THE ŽEMAITIŠKĖ 2 PILE-DWELLING SETTLEMENT

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Abstract

This article discusses issues related to pile-dwelling settlements in Lithuania. It offers a detailed study of the archaeological and osteological material found at the Žemaitiškė 2 pile-dwelling settlement, as well as palynological and radiocarbon research into the settlement's cultural layer. The article discusses the wood anatomy of pile-dwellings, their dendrochronological dating, and the types of construction material. The studies show that the construction of pile-dwellings in Lithuania began in the Late Neolithic Age, whereas the tradition of living on pile platforms existed throughout the Bronze Age.

Key words: Lithuania, pile-dwellings, Late Neolithic, wood anatomy, bioarchaeology, dendrochronology.

Introduction

The knowledge about the existence of pile-dwellings in Lithuania in the Stone Age and Bronze Age is scarce (Girininkas 2005, pp.3-13; Menoti *et al*. 2005, pp.381-403). At present, the Žemaitiškė 1, Žemaitiškė 2, Žemaitiškė 3, Kretuonas 1C (in the Švenčionys district), Šarnelė (Plungė district), Šventoji 4 and Šventoji 6 (Palanga district) settlements might be regarded as pile-dwelling settlements from the Neolithic period in Lithuania; these settlements belonged to communities of Narva, Corded Ware and Globular Amphora cultures (Girininkas 2005, p.26). Luokesai 1 and Luokesai 2 settlements are known from the Bronze Age (Pranckėnaitė *et al.* 2008, p.519ff; Baubonis *et.al*. 2002, p.269ff) (Fig. 1).

All the settlements constituting objects of the study are located next to drainage lakes, or seaside lagoons connected with inflowing and outflowing rivers and the sea. The cultural layers of the settlements are found along the shore in the sandbars of now extinct and existing lakes, next to the beds of inflowing or outflowing rivulets. The majority of the pile-dwelling settlements were discovered under layers of peat; therefore, dwellings of this kind started being talked about when more extensive studies of peatbog shores started in Lithuania, as well as in Latvia, the Pskov region, Poland, Switzerland and Germany, especially in end moraines from the last Ice Age, where a large number of drainage lakes were formed. In all these settlements, vertically driven stakes, logs, poles, boards and household rubbish heaps have been found (Mikliaev 1977, p.10ff; Cherniavski 1997, pp.311-330; Hookk, Mazurkevich, 2007, pp.40-50; Ruoff 2004, pp.9-21; Girininkas 2005, pp.33-45).

Archaeological studies of the Žemaitiškė 2 settlement

Among Lithuania's pile-dwelling settlements mentioned above, the Žemaitiškė 2 settlement (in the Švenčionys district) next to the now extinct Lake Žemaitiškė (Fig. 2), the outlines of which are distinct in orthophotographs (Figs. 3, 4), has been studied in the greatest detail. By employing orthophotography, the former hydrological network in the eastern part of Lake Kretuonas has been reconstructed, which makes it possible to understand and assess the palaeogeographical environment of the former settlement (Fig. 4) (Girininkas 1980, p.6ff; 1982, p.7ff; Girininkas, Brazaitis 2002, p.12ff).

Studies at the Žemaitiškė 2 settlement were carried out from 1979 to 1981, and 2000 to 2001.

During the excavation work, a large number of wooden structures were found, which at the beginning of the studies were interpreted as being the remnants of overground 'long buildings' (Girininkas 1982, p.7ff). The whole inventory of the settlement was considered to be chronologically simultaneous and dating from the Late Neolithic.

A thin layer of sapropelic peat two to 25 centimetres thick that formed on the bottom of the now extinct lake is considered to be the cultural layer of the settlement. Its bottom part consisted of gravel, with abundant remains of aquatic mollusc shells. In the western part of the settlement area, closer to the shore, this layer was much thicker. Under the cultural layer, lake argil lay throughout. The upper horizon of the argil was pressed out by the Neolithic builders during the construction of the settlement's structures; here and there, it contained pieces of charcoal, firebrands, stones or wood chips; however, no archaeological artefacts were found. At a

