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Julien Treuillot, Elena Kostyleva, Alexander Utkin. A new technological analysis of the bone grave goods from the Sakhtysh IIa cemetery: What meanings for the Lyalovo culture of the 4th millennium BC?. *Journal of Archaeological Science: Reports*, 2022, 42, pp.103398. 10.1016/j.jasrep.2022.103398 . hal-03923773

HAL Id: hal-03923773

<https://hal.science/hal-03923773v1>

Submitted on 22 Jul 2024

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A new technological analysis of the bone grave goods from the Sakhtysh IIa cemetery: what meanings for the Lyalovo culture of the 4th millennium BC?

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Abstract:

The Kraynov excavations of the Sakhtysh IIa site in Central Russia revealed burial pits, hearths and dwellings belonging to the Lyalovo culture. Grave goods were rare, but eight bone tools were recovered in the funerary deposit of Sakhtysh IIa. These remains are of specific interest due to the scarcity of such a discovery. These artefacts, which are the only signs of bone industry in this cemetery, have been studied from a technological point of view in order to better understand the social organization of late prehistoric groups in Central Russia. Their analysis leads us to conclude that some of these artefacts were manufactured, used and reshaped before being used as grave goods, not specifically for that purpose. This information, unpublished for the period, encourages us to rethink the social organization of this cemetery and the cultural group it belonged to before developing new research on the subject. Through a new reading of the grave goods, we propose a possible egalitarianism organization for the Lyalovo fisher-hunter-gatherer groups living in the Sakhtysh area during the middle Neolithic period.

Keywords: Lyalovo culture, Bone remains, Bone technology, Grave goods, Sakhtysh IIa

1. Introduction

a. The Lyalovo culture in Central Russia: A presentation

The Lyalovo culture existed in Central Russia between 5000 and 3800 cal BC. According to the Russian periodization, it refers to “Neolithic” communities with a hunter-gatherer lifestyle and ceramic type. These groups intensely exploited their habitat through elaborate fishing systems and diversified hunting. They lived in large houses, which can measure 120 m² as at Sakhtysh I, covered with roofs supported by wooden poles. The houses have been occupied during long periods, as evidenced by traces of repairs on habitations and the size of the cemeteries. Among the 300 sites identified in this area, nearly 80% are located on the banks of streams and lakes. They usually leave storage pits and a rich and diverse inventory of ceramics, bones and flint tools. These tools differ from those attributed to the previous period and suggest a sharp rise in production. As such, it is envisaged that this culture is linked to the arrival of new populations in European Central Russia during the 4th millennium BC (Kraynov, 1996, Engovatova 1998, Zaretskaya and Kostyleva 2010).

In the Upper Volga region of Central Russia, only a few cemeteries belong to the Lyalovo culture. Twenty-seven burials dating from the early phase of the Lyalovo culture (5000-4500 cal BC) have been found in eight locations (Fig. 1). Of these, Sakhtysh IIa is the most interesting due to the presence of fifteen well-preserved graves. In four of these graves, funeral inventories with tool deposits have been found (see Table 2, Fig. 2). Contrary to what we already know about other graves, as in Yazikovo 1, the graves from Sakhtysh IIa contained bone objects, not only tooth pendants (Fig. 3).

The hard animal remains in the Lyalovo culture burials have never been thoroughly studied. We are therefore evaluating a type of artifact whose meaning is unclear. This lack can be explained, to some extent, by the paucity of discoveries. In the Lyalovo graves, bone tool deposits are very rare and remain unknown. The equipment found in the cemetery of Sakhtysh IIa, however, allows the veil to be lifted from these poorly known tools. As grave goods, these items have been intentionally deposited in the burials for reasons that make sense to members of the Lyalovo group. Therefore, the preserved objects found in the Sakhtysh IIa graves give us insight into ritual life, social status and craftsmanship. Our interest in this study therefore increased tenfold, with a goal of better characterizing the bone remains from the Lyalovo populations. To better understand these deposits, we propose an unprecedented technological study of this material here, after some preliminary research on this bone collection (Костылёва *et al.*, 2015).

b. The Sakhtysh peat bog

Located in the central part of European Russia, in the Ivanovo region, the Sakhtysh peat bog is part of a dense hydrographic network in the upper Volga area. Here, a unique complex of fifteen archaeological sites has been excavated. The sites are located on the bank of the ancient Koika riverbed, three kilometers upstream from the river’s source (Fig. 1). These discoveries attest to occupation of this region from the Mesolithic until the Iron Age with several residential habitations, hunting spots, and seasonal and long-term settlements (Zhilin, 1992 ; Kostyleva, Utkin, 2010). Among these sites, Sakhtysh IIa is of particular interest since it delivered well-preserved layers of occupation as well as the remains of a cemetery used by groups of hunter-gatherers of the Lyalovo and Volosovo cultures (Zaretskaya and Kostyleva, 2008).

The first discoveries in the Sakhtysh area date from 1930. They are attributed to V. I. Smirnov, director of the cultural and historical department of the Museum of Local History in Ivanovo. However, it is really only from 1962 that the first systematic excavations have been carried out under the direction of D. A. Kraynov. These scientific investigations revealed a large number of sites. Among them, Sakhtysh IIa was discovered on the first terrace on the banks of the Koika River in 1986. D. A. Kraynov excavated its cemetery until 1994, in collaboration with E. L. Kostyleva and A. V. Utkin (Fig. 2). After an interruption, the research resumed in 1999 under the direction of M. G. Zhilin, and in 2004, continued under the direction of E. L. Kostyleva, with the goal of excavating the

occupied part of the site (Kostyleva, Utkin, 2010, 2012). This paper proposes a first overview of our study of the bone tools discovered in the Lyalovo burials from Sakhtysh IIa.

