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**FOR HUNTING OR FOR WARFARE?
BONE ARROWHEADS FROM THE LATE
BRONZE AGE FORTIFIED SETTLEMENTS
IN EASTERN BALTIC¹**

Archaeological finds from the Late Bronze Age fortified settlements in eastern Baltic include arrowheads, which are outstanding for their careful finishing. Investigating the making of arrowheads, a certain standardization of arrowheads and uniform manufacturing techniques can be observed. The attention is paid to working traces on these arrowheads; a replica of such arrowhead was also made. An answer is sought to the question whether bone arrowheads were used as weapons or for hunting. Considering the shape and properties of bone arrowheads, as well as the absence or scarceness of arrowheads of other material on these sites, one may conclude that the carefully elaborated bone arrowheads were used for warfare.

Baltimaade noorema pronksiaja kindlustatud asulate arheoloogilises leiumaterjalis esineb luust nooleotsi, mis paistavad silma hoolika töötamise poolest. Nende puhul on jälgitav teatud standardiseeritus ja ühetaoline valmistamistehnoloogia. Tähelepanu on pööratud nooleotstel leiduvatele töötlemisjälgedele; on valmistatud ka seesuguse nooleotsa koopia. On püütud leida vastust küsimusele, kas luust nooleotsad olid relvad või jahiriistad. Arvestades luust nooleotste kuju ja omadusi, samuti muust materjalist nooleotste puudumist või vähesust neis muististes, võib järeldada, et hoolikalt töödeldud luust nooleotsi kasutati sõjarelvadena.

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Introduction

Bone arrowheads are quite numerous among the archaeological finds of the Late Bronze Age (ca 1100–500 BC) from the eastern coast of the Baltic Sea. The present article is mainly based on Estonian finds, but in spring 2006 the author

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had an opportunity to study some bone arrowheads from two fortified settlements of Lithuania in the Lithuanian National Museum. Still, most of the Lithuanian and Latvian material is discussed on the basis of published finds: about Lithuania the material published by Elena Grigalavičienė (1986a; 1986b; 1992; 1995) and Regina Volkaitė-Kulikauskienė (1986) has been used, and about Latvia the publications by Jānis Graudonis (Граудонис 1967; Graudonis 1989) and Andrejs Vasks (1994). Estonian arrowheads have been discussed in greater detail by Vello Lõugas (1970, 99–106) and Uwe Sperling (2006, 112–114), but they have also been mentioned in various other publications concerning archaeological finds from fortified settlements (e.g. Indreko 1939, 24; Vassar 1939, 82; Baccap 1955, 118; Lang 1996, 49).

The present study does not aim to compile a typology of Bronze Age arrowheads, such typologies have been compiled in each Baltic country (Lõugas 1970, 100 ff.; Graudonis 1989, 34–35; Grigalavičienė 1995, 113–115; Sperling 2006, 112–114, fig. 35). Sometimes small sharp-tipped bone fragments, which have been but slightly worked, have been discussed together with arrowheads (e.g. Grigalavičienė 1986a, fig. 19; 1986b, fig. 20: 1–5; 1995, fig. 63), but his article deals only with carefully finished arrowheads. One of the aims of the article is to analyze the material, tools and technology used to make these arrowheads. An answer is sought to the question whether these arrowheads were used for hunting or for warfare.

Finds of bone arrowheads from Estonia and other eastern Baltic countries

About 50 bone arrowheads have been found from the fortified settlements of Estonia (Fig. 1). From Asva more than 30 bone arrowheads and their fragments have been found, including some blanks and unfinished objects (Figs. 2: 1–6; 3; 5; Indreko 1939, 24, fig. 7: 3; Baccap 1955, 118, fig. 35: 4, 5, 7; Lõugas 1970, 99, pl. 22; Sperling 2006, 112–114, pls. LI: 1–2; LIV). The number of arrowheads and their fragments from Ridala is more than 20 (Fig. 2: 8–9; Lõugas 1970, 99) and three arrowheads and their fragments dating from the Bronze Age have been found from Iru (Fig. 2: 7; Lõugas 1970, 99; Lang 1996, 49, pl. VII: 4).² From Iru a couple of bone fragments are also known which may be blanks for making bone arrowheads. One arrowhead was found from Kaali (Fig. 4; Lõugas 1978, 328) and one more from Peedu in south-eastern Estonia (Moora 1939, fig. 70). Some

² One more arrowhead found from Iru (Vassar 1939, fig. 52: 4; Lang 1996, pl. VII: 3) most likely belongs to the Viking Age settlement phase, resembling some iron arrowheads found there (Vassar 1939, 84, fig. 52: 1; Lõugas 1970, 103–104). Such bone arrowheads, dated to the Viking Age, have been found e.g. from Otepää, Purtse and Rõuge (Mäesalu 1989, 35, fig. 5: 2; Luik & Maldre in print, fig. 20: 1).



Fig. 1. Fortified settlements of the eastern Baltic, mentioned in the text. Drawing by Kersti Siitan.

Joon 1. Artiklis mainitud kindlustatud asulad Läänemere idakaldal. Kersti Siitani joonis.

bone arrowheads are also known from the Bronze Age fortified settlement of Joaorg in Narva (Nikitjuk 1997, 79, fig. 2), but as this site was already inhabited in the Neolithic, the exact date of these arrowheads is not certain.

