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# Island settlement of Lake Bėlis: New insights into Late Bronze and Pre-Roman Iron Age living spaces in eastern Lithuania

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**Abstract**

In 2021, during underwater archaeological surveys in the lake district of eastern Lithuania, a new settlement was discovered on an island in Lake Bėlis (Švenčionys district). According to $^{14}C$ AMS data, it dates to the 8th–4th centuries BC. The newly discovered Lake Bėlis island settlement stands out due to its size — it is a very small area of land — and because of its well-preserved structures and functional zones. A distinctive feature of this settlement is the wooden structures — piles — found on the underwater slopes around the island, extending along its entire perimeter. Additionally, the research was conducted in an archaeological layer situated in a wetland environment rich in preserved organic material. This article discusses the research on the island of Lake Bėlis, conducted from 2021 to 2023. In recent years, research in Lithuania has produced a significant amount of original material (new sites or reanalysis of known data) from the Late Bronze Age to the Pre-Roman Iron Age. The evidence analysed in this article suggests that in this period, besides common settlement types — hillforts, unenclosed settlements and lake dwellings — there were also settlements located on natural lake islands.

## Introduction

In recent years, research on sites from the end of the Early Metal period (Late Bronze Age – Pre-Roman Iron Age) has become particularly active. Fortified settlements on hilltops (hillforts) (Urbonaitė-Ubė 2022; Minkevičius et al. 2021; Gaižauskas et al. 2022), along with unenclosed settlements (Vengalis et al. 2022; Piličiauskas et al. 2022) and lake settlements (Pranckėnaitė 2014), have been discovered or explored as well as precisely dated. Studies have also analysed and supplemented new data on the economy of the period (Minkevičius et al. 2023), the development of settlement and the investigation of fortified sites in the region (Podėnas 2022). Burial traditions have been newly reassessed and revised (Vengalis et al. 2020; Muradian 2024). The results of these studies point towards significant lifestyle changes during the Late Bronze Age.

The specifics of residential sites from the 1st millennium BC in eastern Lithuania are primarily known from materials found in fortified settlements (hillforts) (Luchtanas 1992; Podėnas 2022). For a long time, analyses of residential sites from the 1st millennium BC claimed that very little is known about unenclosed settlements, as they had not been investigated on a larger scale (Brazaitis 2005, pp. 251–317). However, a synthesis of data on Late Bronze Age and Pre-Roman Iron Age settlements shows that there were various types of coexisting settlements: unenclosed settlements, fortified hilltop settlements (hillforts), island settlements and lake dwellings (Zabiela et al. 2012; Merkevičius et al. 2018). Thus, the established settlement model in eastern Lithuania is being revised. As new settlement sites are discovered and interpreted, it becomes clear

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that community choices in regard to living spaces were not as homogeneous as previously thought. The cultural landscape is enriched not only with new locations on the map but also with different types of residential sites. This raises questions and allows for discussions regarding settlement density, adaptation to the environmental conditions, building techniques and functions of various types of settlement structures during the 1st millennium BC.

In 2021, a previously unknown Late Bronze Age to Pre-Roman Iron Age settlement was discovered on the island of Lake Bėlis (Pranckėnaitė et al. 2022). While it is known that habitation of lake islands occurred during the 1st millennium BC, specific characteristics of settlements built there at that time remain largely unknown. Currently, only 12 such sites have been identified in eastern and southern Lithuania (Merkevičius et al. 2018; Podėnas 2016), a very small number compared to the investigated and well-known Late Bronze Age fortified hilltop settlements (hillforts) (Podėnas 2022). Furthermore, archaeological research on these islands has so far been limited to small-scale excavations or surface-only surveys (Stončius et al. 2010; Zabiela et al. 2012).

The material evidence from the lake island settlements from the 1st millennium BC in the southeastern Baltic region is sparse, and these sites have not been widely studied. Most of the data on island settlements in the region comes from the Masurian Lake area in Poland (Hoffmann 1999; Gackowski 2000a; 2000b), while the majority of lake settlements found in Latvia are dated to an Iron Age period (Apala 2021) and no such settlements have been identified in Estonia (Lang 2007).

In this context, the data from the Lake Bėlis island settlement contributes to the understanding of the phenomenon of natural lake island habitation. The settlement was excavated from 2021 to 2023 (Kraniauskas et al. 2023; Kraniauskas et al. 2024, pp. 44–47). The research employed both terrestrial and underwater archaeological methods, combined with interdisciplinary approaches. This utilisation of a complex of methods broadens the understanding of the little-explored natural lake island settlements in Lithuania and provides a new perspective on settlement diversity and the ways inhabitants adapted to their natural environment.

This article analyses the structure and archaeological material of the newly discovered Lake Bėlis island settlement. It aims to expand knowledge about such settlements in the lakes of northeastern Lithuania within the southeastern Baltic region context. The analysis focuses on the settlement's structural features, including both terrestrial and underwater structures. Preliminary analysis of artefacts and ecofacts is presented to illuminate the settlement's functioning and the inhabitants' lifestyle (economy and subsistence practices). In light of this new data, our understanding of settlement types during the 1st millennium BC is enriched by the awareness of the choice made by some of the communities at the time to settle in natural lake islands.

## 1. Field research and methods

Surveying for underwater archaeological sites in Lithuanian inland waters began in 1998, primarily based on information provided by local residents and recreational divers regarding possible underwater heritage sites, as well as the location of known archaeological sites near water bodies (Pranckėnaitė 2010). In 2021, underwater surveys were conducted in the Švenčionys district, covering the microregion of Lake Bėlis, Lake Bėlaitis and Lake Sėtikis in northeastern Lithuania. This area was selected due to its exceptional geographical significance at the watershed between the Nemunas and Daugava River basins. Until then, no archaeological investigations had been carried out in these lakes or their surroundings — the only nearby archaeological site is Juodeliškiai barrow cemetery located about 3 km to the east, dating to the second half of the 1st millennium and the beginning of the 2nd millennium AD (Pranckėnaitė et al. 2022).

In 2021, the search for new sites began with underwater surveys in the aforementioned lakes. The first stage employed a side-scan sonar operating at 455 kHz frequency, covering the entire lake areas in strips of varying lengths, averaging 50 m in width. Anthropogenic objects were identified in sonar scanning images. In the second stage, visual underwater inspections of identified objects, shoreline explorations and the collection of archaeological finds were conducted. Underwater survey methods allow for extensive exploration since anthropogenic structures submerged underwater are less affected by various environmental factors. In Lake Bėlis, a 12.3 ha area was visually inspected underwater, and wooden piles driven into the slope of the island were recorded at depths of 1–3 m. Additionally, fragments of handmade pottery, burnt stones, charcoal and animal bones were found. In Lake Bėlaitis, a surveyed area of 16.5 ha revealed several fishing stakes, the bottom of a wooden boat and a fishing trap, all dated to the 20th century. In Lake Sėtikis, the surveyed area covered 16.2 ha. Fishing stakes were recorded along the southern and western shores, while a pot with a handle, dated to the 17th–18th centuries, was found on the northern shore. Remains of a bridge of uncertain date were found at the northeastern shore, near the mouth of the Žeimenėlė stream. Underwater surveys in the Bėlis, Bėlaitis and Sėtikis lake microregion revealed a settlement on the island of Lake Bėlis, with only stray finds in the other lakes (Pranckėnaitė et al. 2022) (Fig. 1).