Sakhtysh IIa is a multilayered site discovered in 1986 by D. A. Krainov and E. L. Kostyleva. Two areas have been explored: one in excavation 1 from 1987 to 1994 and the other in excavation 2 in 1999, 2004 and 2015. Almost 800 square meters have been explored during these campaigns. All the graves are located in excavation area n°1 and have been attributed to the Lyalovo and Volosovo cultures (4th-3rd millennia BC in the traditional chronology). Due to the character of the lithological layers (peat, sapropel, peaty clay, sand and loam) numerous objects made of organic materials have been preserved as grave goods in the burials from the cemetery.

c. The Lyalovo Sakhtysh IIa cemetery

The Lyalovo cemetery was investigated in its entirety and consisted of fifteen inhumation graves. Stratigraphic and radiocarbon dating analyses determined that the burials were from the early phase of the Lyalovo culture. Four conventional radiocarbon dates of human remains produced by the Geological Institute of the Russian Academy of Sciences in Moscow range between 5500 and 4500 cal BC (Zaretskaya, Kostyleva, 2008). More recently, AMS dating and isotopic analysis of human remains from graves 40 and 61 have been performed at the AMS ¹⁴C Dating Centre at the University of Århus in Denmark: the results range from 5467 to 5314 cal BC, which puts them at the very beginning of the Lyalovo period. Both samples show negative $\delta^{13}\text{C}$ values and rather high $\delta^{15}\text{N}$ values. Such results point to an important role for the freshwater components of the diet, while plants and terrestrial animals comprised a small part, which could have affected the dating results due to reservoir effects (Piezonka et al., 2016).

Except two graves that contained two bodies (n° 59: two children, n° 61: a young woman with a 2-year-old infant), all were individual burials. Most contain adults from 20 to 60 years old, and the cemetery is organised so that the burials had an elongated elliptical or sub-rectangular shape and were generally oriented along a northwest-southeast axis, parallel to the river Koika, on which settlements were located, and most of the bodies were laid extended on their backs (Fig. 2). Nine of the seventeen corpses were oriented with their heads towards the southeast, four were in the opposite orientation, and two were oriented toward the east. Thus, the majority of the bodies were placed with their head toward the sunrise (Kostyleva, Utkin, 2010). Regarding the sex of the deceased, there were as many children as women, with men being poorly represented. Concerning the age of the deceased, children (1–6 years old) and young adults (<25 years old) dominated, and there was only one individual over 50 years old (the man from grave n° 40). Concerning the spatial organization of the cemetery, there was no clear distribution of the deceased by age or sex, but some burials were grouped at the center, with the children, while some individuals were more isolated in the northern and southern parts of the cemetery. In the same way, the distribution of the tombs with ochre and funerary objects does not seem to correspond to a specific organization (Tab. 2, fig. 8). Indeed, deposits of burial goods were traced in only four graves (n° 21, 40, 61a and 65). In addition to the little figurine made of clay from grave n° 65, eight osseous tools have been discovered in the other burials (Костылёва, Уткин, 2008; Kostyleva, Utkin, 2010). Finally, according to E. Kostyleva and A. Utkin, some of the deceased were buried bound or wrapped up in animal skins held together with bone awls, and traces of ochre were documented in four graves, including tombs n° 40 and 61, where bone awls have been discovered (Kostyleva, Utkin 2010. 39).

In this article, we present the results of our technological analysis of the bone remains discovered in the Lyalovo graves from Sakhtysh IIa. It was the very first time such a study was conducted on this kind of material. We investigated several questions relating to the ways of producing these tools as well as their spatial distribution in the burials. Finally, we also wanted to see if it was possible, in

light of the information provided by the technological study, to specifically attribute certain collections to a culture when the current cultural and chronological attribution is imprecise. Finally, the detailed analysis of bone remains may reveal some important information about Lyalovo behaviour in the Sakhtysh region.

2. Material and Method

For this study, only the osseous remains from the graves have been taken into consideration. All have been identified as bone using textural and structural criteria. The bone objects presented in this paper come from three graves: one from a man of 60 years (n° 40) and others from two graves of two women aged 20 to 25 years (n° 21 and 61a). These tools have been assigned to various moose bones (*Alces alces*) following anatomical and metric criteria.

The sample includes seven osseous tools and one tooth clearly identified as a finished tool that have been stored in the Archaeological Museum of Ivanovo State University (Fig. 3). All the tools taken into consideration have been measured and observed to identify technical stigmata on their surface, following the technological analysis defined by A. Averbouh (2000). The objective of this analysis is to document bone tool production techniques by studying the manufacturing traces left on the bone artifacts as well as the production waste. Due to the lack of blanks and wastes in such context, we have not been able to propose a clear reconstruction of the *chaîne opératoire* used to produce each tool. Nonetheless, we identified the techniques used to shape the tools and some technological choices made by the craftsmen.

3. Results

Except for one barbed point, all the tools are complete (Fig. 3). Their bone surfaces are in a perfect state of preservation, allowing a fine technological analysis of the remains (Tab. 1). This information may serve as a source for further comparative analyses and to complement our understanding of bone processing by Lyalovo communities.

