

THE FINAL PALAEOOLITHIC IN THE COASTAL PART OF LITHUANIA WITH THE TECHNOLOGICAL EMPHASIS ON AUKŠTUMALA STONE AGE SITES

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Keywords

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Abstract

The Final Palaeolithic in the Lithuanian coastal zone has so far been represented only by a few archaeological finds from individual contexts, and a small number of archaeological excavations. However, their analysis has not revealed much regarding the technological development of hunting implements and work tools, or the choice and the use of necessary raw materials, and little data has been provided on the chronological aspects, or the connection between settlement locations and the changing level of the Baltic Sea. This paper presents the latest archaeological material from the Final Palaeolithic in the Lithuanian coastal area, based on the three sites at Aukštumala upland bog, and stray finds found in the area. The article focuses on technological and typological aspects of lithics related to Swiderian culture. The results of the study show that, with the shortage of flint raw material, Final Palaeolithic societies at Aukštumala relied on smaller and narrower blades, and compensated for the lack of flint raw material by using other, locally available metamorphic rocks.

Introduction

After the Last Glacial, the shores of the east Baltic underwent numerous changes in the sea level over the past circa 12,000 years. This is evidenced by the Early Holocene *Pinus* sub-fossil forest remains beneath 11 to 27-metre-deep water, as well as by the Mesolithic man-made tools washed up on to the coast of Lithuania (Žulkus and Girininkas 2012; 2014; 2020; Žulkus et al. 2015; Rimkus 2019; Danusevičius et al. 2021). These changes, and the complicated formation of coastal rivers and lakes, have made locating Late Glacial and Early Holocene sites of human habitation in the area in question complex. There are currently only a few places yielding typical Late Mesolithic to Early Neolithic bone, antler and amber assemblages; however, most of them (e.g. the former Bachmann manor, Smeltė and Palanga) consist of stray finds, or come from sites that are now considered destroyed (e.g. Rimantienė 1992; Girininkas 2011; Piličiauskas et al. 2015; Rimkus

2018; 2019). The first two Stone Age sites at Aukštumala upland bog (the area around the River Nemunas delta, the southern part of the Lithuanian coast) were found excavated in 2004. Forty-five worked flints suggest Final Palaeolithic to Mesolithic habitation sites (Dakanis 2006); but further field investigations were not performed to improve the site chronology. The technological analysis of one arrowpoint and backed piece, as well as of other lithics, suggests that its cultural affiliation should be considered as Ahrensburgian and Middle Mesolithic Neman cultures (Grigaliūnas 2013; Slah 2013); however, after the technological re-investigation of the excavated material, some of the previous hypothesis should be treated as unreliable. Nevertheless, the sites at Aukštumala demonstrate a huge potential for future investigations into the earliest settlement on the east Baltic coast.

In 2018 and 2019, new excavations of the Aukštumala Stone Age sites started, within the framework of a research

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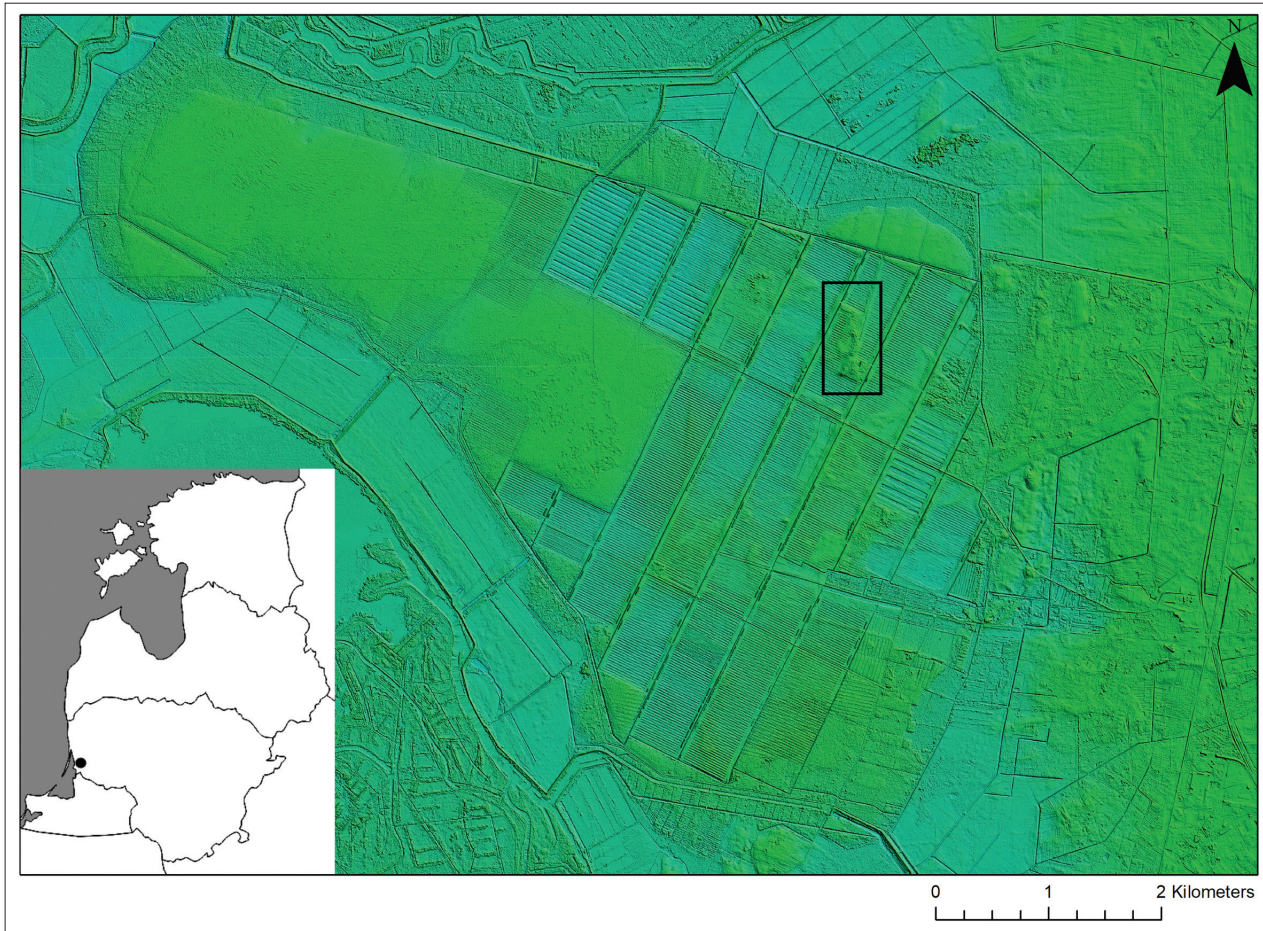


Figure 1. The location of Aukštumala bog, with the area of the fluvio-glacial hill marked.

project regarding the earliest settlement by prehistoric societies on the Lithuanian coast. An area of 84 square metres was investigated, and samples were taken for palaeobotanical and geochemical analysis, and for AMS ^{14}C dating. The newly discovered lithic technological analysis showed that all three sites at Aukštumala should now be regarded as a place of habitation of Final Palaeolithic Swiderian culture, and it should be understood as the earliest habitation site on the current coast of Lithuania. This paper presents the first results of the latest investigations at Aukštumala upland bog, concentrating on lithic technology and its implications for Final Palaeolithic hunter-gatherer societies in coastal Lithuania.

Research background

Aukštumala upland bog is situated in the southern part of the Lithuanian coast, in the Nemunas delta area (Fig. 1). It is the largest upland bog in the lowlands of the Lithuanian coast. The bog itself is divided into two separate sections: the western part has been a nature reserve protecting the natural environment of the bog since 1995; whereas the eastern part is given over to commercial peat extraction. Peat digging at Aukštumala bog started as early as 1882,

when peat was extracted manually in an undrained environment. Only in 1968 did modern peat extraction in the eastern part of the moor start, and it has continued until today. Old maps of the bog demonstrate several major hilly areas, which were possibly former islands. However, most were destroyed during the peat extraction, but one fluvio-glacial hill ($55^{\circ}39'23''\text{N}$, $21^{\circ}41'57''\text{E}$), which lies in the middle of the peat extraction area, contains the remains of three Stone Age sites, and is the main subject of this paper (Fig. 2).