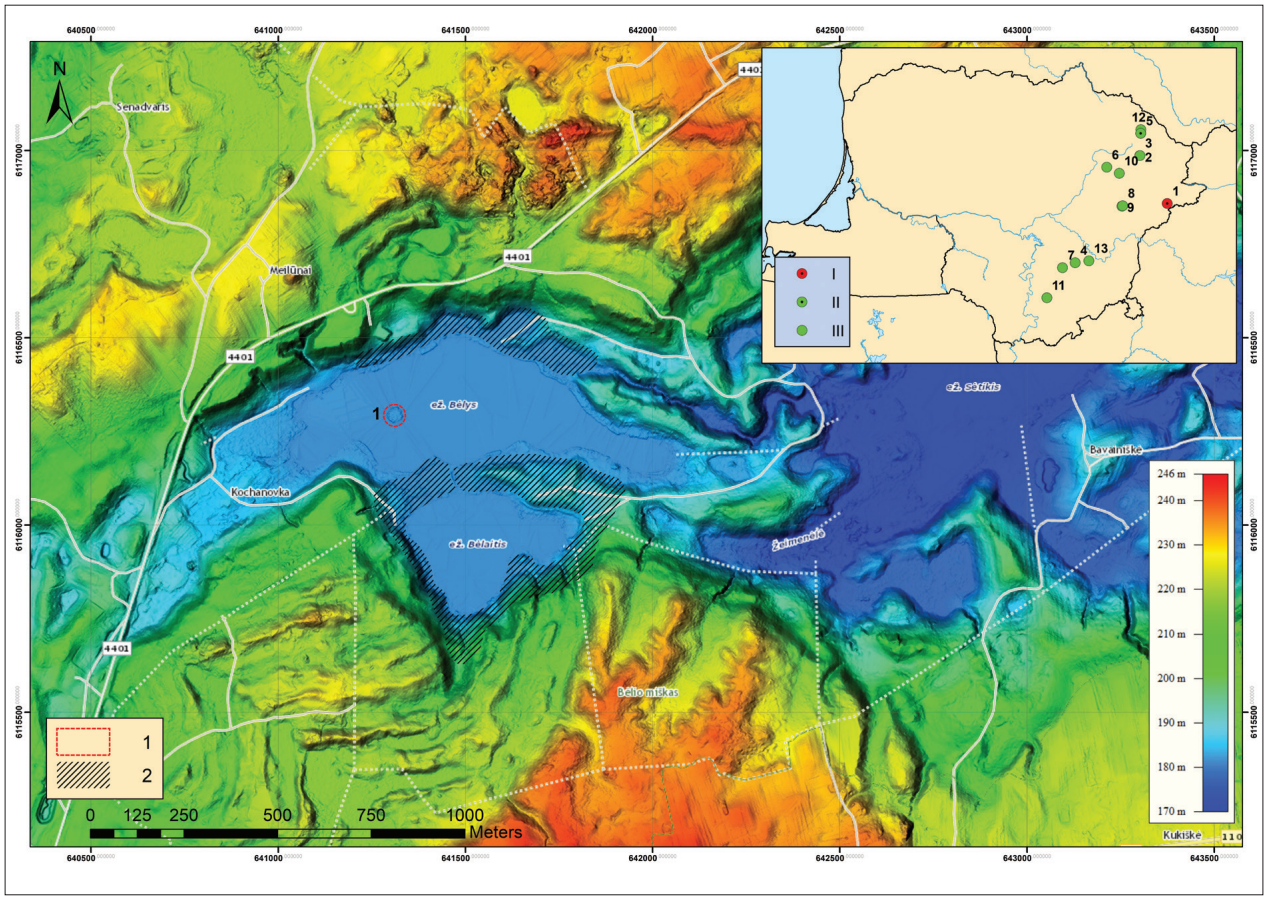


Figure 1A. Location of island settlements from 1st millennium BC in Lithuania. I – Bėlis Lake island settlement (1), II – excavated settlements (5. Dumblynė (Lake Sartai, Rokiškis district)), III – island settlements according to survey data (pottery with striated surface) (2. Bajoriškės I (Lake Indrajai, Utena district), 3. Bajoriškės II (Lake Indrajai, Utena district), 4. Daugirdiškės (Lake Monis, Elektrėnai municipality), 6. Klykūnai II (Lake Rubikiai, Anykščiai district), 7. Ličiūniškės (Lake Antakmenis, Trakai district), 8. Pagraužės I (Lake Galuonis, Molėtai district), 9. Pagraužės II (Lake Galuonis, Molėtai district), 10. Pakalniai II (Lake Vidinkstas, Utena district), 11. Rimėnai I (Lake Suvingis, Alytus district), 12. Rupetos I (Lake Sartai, Rokiškis district), 13. Žydiškės I (Lake Skaistis, Trakai district) (map by Kraniauskas).
Figure 1B. Location of Bėlis lake island settlement (1) and surrounding landscape based on LiDAR data with marked survey areas (2) (map by Kraniauskas).

In 2022, the research continued, with a narrowed investigation area based on the results obtained in 2021. Archaeological surveys and explorations were carried out along the lake shores to identify possible settlements on the shores and anthropogenic objects, and to gather more data on the settlement on the island of Lake Bėlis discovered in 2021. The research included the island of Lake Bėlis, its shores, and the surrounding areas of Lakes Bėlis, Bėlaitis and Sėtikis (Čičiurkaitė and Kraniauskas 2023). During the archaeological investigations, 11 test pits were excavated, covering a total area of 17.25 m², and archaeological surveys encompassed approximately 11.6 ha. In nine of the test pits around Lakes Bėlis, Bėlaitis and Sėtikis, as well as in the 100 probes, no clearly defined cultural layer with archaeological finds was identified. Only possible signs of anthropogenic activity, such as scattered charcoal fragments and dark-toned soil layers, were found. Five areas were designated for potential future research.

On the island of Lake Bėlis, three trenches were initially excavated, yielding charcoal, pottery fragments and a stone with smoothing marks. Two trenches were excavated — one on the island (4 m²) and another on the eastern underwater slope (3 m²) — aligned to create an east–west transection of the island. In both trenches, an archaeological layer and structures of a settlement from the Late Bronze Age and the Pre-Roman Iron Age were identified. Around the island, 129 piles were located and marked with buoys, and their positions were mapped using drone photography.

The underwater portion of the settlement was investigated using a dual approach: visual surveys and an inventory of underwater wooden structures (up to 15 m from the island's shoreline and up to a depth of 5 m). An archaeological trench was also examined using a water pump in different areas around the island. The water in the lake was relatively clear due to the abundance of carbonates, with

an emerald hue, and visibility reached about 4 m. The discovery of the underwater settlement's structures, especially the piles, was significantly hampered by large, densely intertwined roots of water lilies and reed stems.

In 2023, archaeological research continued on the island of Lake Bėlis (Kraniauskas et al. 2024). Four trenches were excavated, covering a total area of 14 $m^2$. Two of the trenches were excavated on the island, expanding the east–west transection, while the other two trenches were explored underwater to clarify the outer settlement structures on the northern and southern parts of the island's underwater slope.

During 2022 and 2023, in total six trenches were excavated on the island of Lake Bėlis and its underwater slope, covering a total area of 21 $m^2$. Eight $^{14}C$ AMS samples were dated at the Vilnius Radiocarbon Laboratory, species analysis of the wood and isolated charcoal samples was conducted by Dr Kęstutis Peseckas, preliminary archaeobotanical material analysis was performed by Dr Giedrė Motuzaite Matuzevičiūtė and Rūta Karaliūtė, and osteological data was analysed by Dr Elina Ananyevskaya.

The uncovered archaeological wooden structures of the settlement were left *in situ*, covered with geotextile for preservation. All finds, including animal bones, lithics and charcoal samples, were transferred to the Nalšia Museum in Švenčionys.

## 2. Site location, landscape and a water basin

Lake Bėlis is situated within the moraine hill landscape and watershed ecosystem of the Sirvėta Regional Park, located to the northeast of Švenčionys. Together with Lakes Bėlaitis and Sėtikis, it occupies the tip of a unique glacial palaeovalley (locally known as 'ravas'), where the lakes connect via water channels and the Sirvėta stream, feeding into the Daugava River basin. The palaeovalley is also connected by a short land segment to the Kūna/Mera River valley, which encircles Švenčionys.

This area is a unique watershed location, linking two major eastern Baltic rivers — the Nemunas and the Daugava. It is the most forested watershed massif within the Daugava River basin and the Žeimena River sub-basin in its central part. The Sirvėta palaeovalley stretches northeast for about 30 km, with a width ranging from 500 to 800 m, broadening in some places to 1.2–1.5 km. The valley's predominant depth is between 20 and 50 m. Its marshy floor contains numerous moraine and sandy hills formed during the penultimate glacier stage, as well as various deposits and accumulations of material. The slopes of the palaeovalley are dotted with gravel and clay hills created by the glacier, now covered in coniferous and deciduous forests. In the southern part of the valley, beyond Lakes Bėlis and Bėlaitis, the landscape gradually transitions into a lower terrace plain.

Lake Bėlis is oriented in an east–west direction, with a length of 1.07 km. Its maximum width, in the north–south direction, reaches 375 m, while the narrowest part of the lake, located in the western section, is only 80 m wide, a location referred to locally as 'Tatars Bay'. In terms of area, Lake Bėlis belongs to the group of larger lakes in Lithuania (Garunkštis 1988), covering approximately 23 ha. In its southern part, Lake Bėlis is connected by a small channel to Lake Bėlaitis, situated about 70 m to the south. In the northeastern part of the lake, the Sėtikė stream flows out, connecting Lakes Bėlis and Sėtikis.

On the western side of Lake Bėlis lies a single island with a diameter of approximately 32 m (0.08 ha), featuring a shoreline terrace of 4–5 m in width. The island's surface is at an altitude of 180.8 m a.s.l, while the water level stands at 180.3 m a.s.l. The underwater slope of the island is quite steep, descending at an angle of about 26 degrees. The depth of the lake at the base of the island reaches about 7–8 m. The lakebed near the island is flat, overgrown with aquatic plants and covered with a thin layer of silt. Up to a depth of 7 m along the island's slope, the lakebed is covered with aquatic vegetation, and closer to the island, up to a depth of 2 m, reeds and water lilies grow. The surface layer of silt and organic matter sediments ranges from 10 to 30 cm thick, with deeper deposits of whitish calcareous sapropel. Brown peat has accumulated along the shore of the island, particularly on the southern side, with a thickness of up to 50 cm. This peat has formed a shoreline terrace around the island, with a width of up to 5 m. After the peat terrace ends, a step-like formation occurs on the lakebed, where the depth drops from 50 cm to 1.5 m. It is likely that the water level of the lake has risen by about 50 cm since the settlement's occupation period, meaning that the current shoreline terrace was once a marshy land area.

## 3. Archaeological layer and archaeological features

### 3.1 Island (terrestrial part)

During the archaeological investigations on the island, three trenches were excavated, resulting in a 14 m long and 1m wide section running in an east–west direction from the water's edge on the island's eastern shore towards its centre (Fig. 2). Although the scope of the research over three seasons is relatively small, the collected material is highly informative. The island has remained untouched by destructive human or natural activities, allowing the settlement's structures and artefacts to be well preserved in the wetland environment.


