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A COLLECTION OF ARTEFACTS MADE FROM BOAR TUSKS FROM THE TRYPILLIA CULTURE SETTLEMENT AT "BEREZOVSKAYA GES"

ABSTRACT The aim of this paper is to present to the academic community previously unpublished materials from the excavation of a settlement at "Berezovskaya GES" belonging to the Trypillia culture, located in the forest-steppe South Bug region. The group of materials under study is a collection of tools made from wild boar tusk. The assembly comprises a large number of tools with varying degrees of use-wear, among them are preforms, blanks and debris. The tools underwent technical, morphological and traceological studies with the results being discussed in the article.

Key words: Chalcolithic, Ukraine, forest-steppe South Bug region, settlement "Berezovskaya GES", wild boar, canines, tools, technological and use-wear analysis, experimental work.

ABSTRAKT W artykule zaprezentowane zostały nieanalizowane wcześniej materiały z wykopalisk przeprowadzonych na osadzie kultury trypolskiej „Berezowskaja GES", w pobliżu wsi Berezowska, Ukraina.

Introduction

The settlement known as "Berezovskaya GES" is situated close to the village Berezovka Gaivoronsky district, Kirovograd region on the left bank of the southern stretches of the river Southern Bug. In 1955 the first archaeological studies took place there directed by V.N. Danilenko.[1] In 1962-1965 extensive excavations of the settlement were carried out by V.P. Tsybeskov.[2] In 1989-2000 rescue excavations were carried out on the Berezovskaya GES settlement under the guidance of E.V. Tsvek.[3] It should be noted that materials from the excavations of V.P. Tsybeskov, though noted in a number of short publications, have never been presented to scientific world in full. Some of Tsybeskov's finds were forwarded for storage to an employee of the Odessa Archaeological Museum, V.G. Petrenko and it is only thanks to his efforts they survived in the auxiliary depository of the Odessa Archaeological Museum of the National Academy of Sciences of Ukraine. Until 2018, the collection of bone artefacts was considered a sample of archaeozoological materials as identified by V.I. Tsalkin in the 1960s**.** A significant part of this collection (47 items) consists of manufacturing waste and blanks. The tools, formed from the lower canine tusks of wild boar (Sus scrofa ferus) are the subject of this publication.

Berezovskaya GES belongs to the Sabatinovsky type of settlements and until recently it had two radiocarbon dates: 4610 + 70 and 4564 + 85 Cal. BC., which dates were established by the Kyiv laboratory. According to the calibration data, the main period of its existence covered the period of around 4750-4550 Cal. BC.[4] However recently the LARA laboratory at the University of Bern has obtained two new dates for two features from Berezovskaya GES (subterranean dwellings 3 and 7 as defined by V.P. Tsybeskov). Their estimates fall between the chronological ranges 4341-4260 and 4331-4240 Cal. BCE (2σ) respectively for these subterranean dwellings. Thus, the new dates differ from the old ones by 200-300 years, and indicate that Trypillia settlements belonging to phase

[1] Danilenko 1955.
[2] Tsybeskov 1964; Tsybeskov 1971; Tsybeskov 1972.
[3] Tsvek 2005.
[4] Burdo 2015: 14.

BI were present in the Middle Bug area during the forty-fourth to the forty-second centuries BCE.

Despite the fact that tools made from boar tusks are commonly found alongside other objects from prehistoric and early historical periods in Europe until quite recent times, they have been rarely subjected to especial attention. Tools made from the tusk of wild boar are mentioned in studies of the excavations of Neolithic and Eneolithic settlements alongside other items made of bone and horn. For example, denticulate objects made from wild boar tusks have been reported by F. Kozubovsky in his study of the archaeological excavations of the settlement of Zhovtyakova Krucha, on the territory of the Bug hydroelectric power station. The author considers them as tools for application of ornamentation to ceramic vessels.[5] About 20 fragments of wild boar tusks are listed in the bone inventory by S.N. Bibikov in his study of the Luka-Vrublevetskaya settlement. He suggests that one of the objects, a curved blade, was used as a tool for weaving. According to him two other denticulate tools found in the same place are ornamental stamps.[6]

Tools made of wild boar tusks (5 items in total) are known from the materials of the early Tripolje settlement of Bernashivka. According to the definition of G.F. Korobkova, tools with linguar blades served as bore-reamers for the processing of hides.[7] Spatulas for the raw ceramic material were also made from this part of the tusk, and were later used as drills.[8] A tool made of a vestibular blade with a serrated cut is defined as an ornamental stamp.[9] These objects are almost identical to products from the Berezovskaya GES.