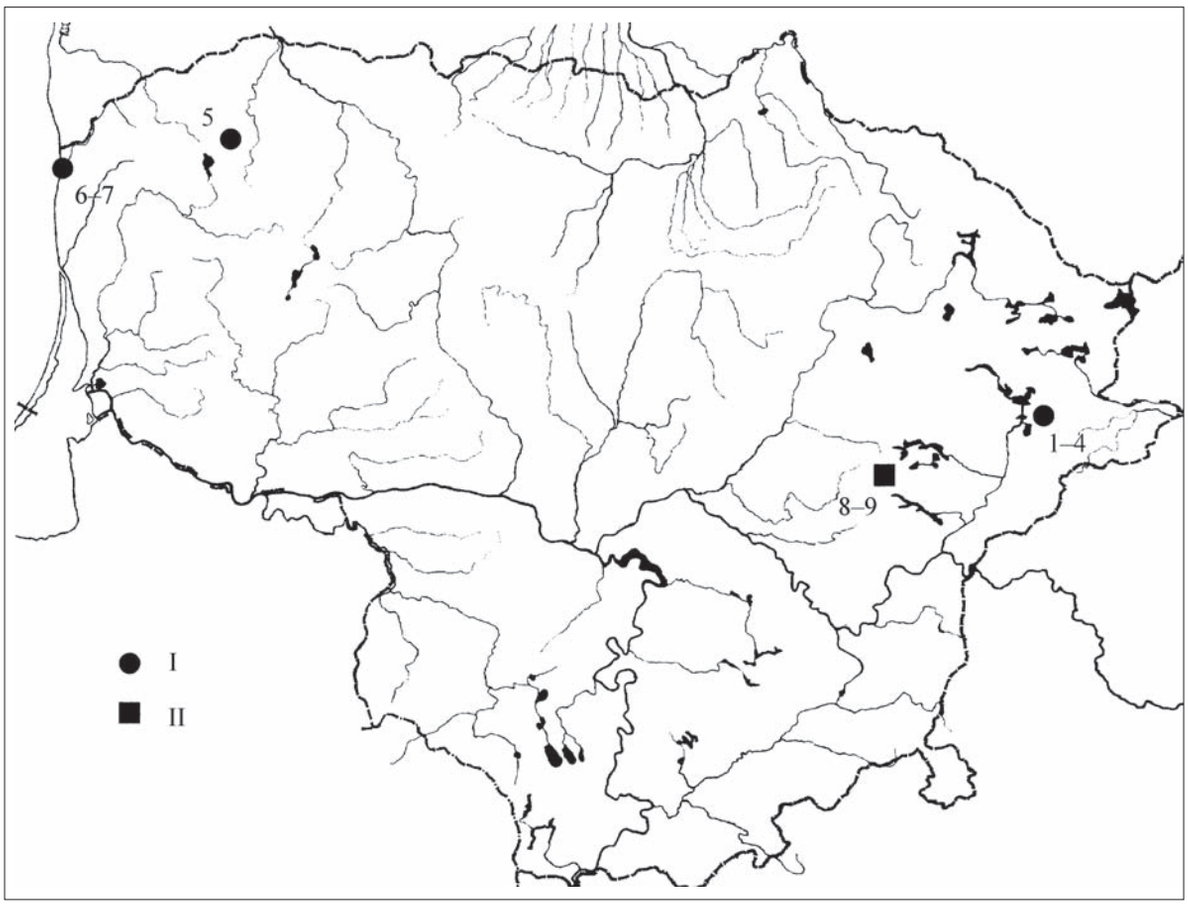

Fig. 1. Pile-dwelling settlements of the Neolithic period in Lithuania: 1 Žemaitiškė 1; 2 Žemaitiškė 2; 3. Žemaitiškė 3; 4 Kretuonas 1; 5 Šarnelė; 6 Šventoji 4; 7 Šventoji 6; 7 Luokesai 1; 8–9 Luokesai 2.

Fig. 2. The Žemaitiškė 2 pile-dwelling settlement (aerial photograph by A. Girininkas).

Fig. 3. Localisation of the pile-dwelling settlements: 1 Žemaitiškė 2; 2 Kretuonas 1 (orthophotograph by A. Girininkas).

Fig. 4. The palaeogeographical environment of the former Kretuonas and Žemaitiškė lakes (orthophotograph by A. Girininkas).

greater depth, the argil was solid, without any traces of human activity.

The studies carried out in 2000 and 2001 confirmed the presumption that this settlement was the site of a pile structure, which had been erected in the water off the shore of the now extinct lake next to a rivulet flowing out of the lake. From 1979 to 1982 and 2001 to 2002, 1,089 vertically driven stakes and pieces of wooden structures were found. The stakes were driven into the lake argil to a depth of around 1.2 metres on average, the longest and thickest ones to a depth of as much as two metres.

Wooden structures were found throughout the area where the research was conducted, with the exception of the northwest corner. Rows of larger piles eight to 16 centimetres in diameter were more distinct at the point where the bottom of the now extinct lake abruptly gets deeper and passes into the first underwater terrace (Fig. 5). The largest stakes/piles, and to the greatest depth, were driven in within a stretch around six to seven metres wide along the shore of the now extinct lake, next to the outflowing rivulet. It has been noted that stakes of a larger diameter are intended for quite a different purpose. They are located along the former shore of Lake Žemaitiškė, and they formed individual structures of pile-dwelling buildings.

In the course of the analysis of the wooden structures, it was found that some of them are not related to pile-dwelling buildings. This can be said of thin (3cm to 4cm in thickness) poles made of different wood types. The upper ends of some of these poles were found quite deep in the argil. It is most likely that these poles are the remnants of fishing barriers that were installed before the pile-dwelling building was erected, or when it had already been erected. Fishing installations of this type are well known from ethnographic studies (Piškinaitė-Kazlauskienė 1998, p.56ff), and they were widely used in the Baltic Sea region during the Neolithic period (Persson 1999, p.60, Fig. 22; Rimantienė 2005, pp.405-414), as well as in other locations in Europe (Brinkhuizen 1983, p.20). The mouth of a rivulet is an ideal place for fishing barriers.

This data explains why so many wooden structures were found in the Žemaitiškė 2 settlement, and at the same time it makes us take a fresh look at material collected earlier and its interpretation. The primary task was to distinguish the remnants of structures from the remnants of fishing barriers. It is highly probable that some of the finds, especially those directly related to fishing (fishing spears, remnants of creels), are related to the above-mentioned barriers, and not to a pile structure from the Late Neolithic period.

Nevertheless, there are few doubts that the larger deep-driven stakes of a larger diameter are the remnants of a pile structure. It has been determined that the majority of the piles were sharpened by using a particular technique. Notice was taken of the fact that the tips of most of the structures had long and rough sharpening facets which had been formed not by cutting with an axe along the tree bast (as would have been the case if working with a metal axe), but by tearing the bast off. People living in the Stone Age had imperfect tools; therefore, they would use wedges to fell trees. Hafted axes-wedges made from stone and horn could be used as wedges, some of which were found at the Žemaitiškė 2 settlement (Girininkas 1990, p.70). Numerous finds of this type have been found in other settlements from the same period in the area around Lake Kretuonas: Kretuonas 1D, Pakretuonė 1. The end of a tree felled in this way would be further slightly squared and driven into the ground.

