recycling) is often very hard with ground tools, due to the their processing technology, but if the attention is directed to the mutual dimensions and proportions between the artifacts, as well as their morphology, there is a possibility of obtaining some information which could direct to certain conclusions. Anyway,

[4] Axe (*PN no. 9*) belongs to the type of axes with a narrow proximal end and inclined edge. The edge on distal end originally wasn't inclined, but that is a product of axe use and damages which occurred. After that, the axe was used as a wedge, according to traces which are more characteristic for adzes than for axes, and damages appeared as a consequence of striking are clearly visible on the poll. The damages are in the form of furrows and dents in the basic mass of the rock.

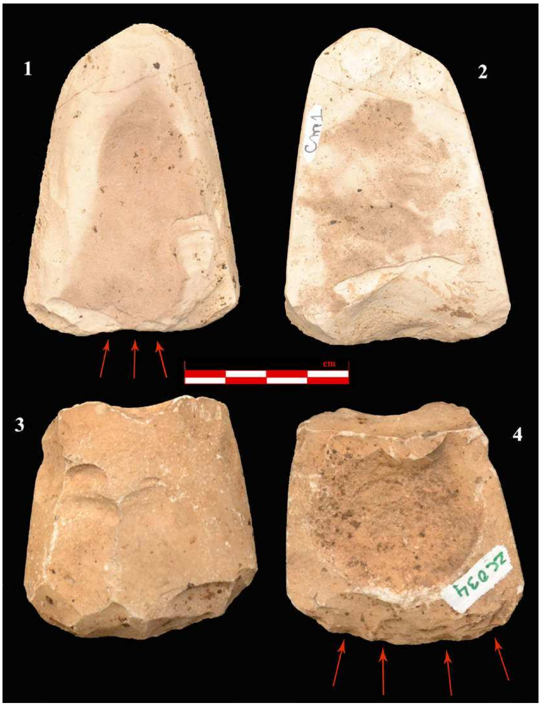

Fig. 22. Implements were primarily adzes, after recycling were formed into scrappers 1) sC br. 2, total length of the tool 83 mm, dorsal side; 2) ventral side; 3) CZ br. 35 total length of the tool 44 mm dorsal; 4) ventral. Fragmented implements with clearly distinctive production traces of knapping of distal end after primary fragmentation (photo by author)

Сл. 22. Приказ предмета који су примарно били тесле, након оштећења рециклирањем су формирани у стругаче; 1) сЦ – 2, дужина 83 мм, дорсална страна; 2) вентрална страна; 3) ЦЗ – 35, дужина 44 мм, дорсална страна; 4) вентрална страна (фото: аутор)

the recycling use of fragmented tools is not a rare case in archaeological material and represents the most rational use of raw material as an answer to a number of factors. (Bogosavljević–Petrović 2012, 217–223An example for that kind of maximal raw material use is visible at the site of Crkvine–Mali Borak s, where after the fragmentation of ground stone tools, tools in the form of scarpers, knives, sidescrapers etc., were produced from fragments by knapping). In other words, if there is enough quantity of raw material left after fragmentation, it would be, through a certain reduction technique, reshaped and therefore a new tool would be gained, which would have the same or a secondary function.

As Lađarište is located on a very convenient place regarding raw material deposits, the recycling practice couldn't have been a consequence of raw material deficiency in a certain period. It is more likely that it was a result of the basic sense of rational behavior of prehistoric craftsmen from this settlement.

Discussion on morphology, function and use-wear traces

From traseological points of view, observing the differences between traces that occur on axes and those on adzes, there is a strong impression that

