

Typology and cultural-chronological variability of bifacially worked implements of siliceous rocks from the territory of Russian Karelia

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Bifacially worked implements made of siliceous rocks constitute one of the most significant groups of lithic tools from archaeological sites in present-day Karelia from the Neolithic to the Early Metal Period. In the present paper a generalised description of these artefacts during the whole period of their existence is given and the typology of these implements is discussed. The spread of bifacial industry, which was followed by the disappearance of blade industries, can be considered an epochal phenomenon, one of composing parts of the "Neolithic package" along with pottery production. The main tendencies in the development of bifacial industry were common for a very large territory of the forested zone of eastern Europe.

Artiklis antakse ülevaade silikaatsetest kivimitest labatehnikas valmistatud esemetest, mis on üks peamisi leiurühmi neoliitikumist kuni varase metalliajani tänapäeva Karjala alal. Kirjeldatakse esemete iseloomulikke jooni ning arutletakse nende tunnuste alusel loodud tüpoloogia üle. Labatehnika levik, mille järel laasttehnika hääbus, oli epohhi loov fenomen, mis koos keraamika valmistamise oskusega oli üks olulisimaid osi „neoliitilisest komplektist“. Labatehnikas töödeldud esemete arengujooned on sarnased laiad el aladel Ida-Euroopa metsavöötmel.

Key words: bifacial knapping technology, bifacially worked implements, siliceous rock, typology, Russian Karelia, Neolithic, Early Metal Period

Võtmesõnad: labatehnika, labatehnikas valmistatud esemed, silikaatsed kivimid, tüpoloogia, Vene Karjala, neoliitikum, varane metalliaeg,

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Introduction

Bifacially worked implements made of siliceous rocks constitute one of the most significant groups of lithic tools from archaeological sites of Neolithic – Early Metal Periods from present-day Karelia. Most of them are arrow- and spear-heads produced using quite sophisticated variants of bifacial knapping technology implying several stages of production process and, very often, the use of “secondary bifacial thinning” (Callahan 1979, 30, 116; Anikovich *et al.* 1997, 154). Cruder variants of bifacial flaking, which do not imply secondary thinning, were also used in this territory for making large wood-chopping tools. As these items were made in Karelia of different sorts of “greenstone” (slates, siltstones, tuffs, etc.), and not of flint and other siliceous rocks, their description is left out of the scope of the present article.

Despite the importance of bifacial points in assemblages dated to the Neolithic – Early Metal Period in the forested zone of eastern Europe, special investigations presenting generalised characteristics of this category of lithic inventory at the settlements of this area are rather rare. The standard list prepared of bifacial points from Neolithic settlements in Karelia by Grigorij A. Pankrushev (Pankrushev 1978, 10, fig. 7) is outdated, and, moreover, it was initially based mainly on the study of settlements with mixed complexes. The typology developed by Aleksandr Zhul’nikov (1999, 58, fig. 46) includes recently obtained assemblages, but considers only points dated to the Late Neolithic and Eneolithic, leaving aside items of the Early Neolithic and the Bronze Age. Because of this, the publication of a special study that presents a generalised description of bifacial tools of siliceous rocks from present-day Karelia during the whole period of their existence is necessary and timely. This work may also be of interest to specialists from other regions, including eastern Baltic countries, because the leading types of bifacial tools were spread over a very wide expanse and Karelia was just a part of the area of their distribution, as will be demonstrated later in the article.

The paper is based on the analysis of materials from sites with pure or relatively pure assemblages of different Karelian archaeological cultures. In general, the author follows the scheme of chronological-cultural divisions of Karelian antiquities presented in the summarising overview of Karelian archaeology (Kosmenko & Kochkurkina 1996). According to this scheme, during the Neolithic and the Bronze Age several cultures were distributed here: Sperrings, Pit-Combed Ware, Combed Ware (Neolithic); Rhomb-Pit Ware and Asbestos Ware (Eneolithic); Textile Ceramics (Bronze Age). The Early Iron Age, according to the scheme by Mark Kosmenko, was presented by several co-existing ceramic types: Luukonsaari, Late Kargopol type (*pozdnekargopolsky*), Late White

Sea type (pozdnebelomorsky), and Arctic (resembling Kjelmoy type) (Kosmenko 1993). Zhul'nikov does not distinguish Late White Sea type ceramics in the south-western White Sea and speaks about presence of Anan'ino type ceramics in this region (Zhul'nikov 2005, 35). The Early Iron Age find material is represented by quite a small amount of vessels, mostly on sites with multiple habitation periods, and identifying the stone objects accompanying them is very often close to impossible. Only few bifacial points can be more or less reliably connected to the assemblages of this time.

The period under consideration starts approximately at 6700 BP or 5600 cal. BC¹ and ends at the turn of eras (in radiocarbon non-calibrated years) (Fig. 1). The dates are mostly derived from radiocarbon analyses (Kochkurkina 1991; Kosmenko 2003; Reimer *et al.* 2004; Piezonka 2008). Subtypes of the Eneolithic Asbestos Ware period, for which more detailed chronology has been developed, are mentioned in accordance with the scheme by Zhul'nikov (Zhul'nikov 1999). Because the lithic industry characteristic to the sites with predominantly rhomb-pit ware is identical to that from sites with the combed ware (usually also containing vessels of the rhomb-pit type), and datings of both types in fact overlap, they are considered here as a single unity.

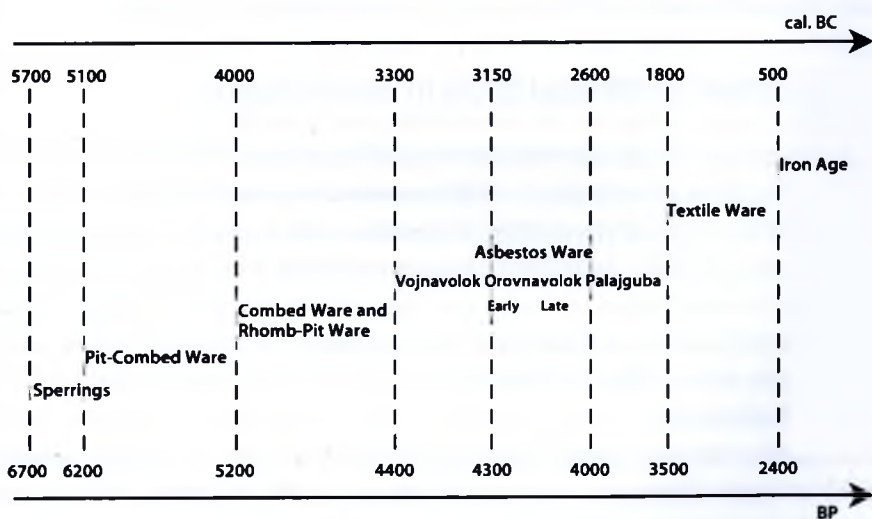


Figure 1. Chronological scheme of lithic artefacts used in the article.

Joonis 1. Artiklis kasutatud kiviesemete kronoloogiline skeem.

¹ If not said otherwise, the dates presented in the article have been calibrated with the computer programme OxCal, version 4.1, calibration curve IntCal 09, by Bronk Ramsey 2009 (<http://c14.arch.ox.ac.uk/embed.php?File=oxcal.html>, accessed 15.12.2012).

Bifaces of siliceous rocks from Karelia: general characteristics

Before describing the principles of bifacial typology, presenting the standard list and cultural-chronological variability of different types, the most general attributes of this group of the lithic inventory need to be characterised. The main traits of this group are as follows:

Hard and homogenous raw materials that can form conchoidal fractures when knapped; the size and proportions of pieces used as blanks, absence of cracks and inclusions are critical.

Technology of “core-tools”, where the aim of the knapping process is the alteration of the shape of the knapped object, which is achieved by detaching a series of flakes from this object. Usually, production of bifaces of siliceous rocks implies quite sophisticated variants of these technologies.

Mostly, the functions of the weapons were to have a penetrating effect (projectiles), while maintaining a potential multi-functionality.

Variation in size depending on the certain function of the tool.

The number of bifacial tools in assemblages

The comparison of the absolute number of tools from this group in assemblages of settlements belonging to different cultures seems adequate for such artefacts (Table 1). The fourteen sites of Sperrings culture that have been analysed provided only 34 such items. These have been mostly interpreted as arrowhead preforms; finished points are very rare. Spearheads are almost absent. Those fragments of broken spearheads and their preforms that have been distinguished are dubious, at least. The only definite example of a spearhead originates from the site Pindushi III.

Eleven sites with pit-combed ware provided a series of bifaces consisting of 33 examples. There are undisputable spearheads among them, and also long bifacially worked knives. No finished arrowheads that may be connected to this culture with certainty have been found in the analysed assemblages. Finished arrowheads originate from the site Ust-Vodla III, where they can also be connected to a small complex with textile ceramics present there next to the Neolithic complex. Bifacially worked knives in general are not very characteristic for Karelia, and the examples found there are connected to the Middle (Late Pit-Combed Ware culture) and Late (Combed Ware, as well as Rhomb-Pit Ware cultures) Neolithic.

Six sites with combed ware and rhomb-pit ware provided 58 bifaces, while five sites with predominantly rhomb-pit ware provided 47. Nineteen sites with asbestos ware provided 645 preforms and finished arrow- and spearheads, twelve sites with textile ceramics yielded 500, and two sites of the Early Iron Age 6 arrowheads (Table 1).

A tendency towards an increase in the role of the group of bifaces in the lithic industry during the Neolithic and existence of a well developed bifacial industry in the Eneolithic – the Bronze Age can be seen distinctly.

Raw material base of the industry

It has been already noted that items from this group are made of siliceous rocks. Flint is the first among them. In Karelia, where natural deposits of this material are absent, flint was an imported raw material, but it is very common at many Karelian sites. The closest deposits of Carboniferous flint can be found on the southern edge of Onega Lake, outside of the present-day administrative borders of Karelia (Zhuravlev 1982). Nevertheless, Lake Onega is very large, and the sites whose materials were analysed in this paper are located at the distance of at least one hundred kilometres from these deposits. Thus, flint can be considered an imported material even for sites on the shore of Lake Onega. In the southern part of the region, there are also some local rocks that can be considered siliceous because of their homogeneity and similarity of the chemical composition (Si as the basic element). The most widespread rock among them is a black-coloured stone known in the Russian literature as “lidite”. Lidite is a sort of silicified slate (Petrov *et al.* 1981, 206), which is related to highly carbonated slates – schungites (Sokolov & Kalinin 1975, 33). The absolute majority of bifacial tools in Karelia were made of flint and lidite.

Items belonging to assemblages of the Sperrings culture were mostly made of flint. There are also some objects made of lidite and quartz, but their amount is much smaller. It is interesting to note that the flake tools (scrapers, awls, flakes with traces of use, etc.) of this culture, which are much simpler to produce, were mostly made of local materials of lesser quality: lidite in form of small pebbles and quartz. This discrepancy is characteristic also for sites with combed ware and rhomb-pit ware, as well as sites with rhomb-pit ware prevailing. It is also characteristic of the sites dated to the Early Iron Age, although the number of points is very small.

Flint bifaces absolutely dominate among such objects at sites with pit-combed ware of the Neolithic period and textile ceramics of the Bronze Age, and this coincides with the absolute domination of imported flint in the whole lithic industry of these cultures.

