

## Hunter-Gatherer Bone and Antler Implements in Lithuanian Coastal Area: Recent Studies in Chronology, Technology and Decoration Patterns\*

Mednieku–vācēju kaula un raga darbarīki Lietuvas  
teritorijas piekrastē: jaunākie pētījumi hronoloģijā,  
tehnoloģijās un dekorēšanas veidos

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Stone Age bone and antler implements are an essential study material, as they contain important information on hunter-gatherer tool making technology, dynamics in hunted animal species, choices of raw materials and much more. Some specimens have unique engravings and incisions on their surface, enabling the studies of the decoration patterns. Moreover, organic finds can be dated by radiocarbon, allowing to approach osseous technologies from a chronological aspect. The Early and Middle Holocene sites containing hunter-gatherer bone and antler implements in Lithuanian coastal area have been discovered and investigated in the last century. The Middle Holocene osseous collection, however, has been studied only recently, shedding light on the manufacturing techniques and chronology of the tools. This paper summarizes the combination of technological, radiocarbon and decoration data of osseous implements found in Palanga and Smeltė sites, as well as the single finds (ca. 6000–3800 cal BC) discovered along the coast of Lithuania.

**Keywords:** Mesolithic, hunter-gatherers, osseous technology, decoration patterns, AMS <sup>14</sup>C dating, coastal Lithuania.

\* This research was supported by the grant (No. 09.3.3-LMT-K-712-01-0171) from the Research Council of Lithuania. The author would like to express his gratitude to Kretinga Museum, History Museum of Lithuania Minor, and Saulius Bučas for the access to study the archaeological material. Further acknowledgment is dedicated to the reviewer, whose comments improved the final version of this paper.

Akmens laikmeta kaula un raga darbariku izpēte ir būtiska, jo tie satur informāciju par mednieku–vācēju darbariku izgatavošanas tehnoloģijām, medijamo dzīvnieku sugu dinamiku, materiāla izvēli u. c. Uz dažu rīku virsmas ir atrodami unikāli gravējumi un iegriezumi, kas ļauj pētīt dekorēšanas tendences. Turklāt organiskos materiālus ir iespējams datēt ar radioaktīvā oglekļa metodi, tādējādi kaula un raga rīku tehnoloģiskie aspekti ir pētāmi arī hronoloģijas perspektīvā. Pagājušajā gadsimtā Lietuvas piekrastes teritorijā tika atklāti un izpētīti agrā un vidējā holocēna arheoloģiskie pieminekļi, kuros atrasti mednieku–vācēju kaula un raga darbariki. Savukārt vidējā holocēna kaula un raga darbariku kolekcija ir izpētīta pēdējā gada laikā, un tā sniedz jaunus datus par darbariku izgatavošanas tehnikām un hronoloģiju. Šajā pētījumā apkopoti Palangā un Smeltē atrasto kaula un raga darbariku tehnoloģiskie aspekti, radioaktīvā oglekļa datēšanas un dekorēšanas paņēmieni (daļa darbariku ir savrupatradumi Lietuvas piekrastes teritorijā ap 6000.–3800. g. p. m. ē.

**Atslēgvārdi:** mezolīts, mednieki–vācēji, kaula un raga tehnoloģijas, dekorēšanas veidi, AMS <sup>14</sup>C datēšana.

## Introduction

Lithuanian coastal area underwent numerous landscape changes in the past ca. 12 000 years.<sup>1</sup> It is primarily related to the shoreline displacement and drastic changes in the Baltic Sea water level. The data from submerged landscapes indicate that during ca. 9700–7000 cal BC the coast was located three to six kilometres in the western direction, whereas during the later Littorina Sea stages the shoreline became much more comparable to the present one.<sup>2</sup> This also has influenced the development of coastal lakes and river deltas,<sup>3</sup> therefore, environmental changes in the Early-Middle Holocene had

a considerable impact on the ecosystems and the habitation choices for coastal hunter-gatherer societies.

The current coast of Lithuania continues about 90 kilometres in north–south direction. The coast is characterised by flooded plains, major coastal rivers, and peat bogs. The river banks and the shores of the former lakes are among the major landscape objects where the main locations of hunter-gatherer sites are situated. Compared to the abundant inland sites' archaeological materials, hunter-gatherer lithic technology in the coastal sites is still poorly understood due the scarcity of findings and the absence of good quality local raw material. However, the sites located in the coastal Lithuania offer a unique insight into hunter-gatherer osseous industry.

The complex of Šventoji sites (the northern part of Lithuanian coast) contain excellent preservation conditions for various organic artefacts, including the ones made of bone and antler. These materials have been extensively published and explored from various points of view, starting from a typological classification, and continuing into interdisciplinary studies, by looking into the ways they were made, their decoration techniques, chronology, and function.<sup>4</sup> The majority of the organic finds from Šventoji date to the 4<sup>th</sup> and 3<sup>rd</sup> millennia cal BC,<sup>5</sup> however, only scarce data about hunter-gatherer osseous industry can be obtained from the earlier Stone Age periods. Therefore, this leaves a vast gap concerning the data of Final Palaeolithic and Mesolithic bone and antler tool types in the coastal part of Lithuania.

The recent revision of old collections and new single finds in Lithuanian coastal area revealed more data about the Middle Holocene hunter-gatherer osseous tools technology in the period between 6000–3800 cal BC. The implements from Palanga and Smeltė sites and a single find from

Melnragė II beach were extensively studied by the AMS  $^{14}\text{C}$ , the single finds from old eastern Prussia collections were re-interpreted, although they still need to be investigated directly by modern research methods. The finds were analysed by studying their technological assessments, raw materials, AMS  $^{14}\text{C}$  dating and decoration patterns. In this paper, all the available Middle Holocene osseous tools data from Palanga and Smeltė sites, and single

finds<sup>6</sup> from the Lithuanian coastal zone are summarized and evaluated.

## Material

### Sites and single find locations

Bone and antler tools from Palanga and Smeltė sites, Melnragė II beach and Kalniškiai<sup>7</sup> locations were investigated (Fig. 1).



Fig. 1. Locations of the main Stone Age sites noted in the text: 1. Šventoji; 2. Palanga; 3. Melnragė II; 4. Kalniškiai (former Bachmann manor); 5. Smeltė; 6. Sise; 7. Šarnelė; 8. Žemaitiškė 2.

1. att. Tekstā minēto akmens laikmeta apmetņu lokācija kartē: 1. Šventoja; 2. Palanga; 3. Melnraģe II; 4. Kalnišķi (bijusī Bahmana muiža); 5. Smelte; 6. Sise; 7. Šarnele; 8. Žemaitišķe 2.