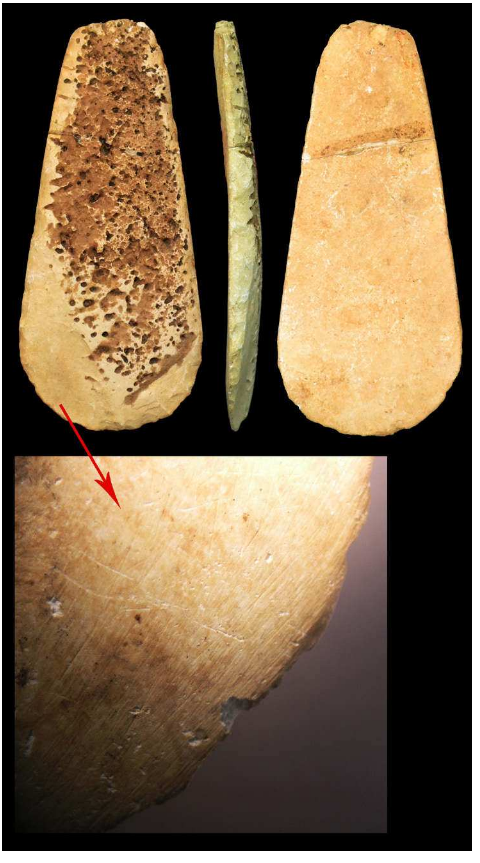

Fig. 23. Ground stone tool "adze" from Lađarište (sB br. 8) (above); Traces of grinding (below)

Сл. 23. Глачана камена тесла са Лађаришта (сВ – 8) изнад, трагови глачања (испод)

the traces on axes are far more heterogenic by structure than those on adzes. It can be presumed that this situation is a consequence of versatility of activities which axes conduct, as well as of morphology of these tools, which needs to be discussed more.

Morphology of stone tools, as well as its hafting method, are of greatest importance when it comes to their practical use. Depending on the proportions, morphology, size and weight, one tool can be used for different activities, weather it is an axe or an adze (Fig. 24). Hence, it is not a rare case that heterogeneity in use–wear traces occur on both of them, except that on axes the intensity and diversity of traces are somewhat more distinctive, which is the main consequence of their morphological characteristics as said above. Therefore, the stone axe–head is manufactured so that the cutting–edge is in the plane of symmetry of the tool, as well as with longitudinal axis of the haft it is attached to. Hafting (free interpretation according to ethnographic data from PNG, see Stout 2002, 2005; Hampton 1997, 1999; Sillitoe, Hardy 2003; Toth, Clark, Ligabue 1992; Smith 1892 and according archaeological artifacts of these category found in peatlands in the UK, Scandinavia and Switzerland, Edmonds 2005) could be performed in various ways: directly – by inserting the axe–head in a wooden handle or indirectly – by inserting the axe–head in antler segment which, we presume, had a role of shock absorber (in the Neolithic of Serbia there has been no record of such hafting methods by means of a shock absorber), and its subsequent hafting. The third way is also indirect and it

Tool type	Ground stone axes	Ground stone adzes	Ground stone chisels	Recycled ground stone tools and secondary use (scrapers and wedges)
Number of analyzed implements	10 *(20)*	30 *(82)*	3 *(6)*	8
Dimension of analyzed implements	60 – 120mm	60 – 120mm	65 – 99mm	44 – 107mm
Types of rocks	"Light white stone", cipolin, serpentinite, sandstone	"Light white stone"	"Light white stone" and sandstone	"Light white stone"
Defined manufacturing traces	Grinding, polishing, in cases of "light white stone" knapping, retouching	Knapping, retouching, grinding, polishing	Grinding, polishing, in cases of "light white stone" knapping, retouching	Retouching, regrinding
Suggested hafting	Wooden handle	Wooden handle	Wooden or bone/antler handle, or none	Wooden handle / hand grip
Defined use-wear traces	Cutting-edge damage, microflakes, striations on both sides	Cutting-edge damage, microflakes, striations, micropolish, more on dorsal side	Striations, micropolish, more on dorsal side	Extensive cutting-edge damage in primary use, micropolish and microflakes in secondary use
Regrinding/resharpening, retouching	Regrinding/resharpening	Regrinding/resharpening	/	Retouching, regrinding
Main function	Woodworking	Woodworking	Woodworking	Woodworking
Suggested function	Felling trees, cutting trunks and branches, splitting trees, cutting lop and undergrowth, splitting dry logs, processing construction segments etc.	Cutting branches, cutting lop, stripping the bark, processing wooden sticks, spears and handles, processing construction segments etc.	Fine wood processing, gouging wood for different purposes, for canoe, construction segments etc.	Splitting trees and logs, stripping the bark and thin pieces of wood

