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The Early Mesolithic bone and antler industry in Latvia, eastern Baltic

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Abstract

The Early Holocene in the eastern Baltic, as in the rest of Northern Europe, was marked by pronounced changes in the environment and human ways of life. The centres of settlement shifted from the major river valleys to inland lakes and river systems. One such example is the Zvejnieki II habitation site on the shore of Lake Burtnieks in northern Latvia, which has yielded a rich assemblage of bone and antler artefacts. The article examines the stratigraphy and possible chronology of the settlement layers, but focuses primarily on a typological analysis of the bone and antler artefacts, also presenting insights into the origins of the Early Mesolithic 'culture' in the eastern Baltic.

1 Introduction

The Stone Age in the eastern Baltic – Estonia, Latvia, and lately there were also discoveries in Lithuania – is characterised by rich and important bone and antler artefact collections, which have been recovered as stray finds at lakeshores and riverbanks as well as settlement sites and burial grounds. Thanks to some well-stratified sites (Pulli in Estonia, Zvejnieki II and Sūļagals in Latvia), a certain proportion of the bone and antler finds can be attributed to the very beginning of the Mesolithic – the second part of the Preboreal and the beginning of the Boreal climatic period.

The earliest habitation in Latvia occurred at the very end of the Late Glacial, after the retreat of the ice sheet, when reindeer and their hunters entered the country along the valleys of the major rivers (ZAGORSKA 2012). At the beginning of the Preboreal, along with climatic amelioration, development of forests and changes in the fauna, new centres of habitation formed around the inland lakes and their river systems. During this period climatic conditions gradually improved, becoming more favourable for plants and animals. Stands of birch and pine spread, later accompanied by spruce, alder and willow. Elk dominated in the forest environment, and the number of fish species in the waters increased, with a strong dominance of pike.

Only two settlement sites with bone and antler assemblages from this period are known in present-day Latvia. One is the Sūļagals site in southeastern Latvia, now located near Lake Lubāns, but previously situated on a hilly peninsula or island in the ancient lake. In the course of small-scale excavation in 1979 conducted by Ilze Loze a Mesolithic cultural layer with bone and flint finds was revealed on the sloping part of the site (LOZE 1988). A sample (twig) taken just under the cultural layer of the site gave a date of 9575±80 BP (TA-1317) or 9239–8730 cal. BC (LOZE 2015, 28).



Fig. 1. Location plan showing the Zvejnieki archaeological complex in relation to palaeo-Lake Burtnieks (drawing V. Bērziņš).

The second settlement site, more extensively excavated by Francis Zagorskis (1971, 1974, 1975, 1977 and 1978) is the Zvejnieki II site, near Lake Burtnieks in northern Latvia (ZAGORSKIS 1987; ZAGORSKA/ ZAGORSKIS 1989; ZAGORSKA 2009). This site was part of a bigger archaeological complex, consisting of a burial ground used over a period of five millennia (approximately 7500-2600 cal. BC) and two settlement sites, Mesolithic and Neolithic, partly contemporaneous with the cemetery. This article examines the bone and antler artefacts from the lower layer of the Mesolithic site.

2 Zvejnieki – the archaeological complex

Lake Burtnieks, a lake of glacial origin, is located in northern Latvia, in a depression within a field of drumlins left by the retreating ice. The upper parts of the drumlins surrounding the lake became ice-free before 13,500–13,300 BP (RINTERKNECHT et al. 2003).

The Zvejnieki archaeological complex is situated on the northern shore of Lake Burtnieks, on a drumlinoid stretching northwest to southeast. This drumlinoid, a gravel ridge approximately 1600 m long and 2–4 m in elevation, was previously a narrow, isolated island in the lake, separated from the northwestern shore of the lake by a low-lying belt of flat, boggy plain – the former lakebed (Fig. 1). The Mesolithic site Zvejnieki II developed at the southeastern end of the island, on its gently sloping northern, leeward side. A recent survey in this area has also revealed remains of Mesolithic habitation on the northern slope of the highest part of the gravel hill, now removed, where the oldest part of the burial field was situated.