Objects made from boar tusks have only fairly recently started to become the object of research.[10] Thus Y. Maigrot,[11] M. Margarit and A. Boroneant,[12] A. Malyutina and M. Charniauski,[13] B. Marquebielle and E. Fabre[14] have carried out experimental and traceological studies of tools made from the tusk of a wild boar.

Material and methods

In total, the collection under study consists of 48 items, three of them being whole lower tusks, with traces of extraction from the lower jaw and partial cutting, five tusk fragments of were manufacturing waste, 16 were enamel blanks, 21 were tools made for various purposes and three were pedants recycled from tools (Fig. 1).

The canine teeth were measured using an electronic Digital Caliper, with an accuracy of 0.01 mm, as well as a centimetre elastic tape with an accuracy of 0.1 cm. The following measurements were taken of the lower canines: the greatest length from the base of the crown to the top along the largest circumference, the diameter at the base of the crown, and the diameter at the thin section. The Brandt method was used to determine the age of the slaughtered animals.[15] Overall, a total of nine canines and their fragments were measured. Irregularities of the canine surfaces were studied using a binocular microscope MSCROmed ZOOM 6630, while the photographic recording was made with a Levenhuk M800 PLUS digital camera (8MP).

Results and discussion

Reconstruction of the manufacturing process, and use of tools manufactured from animal bones, teeth and horns cause certain difficulties, since the vast majority of finds are ready-made forms (tools). Blanks and production waste usually fall into the category of "archaeozoological materials" and are not traceologically studied. The materials from Berezovskaya GES are an exception in this regard, since the collection under study represents all stages of the production of tools – from the extraction of the tusks from the lower jaw to the finished product. The choice of raw materials in this case was selective: only the lower canines were used. Raw materials were obtained by hunting wild boars, which occupied the second place in types of wild animal hunted after the red deer, and accounted for 21.6% of all animals hunted.[16] The diversity of biotopes in the vicinity of the settlement is an excellent food base for the wild boar, which is omnivorous. The study of wild boars shows that they stay in herds throughout the year, but the size and composition of herds varies

[5] Kozubovskyi 1933: 80, tab. 40.
[6] Bybykov 1953:117-118.
[7] Zbenovich 1980: 96, fig. 63, 27; 97, fig. 64, 3.
[8] Zbenovich 1980: 96, fig. 63, 27; 97, fig. 64, 3.
[9] Zbenovich, 1980: 96, fig. 63, 25; 97, fig. 64, 5.
[10] Skorobogatov, 2020.
[11] Maigrot 2005.
[12] Margarit, Boroneant 2021.
[13] Malyutina, Charniauski 2021.
[14] Marquebielle, Fabre 2021.
[15] Brandt 1961.
[16] Siekerska 2020: 294.

Fig. 1. Boar tusk tools from the Trypillia culture settlement “Berezovskaya GES”:
1.1 manufacturing wastes; 1.2 denticulate tool; 1.3, 1.5 pendants;
1.4 pointed ends tool; 1.6 blank; 1.7, 1.8 tools with one pointed end

Table 1. Boar's tusk measurements and age estimation

Measurement, mm	n	OAM 97732	OAM 97756/2	OAM 97756/2	OAM 97747	OAM 97731	OAM 97743	OAM 97760/1	OAM 97748	OAM 97763/1
The length at the largest circumference	9	214	203	203	200	210	195	183	163	95
Diameter at the interface (d_1)	3	64	-	-	-	63	-	-	-	40
Diameter at the base of the crown ($d_{2)}$	3	66,5	-	-	-	66	-	-	-	52
Ratio d_2/d_1	3	1,04	-	-	-	1,05	-	-	-	1,18
Approximate age, years	3	8	-	-	-	8 - 9	-	-	-	5 - 6