Table 1. Bones tools discovered in the Lyalovo graves from Sakhtysh IIa: state and dimensions

ID	Grave N°	State	Object	Length (mm)	Max. Width	Max. Thickness
123	22	Complete	Dagger	202	35	8
124	22	Complete	Pointed tool	162	21	12
125	22	Incomplete	Barbed point	190	21	10
126	22	Complete	Pendant	-	-	-
105/45	40	Complete	Awl	157	16	9
1827	61a	Complete	Retoucher?	190	-	14
1829	61a	Complete	Awl	135	15	8
1828	61a	Complete	Knife	160	40	6

a. Grave 22

In grave n° 22, four objects have been discovered (Fig. 3, n°1-4). Three are made from bone and one from an incisor. These tools—a wide dagger, a narrow pointed tool with a shaped pommel, a barbed point and a pendant made from an elk incisor—were associated with a young woman between 20 and 25 years old. Because they were positioned directly on or near the body, these objects were probably worn by the deceased at the time of burial.

Tool n° 123 has been identified as a dagger and was placed on the right femur of the deceased. It has a long bone handle with a straight profile delineation and a biconvex cross-section (Fig. 3, n°3; Fig. 4). The straight cutting edges narrow to the distal extremity and form a pointed and partially rounded tip. However, the proximal part shows a double-shoulder (amenagement) and a tongue fracture plane. The implement is 20.2 cm long, 0.4-3.5 cm wide, and 0.3-0.8 cm thick. It was made on the diaphysis of a long bone from a moose; the dimensions and morphology probably correspond to a radius or a tibia.

The dagger was practically completely shaped and is covered by long and continuous striations, which one observes on the two faces of the tool (Fig. 4, n° 1). Only the central part of the anatomical inside of the bone has not been affected by these striations because of the natural depression of the medullary cavity. On the rest of the object, the longitudinal striations sometimes intersect each other but are generally organized with marked relief. Some display internal chattermarks. These chattermarks may be observed on the external face of the bone, principally on the lateral edge (Fig. 4, n° 2). Chattermarks are widely separate striations perpendicular to the longitudinal striations. According to the literature, these secondary stigmata appear when great force is applied to the stone tools or when the tool bounces over the surface (Newcomer, 1974, p. 149). All these striations lead us to conclude that the dagger was modified by longitudinal scraping with a stone tool in order to sharpen a point on one extremity and smooth the edges. The long striations and occasional chattermarks bear witness to the use of this technique. As for the proximal double-shoulder amenagement, it has been shaped by sawing, as shown by the presence of short, narrow, perpendicular grooves (Fig. 4, n° 3).

Although this analysis is not intended to determine the function of the tool, some macroscopic use-wear can be described. Indeed, the distal part of the tool is completely smooth with a rounded extremity. This deformation could have been produced during use, which has erased the scraping stigmata, explaining why these have not been observed on this part. This tool therefore seems to have been used before being deposited in the grave. A use-wear analysis would be of great interest to confirm this and to understand the nature of the tools associated with the graves.

Tool n° 124 is a complete pointed tool that was placed near the left leg of the individual (Fig. 3, n°2; Fig. 8). The outline of this object can be compared to a straight knife with a pointed extremity measuring 0.4 cm wide and 0.2 cm thick and a biconvex cross-section (Fig. 5). The proximal part, the handle, has been shaped to represent a human face. From a stylistic point of view, as was usual in the Stone-Age sculpture of this region, the face has perfectly carved eyebrows, and there is no sign of eyes. The mouth is marked by an incision, and the proximal extremity is square with rounded corners to represent the headdress. The tool is 16.2 cm long, 2.1 cm wide at the widest point, and 1.2 cm thick, while the head is 4 cm long. It was made on a moose ulna, with the pointed extremity in the shaft and the proximal extremity in the olecranon.

The pointed extremity has been shaped from a 10.5-cm-long section. On both sides of the bone, con-

tinuous and regular striations organized in stripes were observed on the periphery (Fig. 5, n° 1). On the edges of the tool, scraping striations are intersected by a series of perpendicular incisions that were made in the mesial position on the anterior and posterior sides of the ulna (Fig. 5, n° 2). These grooves are short, shallow and narrow furrows with a V-shaped profile. Sawing made several dozen of these grooves. Finally, regarding the shaping of the human figure, because of the cancellous tissue in the olecranon area of the bone, it is difficult to precisely determine the techniques used to carve the bone, but it can be argued that sawing was used to emphasize the mouth, nose, and eyebrows and the bottom of the headdress (Fig. 5, n°3–4).

Finally, this pointed tool also seems to bear some traces of use. At the distal end, scraping striations are erased on both faces by smoothing over an area 1.9 cm long, probably due to the use of the tool. However, the smoothing that is observed at this extremity is erased on the edges by short striations, organized in stripes, that are newer than the original scraping stigmata and the smoothing. This clue leads us to think that this tool has had its point resharpened. Thus, the distal extremity seems to have been repaired after use and before being placed in the grave.

Tool n° 125 has been identified as a point with a unilaterally barbed head and a triangular stepped tang (Fig. 3, n° 4; Fig. 6). This tool was placed near the left tibia of the deceased (Fig. 8).

The implement is 19 cm long, 0.8-2.1 cm wide, and 0.9-1 cm thick, with a straight profile delineation and an elliptical cross-section. It was made on the diaphysis of a long bone whose dimensions probably correspond to the metapodial of a moose. The proximal part shows a straight shoulder creating a step, whereas the distal extremity shows a transverse fracture plane. The surface of the fracture plane is irregular and granular, which seems to indicate that the fragmentation occurred on dry bone, most probably after the tool was deposited in the grave. It is a fragmentary tool, with the distal part and the barbs broken and partial flaking of the bone surface.