At the end of the 19th century, the Aukštumala upland bog became one of the best-studied wetlands in northern Europe. The first natural research on the wetland was carried out there by the German researcher C.A. Weber, who in July and August 1898 carried out detailed research throughout the Aukštumala wetland (Weber 1902). He returned again late in the summer of 1900. Following his fieldwork, Weber (1902) published a study on wetland vegetation, which is said to be the first detailed study in European upland bog studies¹. However, the first data about possible archaeological sites in the bog comes from

¹ Thanks to the Lithuanian Fund for Nature, C.A. Weber's study of Aukštumala upland bog was also published in Lithuanian in 2016 (Weber 2016).



Figure 2. The locations of Aukštumala sites 1, 2 and 3.

the fieldwork by the German researcher A. Bezenberger, who in 1891 conducted small-scale excavations in the eastern part of the bog. Bezenberger concentrated on the prehistoric archaeology of East Prussia, and thanks to his field studies, many stray finds, Neolithic sites and Iron Age burial grounds are known in the area (Tamulynas 1998; Rimantienė 1999). Bezenberger's research interest in Aukštumala bog was stimulated by locals, who called one of the sandy hills in the eastern part of the bog *Pilskalnis*, which means 'hillfort'. It is also important to mention that the hill and its surroundings were also called 'fox hill'. This name was used over the centuries, and is even used today. In 1891, with the support of the local landowner and amateur archaeologists E. Scheu, Bezenberger undertook the first archaeological excavations in the so-called hillfort; however, besides charcoal, large boulders and wood, no archaeological finds, nor any indications of former fortifications or a settlement site, were found (Bezenberger 1892). According to Bezenberger (1892), the hill was approximately 2.5 metres high above the surface of the ground at that time. It is obvious that Weber was

also familiar with the excavation site. During his bog studies, he conducted several cores around the hill, and even test-pitted the hill itself in order to examine its stratigraphy. He later described the upper layers as consisting of various types of peat characteristic of upland bogs, and only in the deeper layers was fluvio-glacial sand reached (Weber 1902). According to his data, the test pit on the hill should have been approximately 1.4 metres deep, and Weber noted that by that time the hill was almost six metres above the level of the Curonian Lagoon. Nevertheless, he did not mention any archaeological finds during his field studies, although he was acquainted with archaeological studies very well. This can be proven by his collaboration with the famous German archaeologist J. Mestorf in the Kiel fjord, where they both studied Stone Age sites, and Weber took samples for palaeobotanical studies (Weber and Mestorf 1904).

Nevertheless, despite the not so successful results of Bezenberger's excavations, the hillfort of Aukštumala upland bog was later referred to several times by other German

researchers (Hollack 1908; Crome 1938), and Lithuanian archaeologists (Tarasenko 1928; Tautavičius 1975), and it is even included in the latest volume of the 'Atlas of Lithuanian Hillforts' (Baubonis et al. 2017, pp. 16–17). The next archaeological visit to the sandy hill is mentioned only in 1972, when archaeologists surveyed the area of the so-called hillfort. However, during their visit, it became clear that in 1968 and 1969, the entire hill was excavated, and the sand was used to prepare the road to the peat extraction area. Nonetheless, in 1973 it was decided to protect the remains of the sandy hill, and the area was included in the list of Lithuanian cultural monuments. A further visit took place in 1984, the protected area was fixed, and finally in 1998 it was included on the list of the protected state heritage. During this visit, the archaeologist B. Dakanis found flints on the surface, and suggested calling the place a possible Stone Age site (Dakanis 2006). In 2004, the area was threatened by the expansion of the peat extraction fields, and a need emerged to conduct rescue excavations. During the archaeological fieldwork, more than 100 square metres were excavated in the sandy part of the area. The excavations were carried out mostly by test pits, and in ten-square-metre areas. Two major concentrations of lithic assemblages were located: one in the southern part of the island (site 1), and one in the north (site 2). The areas were mapped and included on the list of the protected state heritage. Despite the size of the area studied, the lithic assemblage consisted of a small number of flint finds. However, it included several typologically distinctive tools, such as a dihedral burin, scrapers, a perforator and a fragment of a willow leaf-shape arrowhead, which suggest the possible chronology of the sites. It was immediately assumed that the sites belong to the Final Palaeolithic and Mesolithic (Dakanis 2006). It is worth mentioning that during the field studies, no traces of a former hillfort or any fortifications were found.

The material from the 2004 excavations was first published only in 2013. The typological and technological analysis of the lithics did not change the previously assumed chronology (Dakanis 2006); however, it assigned the sites to Final Palaeolithic Ahrensburgian and Middle Mesolithic Neman cultures (Grigaliūnas 2013). New excavations at the Aukštumala Stone Age sites were planned for the summer of 2018, and before it a critical view was shed on the previous interpretation of taxonomy, as a fragment of a point indicated the possible willow leaf-shape arrowhead technology of Swiderian technology, rather than Ahrensburgian. The latest excavations and its material have enabled us to shed a new light on the Aukštumala bog sites, their place in the earliest occupation of the present coast of the east Baltic, and the lithic technology used at the sites.

Materials and methods

Archaeological excavations

A total of 84 square metres was excavated in the fluvio-glacial hill between 2018 and 2019 (Rimkus and Girininkas 2019; 2020). The excavations were concentrated on sites known before; therefore, 40 square metres were excavated at site 1, and ten square metres were excavated at site 2. The rest of the test pits were concentrated in the most promising locations on the sandy hill to locate new sites. The test pits yielded results, and a new Stone Age site, named site 3, was discovered in the middle between site 1 and site 2. An area of 20 square metres was excavated in this location. All the excavation areas were located on the edges of the sandy hill, close to the peat fields. No features were discovered during the excavations; however, that could be due to the small excavation area, or more possibly to the post-depositional disturbances caused by the extensive peat extraction in the adjacent peat fields.

AMS ^{14}C dating

All the excavated areas at Aukštumala are sandy-type open-air sites. This type of prehistoric site usually contains mixed materials, from at least several episodes of occupation. However, all the sites at Aukštumala contained homogenous lithic material, with no technological admixture from later periods. Therefore, organic samples of wood charcoal and charred hazelnut shells found in the same yellowish sand layers as the lithic finds were sampled for Accelerated Mass Spectrometry (AMS) radiocarbon dating. Four organic samples were dated at the Leibniz Laboratory for Radiometric Dating and Stable Isotope Research at Kiel University. The dates were calibrated by OxCal v4.4 (Bronk Ramsey 2017) and the IntCal20 atmospheric curve (Reimer et al. 2020).

Lithic studies

A total of 311 lithic finds were found at Aukštumala sites 1, 2 and 3 during the fieldwork in 2018 and 2019. The finds constituted flint and various metamorphic rocks, including knapping waste and tool manufacturing debris, as well as tools and pieces of them. The typology and technology of the lithic finds discovered at Aukštumala sites 1 and 2 in 2004 have already been discussed by Grigaliūnas (2013). However, after the re-investigation of these lithics, and with the addition of new material from the 2018 and 2019 excavations, some of the previous suggestions should be revised, and a new technological interpretation is presented in this paper. Therefore, we include some of the previously discussed lithics in the analysis.