Palanga site is the only one in this list that was excavated by archaeologists (in 1958).<sup>8</sup> It is located in Palanga city centre, on the bank of Rąžė River. It was a wetland site, offering good conditions for organic preservation, therefore animal and, possibly, one human's bones, bone and antler tools and amber were found during the excavations. Most of the animal remains and one human bone were lost, although their species identification was conducted after the excavation and the data were included into excavation report. Unfortunately, these bones are considered to be missing, therefore, there is no possibility to re-investigate the osseous assemblage from the site and confirm all the previous conclusions by modern research methods. One grounded stone axe was also found at the site, however, the attribution of previously published flint blades and two more grounded stone tools<sup>9</sup> to this assemblage is questionable, as there is no data in the excavation report and the first initial publication by Pranas Kulikauskas in 1959 that would support the presence of these findings at the site. The amber finds which have been mentioned in the 1959 publication, are also absent from the museum storage. Therefore, only 12 bone and antler implements are available from Palanga site.<sup>10</sup> According to the tool types, the site was considered as belonging to the Late Mesolithic and Late Neolithic/Early Bronze Age.<sup>11</sup> However, recent radiocarbon studies demonstrated that at least the bone and antler tools from the site belong to the second half of the 5<sup>th</sup> – the beginning of the 4<sup>th</sup> millennium cal BC, and one modern date, probably from technogenic layer, is also present.<sup>12</sup> The site is considered to have been destroyed by modern construction works and straightening of the Rąžė River.

The former Smeltė site is another location with preserved organic finds, located

in the southern part of Klaipėda city harbour. This location has not been excavated by archaeologists. During the development of city harbour in 1970–1973, the nearby wetlands close to the mouth of Smeltalė River were excavated. The workers uncovered bone, antler and amber finds, and delivered them to the Klaipėda Museum in 1974.<sup>13</sup>

Subsequently, the finds were only mentioned in the literature as a reference collection on several occasions,<sup>14</sup> and only in 2015 the first extensive research thereof with the first radiocarbon dates was published,<sup>15</sup> and in 2021 more dating results were added.<sup>16</sup> Eight amber ornaments and preforms, as well as 10 osseous implements and two tool manufacturing waste items were identified in this collection.<sup>17</sup> However, the exact location of the area where osseous and amber finds have been excavated is not known, therefore it is not clear whether the finds have been found in the same location or not. Thus, the collection of finds from Smeltė must be considered as single finds. The find chronology spans between 6<sup>th</sup> to 3<sup>rd</sup> millennium cal BC. The Smeltė site is considered as destroyed by harbour construction works.

Separately from the above mentioned Smeltė collection, another single red deer antler tool from Smeltalė River mouth was found in 1970 and delivered to the Klaipėda Museum.<sup>18</sup>

Another single find was located in 2015, washed up in the Melnragė II beach, north of Klaipėda city. The find was identified as a red deer antler T-shape axe,<sup>19</sup> – the find type that was also found in Palanga site. The find is held in private collection.

The last location represented in this paper is Kalniškiai. It is in the eastern outskirts of Klaipėda city, on the left bank of Danė River. Five osseous points were found here in the 19<sup>th</sup> century during marl extraction, and published by the famous researcher of

eastern Prussia prehistory Hugo Groß.<sup>20</sup> In 1865, the finds were transferred to the Museum of Prehistory and Early History in Berlin, however, in 1945 four of these finds along with many other museum collections were moved to the State Hermitage Museum in St. Petersburg. Nowadays, only one of the original osseous points remain in Berlin.<sup>21</sup> The current paper offers only a re-interpretation on the basis of similar studied and published material, as these findings have not been studied in the museums.

### Osseous material

31 osseous finds in total from five locations in Lithuanian coastal area are presented in this paper. The implements are made from large terrestrial animal antlers and bones, and can be classified into different types and functions (Table 1). However, this list is dominated by heavy duty tools (e.g., axes, adzes, and sleeves), whereas the hunting tool category consists only of three different types of bone points from Palanga site.

Table 1

Hunter-gatherer osseous tools and waste pieces from Lithuanian coastal area studied in this paper.

1. tabula

Pētījumā analizētie mednieku–vācēju kaula priekšmeti un to pārpalikumi no Lietuvas piekrastes reģiona.

Site/Location <sup>22</sup>	Raw material <sup>23</sup>	Type	Context	Museum ID <sup>24</sup>
Kalniškiai (Bachmann manor)	<i>Rangifer tarandus</i> antler	Spindle-shaped plain point	Single	II 5643
Kalniškiai (Bachmann manor)	<i>Rangifer tarandus</i> antler	Paddle-shaped plain point	Single	II 5642
Kalniškiai (Bachmann manor)	<i>Rangifer tarandus</i> antler	Paddle-shaped plain point	Single	II 5644
Kalniškiai (Bachmann manor)	<i>Rangifer tarandus</i> antler	Paddle-shaped plain point	Single	II 5641
Kalniškiai (Bachmann manor)	<i>Rangifer tarandus</i> bone	Paddle-shaped plain point	Single	II 5645
Menragė II	<i>Cervus elaphus</i> antler	T-shape axe	Single	-
Palanga	Bone	Biconical point	Settlement layer	A1:10
Palanga	Bone	Conical point	Settlement layer	A1:11
Palanga	<i>Cervus elaphus</i> bone	Adze	Settlement layer	A1:14
Palanga	<i>Cervus elaphus</i> bone	Adze	Settlement layer	A1:7
Palanga	<i>Cervus elaphus</i> antler	Axe/adze	Settlement layer	A1:3
Palanga	Bone	Plain point	Settlement layer	A1:9
Palanga	<i>Cervus elaphus</i> bone	Adze	Settlement layer	A1:5
Palanga	Antler	Sawing tool (?)	Settlement layer	A1:13
Palanga	<i>Cervus elaphus</i> bone	Chisel	Settlement layer	A1:8