In spite of this deterioration, one observes on the whole of the surface a series of long, fine striations organized in narrow courses with a very light faceting of the surface (Fig. 6, n° 1). Because the shaping is complete, the traces related to the debitage are not preserved. However, one observes, under the interior angle of the barbs, convergent grooves located on the two faces that could coincide with a release of the barbs by means of opposite double grooving (Fig. 6, n° 2). Finally, the barbs and the base have been streaked with narrow furrows (Fig. 6, n° 3). These marks, which recut the striations from scraping, were probably created during the completion of the tool. The finality of these installations is difficult to understand. On the level of the shoulder, the transverse incision surface, could facilitate the passage of a line, but without a thorough study of it, the question is impossible to answer.

To summarize, although it is impossible to reconstruct all the stages of the operational sequence of production of this barbed point, a long bone was used to produce a blank used to produce the tool. The blank was shaped in several stages, but only the last is identifiable. By the observation of the stratigraphy of the stigmata, one can attest that shaping of the barbs, probably by grooving, preceded the final working by scraping. The barbs, as well as the base of the shoulder, were incised at the end.

Tool n° 126 is a tooth pendant made from the incisor of an elk (Fig. 3, n°1). The tooth is affected by two opposed grooves that are not very deep located on the inner and outer faces on the first third of the root. Because of flaking on the apical surface, it was not possible to observe the grooves in detail, but they seem to have been made by sawing to arrange the zone of suspension.

b. Grave 40

From a quantitative point of view, the find associated with burial 40 is particularly poor with a sin-

gle pointed bone tool (inventory n° 105/40), which was placed next to the deceased, a male individual aged 50 to 60 years, along his left humerus (Fig. 3, n°5; Fig. 7). In this grave, only a short awl was deposited near an older male (Fig. 8).

This pointed tool has a biconvex section at the distal end and presents a transverse fracture at the apex. It was fashioned on a vestigial moose metapodial and retains most of the original morphology and anatomy of the bone. This kind of bone being naturally appointed, little was done to transform it.

Although rather well preserved, the tool bears traces of some alterations that led to a partial desquamation of the bone surface on the diaphysis. However, it retains stigmata related to its shaping. Thus, over a length of 88 mm from the mesial part to the apex of the tool, we observed a series of striations located on the lateral edges of the bone. These are long, regular streaks that are shallow and oriented longitudinally. They are parallel to each other, organized in the form of narrow bands and homogeneous. Such stigmata seem to attest to shaping of the tool by means of longitudinal scraping. This kind of production corresponds to a technical transformation scheme by direct shaping.

c. Grave 61a

Three bone grave goods were associated with another young woman and an infant (Fig. 8). Above the lower half of the right humerus, a piercing was made by the fragment of the narrow edge of the animal bone with the symmetrically tapering point (Fig. 3, n° 7). On the left side of the skull and perpendicular to frontal bone, the knife without the chosen handle (Fig. 3, n° 6) was located. It had a flat, wide configuration close to the crescent and was definitely intended for cleaning fish. On the right, nearer the end of the sepulchral pit, a long (19 cm), rod-like object with a diameter of 0.8-1.4 cm and one end broken off and the other slightly narrowed and rounded (Fig. 3, n° 8) was identified. This tool has been interpreted as a possible bone retoucher, but additional study is necessary to verify this. Unfortunately, these tools have not been studied in detail, and we are not able to provide more information on their making.

4. Discussion

In this paper, we have presented the results of research into raw material identification and bone working methods based on evidence from the Lyalovo cemetery of Sakhtysh IIa. The results of our study provided new insights about ritual behaviour and the technological knowledge of osseous material processing among the Lyalovo groups. In fact, the information gleaned from the 15 documented graves, which contain the remains of at least 17 individuals, provides us with a unique set of insights into some of the fundamental aspects of Lyalovo society. But, finally, what can these grave goods tell us about the Lyalovo cultural group using the Sakhtysh IIa cemetery? In the funeral context, it is clear that each burial informs us about the actions of the members of a cultural unit. As such, the grave goods result from a mix of cultural norms and values. Consequently, we can analyse these assemblages to find an explanation of the deceased's social status and cultural unit, which requires these objects to be studied as elements of the material culture to better understand their deposition as grave goods.

Alas, Lyalovo sites from Central Russia have yielded few bone tools and a limited number of artefact types. Furthermore, as we explained at the beginning of this paper, bone deposits in Lyalovo graves remain quite rare, and technological studies of these elements are absent. The only tools already published are associated with the Zamostje 2 settlement (Lozovskaya & Lozovski, 2015). Before we compare them, what can we say about the techniques used to produce these tools and the rules governing such deposits?

d. Technical characteristics of the bone grave goods

Due to the scarcity of discoveries, it is difficult to say how well the grave goods from Sakhtysh IIa represent the Lyalovo material culture, but it is of interest to describe their technical characteristics, technology being closely related to cultural choices.

These objects were made only from moose bones and teeth, which may suggest that a certain value was attributed to this large mammal. Moose were intensively hunted throughout the Mesolithic and Neolithic in Central Russia, and their bones were often used to produce artefacts (Zhilin, 2004). Animals used to shape grave goods were probably hunted in the local area and dismembered at a residential base camp where the grave goods were shaped. If it is not possible, without isotopic analysis, to attest that the people who used this cemetery come from the area, it is conceivable that they were related to the nearby habitat campements located on the river banks of the region. In this case, it is conceivable that the bone tools were made at these residential base camps to be used in the daily life and/or deposited in some of the graves.

In the graves from Sakhtysh IIa, 7 bones and 1 tooth were used. The blanks used to make these tools were directly taken from moose carcasses, probably from moose hunted in the local area and dismembered at the residential base camps. In the Sakhtysh area, bone tools, preforms, blanks and waste have been found in the Sakhtysh I and Sakhtysh IIa settlements: all belong to two specific technical transformation schemes. Either the bones were used directly after a quick shaping that did not modify the natural shape of the bone, as is the case with the pointed tools made from the ulna and the vestigial metapodials and for the incisor pendant, or they are subject to the debitage sequence use to produce baguette blanks, as for the metapodials, radii or tibiae. The former tools have a low rate of transformation, while the latter are completely shaped. These two strategies illustrate different levels of technical investment.