One of the distinguishing features of Swiderian culture lithic technology is tanged and willow leaf-shaped points, on which basis the lithic complex can be attributed to a specific technology and the implied chronology (e.g. Berg-Hansen et al. 2019a; Serwatka 2018; Winkler 2019). However, the technology of the Swiderians has been examined in recent years, paying much more attention to the methods of core preparation and their exploitation, as well as blade morphology (e.g. Berg-Hansen et al. 2019b; Gruzdž 2018; Pyżewicz et al. 2019; Gudaitienė 2020). During the fieldwork at the Aukštumala sites in 2018 and 2019, only one flint core was found which was completely exhausted. Therefore, it is difficult to speculate about the technique of the preparation of the cores. In 2018 and 2019, and including the 2004 fieldwork, over 50 blades were discovered at all three sites; however, most of them are only fragments. Therefore, this paper focuses only on full or almost completely preserved blade fragments, in which it would be possible to see the morphology of the bulb, the curvature, the negative number, and the remnants of the core platform and other features. In addition to this data, the blades were measured, and their length, width and thickness are given, which supplements the tendencies in blade technology.

In most Stone Age settlements, raw material of other rocks were used in addition to flint, which were often subjected to a similar preparation method as the flint raw material (e.g. Knutsson et al. 2016). This phenomenon is particularly noticeable in regions where flint is not found, or where it occurs in low numbers. Flint artefacts account for 51% of all rock finds at the Stone Age sites of Aukštumala, while finds made of other rocks (including flakes, blades and tools) account for 49%. This is a significant figure, showing society's priority for individual groups of raw materials and substitutes for flint. Therefore, the technology of metamorphic rocks at Aukštumala is also discussed separately. No non-flint finds were reported during the 2004 excavations; therefore, only 2018 and 2019 data is included in this case. The archaeological material from the Aukštumala sites is stored in the Hugo Scheu Museum in Šilutė.

Results

Dating

A stratigraphy typical of sandy-type open-air Stone Age settlements was found at Aukštumala. Due to the natural environmental conditions, the sandy surface of the hill was covered in many places with thin layers of different types of peat, followed by the exposure of yellowish sand, the main cultural layer of the settlements with archaeological finds. Fine whitish fluvio-glacial sand lay under the yellowish sand. The peat on the sandy hill was formed by the annual growth of the upland bog. Such layers, but with much thicker layers of peat, were described in the hill at C.A. Weber's test pit No 8 section in the southern part of the sandy hill (Weber 1902). Unfortunately, however, the 2018 and 2019 excavations in all three sites revealed ploughing marks, which apparently appeared after a search for suitable areas for peat extraction in the 20th century. As has already been mentioned, this led to the excavation of the sandy hill itself, as well as damage to the archaeological layers of the Stone Age sites. During the archaeological research, in order to date the archaeological material, it was decided to take samples of organic finds (charcoal and charred hazelnut shells) found in the sandy layers for AMS ^{14}C dating. Three samples from site 1 were dated, and one sample from site 3. Unfortunately, all the dates go far beyond the existence of Final Palaeolithic Swiderian culture technology, and reach the 3rd millennium cal BC, and the 3rd to 4th and 8th to 10th centuries cal AD (Table 1). We believe these samples have nothing to do with prehistoric human activity in the sandy hill, because traces of the material culture of dated periods at all three Aukštumala sites were not found; the same could be said regarding the older excavations (Dakanis 2006; Rimkus and Girininkas 2019; 2020). Charcoal and burnt hazelnut shells may have been deposited in the layers naturally, during natural fires in the past and post-depositional factors.

Table 1. Dated organic samples from Aukštumala Stone Age sites 1 and 3. The ^{14}C dates were calibrated by OxCal v4.4 (Bronk Ramsey 2017) and the IntCal20 atmospheric curve (Reimer et al. 2020).

Site	Dated material	Lab. No	^{14}C BP	cal BP (95.4%)	cal BC/AD (95.4%)
Site 1	Hazelnut shell	KIA-53320	4144±24	4823-4575	2874-2626 BC
Site 1	Hazelnut shell	KIA-53323	4036±26	4574-4421	2625-2472 BC
Site 1	Charcoal	KIA-53321	1744±21	1706-1571	245-380 AD
Site 3	Charcoal	KIA-53322	1178±22	1179-1001	772-949 AD

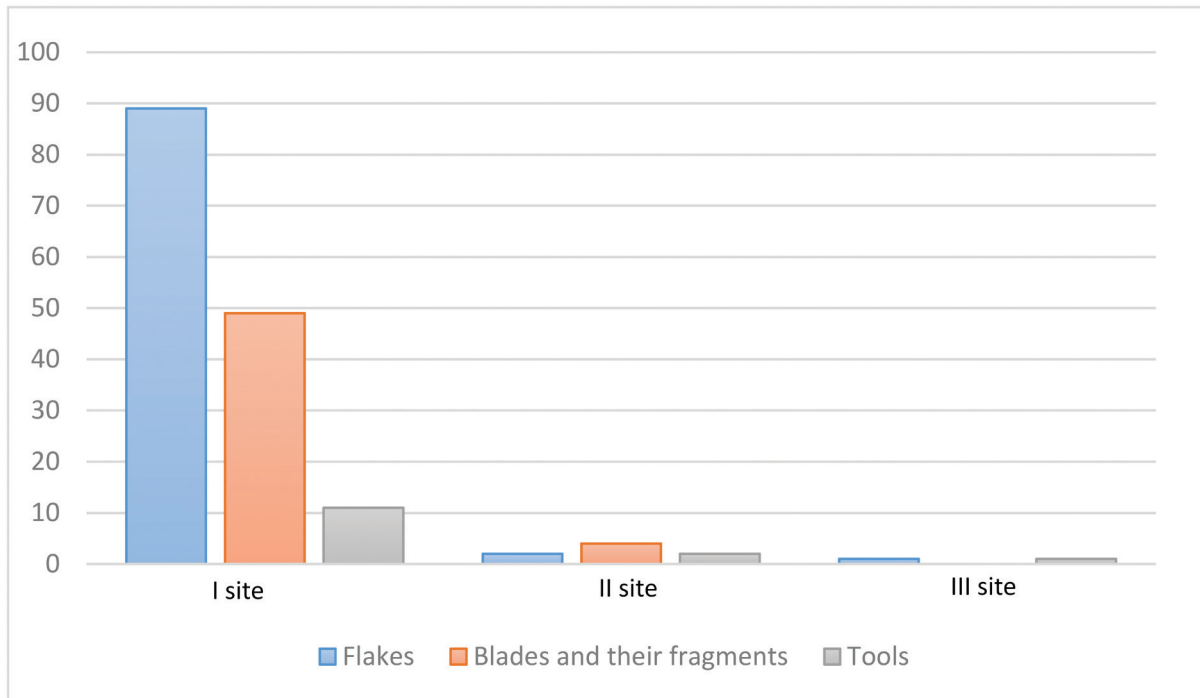


Figure 3. The total number of flint finds at Aukštumala sites 1, 2 and 3, found during the 2004 and 2018–2019 fieldwork (compiled by T. Rimkus).

Flint technology

Most of the lithic finds at Aukštumala sites 1, 2 and 3 are heavily affected by patination and heat. However, the lithics were probably affected by natural fires in former wetlands and peat extraction fields, and not by intentional heat treatment. Light grey cretaceous flint was used at the sites, some with surviving cortex, of which natural outcrops are found in southern Lithuania; however, occasional concentrations are also found in west Lithuania, including the upper reaches of the Nemunas (Baltrūnas et al. 2004; 2007).

Most of the flint finds were discovered at site 1, whereas sites 2 and 3 contained much fewer (Fig. 3). Flakes constituted most of the entire inventory, indicating local tool production. This difference between amounts of flint finds at separate sites can be explained by the difference in excavated territory (see above), and by the density of the finds in a single excavation trench, as the activity at site 1 was probably more intense.