depending on the season and other factors. Most herds consist of 4-10 animals. The most common group is a family, i.e. a female with offspring of different ages. There are also groups of 2-3 females with piglets, they are sometimes joined by 1 or 2 adult males.[17] Hunting an adult wild boar, tusker is dangerous, but the risk is reduced if the hunter is on a hill above the animal. The lower fangs are used by animals not only for digging up food, but also as weapons, for attack and defence. They are triangular in cross-section, arcuate, outward facing and have a natural wear surface the so-called "grind", formed in the process of friction on the upper fangs when opening and closing the mouth. The proximal end of the lower canines is hollow and located in the lower jaw, accounting for 35 to 45% of their total length[18]. The distal end of the canine is a solid block of dentin. The lingual and vestibular surfaces of the canine crowns are covered with a layer of hard enamel (Fig. 2). These were the parts of the tusk that were used to make tools. There were two methods of obtaining raw materials: 1) by extracting the canine from the lower jaw as a whole – by loosening and pulling off following immersion in boiling in water, or mechanical destruction of the mandibular bone; 2) by cutting off part of the canine protruding from the mandibular bone, while its proximal part remains in the jaw. A significant number of tools and blanks were obtained from tusks extracted by the first method. Of the 24 tools, 5 are fragmented (20.8%), 3 are reutilized (12.5%), 12 (50%) have a proximal part, 4 (16.7%) are made on the basis of the medial-distal part of the canines. Of the 16 blanks, 4 (25%) have been preserved in a fragmented state, 9 specimens (56.25%) have the proximal part of the canine, 3 specimens (18.75%) were made on the basis of the medial-distal parts of the canines.

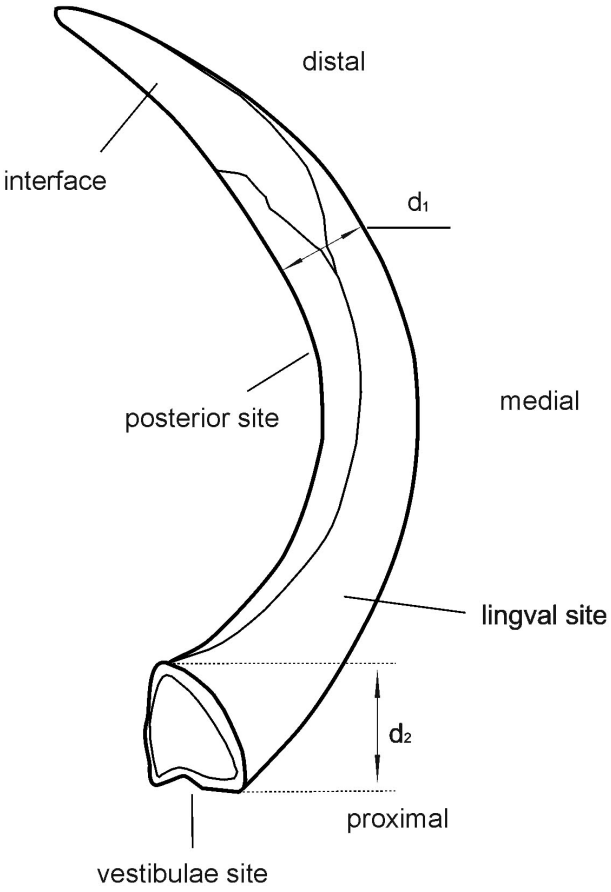

Fig. 2. The structure of the left wild boar's tusk

[17] Rusakov, Timofeyeva 1984: 160.
[18] Chiquet et al. 1997: 514.

To estimate the initial size of the fangs, which were used as raw materials, and the estimated age of the individuals to which they belonged, the archaeological specimens were compared with three intact canines from the same archaeological collection as well as with two modern ones. The length along the largest circumference of the experimental right canine is 115 mm, the ratio d_2/d_1 is 1.18, so estimated age of the specimen could be about 5-6 years. In three cases, for the canines of OAM 97731, 97732 and 97763/1, it was possible to determine the approximate age of the wild boars killed by hunters of the Berezovskaya GES (Table 1). The length along the largest circumference of whole blank blades varies from 163.0 to 203.0 mm. Thus, in order to obtain the optimal quality of raw materials, mainly animals older than 5-6 years were hunted.

