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# Conical bone points in northwestern Lithuania: dating and engraving patterns

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This paper aims to analyse conical bone points from the Palanga and Šarnelė Stone Age sites situated in northwestern Lithuania. Both sites are wetland-type hunter-gatherer sites with good organic preservation. Conical points are part of osseous artefact collections at both sites, but so far, they have been little analysed in the eastern Baltic Stone Age hunter-gatherer material. This paper presents six artefacts, which have been studied from a typological and technological point of view. Their chronology has been supplemented by AMS $^{14}$C dating. Two projectiles are engraved, and their decorative elements have been observed under a stereoscopic microscope. The results indicate that a certain type of conical projectiles had been in use before the appearance of ceramics in hunter-gatherer daily life, but most of the artefacts analysed in this work would fall into the 5th and 4th millennium BC. The decoration found on the surface of two artefacts is typical of the conical points and is prevalent in the eastern Baltic region.

*Keywords:* Hunter-gatherers, Mesolithic, conical bone points, net pattern, incisions, AMS $^{14}$C dating.

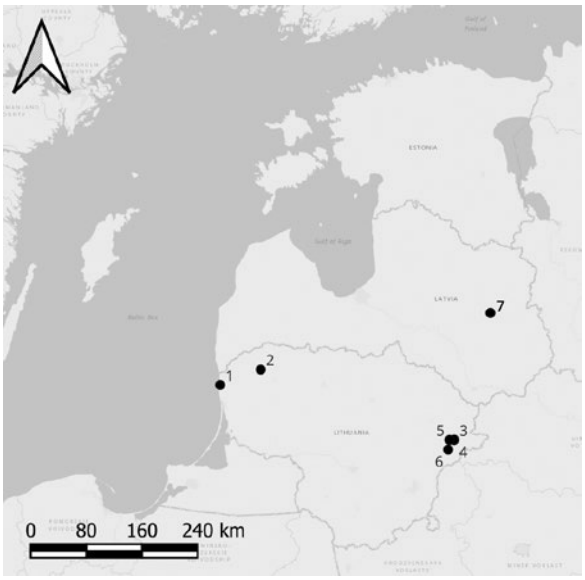
## Introduction

The osseous industry was a highly relevant field of tool-making in Stone Age hunter-gatherer societies. The most suitable parts of animal skeletons were selected for the manufacture of tools ranging from domestic to hunting and fishing implements. The oldest such items in Lithuanian territory date back to the Final Palaeolithic: a *Lyngby*-type tool and a decorated bone "dagger"[1]. More bone and antler implements are dated to the Mesolithic, when more diversity in their types and shapes can be observed. This is particularly evident in the designs of barbed points[2]. Different types of points, such as the Kunda type, triangular in cross-section or slotted ones with lithic inserts, began to be used for hunting and fishing[3]. Some specimens occasionally yield a specific engraving type, which is considered decoration. These are often represented with special patterns and shapes. Some of the most abundantly ornamented osseous Stone Age artefacts in Lithuanian territory are conical points. Although more research is necessary, contextual dating suggests that they were particularly widespread in

1 Algirdas Girininkas, Tomas Rimkus, Gvidas Slah, Linas Daugnora, Miglė Stančikaitė and Gintautas Zabiela, "Lyngby type artefacts of Lithuania in the context of the Stone Age in Europe: multidisciplinary study," *Archeoloģija un Etnogrāfija* 29 (2016): 13–30; Tomas Rimkus, Adomas Butrimas, Marius Iršėnas and John Meadows, "The decorated spindle-shaped bone dagger from Šarnelė: the earliest example of hunter-gatherer mobile art in Lithuania," *Archaeologia Baltica* 26 (2019): 50–62, https://doi.org/10.15181/ab.v26i0.2022

2 Gytis Piličiauskas, Aldas Matiukas, Kęstutis Peseckas, Jonas Mažeika, Grzegorz Osipowicz, Giedrė Piličiauskienė, Eve Rannamäe, Elena Pranckėnaitė, Rokas Vengalis and Mindaugas Pilkauskas, "Fishing history of the East Baltic during the Holocene according to underwater multiperiod riverine site Kaltanėnai, northeastern Lithuania," *Archaeological and Anthropological Sciences* 12 (2020): 279, https://doi.org/10.1007/s12520-020-01233-9; Tomas Rimkus, Berit V. Eriksen, John Meadows and Christian Hamann, "Bone points in time: dating hunter-gatherer bone points in the territory of Lithuania," *Radiocarbon* 65, no. 5 (2023): 1118–1138, https://doi.org/10.1017/RDC.2023.97; Adomas Butrimas, Tomas Rimkus, Marius Iršėnas and Dalia Ostrauskienė, "Socketed antler toggle harpoon head – a unique hunter-gatherer fishing implement in western Lithuania's freshwater lake environment," *Estonian Journal of Archaeology* 28, no. 1 (2024): 3–28, http://dx.doi.org/10.3176/arch.2024.1.01

3 Livija Ivanovaitė, Mathias Bjørnevad, Bente Philippsen, Christian Hoggard, Jan J. Enghild, Carsten Scavenius, Asta Vasiliauskaitė, Gerarda Dručkuvienė, Peter Jensen, Rikke Maring, James Dodd, Kamil Serwatka and Felix Riede, "Making silent bones speak: the analysis of orphaned osseous tools illustrated with Mesolithic stray finds," *Archaeologia Baltica* 25 (2018): 53–70, https://doi.org/10.15181/ab.v25i0.1830; Rimkus, Eriksen, Meadows and Hamann, "Bone points in time."




1. The location of the sites mentioned in the text: 1. Palanga; 2. Šarnelė; 3. Žemaitiškė 2; 4. Kretuonas 1B; 5. Kaltanėnai; 6. Garnys; 7. Lake Lubāns, compiled by Tomas Rimkus

Tekste minimų radimviečių vietos: 1. Palanga; 2. Šarnelė; 3. Žemaitiškė 2; 4. Kretuonas 1B; 5. Kaltanėnai; 6. Garnys; 7. Lubano ežeras, sudarė Tomas Rimkus

the 4th–3rd millennium BC, when hunting and fishing were still prevalent in northeastern Europe, but towards the second half of this period the first husbandry cultures visited these areas[4]. Conical points have been abundantly found at sites around Lake Kretuonas in eastern Lithuania, particularly Kretuonas 1B and Žemaitiškė 2[5]. Several of them have been found in Palanga and Šarnelė sites in northwestern Lithuania, and Garnys and Kaltanėnai sites in eastern Lithuania, while some are also known from single-find contexts in southwestern Lithuania[6]. Little research has been carried out on this type of hunting gear so far in Lithuanian Stone Age studies. There is

4 e.g., Gytis Piličiauskas, *Virvelinės keramikos kultūra Lietuvoje 2800–2400 cal BC* (Vilnius: Lietuvos istorijos institutas, 2018).