Only 14 typologically distinct finds can be attributed to the tool category (Fig. 4). The most important finds, helping us to determine a preliminary chronology of the sites, are arrowheads, burins, and one opposite platform core. Points were located only at sites 1 and 3. Only two arrowheads are almost fully preserved, whereas the rest are only fragments of proximal parts. However, the flat retouch on the ventral surface of the fragments enables us to state that all the points should be attributed to Final Palaeolithic

Swiderian technology. The first point was manufactured from a small blade, and has a side retouch on the lower part on the ventral surface (Fig. 5.1). At first, it does not seem like a classic Swiderian point; however, if this find is compared with the next point from site 1 (Fig. 5.3), we might notice similarities in the side retouch on the lower part on the ventral surface. All the other points represent classic Swiderian willow leaf-shape point hunting implement technology (Fig. 5.2, 4–5).

The domestic tools consisted of one backed piece, a perforator, scrapers, burins, and a core axe (Fig. 6). Typologically, the burins represent classic Final Palaeolithic technology, with examples of an angle and dihedral burins. They are made from massive blades and flakes. Similar examples of burins are known from other Swiderian sites in Lithuania and Latvia (e.g. Šatavičius 2005; Zagorska 2012).

The core technology at the sites is represented by only one opposite platform core, which is entirely exhausted (Fig. 7.10). However, the blades offer much more information about producing blanks (Fig. 7) (Table 2). Most of the blades are large and fragmented, and their size attributions vary. The largest blades have a length of up to 71 millimetres, whereas the width and thickness are between ten and 20 millimetres, and three and seven millimetres, respectively (Fig. 8). The remains of the core platform and expressed bulb indicate that the blades were probably produced by the direct percussion technique, with a hard or soft hammer, but narrow blades could also indicate the

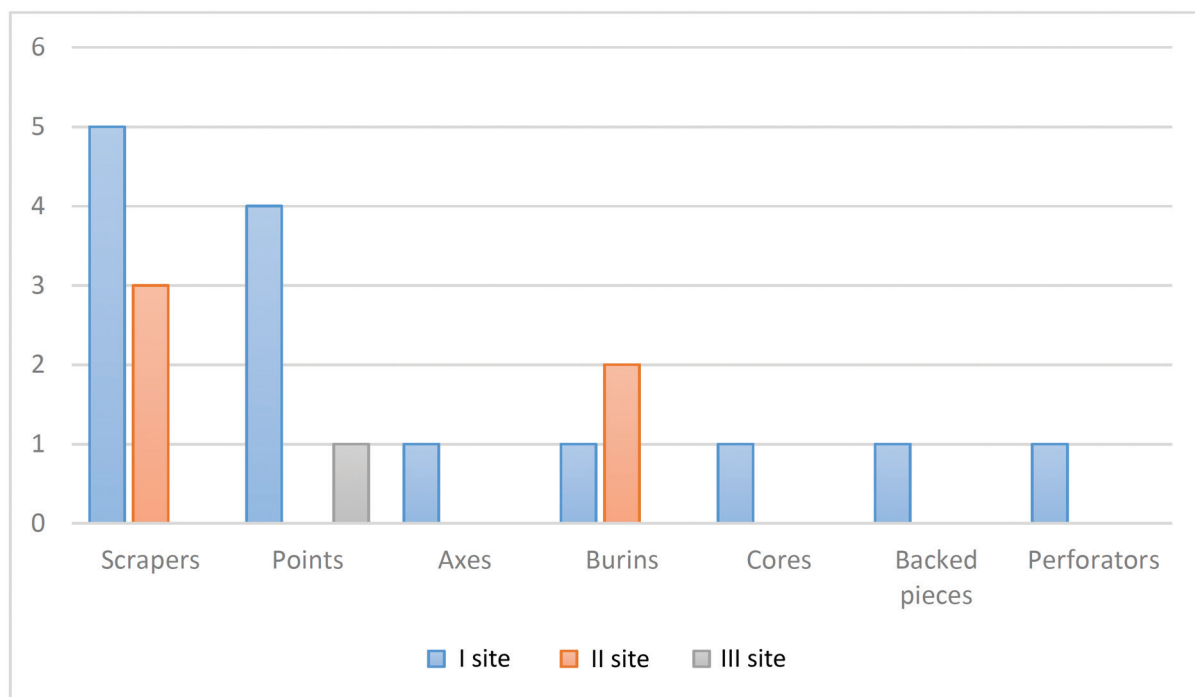


Figure 4. The total number of tools found at Aukštumala sites 1, 2 and 3 during the 2004 and 2018–2019 fieldwork (compiled by T. Rimkus).



Figure 5. Arrowheads found at the Aukštumala sites during the 2004 and 2018–2019 fieldwork: 1–3. site 1; 4. site 3 (photograph by T. Rimkus).

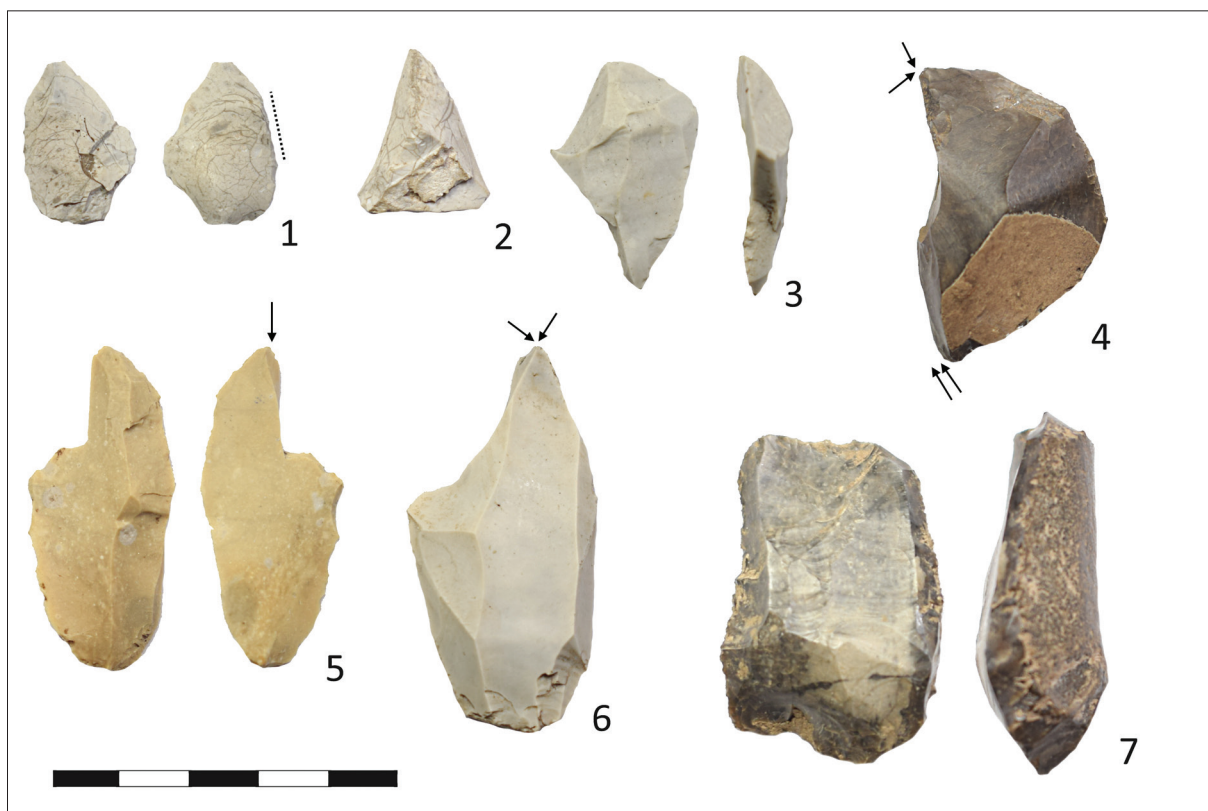


Figure 6. Flint tools found at the Aukštumala sites during the 2004 and 2018–2019 fieldwork: 1. backed piece (sites 1); 2. perforator (site 1); 3. scraper (site 2); 4–6. burins (sites 1 and 2); 7. core axe (site 1) (photograph by T. Rimkus).