Technology

The results of the use-wear analysis, and experiments performed on the fragments allowed to identify the main methods in which the wild boar tusks were treated. Materials that have their own natural shape were transformed into the primary blank, or preform, then the required tools were manufactured through secondary processing. The process of obtaining a blank (preform) included several operations: obtaining a preform and manufacturing a blank. Each canine was initially split along its axis into two parts. In order to achieve that, it was sawn or cut along its side. Grooves could be made on both (the convex and the concave) sides of the tool, or on one side only, which in most cases would be a sawn through concave side (Fig. 3.1).

The largest number of blanks was obtained by sawing or cutting of the concave side, followed by splitting (24 pieces). On 4 tools the traces left by sawing/cutting traces have been traced on the convex side, on 3 tools there are sawing traces on both sides. On the rest of the tools, the sides are damaged, or traces of processing have been destroyed as a result of use. This technology of canine splitting is also found on other sites.[19] Our observations match Ryan J. Rabett`s research. While examining tools from an ethnographic collection in Southeast Asia Rabbett noted that most of the blanks were obtained by longitudinal sawing of the concave side.[20]

Regular retouching is observed on two canines in the distal part on the convex side. (Fig. 3.2). One tool had not been completely split, and its distal end was intact. Evidently the convex side was cut through, but while splitting the canine the sliced off part had not detached fully. The same retouch is also observed on one other tool, though in this case the splitting was successful. Perhaps it was an attempt to improve the working edge of the tool, or possibly someone tried to divide the tusk into blades through knapping.

The vestibular and lingual parts of canine were selected for further processing thanks to the strength of their matter. The next step was to give the instrument the necessary shape. In some cases, the split tusk did not undergo any form of changes. The working edges were sharpened through planing or scraping, and if necessary the edge was processed with an abrasive (Fig. 3.3). On some tools, the inner side (dentin) was also processed by scraping.

This type of blank had been used to make seven of the denticulate tools studied (OAM 97728, 97744, 97745, 97746, 97747, 97748, 97749). They had subrectangular tines carved on the convex edge, at the upper one-third of their distal end, and covering length of 7 to 13 cm (Fig. 1.2). Three specimens of complete tools and three specimens of tool fragments belong to this type of blank. The tools are arched, they are wide at the base (proximal end) and narrowed to distal end, with base width averaging 1-1.8 cm. Specimens of complete tools average 15-18 cm in length. The tines are made by sawing, and the cuts are V-shaped in profile. One of the tools (OAM 97728) had been marked but not finished, it is likely that it had been reformatted for other purposes at a later stage.

One of the denticulate tool specimens, OAM 97744 stands out. It was made from a fragment of the vestibular side of the right canine (Fig. 1.3). The distal end is broken off. The item is 7.6 cm long and arched. The inner part (dentine) is processed by planing or scraping. A hole drilled in the proximal part had traces of wear on a cord. On the convex edge there are tines that occupy almost the entire length of the tool. The tines are not uniform, their width varies from 1 to 7 mm. Linear traces are observed on the tines on both sides of the edge, they are either perpendicular to the edge or are at an angle of 45°. These traces, in our opinion, are evidence that this tool was used to ornament ceramics. The edges of the object had been smoothed, rounded and polished so that they had acquired a soft shine. In the lower one-third part of the tool an ornament in the form of crosses was

[19] Malyutina, Charniauski 2021: 216; Zhilin 2017: 196.
[20] Rabett 2021: 133.

applied using thin, cut lines. We suppose that originally this object had been used to ornament pottery, and later it was recycled for use as a pendant.

We observed another type of blank, i.e. a blade with its distal and proximal ends narrowed and pointed to form dart-like ends (3 specimens) (Fig 1.4). Two tools have their dart-like ends shaped only on the distal side.

Function

A series of experiments was performed in order to establish the use-wear traces on the boar tusk tools from Berezovskaya GES. The goal of the experiment was to reconstruct the working procedures done with the boar tusk tools. Replicas of tools were made for the experiment and various tasks were performed on animal hides, fresh and dry wood, and clay. One of the replica blades (vestibular) was a used as a smoother for an unfired ceramic vessel, the other (lingual) blade – as scraper for dry hide (Fig. 15 photo exp). One of the experimental canines was split into two blades that were then used to scrape fresh and dried wood. The tools were in constant use for one hour each, this was sufficient to obtain clear and easily identifiable traces. A database of resultant samples was then used as a standard for cross-referencing (Fig. 4). The results obtained in our experiments do not contradict those published by other researchers.[21] Through our experiments we were able to identify use-wear traces on 23 objects.