At sites with earlier types of the asbestos ware – Vojnavolok XXVII and Orovnavolok XVI – lidite items dominate among bifaces (55–70%), while flake tools are more often made of flint. Bifaces from sites with younger Palajguba II type pottery are more often made of flint, though the amount of lidite implements remained also substantial.

Assemblages belonging to all Neolithic and Eneolithic cultures in Karelia contain bifaces of local siliceous slate of green or grey colour, while in the Bronze and Iron Age assemblages these rocks are absent. Sometimes single objects of chalcedony are found (only arrowhead preforms have been encountered). Quartz items are encountered almost in all cultures, but mostly they are preforms, and, therefore, there is still some degree of uncertainty in their interpretation. Nevertheless, single finished points were found in assemblages of the Sperrings culture (Pegrema IX, Uya III). A series of finely made bifacial arrowheads of quartz originates from settlements with textile and Late White Sea type ceramics in the outlet of the Vyg River close to the White Sea; several more examples originate from later northern sites (Ust-Poncha, Kaperolakshi), and one further example from the site Ileksha II on the coast of Vodlozero Lake in the eastern part of Karelia. These tools can be dated to the Bronze Age or the Early Iron Age.

The classification system

This study uses a multi-level classification system. In this system all bifaces made of siliceous rocks constitute a separate **group** of lithic inventory. Items within the group are related to each other simultaneously in terms of raw material, function, and technology. Taxon of a lower level, named **kind**, is functionally determined. **Type** in this system is the next, even lower level, and is distinguished based on the difference of such morphological details that are not directly determined by technology or function and, therefore, were the result of a choice made by its ancient producer. Types are established for items of the same kind. When necessary, a type can be divided into subtypes and variants, also based on differences of morphological details.

Only four **kinds** were distinguished among bifaces: 1) arrowheads (Figs 2–7); 2) spearheads (Fig. 8: 1–5; 9: 1–19); 3) bifacially worked knives (Fig. 9: 20–23); 4) bifacially worked inserts (Fig. 8: 7–8). It should be noted that these definitions, although functionally determined, do not necessarily mean that tools were used exactly for the function prescribed by them. It is meant only that one or another shape is better suited for fulfilling certain tasks, but this suitability is only a tendency.

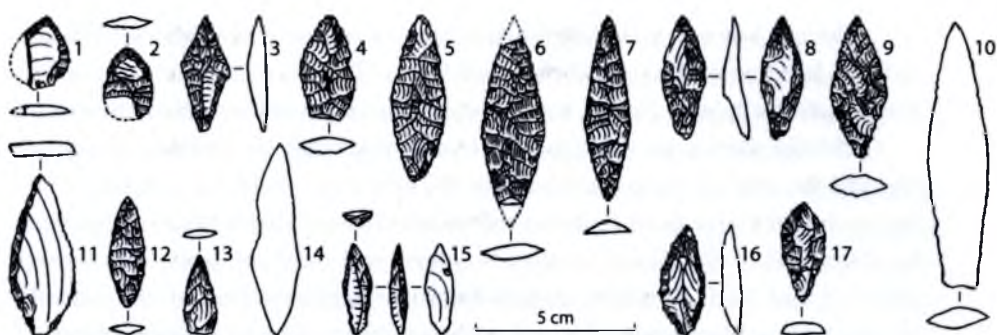


Figure 2. Asymmetric (1–4), leaf-shaped (10, 11) and rhombic (5–9, 12–17) arrowheads: 1–2 – asymmetric leaf shaped, 3–4 – asymmetric rhombic; 5, 14, 16 – with straight bases, 7–9, 12, 13, 15 – with pointed base, 17 – with concave base. Find places: sites with Sperrings pottery – Uya III (1, 2, 5, 12); sites with combed ware and rhomb-pit ware – Chernaya Guba IX (6) and Lakshozero II (10); sites with asbestos ware – Vojnavlok XV (3, 4, 9, 15), Fofanovo XIV (7), Vojnavolok XXV (8), Vojnavolok XXVII (13), Orovnavolok XVI (14), Tungda XIV (16); sites with textile ceramics – Gorely Most VIII (11), Sumozero XV (17). The arrowheads have been made of quartz (2), flint (1, 5, 6, 8, 10, 11, 13, 16) and lidite (3, 4, 7, 9, 12, 14, 15).

Joonis 2. Asümmeetrilised (1–4), lehekujulised (10, 11) ja rombikujulised (5–9, 12–17) nooleotsad: 1–2 – asümmeetrilised lehekujulised, 3–4 – asümmeetrilised rombikujulised; 5, 14, 16 – sirge kannaga, 7–9, 12, 13, 15 – terava kannaga, 17 – nõgusa kannaga. Asulakohad: Sperringsi keraamikaga asulakohad – Uya III (1, 2, 5, 12); kammkeraamika ja romb-lohkkeraamikaga asulakohad – Chernaya Guba IX (6) ja Lakshozero II (10); asbestkeraamikaga asulakohad – Vojnavlok XV (3, 4, 9, 15), Fofanovo XIV (7), Vojnavolok XXV (8), Vojnavolok XXVII (13), Orovnavolok XVI (14), Tungda XIV (16); tekstiilkeraamikaga asulakohad – Gorely Most VIII (11), Sumozero XV (17). Nooleotsad on tehtud kvartsist (2), tulekivist (1, 5, 6, 8, 10, 11, 13, 16) ja lidiidist (3, 4, 7, 9, 12, 14, 15).

Arrowheads and spearheads are distinguished basing on a formal metric attribute – the width. A width of 2 cm was taken as the maximal value for arrowheads; items that were wider were considered to be spearheads. There are some exceptions: objects with widths of 2.1–2.3 cm were considered arrows if their length was not longer than 3 cm. For preforms this value was set to 2.5 cm. This criterion is not fully reliable, but the use of more precise formulae (Shott 1996, 286) requires measuring the whole length of tools. This is very seldom possible for spearheads because the absolute majority of them are broken fragments. At the same time, arrowheads exceed this width only very seldom.

The definition “spearhead” is relative, because some of these items could be used as dart points or to perform cutting or drilling functions (probably, mostly for secondary use). The definition “arrowhead” is also relative, as these items could be used as top inserts in complex harpoons or barbed points made of bone or antler, and some such prehistoric items have been found (Foss 1952, 104).

Bifacial knives are distinguished by their asymmetrical outlines (different radii of bending to two opposite lateral rims). The curve of the rim is even, without abrupt lugs and steps, which testifies to the completeness of the object.

Bifacial inserts are distinguished from arrowheads by their trapezoid outline and the lack of sharp tip, while the object as a whole looks complete. Only two such items have been found in the analysed assemblages; both of them can be connected to the Textile Ceramics culture and originate from sites Gorely Most VI and VIII. Bifacially worked inserts are characteristic of the industry of flint bifaces from regions located to the east from Karelia, including Siberian cultures. Similar but larger items were found, for example, in Turbino I cemetery (Bader 1964, 102).

Principles of distinguishing different types of bifaces

A typology of bifacial projectiles can be based on formal geometrical differences of their outlines. Technology determines only one attribute of such objects: their cross-section, which varies from regular lens-like till regular rhombic, and is not bound to other morphological traits.

At the same time, bifacial technology, especially when bifacial pressure flaking is used, allows for variety in the shape of tools. The resulting differences depend on the will of the master. He acts according to the canons of his community, and also, probably, on functional differentiations within the general function of the artefact – the ability to penetrate into a soft substance (a prey or a victim).

The typology of arrowheads and spearheads presented in this paper is based on the typological system suggested by Nina Gurina (1978), and uses a similar step-like approach. Some deviations from this scheme are caused by peculiarities of the local materials. Moreover, the list of structural parts of projectiles (tip, blade, thorns, base) is supplemented here by one more entity, a haft element. The haft element is lower, adjoined to the base part of the point, and is distinguished regardless of whether the point has a tang or not. Some long bifaces (spearheads and knives) from Karelia have additional morphological details, i.e. lateral notches and lugs.

The criterion for dividing the population into types is the shape of the point's blade. All variants of leaf-like (oval) points are considered to be separate types, in accordance with Gurina, because subtypes that can be determined for points with a leaf-like shape of the blade, but different proportions, are not always the same.

Depending on the presence of a tang or barbs, and the shape of the haft element and base as well as the proportions, subtypes and variants are distinguished.

These categories were not always formed based on the same criteria, as formal logic would order. At the level of subtypes, the main attribute was one that was more subject to chronological variations within the type; attributes that did not appear to change in a similar way were used for division into variants.

It was considered important to take into account all possible combinations appearing at these levels, even if they do not form clear series. Every original combination is self-sufficient in terms of logic. As long as it is met only once it hardly can be used for solving cultural-historical problems. Nevertheless, series of similar objects may be found in the future, when the amount of finds increases. Therefore, at least when describing an assemblage and filling up a database, these combinations need be taken into consideration.

The three-level typological scheme was adopted in order to ensure that divisions were based on the same criterion when distinguishing types of the first level, to create the possibility to include into the existing scheme all the new combinations that may appear, and to consider (at the level of variants) the maximal amount of morphological characteristics. The latter may not have much significance at the moment, when the sample is quite small, but their importance in the future, after the sample has increased, is not possible to forecast. Moreover, division into types and subtypes is justified by the specific character of archaeological sources: many broken items or partly finished preforms allow the type to be determined (e.g. willow leaf-shaped, triangular, etc.), but determination of the subtype is not possible because of the absence of the lower parts (haft element and base), or because these parts have not been completed. Thus, when a one-level typology is used, the precise determination of the type cannot be made for a very substantial part of the material.

The typology of spearheads and bifacially worked knives follows the same principles as the typology of arrowheads. The amount of their morphological variants is much smaller because finished non-broken tools of these kinds are much rarer. Inserts are presented just by two examples, which is too few for building a typology. The type in this case is equalled to the kind.

Types of bifacial tools made of siliceous rocks from Karelian settlements

The types of **arrowheads** encountered in assemblages belonging to the analysed settlements are as follows:

1. Leaf-shaped (length to width ratio is lower than 2). Leaf-shaped points are presented by single examples; subtypes have not been distinguished (Fig. 2: 1, 2).

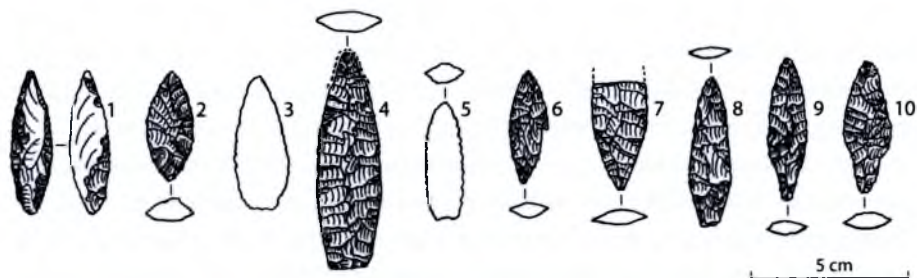


Figure 3. Laurel leaf-shaped arrowheads: 1–6 – without distinct haft element (1–2 – with pointed base, 3–4 – with straight base, 5 – with concave base, 6 – with one lateral thorn); 7–8 – with truncated haft element (7 – with pointed base, 8 – with straight base); 9–10 – tanged points. Find places: sites with asbestos ware – Vojnavolok XXIV (1, 6, 8–10), Vojnavolok XXVII (2), Tunguda V (4), Vojnavolok XXXVIII (7); sites with textile ceramics – Gorely Most VI (3), Gorely Most III (5). The arrowheads have been made of flint (2–7, 10) and lidite (1, 8–9).