5 Algirdas Girininkas, *Kretuonas. Vidurinis ir vėlyvasis neolitas* (Lietuvos archeologija 7) (Vilnius: Mokslas, 1990).

6 Algirdas Girininkas, "Šarnelės vėlyvojo neolito (III tūkstantm. pr. m. e. pag.) gyvenvietė," *MAD'A* 1, no. 58 (1977): 57–65.; Adomas Butrimas, "Šarnelės neolito gyvenvietė," *Lietuvos Archeologija* 14 (1996): 174–191; Vygandas Juodagalvis, Užnemunės priešistorė (Vilnius: Diemedžio leidykla, 2010), 145; Piličiauskas, Matiukas, Peseckas, Mažeika, Osipowicz, Piličiauskienė, Rannamäe, Pranckėnaitė, Vengalis and Pilkauskas, "Fishing history of the East Baltic"; Gytis Piličiauskas, Elena Pranckėnaitė, Aldas Matiukas, Grzegorz Osipowicz, Kęstutis Peseckas, Justina Kozakaitė, Aldona Damušytė, Erika Gál, Giedrė Piličiauskienė and Harry K. Robson, "Garnys: an underwater riverine site with delayed Neolithisation in the southeastern Baltic," *Journal of Archaeological Science: Reports* 52 (2023): 104232, https://doi.org/10.1016/j.jasrep.2023.104232

2. The location of the Palanga site, photo by Tomas Rimkus

Palangos gyvenvietės vieta, Tomo Rimkaus nuotrauka

still a lack of data on their chronology and engraving patterns. It is likely that in the Middle and Late Holocene, this type of artefacts was one of the most relevant. Therefore, this paper is one of the first attempts to discuss the selected conical points with cases from northwestern Lithuania.

In this paper, conical bone points from northwestern Lithuania Stone Age sites – Palanga and Šarnelė – have been selected [Fig. 1]. They were found during archaeological excavations. Two points contain geometric shape engravings. AMS $^{14}C$ dating and microscopic examination were applied to their analysis. This provided more data, a new perspective on their chronology and a better understanding of their position in the hunter-gatherer world.

## Sites

### PALANGA

The Palanga site is situated in Palanga city (coastal Lithuania), on the bank of the Rąžė River (55.918279; 21.062451) [Fig. 2]. It was discovered in 1958 during the straightening of the riverbed. Animal bones and artefacts made of them were found by chance[7]. Archaeologists were informed of the discovery and in the same year, they carried out archaeological excavation. All the finds were found in organic sediment layers, probably peat or gyttja[8]. The research report mentions unworked animal bones, the species composition of which was determined by the Estonian zoologist K. Paaver. The following species were identified at the site: red deer (*Cervus elaphus*), elk (*Alces alces*), wild aurochs (*Bos primigenius*), horses (*Equus ferus*), harp seals (?) (*Phoca groenlandica*), cattle (*Bos taurus*), and pig (*Sus scrofa domesticus*)[9]. Two bird bones and one human bone are also mentioned. Unfortunately, the current location of these bones is unknown, as the museum where they are stored now (Kretinga Museum) contains only bone and antler artefacts and a few small unworked bones. It was thought that the collection could be dated back to several chronological episodes and could be distributed between the 6th and the 2nd millennium BC[10]. The first AMS dating of two artefacts found at the site showed that they belong to the very end of the 5th millennium BC[11]. The follow up dating of more artefacts gave an age range of 4400–3800 cal BC[12]. According to it, it would seem that this

7 Pranas Kulikauskas, "Naujai aptikta akmens-žalvario amžių gyvenvietė Palangoje," *MAD'A* 2, no. 7 (1959): 33–41.

8 Kulikauskas, "Naujai aptikta akmens," 38.

9 Ona Navickaitė, *Palangos akmens amžiaus stovyklos tyrinėjimų dienoraštis. 1958 m. rugpjūčio 19–31 d.* (Vilnius, 1958).

10 Kulikauskas, "Naujai aptikta akmens," 39–40; Rimutė Rimantienė, *Akmens amžius Lietuvoje (2-as papildytas leidimas)* (Vilnius: Žiburio leidykla, 1996), 135; Algirdas Girininkas, "New data on Palanga Stone Age settlement," *Archaeologia Baltica* 16 (2011): 48–57, https://doi.org/10.15181/ab.v16i0.33

11 Gytis Piličiauskas, Heidi Luik and Giedrė Piličiauskienė, "Reconsidered Late Mesolithic and Early Neolithic of the Lithuanian coast: the Smeltė and Palanga sites," *Estonian Journal of Archaeology* 19, no. 1 (2015): 9, http://dx.doi.org/10.3176/arch.2015.1.01

12 Tomas Rimkus and Linas Daugnora, "Akmens amžiaus kaulo ir rago dirbinių technologija Lietuvoje pajūrio regione. Papildant Palangos ir Smeltės kolekcijų duomenis," in *Kretingos rajono archeologiniai tyrimai ir perspektyvos. Kraštotyrininko, archeologo Igno Jablonskio 110-osioms gimimo metinėms. Mokslinių straipsnių rinkinys*, ed. Eglė Rimkienė (Kretinga: Kretingos muziejus, 2021).

place was inhabited by hunter-gatherers, but zooarchaeological analysis described in 1958 showed the presence of domestic animals too[13]. Therefore, the lost zooarchaeological material has the potential to provide more on the site's chronology[14]. Points, axes, adzes, and chisels dominate among the osseous tools[15]. Only a small collection of 12 bone and antler implements and one stone axe from the Palanga site remains.

### Šarnelė

The Šarnelė site is located in northwestern Lithuania. The only known Stone Age site in the area is located next to the drained Lake Ertenis (56.106470; 21.948449) [Fig. 3]. The first bone artefact from the Ertenis Lake wetlands was brought to the Samogitian Museum "Alka" in Telšiai city in 1940, but the location of its discovery was not known in detail. In 1965, four more tools made of animal bones and antlers were brought there only this time their locations were specified: on the left bank of the Varduva River, next to Ertenis Lake[16]. Vitas Valatka, an archaeologist at the then Samogitian Museum "Alka", became interested in the site, and together with Stone Age archaeologist Rimutė Rimantienė, visited the site in 1966. R. Rimantienė surveyed the nearby ploughed fields and discovered flint finds. She thought that a possible site might have existed on the adjacent hills, but it had been destroyed, and its potential remains should be sought in the

13 Radiocarbon of elk tibia showed that it dates to 1688–1924 cal AD: Piličiauskas, Luik and Piličiauskienė, "Reconsidered Late Mesolithic," 9. Thus, there is a possibility that some of the previously identified animal species (especially the domestic ones) in the Palanga site could also belong to the modern period.