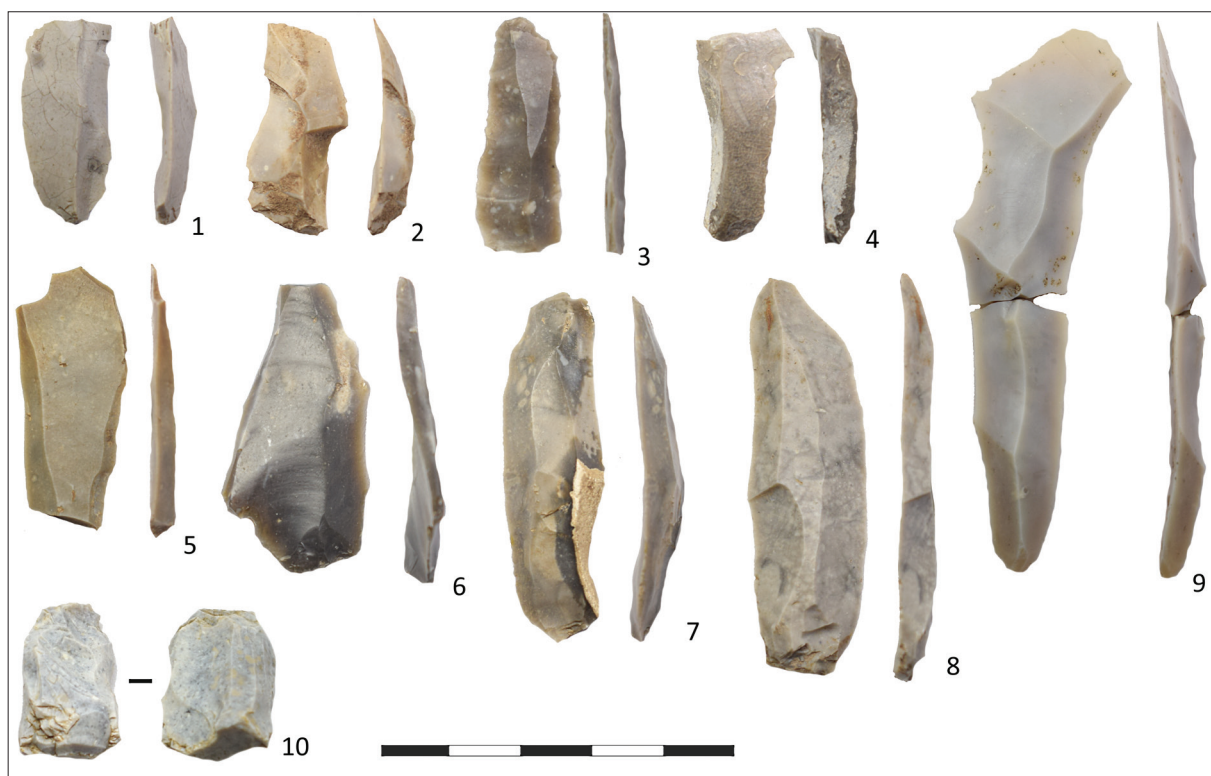


Figure 7. Flint blades (1–9) and the opposite platform core (10) found at Aukštumala sites 1 and 2 during the 2004 and 2018–2019 fieldwork (photograph by T. Rimkus).

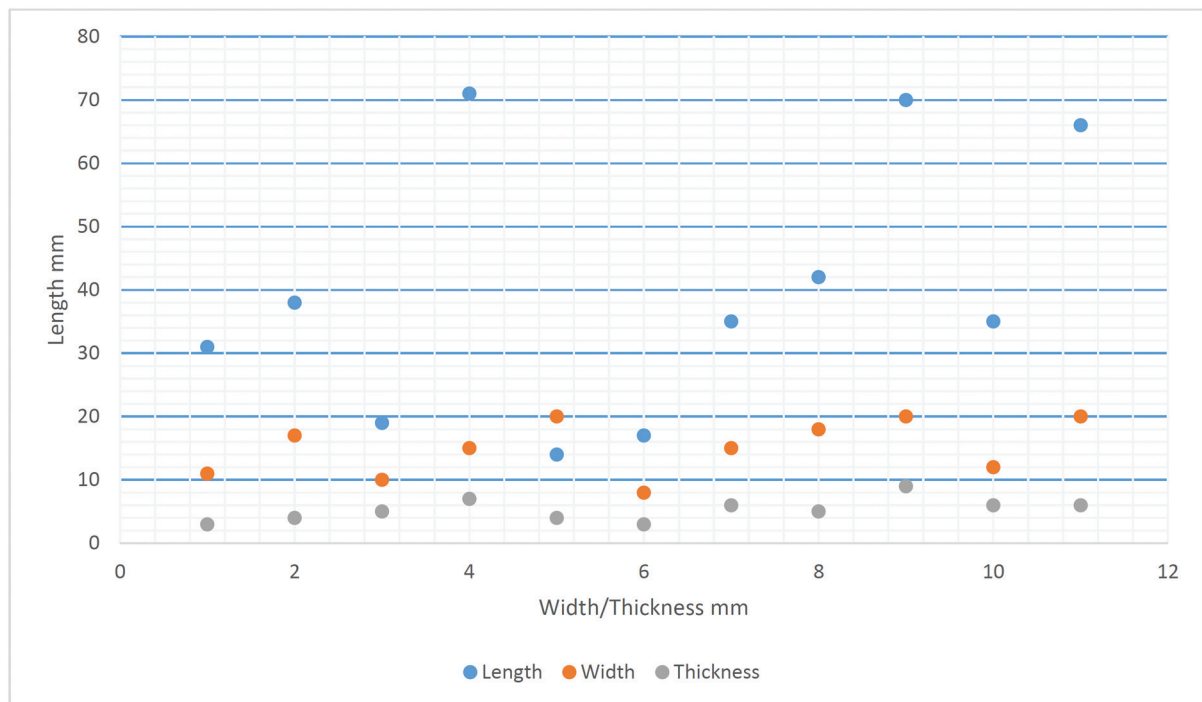


Figure 8. The size attributes of flint blades found at Aukštumala sites 1 and 2 (compiled by T. Rimkus).

Table 2. Flint blade attributes at Aukštumala sites 1 and 2.

Status	Bulb	Core plat- form	Colour	Length mm	Width mm	Thickness mm	Cortex	Other fea- tures
No proximal part	No	No	Dark grey	31	11	3	No	Triangular cross-section
Lack small frag- ment of distal part	Yes	Yes	Dark grey	38	17	4	No	Trapezoid cross-section
No distal part	Barely visible	No	Light grey; burnt	19	10	5	No	Triangular cross-section; curved
Fully preserved	Barely visible	No	Light grey	71	15	7	No	Triangular cross-section; curved
No distal part	Yes	Yes	Dark grey	14	20	4	No	Triangular cross-section
No distal part	No	No	Dark grey; burnt	17	8	3	No	Triangular cross-section
Fully preserved	No	No	Light grey; burnt	35	15	6	No	Curved in the distal part
No proximal part	-	-	Light grey	42	18	5	No	Trapezoid cross-section; straight
Fully preserved	Yes	Yes	Dark grey	70	20	9	White	Curved in the proximal part
Only proximal part	Barely visible	No	Dark grey; burnt	35	12	6	White	Curved in the distal part
Fully preserved	No	Yes	Dark grey	66	20	6	No	Slightly curved in the distal part