Objects realized by direct shaping were linked to a weak technical investment. The awl made from a vestigial metapodial had only been scraped on its distal extremity to sharpen it (Fig. 7); while the pendant had been sawing near the top of the roof for suspension. This kind of shaping is not peculiar to the Lyalovo period in Central Russia; similar observations have been made with Mesolithic and Early Neolithic assemblages (Treuillot, 2013, 2016). In any case, the pointed tool shaped on the ulna is more characteristic of the Lyalovo culture with the shaping, by sawing, of a “human face” on the base, which underlines strong technical involvement (Fig.5).

Daggers and barbed points have been made on baguette blanks after debitage of the long bone. Unfortunately, we have no waste or technical stigmata on the grave goods to describe the techniques used to produce these blanks. All we can say is that the baguettes were shaped first by longitudinal scraping and the barbs by sawing. The techniques used to make these tools are very usual for weapons and domestic tools in the Lyalovo culture, according to our observations of tools from residential base camps in Central Russia (unpublished studies). Consequently, we can attest that the presence of manufacturing waste in the domestic part of the settlement indicates that at least some of the tools discovered in the graves were made at the site.

The shaping techniques used to make these tools (mostly scraping – see, for example, Fig. 4, n° 1-2; Fig. 5, n° 1; Fig. 6, n° 1) are very common for the manufacture of weapons and domestic tools in the Lyalovo culture. Unfortunately, absence of use-wear analysis doesn't make it possible to further interpret these discoveries, and it is not possible to make any accurate assumptions about the function of these tools. However, the smoothing of the dagger's extremity and the pendant, as well as the repair of the extremity of the pointed tool in grave n° 22, might represent use of these tools before they were deposited in the grave, which encourages us to question the social and/or symbolic meaning of these funerary grave goods.

e. Social dimensions of mortuary practices in Sakhtysh IIa

To summarize, Lyalovo peoples included grave goods as part of their burial practice, but how can grave goods be useful for understanding ritual and/or social organization? The question of the meaning and function of funerary rituals is certainly the most-discussed question in our discipline. As an evocation of the statute of the deceased or standardized “viaticum,” funeral deposits can be the expression of a social norm or a reflection of the variability of the practices (Testart, 2006; Arnold, 2006). In any case, an object left intentionally in a grave is a testimony of the first order when questioning the social organization of a prehistoric society (Sohn, 2008; Duboscq, 2017). If the symbolic range escapes us, these objects inform us about the materiality of rituals specific to the studied societies. This is why we wanted to characterize these funerary gifts and reconstitute part of the techno-economic systems which guided their manufacture. In particular, we wanted to see whether there were differences among the tombs that could underline treatment differences between the graves that may be possibly linked to age, gender and/or rank distinctions and thereby to social differences between the members of this group.

The prevalence of grave goods and ritual items varied in Sakhtysh IIa graves, and we are right to question whether these variations are linked to social differences. If we compare the organization of mortuary rites, there is no analogy between burials: the grave goods and ritual items differ according to the individuals. In grave n° 22, the tools and the pendant are directly in contact with the body of the young woman. The dagger with a shaped pommel was located on the back of the right femur and might have been placed in a leather sheath and attached to the leg, perhaps to be used as a spare knife. The second knife, placed near the head of the other young woman, in tomb n° 61a, had a different shape: wider and crescent-like. According to E. L. Kostyleva, “judging by the remains of a resin-like substance at the point of the knife, it was inserted into some kind of handle, most likely, made of wood. The knife was certainly intended for cleaning and cutting fish.” In grave n° 61a, all the grave goods were placed around the woman’s head. Concerning the two awls, it is interesting to note that in both graves, n° 40 and 61a, these items were deposited near the humerus. For that reason, it has been proposed that these awls played the role of pins. In both cases, the long, sharp objects would have held together the animal skins that the dead had been wrapped in before being deposited in the grave (Kostyleva, Utkin, 2010; Kostyleva, 2018).

Although rare, these deposits mark differences between individuals buried with objects, who are in the minority, and those buried without identifiable tools, who are in the majority. Here, the norm looks to be burial without grave goods. Consequently, how should the grave goods be interpreted? Are they related to the social identity of the deceased, their age, their gender or their rank in society? Are they personal goods or gifts related to different social relations in the group? Regarding the deceased, it is interesting to note that of the three individuals buried with objects, two belong to a similar category. Indeed, the two tombs that delivered the most finds (daggers, the barbed point, the pendant, *etc.*) are those of two young women aged from 20 to 25 years (tombs n° 22 and 61a); while the only awl made from a vestigial metapodial was found in the tomb of a man between 50 and 60 years old (tomb n° 40). To sum up, we note that the grave goods with the most important technical investment were placed in the graves of young women. Should we see a special place for such deceased?

Although the bone tools are associated with the younger woman and the older man, it is not possible to interpret this observation in terms of social organization without having access to more data. We hope that new discoveries will allow us to study this aspect in more detail in the future. Nevertheless, the fact that the objects discovered in these tombs have analogies with the industries of other contemporary sites gives us information about the traditions of the Lyalovo culture. Moreover, the

fact that some of the tools, especially those found in tomb n° 22, were probably used before being deposited gives us some interesting information, namely, that these grave goods were not produced specifically for that purpose. In fact, these intentionally deposited bone tools, except the pointed tool with a human face, are clearly linked to the tools discovered in domestic settlements. Furthermore, the organization of the cemetery's Lyalovo layer looks different than that of the following Volosovo period.