Figure 2. A situation plan of research at Bėlis lake island settlement with excavated trenches (1. 2022, 2. 2023), island perimeter (3), main features (4. underwater and on shore piles, 5. piles of possible building structure and axis (6), 7. fireplace, 8. log flooring, 9. building wall) and interpretation (10. outer zone of pile distribution) (drawing by Kraniauskas).

The surface of the island is covered with tall grass, reeds and scattered deciduous trees, primarily alders. The edges of the island are marshy, and at the centre, the highest point rises only about 50 cm above the water level. The upper stratigraphy consists of a 12–19 cm thick layer of turf and vegetation. Beneath this turf is a layer of black, well-decomposed peat soil, rich in silt and interspersed with plant roots, with a thickness of approximately 10–16 cm.

At an average depth of 20 cm, around 180.45 m a.s.l, the archaeological layer was uncovered. This layer consists of blackish peat mixed with coarse sand particles, with a slightly lighter tone due to the sand content. It contains small charcoal fragments, wood chips, bark fragments and eroded granite patches. Additionally, numerous small fragments of eroded ceramics and broken and intact animal bones were found. In the above-ground section of the island, an archaeological layer averages 40 cm in thickness and contains clearly stratified sandy interlayers, ranging from 5 to 11 cm thick (Fig. 3). The cultural layer formed above, alongside and between the settlement structures, which are attributed to the construction of buildings or household activity zones of the settlement (Fig. 4).

Feature 1 — A log flooring was discovered near the eastern edge of the island, exposing a 255 cm long section composed of 15 logs laid in a north–south direction. A transverse log was detected beneath them. The logs ranged in diameter from 8 to 12 cm, with almost all showing signs of burning, except for three on the eastern side. It was determined that all the logs in the flooring were made of pine (*Pinus sylvestris*). Charcoal fragments found between the logs included wood from linden (*Tilia cordata*), pine (*Pinus sylvestris*), alder (*Alnus* sp.), birch (*Betula* sp.), hazel (*Corylus avellana*) and willow/aspen (*Salix* sp./*Populus tremula*). Fragments of pottery and a concentration of charred cereal were found on and between the logs. One log from this flooring was dated using $^{14}$C AMS, yielding a date of 780–541 cal BC (FTMC-VZ-63-1) (Table 1).

Feature 2 — A fireplace was discovered in the western part of the excavated area, near the centre of the island. A 67 x 40 cm fragment of the fireplace was uncovered, consisting of two larger eroded granite stones measuring 21 x 27 cm and 15 x 18 cm, as well as several smaller stones, 5–8 cm in diameter, arranged in a semicircle. The structure was not dug into the ground, and the fill between the stones consisted of black peat with charcoal fragments. Fragments of

Figure 3. Trench 4 profile with a piles and sandy interlayers (photo by Čičiurkaitė).

Table 1. AMS $^{14}$C dates obtained from the Bėlis lake island site.

| No. | Context | Sample | Lab. code | 14C date BP | 14C date cal BC/cal AD 2σ |
|---|---|---|---|---|---|
| 1. | Trench 1 (island) | Wooden flooring (*Pinus sylvestris)* | FTMC-VZ-63-1 | 2506±29 | 780-541 cal BC |
| 2. | Trench 1 (island) | *Triticum diccocum* | FTMC-VZ-63-2 | 2521±28 | 789-544 cal BC |
| 3. | Trench 2 (underwater slope) | Pile (*Betula sp.)* | FTMC-VZ-63-3 | 2536±28 | 749-548 cal BC |
| 4. | Trench 2 (underwater slope) | Pile (*Betula sp.)* | FTMC-VZ-63-4 | 1782±30 | 212-361 cal AD |
| 5. | Trench 2 (underwater slope) | Pile (*Betula sp.)* | FTMC-VZ-63-5 | 2523±23 | 790-544cal BC |
| 6. | Trench 4 (contact with lake marl) | Organics (peat) | FTMC-IA-33-1 | 5125±35 | 4037-3801 cal BC |
| 7. | Trench 5 (underwater slope) | Pile (*Betula sp.)* | FTMC-IA-33-2 | 1753±29 | 238-383 cal AD |
| 8. | Trench 4 (island) | Pile (*Pinus sylvestris)* | FTMC-IA-33-3 | 2398±30 | 731-397 cal BC |

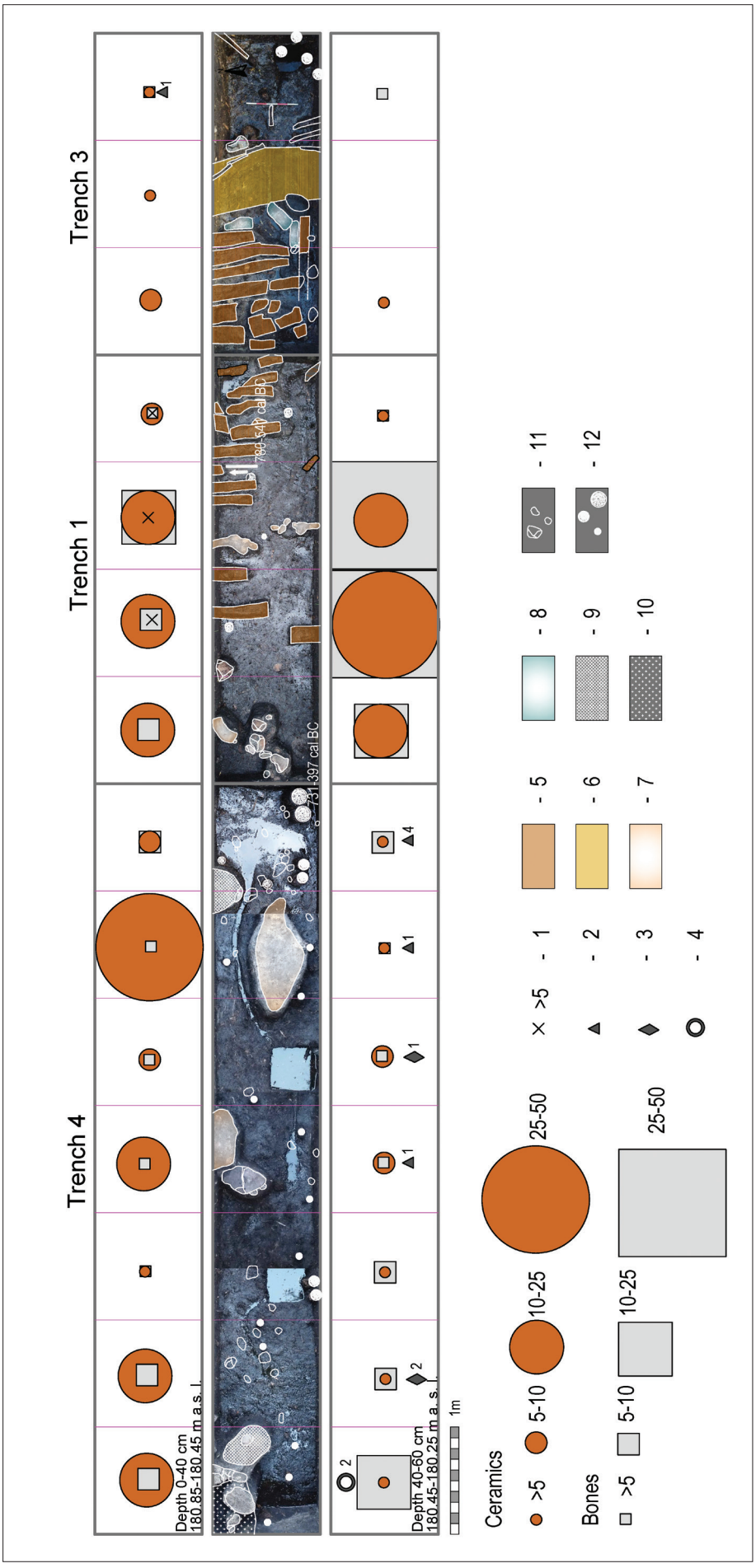


Figure 4. Distribution map of main features and artefacts in the excavated trenches on island (1. flint finds, 2. stone axes, 3. grinding stones, 4. copper alloy finds, 5. log flooring, 6. building wall, 7. brown clay patches, 8. blue-gray clay, 9. eroded granite, 10. charcoal, 11. stones, 12. piles) (drawing by Kraniauskas and Pranckėnaitė).

ceramic vessels and two copper alloy artefacts were found between the stones and close to them.

Feature 3 — Wooden piles, likely the supports for a timber-framed structure, were uncovered at an average depth of 50 cm, at an elevation of around 180.35 m a.s.l. A total of six piles, with diameters ranging from 9 to 14 cm, were discovered. The length of the piles could not be determined, as they were deeply driven into the underlying peat and lake sediments. The piles were arranged in pairs, positioned close to each other along an east–west axis, with a distance of 387 cm between each pair. Those piles were made of pine (*Pinus sylvestris*), and one was dated to 731–397 cal BC (FTMC-IA-33-3R). Also, in the excavation area, 17 poorly preserved stakes made of deciduous wood, each about 4–5 cm in diameter, were found scattered. Near the eastern edge of the excavation area, close to the lake shore, four birch (*Betula* sp.) piles, all with diameters of about 9–10 cm, were uncovered. These piles are likely part of an external structure extending underwater.