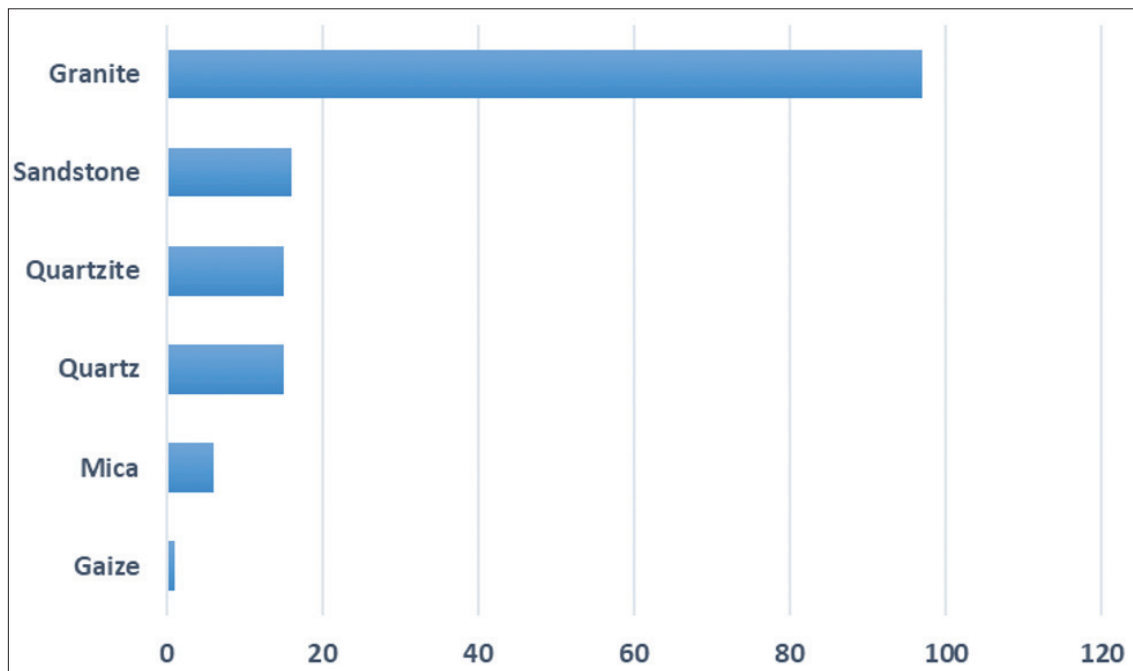


Figure 9. The number of metamorphic rock finds found at Aukštumala sites 1–3 during the 2018–2019 fieldwork (compiled by T. Rimkus).

indirect percussion technique. The negatives on the blades have features of a single or opposite platform cores, which would indicate both core types used at the sites. Figure 7 shows only almost fully preserved blades; however, the rest of the blades are heavily fragmented and burnt. Some of them are much smaller in size, and have more regularity regarding the negatives. They are very similar to some of the regular blades found at Pulli, or post-Swiderian lithic complexes (Ostrauskas 2000). However, no typical Pulli lithic implements were found at Aukštumala, and the technological relationship between the two technologies can only be deduced by several blade fragments, which suggests that more data is required.

Metamorphic rocks

Non-flint raw material and implements are often found in Stone Age sites. Flint technology is described as the main technology used by prehistoric societies; however, metamorphic rocks are often underrated and sometimes poorly represented in Stone Age studies. One of the largest Final Palaeolithic sites in Lithuania that contain non-flint tools and waste is Pasieniai 1, in east Lithuania (Šatavičius 2012). Its lower C layer represents Swiderian technology, and non-flint finds are associated with it. At the Aukštumala Stone Age sites, 150 non-flint finds, including knapping waste, blades and tools, were identified during the 2018 and 2019 fieldwork. The raw materials vary; however, a different kind of granite dominates among all the raw materials. Sandstone, quartzite, quartz, mica and

gaize are other raw materials that were also used for tool production, but in much smaller numbers (Fig. 9).

The identified toolkit made of metamorphic rocks is very small, and only a few characteristic cases were distinguished. One of the most interesting tools was identified as a point made from a granite flake (Fig. 10.1). Its tip was shaped by retouch, which is located on both sides of the point in its distal part. No retouch was found on the ventral part. The technology of this point differs from classic Swiderian arrowheads made from flint; however, this find is missing its proximal part. On the other hand, there is still little data on Swiderian non-flint hunting implement technology in the east Baltic. The next find was identified as the middle part of a granite blade (Fig. 10.2). Both sides have fractures that could have formed during use; therefore, this find most likely represents a cutting tool. However, use-wear examinations should be conducted in order to support this.

The following non-flint finds represent knapping techniques. This category includes granite hammerstone (Fig. 10.3) and single-platform granite cores (Fig. 10.4, 5). The hammerstone is round, and both ends are heavy worn. Negatives from blades and flakes are left on the surface of the cores, whereas their platforms are wide and faceted.

Most of the non-flint finds (79 in total) were found in the area of site 3, where cores, a hammerstone, an arrowhead and a fragment of a blade were found, and are described in this chapter. Only two flint finds were found at this site: an arrowhead typical of Swiderian willow leaf-shape point

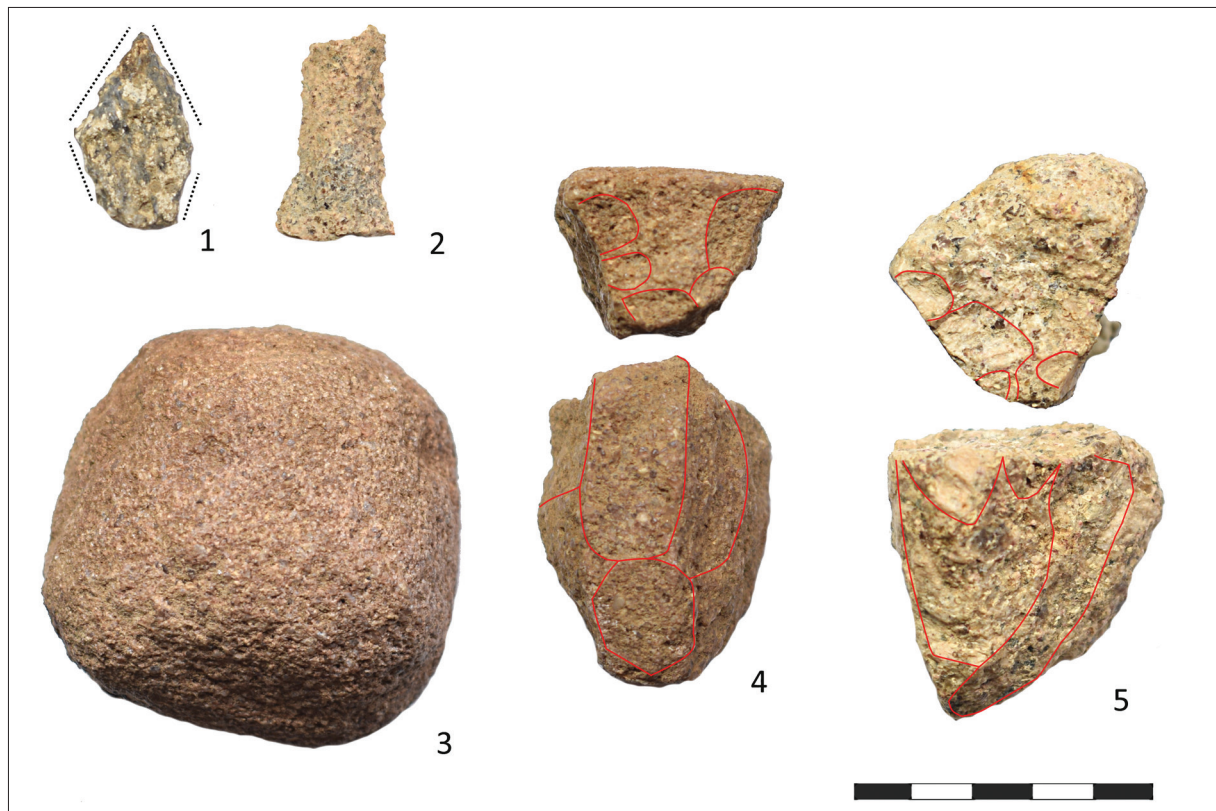


Figure 10. Non-flint tools found at Aukštumala site 3 during the 2018–2019 fieldwork: 1. a piece of an arrowhead; 2. a blade fragment (probably a cutting tool); 3. a hammerstone; 4–5. single platform cores (photograph by T. Rimkus).

technology (Fig. 4.5), and a burin spall. Sites 1 and 2 are dominated by flint finds, while fewer finds from other rocks have been found. Therefore, we would argue that site 3 may have been a site for processing various locally found metamorphic rocks. Among the other finds of non-flint rocks, there was much knapping debris and a few larger stones with signs of knapping and grinding, which does not allow us to suggest clearly their function or how they were used.