Tools associated with the manufacturing of ceramic vessels

A total of 8 exemplars are included. Three of them were identified as spatulas for working on ceramics. For the manufacture of spatulas the right lingual blades were used. One of them is a blade of the proximal part of the lingual blade of the right canine, with a pointed end, the proximal end is broken. On the concave edge of the tool traces of sawing have been identified while on the convex side as a result of the operation of the tool all the traces of its processing are practically erased. The inner surface of the canine is processed by planing. The pointed end contains traces of hand polishing. Wear traces are found on the convex side and are especially intense at the broken proximal end. The wear was identified by traces in the form of scratches and intense grained polishing. On the convex side of the tool thin deep scratches are located along the entire length of the working edge, then they continue on both sides of the edge into the inner and outer sides of the tool, while the edge itself is smoothed and rounded. The edge of the broken proximal end is also smoothed and rounded, it is covered with gloss and the linear traces in the form of long thin scratches perpendicular to the edge which extend far into the inner side of the tool. This tool was used as a spatula for working with ceramic vessels (Fig. 5.1)

Among the objects found at the settlement are ceramic vessels with an ornament in the form of a square stamp. This type of ornament is typical for the Sabatinovka type settlements.[22] Traceological experimental evidence confirmed that application of such ornaments onto the vessels could be produced with denticulate tools. Our research showed that only vestibular blades of both left and right canines (3 items each) served as raw materials for ornamental stamps. This type of tools displays a set of traces indicating they were used to work with clay. Linear traces in the form of thin scratches are observed on the tines, either perpendicular to the edge or at an angle of 45°. The tines themselves are more intensely worn in their middle part, with only the top of each tine been rounded, polished, smoothed and having a grainy sheen (Fig. 5.2).

Tools for working hide

It was possible to identify 8 specimens of tools associated with the processing of hide. They were mainly made from the lingual blades of the left canines (5 items) and right canines (3 items) with one tool made from the left vestibular blade. These are arc-shaped tools with one or two pointed ends. The working edge is convex. Use-wear traces correspond to those resulting from the treatment of hide. The working edge is rounded and smoothed, its sheen is bright and covering the blade all over. The linear traces are thin, perpendicular to the blade, in some cases they extend into the dorsal and ventral parts. Judging by the direction of the traces, most of the objects were used as hide push-planers (Fig. 5.3). Two tools, in addition to transverse traces also display linear traces directed along the axis of the edge which indicates their use as knives.

[21] Rabett 2004; Margarit, Boroneant 2021.

[22] Burdo 2015: 20.