Bone arrowheads are also numerous among archaeological finds from the fortified settlements of Latvia, e.g. from Ķivutkalns, Vīnakalns, Mūkukalns, Brikulī (Fig. 1; Граудонис 1967, 89–90, pl. XII; Latvijas 1974, pl. 18: 3–9, 11–16; Graudonis 1989, 34–35, pls. XVI–XVIII, XLVIV: 16–19; Vasks 1994, 40, pl. VIII: 2, 10–12); and Lithuania, e.g. from Narkūnai, Kereliai, Sokiškiai, Moškēnai, Petrešiūnai (Fig. 1; Volkaitė-Kulikauskienė 1986, 28–29, figs. 33, 34; Grigalavičienė 1986b, fig. 20: 6, 7; 1995, 113–115, fig. 62). In Lithuanian National Museum I could examine some arrowheads from the hillforts of Narkūnai and Kereliai, which resemble Estonian ones by their manufacturing techniques and working traces. Bone arrowheads of the Bronze Age occur also in other countries around the Baltic – in Poland, Sweden and Russia as well as in Finland, where they are found also from the Iron Age sites (Lõugas 1970, 101 ff.; Ikäheimo et al. 2004, 8–10, fig. 3; Sperling 2006, 114).

Most of the Bronze Age arrowheads known today from the Baltic countries are made of bone. No flint arrowheads have been found from Bronze Age fortified settlements in Estonia, except for some specimens from Joaorg in Narva (Nikitjuk 1997, 79, fig. 2). Some stone arrowheads that could be dated to the Bronze Age have come to light in stone-cist graves and open settlements but typologically they are indiscernible from Neolithic arrowheads (Lõugas 1970, 99). In Latvian

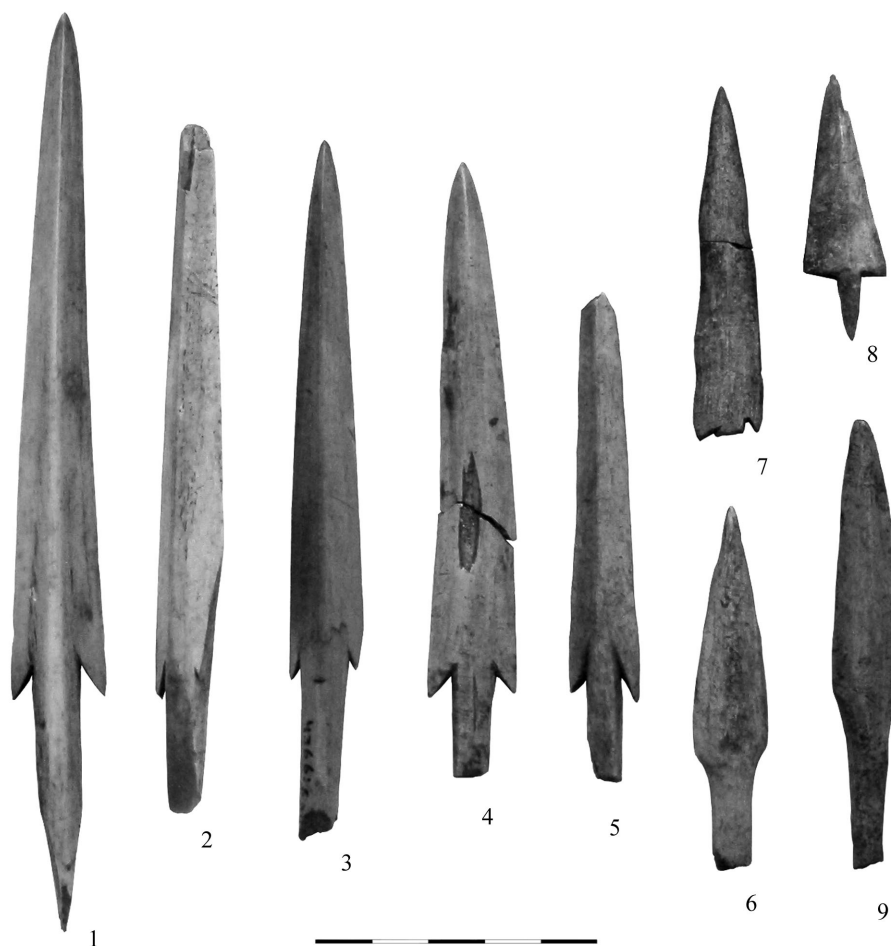


Fig. 2. Arrowheads from Asva, Iru and Ridala. 1–6 Asva: AI 3799: 338; 4366: 1607, 634; 3499: 1435/1636; 3658: 466; 4366: 1770, 7 Iru: AI 3428: 1293, 8–9 Ridala: AI 4329: 822, 865.

Joon 2. Nooleotsi Asvast, Iru ja Ridalast.

fortified settlements flint arrowheads also occur (e.g. Граудонис 1967, 85–86, pl. V; Latvijas 1974, pl. 16: 16–19; Vasks 1994, 37, pl. X: 1–4). As few as seven bronze arrowheads of the Late Bronze Age are known from the Baltic countries (Sidrys & Luchtanas 1999, 174), only one of which was found in Estonia. The latter was not found from a fortified settlement but from the ship-grave of Lülle; by V. Lõugas's estimation the object is comparable with arrowheads of period IV of the Nordic Bronze Age, which are found in Denmark, southern Sweden and Gotland (Lõugas 1970, 105, pl. 101: 3; compare Baudou 1960, 15, pl. III, map 7).

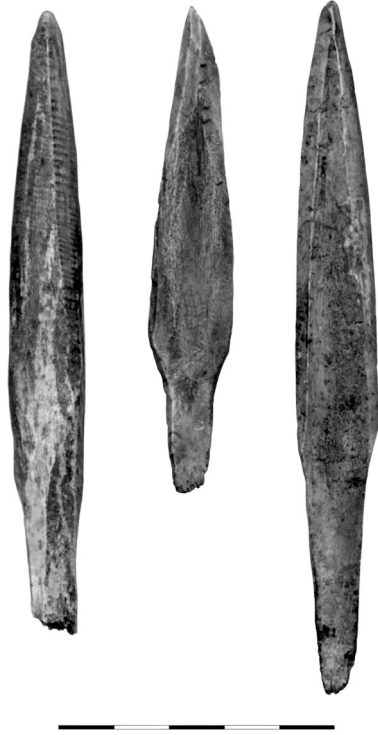


Fig. 3. Unfinished arrowheads from Asva (AI 3994: 377, 1461; 3307: 125).