The drumlinoid consists of stony clay and till, covered by various grades of sand, gravel with pebbles, and occasionally larger boulders. These deposits, covering the ridge, consist mainly of fragments

Fig. 2. Zvejnieki II settlement site: cross-section of the eastern section of area IX (drawing I. Eglite).

of carbonaceous sedimentary rock (dolomite, limestone). On the northern slope of the ridge, at the Zvejnieki farmstead, an accumulation of freshwater lime more than 1 m thick was discovered, covered by a layer approximately 0.8–1 m thick, consisting of pebbles and gravel. Under the freshwater lime there was very fine calcareous sand, with pebbles and gravel



below this, underlain by clay and till. It is in this particular area that the Stone Age settlements, Zvejnieki I and Zvejnieki II, were located (EBERHARDS et al. 2003; EBERHARDS 2006).

A geological section across the upper part of the slope revealed a freshwater lime layer which became thinner downslope. This layer contained sand and gravel-pebble lenses with archaeological material – the Zvejnieki II lower layer (Fig. 2). Starting from the upper part of the slope and falling away gradually, a dark brown, or even black peaty layer was observed, saturated with organic remains and artefacts (Zvejnieki II upper layer). This layer firmly covered the freshwater lime layer with the earliest finds. The pollen from the freshwater lime layer provide evidence of Preboreal conditions (KALNIŅA 2006, 56–62).

The chronology is further supported by radiocarbon dates on bone and antler artefacts as well as on a peat sample (Intcal13 curve; Ox Cal.v.4.2). A fragmentary bone point from the lower layer has been dated to 9415±80 BP or 8921–8479 cal. BC (Ua-18201). A second fragment from a harpoon with wide barbs was dated to 9170±70 BP, corresponding to 8566–8271 cal. BC (Ua-19797). A bulk sample of peat from a layer at the foot of the slope gave a date of 8240±120 BP (TA-2791), or 7481–6714 cal. BC.

During the Late Glacial and early Post-Glacial the inland Lake Burtnieks was much larger than today. With its sinuous shoreline, many shallow bays, peninsulas, islands and river deltas, it provided a very suitable area for Stone Age habitation. The excavations at the settlement site also yielded data that permit a reconstruction of the Mesolithic environment. According to pollen analysis, the Zvejnieki archaeological complex and its surroundings show weak traces of possible human presence even since the very end of the Younger Dryas. The Early Mesolithic environment of the region was characterised by climatic amelioration and a partly open landscape, which was covered by sparse birch-pine forest, accompanied by a rich grass community. Later, pine-birch forest dominated, but with meadows still present. Ruderal plants and charcoal in the pollen spectra from the Zvejnieki II lower layer reflect human activity in the area (EBERHARDS et al. 2003).

Ten species are represented in the mammal remains, with a strong dominance of elk (*Alces alces*). Also present are beaver (*Castor fiber*), wild boar (*Sus scrofa*), brown bear (*Ursus arctos*), roe deer (*Capreo-lus capreolus*) and other species (Fig. 3,1). Pike (*Esox lucius*) dominates among the fish remains from the lake, followed by bream (*Abramis brama*), perch (*Perca fluviatilis*), tench (*Tinca tinca*) and whiting (*Leuciscus cephalus*) (Fig. 3,2). Studies of this material and of the archaeological finds serve to characterise the earliest Mesolithic inhabitants of Zvejnieki as typical hunter-fisher-gatherers.



Fig. 3. Zvejnieki II, lower layer. 1 – Mammal species (after Lõugas 2006); 2 – Fish species (after Lõugas 2006, based on identifications by J. Sloka).

Within the Zvejnieki settlement site, on the upper part of the slope in excavation areas I, IX, XIII, XV, and partly also VI (the lower part), a total area of more than 180 m² was excavated that can be considered as yielding the earliest finds on the site (Fig. 4): approximately 3310 artefacts and waste pieces of bone and antler, 214 pieces of worked flint and debitage, and a large number of animal bones and fish remains. The bone and antler finds were rich and diverse: hunting equipment, domestic inventory, some jewellery and items of art, miscellaneous fragments of artefacts that were impossible to identify precisely, and waste from artefact manufacturing.