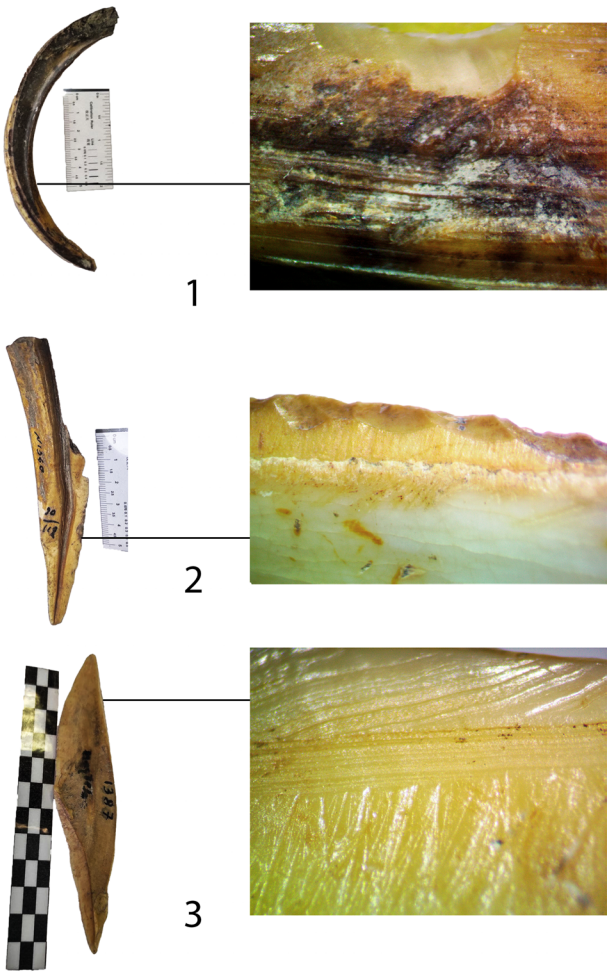

Fig. 3. Traces of processing on Boar tusk tools from the Trypillia culture settlement "Berezovskaya GES":
3.1. traces of sawing x 15;
3.2. retouching at the distal end of the tool x 15;
3.3. traces of abrasive and scraping x 20

Tools for working wood

This category includes 5 items. Three of them typologically represent unmodified blades and two are tools with one pointed end. For processing wood, tools made of the right lingual (3 items), right vestibular (1 item) and left vestibular (1 item) blades were used. The use-wear traces correspond with fresh wood planing, with linear traces taking on the form of deep thick furrows that are perpendicular to the working edge. They are localized on the edge itself, do not run onto the sides and their polish is bright with a distinct and regular contour (Fig. 5.4).

Some tools show various types of polishing in addition to clearly identifiable traces. The condition and degree of intensity of these types of polish do not always allow us to determine exactly what kind of material left these traces. It is possible that one tool could be used on different types of materials, another option would be that these were combined tools.

Pendants

Three such items were found (OAM 97751, 97744, 97791). One of them was possibly recycled from a tool that had become unusable, which would confirm that the raw material used was a highly valuable one. M. Margarit and A. Boroneant provide similar examples where a tool had been recycled after its working surface became ineffective.[23] Another possible example of that – an ornamental stamp that had been converted into a pendant – was also identified among the items from Berezovskaya GES (Fig. 1.3; 1.5).

The absence of field documentation makes linking the finds to exact archaeological complexes challenging. However, the cipher markings indicating the location of the finds still allow us to observe some regularities in the distribution of the finds. Thus, the following 7 tools were found in the V-Yu square: an ornamental stamp for ceramics (OAM 97747), a tool for scraping wood (OAM 97743), a tool for processing hide (OAM 97730), a pendant (OAM 97751), a whole tusk prepared for removal of the lingual blade (OAM 97732) and two raw blanks of vestibular enamel blades (OAM 977760/1-2). In the square IX-D the items found were as follows: 2 spatulas for clay working (OAM 97738, 97742), a tool for processing hide (OAM 97739) and a wood planer (OAM 97753). In the square 4-K there was a tool for working hide (OAM 97735) and an ornamental stamp (OAM 97748). Among the finds from dwelling 3 were an ornamental stamp for ceramics (OAM 97744) and 4 blanks made out of vestibular blades (OAM 97729, 97754/1, 97754/2, 97761). An ornamental stamp (OAM 97745), a tool used in the preparation of hide (OAM 97752) and a vestibular blade blank (OAM 97757/2) were found in square XII G-H. We observe that tools from different categories were found at each complex. This leads us to an assumption that each household had been producing the tools they required for their own needs, and the craft specialization did not exist at that time.

[23] Margarit, Boroneant 2021: 15.