Joon 3. Lõpetamata nooleotsi Asvast.

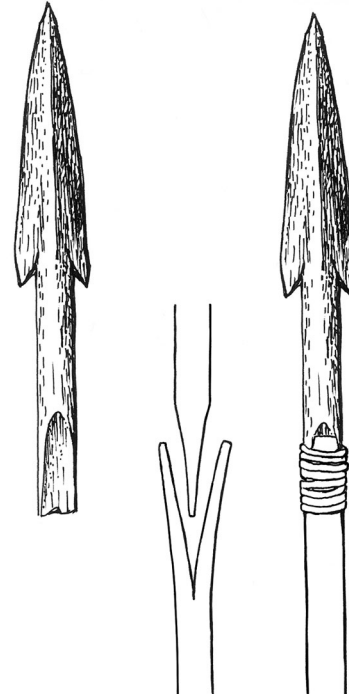


Fig. 4. Hafting of an arrowhead. After an arrowhead from Kaali (AI 4915: 433), drawing by Kersti Siitan.

Joon 4. Nooleotsa varretamine. Kaali nooleotsa järgi, Kersti Siitani joonis.

Shape and size of arrowheads

The cross-section of arrowhead blades is either triangular, lozenge or lenticular. Barbed specimens occur alongside with plain ones (Fig. 2). Although arrowheads with two barbs are most numerous, specimens with three barbs also occur (among the specimens with triangular cross-section, e.g. Asva AI 4366: 438, Iru AI 4051: 734; Graudonis 1989, pl. XVI: 14), as well as specimens with a single barb (e.g. Graudonis 1989, pls. XVII: 10, 11; XVIII: 10, 11, 15; Volkaitė-Kulikauskienė 1986, fig. 34: 1, 3, 4). Estonian Bronze Age arrowheads are divided into four types on the basis of their shape, cross-section and presence or absence of barbs (Lõugas 1970, 99 ff.; Sperling 2006, 112–114, fig. 35). Elena Grigalavičienė (1995, 113–115) has divided the Lithuanian arrowheads into seven groups. Jānis

Graudonis (1989, 34–35) has presented a typology of the arrowheads from Ķivutkalns, Latvia, first dividing the arrowheads into two groups on the basis of the presence/absence of barbs, distinguishing several subtypes in each, according to the shapes and cross-sections of their blade and tang.

All arrowheads found from Estonia have a tang, cut in a specific triangularly tapering shape, which was meant to be inserted in a slit cut into the shaft (Fig. 4). From Mūkukalns, Latvia, socketed arrowheads have also been found, but these are probably later and date from the Pre-Roman Iron Age (Граудонис 1967, 90, pl. XII: 7–9, 11–12). Quite often the tip of an arrowhead is broken, in many cases only a fragment of a tang has survived.



Fig. 5. Blunt arrowhead of antler and triangular arrowhead of rib from Asva (AI 4366: 1324, 1285).

Joon 5. Sarvest tömp nooleots ja roidest valmistatud kolmnurkne nooleots Asvast.

The length of arrowheads varies greatly. In Estonia the shortest specimens are about 5 cm long while the longest is 16.5 cm. In Latvia specimens up to 14 cm are classified as arrowheads and those 14.5–17 cm long are regarded as spearheads (Graudonis 1989, 35, pls. XVI–XVIII), but in Finland specimens 12–17 cm long are also regarded as arrowheads (Ikäheimo et al. 2004, 7). The possibility that longer objects may also be regarded as arrowheads is suggested by the occurrence of bone arrowheads among ethnographic material e.g. from Alaska – their length even reaches 23–26 cm (Rousselot & Grahammer 2004, 236–243). Jaak Mäll, the researcher of the prehistoric and medieval weaponry has expressed an opinion that these objects were all arrowheads, since the longer specimens would be too light to be used as javelin-heads. For example the longest arrowhead from Asva, with the length of 16.5 cm (Fig. 2: 1), weighs 14.20 grams and the smallest one, 5.2 cm long thin specimen (Fig. 5, right) only 1.23 grams.³ The shape, length and width of tang also allow to regard them as arrowheads (Jaak Mäll, pers. comm.).

³ For comparison it could be mentioned that the weight of Iron Age arrowheads e.g. from Otepää is 2.9–28.9 g (Mäesalu 1989, table 1). John Chapman (1999, 109), however, analyzing Copper Age bifacial pressure-flaked stone arrowheads from the Balkan, found that a well-balanced arrowhead must weigh less than 10 g. The possible weight of arrowheads, as well as the range of a bow, evidently depends on the size and properties of the used bow (e.g. Mercer 1999, 147).

Selection of material and manufacturing of arrowheads

Bronze Age bone artefacts can be broadly divided into two groups: 1) artefacts made from suitable bone fragments and representing barely worked objects; 2) artefacts made from carefully selected raw materials and skilfully manufactured (Choyke et al. 2004, 185; Choyke 2005, 131). The majority of bone artefacts among Estonian archaeological finds belong to the first group – usually the natural shape of bone has been exploited when making bone artefacts (e.g. awls, points, chisels, spatulas), and only the working end of the object has been processed more carefully. The handle has been usually either just cut into more or less convenient shape, or the articular surface of a long bone has been used. Bone arrowheads are outstanding among the Bronze Age bone artefacts of the eastern Baltic region for their very careful finishing.

The overwhelming majority of arrowheads are made of the diaphysis of long bones. Bone and species cannot be identified, as a rule, but most likely metapodial bones of large herbivores – cattle, horse, elk and deer – were used, their bones occur also among faunal remains of these sites (e.g. Volkaitė-Kulikauskienė 1986, 43, 47; Graudonis 1989, 101; Lõugas 1994; Vasks 1994, 118; Grigalavičienė 1995, 268; Maldre 1999, 322; Sperling 2006, 125, 127). Only one triangular arrowhead from Asva is made of a split rib and a blunt arrowhead is made of elk antler (Fig. 5; Sperling 2006, pls. LIV: 1; LVI: 6).