Unlike the Volosovo layer of the Sakhtysh IIa cemetery (4000–2500 BC), where the frequency of grave goods seems to increase and to reflect some sort of special ranking for a few members of the group (for details, see Kostyleva, Utkin, 2010), we thought that for the Lyalovo layer, individuals who received special treatment were quite rare, which should reflect a possible egalitarian society in which a few individuals received special grave goods and ritual items, such as ochre, and where most of the bodies were deposited in the same manner: extended on the back, mostly oriented toward the south or west, without any grave goods or ritual items. The exception to this rule is grave n° 22, where the body of a young woman has been extended on the stomach, in the direction opposite that of the other graves, with four items. The nature of the tools, a dagger, a barbed point, a pointed tool with a human figure and a pendant, attests to a special rank of the person buried here, but it is impossible to understand the nature of this exception: is it due to her rank, gender, or occupation? Or are these variations related to a diachronic difference? What we can say is that even so, the grave goods associated with this young woman are typical of the Lyalovo material culture.

Concerning the idea of possible egalitarianism during the Lyalovo period, it is interesting to say that a similar picture emerges from the study of another Lyalovo cemetery, Sakhtysh II. Here, grave goods are quite rare, with no artifacts in adult tombs and only six predator teeth pendants being associated with a 1-3-year-old child (Kostyleva, 2018). The presence of tooth ornaments in a child's grave may suggest a special attitude towards children, but no ostentatious signs, as at Sakhtysh IIa, where special attitudes may be underlined in some graves without any conspicuous symbols, most of these grave goods are similar to the bone artifacts discovered in residential base camps from that period.

Table 2. Main characteristics of the Lyalovo culture burials at Sakhtysh IIa

Burial №	Sex	Age	Position of the skeleton				
			Extended on the back	Extended on the stomach	Extended on the side	Crouched on the side	Destroyed
11	Female	20-25				+	

12	Male	30-40		+			
16	Female	20-25	+				
22	Female	20-25		+			
29	Female	40-45	+				
40	Unknown	50-60	+				
41	Unknown	1-2	+				
42	Male	20-25	+				
43	Unknown	5-6	+				
52	Unknown	1-2	+				
55	Unknown	≈ 3					+
59a	Unknown	3-4	+				
59b	Unknown	1,5-2			+		
60	Unknown	≈ 20					+
61a	Female	20-25	+				
61b	Unknown	≈ 2					+
65	Female	35-45	+				

a. The Lyalovo burial goods from Sakhtysh IIa in a regional context

All the items found in the graves at Sakhtysh IIa can be divided into five groups based on their composition and shape: 1) bone awl; 2) tooth pendant; 3) bone point with a unilaterally barbed head and a triangular stepped tang; 4) bone dagger without or with representation of a human head; and 5) “embryo-shaped” clay figurine. These grave goods can be compared with artefacts discovered in other Middle Neolithic settlements from the Northeastern European forest zone. Nevertheless, all these discoveries are not necessarily significant for the Lyalovo culture.

Awls and pendants are insignificant, as they are not substantially transformed and are very similar to the awls and pendants discovered in Central Russia from the Mesolithic to the Bronze Age (Treuil-lot, 2016; Zhilin, 2004).

The point with a unilaterally barbed head and a triangular stepped tang is more representative. At Sakhtysh II, some comparable tools have been assigned to the Lyalovo culture (Gadzâckaâ, 1966). In other places, similar barbed points have been discovered on the surface, as at Zamostje 2 and Zamostje 3. In such contexts, it is not possible to attest indubitably that these barbed points are attributable to the Lyalovo culture. In any case, at Zamostje 2, these tools look like the tools discovered in grave n° 22 at Sakhtysh IIa (Lozovskaya & Lozovski, 2013).

The dagger with a shaped pommel with a representation of a human head appears to be unique find to the Lyalovo culture, but the anthropomorphic representation can be compared with other representations of human faces from this epoch, all discovered in domestic contexts. From the 5th to the 3rd millennium BC, human faces have been represented on numerous monumental wooden sculptures and bone figurines. Nevertheless, human figures are completely absent from Lyalovo culture graves, except at Sakhtysh IIa. The human head from grave n° 22 is a two-level face with a forehead and a nose. Typologically, this human face doesn't look like the representations of human faces found in contemporary graves, such as those at Kubenino 2. It could be explained through cultural differences, since this site is located further north, in Eastern Prionezhie (Oshibkina, 1992; Kashina, 2004).

Finally, it is interesting to note that the clay figurine discovered in grave n° 65 is quite similar to other discoveries from the Middle Neolithic. “Embryo-shaped” clay figurines are found throughout the Northeastern European forest zone, from Finland to the Eastern Baltic and Northern Russia. They all connected to Middle and Late Neolithic Comb Ceramic complexes (Butrimas, 2000). In Central Russia, these figurines are also present during the Middle Neolithic at Sakhtysh IIa, Torgovische I, Nikolo-Perevoz and Stanok I, but they are less common (Kostyleva, Utkin, 2010; Раушенбах, 1969; Крайнов, Уткин, 1992; Kashina, 2004; Nunez, 1986). In Estonia, at the Valma settlement, a similar embryonic figurine was discovered in a layer dating from the Middle Neolithic. The symbolic meaning of these figurines remains unclear, but Miettinen suggested that they could represent human embryos (Miettinen, 1965). As summarized by E. Kashina, “whatever the specific significance of the figurines, it is clear that they were important cultic objects” (Kashina, 2009). At the same time, we note that few clay figures were found in graves, with only two examples at Sakhtysh IIa (grave n° 65) and Zveynieki (grave n° 221) (Kostyleva EL, Utkin AV 2010, p. 106; Zagorskis F. 1987, p. 78), which authorizes us to question the cultic significance of such productions. Indeed, if human representation should be interpreted as symbolic, it is not possible to traduce them, as symbols may vary from context to context.