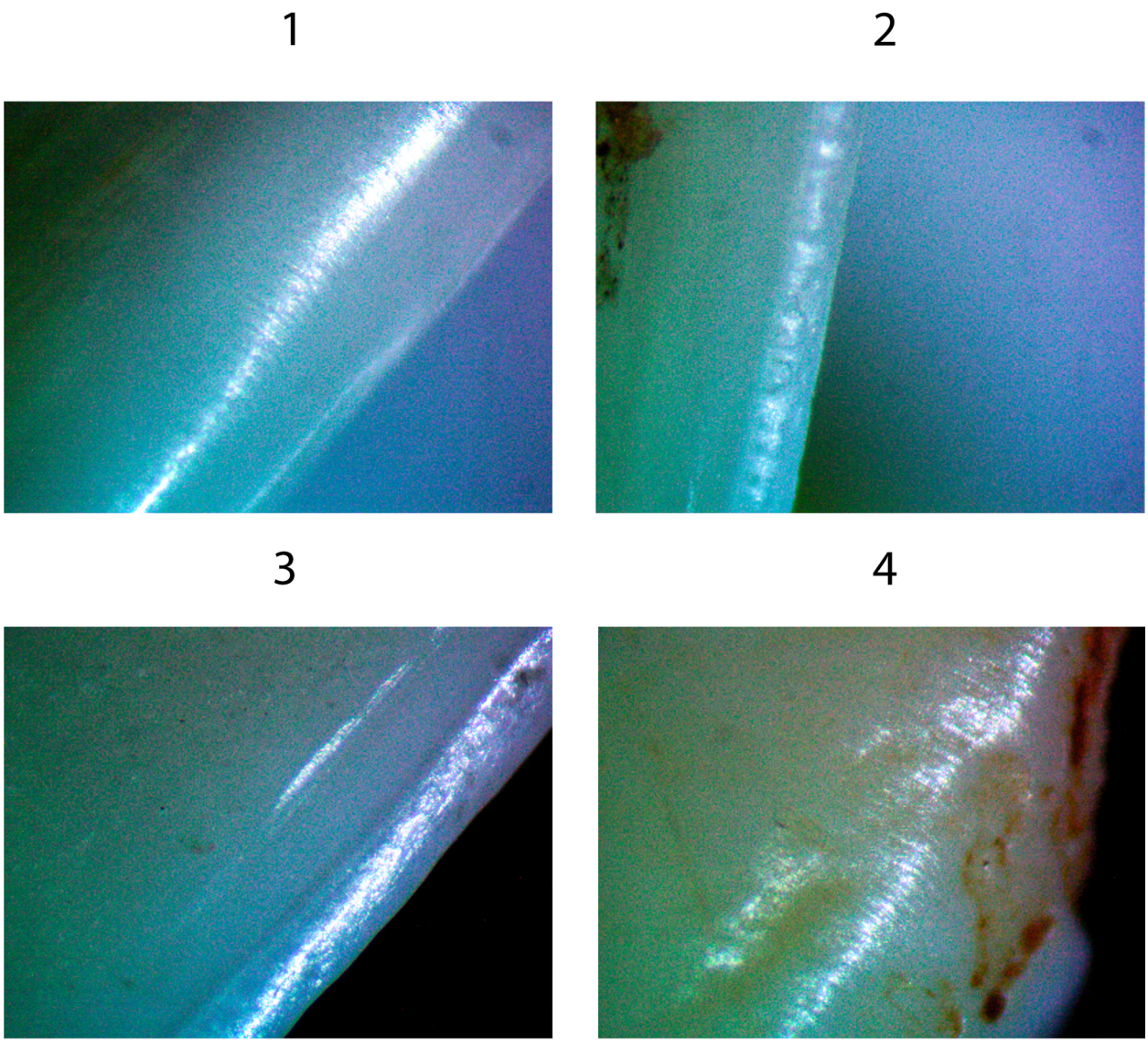

Fig. 4. Use-wear traces on experimental boar tusk tools:
4.1. traces of fresh wood scraping x 45; 4.2. traces of dry wood scraping x 45;
4.3. traces of hide processing x 45; 4.4. traces of raw clay processing x 45

Conclusions

The material analyzed in the pages above is functionally and typologically diverse, and provides a good insight into certain aspects of the economic life led by the inhabitants of the settlement at Berezovskaya GES. The production of tools from boar tusks is characterized by such traits as the standardization of methods for processing the raw materials and a considerable number of forms and functions of tools.

All items are made from the lower canines of adult male wild boars obtained through hunting. Raw materials were obtained in two ways. In the first case, the part of the canine protruding from the lower jaw was cut off, in the second case, the whole canine was removed by destroying the mandibular bone, or by pulling it out following the water-boiling procedure. The second way was obviously the predominant one.

The collection contains objects from all the technological stages of tool production: raw tusks, production waste, tool blanks, finished tools with strong traces of use and recycled items. The processing of canines was aimed at obtaining blanks from enamel blades of the lingual and vestibular sides of the adult wild boar lower canines, followed by manufacturing various tools from the blanks. Lingual and vestibular sides obtained by longitudinal splitting of a tusk along the pre-cut preparatory grooves were used as blanks for the production of tools.