Feature 4 — A peat wall was discovered in the eastern part of the excavation area between the outer piles and the log flooring, at a depth of 50–60 cm. This structure consisted of a compact brown peat strip with occasional twig inclusions, measuring about 52–60 cm in width. It is located at the edge of the former building, just beyond the log flooring and clay fragments, coinciding with the presumed boundary of the building's wall. Peat, valued for its excellent thermal insulation properties, ease of extraction and mouldability, was likely used as a building material. Based on the material composition and location, it is suggested that peat, combined with twigs, could have been used as wall insulation. Beyond this boundary (building wall), the stratigraphy changes, with the archaeological layer disappearing and a washed layer of loose brown peat with coarse organic material beginning.

Feature 5 — A large clay block was found between the log flooring and the fireplace. The irregularly rhombic block measures up to 104 cm in length, 44 cm in width, and about 12 cm in thickness. Irregular larger and smaller amorphous clay fragments were found throughout the excavation area. All the clay fragments appear to have been brought in, likely for use in pottery production. In the zone between the log flooring and the fireplace, two large stones with working surfaces were uncovered. One of these stones is a flat sandstone slab measuring approximately 40 x 24 cm and 5–6 cm thick, which had broken into three parts. The stone was supported from underneath by several small pebbles to level its surface. Next to the sandstone slab, a large clay fragment was found. A multifaceted stone, about 19 x 18 x 12 cm in size, resembling a pyramid, was found near the northern wall of the excavation area. Its apex showed clear signs of wear from use as a working surface.

At a depth of about 65–70 cm, no artefacts were found, and the presence of charcoal fragments diminished. Below this, the natural black peat layer continued. To verify the stratigraphy, two test pits were dug near the centre of the island. It was determined that the peat layer extends to a depth of 1.25 m, where a whitish calcareous sapropel layer with fine sand particles was encountered — representing the natural lake sedimentation layer. A second test pit was dug 6 m east of the first, where sapropel was encountered 30 cm deeper, at a depth of 155 cm. This confirmed that the peat layer thins from the western to the eastern side of the island. To determine the onset of peat formation and the island's development, a sample was taken from the base of the peat with contact with lake sediments for $^{14}$C dating, which yielded a date of 4037–3801 cal BC (FTMC-IA-33-1R) (Fig. 5).

### 3.2 Underwater structures — island slope

During the first stage of archaeological research, 129 piles protruding from the lakebed were marked during visual surveys. The average diameter of the piles ranged from 10 to 14 cm, though smaller piles with diameters as small as 6 cm were also found. The compiled plan of the piles reveals several trends (Fig. 2).

First, the piles form a circle around the island, with the highest concentration found on the northeastern side. It is hypothesised that they have been better preserved in this area due to it being the shaded side, where biodegradation occurred more slowly. This region also exhibited fewer molluscs (mussels) and significantly less aquatic vegetation and sedimentation. Since piles were found around the entire perimeter of the island, it is likely that they were originally driven densely into the silt, though due to various natural processes, they are difficult to detect visually.

Second, the circle of piles surrounding the island is located about 4–5 m from the current shoreline. However, it is likely that piles originally extended from the very edge of the island. The inner boundary of the pile circle was detected during excavations onshore, where piles begin immediately beyond the settlement structures (building). Therefore, the total width of the pile circle would have been around 9–11 m, with piles driven both along the shoreline and into the lakebed to depths of up to 3 m below the water surface.

Third, in the inventoried row of piles, larger piles, with diameters ranging from 10 to 14 cm, were arranged in at least three rows, with smaller stakes measuring 3–6 cm in diameter driven between them. Separate rows of piles (vertical structures) were clearly visible along the island's eastern shore.

Archaeological trenches underwater were explored by positioning them perpendicular to the island and in areas where piles were recorded. It was determined that between the piles on the underwater slope of the island, an archaeological layer had formed, ranging from 10 to 35 cm in thickness. At the base of the slope, the layer was very thin, just a few centimetres thick, having eroded along with sedimentation. However, at the top of the slope, closer to the island, the layer thickened to around 30 cm. The underwater archaeological layer is distinctive, starting immediately at the lakebed surface and consisting of organic material — macrofossils of aquatic vegetation, wood chips, branches, bark, shavings, peat and silt, mixed with a clear fraction of fine gravel. This layer contained charcoal fragments, archaeological finds, animal bones and burnt stones. Some larger finds (pottery fragments) protruded from the surface, almost uncovered by silt, and were found visually.

It is important to note that, during underwater excavation, after removing the silt layer and exploring the archaeological layer, many more piles were uncovered, which had not been visible during the initial visual surveys. In trench 2, on the eastern side, 21 piles were revealed; in trench 5, on the southern side, 14 piles and 3 horizontal logs were found. This confirms that the map with marked piles can be expanded and that more underwater structures around the island exist, with piles driven densely into the lakebed.

The uncovered piles were made from deciduous trees (birch (*Betula* sp.) and alder (*Alnus* sp.)) and coniferous trees (pine (*Pinus sylvestris*)). The coniferous wood was better preserved, protruding up to 20 cm above the sedimentation on the lakebed. The pile diameters in the excavated areas varied from 3 to 14 cm. In trench 2, 3–4 rows of piles could be distinguished (Fig. 6). One row of piles was diagonal, suggesting that they protruded from the water at an angle of about 30–45 degrees. In trench 6, located in the northern part of the island, fewer structures were found, and the archaeological layer was thinner, with only 9 stakes detected, ranging from 2 to 10 cm in diameter.

Four pile samples, three from the eastern side of the island and one from the southern side, were dated using $^{14}$C AMS. The dates of 790–544 cal BC (FTMC-VZ-63-5) and 749–548 cal BC (FTMC-VZ-63-3) coincide with the settlement dates from the island, while two other dates — 212–361 cal AD (FTMC-VZ-63-4) and 238–383 cal AD (FTMC-IA-33-2R) — indicate later use of the settlement or its surroundings (Table 1).

In interpreting the underwater structures, it seems plausible that these could have been part of a defensive fence surrounding the settlement on the island. The diagonal piles may have been sharpened stakes pointing outward. Some of the piles, especially the thinner stakes, were likely used for fishing or securing traps, nets or boats, and may

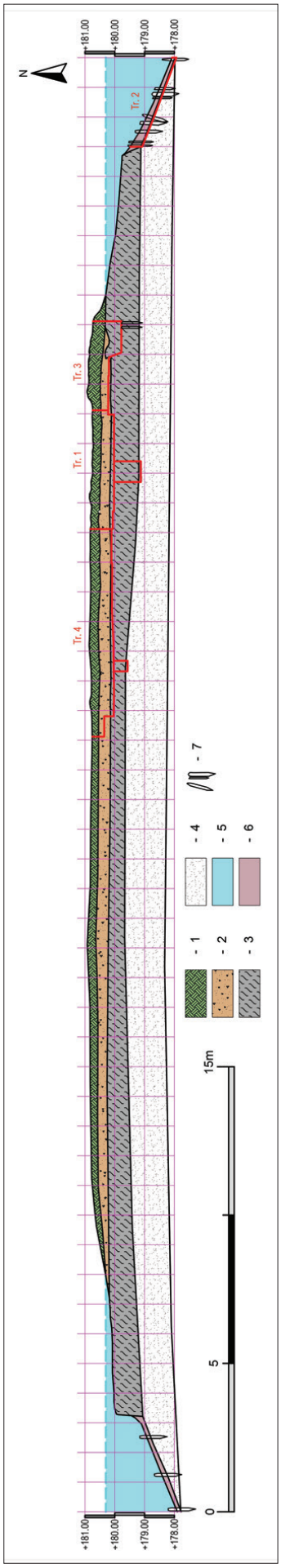


Figure 5. Transection (west–east) of the Bėlis lake island settlement with an excavated trenches (1. vegetation, 2. archaeological layer, 3. peat, 4. lake marl, 5.water level, 6. archaeological layer on the underwater slope, 7.piles) (drawing by Kraniauskas).