Regrettably, the upper parts of the piles have deteriorated; therefore, we cannot yet make any judgments concerning now extinct overwater technological elements of the structures. During the research conducted between 1980 and 1983, several stakes with surviving upper parts were found. They looked as if they had shoulders on to which another structure of the building, most likely a platform, would be mounted (Fig. 6). Two such stakes had shoulders in their upper parts, on to which thin platform-bearing logs with a hole for connecting the vertical stake and the thin log of the platform would be mounted. The tips of some of the stakes are sharpened in the shape of small facets by using axes (Fig. 7). The tips of some structures were slightly burnt to make them firmer; the tip of one large stake was slightly burnt and driven into the ground without any additional handling. The tips of several stakes that were better preserved were burnt. Numerous pieces of charcoal and firebrands were found in the cultural layer. Therefore, there are grounds to believe that the pile structure was destroyed by fire.

The finds in the cultural layer were distributed unevenly. They were more common in places where there were fewer vertically driven stakes. No pottery artefacts, artefacts made of bone and horn, or other artefacts, with the exception of those made of stone, were found around the stakes where fragments of a wooden platform structure were found, that is, logs with holes and stakes with shoulders, on to which the platform would be mounted.

Very few archaeological finds were found in the cultural layer next to the piles. There probably used to be a pile platform erected above the area investigated, and very little, if any, household refuse could get

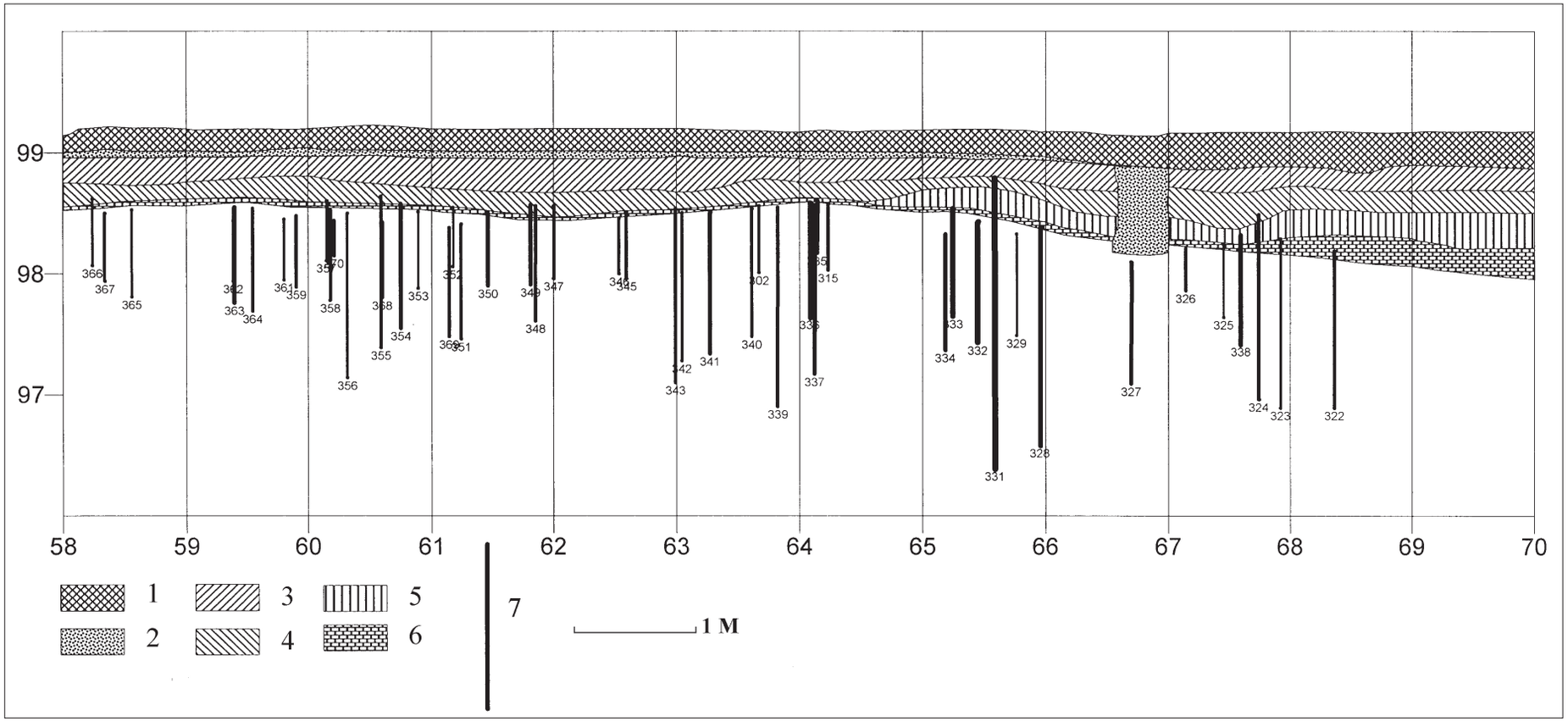

Fig. 5. The Žemaitiškės 2 settlement, a cross-section: 1 filling ground; 2 turf; 3 black peat; 4 brownish peat; 5 sapropel (cultural layer); 6 sediment of the lake; 7 stakes (reconstructed by the author).

Fig. 6. The Žemaitiškės 2 settlement: stakes and platform-bearing logs *in situ* (photograph by A. Girininkas).