Examining the making of arrowheads, a certain standardization of arrowheads and uniform manufacturing techniques can be observed. Some of the arrowheads bear even small transverse lines on their surface (Fig. 6), which raised a question whether these could be traces of file or rasp, or whether they were left by some other tool. According to Anthony Harding, bronze files were used in Bronze Age Europe, e.g. for working wood (Harding 2000, 226, footnote 110). No bronze files have been hitherto found in Estonia, but bronze artefacts of the Bronze Age are altogether rare here.

To find out the tools and technology, which could be used in manufacturing the arrowheads, Jaana Ratas and Jaak Mäll made a replica of an arrowhead from Asva (Fig. 7). In the course of the work they discovered that when cutting a rather hard matter like bone powerfully and with steady force, the blade may begin to vibrate, thus leaving small transverse lines with equal intervals – chatter-marks – on the surface of bone (compare e.g. Cristiani & Alhaique 2005, 400, figs. 2: 4, 6; 3: 4, 6). Such chatter-marks can be also seen on the surface of the produced replica (Fig. 8). The traces on the arrowheads found from Estonia (Fig. 6) have been evidently also caused by the vibration of the cutting blade. Similar traces occur on several arrowheads from the hillfort of Narkūnai, which I had the opportunity to study in the department of archaeology of Lithuanian National Museum (e.g. LNM AR 594: 235, 244, 256). By the opinion of Ratas and Mäll, the chatter-marks are probably the result of working the artefact surface with

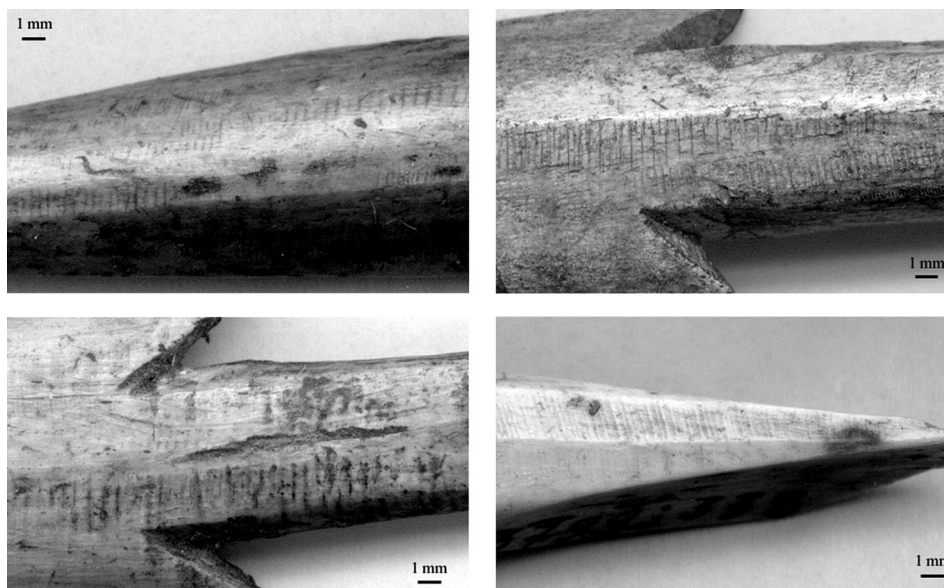


Fig. 6. Chatter-marks on arrowheads (AI 3994: 586; 3307: 296; 3994: 1636; 3799: 338).

Joon 6. Lõiketera vibreerimise jälgi nooleotstel.



Fig. 7. Replica of an arrowhead from Asva (AI 4366: 1607), made by Jaana Ratas and Jaak Mäll.

Joon 7. Asva nooleotsa koopia, valmistanud Jaana Ratas ja Jaak Mäll.

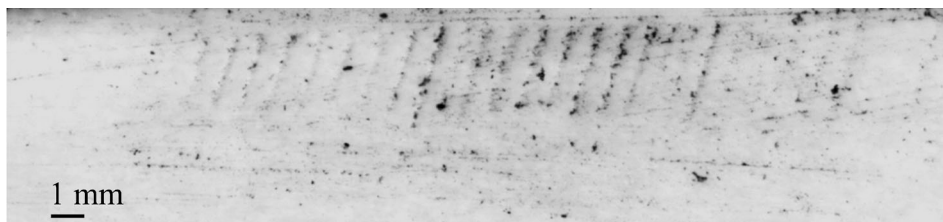


Fig. 8. Chatter-marks on the replica. Photo by Jaana Ratas.

Joon 8. Lõiketera vibreerimise jäljed koopial. Jaana Ratase foto.

a flint blade,⁴ which has been inserted into some sort of handle. Such antler handles, probably used for inserting flint blades, have been found from the fortified settlements in the Baltic countries (e.g. Lõugas 1970, pl. 27: 5–10; Graudonis 1989, pl. XV; Grigalavičienė 1995, fig. 61: 10–12; Sperling 2006, 104–105, pl. XLVII: 2–5). According to Ratas and Mäll, it takes an experienced workman about 40–50 minutes to make a bone arrowhead.

The blades of arrowheads usually have very smooth and even surfaces (Fig. 9), most likely the final elaboration was performed by grinding the edges upon a stone. The faces of the point of the replica were also polished on sandstone to achieve smooth surfaces. Since the tip of the original arrowhead was broken, the tip of another arrowhead (AI 3799: 338) was used as an example at finishing the tip of the replica. Longitudinal lines (Fig. 10) can be observed on the blades of some arrowheads. Mäll has supposed that these lines resulted either from scraping the blade with a blunt and irregular flint blade, or from polishing the blade with sand (containing also larger grains) upon a piece of wood.



Fig. 9. The blades of arrowheads have very even and smooth surfaces (AI 3799: 338).