5. Conclusion

The burials uncovered at Sakhtysh IIa share common characteristics. Nevertheless, tombs that contain grave goods are rare. Four of them were covered in this study, with a focus on the analysis of artefacts made from hard animal materials. Because it is poorly known, the Lyalovo bone industry

has been studied very little. By providing a chronologically reliable milestone, dating from the hinge between the 5th and 4th millennia BC, the Sakhtysh IIa burials contribute to a better knowledge of this material and assist the current reflections on the dynamics that affect the forest territories of Eastern Europe at that time. Beyond the exceptional nature of the discovery, the bone tools call for several remarks.

Although very diversified, these tools can be divided into two groups: tools made on natural anatomical supports with little transformation and tools made on supports manufactured by craftsmen. The least-processed objects were the subjects of general shaping by scraping. This is the same technique that was used to shape the most-transformed tools. Nevertheless, in the case of daggers and barbed points, the shaping is much more careful and uses strict codes related to the production of standardized tools. To confirm this, we expect to continue technological studies of artefacts from Lyalovo settlements in order to assess their place in the context of the Neolithic cultures of the Central Russian plains. Although these comparisons need further study, the listed analogies tell us about close links between the forest-hunter-gatherer populations in Eastern Europe during the Middle Neolithic.

Summing up the above, we can say that the equipment accompanying the deceased appears quite diverse, which could correspond to distinctions between the individuals buried here. As such, the technical care given to the manufacture of the objects from tomb n° 22 (a barbed point and a dagger decorated with a human head) could imply a particular social status for the individual buried there. In this sense, these discoveries are a good illustration of the slow process of development of complex societies among fisher-hunter-gatherer groups in North-Eastern Europe during the Atlantic and Subboreal climatic periods. Although these societies were developing an economic model based on fishing that could have made the groups more sedentary, this does not mean that unequal societies were developing at the same time. The information we have available for later periods seems to show that this type of organization does indeed develop later, during the Volosovo period (Kostyleva, 2018). To better understand the development of new social organizations, fine comparative studies between the assemblages of the two periods will have to be carried out.