Fig. 7. The Žemaitiškės settlement: stakes (photograph by A. Girininkas).

under the platform. The total number of finds in the plans of the investigated area of the settlement shows that pottery artefacts are concentrated in areas with the smallest number of stakes used for the construction of the structure. It was noticed that the majority of the artefacts found in the cultural layer were in a vertical position, because there was a layer of silt around the pile-dwelling settlement; the layer had formed due to pollution by the dwellers, or by the peatifying process of the lake. This shows that people lived above the water, whereas the artefacts appeared in the layer at a time when the environment around the settlement was silty.

Another interesting phenomenon was noticed during research into the Žemaitiškė 2 settlement. No hearths were found in the area of the settlement where there was a large number of vertically driven stakes. This shows that hearths were located on the platform, most likely in special places inside the buildings where the base of the platform was covered with layers of soil and clay. No hearths were found in other pile-dwelling settlements at Šarnelė, Šventoji 4, Šventoji 6 and Žemaitiškė 3 either.

The tradition of erecting pile structures on lake sandbars existed until the Late Bronze Age (Baubonis *et al*. 2002, p.229ff). It is interesting to note that in that period, too, the piles were of the same diameter. However, the structures from this period were much more

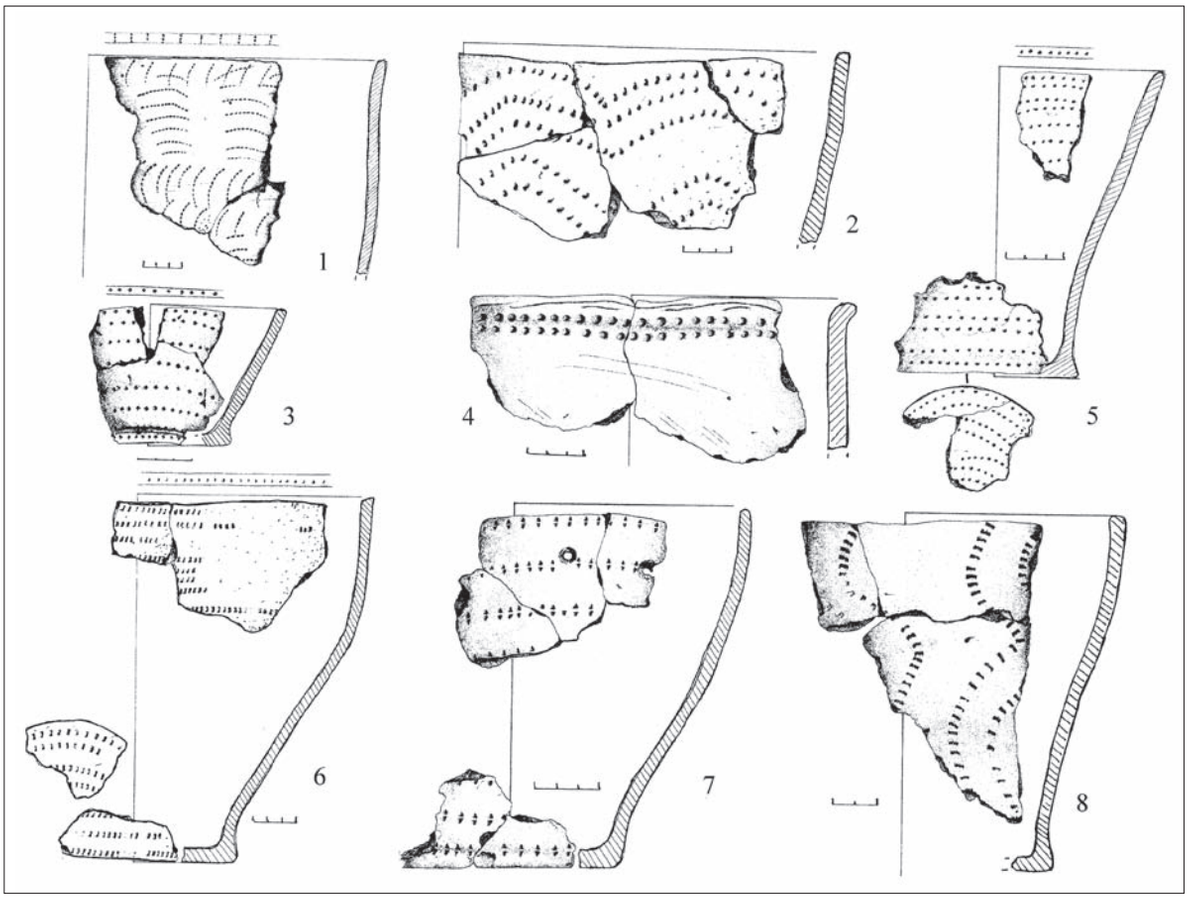

Fig. 8. The Žemaitiškės 2 settlement: ceramics of late Narva culture.

distinct in the total pile arrangement plan, because there were no other structures intended for household purposes next to them, such as fishing barriers, footbridges, and so on.

Finds and their interpretation

All the pottery artefacts found in the Žemaitiškė 2 settlement are of nearly the same type. The artefacts include tulip-shaped pots, small tapered cups and, to a lesser extent, profiled cutlery with S-shaped walls. The clay mass of the entire cutlery found there contains a large quantity of shell admixtures decorated with ornamental motifs characteristic of Late Narva culture (Fig. 8). This kind of pottery is characteristic of monuments of Late Narva culture from the Late Neolithic, which are undoubtedly related to the pile structures of the settlement.

Items belonging to the period of pile structures are net floaters, sinkers, fishing rod hooks, stones intended for grinding bone, horn and stone artefacts, herringbone-shaped fish-spears, flint knives, chisels, wedges, pieces of art, and so on (Fig. 9). Besides thick-walled pottery dating from the Late Neolithic, a few pieces of pottery fragments indicated thin-walled Narva ceramics, which could be chronologically earlier. A single piece of pottery thinned with sand and decorated with a comb pattern was also found. It should probably be referred to as Pit-Comb Ware culture. It attests to the fact that people visited the site of the settlement in earlier periods too.