A distinctive trend is observed in the choice of a canine tooth and its part (right/left, lingual/

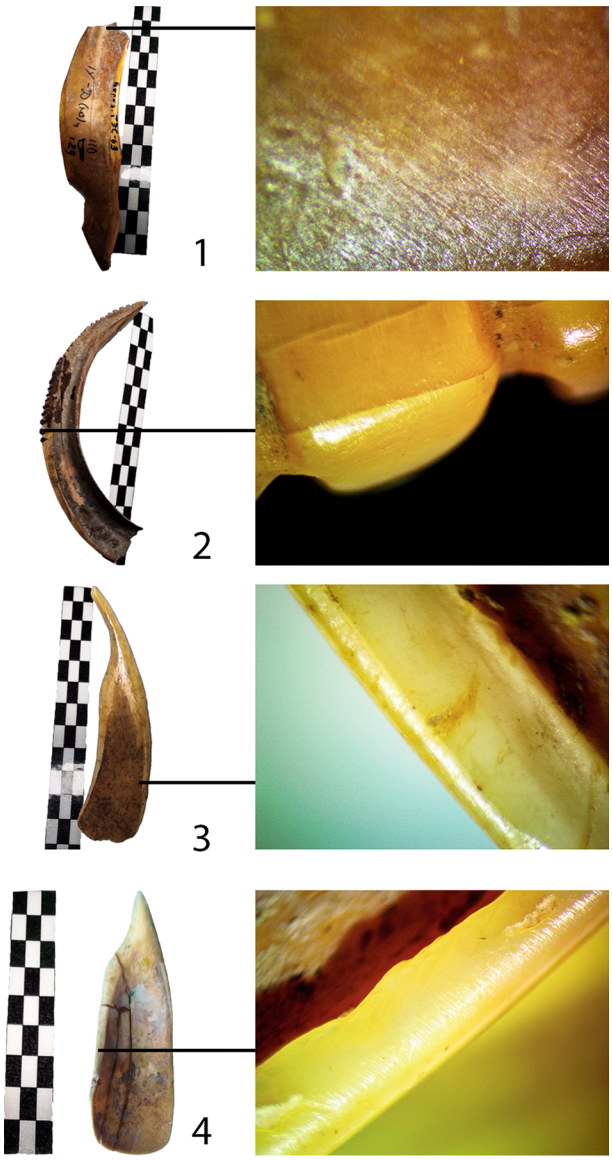

Fig. 5. Use-wear traces on Boar tusk tools from the Trypillia culture settlement "Berezovskaya GES":
5.1. use-wear traces on spatula x 30;
5.2. use-wear traces on ornamental stamp x 30;
5.3. use-wear traces on hide planer x 30;
5.4. use-wear traces on wood planer x 30

vestibular) for the manufacture of certain tools. Thus, all identified spatulas for ceramics were made from right lingual blades. Certain selectivity is evident in choosing a blade for the production of hide scrapers – 7 out of 8 tools were made from the lingual sides of the right (2 specimens – 28.6%) and left (5 specimens – 71.4%) boar tusks. Ornamental stamps were made only from vestibular blades of both the left and right sides. All available blanks (16 specimens) were made of vestibular blades, while there are only 3 finished tools based on them – 1 for working hides (OAM 97736) and 2 for working wood (OAM 97728 and 97753).

Three of the 24 tools were recycled into pendants. The initial purpose was established only for 1 pendant – an ornamental stamp. Thus, the purpose of 2 tools (8.3%) is unknown, 5 specimens (20.8%) were associated with woodworking, 9 with ceramics (37.5%), and 8 with the working of skins (33.4%).

Therefore, we can conclude that mainly lingual blades had been used for the production of tools such as planers for hide and wood and spatulas for ceramics. Finished tools made of vestibular blades are mainly represented by ornamental stamps and wood scrapers. The use of vestibular blades for working with ceramics and wood is obviously associated with their greater density and durability. Blanks are represented exclusively by vestibular blades – probably, ornamental stamps wore out slowly and were produced as required. The most common tools were planers for soft organic material (hides). The hides of domestic and hunted animals, including furs, had to be regularly processed for sewing clothes and making leather utensils and belts.

The value of enamel blades made from boar tusks is evident from the recycling of worn and broken tools that could no longer be utilized in their original capacity.

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