Site/Location <sup>22</sup>	Raw material <sup>23</sup>	Type	Context	Museum ID <sup>24</sup>
Palanga	<i>Cervus elaphus</i> antler	Axe/adze	Settlement layer	A1:4
Palanga	<i>Cervus elaphus</i> antler	Axe/adze	Settlement layer	A1:2
Palanga	<i>Cervus elaphus</i> antler	T-shape axe	Settlement layer	A1:6
Smeltė (1970)	<i>Cervus elaphus</i> antler	Axe	Single	6596
Smeltė (1974)	Bone	Perforator	Single	9148
Smeltė (1974)	<i>Bos primigenius</i> / <i>Bison bonasus</i> bone	Adze	Single	9146
Smeltė (1974)	<i>Cervus elaphus</i> antler	Adze	Single	9149
Smeltė (1974)	<i>Cervus elaphus</i> antler	Sleeve	Single	9152
Smeltė (1974)	<i>Cervus elaphus</i> antler	Axe	Single	9153
Smeltė (1974)	<i>Cervus elaphus</i> antler	Adze	Single	9141
Smeltė (1974)	<i>Cervus elaphus</i> antler	Sleeve	Single	9151
Smeltė (1974)	<i>Cervus elaphus</i> Antler tine	Waste piece	Single	9143
Smeltė (1974)	<i>Cervus elaphus</i> antler	Pressure tool	Single	9142
Smeltė (1974)	<i>Cervus elaphus</i> Antler tine	Waste piece	Single	9145
Smeltė (1974)	<i>Alces alces</i> antler	Axe	Single	9150
Smeltė (1974)	<i>Alces alces</i> antler	Axe	Single	9147

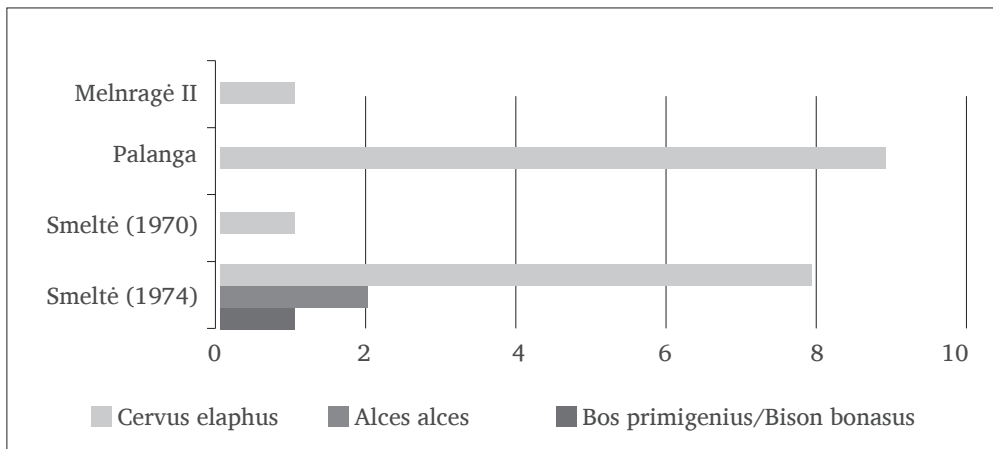


Fig. 2. Animal taxa identified among osseous implements.

Compiled by Tomas Rimkus.

2. att. Identificētie dzīvnieku taksoni no kaula rīkiem.

Apkopojis Toms Rimkus.

## Results

### Raw material

According to the identified taxa from the studied finds,<sup>25</sup> large terrestrial animal bones and antlers were used for manufacturing of tools (Fig. 2).

The organic tools from Palanga and Smeltė sites are slightly more diverse in animal species compared to the rest of the single finds, and indicate at least three animal species. Both antler axes from Melnragė II and Smeltė (1970) are made of red deer antlers. Likewise, this type of raw material and animal species prevails in Palanga (9 objects) and Smeltė (8 objects) collections, however, the use of red deer bones for adzes and axes manufacturing have also been identified at Palanga (3 objects). Two more axes at Smeltė site are manufactured from elk antlers, whereas one bone adze belongs to *Bos primigenius* or *Bison bonasus*. Although the recent studies in hunter-gatherer subsistence economy in the eastern Baltic proved that aquatic resources formed a large part of hunter-gatherers' daily nourishment,<sup>26</sup> the find assemblages discussed in this paper prove that red deer and other cervids remained an important hunting object, even for the societies inhabiting the areas near the coast. Not only their meat but also raw materials (antler, bones, fur) represented a vital resource.<sup>27</sup>

The raw material for osseous points from Kalniškiai, when considering its past interpretation by H. Groß,<sup>28</sup> belong to the reindeer bone (1 object) and antlers (4 objects). According to the radiocarbon data, reindeer roamed the territory of Lithuania from the late Bølling/early Allerød until the early Preboreal.<sup>29</sup> However, the types and morphology of osseous points from Kalniškiai do not quite comply with the known Final Palaeolithic tool making tradition in northern Europe,<sup>30</sup>

whereas in the eastern Baltic there is no data concerning the use of the reindeer skeletal remains for the tool manufacturing in the Mesolithic societies. Therefore, this former interpretation will be discussed in this paper (see the discussion chapter), as the interpretation of this material has also raised questions in other published works.

### Tool types

The three main different antler tool type categories can be distinguished, as follows: axes, adzes, and sleeves. Most of them are made from the proximal part of the antler, removing the brow and bez tines and then diagonally cutting its main beam. The areas of the removed tines, as well as the burr, were further processed by smoothing, thus removing sharp edge remains from cutting or breaking. The working blades were formed through an oblique cut at the main beam, which also were further treated by polishing. The perforations for the shaft were also shaped. Such tool production elements can be seen in the Smeltė (1970 and 1974) collection of finds (Fig. 3: 3–7, 11–12; Fig. 5: 1).

Other objects made of red deer antler were found in Palanga site. They are made from the main beam parts of antlers with no tines (Fig. 4: 5, 10). One of them is manufactured from split antler (Fig. 4: 11). Their lower parts are also cut diagonally and polished in order to shape a working blade.

One of the objects found in Palanga site is made of antler's plate (Fig. 4: 8). It is difficult to tell which animal's antler was used to make this tool. The workpiece was carefully polished to form a sharp blade. It is therefore likely that this object could have been used as a cutting tool.