Joon 9. Nooleotste teravikud on väga ühtlase ja sileda pinnaga.

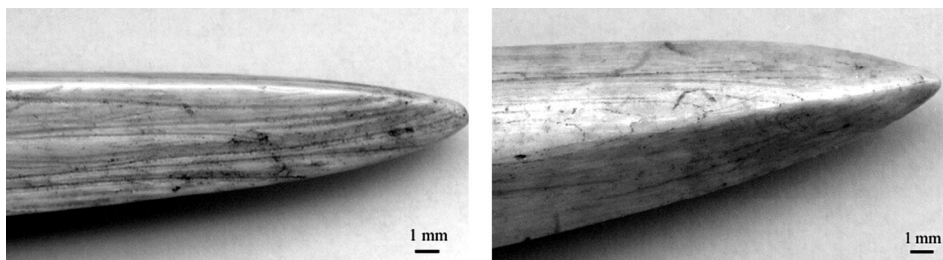


Fig. 10. Probable traces of grinding on arrowheads (AI 3799: 338; 3994: 1435).

Joon 10. Oletatavad lihvimisjäljed nooleotstel.

⁴ The researchers of boneworking have tried to distinguish between working traces left by metal and stone tools, comparing working traces on experimentally made bone objects using microscope with high magnification, e.g. metallographic microscope and SEM – Scanning Electron Microscope (see e.g. LeMoine 1997; Cristiani & Alhaique 2005).

In the course of work one of the barbs of the replica broke at about the same place as the original's barb had broken – the barb is one of the possible weak points of an arrowhead. Probably a wrong method was chosen for making the barb – it was attempted to cut it in, but the bone split and the barb broke. The other barb was sawn with a sharp-edged piece of sandstone (Jaak Mäll, pers. comm.). The original, however, was evidently broken while used, not in the course of manufacturing. Although some more arrowheads have broken barbs (e.g. AI 4329: 853; 4366: 89), broken tip or tang is more common. In Ridala, where most of the bone objects have survived quite fragmentarily, often only a small fragment of a tip or a tang is left of a bone arrowhead (e.g. AI 4261: 135, 688, 516, 520; 4239: 159, 256).

For hunting or for warfare?

Were such arrowheads meant for hunting or for warfare? Richard Indreko (1939, 24) and Artur Vassar (Baccap 1955, 118) regard bone arrowheads as hunting weapons. Uwe Sperling (2006, 120) has also regarded them primarily as hunting tools, which may have been used for warfare as well.

Although the majority of faunal remains from the Bronze Age of the eastern Baltic consists of bones of domestic animals (Vasks 1994, table 7; Lõugas 1994; Grigalavičienė 1995, 268; Maldre 1999, 322; Sperling 2006, 125–127), hunting still played a certain part in economy. Popular game species were elk, wild boar, deer and roe deer; small fur animals are less represented among faunal remains (Indreko 1939, 24; Graudonis 1989, 101; Lõugas 1994, 82, table 2; Vasks 1994, 118, table 9; Grigalavičienė 1995, 268). In Asva and Ridala, which were located on the shore, seals prevail among game bones (Lõugas 1994, 90; Sperling 2006, 127–128) – they were hunted with harpoons, and harpoon heads of bone and antler occur among the finds from these sites (Indreko 1939, fig. 7: 1; Baccap 1955, 118, fig. 35: 1–3, 6; Sperling 2006, 105–106, pl. XLVIII: 3–5).

Experiments have been carried out to estimate the effectiveness of bone arrowheads (Ikäheimo et al. 2004). These have revealed that bone arrowheads are as effective as stone and metal specimens. One of their assets is their greater elasticity, they are not smashed so easily and neither do they come loose from the shaft as easily as stone arrowheads. Therefore bone arrowheads were more suitable for hunting (they could be recovered from the body of game animal and used again; however, it should be mentioned here that replicas used in these experiments were not barbed) and stone specimens were more fit for warfare (broken arrowhead or its tip remained in wounded enemy and the attempts to remove the arrowhead resulted in severe inflammation). Nevertheless, according to the researchers who carried out the experiments, the use of arrowheads of each material for each purpose cannot be excluded (Ikäheimo et al. 2004, 15).

In ethnographic material, for example antler arrowheads with slate tips of the Inuit were presumably used for hunting big game as well as for warfare (Varjola

1990, fig. 27). About the Inuit it is known that more arrowheads than shafts were taken along to a hunting trip; arrowhead was chosen and hafted just before shooting. Arrows of different shape and size had different functions at hunting: blunt arrowheads were for fowl and fur animals, to avoid damage of valuable fur. While hunting big game, small arrowheads were first used from longer distance, to injure the prey, make it bleed and weaken it. Then a larger and stronger arrow was shot from a shorter distance to kill it. Barbed arrowheads were meant to stick in the wound and hamper the escape of the prey (Rousselot & Grahammer 2004, 236–243).

John Chapman (1999, 108 ff.) has found it expedient to divide artefacts according to their function into tools, tool-weapons, weapon-tools and weapons (see also Vencl 1999, 65 ff.; Johanson 2006, 40, 144). According to Chapman, specialized weapons are a relatively late phenomenon and in earlier times artefacts could be used both as weapons and as tools. So the same arrowheads could be used for hunting as well as for warfare. Gradually the specialization of artefacts increased, and while Chapman classifies the earlier Mesolithic and Neolithic arrowheads as tool-weapons, he has regarded the later Copper Age pressure-flaked bifacial stone arrowheads from Balkan as weapon-tools, meant primarily for warfare (Chapman 1999, 125). In Rodger Mercer's opinion (1999) a certain type of arrowheads of the British Isles – leaf-shaped flint arrowheads – were meant particularly for warfare and during the Early Neolithic the bow and arrow became an efficient human-killing weapon in north-west Europe.