Furthermore, one-sided fish-spears that might be typologically referred to the earlier period of Narva culture were found in the cultural layer of the settlement (Girininkas 1994, p.170). Most of the flint artefacts belong to the broad-flake industry used by the people of Late Narva culture. Three artefacts of the ‘wood chisel’ type used for woodworking and most likely related to pile construction were found. Two artefacts do not fit in the general context. These are a thin regular retouched blade and a lancet found in the cultural layer. These pottery artefacts and work tools are most likely related not to the pile building, but to the fishing barriers, to which people from more distant communities would come during an earlier period when there were still no pile structures erected by the community of Žemaitiškė 2.

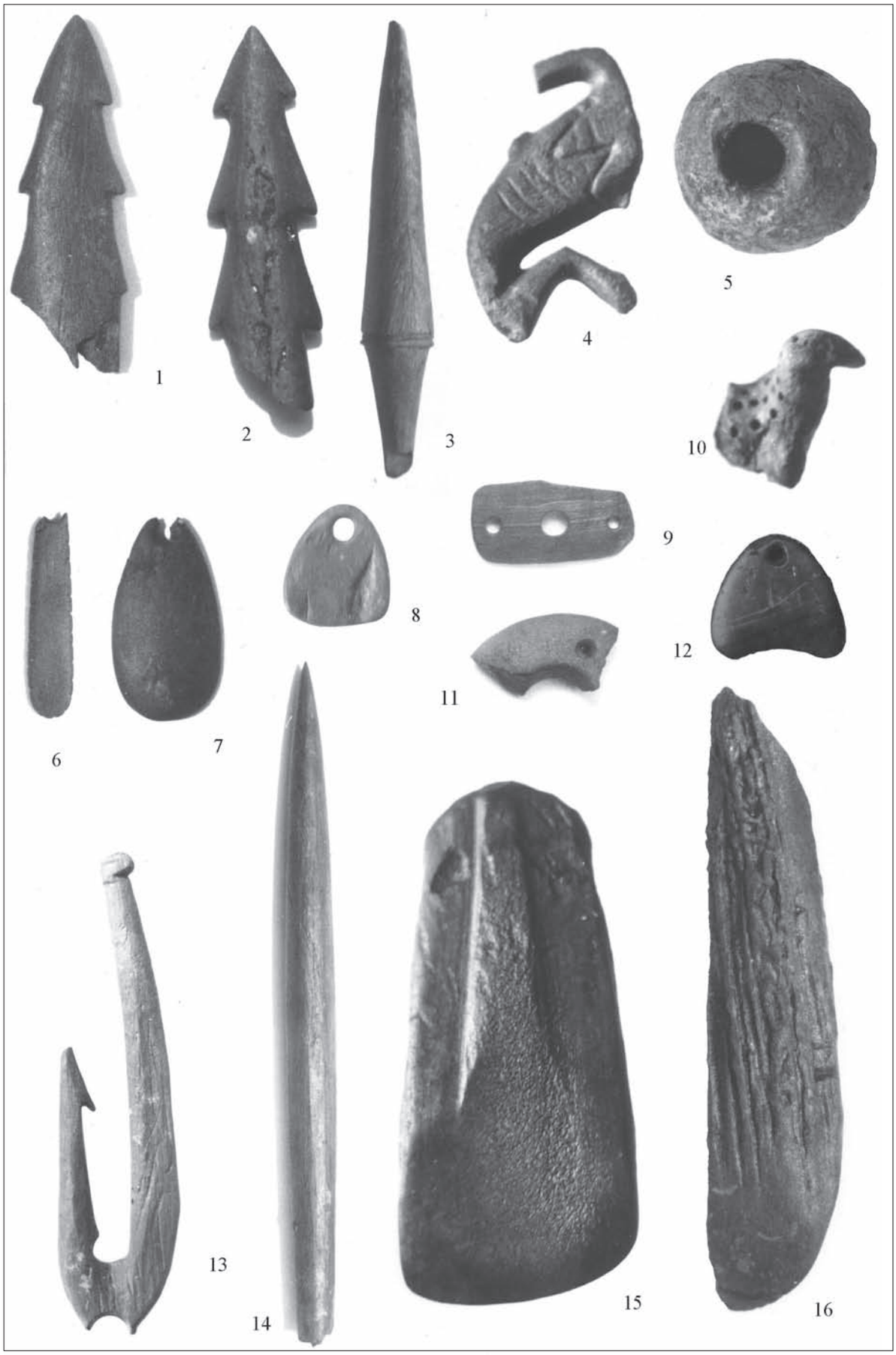

Fig. 9. The Žemaitiškės 2 settlement: bone and antler artefacts: 1, 2 gaffs; 3 arrowhead; 4 deer figurine; 6–8 pendants; 9 spreader of ornament; 13 fishing hook; 14 spearhead; 15–16 axes; 8, 9, 11 amber ornament; earthenware: 5 spinning-wheel; 10 bird figure (photograph by A. Girininkas).

Animal bones were found, too, which attests to the fact that the people of the pile-dwelling settlement hunted beaver, deer, elk, bear, wild boar, duck and geese. When living next to the fishing installation, they would catch large pike, sheatfish and other kinds of fish (Daugnora, Girininkas 2004, p.256ff).

Research data shows that there were already horses among the bred livestock (Girininkas *et al.* 2009, p.24).