14 One seal bone attributed to the Palanga site was recently mentioned by Linas Daugnora and Algirdas Girininkas, "Osteological material and the natural environment on the Baltic coast: the Middle Pleistocene to the Middle Holocene," in *Lithuanian Baltic Sea coasts during the Holocene. Sea level changes, environmental developments and human adaptations* (BAR inernational series 3089), ed. Algirdas Girininkas and Vladas Žulkus (Oxford: Archaeopress, 2022), 105. It was AMS dated to 3627–2473 cal BC (Vs-2648, 4370±220). This suggests that the site represents a much younger chronological phase; however, the date is likely influenced by the marine reservoir effect. Moreover, the bone is not present in the collections where the archaeological material from Palanga is stored.

15 Tomas Rimkus, "Hunter-gatherer bone and antler implements in Lithuanian coastal area: recent studies in chronology, technology and decoration patterns," *Journal of the University of Latvia. History* 13/14 (2022): 26–47, https://doi.org/10.22364/luzv.13.14.02

16 Vitas Valatka, "Šarnelės stovykla," *Muziejai ir paminklai* (1968): 39–42.

**3.** The location of the Šarnelė site, photo by Tomas Rimkus

Šarnelės gyvenvietės vieta, Tomo Rimkaus nuotrauka

marshy area down the hill[17]. The first archaeological excavation in Šarnelė was carried out in 1973 when the area was about to be drained once more. The excavations were located on the left bank of the Varduva River, on the slopes of the hills mentioned above, next to the places where organic finds had been found. Excavation revealed animal bones, fishing and hunting gear, wooden stakes, lithic finds and pottery. The finds and structures were associated with the Corded Ware culture and dated to the 3rd millennium BC, highlighting the presence of domestic livestock and agriculture[18]. In the 1980s, the site was threatened by further drainage works, so in 1981 and 1982, archaeological research was once more carried out in Šarnelė, headed by Adomas Butrimas. The research areas were concentrated next to R. Rimantienė's trenches, and further surveys of the territory on the left bank of the Varduva River continued[19]. Finds analogical to those of R. Rimantienė's earlier research were found: various types of osseous artefacts, animal

17 Rimutė Rimantienė, "Šarnelės (Plungės raj.) stovykla," *Archeologiniai ir etnografiniai tyrinėjimai Lietuvoje 1972 ir 1973 metais* (1974): 7.

18 Girininkas, "Šarnelės vėlyvojo neolito."

19 Adomas Butrimas, "Biržulio baseino ir Žemaičių aukštumos akmens amžiaus tyrinėjimų apžvalga," *Lietuvos Archeologija* 15 (1998): 122.

bones, fishing and hunting tools, and pottery were discovered. The first three conventional radiocarbon dates were also obtained from wood samples taken from the find layer: 4260±90 (Vs-318), 4040±50 (Le-1787), and 2630±90 (Vs-2201)[20]. This allowed the site to be dated to the 3rd millennium BC. These excavations were followed by further straightening of the bed of the Varduva River, and there was a high probability that the remains of the site were destroyed.

After a long break, archaeological excavation at Šarnelė was resumed in 2023 by the author of this paper. It took place along the left bank of the Varduva River in search of the preserved archaeological layer[21]. It was found buried under a layer of silt, adjacent to the trenches investigated in 1973 and 1981–1982. Animal bones were found, as well as lithic artefacts. In addition to these finds, one biconical bone point (No. 37) was discovered.

The excavation of the Šarnelė site and the finds found during it have somewhat overshadowed the old collection of single finds found there, which only came to the scientific attention in 2016. A decorated bone "dagger" was dated to 10 639–10 103 cal BC[22]. Another bone "dagger", which was the first find the Samogitian Museum "Alka" received from Šarnelė, was dated to 8200–7754 cal BC[23], whereas a T-axe was dated to 4158–3820 cal BC[24]. These single finds were found adjacent to later archaeological excavation trenches, so it is evident that the site has more than one chronological episode of human activity. Recent research also confirmed that the site was inhabited during the Bronze Age[25].

20 Butrimas, "Šarnelės neolito gyvenvietė."; Adomas Butrimas, *Biržulis. Medžiotojai, žvejai ir senieji žemdirbiai X-II tūkstantmetyje pr. Kr. Paminklų tyrinėjimai* (Vilnius: Vilniaus dailės akademijos leidykla, 2019).

21 Tomas Rimkus, Vilius Memgaudis, Adomas Butrimas, Marius Iršėnas and Kristiina Mannermaa, "Šarnelės akmens amžiaus gyvenvietė ir Ertenio ežero aplinka," *Archeologiniai tyrinėjimai Lietuvoje 2023 metais* (2024): 33–37.

22 Rimkus, Butrimas, Iršėnas and Meadows, "The decorated spindle-shaped."

23 Butrimas, *Biržulis. Medžiotojai, žvejai*, 277.

24 Tomas Rimkus, Adomas Butrimas, Harald Lübke and John Meadows, "T-shaped antler axes in Lithuania: previously unrevealed Middle Holocene hunter-gatherer technology," *Archaeologia Baltica* 30 (2023): 41–57, https://doi.org/10.15181/ab.v30i0.2563

25 Algirdas Girininkas and Linas Daugnora, *Ūkis ir visuomenė Lietuvos priešistorėje t. 1* (Klaipėda: Klaipėdos universiteto leidykla, 2015), 161; Gytis Piličiauskas, Dalia Kisielienė, Giedrė Piličiauskienė, "Deconstructing the concept of Subneolithic farming in the southeastern Baltic," *Vegetation History and Archaeobotany* 26 (2017): 183–193, https://doi.org/10.1007/s00334-016-0584-9


**4**. Analysed conical bone points: 1. A1: 10 (Palanga); 2. EM 2237: 11 (Šarnelė); 3. EM 2237: 12 (Šarnelė); 4. EM 2237: 13 (Šarnelė); 5. EM 2237: 49 (Šarnelė); 6. 37 (Šarnelė), photos by Tomas Rimkus

Analizuoti kūginiai antgaliai: 1. A1: 10 (Palanga); 2. EM 2237: 11 (Šarnelė); 3. EM 2237: 12 (Šarnelė); 4. EM 2237: 13 (Šarnelė); 5. 37 (Šarnelė); 6. EM 2237: 49 (Šarnelė), Tomo Rimkaus nuotrauka

Stray bone and antler artefacts found in Šarnelė are stored in the Samogitian Museum "Alka" in Telšiai city, whereas finds from the 1973, 1981–1982 and 2023 excavations are stored in the National Museum of Lithuania.