Anthony Harding has expressed an opinion that bow and arrows were standard weapons at the beginning of the Bronze Age and stone arrowheads, similar to the Neolithic ones, were continually used. Wooden bows have been found in Bronze Age context, and bows and arrows are depicted on rock carvings of Italy and Sweden. In the Early Bronze Age arrowheads in Europe were mainly made of flint, but since the Middle Bronze Age bronze was used. For hunting, bow and arrows were used throughout the Bronze Age but it is not clear to what extent they were used for warfare. According to Harding, new weapons of close combat – sword, spear, armour – indicate the spread of new methods of fight, but for long-distance fighting evidently the bow was used throughout the Bronze Age (Harding 1999; 2000, 283–284; see also Kristiansen 1999; Randsborg 1999).

Jaak Mäll is convinced that the long and slender barbed arrowheads of Estonian Bronze Age were used as weapons. Missile weapons in military conflicts are usually aimed at thorax, where the long and sharp arrowhead would most likely hit internal organs. On the basis of the shape of the tang, it can be said that arrowheads were hafted so that at the attempt to remove the arrow from the wound the arrowhead would be detached and, owing to barbs, stuck in the wound. The wound need not be fatal, but the removal of arrowhead would take time, and pain would immobilize the enemy. On the other hand, arrowheads with a shorter, wider and thinner blade, causing heavy bleeding, would be more suitable for hunting. The hunting arrowhead should be also firmly hafted: the moving of the animal would move it, thus enlarging the wound and causing pain (Jaak Mäll, pers. comm.).

Ain Mäesalu has also discussed the classification of arrowheads on the basis of their function, but his treatment concerns considerably later finds and primarily iron arrowheads. He also admits that arrowheads with wider and thinner blades and sharp edges are more suitable for hunting while long, slender and faceted specimens were for military purposes. Nevertheless Mäesalu suggests that such classification is subjective, and, if necessary, hunting arrowheads could be used in battles and vice versa (Mäesalu 1989, 28). Slavomil Vencl (1999, 65) has also argued that the possibility of a morphological use determination of archaeological arrows is questionable.

In my opinion the classification of arrowheads on the basis of their function is justified. With the society becoming more complex, tools and weapons also became more complicated as well as more specialized (see e.g. Chapman 1999). I believe that people who made artefacts had an idea of the purpose for which they were making them, which influenced their choice of bone of suitable size and shape and design of the arrowhead (see e.g. Caple 2006, fig. 1.3). It is certainly possible that arrowhead (or any other object) was used for some other purpose on some occasion; sometimes it can be inferred from the find context. However, it does not alter the function it was originally designed for.

As mentioned above, the archaeological finds from the fortified settlements of the Bronze Age in the Baltic region also include arrowheads of different size and shape. A blunt arrowhead of elk antler (Fig. 5, left) was certainly used for hunting, probably for fowl or fur animals. Bones of fur animals as well as of waterfowl are found among the faunal remains from Asva (Indreko 1939, 24–25; Lõugas 1994, 82, table 2). Some small and light arrowheads (Figs. 2: 6, 8; 5, right) were probably also meant for hunting small game. The small arrowheads made from sharp-tipped bone fragments could be also used for hunting (Grigalavičienė 1986a, fig. 19; 1986b, fig. 20: 1–5; 1995, fig. 63).

Considering the small number of bronze objects, including weapons (swords, spearheads, arrowheads), found in the countries of the eastern Baltic (Sidrys & Luchtanas 1999, 174) and particularly in Estonia, the carefully finished long and slender bone arrowheads were obviously used for warfare. The abundance of bronze weapons in other regions of Europe has been connected with the appearance of warrior aristocracies and chiefdoms (Kristiansen 1999; Harding 1999). Valter Lang reckons that one cannot speak of chiefdom in connection with the Late Bronze Age in Estonia. The settlement mode in Estonia was nevertheless hierarchical, but the systems here were considerably smaller than was necessary for the existence of chiefdom (Lang 1996, 463–465). This may also be one of the reasons for the scantiness of bronze weapon finds here. Still, the necessity to fortify settlements and the fact that sometimes the fortifications have been destroyed by fire (Jaanits et al. 1982, 138, 146) indicate possible military conflicts. The fact that bone arrowheads have been found particularly from fortified settlements, which were the centres in their time, also suggests their use for warfare.

Summary

The occurrence of bone arrowheads primarily in the Bronze Age centres – fortified settlements, their standardization as well as greater skill of their manufacturing compared with most of the bone artefacts of the same period indicate their essential place, significance and meaning in the Late Bronze Age society of the eastern Baltic. Considering the shape and properties of bone arrowheads, as well as the absence or scarceness of arrowheads of other material on these sites one may conclude that the carefully elaborated bone arrowheads were used for warfare.

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Heidi Luik

**RELVAD VÕI JAHIRIISTAD?
LUUST NOOLEOTSAD BALTIMAAD NOOREMA PRONKSIAJA
KINDLUSTATUD ASULATE LEIUMATERJALIS**

Resüme

Luust nooleotsi esineb küllaltki arvukalt Läänemere idakalda noorema pronksiaja (u 1100–500 eKr) leiumaterjalis. Käesolev artikkel põhineb peamiselt Eesti leiuainesel. Läti ja Leedu puhul tugineb artikkel publitseeritud leidudele, lisaks oli autoril 2006. a kevadel võimalus tutvuda Leedu kahe kindlustatud asula materjalis leiduvate nooleotstega Leedu Rahvusmuuseumis. Artikli eesmärgiks ei ole koostada luust nooleotste tüpoloogiat, vaid analüüsida nooleotste valmistamiseks kasutatud materjali, tööriistu ja töötlemisvõtteid. On otsitud vastust küsimusele, kas nende nooleotste puhul on tegu eelkõige jahiriistade või sõjarelvadega.

Eesti kindlustatud asulatest on teada üle poollesaja luust nooleotsa (joon 1–5). Asvast on nooleotsi teada üle kolmekümne, leidub ka lõpetamata eksemplare.