Discussion

Until now, only one area is known in the current Lithuanian coastal zone with finds from the Final Palaeolithic: the eastern part of Aukštumala bog. It contains three separate sites, excavated in 2004, and in 2018 and 2019. All the other Stone Age finds on the Lithuanian coast are associated with the end of the Mesolithic or the Neolithic (Piličiauskas 2016; Rimkus 2019). The bone implements found at Kalniškiai (formerly Bachmann manor) close to Klaipėda (Groß 1939, p. 111; Rimantienė 1971, p. 35) cannot be reliably connected with Final Palaeolithic chronology, as dating studies have not so far been performed, and their typological features would be more reminiscent of Mesolithic artefacts (e.g. Zhilin et al. 2014; Zhilin 2020, Fig. 7). In 2021, in the village of Pūzraviečiai, close to the

left bank of the River Ašva, about 20 kilometres northeast of the Aukštumala sites, a single Swiderian-type arrowhead was found. It is made of a slightly curved 86-millimetre-long, 21-millimetre-wide, and nine-millimetre-thick blade, which is covered with a light brownish patina, and is formed from a single platform core (Fig. 11). The arrowhead has a very characteristic tang with a flat retouch on the ventral surface. Therefore, at present, this and the finds of Swiderian culture found at the Aukštumala sites are the only firm evidence of Final Palaeolithic societies on the current Lithuanian coast.

Most of the Swiderian culture arrowheads found at Aukštumala are fragmented; but from the surviving tang elements, it can be assumed that they should be attributed to the category of willow leaf-shape points. This is also confirmed by two fully preserved points (Figs. 4.3 and 5), which do not have distinctly shaped pointed tangs. Comparing the technology of these arrowheads with the find from the village of Pūzraviečiai, there are significant differences in the characterisation of the tangs and the size of the blanks. Therefore, according to the classic periodisation of Swiderian culture (Schild 1975), these points belong to separate groups: with a distinctly shaped pointed tang, dated to the Younger Dryas (the case of Pūzraviečiai); and with willow leaf-shape points, dating from the beginning of the Preboreal (the case of Aukštumala). However,



Figure 11. The Swiderian arrowhead found in the village of Pūzraviečiai (photograph by T. Rimkus)

there is no clear chronological clarity in this division. There is still a lack of data on the chronological differences between these two individual technological stages, and the time when these hunting implement technologies are interchangeable, or possibly used in parallel. Both types of arrowheads are often found together in Swiderian culture sites in Lithuania; therefore, it cannot be ruled out that both types of hunting implement could have been used simultaneously.

It is difficult to estimate in what form the flint raw material was brought to the Aukštumala sites. No nodules were obtained, whereas only one exhausted opposite platform core was found at site 1. The large number of flakes at site 1 would perhaps suggest that flint was worked on the site, and it is possible that cores were completely used or transformed into tools, like, for example, the core axe found at site 1. However, this may apply to site 1, as the other sites do not have a large number of flakes, and mostly completed tools or blades were found there. Therefore, this may suggest that the flint was worked elsewhere, and only later brought to site 2, for example. But, in order to improve this hypothesis, it would be necessary to study a larger area at site 2.

So far, there is little radiocarbon data on the dating of Swiderian culture in the east Baltic region. The present data from the lower C layer of the Kabeliai 2 site in southern Lithuania indicates that Swiderian tanged and willow leaf-shape points, and opposite platform cores, probably belong to the end of the Younger Dryas and the first half

of the Preboreal (Ostrauskas 2002, Table 14). Apart from the Kabeliai 2 site in southern Lithuania, there are few other radiocarbon dates that would resemble Swiderian chronology. However, the recent dating of stray osseous finds from Lithuania and Latvia puts them in the Younger Dryas and the Early Preboreal (Meadows et al. 2014; Rimkus et al. 2019), that is, the chronology of the Swiderians. However, the finds lack context data to relate them firmly to Swiderian bone technology. More data is available from Swiderian sites in Poland, where radiocarbon dating has been applied. The dated animal bones, wood charcoal and pollen from the major sites also indicate the continuity of the techno-complex from the Younger Dryas to the Preboreal (Płonka et al. 2020; Schild 2014, pp. 48–55; Winkler 2019, Table 1). No reliable radiocarbon data has been obtained from the Aukštumala sites (Table 1). Therefore, the settlements can only be dated on a preliminary basis, based on the technological features of the finds and geological data. The Aukštumala upland bog is located in the Nemunas delta region, where geological surveys have been carried out to determine the change in the water level of the Baltic in the Lithuanian coastal region. According to the core and sediment studies published by Damušytė (2011, p. 53), the Aukštumala upland bog was not formed during the Younger Dryas, and most likely the favorable conditions for human habitation at the fluvioglacial hill in the eastern part of the Aukštumala upland bog became available in the Preboreal with the onset of Yoldia Sea water level regression. During the Preboreal, the water level declined, and the area in question must have been on dry land, as the water level fell sharply during the Yoldia Sea stage, and the shoreline was west of the current east Baltic region at -55 to -53.4 m a.s.l. (Gelumauskaitė 2009; Rosentau et al. 2017; Žulkus and Girininkas 2020). Based on the Swiderian culture technology found at Aukštumala, and the existing chronology in adjacent countries (Schild et al., 1999; p. 15; Winkler 2019, Table 1; Płonka et al. 2020, Table 1), we can assume that the sandy hill in the eastern part of Aukštumala could have been inhabited during the Preboreal. It is probable that no larger water basin had formed in the eastern part of Aukštumala at that time², and the hill itself could have existed next to a smaller body of water.

Peat studies from the western part of the Aukštumala wetland reveal that different peat types (wood, wood-sedge, reed) formed here during the emergence of the lowland bog. It was only much later that layers characteristic of upland bogs were formed by *Eriophorum*, *Pinus-Eriophorum*, *Scheuchzeria palustris-Sphagnum* peat, and only in the lat-

² This is evidenced by sediment studies from cores dated to the mid-Holocene, and published by Damušytė (2011, p. 66), as well as by new sediment analyses from wetland areas adjacent to the archaeological sites conducted during the 2018 and 2019 fieldwork, of which the results will be published separately.

est period did *Sphagnum* peat cover the current eastern upland wetland part of the Aukštumala bog, including the sandy hill (Weber 1902; Kunskas 2005).

There is currently little data on the function of individual sites at Aukštumala. It also lacks organic finds and features, but such objects are often poorly preserved in sandy Stone Age sites, especially in Final Palaeolithic contexts. However, based on the abundance of non-flint rock finds at site 3, including hammerstone, cores, and large amounts of knapping debris, we would suggest that this area may have existed as a metamorphic rock-processing site. Granite, quartz, sandstone, gneiss and other rocks, which were suitable for replacing flint raw material, are found locally in the Nemunas delta region and its surroundings. We assume that metamorphic rocks should not always be treated as just a substitute for flint raw material. Such materials were important in the production of other tools, such as hammerstones, net weights, or grinding plates, which prehistoric societies did not produce from flint. The chronological relationship between all three sites also remains unclear. Although willow leaf-shape points and blade technology, large dihedral burins and cores were found in all the sites, their relationship cannot be explained at present due to the lack of reliable data.

Data about subsistence strategies at Aukštumala is also scarce. There is currently only data about reindeer (*Rangifer tarandus*) as the main hunted animal species during the Final Palaeolithic in Lithuania. There is evidence of reindeer skeletal remains in the coastal parts of Lithuania and the Kaliningrad oblast as well, published in the 20th century by Groß (1940), which could belong to the very end of the Late Glacial. This data was later referred to several times in studies on the Lithuanian prehistoric subsistence economy (Daugnora and Girininkas 2005, Fig. 2; Girininkas 2009, Fig. 14; Girininkas and Daugnora 2013, Fig. 1; 2015, Fig. 20). However, the skeletal remains found on the Lithuanian coast are not radiocarbon dated, and there is currently no possibility to compare or associate their age with the relative Swiderian chronology at Aukštumala.