Two T-shaped antler axes were found in Palanga site and Melnragė II (Fig. 4: 12; Fig. 5: 2). These are classical hunter-gatherer tools typical to most European

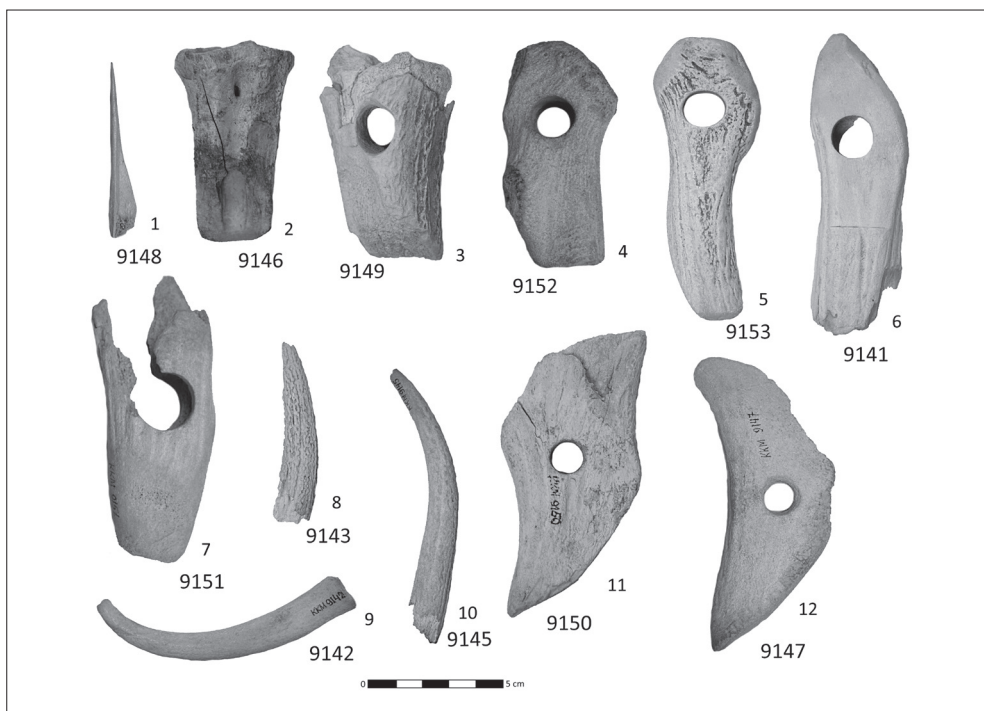


Fig. 3. Osseous implements from Smeltė (1974) site: 1. Bone awl; 2. Bone adze; 3. Antler adze; 4. Antler sleeve; 5. Antler axe; 6. Antler adze; 7. Antler sleeve; 8. Antler tine (waste piece); 9. Antler pressure flake tool; 10. Antler tine (waste piece); 11–12. Antler axes. The numbers of finds correspond to the museum ID numbers in Tables 1 and 2.

Photo: Tomas Rimkus.

3. att. Kaula un raga riki no Smeltes (1974) apmetnes: 1. Kaula ilens; 2. Kaula cėrte; 3. Raga cėrte; 4. Raga uzmava; 5. Raga cirvis; 6. Raga cėrte; 7. Raga uzmava; 8. Raga tapa (pārpalikums); 9. No raga izgatavots atspiešanas riks; 10. Raga tapa (pārpalikums); 11.–12. Raga cirvji. Atradumu numuri sakrīt ar muzeja ID numuriem 1. un 2. tabulā.

Foto: Toms Rimkus.

regions, and their technology in the Baltic region mainly covers the 6<sup>th</sup> and 5<sup>th</sup> millennium cal BC.<sup>31</sup> These types of implements are made of red deer antlers' main beam by removing trez tine and shaping a perforation for the shaft through it. A working blade is usually formed in the proximal part of the main beam.

Red deer antler was also used as a raw material for household activities. For example, during the Mesolithic antler tines

were shaped into punches or retouchers for lithics processing.<sup>32</sup> Three antler tines are available in Smeltė finds collections. One of them has clear traces of modification on its basis and the pointy end (Fig. 3: 9). Therefore, this leaves little doubt that this find should be regarded as a tool. However, the remaining two tines do not show similar marks of processing. Their breaking points have not been worked and there are no clearly visible wear traces on



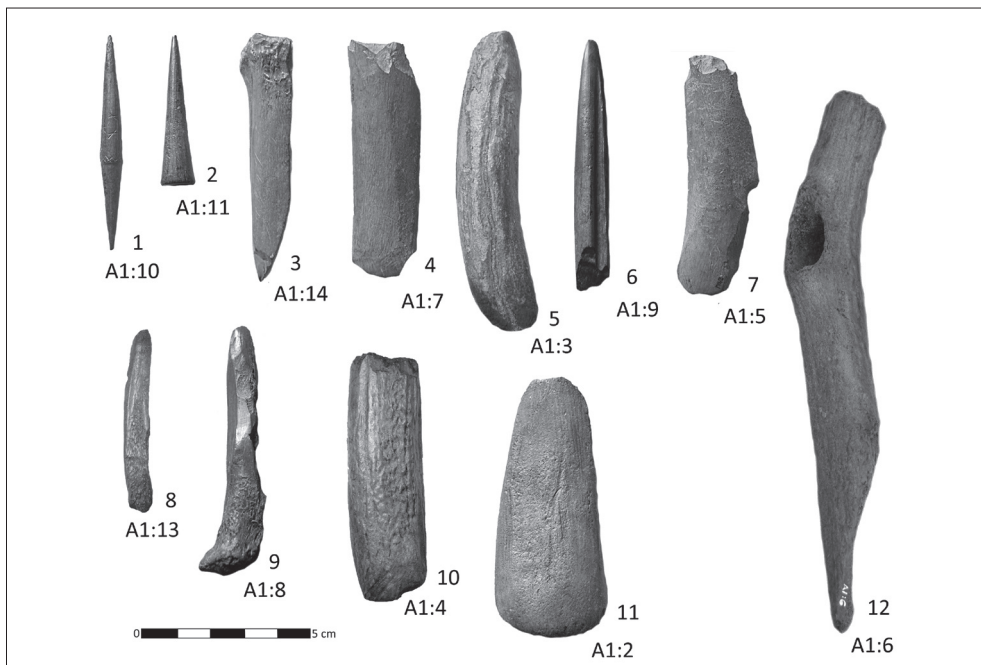


Fig 4. Osseous implements from Palanga site: 1. Biconical bone point; 2. Conical bone point; 3–4. Bone adzes; 5. Antler axe/adze; 6. Plain bone point; 7. Bone adze; 8. Antler sawing tool; 9. Bone chisel; 10. Antler axe/adze; 11. Bone axe/adze; 12. T-shape antler axe. The numbers of finds correspond to the museum ID numbers in Tables 1 and 2.

Photo: Tomas Rimkus.

4. att. Kaula un raga rīki no Palangas apmetnes: 1. Bikoniskais kaula bultas gals; 2. Koniskais kaula bultas gals; 3.–4. Kaula cērtes; 5. Raga cirvis/cērtē; 6. Kaula bultas gals; 7. Kaula cērtē; 8. Raga zāģveida priekšmets; 9. Kaula kalts; 10. Raga cirvis/cērtē; 11. Raga cirvis/cērtē; 12. T formas raga cirvis. Atradumu numuri sakrīt ar muzeja ID numuriem 1. un 2. tabulā.