Ridalast on leitud paarkümmend nooleotsa katkendit, Irust kolm pronksiaegset nooleotsa, Kaalist ja Peedult üks. Mõned luust nooleotsad on teada Narva Joaoru kindlustatud asulast, see koht oli aga asustatud ka neoliitikumis ja neid nooleotsi ei saa kindlalt pronksiaega dateerida. Arvukalt leidub luust nooleotsi Läti kindlustatud asulate materjalis, nt Kivutkalnsis, Vīnakalnsis, Mūkukalnsis, Brikuļis; samuti Leedus, nt Narkūnai, Kereliai, Sokiškiai, Moškėnai ja Petrešiūnai kindlustatud asulates (joon 1). Leedu Rahvusmuuseumi kogudes õnnestus vaadata Narkūnaist ja Kereliaist leitud nooleotsi, mille valmistamistehnoloogia, samuti esemete pinnal nähtavad töötlemisjäljed on samasugused nagu Eesti leidudel. Luust pronksiaegseid nooleotsi tuleb ette ka teistes Läänemere ümbruse maades – Poolas, Rootsis, Venemaal ja Soomes. Suurem osa Baltimaade praeguseks teadaolevatest pronksiaegsetest nooleotstest ongi tehtud luust. Tulekivist nooleotsi pole Eesti kindlustatud asulatest teada, v.a mõned nooleotsad Narva Joaorust. Läti kindlustatud asulates neid siiski leidub. Noorema pronksiaja pronksist nooleotsi on Baltimaadest leitud vaid seitse, seejuures Eestist üksainus (Lülle laevkalmest).

Nooleotste tera läbilõige on kolmnurkne, rombikujuline või teravovaalne, esi- neb nii kiskudega kui ka kiskudeta eksemplare (joon 2). Kõige enam leidub kahe kisuga nooleotsi, kuid tuleb ette kolme ja ka ainult ühe kisuga eksemplare. Kõik Eestist leitud nooleotsad on rootsuga, mis on lõigatud kolmnurkselt ahenevaks, võimaldades varretamist noolevarre sisse lõigatud lõhesse (joon 4). Nooleotste pikkus on küllaltki erinev. Eestis on lühemad nooleotsad u 5 cm pikkused, kõige pikem aga 16,5 cm. Läti leiumaterjalis on nooleotste hulka arvatud kuni 14 cm pikkused eksemplarid ja odaotste hulka 14,5–17 cm pikkused esemed, Soomes aga on ka 12–17 cm pikkusi eksemplare nimetatud nooleotsteks. Sellele, et ka pikemad esemed võivad olla nooleotsad, viitavad Alaska etnograafilises materjalis leiduvad luust nooleotsad, mille pikkus ulatub 23–26 cm-ni. Muinas- ja keskaegset relvastust uuriva Jaak Mälli arvates on kõigi nende esemete puhul tegu nooleotstega, sest ka pikemad luust otsikud oleksid viskeoda otsana kasutamiseks liiga kerged. Tema hinnangul näitab ka rootsu kuju, pikkus ja laius, et tegemist on nooleotstega.

Luust nooleotsad paistavad Baltimaade pronksiaegsete luuesemete hulgas silma hoolika töötamise poolest. Suurema osa siinsete luuesemete (naasklid, teravikud, peitlid) valmistamisel on ära kasutatud luu loomulikku kuju, hoolikamalt on töödeldud ainult eseme töötamiseks mõeldud otsa. Valdav enamik nooleotsi on tehtud pikkade toruluude seinast. Luu ja liigi täpsem määramine pole võimalik, kõige tõenäolisemalt kasutati kämbla- ja põialuid. Liikidena tulevad kõne alla veis, hobune, põder ja hirv, kelle luid leidub nende muististe faunajäänuste hulgas. Vaid üks kolmnurkne nooleots Asvast on tehtud lõhestatud roidest ja üks tõmp nooleots põdrasarvest (joon 5).

Mõne nooleotsa pinnal on nähtavad väga ühtlased põikjoonekesed (joon 6), mille puhul tekkis küsimus, kas need võiksid olla viili või raspli jäljed. Anthony Hardingu arvates on Euroopas pronksiajal nt puutöötlemisel pronksist viile kasutatud. Et saada selgust nende esemete valmistamise osas, meisterdasid Jaana Ratas ja Jaak Mäll ühe Asva nooleotsa koopia (joon 7). Töö käigus selgus, et

luud tugevalt ja ühtlase jõuga lõigates võib lõiketera hakata vibreerima, tekitades luu pinnale ühtlaste vahedega põikjoonekesed. Sellised lõiketera vibreerimise jäljed on nähtavad valmistatud koopia pinnal (joon 8). Ilmselt on lõiketera vibreerimise tulemusel tekkinud ka Eestist leitud nooleotstel leiduvad jäljed (joon 6), samuti esineb selliseid jälgi mitmel Narkūnai nooleotsal. Need jäljed on arvatavasti tekkinud eseme töötlemisel mingisse käepidemesse kinnitatud tulekivist lõiketera abil. Nooleotste teravikud on tavaliselt väga sileda ja ühtlase pinnaga (joon 9), tõenäoliselt toimus nende lõplik viimistlemine liivakivil lihvides. Mõne nooleotsa teral on nähtavad pikijooned (joon 10), mis Mälli arvates võisid tekkida nūri ja ebauhtlase tulekiviteraga kraapimisel või nooleotsa teraviku lihvimisel puutüki peal liivaga, milles leidis ka suuremaid liivateri. Koopia teraviku tahke siluti ühtlase pinna saavutamiseks liivakivil, kiskude valmistamiseks kasutati liivakivist õhukese servaga plaadikest. Mälli ja Ratase hinnangul kulub vajaliku vilumuse olemasolu korral luust nooleotsa valmistamiseks u 40–50 minutit.