Following the discussion of the radiocarbon data obtained, the table shows that two radiocarbon dates are available for the cal AD period (Table 1). Based on the periodisation of the Iron Age used in Lithuanian archaeology (e.g. Bliujienė 2013, Table 7; Žulkus and Jarockis 2013, p. 10), the dates would fall into the Roman Iron Age (KIA-53321), and the Migration period to the Viking Age (KIA-53322). However, these dates do not in any way confirm the human activity in the eastern part of the Aukštumala bog during later periods, which could be related to the hillfort mentioned in literature (Bezzemberger 1892; Dakanis 2006; Baubonis et al. 2017, pp. 16–17). We will repeat that no archaeological finds have been discovered

from the latter periods; therefore, it should be assumed that the dated charcoal found in the sandy layers occurred naturally, possibly from natural forest fires or other post-depositional factors.

Conclusions

In 2004, Stone Age sites discovered in the eastern part of Aukštumala bog provided the first data on the Final Palaeolithic in the Lithuanian coastal area. In 2018 and 2019, the re-investigation of the Aukštumala sites supplemented this data, and provided new technological and chronological interpretations. Three Final Palaeolithic Swiderian culture sites at Aukštumala with flint and metamorphic rock finds are currently known in the Lithuanian coastal region. One single tanged point of Swiderian culture was also found at the village of Pūzraviečiai, about 20 kilometres northeast of the Aukštumala Stone Age sites. The technique of processing lithic material in the coastal region differed little from finds of Swiderian culture found in the mainland. This could also be due to the lack of local raw materials, as the flint and technological knowledge could have travelled to the western peripheries of Lithuania. The differences are mostly observed only in the amount of processing of other metamorphic rocks, choosing them as a substitute for local flint raw material. The finds found at Aukštumala are assigned to the willow leaf-shape point technological stage, which is dated to the Preboreal period. At present, there is little data on the economies of prehistoric communities in the Aukštumala sites, and the chronological connection between the three separate sites remains unclear. Nevertheless, the research at Aukštumala and its archaeological material have provided the first technological data on Final Palaeolithic communities in the current Lithuanian coastal area, and their possible connection with the environment.

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Abbreviations

Archaeol. Baltica – Archaeologia Baltica

ATL – Archeologiniai tyrinėjimai Lietuvoje metais. Vilnius (since 1967)

Lietuvos Arch. – Lietuvos archeologija. Vilnius (since 1979)

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FINALINIS PALEOLITAS LIETUVOS KRANTO ZONOJE SU TECHNOLOGINIŲ AUKŠTUMALOS AKMENS AMŽIAUS GYVENVIEČIŲ IŠSKYRIMU

TOMAS RIMKUS, ALGIRDAS GIRININKAS

Santrauka

Lietuvos pajūrio zonoje šiuo metu daugiausia tyrinėtose vėlyvuosiu mezolitu ir neolitu datuojamos gyvenvietės ir atskiri šiems laikotarpiams priskiriami radiniai. Finalinis paleolitas iki šiol čia buvo reprezentuojamas tik remiantis Aukštumalos akmens amžiaus I ir II gyvenvietėmis, kurios rastos 2004 m. Publikuota šių tyrimų archeologinė medžiaga ir jos interpretacijos neatskleidė tikrosios šių gyvenviečių technologijos ir chronologijos, todėl 2018–2019 m. Aukštumalos gyvenviečių tyrimai buvo atnaujinti. Gyvenvietės lokalizuojamos Aukštumalos aukštapelkės rytinėje dalyje, fluvioglacialinės kilmės kalvelėje (1 pav.). Per šiuos tyrimų metus ištirtas iš viso 84 m² dydžio plotas. Be jau žinomų gyvenviečių, aptikta dar viena, kuriai suteiktas Aukštumalos akmens amžiaus III gyvenvietės pavadinimas (2 pav.). XIX a. pabaigoje ir XX a. čia lokalizuojamą kalvelę aprašė vokiečių gamtininkas C. A. Weberis, kaip numanomą piliakalnį ją tyrinėjo A. Bezenbergeris, vėliau ją minėjo ir kiti XX ir XXI a. senoviniams įtvirtinimams skirti darbai.

2018–2019 m. tyrinėjimų laikotarpiu iš viso aptikta 311 vnt. įvairių uolienų radinių, kuriuos sudarė dirbiniai, jų ruošiniai ir gamybos atliekos. Titnago žaliavos nuoskalų ir dirbinių daugiausia aptikta I gyvenvietėje (3 pav.), o tarp jų dirbinių kategorijai buvo priskirti gremžtukai, kirviai, antgaliai, perforatoriai, retušuotos nuoskalos, rėžtukai ir skaldytiniai (4 pav.). Daugelis aptiktų antgalių fragmentiški, jie priskiriami finalinio paleolito Svidrų kultūros technologijai ir turi karklo lapo formą (5 pav.). Kiti dirbiniai, naudoti ūkio darbams, taip pat būdingi finalinio paleolito technologijai (6 pav.). Gyvenvietėse rastos skeltės atskeltos nuo vienagalių ir dvigalių skaldytinių, daugelis jų plačios ir ilgos, degusios ir padengtos balkšva patina (7 ir 8 pav.; 2 lentelė). Titnago dirbinių gamybai naudotas Baltijos eratinis titnagas, kurio ištekliai Nemuno deltos regione nėra, o aptinkami tik pavieniai nedideli rieduliai. Netitnaginių uolienų dirbinių ir skaldymo atliekų rasta visose Aukštumalos gyvenvietėse, tačiau jų kiekiu išsiskyrė III gyvenvietė. Tarp žaliavos dominuoja granitas, kvarcas, kvarcitas, smiltainis, žerutis ir opoka (9 pav.). Šių uolienų dirbinių grupei buvo priskirtas antgalis, skeltės fragmentas, muštukas ir skaldytiniai, taip pat neidentifikuotos paskirties apskaldyti stambesni rieduliai (10 pav.).

Šiuo metu Lietuvos pajūrio zonoje žinomos trys finalinio paleolito gyvenvietės, aptiktos Aukštumaloje, jos priskiriamos Svidrų kultūrai. 2021 m. Pūzraviečių k. aptiktas pavienis šios kultūros technologijai būdingas antgalis su charakteringa įkote (11 pav.). Tai šiuo metu vieninteliai finalinio paleolito technologijos įrodymai dabartinėje Lietuvos kranto zonoje.

Aukštumalos akmens amžiaus gyvenvietės yra smėlinio tipo gyvenvietės, kuriose aptikta medžiaga dažnai būna maišyta, be organikos radinių. Technologiniu požiūriu Aukštumaloje aptikti radiniai yra homogeniški, ir priemaišų iš kitų laikotarpių neaptikta. Smėlio sluoksniuose rasti ir datuoti degę lazdyno riešutų fragmentai bei medžio angliukai neatskleidžia realaus gyvenviečių egzistavimo laiko (1 lentelė). Remiantis Baltijos jūros vandens lygio kaita ir Aukštumalos aukštapelkės raida, gyvenvietės turėjo egzistuoti preborealio pradžioje.

Kol kas trūksta duomenų apie atskirų Aukštumalos akmens amžiaus gyvenviečių chronologinį ryšį ir funkciją. Tam reikalingi papildomi tyrimai. Tačiau darome prielaidą, kad III gyvenvietė galėjo būti skirta netitnaginėms uolienoms apdirbti. Prielaida daroma šioje vietovėje aptikus didelį kiekį nuoskalų, taip pat skaldytinių ir muštukų (iš viso 79 vnt.).