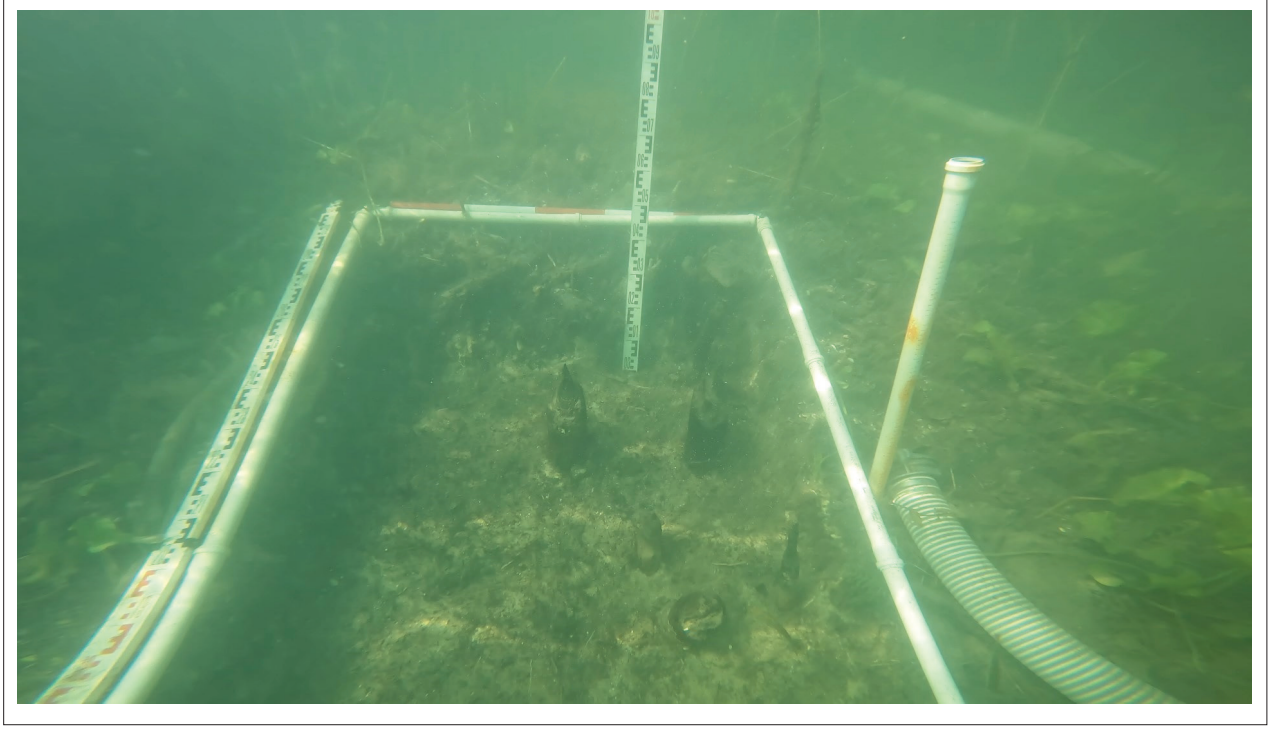

Figure 6. Lines of piles uncovered in trench 2 (photo by Pranckėnaitė).

not be contemporaneous, having been driven into the ground near the island over a long period of time, which could explain the Roman period dates, as no cultural layer or specific artefacts from that period were found on the island. The situation in the northern part of the island differs from the eastern and southern parts, as very few finds were uncovered there. It is possible that trench 6 was positioned in a fence gap — an entranceway to the settlement — considering that this point is the closest to the mainland, with a distance of 120 m from the shore to the island.

Given that the piles are spread over a relatively wide area, were driven in fairly densely, and horizontal wooden structures (logs) were found in the investigated areas, it is possible that some piles may have supported raised structures, such as platforms or buildings, at least in certain parts around the island.

## 4. Artefacts and organic remains

### 4.1. Pottery

The finds discovered in the archaeological layer on the island and on the underwater slope, found on the surface between the wooden piles, are discussed as part of a single complex. It is important to note that stray finds from later periods (such as wheel-thrown ceramics) were also found on the slopes of the island, but are not included in the scope of this article.

In total, approximately 480 fragments of pottery were collected. It was observed that the pottery fragments found on the island in the excavated areas were much smaller and more eroded than those found in the underwater areas. Therefore, most of the clearer morphological features were identified from the pottery found on the underwater slope of the island. All of the identified fragments are hand-made. Fragments with striated surfaces dominate (about 80%), and all fragments are tempered with coarse granite particles. Additionally, thick-walled vessels are predominant. Although several groups of pottery can be distinguished in the collection, a detailed chronological classification of the ceramics cannot be made from the available material. A more comprehensive analysis, including pottery finds from reliably dated stratigraphy, would be necessary (Fig. 7).

Vessels that are slightly striated in an irregular manner are most common, but the found fragments are small and lack distinctive features. The wall thickness of these vessels is 7–10 mm. Some of the rims and their interior surfaces are also striated. The clay temper of these vessels contains medium-sized and coarse granite inclusions, measuring 1–4 mm. A few vessel necks are decorated with horizontal striations and circular impressions (pits) (Fig. 7. 5, 7, 15, 16). Within the category of slightly striated vessels in this complex, S-profile-shaped vessels with thinner walls, ranging from 6–9 mm in thickness, stand out (Fig. 7. 11–13).

Deeply striated vessels with thick walls (9–12 mm), most of which can be attributed to barrel-shaped forms, were

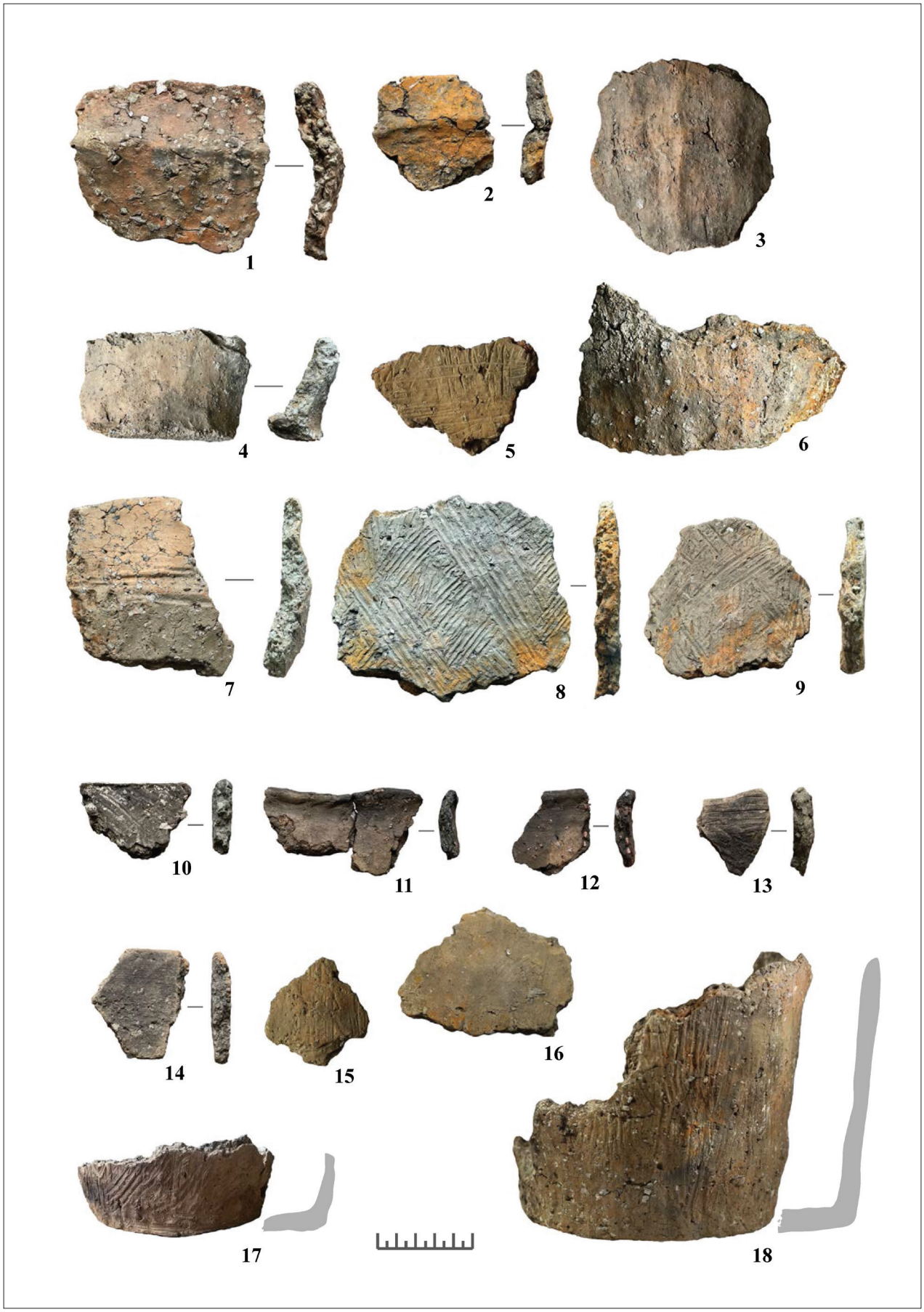


Figure 7. Various types of pottery from Bėlis site (photo by Pranckėnaitė).


Figure 8. Metal and stone finds from Bėlis site (1. iron sickle, 2. loop of copper alloy, 3. crook-like pin of copper alloy, 4. iron crook-like pin, 5.grinding stone, 6–9. hafted stone axes (photo by Pranckėnaitė).

notable. Vertical striations descending from the neck are a common feature. The clay temper contains coarse granite, with particle sizes around 5–7 mm. Some sherds have a clear intersecting linear ornamentation created by deep striations (Fig. 7. 8–9, 17–18). This group also includes sherds with striations that appear to be smoothed over.

Distinctive vessels were found during the excavations, characterised by thick walls (9–11 mm) and smooth surfaces (though some faint striations can be observed). These vessels display vertical finger furrows on the surface (Fig. 7. 1–4, 6). Based on the rim profile shape, they can be attributed to biconical vessels with a ridged neck (Type K) (Visocka et al. 2022).

### 4. 2 Metal, stone and other artefacts

In both the island and underwater excavated areas, four metal artefacts were found: two iron objects — a crook-like pin and a sickle — and two copper alloy objects — a loop and another crook-like pin (Fig. 8).