Fig. 24. Tabular display of data related to morphology and metric, use-wear traces and function of certain implement category

Сл. 24. Табеларни приказ података који се односе на морфологију, метричке карактеристике алатки, трагове употребе и претпостављену функцију одређене категорије глачаног оруђа

is related to axe–head insertion into the wooden socket, which is tied or fixed to a handle with a rope, lash or string. No matter the hafting method, the essence is the same: the cutting edge is in the plane symmetry and it follows the longitudinal axis of the haft it is fixed on. That structure of the tool provides a wide range of possible motions which allow easy and various maneuvering. The object can be smoothly hit from all sides and angles with equal force, resulting in equal effect. Stone axe cutting–edge penetrates into the material, enduring the same amount of pressure and friction from both ventral and dorsal side, and that situation causes distribution and intensity of traseological markers equally visible on both sides of the cutting–edge.

On the other hand, morphological features of stone adzes cause a different way of handling. Ground stone adzes are cutting–implements, whose cutting–edge is not in the plane of symmetry and the very tool is characterized by non–symmetrical appearance. The ventral side of the tool is most often flat, while the dorsal side is round to semi–circular, depending on the type. That shape of the adze head causes a different way of hefting. Fixing, as with axes, can be direct and indirect, except that the cutting–edge on adzes are placed perpendicular to longitudinal axis of haft. This relation between the adze–head, that is cutting–edge and haft, results in significantly reduced range of possible moves, which would be used to impact a certain object (e.g. tree log). In order to achieve the highest performance and transfer the maximum force to the impact point, striking could almost exclusively be in the form of swinging above the head and directing the strike straight ahead. The only possible deviation would be in the angle in which the cutting–edge penetrates into the object while other variations in strike moves are not possible. Hence, traseological markers which can be observed on cutting–edges and the distal ends of stone adzes are different than those on axes, not so much in structure, as in homogenous distribution and because they are often formatted on dorsal side.

When discussing the function of axes, due to various number of working activities where they could find their use, axes are seen as multifunctional tools. Based on their morphological characteristics, as well as use–wear traces on them, they could be used for: felling trees, cutting trunks and branches, splitting trees, cutting lop and undergrowth (cleaning space), processing construction segments, splitting dry logs, processing various handles, sticks, poles and pillars (according to some research, a stone axe in skilled hands proved to be a very effective tool. Experiments have shown that the relation between today's steel axe and stone axe surprisingly was 4:1, 3:1 even 1.5–2:1, looking toward speed and quantity of chopped wood. Sillitoe P. & K. Hardy 2003). Unlike axes, which were used for rough work, adzes are assumed to be used for fine work, such as wood processing, gouging, adzing, stripping a bark, processing house elements and mobiliar. Ethnographic data show that adzes were also used in producing canoes and vessels, made by gauging of bigger trunks (http://www.ehow.co.uk/info_8637750_dugout–canoe.html, http://www.fruitlands.org/media/Dugout_Canoe_Article.pdf). As Lađarište is a locality situated on the old Zapadna Morava riverbank, the possibility of using adzes in production of vessels should not be rejected.

Conclusion

The analysis of the surface of ground stone tools reveals a lot of details which are most directly related to the production technology of this tool category as well as its use. Traseological markers as indicators of technological choices and actions contribute a great deal to understanding of economy, everyday human activity and technological reaches of a certain prehistoric community. Therefore, all ground stone tools from Lađarište are analyzed in detail and the traces that occurred during production, as well as traces and damages that occurred during the use of the tool are clearly defined on them. According to them, several technological stages in tool production have been determined.