Foto: Toms Rimkus.

their points (Fig. 3: 8, 10). Yet, the microscopical investigation of these finds has not been conducted, therefore, these remarks about their potential use or consideration as a waste piece should be examined in future studies.

There are much fewer implements made of elk antler compared to the ones made of red deer antler. Only two specimens are found in Smeltē (1974) collection. These are two double-ended axes with the perforations for shafts. One of them is almost

fully preserved, showing only minor breakages (Fig. 3: 11), whereas the other lacks one of the ends (Fig. 3: 12).

In Smeltē site, there are fewer tools made of bone than of antler raw material. Two bone artefacts can be identified here – an awl (Fig. 3: 1) and an adze (Fig. 3: 2). While the animal species of bone awl is not determined, an adze is made either of *Bos primigenius* or *Bison bonasus* metapodial. This is a classic heavy duty tool type known in other regions in northern Europe,

dated to the Mesolithic.<sup>33</sup> According to the recent data, the earliest *Bos primigenius* remains are known from south eastern Lithuania and date to the 8749–8556 cal BC, whereas their evidence in the early Atlantic is also known from southwestern and western Lithuania.<sup>34</sup>

Palanga site finds include seven tools made of bone. Three of them have different types of points: a conical point with a perforation in its proximal end for the shaft (Fig. 4: 2), a fully preserved biconical point (Fig. 4: 1), and a plain point with a missing proximal end (Fig. 4: 6). Biconical points were quite common in the territory of Lithuania during the Middle and Late Holocene. For instance, their larger collections in inland sites are known from Šarnelė<sup>35</sup> and Žemaitiškė 2<sup>36</sup> sites, whereas the latest AMS <sup>14</sup>C analysis of one similar, but with a much slenderer tang, point

from Kaltanėnai belong to the 3516–3360 cal BC.<sup>37</sup> Parallels for conical type bone points from Palanga site are not common in the territory of Lithuania, while analogies for plain points can be found in many Late Holocene sites. However, the plain point from Palanga is missing its lower part, therefore, it is difficult to speculate as to its former final shape.

The rest of the bone finds from Palanga are made of split long bones (Fig. 4: 3–4, 7, 9). Their surface contains many cutmarks, traces of polishing and splitting. All of them have shaped working blades in the proximal ends.

The five osseous implements from Kalniškiai represent two different point types: spindle and paddle-shaped points. Spindle-shaped point is 28.2 cm long with narrow 2.7 cm long pointy tang (Fig. 6: a).<sup>38</sup> The length of the four paddle-shaped



Fig. 5. Osseous finds from Smeltė (1970) and Melnragė II: 1. Smeltė antler axe; 2. Melnragė II T-shape antler axe.

Photos: Tomas Rimkus and Saulius Bučas.

5. att. Raga atradumi no Smeltes (1970) un Melnraģes II: 1. Raga cirvis no Smeltes; 2. T formas raga cirvis no Melnraģes II.

Foto: Toms Rimkus un Sauļus Bučas.

points varies between 25.6 to 13.7 cm (Fig. 6: b–e). Their tang length also varies, however, as seen in Figure 6, the lower parts of their tangs have been flattened

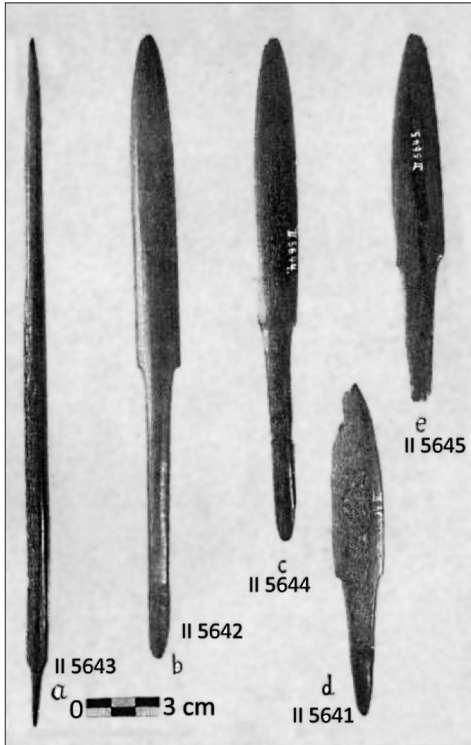


Fig. 6. Spindle and paddle-shaped osseous points from Kalniškiai (former Bachmann manor). ID numbers of original finds' added by the author. They correspond to the museum ID numbers in Table 1.

Figure originally published in: HUGO GROSS. Die bedeutung des renntierjägerfundes von Bachmann, Kr. Memel. In: *Alt Preußen* 3, 1939, No. 4, pp. 65–67.

6. att. Vārpstas un aira formas kaulu bultu gali no Kalnišķiem (bijusī Bahmana muiža). Atradumu ID numurus pievienojis raksta autors.

Orīginālais attēls publicēts: HUGO GROSS. Die bedeutung des renntierjägerfundes von Bachmann, Kr. Memel. In: *Alt Preußen* 3, 1939, No. 4, pp. 65–67.

in order to fit them into the shafts. Such long blanks for tool production must have been taken from a large ungulate's long bones, however, there are different views considering the raw material types used for the production of these finds.<sup>39</sup> Similar to Kalniškiai, a spindle-shaped point with pointy tang was found in Pumpėnai (Ištras River) in northern Lithuania,<sup>40</sup> while the paddle-shaped type points are quite rare and no fully preserved analogous finds are known in Lithuania.

### Decoration

The hunter-gatherer osseous implements in northern Europe commonly are decorated with various patterns.<sup>41</sup> Although usually it is difficult to comprehend their true meaning, the shaped patterns and particular scenes give valuable data for interpretation of worldviews and rituals of the prehistoric societies. In the discussed osseous implement collections from coastal Lithuania, only three finds can be ascribed to the category of tools with decoration. The decorations mostly resemble geometric compositions, however, one example shows significant differences in decoration techniques compared to the framework of geometric patterns.

Osseous collection from Palanga site contain one decorated object – the biconical bone point. The point has a smooth surface with distinguished tang. The transition between tang and the exposed part is decorated with the net pattern (Fig. 7). It is made of intersecting precise incisions, forming the pattern around the transitional area. The net pattern does not encase this part uninterruptedly. There are gaps between two parts of decoration. The second part of decoration type on this point consists of the X shape symbols on its distal part. A total of six such symbols can be observed on the find. Their size and the width of incisions varies.