Joonis 3. Loorberilehekujulised nooleotsad: 1–6 – ilma eristuva tagaosata (1–2 – terava kannaga, 3–4 – sirge kannaga, 5 – nõgusa kannaga, 6 – ühe külgekisuga); 7–8 – tõmbistatud tagaosaga (7 – terava kannaga, 8 – sirge kannaga); 9–10 – rootsuga otsikud. Asulakohad: asbestkeraamikaga asulakohad – Vojnavolok XXIV (1, 6, 8–10), Vojnavolok XXVII (2), Tunguda V (4), Vojnavolok XXXVIII (7); tekstiilkeraamikaga asulakohad – Gorely Most VI (3), Gorely Most III (5). Nooleotsad on tehtud tulekivist (2–7, 10) ja lidiidist (1, 8–9).

2. Laurel leaf-shaped (the ratio is lower than 4). Subtypes: 1) without a distinct haft element (Fig. 3: 1–6) (variants with pointed, convex, concave, and straight base, with one lateral barb); 2) with a truncated haft element (Fig. 3: 7–8) (variants with pointed, convex, or straight bases); 3) tanged points (Fig. 3: 9–10).

3. Willow leaf-shaped (the ratio is higher than 4). Subtypes: 1) without a distinct haft element (Fig. 4: 10–26) (variants with convex, pointed, or straight bases); 2) with a fishtail-shaped haft element (Fig. 4: 27); 3) with a truncated haft element (Fig. 4: 28–32) (variants with convex, pointed, straight, or concave bases); 4) tanged points (Fig. 4: 33).

4. Triangular. Subtypes: 1) tanged (Fig. 5: 1–10) (variants with pointed or straight bases); 2) tanged with barbs (Fig. 5: 11); 3) with a concave base (Fig. 5: 12); 4) with a straight base (Fig. 5: 13).

5. Triangular with convex sides. Subtypes: 1) tanged (Fig. 6: 1–5); 2) with a straight base (Fig. 6: 6–12); 3) with a concave base (Fig. 6: 13–22). Variants, which are common for both subtypes, are distinguished by proportions: shortened (length to width ratio is lower than 2) and elongated (the ratio is higher than 2).

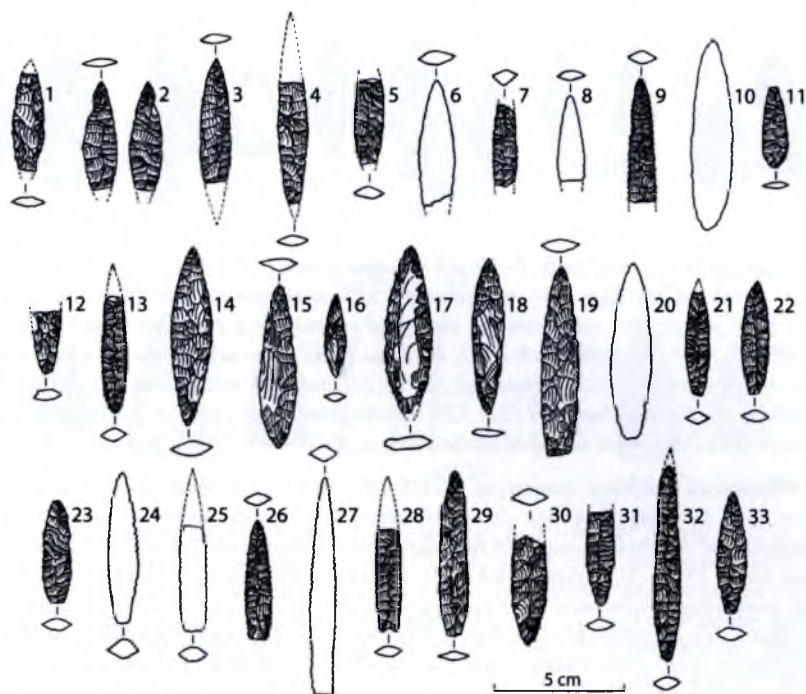


Figure 4. Willow leaf-shaped arrowheads: 1–9 – subtype and variant are not determinable; 10–26 – without distinct haft element (10–13 – with convex shape, 14–18 – with pointed base, 18–26 – with straight base); 27 – with fishtail-shaped haft element; 28–32 – with truncated haft element (28 – with concave base, 29 – with straight base, 30 – with pointed base, 31–32 – with convex base); 33 – tanged point. Find places: sites with combed ware and rhomb-pit ware – Chernaya Guba IX (1), Vigajnavolok I (2); sites with asbestos ware – Fofanovo XIV (3, 4), Vojnavolok XXIV (5, 21, 29), Vojnavolok XXVII (10, 11, 14, 15, 18–20, 22, 23), Orovnavolok XVI (16, 17), Vojnavolok XXV (31), Tunguda XVII (32), Tunguda XIV (33); sites with textile ceramics – Gorely Most III (6, 13, 26), Gorely Most VII (7), Gorely Most VI (8), Suna VI (9), Sumozero XV (24), Ochtoma I (25), Gorely Most VIII (27), Kudama XI (28), Ust-Vodla II (30); Luukonsaari culture – Pichevo (12). The arrowheads have been made of flint (1–9, 12–14, 20, 22–28, 30–32, and lidite (10, 11, 15–19, 21, 29). Some points (7, 9, 13, 24–27) have saw-like retouch.

Joonis 4. Pajulehekujulised nooleotsad: 1–9 – alltüüp ei ole määratav; 10–26 – ilma eristuva tagaosata (10–13 – nõgusa kujuga, 14–18 – terava kannaga, 18–26 – sirge kannaga); 27 – kalasabakujulise tagaosaga; 28–32 – tõmbistatud varreosaga (28 – nõgusa kannaga, 29 – sirge kannaga, 30 – terava kannaga, 31–32 – kumera kannaga); 33 – rootsuga otsik. Asulakohad: kammkeraamika ja romblohkkeraamikaga asulakohad – Chernaya Guba IX (1), Vigajnavolok I (2); asbestkeraamikaga asulakohad – Fofanovo XIV (3, 4), Vojnavolok XXIV (5, 21, 29), Vojnavolok XXVII (10, 11, 14, 15, 18–20, 22, 23), Orovnavolok XVI (16, 17), Vojnavolok XXV (31), Tunguda XVII (32), Tunguda XIV (33); tekstiilkeraamikaga asulakohad – Gorely Most III (6, 13, 26), Gorely Most VII (7), Gorely Most VI (8), Suna VI (9), Sumozero XV (24), Ochtoma I (25), Gorely Most VIII (27), Kudama XI (28), Ust-Vodla II (30); Luukonsaari kultuur – Pichevo (12). Nooleotsad on tehtud tulekivist (1–9, 12–14, 20, 22–28, 30–32) ja litiidist (10, 11, 15–19, 21, 29). Mõnedel otsikutel (7, 9, 13, 24–27) on saagi meenutav retuüs.

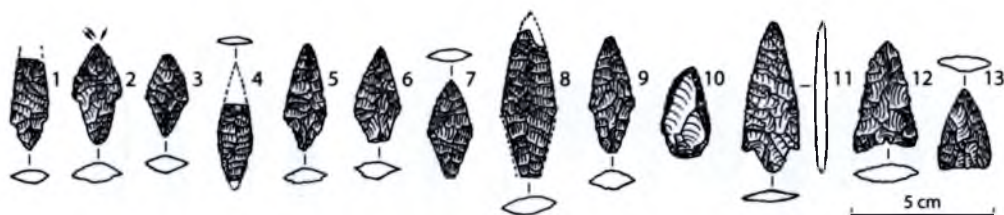


Figure 5. Triangular flint arrowheads: 1–10, 13 – tanged points (1–2, 5, 8–9 – with pointed base, 3–4, 6, 7, 13 – with straight base, 10 – with thorns); 11 – with concave base (preform); 12 – with straight base. Find places: sites with combed ware and rhomb-pit ware: Chernaya Guba IV (1), Chernaya Guba IX (3, 5), Vigajnavolok I (4), Pegrema I (6), Chernaya Guba III (13); sites with asbestos ware: Vojnavolok XXV (2), Vojnavolok XXIV (9); sites with textile ceramics: Gorely Most V (7), Elmenkoski I (8), Gorely Most VIII (11, 12); a point from a site with Early Neolithic Sperrings finds Vojnavolok XXVIII; cannot be dated earlier than to the Bronze Age (Seima type) (10).

Joonis 5. Kolmnurksed tulekivist nooleotsad: 1–10, 13 – rootsuga otsikud (1–2, 5, 8–9 – terava kannaga, 3–4, 6, 7, 13 – sirge kannaga, 10 – kiskudega); 11 – nõgusa kannaga (toorik); 12 – sirge kannaga. Asulakohad: kammkeraamika ja romblokkkeraamikaga asulakohad: Chernaya Guba IV (1), Chernaya Guba IX (3, 5), Vigajnavolok I (4), Pegrema I (6), Chernaya Guba III (13); asbestkeraamikaga asulakohad: Vojnavolok XXV (2), Vojnavolok XXIV (9); tekstiilkeraamikaga asulakohad: Gorely Most V (7), Elmenkoski I (8), Gorely Most VIII (11, 12); nooleots, mida ei saa dateerida pronksiajast (Seima tüüp) varasemaks, leitud varaneoliitilisi Sperringsi kultuuri leide sisaldavast asulakohast Vojnavolok XXVIII (10).

6. Lancet-like and 5-angled – long and wide points with almost parallel lateral sides up to two-thirds of their total length, bent only in the upper part (tip). Maria Foss named them points of “Belomorsky” (White Sea) type (Foss 1952, 122). Subtypes: 1) without a distinct haft element (Fig. 7: 1–13) (variants with straight or concave bases); 2) with truncated haft element (Fig. 7: 14–16); 3) with fishtail-shaped haft element (Fig. 7: 17–24) (variants with straight or concave bases); 4) tanged points (Fig. 7: 25)

7. Rhombic (Fig. 2: 3–13). Only variants with pointed, straight, or concave bases have been distinguished.

8. Asymmetric. Because preforms whose general outline has not been completed are not included in this standard list, only asymmetric points with marginal retouch (abrupt, flat or marginal bifacial) are considered here. Subtypes: 1) asymmetric leaf-shaped (Fig. 2: 14–15); 2) asymmetric rhombic (Fig. 2: 16–17).