The copper alloy crook-like pin was found in trench 4. It is 9 cm long, with a circular cross-section (0.25 cm in diameter), and features a small looped head, 1.4 cm in diameter. Based on the absolute dating of the structures documented in the trench, this pin could be dated to the Late Bronze Age and the Pre-Roman Iron period. A similar copper alloy crook-like pin was found at the Sokiškiai hillfort (Grigalavičienė 1995, pp. 188–191). A slightly larger iron pin — 12 cm long with a head 3.3 cm in diameter and a tapered curved tip — was found in underwater trench 2. Although it was discovered in the archaeological layer, it cannot be definitively attributed to the period BC based on the $^{14}$C dated structures (the piles) (Table 1). However, it is likely associated with the occupation period of the island. Similar iron crook-like pins have been found in archaeological material and are dated to the 1st to 2nd centuries AD (Grigalavičienė 1995, pp. 188–191).

The copper alloy ring which was found in a trench 4 archaeological layer is made from wire 3 mm in diameter, with a total diameter of 1.5 cm. Unfortunately, it lacks distinctive typological features that would allow for a more precise classification.

The iron sickle, measuring 16 cm in length, with a blade width of 1.7 cm and thickness of 0.3 cm, was also found in underwater trench 5, within the archaeological layer on the southern underwater slope of the island. The only absolute date from this excavation area is from the 3rd–4th century AD (Table 1). The formation of the archaeological layer on the underwater slope of the island is influenced by complex processes that require additional interdisciplinary research to determine their precise nature. The layer is not compact, so it is necessary to assess various factors, such as erosion, changes in water level or possible sporadic influences (trampling, embedding). Therefore, at least on the basis of the available data, an unequivocal dating of the archaeological finds on the basis of the stratigraphy cannot yet be precise.

The stone artefact collection includes three polished hafted axes, at least two axe blanks, stone grinders or stones with working surfaces and stoneworking debris — chips and fragments of granite, flint, basalt and quartz. The polished hafted axes are small, measuring 6.2–7.5 cm in length and 3.2–4 cm in width, with straight sides. One tool (Fig. 8. 7) stands out due to its asymmetric cross-section and may have been used as an adze (Luchtanas 1992). It is also worth noting the flint and several fragments of bone or antler artefacts, which can be added to the archaeological collection of the site.

When analysing the distribution of finds in the excavated areas of the island, several patterns emerge. The finds were recorded at two levels — above the documented structures and below them. The smallest number of finds was recorded on the eastern side of the island, near the edge, where the continuous circle of piles was found. The highest concentration of artefacts was recorded beyond the log flooring, among the piles associated with structural remains. A notable area is also located near the clay block which is rich in ceramic artefacts. Additionally, a trend was observed in which a greater number of finds was recorded above the archaeological structures, while the number of artefacts decreased in the deeper layers (Fig. 4).

### 4.3 Archaeobotanical and zooarchaeological data

Nine samples, each ranging from 12 to 20 litres, were taken from the excavation areas on the island for the analysis of plant macroremains. These samples were collected subjectively from the archaeological layer. A notable concentration of charred grain remains, visible to the naked eye, was found in trench 1, particularly in the central part of the trench, on and between the logs of the wooden flooring (Fig. 9). Other archaeobotanical samples were taken from

Figure 9. Charred cereal remains found in trench 1 (photo by Čičiurkaitė).

the areas near identified archaeological features and from the archaeological layer at different depths (Kraniauskas et al. 2023; Kraniauskas et al. 2024).

This article presents only preliminary data, focusing on cultivated plants, as the collected samples have not yet been fully analysed. In total, 2437 cultivated plant macroremains were identified in the samples. The dominant species was *Triticum dicoccum* (n = 1689, 69.3%). Other identified plant remains included *Camelina sativa, Hordeum vulgare, Panicum miliaceum, Pisum* sp., *Triticum spelta* and *Triticum cf. aestivum* (Table 2). A significant quantity of hazelnut shells was also found in the archaeological layer. Among the wild taxa, ruderal, forest, shrubland, meadow and wetland plant remains were identified.

A total of 259 animal bone fragments were collected during the archaeological excavations. It is important to note that the summarised analysis combines data from both animal bones found in the archaeological layer and stray bones found underwater in non-stratified areas on the island's slope during the pile inventory work (Table 3). The zooarchaeological analysis of the identified animal bone fragments (n = 67) indicates that the majority were attributed to cattle (n = 34). Other fragments included horse (n = 9), pig (n = 7) and goat/sheep (n = 4). Wild animal remains included fragments from roe deer, beaver and bear. Most of the bones were found in very small fragments, which could not be identified due to the lack of distinctive morphology. Some bones were charred or burned, and evidence of cutting, chopping and gnawing marks from predators/rodents was observed. Only a few fish bones were found (5 fragments), though this is supplemented by small fish bones and scale fragments found in the archaeobotanical samples, which are awaiting further analysis. While the amount of collected bone material is not large, making it difficult to draw broader conclusions at this stage of research, the ratio of domestic to wild animals does align with findings from other Late Bronze Age and Pre-Roman Iron Age settlements (Micelicaitė et al. 2023).

The small area of the settlement on the island (0.08 ha) precludes the identification of distinct zones within it, such as grazing or cultivated fields. It is logical to assume that the island's inhabitants used the surrounding lake areas for these activities, which could guide future research aiming to reconstruct the palaeogeographical environment and analyse the use and habitation of the areas around the lake.

Table 2. Cultivated plant macroremains from island (trenches 1 and 4). Context: AL 1–4. archaeological layer, 30–35 cm depth, AL-5–6. archaeological layer, 45-49 cm depth, F1 – feature 1, AL7– archaeological layer with sandy interlayers, depth 55–60 cmaPAL, F2– feature 2.

| **Sample** | **22-1** | **22-2** | **22-3** | **22-4** | **22-5** | **22-6** | **22-7** | **23-1** | **23-2** |
|---|---|---|---|---|---|---|---|---|---|
| Trench No | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 4 |
| | | | | | | | | | |
| Context | AL1 | AL2 | AL3 | AL4 | AL5 | AL6 | F1 | AL7 | F2 |
| Sample volume (l) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 2 | 20 |
| Volume examined (%) | 50 | 50 | 50 | 50 | 100 | 50 | 50 | 100 | 100 |
| **Taxon** | | | | | | | | | |
| **Cultivated plants** | | | | | | | | | |
| *Camelina sativa L.* | | | | | 2 | 2 | | | |
| *Hordeum vulgare L.* | | 2 | 1 | | 6 | 34 | 138 | | 17 |
| *Hordeum vulgare L.* (rachis internode) | | | | | | 3 | | | |
| *Cerelia sp.* | | | | | 10 | 3 | 170 | 2 | 4 |
| *Panicum miliaceum L.* | | | | | 22 | 109 | 115 | 9 | 5 |
| *Panicum miliaceum L.* (palea, lemma) | | | | | | 18 | 15 | | |
| *Pisum sp.* | | | | | 1 | | | | |
| *Triticum cf. aestivum L.* | | 2 | | 2 | | | 2 | | |
| *Triticum diccocum* Schrank ex Schübl. | | | | | 41 | 156 | 1415 | | |
| *Triticum diccocum* Schrank ex Schübl (glume base) | | | | | | 64 | 8 | | |
| *Triticum spelta L.* | | | | | | 3 | | | |
| *Triticum spelta L.* (glume base) | | | | | | 27 | | | |
| *Triticum spelta/diccocum* | | 9 | 8 | 7 | | | | 1 | 4 |

Table 3. Species and anatomical distribution of the examined animal bones of the Bėlis lake island settlement. Context: AL – archaeological layer, S – found during underwater survey on the underwater slope.

| Animal/Bone | Maxilla | Mandibule | Scapula | Humerus | Ulna | Radius | Coxae | Femur | Tibia | Diaphysis | Costae | Vertebrae | Phalanges | Unindetified | Dentes | Ilium | Context | In total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cattle *(Bos taurus)* | | 2 | 3 | 2 | 1 | 4 | 4 | 3 | 2 | | 1 | 3 | 6 | 1 | 2 | | AL, S | 34 |
| Horse (*Equus ferus caballus)* | | | | 1 | 1 | 1 | | 1 | | | | 1 | 1 | | 2 | | AL, S | 8 |
| Sheep (*Capria hircus)* | | | | | | 1 | | | | | | | | | | | AL | 1 |
| Sheep/goat (*Ovis aries/ Capria hircus* | | | | | | | | 1 | | | | | 1 | | 1 | | AL | 3 |
| Pig (*Sus scrofa domesticus)* | 1 | | | | | | | | 1 | | | | 1 | | | | AL | 3 |
| Pig/wild boar (*Sus scrofa domesticus/Sus scrofa)* | | | | | | | | | 1 | | | | 1 | | | 2 | AL | 4 |
| Duck (*Anatidae*) | | | | 1 | | | | | | | | | | | | | AL | 1 |
| Beaver (*Castor fiber)* | | | | | 1 | | | | 1 | | | | | | 4 | | AL, S | 6 |
| Roe deer (*Capreolus capreolus*) | | | | | | | | 1 | | | | | | | | | AL | 1 |
| Brown bear (*Ursus arctos*) | | | 1 | | | | | | | | | | | | | | S | 1 |
| Small carnivoran | | | | | | | | | | | | | | | 1 | | AL | 1 |
| Small mammal | | | | | | | | | | 1 | 1 | | | | | | AL | 2 |
| Medium mammal | | | 3 | | 2 | | | 1 | | 18 | 3 | | 1 | | | | AL, S | 28 |
| Large mammal | | | | | | | | | 1 | 14 | 7 | 7 | | 1 | | | AL | 30 |
| Ungulate | | | | | | | | | | | | | | | 1 | | AL | 1 |
| Fish | | | | | | | | | | | 1 | 4 | | | | | AL | 5 |
| Unindetified fragment | | 1 | | | | | | | | | | | | 128 | 1 | | AL | 130 |
| **In total** | 1 | 3 | 7 | 4 | 5 | 6 | 4 | 7 | 6 | 33 | 13 | 15 | 11 | 130 | 12 | 2 | | **259** |

## 5. Settlement structure and chronology

The settlement at Lake Bėlis was established on a specific type of island, characterised by an organic foundation. This island formed as an accumulation of organic material over time, eventually transforming into a peat in the lake's shallow waters, with the archaeological layer developing above the peat. The beginning of peat formation in the shallow waters is dated to 4037–3801 cal BC (FTMC-IA-33-1) (Table 1). This unique soil composition facilitated the use of pile construction technology, allowing wooden piles to be driven or pushed into the soft organic substrate and lake marl with minimal time and effort.