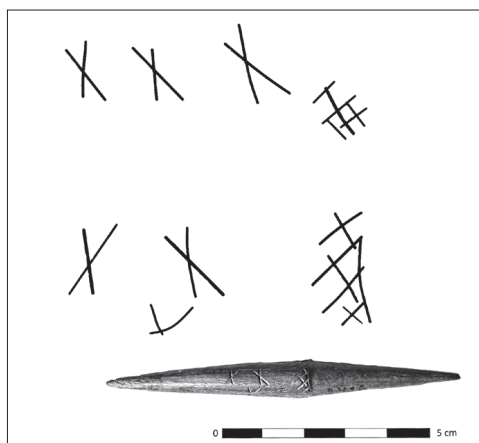


Fig. 7. Decorated biconical bone point from Palanga (No. A1: 10).

Photo: Tomas Rimkus.

7. att. Dekorēts bikoniskais kaula bultas gals no Palangas (Nr. A1: 10).

Foto: Toms Rimkus.



Fig. 8. Decorated antler axe from Smeltė (1974) site (No. 9153).

Photo: Tomas Rimkus.

8. att. Dekorēts raga cirvis no Smeltes (1974) apmetnes (Nr. 9153).

Foto: Toms Rimkus.

The next two finds with decoration examples come from Smeltė site. The first of them is an axe made from the main beam part of a red deer antler. Its burr has been polished roundly, and a small ca. 3 cm size rectangular area has been prepared by polishing it for shaping incisions (Fig. 8). 13 incisions can be observed in this part. They are parallel to each other, however, some of them do not constitute straight lines and differ in length.

The last decorated object discussed in this paper is the red deer antler adze from Smeltė site. The adze has been made from the main beam of antler and has a perforation for a shaft. The tool is not adorned with geometric decoration patterns as observed on the previously discussed objects. The decoration type and technique in this case differs significantly. As observed on the surface of the antler, the antler's cortex has been partly removed in particular areas – on its sides, ventral and dorsal surfaces (Fig. 9). However, at the same time the cortex in these parts has been partly preserved. Therefore, we observe the special treatment of antler surface, where its cortex has been partly removed. However, the proportion of removed surface is greater compared to the one remaining with the cortex. This decoration technique is special, since the craftsmen most likely strove to expose the difference in antlers' colours. The natural red deer antlers' colour is brownish, whereas the exposed inner surface becomes whitish. Therefore, these colour-changing patterns could have been the main reason for the antler's cortex to be partly removed in some of the areas. Stone Age societies paid great attention to bright colours, since this aspect probably concerned rituals and recognition among society members. The examples of red colour ochre in the Mesolithic and Neolithic graves and colour residues in amber



Fig. 9. Decorated antler adze from Smeltė (1974) site (No. 9141).

Photo: Tomas Rimkus.

9. att. Dekorēta raga cērtē no Smeltes (1974) apmetnes (Nr. 9141).

Foto: Toms Rimkus.

ornaments in the eastern Baltic might support this assumption.<sup>42</sup>

### Chronology

14 Accelerated Mass Spectrometry (AMS) radiocarbon dates are available from the discussed sites and single find locations (Table 2). The samples were dated in two radiocarbon dating laboratories: Christian Albrechts University, Kiel, Germany (KIA), and Poznan Radiocarbon Laboratory, Poznan, Poland (Poz). Radiocarbon dating results are the references obtained from the published works in 2015,<sup>43</sup> 2019<sup>44</sup> and 2021.<sup>45</sup> The modern dates from technogenic layers of Smeltė and Palanga sites have been excluded from the table. The dates have been calibrated by OxCal v4.4.4<sup>46</sup> and the IntCal20 calibration curve.<sup>47</sup> The dates are represented in 95.4% probability.

Table 2

Available AMS <sup>14</sup>C dates of directly dated hunter-gatherer osseous finds from coastal Lithuania.

2. tabula

Pieejamie tiešie kaula un raga priekšmetu radioaktīvā oglekļa AMS <sup>14</sup>C datējumi no Lietuvas piekrastes reģiona.

Tool type and museum ID	Lab. index	<sup>14</sup> C BP	cal BC (95.4%)
Melnragė II, antler T-shape axe	KIA-53036	6170 ± 35	5214–5009
Palanga, bone adze A1:14	KIA-54285	5354 ± 30	4325–4054
Palanga, bone adze, A1:5	KIA-54281	5310 ± 30	4246–4046
Palanga, bone chisel, A1:8	KIA-54282	5060 ± 29	3954–3786
Palanga, antler axe/adze, A1:4	Poz-64684	5515 ± 30	4446–4274
Palanga, antler T-shape axe, A1:6	Poz-66588	5240 ± 40	4230–3967
Smeltė (1970), antler axe, 6596	KIA-54286	3069 ± 29	1416–1259
Smeltė (1974), antler pressure tool, 9142	KIA-54288	6206 ± 32	5298–5046
Smeltė (1974), antler tine, 9145	KIA-54289	3850 ± 28	2456–2204
Smeltė (1974), bone adze, 9146	KIA-54290	5970 ± 34	4949–4727
Smeltė (1974), antler sleeve, 9151	KIA-54291	6378 ± 32	5472–5225
Smeltė (1974), antler axe, 9153	KIA-54292	7085 ± 40	6059–5849
Smeltė (1974), antler adze, 9141	Poz-61594	6920 ± 40	5894–5721
Smeltė (1974), antler axe, 9150	Poz-66589	6130 ± 40	5210–4952

## Discussion

Osseous tools from Palanga site, Smeltė (1970 and 1974), Melnragė II and Kalniškiai provide new insights into the tool types, manufacturing techniques, raw material selection and decoration patterns during the 6<sup>th</sup>–4<sup>th</sup> millennium cal BC in coastal Lithuania. After combining new data of all these findings, we can point out several research aspects in the studies of hunter-gatherer societies that are important to discuss.