It can be concluded that basic raw material reduction technique was knapping, except that it is related only to tool made of "light white stone". Other types of raw material determined in ground material from Lađarište were most probably brought to the settlement from alluvial rock deposits in form of pebbles and flattened pieces of stones, which morphologically resemble complete tools, so that they could finally be processed with the pecking technique, grinding and eventual polishing. As already mentioned, the pecking technique is most often used with pieces of raw material which, during the knapping, don't have a conchoidal fracture. This technique was defined with certainty in production of abrasive tools, however when the production of axes, adzes and chisels is in question, the reduction of raw material through pecking technique is only presumed. The technique of grinding was practiced as the final processing technique, used to reduce all extra material, stone particles and all irregularities that occurred in previous processings. According to production traces on tools, as well as findings of abrasive tools from Lađarište, it can be concluded that grinding was conducted on static grindstones and whetstones of different granulation and structure, among which mostly fine–grain and very fine–grain sandstones are the most common. Depending on visible traces, several grinding methods can be determined, from circular dragging of the object over the grindstone to linear dragging back and forth. Special attention was directed to edge grinding, so that irregularities and cavities which could bring to unexpected fracture of the tool would be amended. Besides that, a well processed and sharper edge would definitely provide better results in woodworking, that is, cleaner and deeper cut which would result in less energy spending and more efficiency.

Fragmentation of tools is recorded in a large percentage. Damages are most often localized on distal and medial part of the tool. They occur in the form of smaller and bigger flakes and step fractures on tools, then edge devastation, as well as devastation of the bigger surface of the tool which makes it useless. If the object suffered small damages, recycling use would be practiced which is recorded on several implements with certainty.

According to the analysis of use–wear traces on ground stone tool from Lađarište, the existence of specific traces characteristic of certain tools and their practical use have been confirmed. A bigger transparency of traces is more visible on tools made of "light white stone" especially of more silicified pieces, as well as on tools made of fine–grain rocks. Use–wear traces are recorded in form of microflake scars, striations and micropolishes, and their distribution and intensity are different depending on tool category and their function. During the analysis of stone material, use–wear traces which were found clearly indicated that the specialization of certain tool category hasn't been prominent at a large scale. According to tool morphology, use–wear traces and different archaeological and ethnographic analogies, it can be concluded that ground stone cutting–implements from Lađarište have been used in a wide range of prehistoric woodworking activities.

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Видан Димић
Београд

ТРАСЕОЛОШКИ МАРКЕРИ НА ГЛАЧАНОМ КАМЕНОМ ОРУЂУ СА СЕЧИЦОМ СА ЛОКАЛИТЕТА ЛАЂАРИШТЕ КОД ВРЊАЧКЕ БАЊЕ

Кључне речи: *неолит, винчанска култура, Лађариште, глачано камено оруђе са сечицом, трасеолошка анализа, трагови израде, трагови употребе*

Анализа површине глачаних камених алатки открива мноштво детаља који су најдиректније повезани са технологијом израде ове категорије оруђа као и са њиховом употребом. Трасеолошки маркери као индикатори технолошких избора, радњи и активности умногоме помажу да разумемо економију, деловање и технолошке домете појединe праисторијске заједнице. Сходно томе, све глачано камено оруђе са Лађаришта детаљно је анализирано и на њему су јасно дефинисани трагови настали у продукцији као и трагови и оштећења настали услед употребе ове врсте алатки. Према њима, детерминисано је неколико технолошких ступњева у изради оруђа.