The typology suggested here differs from the typology by Zhul'nikov (Zhul'nikov 1999, 58, fig. 46) in two respects. First, it is a three-level system, and single types of Zhul'nikov's scheme are at the level of subtypes here. Second,

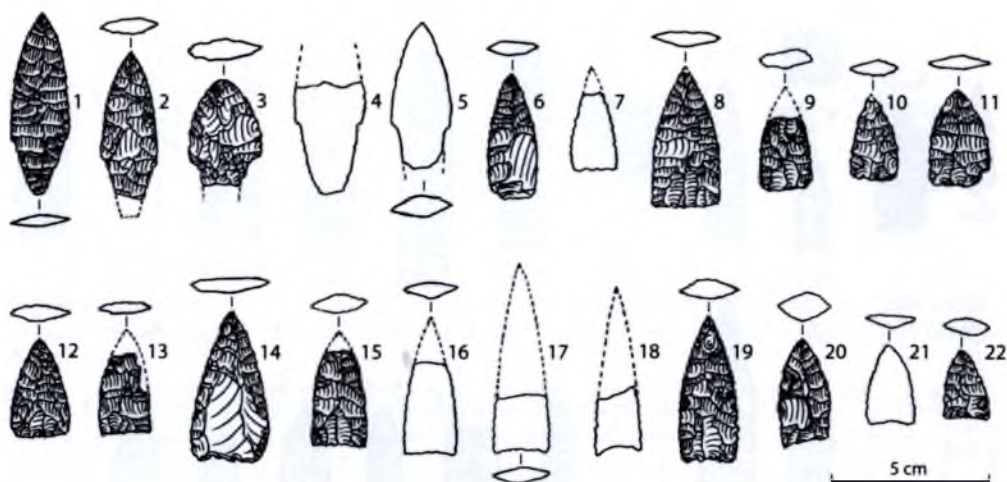


Figure 6. Triangular arrowheads with convex laterals: 1–5 – tanged points; 6–12 – with straight base (6–7, 11 – elongated, 8–10, 12 – shortened); 13–22 – with concave base (14–17, 19–22 – elongated, 13–18 – shortened). Find places: sites with combed ware and rhomb-pit ware: Chernaya Guba III (1); sites with asbestos ware: Vojnavolok XXXVIII (2); sites with textile ceramics: Gorely Most II (3), Gorely Most V (4, 15), Gorely Most VI (6–7, 20), Sumozero XV (5), Gorely Most VIII (8–9, 13–14, 16, 18), Ust-Vodla II (10, 19), Kelka III (17, 21); Late Kargopol culture: Ileksa II (11–12), Early Iron Age: Kaperolakshi (22). Arrowheads are made of quartz (9, 12, 13, 22) and flint (1–8, 10, 11, 14–21).

Joonis 6. Kumerate külgedega kolmnurksed nooleotsad: 1–5 – rootsuga otsikud; 6–12 – sirge kannaga (6–7, 11 – pikad, 8–10, 12 – lühikesed); 13–22 – nõgusa kannaga (14–17, 19–22 – pikad, 13–18 – lühikesed). Asulakohad: kammkeraamika ja romblokkkeraamikaga asulakohad: Chernaya Guba III (1); asbestkeraamikaga asulakohad: Vojnavolok XXXVIII (2); tekstiilkeraamikaga asulakohad: Gorely Most II (3), Gorely Most V (4, 15), Gorely Most VI (6–7, 20), Sumozero XV (5), Gorely Most VIII (8–9, 13–14, 16, 18), Ust-Vodla II (10, 19), Kelka III (17, 21); hiliskargopoli kultuur: Ileksa II (11–12), varane rauaaeg: Kaperolakshi (22). Nooleotsad on tehtud kvartsist (9, 12, 13, 22) ja tulekivist (1–8, 10, 11, 14–21).

it distinguishes triangular points with convex laterals from points with fishtail-shaped haft elements. The “fishtail” shape is usually very subtle on Karelian points, except in the case of one point from Kelka I settlement (Fig. 7: 21), but still discernible (Fig. 4: 27; 7: 17–21, 23, 24).

The distribution of the types described above in assemblages belonging to the analysed sites is given in tables (Table 2–3). It should be stressed that the total amount of points of a given type does not always coincide with the amount of points attributed to single subtypes and variants of this type, because their determination is not possible for many broken pieces.

Despite very limited amount of points from settlements of the Sperrings culture, it is evident that they are mostly represented by asymmetric and rhombic

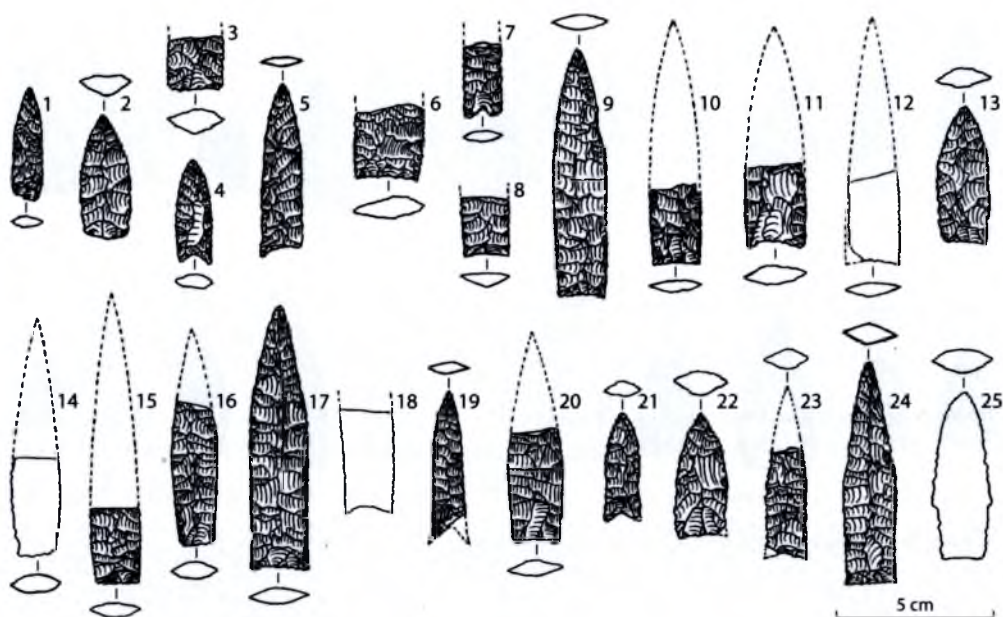


Figure 7. Lance-like and five-angled arrowheads: 1–13 – without distinct haft element (1–3 – with straight base, 4–13 – with concave base); 14–16 – with truncated haft element; 17–24 – with fishtail-shaped haft element (17–20, 22–24 – with concave base, 21 – with straight base); 25 – tangented point. Find places: sites with asbestos ware: Chelmužhskaya Kosa XXI (1, 4), Vojnavolok XXIV (5), Kochnavolok II (19); sites with textile ceramics: Gorely Most VIII (2, 8–12, 14–15, 24), Gorely Most VII (6), Kelka I (7, 22), Gorely Most V (16, 21), Suna VI (17), Gorely Most VI (18), Kelka III (20, 23), Ochtoma I (25); Early Iron Age: Ust-Poncha site (3, 13; Arctic type ceramics). Arrowheads are made of quartz (2, 3, 13), flint (1, 4, 6–12, 14–25) and lidite (5).

Joonis 7. Lantsetikujulised ja viienurksed nooleotsad: 1–13 – ilma eristuva tagaosata (1–3 – sirge kannaga, 4–13 – nõgusa kannaga); 14–16 – tõmbistatud tagaosaga; 17–24 – kalasabakujulise tagaosaga (17–20, 22–24 – nõgusa kannaga, 21 – sirge kannaga); 25 – rootsuga otsik. Asulakohad: asbestkeraamikaga asulakohad: Chelmužhskaya Kosa XXI (1, 4), Vojnavolok XXIV (5), Kochnavolok II (19); tekstiilkeraamikaga asulakohad: Gorely Most VIII (2, 8–12, 14–15, 24), Gorely Most VII (6), Kelka I (7, 22), Gorely Most V (16, 21), Suna VI (17), Gorely Most VI (18), Kelka III (20, 23), Ochtoma I (25); varane rauaaeg: Ust-Poncha site (3, 13; arktiline keraamika). Nooleotsad on tehtud kvartsist (2, 3, 13), tulekivist (1, 4, 6–12, 14–25) ja lidiidist (5).

forms. The assemblage from the Vojnavolok XXVIII settlement contains a finely made triangular point with barbs (Fig. 5: 11). This form does not have analogies among all other points from the analysed Karelian settlements. Outside of the borders of present-day Karelia these (Seima type) items are found on settlements of the Bronze Age (Bader 1964, 99; Krajnov 1972, 69; Bader *et al.* 1987, 229, 237, 238). Therefore, we have to assume that this point is also dated to the Bronze Age, and appeared in the cultural layer of this Early Neolithic settlement only by accident.

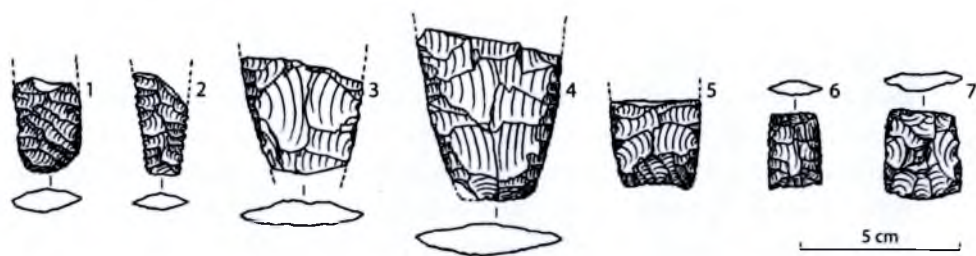


Figure 8. Broken spearheads (1–5) and bifacially worked inserts (7, 8) of flint from sites with textile ceramics: Gorely Most VI (1, 6, 8), Gorely Most III (2), Gorely Most V (3, 5), Kelka III (4), Gorely Most VIII (7).

Joonis 8. Tulekivist odaotste (1–5) ja labatehnikas valmistatud pistikterade (7, 8) katked tekstiil-keraamikaga asulakohtadest: Gorely Most VI (1, 6, 8), Gorely Most III (2), Gorely Most V (3, 5), Kelka III (4), Gorely Most VIII (7).

Assemblages from sites with combed ware and rhomb-pit ware are mostly characterised by triangular tanged (without horns), laurel and willow leaf-shaped, rhombic points. Leaf-shaped points have distinct (truncated) haft elements but no tangs.

During the Eneolithic, willow and laurel leaf-shaped types were predominant at sites with the asbestos ware, and the amount of their subtypes and variants increased due to the appearance of points with truncated haft elements and tangs. They have been found in one of the earliest sites with Vojnavolok XXVII ceramics. According to A. M. Zhul'nikov, the next innovation took place in the third period of the Eneolithic (Zhul'nikov 1999). One of the sites belonging to this period (Orovnavolok XVI) contained a triangular point without a tang. Furthermore, the Eneolithic sites dated to the period starting from ca. 4000 BP or 2520 cal. BC contain triangular points with convex laterals and lancet-like points with a concave base. One lancet-like point belongs to the assemblage of an earlier site Vojnavolok XXIV, but it cannot be reliably connected to the floor layer of any dwelling from this site.

The largest number of subtypes and variants of triangular points, triangular points with convex laterals, and lancet-like points originates from assemblages of the Bronze Age with textile ceramics. These types dominate the bifacial industry of that time. Subtypes characteristic only of northern or of southern sites of this period cannot be distinguished. It should be noted, though, that subtypes with leaf-shaped blades did not disappear, and their amount was quite substantial. Moreover, one innovation took place among them: a subtype with a fishtail-shaped haft element was encountered among willow leaf-shaped points.

It is very difficult to reliably distinguish types and subtypes that remained in the beginning of the Early Iron Age. Willow leaf-shaped items without distinct haft elements and with truncated haft elements, which are present in the assemblage from site Pichevo, definitely existed during this period. Moreover, two triangular points with convex laterals (subtype: with straight base), one of which is made of quartz, were found on a site of multiple habitation periods, Ileksa II, the assemblage of which contains Late Kargopol type ceramics of the Early Iron Age, but does not contain textile ceramics. One lancet-like point with a concave base was found at the site Ust-Poncha I with ceramics of the Arctic type according to Kosmenko (Kosmenko 1996, 254). Probably, quartz points from settlements Gorely Most VI and VIII that belong to the types of triangular points or triangular points with convex laterals may also belong to the Early Iron Age part of their assemblages.