### Characteristics of projectiles

Six conical bone points were selected for this study from Palanga and Šarnelė sites [Fig. 4; Table 1]. All the specimens are roundish or oval in cross-section, except for one specimen from Šarnelė (EM 2237: 49), which has a bevelled proximal part. This piece is the most distinctive in shape among the other points discussed here.

Only one such point (ID A1: 10) is known from the Palanga site. It has been previously published in discussions of the site and its organic material[26], but its engraving was not thoroughly emphasized[27]. Therefore, in this paper more data on its decorative elements will be highlighted.

The remaining five artefacts were found at Šarnelė in 1973, 1982, and 2023 archaeological investigations. Their IDs are EM 2237: 11, EM 2237: 12, EM 2237: 13 and EM 2237: 49. The artefact labelled as No. 37 was found in 2023. The archaeological data from the recent excavation and the results of the laboratory studies have not yet been extensively published. However, the newly discovered projectile matches in type with similar artefacts previously found here. Only one of the points found at Šarnelė yields engraving. However, neither this nor the other conical bone points found at Šarnelė have received much scientific attention. In the works published on the Šarnelė site, these artefacts were discussed as items representing hunting activities[28].

Table 1. Conical bone points from Palanga and Šarnelė discussed in this paper. KM – Kretinga Museum, LNM – National Museum of Lithuania.
1 lentelė. Kūginiai kauliniai antgaliai iš Palangos ir Šarnelės. KM – Kretingos muziejus, LNM – Lietuvos nacionalinis muziejus.

| Site | Museum ID | Excavation year | Length (mm) | Preservation | Engravings | Reference |
|---|---|---|---|---|---|---|
| Palanga | KM, A1: 10 | 1958 | 102 | Full | + | Kulikauskas 1959 |
| Šarnelė | LNM, EM 2237: 11 | 1973 | 103 | Full | – | Girininkas 1977 |
| Šarnelė | LNM, EM 2237: 12 | 1973 | 102 | Full | – | Girininkas 1977 |
| Šarnelė | LNM, EM 2237: 13 | 1973 | 112 | Full | + | Girininkas 1977 |
| Šarnelė | LNM, EM 2237: 49 | 1982 | 84 | Full | – | Butrimas 1996 |
| Šarnelė | LNM, No. 37 | 2023 | 70 | Fragment | – | This study |

27 Tomas Rimkus, Marius Iršėnas, Adomas Butrimas and Kristiina Mannermaa, "The examples of decorated hunter-gatherer bone and antler implements in Lithuania, c. 10 500–4000 cal BC," in *Mesolithic art – abstraction, decoration, messages. International conference Halle (Saale), Germany, 19th-21st September 2019. Tagungen des Landemuseums für vorgeschichte Halle 26/II*, eds. Judith M. Grünberg, Bernhard Gramsch, Erik Brinch Petersen, Tomasz Płonka and Harald Meller (Halle (Saale): Landesmuseum für Vorgeschichte Halle, 2023), 428.

28 See cited literature in the section about the research background of Šarnelė site.

## Methods

### SAMPLING AND DATING

The chronology of all conical points analysed here in past works has been determined according to the general chronological context of each site, based on typological criteria or contextual radiocarbon dates. However, finds from wetland sites can be influenced by various natural processes, which can place finds from different periods in the same layer. Therefore, the stratigraphic context is not always a reliable dating indicator. In this case, the aim was to take a sample from each point for Accelerator Mass Spectrometry (AMS) radiocarbon ($^{14}C$) dating and date it directly. Samples were taken from four points found at Šarnelė. Samples from artefacts EM 2237: 11, EM 2237: 13 and EM 2237: 49 were taken in powder form by drilling selected areas. The drilling was carried out with a diamond drill using a DREMEL equipment. The powder was taken only for dating by drilling into the deeper layers of the bone, while bone material from the outer surface (primary surface) was not taken for dating. This was done to minimise possible contamination as the sampled artefacts had some visible consolidants on their surface. Find No. 37 was not contaminated with any consolidants, as the sample was taken immediately after excavation. The compact bone sample for dating was cut from this point with a diamond disc using the same DREMEL equipment.

Samples have been sent for dating to the Vilnius Radiocarbon Laboratory at the Centre for Physical Sciences and Technology (FTMC). The acid-base-acid procedure followed by gelatinization was used for bone collagen extraction. Samples were treated with 0.5M HCl (~18 hrs), 0.1M NaOH (30 min), and 0.5M HCl (1 hr). Collagen was gelatinized in a pH 3 solution at 70°C for 20 hrs. The solution was filtered using a cleaned Ezee-filter and freeze-dried. Graphitization of the samples was performed using Automated Graphitization Equipment AGE-3 (IonPlus AG). A Single-stage Accelerator Mass Spectrometer (SSAMS, NEC, USA) was used for radiocarbon ($^{14}C$) measurements. The background of measurements was estimated to be 0.25 pMC using phthalic anhydride (Alfa Aesar). The NIST-OXII (134.06 pMC) standard was used as reference material. The

$^{14}C/^{12}C$ ratio was measured with an accuracy of better than 0.3%. For the isotopic fractionation correction, the ratio of $^{13}C$ to $^{12}C$ was used. Typical SSAMS system parameters can be found in the published study[29]. Dates were calibrated using OxCal v4.4.4 and the IntCal20 curve[30]. All dates are presented with 95.4% probability.

A sample from a point from the Palanga site was not taken for dating due to the fragile condition of the artefact. AMS dating of osseous artefacts found there in the published works has shown that all five of the 12 dated artefacts date to the period between ca. 4400–3800 cal BC[31]. While this does not fully prove that each of the remaining undated artefacts falls into this period, none of them are typical of earlier or later Stone Age periods either. It is, therefore, highly probable that the chronology of the whole remaining osseous assemblage is of this period, and the conical point would also fit this chronology in terms of type. Therefore, in the following sections, the chronology of the point from Palanga will be discussed by combining all five published AMS $^{14}C$ dates according to the KDE_Model option in OxCal v4.4.4. Previously published dates from Palanga site were received from the Leibniz Laboratory for Radiometric Dating and Stable Isotope Research at Kiel University (KIA) in Germany, and Poznan Radiocarbon Laboratory (Poz) in Poland[32].