Several more bone and antler artefacts can also be attributed to the earliest stage of habitation, namely those found in the freshwater lime layer, which extended even further, constituting the basal layer in other excavation areas, but the stratigraphic and typological evaluation have yet to be checked by radiocarbon dating, which is a task for the immediate future.

3 Manufacturing methods

Tools were manufactured from the long bones of large ungulates – elk, aurochs, and less commonly red deer (mainly metapodials). Sometimes, artefacts were also produced from other bones, such as ribs, scapulae and mandibulae. Worked antler tines and other parts of antler are also present.

Éva David, who studied the bone finds from the Zvejnieki lower layer, focused on the technological aspects of the industry (DAVID/ZAGORSKA 2004; DAVID 2006). During the preparation of blanks for artefacts, the distinctive 'Z' method was used (after Zamostje, the well-known Russian site). After sawing and fracturing the distal parts of metapodial and metacarpal bones, the upper surfaces of these long bones were then prepared by the removal of axial flakes all around the preform, obtaining a cylindrical matrix. Then the bones were split lengthwise, obtaining blanks for manufacturing tools. Blanks of maximal length were obtained, 1.2–2.5 cm wide and 4–6 mm thick, and subsequently divided into smaller fragments. Other methods for producing implements were also used, but these always depended on the raw material itself, or on the morphology of the item to be produced (DAVID 2006, 238–239).



Fig. 4. Zvejnieki II settlement site, areas (I-XVII) excavated in 1972, 1973, 1975, 1977, 1978 (drawing I. Eglīte).

Table 1. The bone and antler artefact assemblage from the Zvejnieki II settlement, lower layer.

	Hu	inting	weapo	ons	Domestic inventory								Ornaments		Indet.	Waste		
Square	Harpoons	Projectile points	Slotted points	Daggers	Chisels	Knives	Wedges	Awls	Axes / adzes	Blade axes	Punches	Sleeves	Tooth pendants	Others		Phalanges	Foot bones	Others
Ι	1	18	0	0	6	0	6	2	1	2	1	1	5	1	9	3	0	4
VI	3	10	5	1	9	0	10	5	1	1	3	0	7	2	7	9	2	5
IX	1	2	0	4	6	1	2	2	0	1	1	0	9	5	7	4	0	5
XIII	0	7	2	4	11	2	5	2	1	1	2	0	2	0	10	18	0	12
XV	0	2	2	2	3	3	6	1	0	0	4	1	1	0	15	11	2	13
Sum	5	39	9	11	35	6	29	12	3	5	11	2	24	8	48	45	4	39
Altogeth	er: 33	5																

Zvejnieki II settlement, lower layer

4 The bone and antler inventory

Using a classification scheme elaborated for bone and antler artefacts from the eastern Baltic (ZAGORSKA 1983), all the finds from the Zvejnieki II lower layer have been classified according to their function, after which morphological types and subtypes have been singled out. Indeterminate fragments form a separate group, quite a large one, as it is usual for settlements. Waste from tool production forms the last group (Table 1).

The first major group consists of hunting equipment – harpoons, projectile points, and daggers (Fig. 5). Harpoons are preserved only in fragmentary form - the tips are usually missing and barbs in many cases broken off. They belong to a type with widely arranged, angular or slanting barbs along one side of the tool and a reverse barb at the base (Fig. 5,9.10). The projectile points group consists of spear- and arrowheads. Spearheads were made of long bones, with a smoothed surface and a rounded oval, sometimes irregular or flattened cross-section, narrowing towards both ends. Some of these spearheads are quite massive (Fig. 5,5.12). One fragmentary example of a flat spearhead had an ornamentation consisting of incisions forming rhombuses (Fig. 5,11). The arrowheads are needle-shaped, round in cross-section with a tapered tip and a short, conical, pencil-shaped base (Fig. 5,3.8). Some arrowheads are smaller and show a flat cross-section (Fig. 5,4). Quite characteristic are slotted bone artefacts - points with a groove for inserts along one or both edges. In two cases flint inserts were still preserved intact in the grooves (Fig. 5,1-2). Some daggers and knives also have such grooves. Bone daggers were made of large mammal bones (ulna, tibia, scapula), preserving the natural form of the bone as the handle, while the other end has a curved, pointed tip, which is sharpened and smoothed (Fig. 5,14). In some cases the natural form has not been retained, and the handle has been worked (Fig. 5,13). Thus, the main hunting weapons from this earlier period were harpoons and various projectile points, including spears, arrowheads and slotted artefacts, along with daggers, confirming the importance of hunting in the Early Mesolithic.