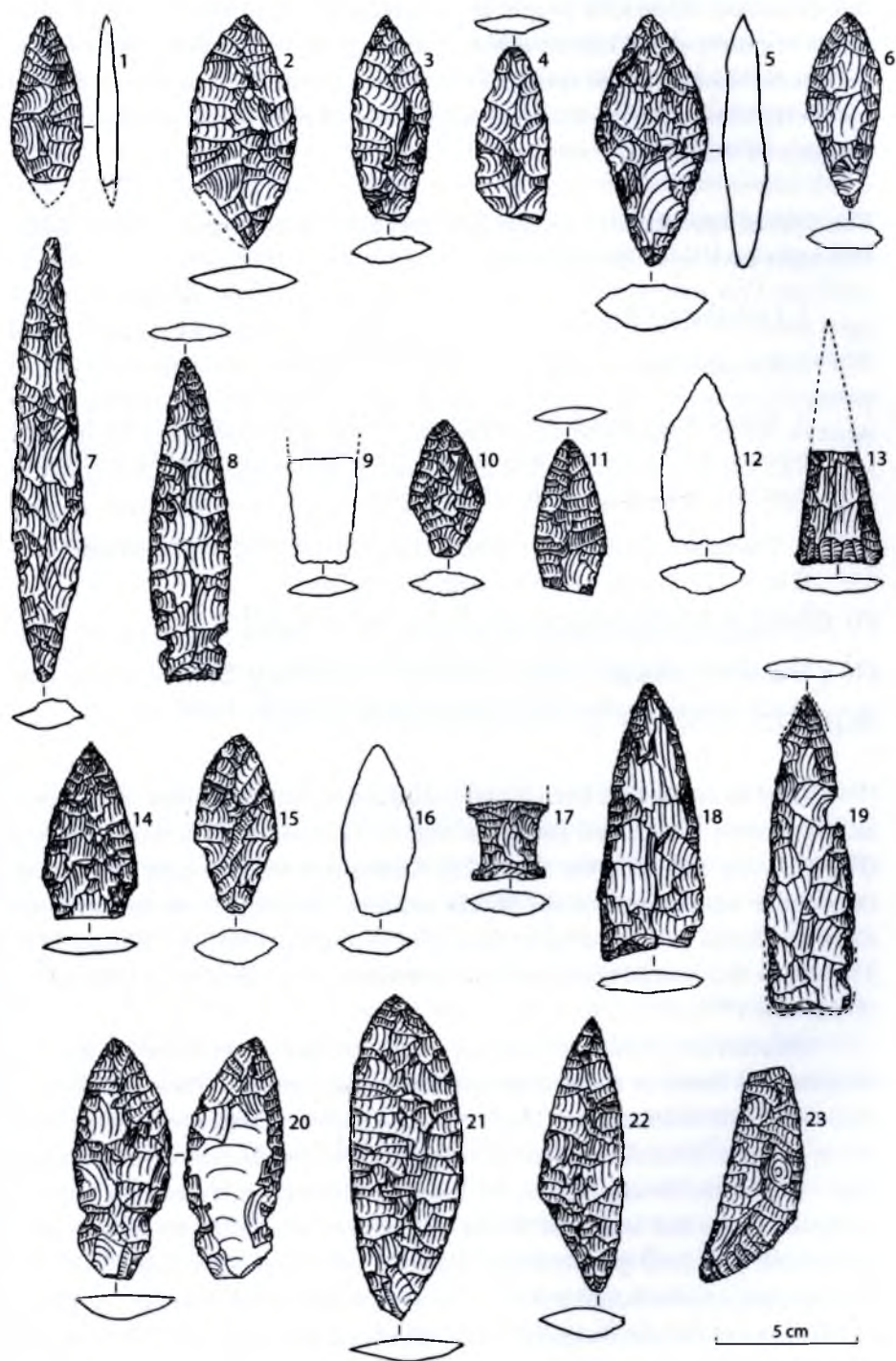
These late quartz arrowheads are quite finely made. If they really can be dated to the Early Iron Age, their appearance can be explained in the following way. In the beginning of the period, because of the spread of iron production, active exchange of lithic (flint) raw material ceased to exist. Nevertheless, the technology of bifacial pressure flaking of stone remained for some time in the

Figure 9. *Spearheads: 1–2, 7–8 – leaf-shaped; 3–4 – rhombic; 5–6, 12 – willow leaf-shaped (5 – with concave base and lateral notches, 6 – with pointed base, 12 – with straight base); 9, 11, 15, 17 – triangular (9, 15 – tanged points, 11 – with concave base, 17 – with straight base); 10, 13–14, 16, 18(?), 19 – triangular with convex laterals (10, 16, 19 – with straight tang, 18 – with fishtail-shaped tang, 13 – with concave base, 14 – with concave base and lateral lugs).*

Bifacial knives: 20–22 – asymmetric leaf-shaped (20 – with lateral notches); 23 – sickle-like. Find places: sites with Sperrings ceramics: Pindushi III (1); sites with pit-combed ware: Orovnavolok VI (3, 20, 21); sites with combed ware and rhomb-pit ware: Chernaya Guba III (10, 22), Chernaya Guba IV (2, 7), Vigajnavolok I (4, 15, 23); sites with asbestos ware: Vojnavolok XXVII (6), Vojnavolok XXIV (8–9), Tunguda V (13), Vojnavolok XXV (19); sites with textile ceramics: Gorely Most VIII (5), Gorely Most VI (11, 14, 17), Gorely Most III (12), Sumozero XV (16), Ochtoma I (18). Artefacts have been made of flint (1–5, 7, 9–23) and lidite (6, 8).

Joonis 9. *Odaotsad: 1–2, 7–8 – lehekujulised; 3–4 – rombikujulised; 5–6, 12 – pajulehekujulised (5 – nõgusa kanna ja külgsälkudega, 6 – terava kannaga, 12 – sirge kannaga); 9, 11, 15, 17 – kolmnurksed (9, 15 – rootsuga otsikud, 11 – nõgusa kannaga, 17 – sirge kannaga); 10, 13–14, 16, 18(?), 19 – kolmnurksed kumerate külgedega (10, 16, 19 – sirge rootsuga, 18 – kalasabakujulise rootsuga, 13 – nõgusa kannaga, 14 – nõgusa kanna ja külgmõigastega).*

Labatehnika noad: 20–22 – asümeetrilised lehekujulised (20 – külgsälkudega); 23 – sirbikujuline. Asulakohad: Sperringsi keraamikaga asulakohad: Pindushi III (1); lohkkammkeraamikaga asulakohad: Orovnavolok VI (3, 20, 21); kammkeraamika ja romblohkkeraamikaga asulakohad: Chernaya Guba III (10, 22), Chernaya Guba IV (2, 7), Vigajnavolok I (4, 15, 23); asbestkeraamikaga asulakohad: Vojnavolok XXVII (6), Vojnavolok XXIV (8–9), Tunguda V (13), Vojnavolok XXV (19); tekstiilkeraamikaga asulakohad: Gorely Most VIII (5), Gorely Most VI (11, 14, 17), Gorely Most III (12), Sumozero XV (16), Ochtoma I (18). Esemed on tehtud tulekivist (1–5, 7, 9–23) ja lidiidist (6, 8).



cultural arsenal of the local people, and when the supply of flint was insufficient, pieces of quartz of the highest quality could be used for the production of bifacial points. Most likely, this episode in the history of the lithic industry in Karelia had a very short duration and was immediately followed by the complete disappearance of the bifacial tradition.

The types of **spearheads** that have been met in the assemblages are less variable. Five types have been distinguished:

1. Leaf-shaped (Fig. 9: 1–4).
2. Rhombic (Fig. 9: 5–6).
3. Willow leaf-shaped (the length to width ration is higher than 4). Subtypes: 1) with a pointed base (Fig. 9: 7); 2) with a concave base and lateral notches (Fig. 9: 8); 3) with a straight base (Fig. 9: 9).
4. Triangular. Subtypes: 1) tanged (Fig. 9: 10–11); 2) with a straight base (Fig. 9: 12); 3) with a concave base (Fig. 9: 13).
5. Triangular with convex sides. Subtypes: 1) tanged (Fig. 9: 14–17) (variants with a straight tang or a fishtail-shaped tang); 2) with concave base (Fig. 9: 18–19) (variants with lateral barbs or without barbs).

Only two types have been distinguished among bifacial **knives**: leaf-shaped, i.e. asymmetric leaf-shaped (subtypes with lateral notches or without notches) (Fig. 9: 20–22), and sickle-like (Fig. 9: 23). Analogies to the leaf-shaped knives can be found in assemblages of the Middle and Late Neolithic from the territories to the south and to the south-east from Karelia (Gurina 1961, 349; Zimina 1993, 118). Sickle-like bifacial knives are encountered in the eastern Onega Lake region (Oshibkina 1978, 193).

Finished long bifaces whose type can be precisely determined are rare. All the examples found in the analysed assemblages are given in Table 4. The main tendency in the distribution of these types among assemblages belonging to different cultures is similar to that recorded for the distribution of arrowheads. This includes the decreasing role of leaf-shaped forms in favour of elongated triangular forms and triangular forms with convex laterals. Along with this development, additional morphological elements appear: concave bases, small lateral lugs, and narrow lateral notches. The earliest spearhead with a concave base originates from the site Tunguda V with asbestos ware of the early Orovnavolok XVI type.

The amount of separate types of bifaces, as well as their subtypes and variants, increased as time went on. The dynamics of complicating the shapes of bifaces is as follows. Only seven morphological variants of points, including arrowheads and spearheads, have been encountered on settlements of the Sperrings culture. And one of them most likely dates from the Bronze Age and appeared in the cultural layer accidentally: the Seima type point mentioned above. Sites with combed ware and rhomb-pit ware provided 14 variants (together with bifacial knives). Sites with asbestos ware of the Vojnavolok XXVII type provided fourteen variants. Sites with asbestos ware of the Orovnavolok XVI and Palajguba II types (because of insufficient amount of materials of the latest stage of the Eneolithic, they are counted together) provided 25 variants. At sites with textile ceramics of the Bronze Age, 34 variants have been discerned (together with inserts as a separate variant). This process can be explained by the increase in functional differentiation of weapons, but also by stylistic elaboration of this weapon caused by some changes in the social consciousness. Possibly, both factors acted simultaneously.

Bifacially worked tools from Karelia in the general context of bifacial industry in the forested zone of eastern Europe

This paper does not intend to provide a detailed comparison of bifacial points from the territory of Karelia and neighbouring regions of the forested zone of eastern Europe. This comparison is hardly possible now. Nonetheless, it is already justified to claim that the main tendencies discerned in assemblages from Karelia were common for the whole forested zone. The spread of bifacial industry, which was followed by the disappearance of blade industries, can be considered here an epochal phenomenon, one of composing parts of the “Neolithic package” along with pottery production. Some Early Neolithic sites from the north-eastern part of this zone (Chernoborsky type) provide evidence for a certain transitional state, when bifacial flaking, as yet without secondary thinning, was used to make points from wide blades and blade-like flakes, and a considerable part of surface of finished objects remained untouched by scars of bifacial knapping (Karmanov 2007). Similar transitional conditions have not been recorded for sites from Karelia. It can be mentioned here that the earliest bifacially worked objects of siliceous rocks to-date found in the Karelian context originate from the Late Mesolithic Oleneostrovskaya site, where the blade industry is well represented. However, we cannot fully exclude the possibility that their appearance

on the site was accidental and took place somewhat later (Tarasov 2011). The site is radiocarbon dated to 7200–6880 BP or 6050–5750 cal. BC (Murashkin *et al.* 2011). In central Russia, the earliest unequivocal bifacial points originate from Neolithic assemblages dated to ca. 6500 BP or 5480 cal. BC (Tsvetkova 2011). It is still a question whether it was a result of evolutionary development of the local culture or of infiltration by a foreign cultural tradition.