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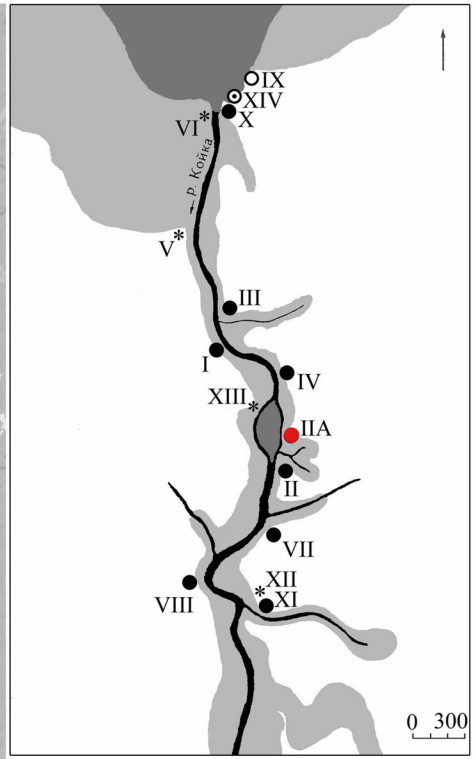
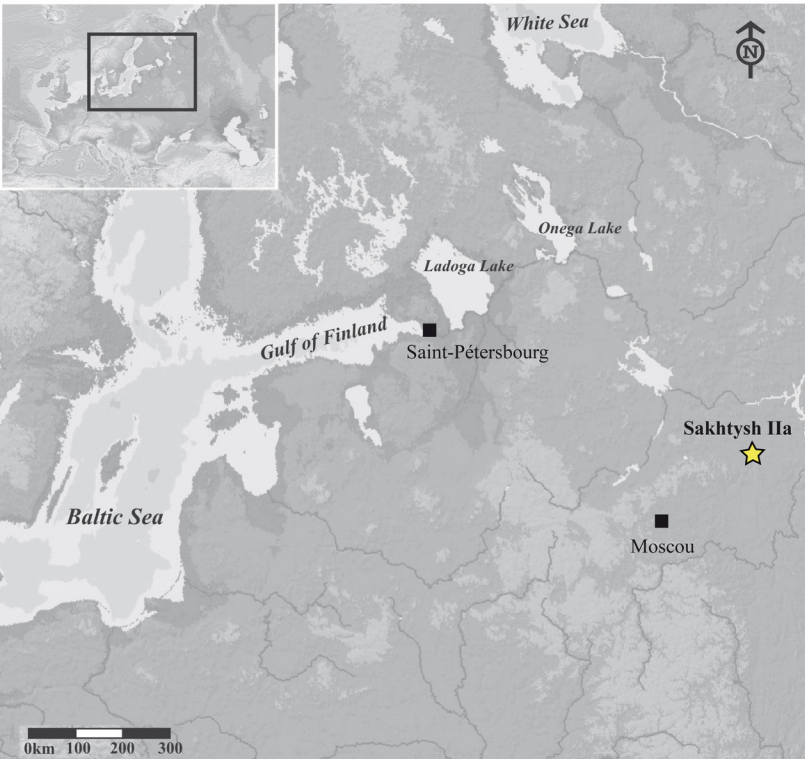
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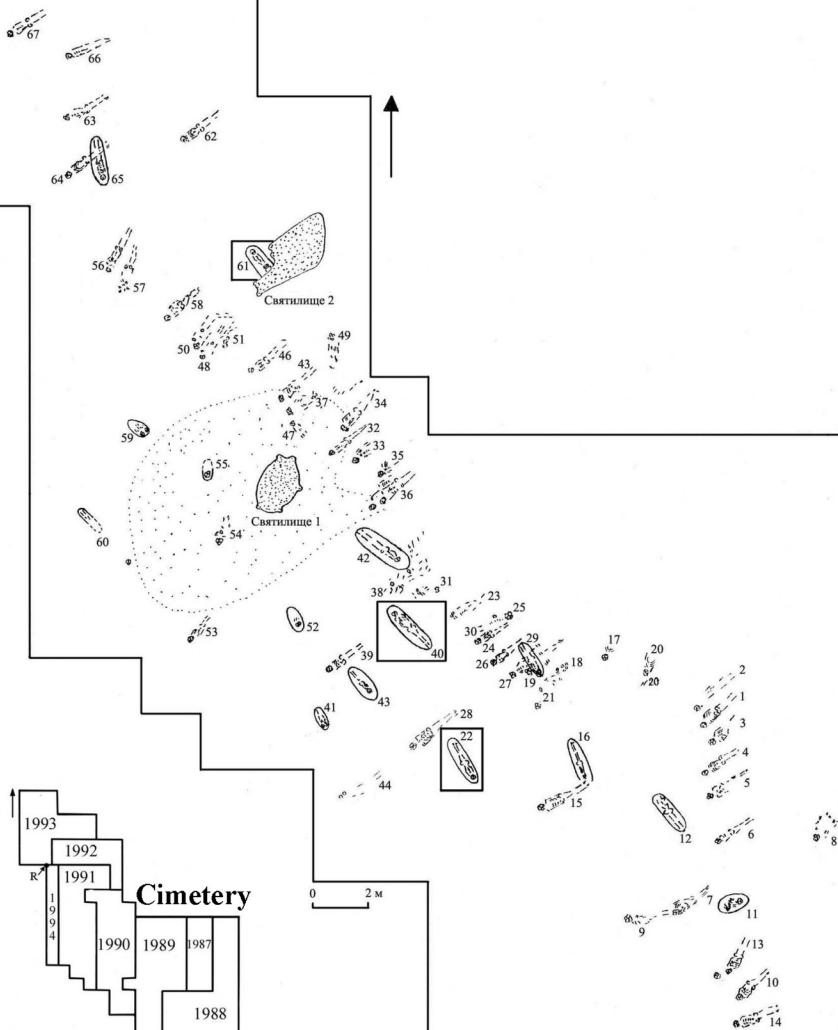
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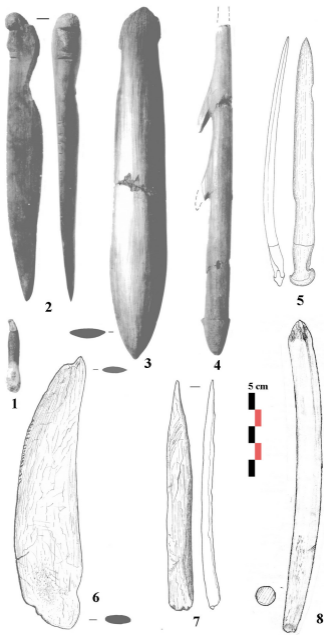
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Fishing area

1999 2004







X2,5



1

X2,5



2

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3

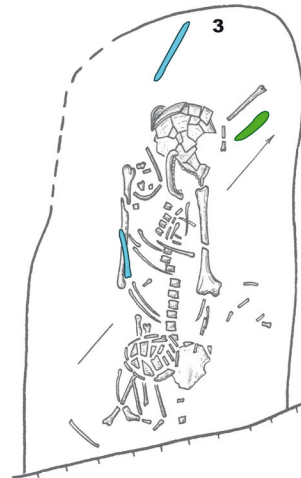
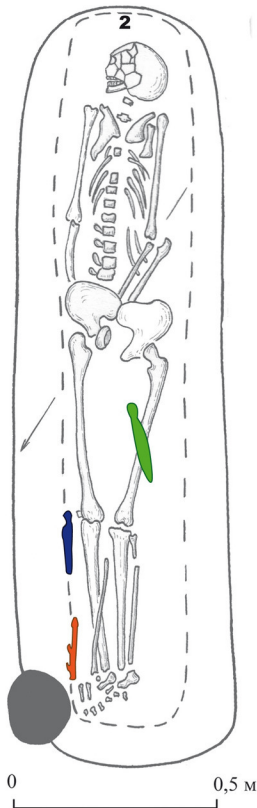
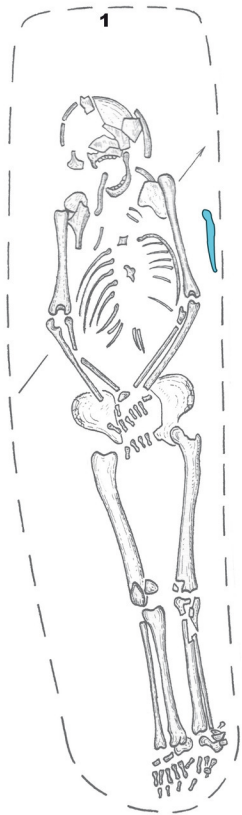
5 cm



3



5 cm



-  **Bone Awl**
-  **Bone pointed tool**
-  **Bone Dagger**
-  **Bone barbed point**