Domestic utensils were more numerous and diverse, including chisels and gouges, knives, axes and adzes, blade axes, awls, punch artefacts made of antler tines, and others (Fig. 6). Various parts of animal bones as well as antlers were used for manufacturing such items. Most numerous are finds of chisels, made of longitudinally split bone strips, varying in width (3–5 cm wide). The surface was smoothed, with



Fig. 5. Bone artefact inventory (weapons) from the Zvejnieki II settlement site, lower layer: 1–2 – slotted arrowheads; 3–4.6–8 – complete and fragmentary arrowheads; 9–10 – harpoons; 5.11–12 – spearheads; 13–14 – daggers (drawings M. Jāņkalniņa).

a straight or slightly convex working edge, bevelled on the inner face. The more robust convex examples could have been used as gouges. Some of these chisels still show traces of processing in the form of large, rough flake negatives on the sides. The active parts, i.e. the working edges, are quite damaged and worn (Fig. 6,9-10). So-called wedge-shaped artefacts were made of bone splinters of various sizes, the working part being made by splitting off material from both sides. The large number of these artefacts suggests that they must have seen extensive use, partly fulfilling the function of burins (Fig. 6,6-8). Knives were made of narrow strips of bone or ribs, sharpened on one or both sides; these could also have been used as scaling tools. Very characteristic for the site are large, broad knives made of the scapulae of large mammals, with a convex, sharpened working edge (Fig. 6,11). Constituting the next category of finds are awls and drills - artefacts with a rounded, polished sharp end made from split tubular bones, elk epiphyses and other bone splinters (Fig. 6,2–3). Antler axes or adzes were preserved in fragmentary form: there are two finds of upper parts with drilled perforations for the shaft (Fig. 6,12) and a heavy antler adze with a shaft hole; the lower part, where there could have been a socket for some kind of insert, has decayed (Fig. 6,13). Antler tools, mainly made of the palm of the antler, form a special group. They were very well worked and smoothed, all of them with a flattened upper part and a lower part sharpened from both sides. These artefacts could have served as blade axes or adzes, when inserted into large sockets (Fig. 6,14–15). Some of the bone items made of mandibulae could have functioned as sockets (sleeves) (Fig. 6,4). Antler tines sometimes bear traces of working at the very tip; they could have been used as punches or as polishers.

Decorative articles are represented in the form of pendants made of teeth of elk and small carnivores, each one with incisions at the root. There is also a pendant made of the middle section of a beaver canine as well as a bone plate with a drilled hole.

There are also a great number of bone and antler fragments the function of which is difficult to determine. Constituting a significant part of the find material are animal bones with traces of use: first and second phalanges with broken holes (Fig. 6,5) and foot bones with shallow holes in the heel (?) part. Waste from tool production includes animal long bones (metapodials, metacarpals, etc.), various bone splinters and worked fragments, as well as segments of antler tines and palms (Fig. 6,1).

The bone and antler inventory from the Zvejnieki II layer thus consists of hunting tools, including specific forms of harpoons, projectile points, slotted artefacts and daggers, along with a great variety of domestic implements – chisels, awls, knives, axes and adzes, blade axes, sleeves and decorative items, mainly animal tooth pendants, all stressing the great importance of the bone and antler industry in this earliest period.