The findings from Kalniškiai have been regarded as the tools made of reindeer bone and antler,<sup>48</sup> thereby ascribing them to the Final Palaeolithic. They have been thus considered in most of the publications regarding the Lateglacial bone and antler tool industry in the eastern Baltic.<sup>49</sup> However, the AMS <sup>14</sup>C data or species identification analysis has never been performed on these implements. Therefore, it is not certain whether they have been produced from bone and antler, or only from bone, and if they can be attributed to the Final Palaeolithic chronology or to reindeer species. Recent published works mention them as the tools made of deer bone, and dating to the Mesolithic,<sup>50</sup> also adding that accumulation of marl was much more significant during the Early Holocene.<sup>51</sup> The shapes of these points indeed can be traced back to the Mesolithic. For example, the paddle-shaped bone points with flattened tangs were found in cultural layer IV in Beregovaya 2 site in Urals region, which, according to published radiocarbon dating, belong to ca. 8300–7500 cal BC,<sup>52</sup> yet no direct dating of these bone points is available. The spindle-shaped bone points are not extensively dated compared to the different types of barbed and slotted points or harpoons across the northern Europe. Their find locations are known in north eastern Poland and Kaliningrad area, and Brandenburg in north eastern Germany.<sup>53</sup>

According to the layer dating, one of such points from Friesack 4 site has been ascribed to the later part of the Preboreal.<sup>54</sup> Unfortunately, the spindle-shaped bone point from Kalniškiai cannot be directly compared with the dated one from Šarnelė (north western Lithuania), which belongs to the end of the Youngers Dryas.<sup>55</sup> These two tools have different shapes and, most likely, had different functions. The exact parallel in tool shapes can be found in northern Lithuania, where spindle-shaped bone point with narrow tang from Pumpėnai village has been found, although this find likewise has not been directly dated. To conclude, the Final Palaeolithic chronology and reindeer bone and antler attribution to the points from Kalniškiai seems doubtful, however, only future research could improve the interpretations based on the discussed parallels.

The chronology of Palanga and Smeltė sites, as well as of some particular organic implements from coastal Lithuania has been improved with the recent AMS <sup>14</sup>C dating (Table 2). Radiocarbon dating indicates that the majority of tools from Smeltė (1974) site belong to ca. 6000–4700 cal BC, whereas one red deer antler tine dates to ca. 2400–2200 cal BC. This may suggest that the site was situated somewhere close to the Smeltalė River mouth had long spanning chronology and at least two settling episodes with the first one in the Middle Holocene, and the second in the Late Holocene. However, this assumption lacks contextual data. It is not certain whether all the finds have been found in the same spot or gathered from different locations during the excavation works. Therefore, it is also highly likely that all these finds come from different spots around the excavated peat bog. The assumption that more prehistoric sites were situated around the surroundings of Smeltalė River mouth is supported by the red deer antler axe found in 1970,

which date to the Early Bronze Age – ca. 1400–1200 cal BC.

The chronology of Palanga site has been a subject of discussion in several previously published works.<sup>56</sup> With five radiocarbon dates from osseous tools, it can be assumed that the site fits into the gap between ca. 4400–3800 cal BC. However, more samples would be necessary in order to clarify if all osseous tools from Palanga date to the same chronology. Also, the re-analysis of animal remains would be important to elucidate the old research results, yet this data is missing.

A single T-shape antler axe was found on the beach of Melnragē II, close to Klaipēda. The find was washed up into the shore, thus assuming that a submerged hunter-gatherer site might have been located in the vicinity. Submerged prehistoric landscapes were found in the surroundings of Melnragē beach, a few hundred metres to the south from Melnragē II beach. In this location, known as RF-II (Relict Forests II) one submerged *Pinus* log was dated to the 6059–5622 cal BC,<sup>57</sup> the age that comes close to the AMS <sup>14</sup>C date of T-shape antler axe (5214–5009 cal BC). Nevertheless, the dated sample of submerged tree could be affected by the old wood reservoir effect and might be slightly younger coming closer to the obtained date of the T-axe.

The dating of T-shape antler axe gives more insights about this specific hunter-gatherer tool technology. Another such type of axe was found in Palanga site, although the difference between their radiocarbon age is by ca. 800 years. Combining this data and new studies on the T-shape antler axes in north eastern Europe it can be concluded that this particular technology in Lithuanian territory was introduced in the 6<sup>th</sup> millennium cal BC and most likely lasted until ca. 3900/3800 cal BC.<sup>58</sup>

The direct comparison of discussed tool types in this paper, their chronology and

raw material can be done between Sise site, located in Latvian coastal area on the shore of a former Ventspils lagoon.<sup>59</sup> The site is known for its diverse types of osseous finds collection discovered in Užava River.<sup>60</sup> The tools found in this site consist of heavy-duty tools (axes, adzes, and sleeves), punches, waste pieces and figurative depictions. AMS <sup>14</sup>C dating assigns a large proportion of this collection to ca. 6000–5200 cal BC.<sup>61</sup> According to the identified species, most of the bone and antler finds belong to red deer, whereas elk, wild boar, brown bear constitute a lesser number. This is comparable to Smeltē osseous finds collection, where the majority of finds also dates to the 6<sup>th</sup> millennium cal BC and most of them belong to red deer, whereas only two finds were made of elk antler. Red deer also dominates in Palanga site bone and antler assemblage, although this site is younger compared to Sise and Smeltē.

Similar decoration pattern to the biconical bone point from Palanga site can be observed on other osseous findings dated to the Stone Age. The decoration of net pattern and X symbols are known from Kretuonas 1B and Žemaitiškė 2 sites in eastern Lithuania.<sup>62</sup> Net patterns and X incisions are abundantly observed on biconical points from the osseous finds collection of Lubana Lake in eastern Latvia.<sup>63</sup> The biconical bone points are probably the most abundantly decorated osseous tool type dated to the Stone Age in the territory of Lithuania. They contain diverse decoration patterns, yet they are still not studied properly, accordingly, even their exact number with decoration is not known. Therefore, their future research could bring more data on the decoration techniques on hunter-gatherer osseous implements.

We cannot fully discuss human subsistence strategies and prey choice in coastal Lithuania based solely on Smeltē and

Palanga osseous assemblages. However, it is important and directly related to the choice of raw materials to produce osseous implements. Also, the other data (i.e., not modified animal remains) concerning the population of large ungulates in this area during the Early and Middle Holocene is scarce. Smeltė collection consists of single finds and most likely from different occupational episodes, whereas Palanga site lacks its zooarchaeological material. However, based on the information of the unpublished excavation report it would seem that large ungulates with red deer as predominate were the main prey choice selection for hunter-gatherers in Palanga site.<sup>64</sup> However, we do not know how much of these animal remains could belong to technogenic layer or might be mixed, if at all, with the younger periods. Both assemblages also do not give information on the presence of freshwater or marine water animals, with one exception of a few seals (*Phoca groenlandica*) remains mentioned in the excavation report of Palanga site, yet their number is very moderate and the tendencies in the choice of raw material indicate that red deer skeletal was in priority for osseous tool making between 6<sup>th</sup>–5<sup>th</sup> millennium cal BC in coastal Lithuania.