Kas sellised nooleotsad olid mõeldud jahiriistadeks või on tegu sõjarelvade? Richard Indreko, Artur Vassar ja Uwe Sperling nimetavad luust nooleotsi küttemisriistadeks. Teatud osa oli Läänemere idakalda maade pronksiaegses majanduses ka jahipidamisel, kuigi suurema osa faunajäänustest moodustavad koduloomade luud. Metsloomadest kütiti rohkem põtru, metssigu, hirvi ja metskitsi, vähem karusloomi. Rannikul paiknenud Asvas ja Ridalas moodustavad enamiku kütitud loomade luudest hüljeluud. Hüljeste küttemiseks kasutati harpuune, mille luust ja sarvest otsikuid esineb ka nende leiukohtade materjalis.

Janne Ikäheimo, Juha-Pekka Joona ja Mikko Hietala poolt läbi viidud eksperimentide käigus selgus, et luust nooleotsad on sama efektiivsed kui kivist ja metallist eksemplarid. Nende üheks eeliseks on, et luust nooleotsad on elastsemad ja ei purune ega eraldu noolevarrest nii kergesti kui kivist nooleotsad. Seetõttu võisid luust nooleotsad olla sobivamad jahiks (neid oli võimalik saaklooma kehast kätte saada ja uuesti kasutada; siinkohal tuleb mainida, et eksperimentides kasutati kiskudeta nooleotsi) ja kivist nooleotsad jälle sõjapidamisel (purunenud nooleots või selle tipp jäi vaenlase kehasse, tekitades haavas põletikku). Siiski ei saa eksperimente korraldanud autorite arvates välistada kummastki materjalist nooleotste kasutamist mõlemal otstarbel.

Etnograafilise materjali puhul on näiteks inuitide luust nooleotste kohta väidetud, et neid tarvitati nii jahil kui ka sõjapidamisel. Jahikäigule võeti tavaliselt noolevarsi kaasa vähem kui nooleotsi, nooleots valiti vastavalt tekkinud vajadusele ja kinnitati noolevarre külge. Erineva suuruse ja kujuga nootel oli jahil erinev funktsioon.

Hardingu hinnangul olid pronksiaja algul vibu ja nooled tavaliseks relvaks. Varasel pronksiajal tehti Euroopas nooleotsi peamiselt tulekivist, alates keskmisest pronksiajast aga pronksist. Jahipidamisel kasutati vibu ja nooli kogu pronksiaja jooksul, kuid pole teada, mil määral tarvitati neid sõjapidamisel. Hardingu arvates annavad pronksiajal kasutusele tulnud lähivõitluse relvad – mõök, oda ja kaitserüüd – tunnistust uute sõjapidamismeetodite levikust, kuid siiski oli kaugrelvana ilmselt kasutusel ka vibu.

Mäll on veendunud, et Eesti pronksiaegsed kiskudega nooleotsad olid kasutusel relvadena. Nooleotsad on varre külge kinnitatud selliselt, et kui püüda noolt välja tõmmata, eralduks nooleots varrest ja jääks kiskude tõttu haava sisse kinni, mistõttu võtab selle väljavõtmine aega. Kuigi haav ei pruugi olla surmav, muudab valu vaenlase liikumisvõimetuks. Jahinoolteks sobivad pigem lühema, laiema ja õhema teraga nooleotsad, mis põhjustaksid ägeda verejooksu. Samuti peaks jahinoolel olema kindlalt kinnitatud noolevars, mis looma põgenemisel haavas liikudes suurendaks haava ja verejooksu ning tekitaks valu. Nooleotste jaotamise üle otstarbe põhjal küttimisriistadeks ja sõjarelvadeks on arutlenud ka Ain Mäesalu, seda küll seoses tunduvalt hilisema leiuainesega ning eeskätt rauast nooleotste osas. Ka Mäesalu sõnul on jahiks sobivamad laia ja õhukese lehega ning teravate servadega nooleotsad, sõjarelvaks aga pikad, saledad ja tahulised eksemplarid. Siiski leiab Mäesalu, et selline jaotamine on subjektiivne ja vajadusel võidi küttimiseks mõeldud nooli kasutada ka lahingus ja vastupidi. Autori arvates on nooleotste jaotamine nende otstarbe põhjal siiski põhjendatud. Koos ühiskonna komplekssemaks muutumisega on ka tööriistad ja relvad muutunud keerukamaks ning enam spetsialiseerituks. Esemeid valmistanud inimesel oli olemas idee selle kohta, milliseks otstarbeks ta eset valmistab, ja sellest sõltusid tema valikud sobiva suuruse ja kujuga luutüki valimisel ja nooleotsale kuju andmisel. See, et nooleotsa (nagu mis tahes muud eset) võidi mingil põhjusel ka teisel otstarbel kasutada, on kahtlemata võimalik, mis võib selguda näiteks eseme leiukontekstist. Siiski ei muuda see esemele algselt mõeldud funktsiooni.

Nagu eespool mainitud, leidub ka Baltimaade pronksiaja kindlustatud asulate leidude hulgas erineva kuju ja suurusega nooleotsi. Jahiriistaks oli kahtlemata karusloomade või veelindude küttimiseks mõeldud põdrasarvest tõmp nooleots (joon 5, vasakul), jahipidamiseks võisid olla mõeldud ka mõned väikesed nooleotsad (joon 2: 6, 8; 5, paremal).

Luust nooleotste esinemine eelkõige pronksiaegsetes keskustes – kindlustatud asulates –, nende standardiseeritus, samuti valmistamise meisterlikkuse erinevus suuremast osast samaaegsetest luuesemetest viitab sellele, et neil oli oluline koht, tähtsus ja tähendus Läänemere idakalda noorema pronksiaja ühiskonnas. Arvestades luust nooleotste kuju ja omadusi, samuti muust materjalist nooleotste puudumist või vähesust neis muististes, tundub tõenäoline, et pikad ja saledad hoolikalt töödeldud luust nooleotsad olid sõjarelvad.