Основна техника редукције сировине било је окресивање, с тим што се оно – може се закључити – везује искључиво за алатке израђене од „лаке беле стене", највероватније експлоатисане са лежишта на гочком побрђу око реке Рибнице поред Краљева. Остале врсте сировина које су детерминисане у глачаном материјалу са Лађаришта највероватније су доношене у насеље са алувијалних стенских наноса у виду облутака и пљосни које морфолошки подсећају на готове алатке, тако да су финално могле бити обрађене техникама озрњавања, глачања и евентуално полирања. Као што је већ напоменуто, техника озрњавања најчешће је коришћена код оних комада сировине који при окресивању немају шкољкаст прелом. Ова техника је са сигурношћу дефинисана у производњи абразивног оруђа, међутим, када је у питању израда секира, тесли и длета редукција сировине озрњавањем, и даље постоје само претпоставке. Техника глачања практикована је као завршна техника обраде којом је уклањан сав вишак материјала и све неравнине настале приликом претходне обраде сировине. Према траговима израде на оруђу као и према налазима абразивног оруђа са Лађаришта може се закључити да је глачање вршено на статичним глачалицама и брусевима различите гранулације и састава, међу којима највише доминирају финозрни и ситнозрни пешчари. Према видљивим траговима може се издвојити неколико начина у глачању, од циркуларног превлачења предмета по глачалици до праволинијског превлачења напред-назад. Посебна пажња била је усмерена на углачавање сечице како би се анулирале неравнине и шупљине које су могле довести до неочекиване фрактуре оруђа. Поред тога, боље обрађена и оштрија сечица свакако би показала боље резултате у обради дрвета, то јест правилинији и дубљи рез који би резултирао мањим утрошком енергије и већом ефикасношћу.

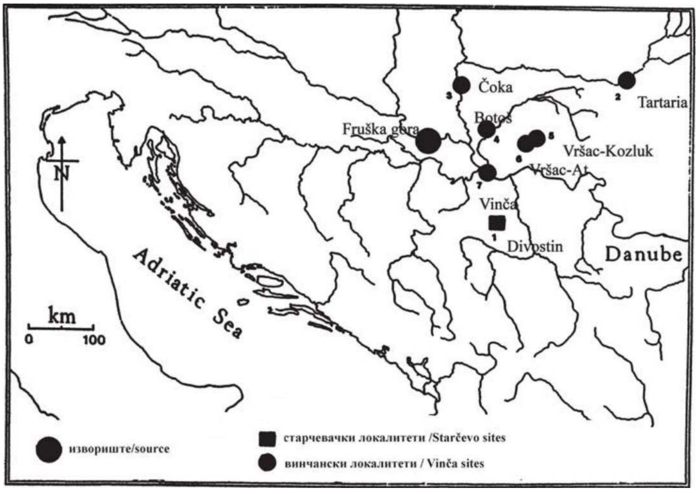
Фрагментација алатки забележена је у великом проценту. Оштећења су најчешће локализована на дисталном и медијалном крају алатке. Јављају се у облику мањих и већих неправилних одбитака на оруђу, затим девастације сечице, као и девастације веће површине оруђа, услед чега оно постаје неупотребљиво. Уколико је предмет претрпео мања оштећења, практиковано је рециклажно коришћење, које је са сигурношћу забележено на неколико предмета.

Приликом анализе трагова употребе на глачаном каменом оруђу са Лађаришта потврђено је постојање специфичних трагова карактеристичних за одређено оруђе и њихову практичну примену. Израженија транспарентност трагова видљива је код оруђа израђеног од „белих лаких стена”, и то од силификованијих комада, као и код оруђа израђеног од финозрних стена. Трагови употребе забележени су у виду бразди и микрострија, политуре и негатива микроодбитака, а њихова дистрибуција и интензитет се разликују у зависности од категорије оруђа и функције која је њима вршена. Према морфологији оруђа, траговима употребе као и различитим археолошким и етноархеолошким аналогијама, може се закључити да су алатке са сечицом са Лађаришта употребљиване у широком спектру праисторијских дрводељских активности.

ERRATA

У *Гласнику Српског археолошког друштва* бр. 30 за 2014. годину, у тексту Р. Балабан – *Алабастер у винчанској куилтури на простору Србије* дошло је до грешке у легенди код Карте 1 (Map 1), стр. 13.

Корекција је извршена тако да су сада малим кругом обележени винчански локалитети, док је квадратом представљена ознака за старчевачке локалитете.



Карта 1. Локалитети са налазима од алабастера и изворишна област на Фрушкој гори (преузето и модификовано према Chapman 1981, 301–311: Fig. 101)

Map 1. Alabaster finds and source in Fruška gora (taken and modified from Chapman 1981, 301–311: Fig. 101)

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