Making a comparison to the subsistence data from the younger periods, we see that during the 4<sup>th</sup> millennium cal BC in coastal Lithuania seal hunting becomes predominant, while hunting of large terrestrial animals, e.g., red deer or elk, declines.<sup>65</sup> During this period, seal bones emerge amongst the main raw material selections for tool manufacturing.<sup>66</sup>

## Conclusions

This paper summarized the data of the hunter-gatherer osseous implements in coastal Lithuania. Based on the finds

from Palanga, Smeltė and Melnragė II, we observe that large ungulate bones and antlers, red deer foremost, prevailed in raw material selection for tool making. Tools category consists of heavy duty and hunting implements in all findspots. The sites discussed in this paper are important, as they present hunter-gatherer implement technologies mostly dated to the early Middle Holocene. As hunter-gatherer lithic technologies from this particular period in coastal Lithuania remain poorly investigated, the osseous finds provide important data on several prehistoric aspects: i) the selection of raw materials, ii) tool making techniques, iii) and decoration patterns. The animal species also give insights into the hunter-gatherer subsistence strategies, where large terrestrial animals like red deer and elk were hunted during the early Middle Holocene. Compared to the later part of the Holocene, marine resources (e.g., seals) and freshwater fish dominate in the hunter-gatherer subsistence economy. The decoration patterns on osseous implements consist of geometric patterns, whereas one example from Smeltė demonstrates a unique engraving technique on one of the antler tools with the removal of antler's cortex in selected parts of this find.

The chronological aspect presented in this paper yields new perspectives regarding the chronologies of specific tools and sites. As mentioned above, the osseous collection from Smeltė (1970 and 1974) mostly dates to the 6<sup>th</sup> and 5<sup>th</sup> millennium cal BC, whereas two finds present the 3<sup>rd</sup> and 2<sup>nd</sup> millennium cal BC. These conclusions indicate that this area was occupied at least several times throughout the Holocene. The Palanga site, on the other hand, reveals a quite compact chronology model after adding a few more AMS <sup>14</sup>C dates to the ones published previously. It currently suggests that the site should be ascribed



to 4400–3800 cal BC, however, not all the finds from this collection have been dated, therefore, their dating in future might reveal younger or even older dates. While the dating of T-shape antler axe from Melnragė II fits the general chronology of such tool types in the eastern Baltic, the same cannot be asserted regarding

osseous implements from Kalniškiai. Their attribution to the Final Palaeolithic and raw material type is questioned, as comparable material from other regions is dated to the Mesolithic. Therefore, only direct studies of this material with the aid of modern research methods could help to re-interpret these findings.

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## KOPSAVILKUMS

Šajā pētījumā apkopoti un izvērtēti visi pieejamie dati par agrā un vidējā holocēna kaula un raga darbarīkiem no Palangas un Smeltes arheoloģiskajiem pieminekļiem, kā arī savrupatradumiem no Lietuvas piekrastes zonas. Nesen atkārtoti tika analizētas vecās kolekcijas un jaunie savrupatradumi Lietuvas piekrastes zonā, un iegūtie rezultāti sniedz

vairāk datu par vidējā holocēna mednieku–vācēju kaula un raga darbarīku tehnoloģijām laika posmā no 6000. līdz 3800. g. p. m. ē. Palangas un Smeltes pieminekļu darbarīki un Melnraģes II pludmales savrupatradums ir plaši datēti, izmantojot radioaktīvā oglekļa AMS <sup>14</sup>C metodi, atkārtoti analizēti arī atradumi no bijušās Austrumprūsijas kolekcijām, lai gan tie vēl jāpēta ar mūsdienu pētniecības metodēm. Atradumi analizēti pēc to tehnoloģiskajām īpašībām, materiāla, radioaktīvā oglekļa AMS <sup>14</sup>C datiem un dekorēšanas veidiem.

Kopumā šajā pētījumā aplūkots 31 kaula un raga atradums no piecām Lietuvas piekrastes zonas vietām (1. att.). Darbarīki ir iedalāmi dažādos tipos un klasificējami pēc to funkcijām (1. tabula), tomēr dominē t. s. smagie rīki (cirvji, cērtes un uznavas), savukārt medību rīku kategorijā ietilpst vien trīs dažāda tipa kaula un raga bultu gali no Palangas apmetnes. Pēc pētīto atradumu identificētajiem dzīvnieku taksoniem noskaidrots, ka darbarīku izgatavošanā izmantoti lielle sauszemes dzīvnieku kauli un rāgi (2. att.). Palangas, Smeltes (1970 un 1974) un Melnraģes II kolekcijās dominē raga cirvji, cērtes un uznavas, tomēr atrasti arī vairāki kaula darbarīki – cirvji, cērtes un viens ilens. T formas cirvji no Palangas un Melnraģes II ir vieni no prominentākajiem darbarīku tipiem Eiropā zināmajās mednieku–vācēju sabiedrībās (3.–6. att.). Triju atradumu virsmā redzami dekorī: bikoniskajam kaula bultas galam un raga cirvim ģeometriski raksti – tīkla raksts, X veida un paralēli iegriezumi (7.–8. att.), savukārt viena raga cērte dekorēta unikālā gravēšanas tehnikā – atsevišķās tās daļās atdalīts raga virsslānis (9. att.).

Pētījumā analizēti 14 akselatora masspektrometrijas (AMS) radioaktīvā oglekļa <sup>14</sup>C datējumi no apmetnēm un savrupatradumu vietām (2. tabula). Saskaņā ar jaunākajiem datiem atradumi no Smeltes (1970 un 1974) datējami starp 6. un 5. gadu tūkstoti p. m. ē., savukārt divi atradumi – ar 3. un 2. gadu tūkstoti p. m. ē. Palangas apmetne datējama ar 4400.–3800. g. p. m. ē., savukārt T formas raga cirvis no Melnraģes II datējams ar 6. gadu tūkstoša beigām p. m. ē. AMS <sup>14</sup>C datējumi palīdz uzlabot šo apmetņu un savrupatradumu interpretāciju un sniedz jaunas atziņas par kaula un raga priekšmetu izgatavošanas tehnoloģiju attīstību Austrumbaltijā. Pieci kaula un raga priekšmeti no Kalnišķiem (bijusī Bahmana muiža) nav padziļināti pētīti ar AMS <sup>14</sup>C metodi, taču dati no līdzīgiem atradumiem, kā arī iepriekš uzskatīts, liecina, ka tie ir jaunāki par vēlo paleolitu. Šo atradumu materiāls un dzīvnieku taksoni joprojām nav identificēti.