### MICROSCOPIC OBSERVATION

Two analysed points are engraved. In order to obtain more information about these patterns they were observed and measured with a Zeiss

29 Žilvinas Ežerinskis, Justina Šapolaitė, Algirdas Pabedinskas, Laurynas Juodis, Andrius Garbaras, Evaldas Maceika, Rūta Druteikienė, Darius Lukauskas and Vidmantas Remeikis, "Annual variations of $^{14}C$ concentration in the tree rings in the vicinity of Ignalina nuclear power plant," Radiocarbon 60, no. 4 (2018): 1227–1236, https://doi.org/10.1017/RDC.2018.44

30 Christopher Bronk Ramsey, "OxCal 4.4 manual." (2021) https://c14.arch.ox.ac.uk/oxcal/OxCal.html; Paula J. Reimer, William E.N. Austin, Eduard Bard, Alex Bayliss, Paul G. Blackwell, Christopher Bronk Ramsey, Martin Butzin, Hai Cheng, Lawrence R. Edwards, Michael Friedrich, Pieter M. Grootes, et al., "The IntCal20 northern hemisphere radiocarbon age calibration curve (0–55 cal kBP)," *Radiocarbon* 62, no. 4 (2020): 725–757, https://doi.org/10.1017/RDC.2020.41

31 Piličiauskas, Luik and Piličiauskienė, "Reconsidered Late Mesolithic," 9; Rimkus, "Hunter-gatherer bone," 38.

32 On the dating of the osseous collection from Palanga see Piličiauskas, Luik, and Piličiauskienė, "Reconsidered Late Mesolithic."; Rimkus and Daugnora, "Akmens amžiaus kaulo."

Stemi 508 stereoscopic microscope under magnifications ranging from 0.63 to 5 times (on the microscope's magnification handle) with 1.5x attached objective lenses and 10x binoculars. Images were captured with a Zeiss Axiocam 208 color camera. Zeiss Labscope software was used to process the captured images.

## Results and discussion

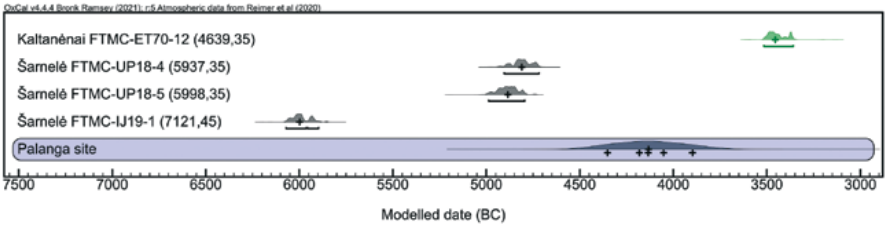
### TYPES AND DESIGNS

The five analysed projectiles in this paper are of the biconical type [Fig. 4: 1–5]. Each of them has a conical point at both ends. Their tips are separated by a thicker expansion in the middle or near the tip of the artefact. These expansions are between 10 and 16 mm thick. The thickness of projectile tips ranges from 5 to 9 mm, while the tang parts are between 6 and 7 mm. The fully preserved biconical points are between 102 and 112 mm long. Their surfaces show scratches, grinding, cut marks and other visual traces of bone working and its transformation into a point. Only one end of point EM 2237: 49 is conical [Fig. 4: 6]. Its tang part is bevelled. This point also widens towards its upper part, although this expansion differs from other biconical point types discussed here. It is cylindrical in shape, with clearly formed separations in its upper and lower parts. Interestingly, it is not only the shape that differs, but also its chronology in relation to the other specimens (see the chronology section). The bevelled angle is also present in the lower part of another biconical point from Šarnelė (EM 2237: 12), but only a very small part of it is bevelled [Fig. 4: 3].

EM 2237: 13 and No. 37 are slightly flat when viewed from the cross-section, compared to other points [Fig. 4: 2 and 5]. Perhaps the shape of the bone had an impact on it.

Conical points are widespread in northeastern Europe. As already mentioned, they have been found in the territory of Lithuania at several sites with preserved organic material. They are also known in other countries. For example, they are abundant in the Asaviec 2 site in northern Belarus, and in the Zamostje 2 settlement (Volga basin, western Russia)[33]. One of the largest collections of these objects is known from Lake Lubāns in

33 Maxim Charniauski and Mikola Kryvaltsevich, "Belarusian wetland settlements in prehistory," in *Wetland settlements of the Baltic: a prehistoric perspective*, ed. Elena Pranckėnaitė (Vilnius: Center of Underwater Archaeology, 2011); Olga Lozovskaya and Vladimir




5. Calibration plot of dated conical bone points from Lithuania. The previously published date from Kaltanėnai is marked in green. A KDE_Model was applied in the case of the Palanga site in order to combine all of the available dates from osseous tools. Dates were calibrated using OxCal v4.4.4 and the IntCal20 curve

Kalibracinis datuotų kūginių kaulinių antgalių iš Lietuvos teritorijos grafikas. Žalia spalva pažymėta anksčiau paskelbta data iš Kaltanėnų. Palangos radimvietės atveju, siekiant sujungti visas turimas kaulinių įrankių datas, taikytas KDE_Modelis. Datos kalibruotos naudojant OxCal v4.4.4 ir IntCal20 kreivę

eastern Latvia[34]. They show variations in the shape and length of the tangs, including the bevelled ones. Differences are also visible in the sizes of the tips, which vary in length. Most conical points are made of bone, though there are examples made of antler. In the territory of Lithuania, one such example is known from Alksnėnai, southwestern Lithuania[35].

## CHRONOLOGY

Three points from Šarnelė were successfully dated in this study. Their age ranges between c. 6000–4700 cal BC, indicating that the technology of conical-shaped projectiles appeared in the territory of Lithuania before the introduction of ceramic vessels in the hunter-gatherer communities[36] [Table 2; Fig. 5]. The oldest of the dated specimens is EM 2237: 49.

Lozovski, "Bone and antler projectile points from the Meso-Neolithic site Zamostje 2, Moscow region, Russia," in *Working at the sharp end: from bone and antler to Early Mesolithic life in northern Europe*, ed. Daniel Groß, Harald Lübke, John Meadows and Detlef Jantzen (Kiel/Hamburg: Wachholtz Verlag, 2019).

34 Lūcija Vankina, *The collection of Stone Age bone and antler artefacts from Lake Lubāna* (Riga: National History Museum of Latvia, 1999), 231–238.

35 Juodagalvis, *Užnemunės priešistorė*, 145; The point from Alksnėnai was also examined by the author of this paper, but the results will be published elsewhere.