The general conclusion can be drawn that a typological analysis of the finds supports the earlier conclusion that in the Žemaitiškė 2 settlement, along with the dominating material of the Late Neolithic relating to pile structures, there is a small quantity of chronologically earlier finds. They should be related to fishing barriers, which might have been used in the area around Lake Kretuonas from very early times. Barriers intended for fishing used to be built there from the Mesolithic (for instance, stake Že-88 was dated 8380±60 BP VDU-167) and existed until the Bronze Age. Fish barriers next to the Žemaitiškė 2 settlement used to be repaired and rebuilt.

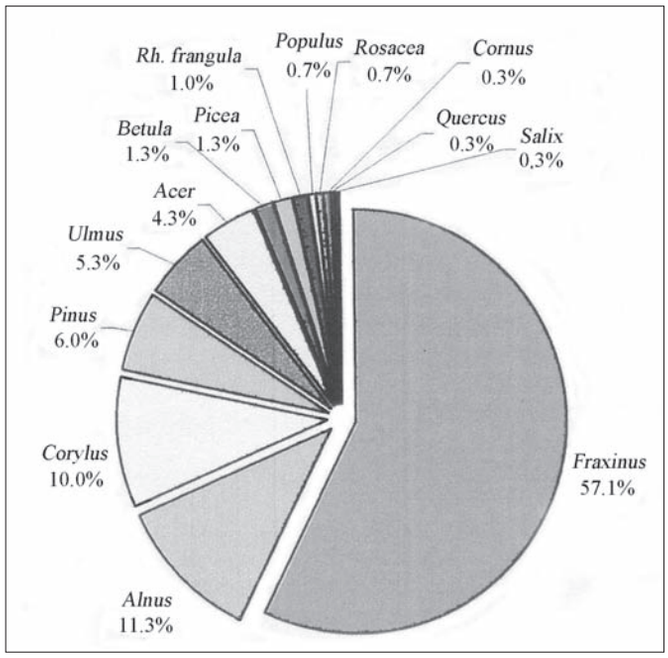

Fig.10. The range of wood types of the piles of the Žemaitiškė 2 settlement (compiled by R. Pukienė).

Research into the wood of the pile structures of the Žemaitiškė 2 settlement

Research into the wood of the Žemaitiškė 2 settlement was conducted by Dr R. Pukienė. The tree species used for piles in the Late Neolithic settlement were determined on the basis of macro-features. The archaeological material, with the exception of cases when the wood was badly disintegrated, was divided into three wood groups: conifers, hard deciduous trees and soft deciduous trees. In the group of hard deciduous trees, the wood was identified to the tree species on the basis of macro-features. The wood type was determined on the basis of wood diagnostic features in three sections: cross-section, tangential section and radial section. In the course of the analysis of wood in these three sections, microscoping at 56 to 250 times magnification was used for the identification of the species.

Due to the fact that quite a few wood samples from the pile-dwelling settlement, especially those of soft deciduous trees, such as birch and alder, were very soft due to chemical and biogenic destruction, all the samples were frozen before preparation. This set of methods made it possible to analyse the cell structure even in samples which had totally lost their strength and become soft.

The identification of wood types was carried out by analysing more than 300 pile samples obtained during the investigations in 2000 and 2001. The majority of the structures consisted of European ash (*Fraxinus excelsior* L.) piles (57.1%) (Fig. 10). Ash piles and stakes were distributed almost evenly throughout the area of the 2000 to 2001 excavations (Fig. 11). Structural elements of various dimensions were made from ash: from poles three centimetres in diameter to split piles 14 centimetres in diameter.

With the exception of a pine sample and a few birch (*Betula pendula* Roth) samples representing coniferous forests, the majority of the remaining samples were typical of the broad-leaved forests that prevailed in the Atlantic period. The second tree species usually used for the structures was alder (*Alnus* sp.) (11.3%).

Hazel (*Coryllus avellana* L.) (10.0%) piles were grouped in indistinct lines crossing the area under investigation in different directions. This wood type was probably used for building fishing barriers. Other more common tree species are typical species of broad-leaved forests, such as elm (*Ulmus* sp.) (5.3%) and maple (*Acer platanoides* L.) (4.3%). However, oak (*Quercus robur* L.), the most typical wood of broad-leaved forests, was not used for the construction of the structures. Only one oak stake was found among all the structures of the area of the Žemaitiškė 2 settlement investigated in 2000 and 2001. This fact distinguishes the settlement from pile-dwelling settlements in Switzerland and southern Germany, where oak is one of the