Summarising the research data, it was determined that the settlement at Lake Bėlis was established on a natural, peat-based island, and was likely surrounded by a wooden fence, though some remains of vertical structures may have been part of raised buildings or platforms. The settlement may have been built around the island's perimeter, with log flooring remaining inside the structure, extending to an outer wall made of peat. Beyond this, the homogeneous cultural layer ends, and the fence or external structure piles begin, continuing into the underwater slope. Between the log flooring and the fireplace in the centre of the island, there was household zone.

The radiocarbon dates and archaeological findings suggest two main periods of habitation in the settlement: Late Bronze Age and Pre-Roman Iron Age (8th–4th centuries BC) and Roman period (3rd–4th centuries AD)(Fig.10).

Most of the finds are associated with the 1st millennium BC (stone axes, pottery), with only a few possible Roman period artefacts (such as the sickle and iron crook-like pin), suggesting that habitation during the Roman period was brief. Therefore, the primary use of the island settlement at Lake Bėlis is associated with the 1st millennium BC, particularly during the Late Bronze Age and Pre-Roman Iron Age.

The majority of the radiocarbon dates from the archaeological layer on the island and from the underwater struc-

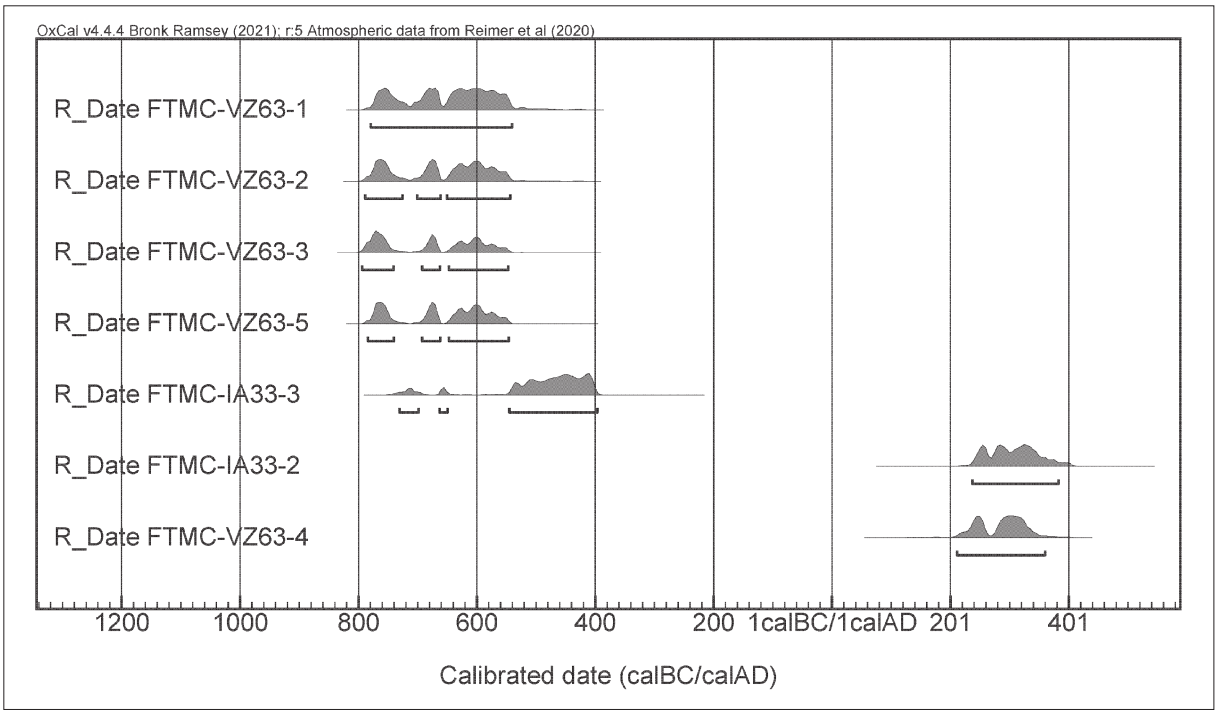


Figure 10. A calibration plot of 14C dates obtained from the Bėlis lake island site.

tures (piles) fall within the period dated from 789 to 397 cal BC. It is also important to emphasise that determining a more precise, narrower timeframe for the settlement's existence is challenging due to the calibration curve plateau known as the Hallstatt Plateau, which affects the period from 800 to 400 BC.

## 6. Some remarks on settlement patterns

Archaeological material from island settlements dating to the 1st millennium BC in the southeastern Baltic region is scarce, and these settlements have not been widely studied. In Latvia, most research on island settlements has focused on those from the 8th–10th centuries AD, located in northeastern Latvia. Currently, ten lake island settlements have been identified: Āraiši, Auļukalns, Dūķi, Brici, Liezēre, Ižezers, Salas, Bakāni, Ušuri and Lisa (Apals and Apala 2005). These settlements were established in shallow lake areas on artificially formed wooden structures, many of which were fortified. The most extensively studied and reconstructed settlement is Āraiši in the Cēsis region (Apala 2021).

A clear example of an island settlement dating to the Late Bronze Age to Pre-Roman Iron Age is located on Lake Krīgāni, although it was only fragmentarily studied in the late 20th century (Stubavs 1980). Evidence shows that this is a multi-layered settlement with a Late Bronze Age layer, which includes finds such as a fragment of a mould from that period (Vasks 2022).

In Estonia, there is no clear evidence of lake island settlements in the archaeological record (Lang 2007).

The greatest amount of information about lake island settlements in the region comes from northeastern Poland, specifically the archaeological material from the Masurian Lakeland (Hoffmann 1999; 2000). As of 2000, there were approximately 11 identified lake island settlements in this region (Hoffmann 2000). Most of these settlements were studied or surveyed in the early 20th century. However, ongoing research projects aimed at verifying the known sites are expected to provide more information (Mileszczyk 2016; Mileszczyk et al. 2019).

In this region, natural island settlements coexisted with well-known grid construction settlements on artificial islands (Gackowski 2000a; 2000b). Grid construction settlements (Polish: *konstrukcja rusztowa*) were built on artificial islands using horizontal logs reinforced with vertical piles and stones. Settlements such as Orzysz, Mołtajny, Pieczarki, Bogaczewo and Rybno are examples of 'classical' grid construction, built on regular grid platforms (Pydyn et al. 2011). These settlements were established in lake bays in shallow areas. The remains of these settlements consist of compact wooden platforms and other elements, such as bridges and surrounding fences. The size of the grid-constructed platforms varies from 120 to 500 $m^2$. These settlements are generally thought to have had a protective function, indicating that they were fortified.

The Late Bronze Age to Pre-Roman Iron Age settlement on Lake Bėlis is a clear and well-supported example of natural island habitation in eastern Lithuania, where space and resources were limited. A distinguishing feature of this settlement is the well-preserved wooden structures on the island and on the underwater slopes surrounding the island, including a circle of wooden piles. Interpreting this circle of piles as a fence suggests that the settlement was fortified, similar to fortified hilltop settlements from the same period (Podėnas 2022). The theory of a fortified island settlement, chosen for reasons of security and protection, is further supported by evidence of hillforts established on islands in Lithuania. For example, two island hillforts from the late 1st millennium BC can be identified: Didieji Gulbinai (Lake Gulbinas, Vilnius) and Jonėnai (Lake Asveja, Molėtai district) (Stončius et al. 2009; Merkevičius 2018). Jonėnai hillfort on Asveja Lake island has been dated using $^{14}$C to 96 cal BC–74 cal AD (Kuncevičius et al. 2015). Another example of a settlement with defensive structures is Luokesai Lake I settlement, where the residential area was surrounded by a semicircular fence made of two to three rows of piles (Pranckėnaitė 2014).