36 The start of the production of ceramic vessels in the eastern Baltic hunter-gatherer societies is still questionable, but the most recent studies suggest that it could have happened already at the end of the 6th millennium BC (Ekaterina Dolbunova, Alexandre Lucquin, Rowan T. McLaughlin, Manon Bondetti, Blandine Courel, Ester Oras, et al., "The transmission of pottery technology among prehistoric European hunter-gatherers," *Nature Human Behaviour* 7 (2023): 171–183, https://doi.org/10.1038/s41562-022-01491-8).

As discussed earlier, its type differs from the rest of the artefacts. Only its upper part is conically shaped, while the lower part is bevelled. The expansion part is round in shape and resembles a cylinder. The rest of the artefacts are biconical, with only EM 2237: 12 having a small, bevelled cut at the very end of the tang. So far, there are too few directly dated conical points to link their different design features to the absolute chronology. However, the item EM 2237: 49 would suggests that there may be potential differences between designs and chronologies. But this aspect must be further elaborated in the future studies as this study focus on a very limited number of points.

The dating of the biconical point from the 2023 excavation (No. 37) failed, as its collagen yield was too poor, and the C and N ratio was outside the usual range. Although its dating result would still fit into the general dating of conical points, the dating result is not reliable.

Table 2. Directly dated conical points from Šarnelė in this study. The result of sample FTMC-UP18-6 is not reliable as its collagen yield and C and N ratio do not meet the usual requirements.
2 lentelė. Tiesiogiai datuotų kūginių antgalių datos. Mėginio FTMC-UP18-6 rezultatas nepatikimas dėl kolageno kiekybinio ir kokybinio parametrų neatitikimo.

| Lab. index | ID | % yield | N (%) | C (%) | C/N ratio | $^{14}$C BP | cal BC (95.4%) |
|---|---|---|---|---|---|---|---|
| FTMC-IJ19-1 | LNM, EM 2237: 49 | 11.78 | 4.58 | 12.5 | 3.18 | 7121±45 | 6071–5897 |
| FTMC-UP18-4 | LNM, EM 2237: 11 | 1.06 | 14.94 | 43.04 | 3.36 | 5937±35 | 4930–4718 |
| FTMC-UP18-5 | LNM, EM 2237: 13 | 2.09 | 15.17 | 43.69 | 3.28 | 5998±35 | 4989–4796 |
| FTMC-UP18-6 | LNM, No. 37 | 0.48 | 1.17 | 6.2 | 6.18 | ~~4960±47~~ | ~~3936–3643~~ |

Until now, the chronology of conical points has not been summarized in detail. They were mainly dated by the general context of the sites where they have been found. As seen from the published archaeological material from Kretuonas 1B, Žemaitiškė 2 and Šarnelė sites, this type of artefact was usually placed between the 4th and 3rd millennium BC, and associated with hunter-gatherers[37]. In recent years, during surveys of the sites on the banks of the rivers of eastern Lithuania, several conical points have been found at the Garnys and Kaltanėnai sites. Both sites span a wide

37 Butrimas, "Šarnelės neolito gyvenvietė," 189; Algirdas Girininkas, *Akmens amžius* (Lietuvos archeologija vol. 1) (Vilnius: Versus Aureus, 2009), 164, 167.

chronological range, making it difficult to assign specific artefact types to a particular period. However, one conical projectile from Kaltanėnai was directly dated to 3516–3360 cal BC[38], making it one of the first directly dated conical points in the territory of Lithuania. Nevertheless, there is still a lack of direct dates to better understand the chronology of this particular type. In the case of Palanga, the modelling of available dates suggests that the available dates fall within the same period characteristic of biconical points, i.e. the end of the 5th millennium BC. Thus, the biconical point from this assemblage could potentially be dated to this period.

### ENGRAVING PATTERNS

Concerning engraved osseous artefacts, it is quite clear that conical points are among the most engraved types of the osseous projectiles in the territory of Lithuania[39]. While it is difficult to determine why this trend occurs, it may be related to the fact that the number of known ornamented bone and antler tools in Lithuania is currently very small. Therefore, too little is known about the decoration and the trends of engraved types to draw broader conclusions.

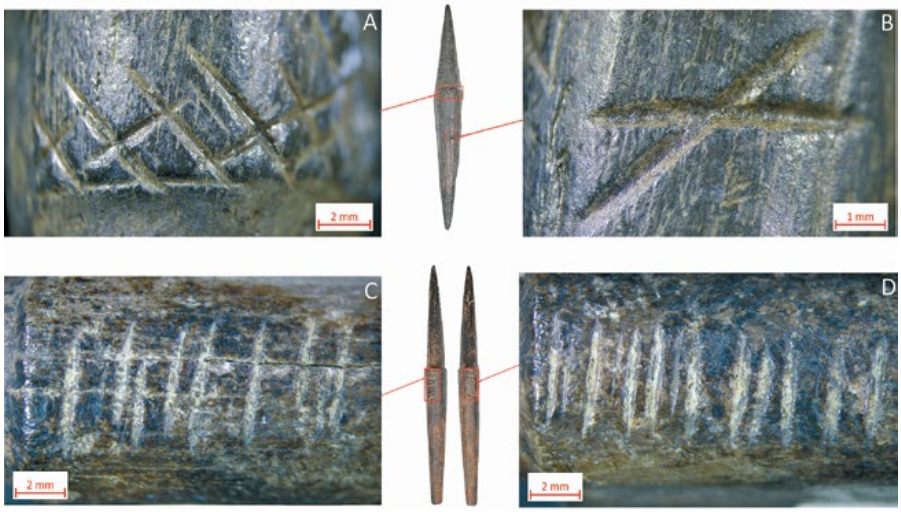
Interestingly, the decoration type on conical points often repeats geographically, even across different artefact types and possibly different chronological phases. This can also be seen in the two discussed objects from Palanga and Šarnelė. The artefact from Palanga is decorated with two types of engraving: 1) a net pattern on the expansion and 2) X-shaped markings on its proximal part. The net-shaped motif is extremely precise, created by incising straight lines 0.2–0.5 mm wide on the expansion part of the tool. They form small rhombuses, reflecting similarities with a mesh [Fig. 6: A]. The pattern runs only partially around the expansion part.

The net pattern on the Palanga artefacts is supplemented by six X-shaped incisions on the proximal part [Fig. 6: B]. Almost all of them are straight, with only one being slightly curved. Their width varies between 0.3–0.6 mm.

The single engraved point from Šarnelė is decorated differently. Both sides of its expansion are decorated with a motif of short and straight

38 Piličiauskas, Matiukas, Peseckas, Mažeika, Osipowicz, Piličiauskienė, Rannamäe, Pranckėnaitė, Vengalis and Pilkauskas, "Fishing history of the East Baltic."