Insignificant amounts of bifacial tools in assemblages of the Sperrings culture dated from the Early Neolithic, which correlates with peculiarities of the raw material base of this culture: the predominant use of local rocks of low quality (quartz and lidite in form of pebbles). These materials are neither suitable for bifacial production nor even for production of arrowheads (Tarasov 2009, 118–120). The flow of imported flint of proper quality became more active in the middle and the late periods of the Neolithic, but the supply of this material became ample enough to refuse the use of local materials of low quality only in the Eneolithic with asbestos ware, when pieces of lidite from deposits were also actively utilised, and in the Bronze Age with textile ceramics. In these periods the technology of producing bifacial tools became the foundation for the whole industry of siliceous rocks, and flakes detached during bifacial reduction were used as blanks for making flake tools (Tarasov 2006).

In the Neolithic period of the whole forested zone, the bifacial industry was initially represented mainly by double-pointed forms: different types of leaf-shaped, rhombic, triangular tanged points (Tret'yakov 1972, 91–118; Oshibkina 1996, fig. 56, 58–59, 61–63, 73; Gurina 1997, fig. 10, 12, 16, 22, 26; Karmanov 2007). This picture can be seen also in the Late Neolithic and Eneolithic. Double-pointed forms were characteristic of the sites with combed ware in the whole area of their distribution, up to the limits of their distribution in Latvia and northern Sweden (Jaaniits 1959, 186–188; Vankina 1970, 88–89; Kozyreva 1986, 151; Loze 1988, 30–31; Halén 1994, 106–111; Manninen *et al.* 2003, 166 and the references therein). Sites of the Eneolithic Volosovo culture and sites of the Modlona type in the eastern Onega Lake region as well as synchronous settlements in Karelia are characterised by a substantial amount of leaf-shaped points with elongated proportions (willow leaf-shaped), along with other leaf-like, rhombic, and triangular tanged forms (Tret'yakov 1990, 341; Oshibkina 1978, 119, 131, tab. 47, 52). Approximately the same properties can be discerned among bifacial points from the Yurtikovskiy sites from Vyatka region (Nagovitsyn 1984, 106, 110) and the Chuzh'yayelskaya culture of the north-east (Stokolos 1988, 28).

Obviously, the correlation of different subtypes and variants of bifacial tools, which cannot be established at the moment, will result in somewhat different pictures for these cultural groups, which are very distant from each other.

Nonetheless, the general overview given here shows that the leading double-pointed forms were common for the whole forested zone from the Early Neolithic until the end of the Eneolithic.

Very remarkable changes in the morphological repertoire of the bifacial industry in this zone took place at the turn of the Eneolithic and the Bronze Age (according to the periodisation adopted in Russia). As was mentioned above, the predominant types at the sites of the Textile Ceramics culture in Karelia are lancet-like and 5-angled bifaces along with triangular points or triangular ones with convex laterals without tang points. The first examples of such points appeared at sites with the preceding asbestos ware date from the period after ca. 4000 BP or 2520 cal. BC. Similar forms are characteristic of sites with developed textile ceramics outside of the borders of the present-day Karelia, in the central part of European Russia and in the eastern Onega Lake region, although they are found also on sites with the early textile ceramics (Voronin 1998, 322, fig. 6, 11).

In Finland a series of such points are most likely connected to assemblages with textile ceramics, but it is still possible that some of them may belong to the Late Neolithic (Lavento 2001, 128). They are spread up to the northern parts of Sweden and Norway, and are also present at the Kola Peninsula (Forsberg 1985, 5; Hood & Olsen 1988, 110–115; Holm 1991, 118–122; Baudou 1995, 96; Gurina 1997, fig. 34, 45). In northern Sweden and Norway the appearance of such points meant at the same time the infiltration and adoption of the bifacial industry as such, and was also followed by the spread of pottery production, which local people had refused to adopt in the earlier periods (Holm 1991, 118).

In the eastern Baltic, it seems, these types do not constitute numerous series. This may partly have to do with the lack of archaeological sources for the earlier part of the Bronze Age (Lang 2007, 36). Nevertheless, single items of this sort are also present here. According to observations of Lembit Jaanits, single points with straight and concave bases from the site Akali in Estonia were encountered in the upper part of the cultural layer and can be connected either with the final period of the existence of combed ware, or with later periods that are represented there by finds of corded and textile ceramics (Jaanits 1959, 188). Such forms were found also on some other sites in Estonia and Latvia (Jaanits 1959, fig. 19; Loze 1979, tab. 1).

The majority of Scandinavian and Finnish researchers suppose an eastern origin of these types and the tradition which they represent (Lavento 2001, 129 and the references therein). Some Russian authors also support this point of view (Chernykh & Kuz'minykh 1987, 100–101; Zhyl'nikov 1999, 58). The tradition of making points with straight and concave bases, as well as bifacially worked inserts, is widely represented in the Neolithic and Bronze Age cultures

from southern and eastern Siberia (Okladnikov 1955), i.e. in territories to the east of the Ural Mountains this tradition had emerged earlier than it began to spread to the west from the Ural ridge.

It must be mentioned that triangular arrowheads with concave bases could be also connected to the western tradition. Points with such an outline are characteristic of western sites of the Neolithic Narva culture in the eastern Baltic (Vankina *et al.* 1973, 213; Gurina 1996, fig. 44). Nonetheless, they are shaped by marginal retouch. Triangular points as well as triangular points with convex laterals with straight and concave bases, shaped mainly by marginal retouch, are characteristic also of later sites with the corded ware in this region (Rimantienė 1973, 219; Loze 1979, 61, tab. 1; Kriiska & Saluäär 2000, 26). These forms, besides triangular tanged and leaf-shaped points, constituted a part of the morphological kit of the bifacial industry of the Fatyanovo culture in the central region of European Russia, which belonged to the realm of cultures with corded ware (Krajnov 1972, 69–70).

Triangular tanged points with horns (Seima type), which are very characteristic of assemblages belonging to the Fatyanovo culture (Krajnov 1972, 69–70), remained in the cultural arsenal of inhabitants of central Russia and neighbouring regions of the forested zone also after this culture had disappeared (Voronin 1998, 311, fig. 6). Nevertheless, as it can be concluded based on the available materials, in Fennoscandia, including Karelia, this tradition was very weak and short-term. As it has been already said, only one point of this type has been distinguished in the analysed assemblages from Karelian sites with pure or relatively pure complexes; what is more, its appearance in the cultural layer (Early Neolithic) is most likely accidental.

Thus, triangular points with convex laterals with straight and concave bases, the majority of which are finely made by bifacial pressure flaking, should be connected to the eastern impulse, the same as lancet-like and 5-angled forms.

Scandinavian and Finnish authors (Gutorm Gessing, Christian Carpelan, and Matti Huurre) proposed some connection between the spread of these forms of bifacial points and the Seima-Turbino phenomenon (Lavento 2001, 129). This point of view was also presented by Evgenij Chernykh and Sergej Kuz'minykh (Chernykh & Kuz'minykh, 1987, 100–101). According to their interpretation, sites belonging to the Seima-Turbino transcultural phenomenon were left by belligerent mobile groups of people, which, due to their superiority in weapons, social organisation, and technologies of transportation, managed to establish short-term political dominance over tribes that inhabited large areas of the forested zone in ca. 3500 BP or 1830 cal. BC.

Nevertheless, the beginning of the spread of lancet-like, 5-angled points and triangular points without tang, very likely date from an earlier time. In

Karelia, they appeared in assemblages dated to period after ca. 4000 BP or 2520 cal. BC. Such points are numerous on Garinsky-Borsky sites of the Kama region (Bader 1961), the earliest of which may be dated already to the period between ca. 4500–4000 BP or 3120–2520 cal. BC (Nagovitsyn 1984, 117). They are also characteristic of the early Chojnovtinsky sites of the north-east (Stokolos 1988, 69), approximately dated to 4250–3750 BP or 2890–2170 cal. BC (*ibid.*, 74–75).

Therefore, the mechanism of the spread of this tradition in the bifacial industry might have been different from that of bronze artefacts of the Seima-Turbino circle, and both processes might have not been fully synchronous. Such a mechanism has yet to be described. It is not very likely that migrations of ancient people played the leading role in it, because this phenomenon affected a very large territory, it did not result in establishing a cultural unity in the whole area affected by it, and it was not fully synchronous to changes in other spheres of the material culture. At the same time, local migrations and movements of small mobile groups, including those following the model of the Seima-Turbino phenomenon, might have taken place as well.

According to the predominant point of view among Karelian archaeologists, the emergence of sites with textile ceramics in the territory of present-day Karelia with dominating lancet-like and triangular points was a result of migration from regions located to the south and south-east of it (Kosmenko 1996). One of the proofs for this idea is the fact that people with textile ceramics almost fully refused local lithic materials and used exclusively imported flint as the raw material for their lithic industry. Nonetheless, the first such forms appeared on sites left by preceding inhabitants of this area (with asbestos ware), and some of them were made of the local material – lidite.

It is also impossible that these items were spread only through exchange because of the practical impossibility to supply such a large territory from a few centres at a time. Additionally, the full technological context of their production can be found at many sites. In northern Fennoscandia, which is very distant from deposits of flint, these points were made of local materials, such as quartzite and brecciated quartz (Forsberg 1985, 5; Hood & Olsen 1988, 110–115; Holm 1991, 118–122).

Lena Holm stressed that the emergence of these types in northern Sweden meant, first of all, the introduction of a precise, quite developed and complex technological tradition. This tradition implied a certain degree of specialisation in this sphere of production and well-planned organisation of the production process (Holm 1991, 122). For neighbouring regions located to the east and south-east, the spread of this tradition did not have a similar revolutionary significance, as the bifacial industry had been developing there for some millennia before. At

the same time, when the territory of Karelia is considered as an example, it is justified to say that the highest level of development of the bifacial industry was achieved here during the Bronze Age. This can be concluded based on both quantitative – the extensive role of bifacial tools in the assemblages and their number, as well as qualitative attributes – the variability of shapes and the presence of complicated morphological details, such as narrow lateral notches and fishtail-shaped haft elements and very qualitative bifacial retouching, including very fine and thin saw-like retouch on some of the points. It has been proved with the aid of electron microprobe analysis of two arrowhead preforms from sites with textile ceramics in Karelia (located close to the White Sea) that pressure flakers with copper tips were used for processing them. These tools are much more effective than retouchers made of other materials available during this period (Tarasov 2002).