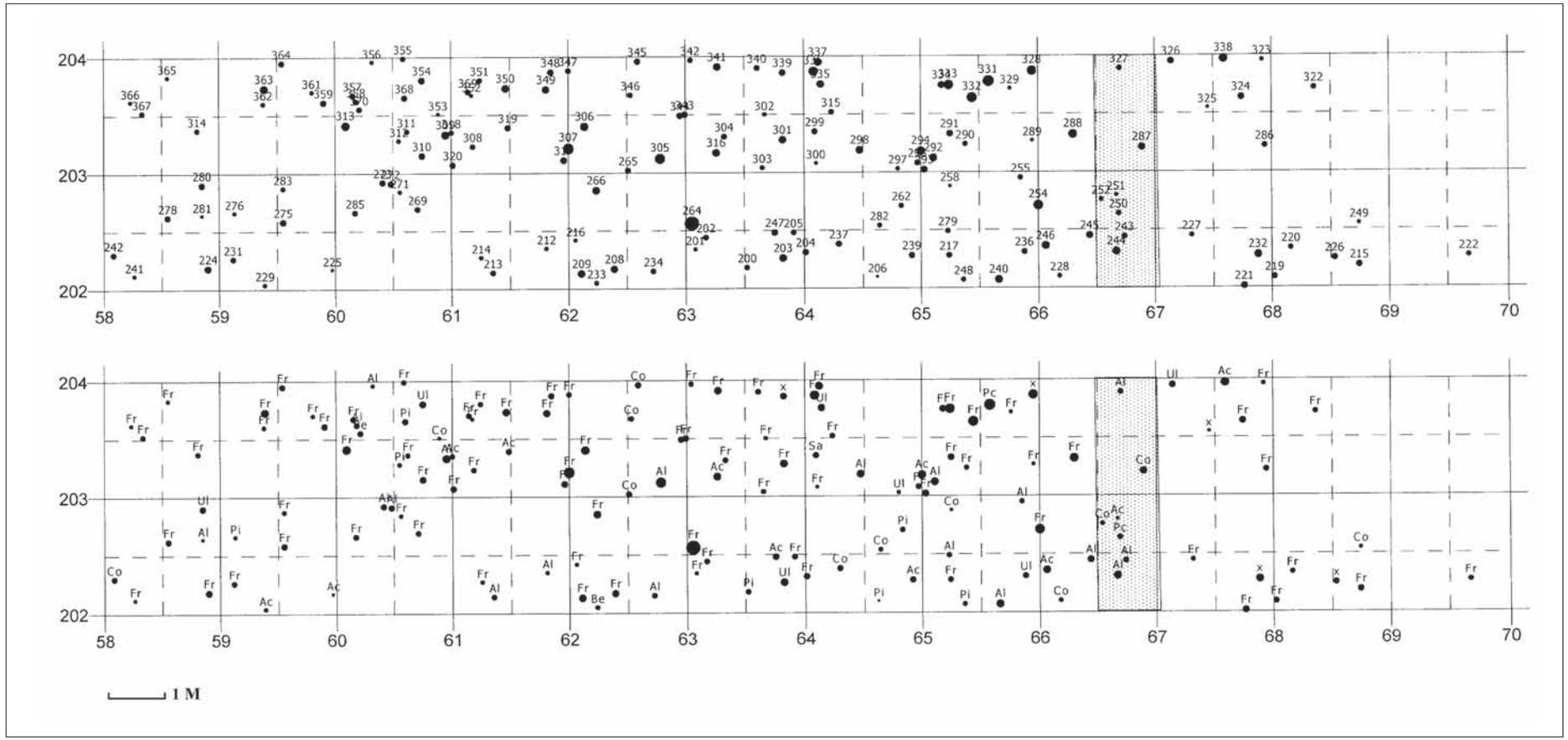

Fig. 11. The Žemaitiškės 2 settlement: the spectrum of wood sorts in the 2000–2001 investigated settlement area.

most widely tree species used in Neolithic structures and comprises up to 75% of samples (Tercier *et al.* 1996, pp.567-582).

In terms of the entire collection, pine (*Pinus sylvestris* L.) makes up 6%. In the excavation area, structural elements made of pine are distributed in islets; the largest accumulation can be found in the excavation area excavated in 2000. The rest of the structural elements of the pile-dwelling settlement, that is, individual stakes and piles, are from small trees and bushes: buckthorn (*Rhamnus frangula* L.), trembling aspen (*Populus tremula* L.), red dogwood (*Cornus sanguinea* L.), willow (*Salix* sp.), and the *Rosaceae* family (mountain ash). Since these stakes make up a small part of the structural elements, they do not form a visible spatial structure in the area of excavation. They were probably used in the structures together with piles made from other tree species.

The Late Neolithic people of the Žemaitiškė 2 settlement would not debark the wood used for construction: they would use round timber or timber split lengthwise in two, and sometimes wood slightly burnt in a bonfire. This circumstance is especially favourable, since due to the preserved rings of the last years, their anatomical structure makes it possible to restore the seasonal prevalence of the felling of the tree.

More often than not, the wood samples taken at the Žemaitiškė 2 settlement are intact until the bark or the outermost ring. During archaeological investigation, the outer layers were preserved. This made it possible to carry out an anatomical analysis of the outer ring formed by the tree during the last year of growth on most samples.

The formation of rings of every individual tree species during a season is different and depends on the climatic conditions. The formation of a tree ring starts at the beginning of the vegetation season, when cambium cells begin to divide. Under the conditions existing in Lithuania, this normally takes place in May. As the leaves of hard deciduous trees (oak, ash, elm) appear and grow, the early part of the ring forms; it consists of large wood vessels, tracheae (pores). Later on, before the end of the vegetation season, the late part of the wood, consisting of smaller cells, forms. There is a clear difference between the early and the late wood in the rings of coniferous trees, too. At the end of the season (in Lithuania, approximately in September) the ring formation stops, and the division of cambium starts anew only the next year. When the tree dies, the division of cambium and the formation of cells are disrupted. The season of the tree's death is recorded in the structure of the ring.

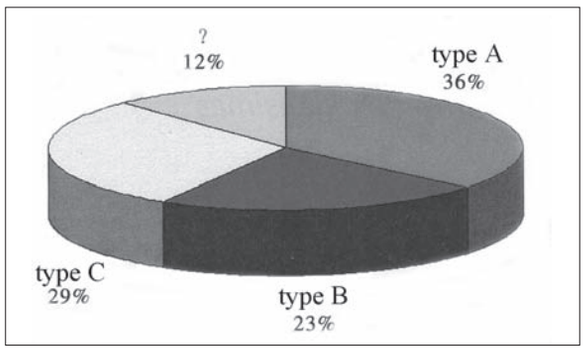

Fig. 12. The piles according to the type of the last ring and the felling season (data from R. Pukienė).