39 e.g., Girininkas, *Kretuonas. Vidurinis ir*, 96.




**6.** Net pattern (A) and X-shaped incisions (B) on the Palanga point, and straight incisions (C and D) on the Šarnelė point. All microscopic pictures were taken under the 1.5x magnifying objective. The following zoom levels were used for the pictures: A–0.8x; B–1.25x; C–0.63x; D–0.63x, photos by Tomas Rimkus

Tinklo raštas (A) ir X formos įpjovimai (B) ant Palangos antgalio bei tiesūs įpjovimai (C ir D) ant Šarnelės antgalio. Visos mikroskopinės nuotraukos darytos po 1,5 karto didinamuoju objektyvu. Nuotraukoms buvo naudojami šie priartinimo lygiai: A-0,8x; B-1,25x; C-0,63x; D-0,63x, Tomo Rimkaus nuotraukos

incisions [Fig. 6: C and D]. There are 10 on one side and 12 on the other, varying between 0.3–0.6 mm wide and between 3–7 mm long.

It is difficult to interpret the meaning behind the engraving type and the desire to decorate these points. It is believed that the worldview of hunter-gatherers can be read through the analysis of decorated artefacts. Symbols that strengthen the tool symbolically, identify the owner of the tool, or have a supernatural meaning to protect the user may be hidden here[40]. In northern Europe, the net pattern is one of the most frequently

40 e.g., Ilga Zagorska, John Meadows and Marius Iršėnas, "New dates from Zvejnieki burial ground graves with anthropomorphic and zoomorphic figurines," *Archaeologia Baltica* 25 (2018): 100–124, https://doi.org/10.15181/ab.v25i0.1833; Peter Vang Petersen, "Zigzag lines and other protective patterns in Palaeolithic and Mesolithic art," *Quaternary International* 573 (2021): 66–74, https://doi.org/10.1016/j.quaint.2019.09.029; Olga Lozovskaya, "Techniques and ideas. Zigzag motif, barbed line and shaded band in the Meso-Neolithic bone assemblage at Zamostje 2, Volga-Oka region (Russia)," *Open Archaeology* 8 (2022): 175–195, https://doi.org/10.1515/opar-2022-0228

used decoration elements on bone and antler[41]. It is believed that this type of engraving could convey the importance of fishing, even when expressed on non-fishing objects[42]. Fish was one of the most important sources of human nutrition in the eastern Baltic region for a much longer time in the Stone Age societies compared to the western Baltic area[43], which likely gave fishing an important role in the lives of prehistoric communities. Although the conical points themselves were probably not used for catching fish, the ornament and the tool may not have been functionally related. It could also be a sign of identity, reflecting the way of life of that community or individual. However, the Palanga point also features X-shaped engravings in addition to the net pattern, which may carry a different meaning, possibly more related to hunting. This could also reflect the actual function of this tool. As a result, both types of ornament were depicted in one composition.

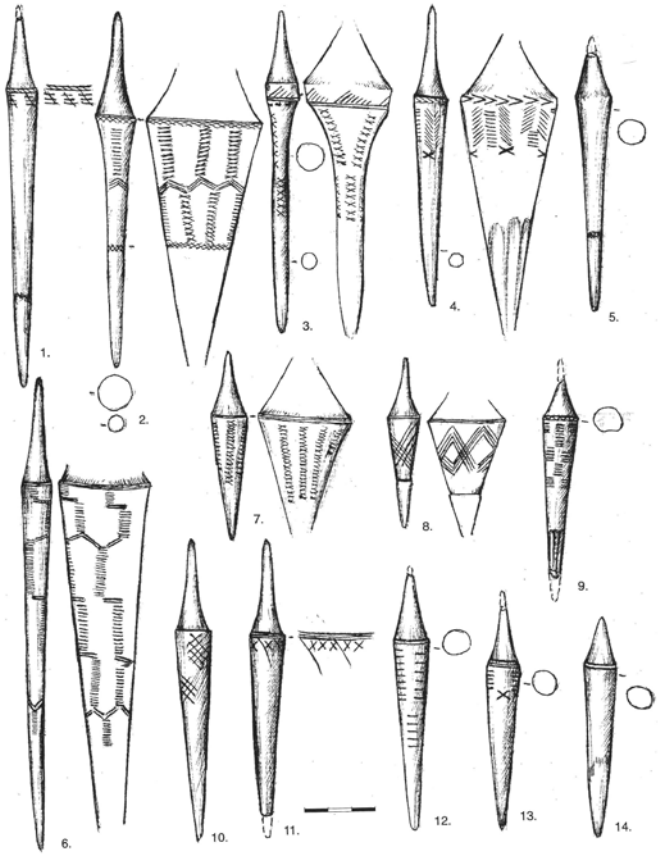
Simple linear incisions on bone and antler items are probably the most common pattern of decoration[44]. These compositions consisting of various numbers of incisions are often observed. This type of ornamentation is seen on the discussed conical point from Šarnelė, where one side of the artefact has a different number of incisions compared to the other. It is

41 Marius Iršėnas and Adomas Butrimas, "Daktariškės 5-osios gyvenvietės keramikos su organinės kilmės priemaišomis ornamentika," *Lietuvos Archeologija* 19 (2000): 125–138; Tomasz Płonka, *The portable art of Mesolithic Europe* (Acta Universitatis Wratislaviensis No. 2527) (Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego, 2003); Olga Lozovskaya, "Rhomb motif and net pattern in the Mesolithic-Neolithic mobile art of Zamostje 2, Volga-Oka region," in *Mesolithic art – abstraction, decoration, messages. International conference Halle (Saale), Germany, 19th-21st September 2019. Tagungen des Landemuseums für vorgeschichte Halle 26/II*, ed. Judith M. Grünberg, Bernhard Gramsch, Erik Brinch Petersen, Tomasz Płonka and Harald Meller (Halle (Saale): Landesmuseum für Vorgeschichte Halle, 2023).

42 Tomasz Płonka, "Net patterns in Mesolithic art of north-western Europe," in *Foraging assemblages volume* 2, ed. Dušan Borić, Dragana Antonović and Bojana Mihailović (Belgrade: Serbian Archaeological Society, 2021).