Information on settlements in natural lake islands dating to the late 1st millennium BC has been known since the late 20th century in Lithuania. Archaeologist Vytautas Ušinskas, searching for lake settlements in Lithuanian lakes, found fragments of striated pottery on Suvingis Lake island (Alytus district) (Ušinskas 1980). The Dumblynė settlement on Lake Sartai island was investigated, revealing fragments of the Striated Pottery culture (Griciuvienė and Grižas 2002, pp. 10–11). Broader surveys for lake island settlements were conducted in 2009–2010, leading to the identification of several more settlements dating to the end of the Early Metal period (Stončius et al. 2010; Zabiela et al. 2012).

Based on isolated surface finds — striated pottery sherds — 12 settlements in natural lake islands are currently attributed to the Late Bronze Age and Pre-Roman Iron Age. These settlements are located in eastern and southern Lithuania: Bajoriškės I and II (Lake Indrajai, Utena district), Daugirdiškės (Lake Monis, Elektrėnai municipality), Dumblynė and Rupeta I (Lake Sartai, Rokiškis district), Klykūnai II (Lake Rubikiai, Anykščiai district), Ličiūniškės (Lake Antakmenis, Trakai district), Pagraužės I and II (Lake Galuonis, Molėtai district), Pakalniai II (Lake Vidinkstas, Utena district), Rimėnai I (Lake Suvingis, Alytus district) and Žydiškės I (Lake Skaistis, Trakai district) (Merkevičius 2018; Podėnas 2016). None of these investigations or surveys in Lithuania have uncovered wooden structures that would provide insights into the architectural features of the buildings or the construction of island settlements (Fig. 1.1).

Underwater archaeological surveys around island settlements have been conducted in only a few locations. In Lake Vaikesas (Utena district), the underwater slopes surrounding the island were surveyed, but no wooden structures or finds were uncovered (Baubonis 2000). In Lake Asveja, an underwater survey was conducted around Jonėnai hillfort in search of wooden structures or artefacts, but none were found. However, a logboat was discovered in a bay to the north of the island, though it has not been dated (Baubonis 2000).

Based on the officially available information about island sizes, disregarding the actual inhabited area (since this is not known), it can be noted that the islands with identifiable 1st millennium BC layers are significantly larger. Their land areas range from 0.15 to 6 ha, while the settlement on Lake Bėlis Island covers only 0.08 ha. The distance to the nearest shore is similar across these sites, ranging from 65 to 650 m. Currently, Lake Bėlis island rises only about 50 cm above the water surface, whereas other islands are much higher (ranging from 1.5 to 6 m) (Merkevičius 2018; Podėnas 2016).

A key question regarding lake island settlements is the means of accessing them. Neither for Lake Bėlis island nor for the other discussed lake island settlements in eastern and southern Lithuania have bridge remains leading to the settlement been found. It is likely that the most logical explanation is that water transport was used to access the settlements. Based on currently available data, the only prehistoric watercraft found in the region is the logboat. No other types of prehistoric watercraft have been discovered in the inland waters of Lithuania or the region (Piličiauskas et al. 2020).

In the southeastern Baltic region during the Late Bronze Age to Pre-Roman Iron Age, settlements in lakes were established on natural islands, on raised structures in shallow areas of lakes and on artificial islands. The location of a community's settlement depended on various factors, which may not always be easily identified. For example, in Lake Luokesas (Molėtai district), there are two natural islands, but according to archaeological surveys, there is no evidence of habitation or use, while settlements were established in the shallow areas of the lake on raised structures (Pranckėnaitė 2012).

## Conclusions

In 2021, a new prehistoric settlement was discovered on the island in Lake Bėlis. Terrestrial and underwater archaeological investigations conducted in 2021–2023 revealed that this is one of the few Late Bronze Age to Pre-Roman Iron Age island settlements in Lithuania. A distinctive feature of this settlement is the wooden structures — piles — found on the underwater slopes around

the island, extending along its entire perimeter. Additionally, the research was conducted in a wetland environment where organic material is very well preserved.

As the investigation showed, the application of terrestrial and underwater archaeological methods in research on prehistoric lake island settlements gathers the most comprehensive information about the settlement's construction and use. The research methods allowed for the collection of data which could be used in the evaluation not just of the island itself but also of its surroundings.

Currently, 13 lake island settlements that date to the 1st millennium BC, including the Lake Bėlis site, are known in Lithuania. The Lake Bėlis island settlement remains one of the most thoroughly researched among these. It is the only one where well-preserved wooden structures of buildings and fortifications have been discovered.

The discovery of piles surrounding the island and their interpretation as fortifications, classifies this site as a fortified settlement. Given the assessment of the settlement's structure, the assertion that the community's choice for settling this site was based on security concerns in regard to external threats is plausible.

The primary period of habitation on Lake Bėlis island was during the Late Bronze Age to the Pre-Roman Iron Age (8th–4th centuries BC). Most of the artefacts — such as hafted stone axes, metal objects and pottery — are characteristic of this period. However, traces of later habitation, dated to the Roman period (2nd–4th centuries AD), were also found.

The research data, specifically the large quantity of cultivated plant remains found, suggest that the community living on the island engaged in agriculture and animal husbandry. However, it is likely that the fields and pastures were located on the shore, not on the island itself, as the island's area (only 0.08 ha) would have been too small to sustain these activities. The discovered artefacts indicate that the prehistoric island community was not isolated — metal objects could have been produced locally or acquired through trade with other communities. Further research is required to determine whether tools related to metalworking, which are typically found only in fortified settlements (hillforts) from the Late Bronze Age to the Pre-Roman Iron Age, exist in the settlement. The overall artefact assemblage does not show significant differences from other settlements of the same period.

A more complete understanding of the settlement requires more detailed studies and research of the surrounding area, which might allow us to determine the motives and preferences for settling in such a specific location, where space and resources were limited, remote from the mainland and with no structures connecting to the shore.

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## Abbreviations

ATL – Archeologiniai tyrinėjimai Lietuvoje/Archaeological Investigations in Lithuania

Lietuvos Arch. – Lietuvos Archeologija

Archaeol. Baltica – Archaeologia Baltica

Arch. Lituana – Archaeologia Lituana.

Veget Hist Archaeobot – Vegetation History and Archaeobotany

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# Bėlio ežero salos gyvenvietė: naujos įžvalgos apie vėlyvojo bronzos ir ankstyvojo geležies amžiaus gyvenamąsias erdves Rytų Lietuvoje

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## Santrauka

2021 m. vykdant povandeninius archeologinius žvalgymus Rytų Lietuvos ežeryne, Bėlio ežero saloje (Švenčionių r.) buvo rasta nauja, iki šiol nežinota senovės gyvenvietė, kuri pagal 14C AMS duomenis datuojama VIII–IV a. pr. Kr. 2022–2023 m. gyvenvietė buvo tyrinėta šlapynių aplinkoje, su archeologiniame sluoksnyje gausiai išlikusia organine medžiaga, taikant tiek įprastus antžeminius, tiek ir povandeninius archeologinius tyrimus. Ši Bėlio ežero salos gyvenvietė įkurta labai nedideliame, vos 0,08 ha, sausumos plote ežero viduryje, su gerai išlikusiomis gyvenvietės struktūromis ir atskiromis funkcinėmis zonomis, o išskirtiniu gyvenvietės bruožu galima laikyti aplinkoje, salos povandeniniame šlaite, rastas medines struktūras – polius, kurie tęsiasi visu salos perimetru (1, 3–4 pav.). Bent jau dalis šių aptiktų polių, formuojančių kelias eiles įtvirtinimų – tvorų, leidžia šį objektą priskirti įtvirtintų gyvenviečių tipui (2, 5–6 pav.).

Pagrindinis Bėlio ežero apgyvendinimo laikotarpis buvo vėlyvasis bronzos – ankstyvasis geležies amžiai (1 lentelė, 10 pav.). Daugelis dirbinių – akmeniniai kirviai, metaliniai dirbiniai ir keramika – būdingi būtent šiam laikotarpiui, tačiau aptikta ir vėlesnio laikotarpio apgyvenimo ir specifinių veiklų pėdsakų (medinių polių), kurie datuojami romėniškuoju laikotarpiu (II–IV a.) (7–8 pav.). Šiuo metu Lietuvoje žinoma 11 (kartu su Bėlio ežero salos gyvenviete) salų gyvenviečių, kurios datuojamos aptariamuoju laikotarpiu. Bėlio ežero sala kol kas yra viena iš nuodugniausiai ištirtų šiuo laikotarpiu apgyventų salų. Tai yra vienintelė sala, kurioje rasta išlikusių medinių įtvirtinimų ir struktūrų. Tyrimų duomenys rodo, kad saloje gyvenusi bendruomenė vertėsi gyvulininkyste ir žemdirbyste – gausiai aptikta kultūrinių augalų liekanų (9 pav., 2, 3 lentelės). Tikėtina, dirbamieji laukai ir ganyklos buvo ne pačioje saloje, o krante.

Pastarųjų metų tyrimai Lietuvoje ypač gausūs naujos medžiagos (naujų objektų arba žinomos medžiagos naujos analizės) iš vėlyvojo bronzos amžiaus – ankstyvojo geležies amžiaus. Šiame straipsnyje analizuojami duomenys papildo to laikotarpio žinomų gyvenamųjų vietų: piliakalnių, atvirojo tipo gyvenviečių ir ežerų gyvenviečių, taip pat ankstyvojo metalų laikotarpio pabaigos duomenis dar vienu gyvenviečių tipu – gyvenvietėmis natūralioje ežero saloje.