As a hypothesis, it can be proposed that the introduction of these forms into the tradition of bifacial industry of the forested zone of eastern Europe was followed by the spread of more effective technology of pressure bifacial flaking. But at the moment there is too little proof for such a proposition. Conclusions about the possible use of copper-tipped flakers have been drawn also for some points from the Volosovo culture sites in the Middle Volga region (Galimova 2008, 76–78); that is, before the infiltration of points with a straight and concave base into areas to the west from the Ural mountains.

The Early Iron Age was a time of degradation of lithic industry and an almost full replacement of lithic tools by iron ones for most tasks. It was also the time of the complete disappearance of bifacial points. In the initial stage of this period, probably, the bifacial tradition of the Bronze Age continued, the same as it was taking place in northern Fennoscandia (Forsberg 1985, 5; Holm 1991, 118), but this industry was decreasing in quantity and its morphological arsenal was becoming simpler. A precise date for the disappearance of such points from the assemblages cannot be suggested because of the lack of representative radio-carbon dated assemblages.

Concluding remarks

As it can be seen from the overview presented above, the main tendencies in the development of bifacial industry were common for a very large territory of the forested zone of eastern Europe. Considerable changes in the repertoire of this industry, on the one hand, required much longer time, than, for example, changes in ceramic assemblages. On the other hand, they are quite surprisingly synchronous in different parts of this zone. Certainly, these peculiarities must have to do with some common (transcultural) processes that might have been taking place

among inhabitants of this area, and with the existence of some sort of informational exchange. A detailed description of the morphological kit of the industry of bifacially worked tools and the main changes in this industry on the territory of Karelia, which was presented in this paper, can be useful to compare and juxtapose the phenomena occurring in many other regions of the forested zone.

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Table 1. Number of bifacially worked tools of siliceous rocks from Karelian settlements sites, dated from the Neolithic until the Early Iron Age.

Tabel 1. Silikaatsetest kivimitest labatehnikas esemete arv neoliitikumist kuni varase rauaajani dateeritud Karjala asulakohtadest.

	Site	Arrowheads		Spearheads		Inserts	Knives	Total
		Finished	Preforms	Finished	Preforms			
Sperrings Ceramics	Pegrema IX	2						2
	Orovnalok IVa	1			1			2
	Uya III	8	4					12
	Orovnalok VI			1				1
	Peski II		1					1
	Pindushi III	2	4	1	1			8
	Vojnavolok XXVIII	1	1		1			3
	Sulgu IIIg		3					3
	Sheltozero VIII		2					2
	Total	14	15	2	3	0	0	34
Pit-Combed Ware	Chernaya Rechka I	4	4					8
	Chermaya Rechka II		1	1				2
	Chernaya Rechka VI				1			1
	Orovnalok IV		1	1			2	4
	Pindushi I		2					2
	Pindushi II		5					5
	Ust-Vodla III	5	4	1	1			11
	Total	9	17	3	2	0	2	33
Combed and Rhomb-Pit Ware	Lakshezzero II	1	4					5
	Chernaya Guba III	5	5	5				15
	Chernaya Guba IX	6	5	2	1			14
	Chernaya Guba IV	1	1	2	3		1	8
	Chelmuzhskaya Kosa XII				16			16
	Vigajnavolok I	9	28	2	5		1	45
	Pegrema I	1	1					2
	Total	23	44	11	25	0	2	105
Asbestos Ware	Chernaya Guba IX, trench in 1988	1	8		14			23
	Vojnavolok XXVII	34	65	11	67			177
	Bely Porog I			1				1
	Vojnavolok XXIV	35	107	2	43		1	188
	Vojnavolok XXV	11	37	6	29			83
	Fofanovo XIII	4	7		1			12
	Fofanovo XIV	8	5		6			19
	Vojnavolok XXXVIII	3	12		1			16

	Site	Arrowheads		Spearheads		Inserts	Knives	Total
		Finished	Preforms	Finished	Preforms			
Asbestos Ware	Orovnavolok XVI	5	14		16			35
	Chelmuzhskaya Kosa XXI	3	31		7			41
	Tunguda V	2	1	1	3			7
	Tunguda XIV	2						2
	Tunguda XVII	5	6		3			14
	Kochnavolok II	3	13		10			26
	Berezovo XV				1			1
	Total	116	306	21	201	0	1	645
Textile Ceramics	Bostilovo II		1		1			2
	Pichevo III				1			1
	Sumozero XV	11	8		6			25
	Gorely Most III	11	56	6	15			88
	Gorely Most V	6	19	1	14			40
	Gorely Most VI	15	64	4	78	1		162
	Gorely Most VII	4	12		7			23
	Gorely Most VIII	29	62	3	38	1		133
	Elmenkoski I	2	3					5
	Ust-Vodla II	6	3		12			21
	Total	84	228	14	172	2	0	500
Early Iron Age (Laukonsaari)	Pichevo	3						3
	Kento IV	1	2					3
	Total	4	2		0	0	0	6
Mixed assemblages (Bronze and Early Iron Age)	Suna VI	3						3
	Ust-Poncha I	2	1					3
	Kaperolakshi	1						1
	Kelka III	6	3					9
	Ochtoma III	1			1			2
	Ochtoma I	1	2	1	1			5
	Kelka I	1						1
	Kudama XI	1						1
	Ileksa II	2						2
	Total	18	6	1	2	0	0	27

Table 2. Number of asymmetric, rhombic, leaf-shaped, laurel leaf-shaped and willow leaf-shaped arrowheads from Karelian settlements, dated from the Neolithic until the Early Iron Age. Variants of arrowheads: ar – asymmetric-rhombic; al – asymmetric-leaf-shaped; s – with straight base; p – with pointed base; c – with convex base; b – with concave base; th – with one lateral thorn.

Tabel 2. Asümmeetriliste, rombikujuliste, lehekujuliste, loorberilehekujuliste ja paju-lehekujuliste nooleotste arv neoliitikumist varase rauaajani dateeritud Karjala asulakohtadest. Nooleotste variandid: ar – asümmeetriline rombikujuline; al – asümmeetriline lehekujuline; s – sirge kannaga; p – terava kannaga; c – nõgusa kannaga; b – kumera kannaga; th – ühe külgekisuga.

Site	Type	Asym-metric			Rhom-bic	Leaf-shaped	Laurel leaf-shaped										Willow leaf-shaped											
	Subtype	ar	al	Total	Total		Without distinct haft element					Trun-cated haft element					Tang	Total	With-out distinct haft element			Truncated haft element				Fishtail	Tang	Total
							c	p	th	b	s	c	p	s	c	p			s	b								
	Variant						s	p										c	p	s	c	p	s	b				
Sperrings Ceramics	Vojnavolok XXVIII																											
	Orovnavolok IVa								1							1												
	Pegrema IX	2		2																								
	Uya III		2	2	1	1	2																					
	Total	2	2	4	1	1	2		1							1												
Combed and Rhomb-Pit Ware	Lakshezzero II							1								1												
	Chernaya Guba III							1								1												
	Chernaya Guba IV																											
	Chernaya Guba IX				1	1	2									1												
	Pegrema III																											
	Vigajnavolok I					1	1					1				2		1	1								5	
	Total					2	3	2								5		1	1								5	
Asbestos Ware (Vojnavolok XXVII type)	Vojnavolok XXVII	1		1	2	2	2	1	4			4		1		1	16	1	9	2							25	
	Chernaya Guba IX ²																									1		

² 1988 trench in Chernaya Guba IX.

Site	Type	Asym-metric			Rhom-bic	Leaf-shaped	Laurel leaf-shaped										Willow leaf-shaped									
	Subtype	ar	al	Total	Total		Without distinct haft element					Trun-cated haft element			Tang	Total	With-out distinct haft el-ement			Truncated haft ele-ment				Fishtail	Tang	Total
							c	p	th	b	s	c	p	s			c	p	s	c	p	s	b			
	Variant				s		p																			
Asbestos Ware (Orovnavolok XVI type)	Vojnavolok XXIV ³	1		1													1									2
	Vojnavolok XXV ⁴					1									2											
	Tunguda V										1				1				1							1
	Tunguda XIV					1	1																1		1	
	Tunguda XVII	1		1							1				1					1						3
	Fofanovo XIII	1		1	1	1	1								3		1									2
	Fofanovo XIV					2	2			1					2											2
Asbestos Ware (Orovnavolok XVI type)	Vojnavolok XXIV ⁵	2		2		1	1	1							1		1		1		1					4
	Vojnavolok XXV ⁶									1					1		1		1							2
	Orovnavolok XVI					1	1			4					6			1								2
	Vojnavolok XXXVIII																									3
	Chelmuzhs-kya Kosa XXI ⁷																									
Asbestos Ware (Palaiguba type)	Kochnavolok II					1		1																		3
	Chelmuzhs-kya Kosa XXI ⁸	2		2						1					1											

³ Materials from the upper of the cultural layer, from dwellings 2, 3, 4.

⁴ Materials from the upper of the cultural layer, from dwellings 2, 3, 4, 5.

⁵ Materials from the upper of the cultural layer, from dwellings 1, 5.

⁶ Materials from the upper of the cultural layer, from dwelling 1.

⁷ Materials from the upper of the cultural layer, from dwellings 2, 4, 5, 6.

⁸ Materials from the upper of the cultural layer, from dwellings 1, 3.

Site	Type	Asym-metric		Rhombic		Leaf-shaped	Laurel leaf-shaped										Willow leaf-shaped											
	Subtype	ar	al	Total	Total		Without distinct haft element					Truncated haft element					Tang	Total	Without distinct haft element			Truncated haft element				Fish-tail	Tang	Total
							c	p	th	b	s	c	p	s	c	p			s	c	p	s	b					
	Variant				s		p																					
Asbestos ware (unidentified)	Vojnavolok XXV	2		2	1	1										2	1										4	
	Vojnavolok XXIV				1	3	1		2	1			1	1		7	1	3	1	1	1	4					17	
	Chelmuzhs-kya Kosa XXI																											
	Total	10		10	3	9	14	4	1	13	1	6	2	1		43	2	17	4	4	2	5			1		72	
Textile Ceramics	Gorely Most III															3					1						1	
	Gorely Most V																											
	Gorely Most VI	2		2				1		1	3			1	8			1			1		1			3		
	Gorely Most VII																									1		
	Gorely Most VIII						1																1			1		
	Sumozero XV				2	2							2		2						1					1		
	Elmenkoski I																											
	Pichevo III																											
	Ust-Vodla II	1		1			1							1							1	1				2		
	Total	3		3	2	2	2				3			2	1	13			1		2	3		2			9	
Iron Age (Luukonsaari)	Pichevo																1				1					2		
Mixed assemblages (Bronze and Early Iron Age)	Kelka I																						1				1	
	Suna VI																										1	
	Kelka III																											
	Ochtoma I																			1							1	
	Ochtoma III																			1							1	
	Kudama XI																											
	Ileksa II																											
	Ust-Poncha I																											
	Kaperolakshi																											
	Total																			2			1				4	

Table 3. Amount of triangular, triangular with convex laterals and lancet-like arrowheads from settlements in Karelia dated from the Neolithic until the Early Iron Age. Variants of arrowheads: *s* – with straight base; *p* – with pointed base; *b* – with concave base; *sh* – shortened; *lo* – elongated.

Tabel 3. Kolnurksete, kolmnurksete kumerate külgedega ja lantsetikuliste nooleotste arv neoliitikumist varase rauaajani dateeritud Karjala asulakohtadest. Nooleotste variandid: *s* – sirge kannaga; *p* – terava kannaga; *b* – nõgusa kannaga; *sh* – lühikesed; *lo* – pikad.