43 John Meadows, Valdis Bērziņš, Dardega Legzdiņa, Harald Lübke, Ulrich Schmölcke, Ilga Zagorska and Gunita Zariņa, "Stone-age subsistence strategies at Lake Burtnieks, Latvia," *Journal of Archaeological Science: Reports* 17 (2018): 992–1006, https://doi.org/10.1016/j.jasrep.2016.03.042

44 Judith M. Grünberg and Heribert A. Graetsch, "Mesolithic graphic signs, motifs and ornaments," in *Mesolithic art – abstraction, decoration, messages. International conference Halle (Saale), Germany, 19th-21st September 2019. Tagungen des Landemuseums für vorgeschichte Halle 26/II*, ed. Judith M. Grünberg, Bernhard Gramsch, Erik Brinch Petersen, Tomasz Płonka and Harald Meller (Halle (Saale): Landesmuseum für Vorgeschichte Halle, 2023).



**7.** Examples of decorated biconical bone points from Lake Lubāns, eastern Latvia. Adapted from Lūcija Vankina, *The collection of Stone Age bone and antler artefacts from Lake Lubāna* (Riga: National History Museum of Latvia, 1999), 234

Dekoruotų dvigubo kūgio formos kaulinių antgalių pavyzdžiai iš Lubano ežero, rytų Latvijoje. Parengta pagal Lūcija Vankina, The collection of Stone Age bone and antler artefacts from Lake Lubāna (Ryga: Latvijos nacionalinis istorijos muziejus, 1999), 234

difficult to determine whether their certain number was chosen intentionally or simply used to fill a specific section of the projectile's surface. However, as seen in similar engraving patterns from Latvian material, specific numbers of incisions are usually grouped and placed in different parts of the tool[45].

The types of engraving patterns on Palanga and Šarnelė conical points coincide with those on some conical projectiles found at Lake Lubāns in eastern Latvia, as well as at Kretuonas 1B in eastern Lithuania [Figs. 7 and 8]. The points found in Latvia have not yet been directly dated, so it is difficult to compare them chronologically with the ones discussed here. In the case of Kretuonas 1B, these points are usually placed between

45 Vankina, *The collection of Stone Age*, 234.

8. Biconical bone point from the Kretuonas 1B site with a net pattern engraving similar to the Palanga specimen. Švenčionys Nalšia Museum, ID GEK-VI-8907/392, photo by Tomas Rimkus

Dvigubo kūgio kaulinis antgalis iš Kretuono 1B radimvietės su tinklo rašto ornamentu, panašiu į esantį ant Palangos antgalio. Švenčionių Nalšios muziejus, ID GEK-VI-8907/392, Tomo Rimkaus nuotrauka

the 4th and 3rd millennium BC, but they have only been dated by samples from zooarchaeological material or pottery from nearby contexts[46]. The present AMS datings from Palanga and Šarnelė indicate that the mentioned methods of ornamentation on these items should be dated to the 5th millennium BC, but there is still a lack of data to clarify their continuity.

## Conclusions

The studied conical bone points from Palanga and Šarnelė represent one of the first attempts to examine the types, chronology and engraving patterns of these items in hunter-gatherer communities in northwestern Lithuania. Based on the AMS $^{14}$C data, it can be concluded that conical points started to be used even before the advent of ceramic vessels. However, most of them should still be assigned to the 5th–3rd millennium BC. Although more direct dating is required, it seems that the biconical points fall within this chronology. The oldest type presented in this work is from Šarnelė, dating to 6071–5897 cal BC. It differs in shape and type, and, therefore, in dating, from the rest of the studied artefacts.

46 Algirdas Girininkas and Linas Daugnora, "The Neolithic in East Lithuania," in *A hundred years of archaeological discoveries in Lithuania*, eds. Gintautas Zabiela, Zenonas Baubonis and Eglė Marcinkevičiūtė (Vilnius: Society of the Lithuanian Archaeology, 2016).

The conical points from northwestern Lithuania do not differ significantly in shape, design or engraving patterns from those found in eastern Lithuania or the territory of Latvia. The net pattern, linear incisions and X-shaped ornamentation are among the most characteristic ornamentation styles found on these tools. However, more complex ornamentation, though less common across regions, can also be observed. Therefore, a much larger database of conical points must be accumulated and studied comprehensively in order to track changes of this osseous technology.

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Santrauka

# Kūginiai kauliniai antgaliai šiaurės vakarų Lietuvoje: datavimas ir ornamento modeliai

Tomas Rimkus

*Reikšminiai žodžiai:* Medžiotojai-rankiotojai, mezolitas, kūginiai kauliniai antgaliai, tinklelio motyvas, įraižos AMS $^{14}$C datavimas.

Medžiotojų-rankiotojų bendruomenėse akmens amžiuje rytiniame Baltijos jūros regione kūginiai antgaliai buvo vienas labiausiai paplitusių medžioklės įrankių. Vakarų Lietuvoje jie rasti Palangos ir Šarnelės gyvenvietėse. Pastebima, kad ant daugumos jų yra dažnai atsikartojantis ornamento modelis, ypač paplitęs Latvijos ir Lietuvos teritorijose. Iki šiol ji buvo mažai analizuojami iš tipologinės ir technologinės perspektyvų, tiesiogiai nedatuoti AMS $^{14}$C metodu, o jų ornamentas taip pat aptartas dar mažai. Šis straipsnis skirtas Palangoje ir Šarnelėje rastų kūginių kaulinių antgalių analizei, kur panaudotas radiokarbono datavimas ir stereoskopinis mikroskopas.

Palangos ir Šarnelės gyvenvietės buvo tyrinėjamos XX a., o 2023 m. pradėti nauji tyrimai Šarnelės gyvenvietėje. Šiame darbe analizuojamas vienas antgalis iš Palangos ir penki iš Šarnelės. Visi antgaliai yra dvigubo kūgio formos, tik vienas dirbinys iš Šarnelės yra viengubo kūgio formos. Visi dirbiniai turi išplatėjusias dalis arčiau antgalių smaigalių. Radiokarbono datavimas rodo, kad viengubo kūgio formos antgalis yra datuojamas 6071–5897 cal BC. Dvigubo kūgio formos antgaliai datuojami 4930–4718, 4989–4796 ir 3936–3643 cal BC. Tai rodo, kad kūginių kaulinių antgalių technologija buvo pradėta naudoti dar iki keramikinių indų naudojimo pradžios Lietuvos teritorijoje.

Palangoje rastas antgalis yra ornamentuotas tinklelio motyvu ir X formos įrėžomis. Vienas antgalis iš Šarnelės iš abiejų pusių ant išplatėjimo dalies yra ornamentuotas 10 ir 12 įrėžtų linijų motyvu. Visi ornamentavimo stiliai yra būdingi kūginiams antgaliams, o jų atsikartojimą galima pamatyti Kretuono apyežerio gyvenvietėse (Kretuono 1B ir Žemaitiškės 2) ir Lubano ežero kaulo ir rago dirbinių kolekcijoje.