A very similar inventory, only more fragmented, is represented on the Sūļagals site, with similar bone harpoons, slotted bone points, needle-shaped arrowheads, massive, smoothed spearheads, daggers, chisels and gouges (LOZE 1988, plate II–III; 2015, fig. 13–14). All these finds have parallels in the rich collection of stray finds from Lake Lubāns in southeastern Latvia (VANKINA 1999). Here, similar finds occur as whole, unbroken items: harpoons with wide, angular barbs and a basal barb facing the stem, needle-shaped points, a large number of slotted artefacts, daggers with a curved, pointed end and others (VANKINA 1999, plate II; XXVIII; XLII; XLIX), testifying that the shores of Lake Lubāns were already quite densely inhabited during the early part of the Mesolithic. Further sites need to be located.

The closest resemblance is to the assemblage of bone and antler artefacts found at the well-known Pulli site in southwestern Estonia, excavated by Lembit Jaanits (JAANITS/JAANITS 1975; 1978). The same kind of needle-shaped arrowheads, massive projectiles, harpoon fragments, adzes, chisels and awls are present. Small differences are observed, of course, e.g. in harpoon details (barbs) and some arrowhead forms. At Pulli long, needle-shaped arrows with conical and biconical upper parts occur, whereas at Zvejnieki only a small fragment – a very small tip of such an arrowhead – is known.



Fig. 6. Bone and antler inventory (domestic appliances) from the Zvejnieki II settlement site, lower layer: 1 – distal part of metacarpal of aurochs; 2–3 – awls; 4 – socket or sleeve; 5 – phalange with a broken hole; 6–8 – wedge-shaped artefacts; 9–10 – chisels; 11 – scapula of large mammal with a sharpened working edge; 12–13 – antler adzes; 14–15 – antler blade axes (inserts) (drawings M. Jāņkalniņa).



Fig. 7. Flint stray finds from present-day Latvia: 1 – Olaine; 2–3 – Jersika hillfort (photos J. Kankaanpää).

The Pulli site has now yielded seven radiocarbon dates, ranging between 9300 and 8200 cal. BC (KRIISKA/LOUGAS 2009, 168), i.e. the Early Mesolithic, contemporaneous with the Zvejnieki II lower layer.

In Lithuania, a typologically similar bone harpoon from Rudninkai, palynologically dated to the Preboreal, and perhaps also a fragmentary harpoon with broad barbs from Balsupai, as well as some of the slotted bone stray finds may be typologically attributed to the Early Mesolithic; there are as yet no stratified sites with a bone inventory from this period (RIMANTIENĖ 1994, 62 plate 15).

The eastern Baltic Early Mesolithic finds constitute a typical forest zone hunter-gatherer hunting complex, used for hunting large and small terrestrial mammals and birds, and also species inhabiting the inland lakes and rivers. The bow and arrow was the main hunting weapon, supplemented by the spear, dagger, and harpoon. Implements for domestic use were numerous and diverse. The environment, the bone and antler artefact complex as well as evidence of the hunted animals characterise the society as subsisting from the terrestrial and the freshwater ecosystem.

5 Origins

When discussing the origins of the Early Mesolithic bone and antler artefact complex, the Late Palaeolithic influence must be mentioned first. This is seen in the form of the harpoon, with widely spaced, robust barbs and a reverse barb at the base – an archaic type known from the North European Late Palaeolithic, Clark's type 11 (CZIESLA 2004; CZIESLA/MASOJĆ 2007; VERHART 1990). Stefan Karol Kozłowski has connected this type with the Tanged Point cultural tradition and its immediate successors (KozŁowski 2007, 498). Our harpoon, when it had broken, was later reshaped into a chisel. It has been dated to 9170±70 BP, or 8566–8271 cal. BC (Ua-19797). It is most interesting that it has been established in the frame of interdisciplinary studies that the artefact may have been made of the bone of an herbivore that subsisted mainly on lichen (ERIKSON 2006). If this were confirmed, then perhaps it would be the last evidence of reindeer on the eastern shore of the Baltic Sea basin in the early part of the Holocene. Éva David also identified two pieces of retoucheurs which were worked using a Palaeolithic technique and later reshaped into a chisel and gouge (DAVID 2006, 236–237).