Period		Type	Triangular					Triangular with convex lateral					Lancet-like							
	Site	Subtype	Tang		Tang, thorns	Concave base	Straight base	Total	Tang	Straight base		Concave base		Total	Without distinct haft element		Fishtail	Tang	Truncated haft element	Total
			Variant	s	p					sh	lo	sh	lo		s	b	s	b		s
Sperrings Ceramics	Voinavolok XXVIII				1		1													
	Orovnavolok IVa																			
	Pegrema IX																			
	Uya III																			
	Total				1		1													
Combed and Rhomb-Pit Ware	Lakshezzero II																			
	Chernaya Guba III	1					1	1				1								
	Chernaya Guba IV		1				1													
	Chernaya Guba IX	1	1				4													
	Pegrema III		1				2													
	Vigajnavolok I		1				2													
	Total	2	4				10	1				1								
Asbestos Ware (Voinavolok XXVII type)	Voinavolok XXVII		1				3													
	Chernaya Guba IX ⁹																			

⁹ 1988 trench in Chernaya Guba IX.

Period		Type	Triangular					Triangular with convex lateral					Lancet-like									
	Site	Subtype	Tang		Tang, thorns	Concave base	Straight base	Total	Tang	Straight base		Concave base		Total	Without distinct haft element		Fishtail		Tang	Truncated haft element		Total
			Variant	s	p					sh	lo	sh	lo		s	b	s	b	s	b		
Asbestos Ware (Orovnavolok XVI type (early))	Vojnavolok XXIV ¹⁰																					
	Vojnavolok XXV ¹¹																					
	Tunguda V																					
	Tunguda XIV																					
	Tunguda XVII																					
	Fofanovo XIII																					
	Fofanovo XIV																					
Asbestos Ware (Orovnavolok XVI type (late))	Vojnavolok XXIV ¹²	2					2															
	Vojnavolok XXV ¹³	1					1															
	Orovnavolok XVI					1	2															
	Vojnavolok XXXVIII	2					2	1					1									
	Chelmuzhskaya Kosa XXI ¹⁴													1							1	
Asbestos Ware (Palaiguba II type)	Kochnavolok II																1				1	
	Chelmuzhskaya Kosa XXI ¹⁵						1															
Asbestos Ware (unidentified)	Vojnavolok XXV	1					1															
	Vojnavolok XXIV	1					2							1							1	
	Chelmuzhskaya Kosa XXI													1							1	
	Total		8			1	14	1					1	3		1					4	

¹⁰ Materials from the upper of the cultural layer, from dwellings 2, 3, 4.
¹¹ Materials from the upper of the cultural layer, from dwellings 2, 3, 4, 5.
¹² Materials from the upper of the cultural layer, from dwellings 1, 5.
¹³ Materials from the upper of the cultural layer, from dwelling 1.
¹⁴ Materials from the upper of the cultural layer, from dwellings 2, 4, 5, 6.
¹⁵ Materials from the upper of the cultural layer, from dwellings 1, 3.

Period	Site	Type	Triangular					Triangular with convex lateral					Lancet-like							
			Tang	Tang thorns	Concave base	Straight base	Total	Tang	Straight base	Concave base	Total	Without distinct haft element	Fishtrail	Tang	Truncated haft element	Total				
		Variant	s	p					sh	lo	sh	lo		s	b	s	b	s	b	
Textile Ceramics	Gorely Most III		1	1			2													
	Gorely Most V		2				4	1			2		1		1					2
	Gorely Most VI				1		1		1	2	3									
	Gorely Most VII								1		1		1							
	Gorely Most VIII				6	2	11	2		1	5	5	3	2						10
	Sumozero XV		3					1			1	3	1							4
	Elmenkoski I		1				1													
	Pichevo III																			
	Ust-Vodla II					1	1		1											
	Total		7	1	7	3	20	3	3	3	12	8	4	2	2	1				16
Mixed assemblages (Bronze and Early Iron Age)	Kelka I														1					1
	Suna VI														1					1
	Kelka III									1	2	5			3					3
	Ochtoma I											1			1					1
	Ochtoma III																			
	Kudama XI																			
	Ileksa II								2			2								
	Ust-Poncha I										1									
	Kaperolakshi									1		1								
	Total								2	2	3	9	0	5	1					6

Table 4. Amount of long bifaces (spearheads and knives) of different types from settlements in Karelia dated from the Neolithic till the Early Iron Age. Variants of spearheads and knives: st – with straight tang; f – with fishtail-shaped tang; lug – with lateral lugs; notch – with lateral notches.

Tabel 4. Pikkade labatehnikas erinevat tüüpi odaotste ja nugade arv neoliitikumist varase rauaajani dateeritud Karjala asulakohtadest. Odaotste ja nugade variandid: st – sirge rootsuga; f – kalasabakujulise rootsuga; lug – külgmõigastega; notch – külgsälkudega.

Period	Site	Type	Rhombic	Leaf-shaped	Willow leaf-shaped			Triangular			Triangular with lateral notches				Knives				
		Subtype			Pointed base	Straight base	Concave base, notches	Tang	Concave base	Straight base	Tang		Concave base		Leaf-shaped		Sickle-like		
		Variants									st	f	us	lug	us	notch			
Sperrings ceramics	Pindushi III			1															
Pit-Combed Ware	Chernaya Rechka VI			1															
	Orovnavolok IV			1										1	1				
Combed Ware – Rhomb-Pit Ware	Chernaya Guba III										1				1				
	Chernaya Guba IV				2										1				
	Vigajnavolok I			1				1										1	
Asbestos Ware	Vojnavolok XXVII				7	5													
	Vojnavolok XXV ¹⁶							1											
	Tunguda V											1							
	Vojnavolok XXV				1	2													
	Vojnavolok XXIV				3						1								
Textile ceramics	Gorely Most VI				2				1	1				1					
	Gorely Most VIII						1	1											
	Sumozero XV										2								
	Ochtoma I											1							

¹⁶ Materials from the upper of the cultural layer, from dwellings 2, 3, 4, 5.

Vene Karjala territooriumilt leitud silikaatsetest kivimitest labatehnikas valmistatud esemete tüpoloogia ja kultuurilis- kronoloogiline varieeruvus

Artiklis käsitletakse ühte tänapäevase Karjala ala peamist kivitöönduse kategooriat – labatehnikas valmistatud tööriistu – ja esitatakse esmakordselt ülevaade nende peamistest eripäradest kogu kasutusaja vältel. Välja on jäetud vaid suured raieriistad, mis on küll valmistatud sarnaselt, kuid palju algelisemalt. Kronoloogiliselt hõlmab käsitus ajajärku u 6700 radiosüsiniku aastat tagasi (u 5700 kal eKr) kuni ajaarvamise alguseni ja kätkeb lokaalse kronoloogia järgselt neoliitikumi (Sperringsi tüüpi, kammlohk-, lohkkamm ja rombkeramikaga muistised), eneoliitikumi (asbestkeramikaga muistised), pronksiaega (tekstiilkeramikaga muistised) ja varast rauaega. Peamiselt põhinetakse tüpoloogilisele analüüsile, kuid fikseeritakse ka muutused toormes ja tehnoloogias.

Labad ilmuvad Karjala alal esmakordselt Sperringsi kultuuri kompleksides, kuid kuni eneoliitikumini on nende osakaal võrdlemisi väike. Labatehnikas raieriistade maksimaalne hulk (87%) on leitud eneoliitilistest ja pronksiaja muististest. Nende valmistamiseks kasutati peamiselt importtulekivi, aga samuti kohalikke tulekivilaadseid kivimeid, peamiselt litiiti. Kohalikest tulekivilaadsetest kivimitest esemete osakaal on eriti suur asbestkeramikaga muististes.

Klassifitseerimissüsteem koosneb mitmest taksonomeetrisest tasandist. Labatehnikas esemete liigid on omakorda jagatud tüüpideks, mille aluseks on funktsioonist tulenevad vormierisused (noole- ja viskeoda otsad, kahepoolse töötusega noad, pistikterad). Labatehnikas esemed jagatakse lehe kuju järgi tüüpideks; muud erisused on aga aluseks alatüüpide ja variantide diferentseerimisel. Eristatud on nooleotste kaheksa morfoloogilist tüüpi (lehekujulised, loorberilehekujulised, pajulehekujulised, kolmnurksed, kumerate külgedega kolmnurksed, lantsetikujulised ja viienurksed, rombikujulised, asümmeetrilised), igas kaks kuni neli alatüüpi, mis jagatakse omakorda veel ka variantideks. Viskeoda otsad jaotatakse viide tüüpi (lehekujulised, rombikujulised, pajulehekujulised, kolmnurksed ja kumerate külgedega kolmnurksed). Labatehnikas nuge on Karjalast leitud vaid mõned eksemplariid ja need jaotatakse kahte tüüpi (asümmeetrilised-lehekujulised

ja sirbikujulised). Pistikterasid on teada vaid kaks eksemplari ja need kuuluvad ühte tüüpi.

Labatehnikas tööriistade morfoloogiliste variantide arvukus suureneb ajas – kui Sperringsi kultuuri asulakohtades on neid seitse, siis pronksiaegsetes tekstiilkeraamikaga muististes on variante juba kolmkümmend neli. Seda tendentsi võib seletada jahiriistade diferentseerumisega, ühiskondliku teadvuse teisenemisest tingitud stilistika keerulisemaks muutumisega ja samuti tehnoloogia täiustumisega, mis võimaldas valmistada senisest keerulisemaid vorme. On tõendeid, et pronksiajal kasutati nooleotste valmistamiseks surutehnikas vaskotsaga kärne.

Neoliitikumi ja eneoliitikumi muististes domineerivad otsikute hulgas mõlemast otsast teravad vormid – lehekujulised (sh nii loorberi- kui ka pajulehekuju- lised), rombikujulised ja rootsuga kolmnurksed otsikud. Üleminekul pronksiaega on aset leidnud suured muutused. Kuigi säilisid ka varasemast tuntud tüübid, moodustavad enamiku lantsetikujulised ja viienurksed ning samuti kumerate külgedega kolmnurksed ilma rootsuta nooleotsad. Esmakordselt ilmusid sellised vormid nooremaks kui 4000 radiosüsiniku aastat dateeritud asbestkeraamikaga asulakohtades, kusjuures osa eksemplare valmistati toona ka lidiidist, samas kui pronksiaegsetes asulakohtades seda kivimit labatehnikas tööriistade tegemiseks ei kasutatud. Kuni tekstiilkeraamika kasutuselevõtuni on sellised vormid siiski erandlikud.

Labatehnikas otsikute peamised vormid teiste Ida-Euroopa metsavööndi ja selle lähialade piirkondade (Kesk- ja Kirde-Venemaa, Ida-Baltikum, Soome, Põhja-Rootsi ja Norra) samaaegsetes kompleksides osutavad morfoloogiliste muutuste samasugustele tendentsidele. Sellised esemed muutusid aeglasemalt kui keraamika, kuid samas näitavad need väga suurt sünkroonsust tohutul territooriumil. See lubab oletada mingisugustest infovahetuse vormidest tingitud transkultuuriliste protsesside olemasolu. Käesolevas artiklis esitatud Karjala labatehnikas tööriistade morfoloogiliste vormide ja esemete valmistamistehnika peamiste tendentside kirjeldus võib olla kasulik teiste metsavööndi piirkondades aset leidnud nähtuste tundmaõppimisel.