In contrast to this, the finds of long, needle-shaped arrowheads with conical or biconical tips connect our tool complex with areas further to the east, where during the Mesolithic the so-called 'Shigir-type' arrowheads occur in the area from the eastern shore of the Baltic basin to the Ural Mountains in the east. Finds of biconical arrowheads from the Early Mesolithic site of Stanovoje IV in the Upper Volga area have also been dated to the end of the Preboreal (HARTZ et al. 2010, 163 fig. 11). The main technical manufacturing method (the so-called 'Z' method) also reveals similarities with more easterly regions. This method of manufacturing bone artefacts is known at e.g. the Zamostje site (Upper Volga region), at Pulli in Estonia, and at the Scanian Ageröd sites, forming the 'North-Eastern Technocomplex' (DAVID 2009).



Fig. 8. The area of the Pulli Culture in the eastern Baltic Mesolithic: 1 – sites with a bone and antler inventory; 2 – stray finds of bone and antler harpoons; 3 – sites with a flint inventory; 4 – stray finds of flint arrowheads.

A bone and antler artefact complex very similar to the early Baltic complex was found in the Upper Volga region at the site of Stanovoje 4, layer IV. It dates a little earlier, to the very end of the Younger Dryas and the beginning of the Preboreal, and consists of needle-shaped and slotted points, antler sockets, blade axes, broad knives made of scapulae, etc. (ZHILIN 2007).

Some more new influences, coming from the south, may be seen in the flint material of the Early Mesolithic sites. Visual analysis reveals that two types of flint are present in Latvia. One consists of small, mainly grey, light brown or yellowish pebbles and nodules, most likely from Silurian flint, distributed by glacial processes in Estonia and northern Latvia (KRIISKA et al. 2011, 79–80). More interesting in this context is the second type of flint – black-brownish flint of high quality, probably deriving from Cretaceous flint formations. This type of flint is known from southern Lithuania and Belarus, as well as Poland and Ukraine (KRIISKA/LÕUGAS 2009). The finds are characterised by blade technology and pressure technique, with single-platform conical cores, blades, and special tanged points. These arrowheads are long, with ventral retouch along the sides of the tang, and the tip sharpened by flat, ventral retouch. These finds are widely distributed on Early Mesolithic sites from northeastern Poland, Lithuania, northwestern Belarus, through Latvia and Estonia to southern Finland (OSTRAUSKAS 2000; SØRENSEN et al. 2013). In Latvia we know at least three places with objects made of this black flint. Cores and a fragmentary arrowhead are known from cultural layers of later sites, the Jersika and Ķenteskalns hillforts on the River Daugava, and a complete arrowhead has been recovered as a stray find by the lower reaches of the River Lielupe (Olaine); both rivers flowing through central Latvia (Fig. 7).

A similar bone artefact complex and comparable artefacts made of black, high quality flint mark the territory of the Early Mesolithic cultural unit which is known as the early Kunda or Pulli stage of the Kunda Culture, or even identified as an independent Pulli Culture (Fig. 8). I support the use of the latter term for this phenomenon. Of course, the eastern Baltic Kunda Culture later developed from this earliest stage, but in the beginning our assemblages do not include the main weapon of the Kunda Culture – the barbed Kunda-type fishing spear.

6 Conclusions

The described complex of Early Mesolithic bone and antler artefacts from Latvia (c. 9000–7000 cal. BC) not only serves to characterise the material culture of the ancient inhabitants and their hunter-fisher lifestyle, but also indicates the place of this industry within the wider geographical and cultural area encompassing Estonia, the southern part of Finland and northwest Russia. In assessing the origins of the Early Mesolithic bone and artefact complex, a continuation of Palaeolithic artefact forms may be identified, as well as the appearance of new processing techniques and tool forms.

Questions remain with regard to the rather complex stratigraphy of the rest of the area of the Zvejnieki II habitation site itself (not only the upper part of the slope), where the dating of layers on the basis of artefact forms should be verified by radiocarbon dating. This might actually increase the number of finds relating to the Early Mesolithic. There is also a need for further technological and use-wear analysis of the bone and antler assemblage. The rich array of bone and antler artefacts and production waste, as well as faunal remains, could still yield a great deal more information regarding the beginnings of the Middle Stone Age in the eastern Baltic.

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