An analysis of the last ring (Fig. 12) shows that the majority of the piles were prepared in the spring, at the beginning of the vegetation season (Type A, 36%), or in the summer (Type B, 23%). In as many as 36% of the samples, the last ring contains only early wood. Under present-day climatic conditions, ash, elm and pine begin forming early wood in May. Our studies show that in approximately mid-June, the formation of late wood in some ash has not yet started. Therefore, we can claim that the most extensive construction work in the Žemaitiškė 2 pile-dwelling settlement happened in May and June. Some of the piles referred to as Type C (29%) might also have been prepared in the spring, in April or May, just before the beginning of the vegetation season (Pukienė 2004, p.103).

A characteristic peculiarity of the wood samples is the structure of the annual rings. The number of annual rings indicates the age of the tree. On the basis of the annual ring width dynamics, we can distinguish the dendrotypological groups of the trees, and synchronise the sequences of rings of individual trees, that is, determine the simultaneity of the structural elements and the spatial structures of these structures. The annual rings of the wood were mostly analysed in the samples of hard deciduous (ash, elm, oak) and coniferous (pine, spruce) trees.

Although thin trees were used in the structures of the Žemaitiškė 2 settlement, the annual ring sequences of some of them are quite long, because the growth of most of the trees was slow. Trees up to 40 years old were mostly used for the construction. However, quite a large number of ash trees 50 to 70 years old were also felled. Trees older than 70 years are seldom found in the structures. It goes without saying that the use of young and maturing trees reflected the technical possibilities of the people of that time. Young trees were usually used in the construction of Stone Age pile-dwelling settlements in other European regions, too. For example, in Swiss pile-dwelling settlements, trees

up to 40 years old make up 62% to 83% of the pile collection (Tercier *at al*. 1996, p.570).

The dating and construction of pile structures

On an anatomical analysis of the pile wood, it was found that the piles which had remained in the settlement were made of different trees, mostly ash. Despite the tendency to arrange piles made from certain tree in groups, for instance, hazel piles in lines going in different directions, and piles arranged in quite a compact group, in general, the piles do not form a visible spatial structure in the investigated area. In terms of annual growth (tree rings) type, the trees of which the piles were made are different. A few dendrotypological groups that show the heterogeneity of the material were identified. This leads us to the idea that there are structures in the settlement dating from different times. Along with piles used for dwelling structures, there could be the remains of fishing barriers, because thin and long pine billets used for creels were found.

For the purpose of obtaining as accurate information as possible on the likely time of construction of the structures, wood samples of ten different species and dendrotypological groups were dated by radiocarbon dating. The dating was carried out at the radioisotope laboratory of the Dendroclimatology and Radiometry Group of Vytautas Magnus University.

The radiocarbon dates obtained support the earlier hypothesis that the wooden structures of the settlement date from different times. The latest wood is alder, from the peat layer that formed over the bottom of the lake. The dating of this sample (3310+/-50 BP, VDU-165) indicates that in the second half of the second millennium BC, the peatifying process at Lake Žemaitiškė had already started. The earliest date (8380 +/- 60 m. BP, Boreal Period, VDU-187) refers to pine pile No 88. Due to the fact that pine is not typical of broad-leaved forests, we can suppose that other structural elements made from pine, as well as from birch, another Boreal species, which were found in the excavation area, also date from a much earlier Mesolithic period.

The dates of other piles are within the range from 3670+/-80 (alder pile No 172, calibrated date 2140–1930 BC) to 5970+/-60 (ash pile No 145, calibrated date 4970–4790 BC). The majority of the dates are grouped in the range of 3000 BC. All the dates of the piles made from broad-leaved trees correspond to the end of the Atlantic and the beginning of the Subboreal periods, when broad-leaved tree species still prevailed in the forests.

Upon confirmation of the presumption that the wooden structures found in the Žemaitiškė 2 settlement are not of the same date, it is important to single out structures dating from different periods. The dendrochronological synchronisation of pile ring sequences is used for this purpose. Despite the very narrow rings, individual growth dynamics and comparatively short annual ring sequences, the ring sequences of certain ash and elm piles can be synchronised. The results of the dendrochronological synchronisation of some pile ring sequences show that ring sequences which contain the last underbark ring end the same year, that is, the piles were felled the same year. It was determined that in certain cases there is a felling time difference of a few years among piles situated at a short distance from each other. This might indicate repairs to a building structure, or different stages in the construction of the structures.

In the course of studies of the piles, an attempt was made to reconstruct a piece of simultaneous structures. Here a simultaneous structure is understood as a spatial structure consisting of piles felled the same year, and identified by the dendrochronological synchronisation of the ring sequences. It is evident that the excavated area (12x4m) investigated in detail by applying the dendrological method between 2000 and 2002 is not large enough for the identification of the structures of the entire settlement, because the area contains only individual parts of the structures. Some parts of the structures have the features of a rectangular spatial structure.

A reconstruction of the spatial structure of the structures, just like the radiocarbon dating, indicates that the settlement contains several overlapping wooden pile structures dating from different periods. A more thorough study and identification of the spatial structure of the structures would be possible on expanding detailed studies of the wooden structures, so that the studies cover a larger part of the settlement. Due to the fact that the length of the ring series of wooden elements does not exceed a hundred years, at longer intervals between the construction of the structures (according to radiocarbon dating, this interval can be hundreds, and even thousands, of years), the overlapping of pile ring sequences and the relative dating of the structures by the dendrochronological method is not possible. In order to resolve the issue of the evolution of the construction of the structures, a larger number of radiocarbon dates is required, as is done in reconstructions of Swiss or German pile-dwelling settlements. As complex studies are continued, piles from individual reconstructed structures should be radiocarbon dated in the future. These dates would make it possible to make judgments on the sequence of the construction

of the structures and their correspondence to other archaeological finds. The studies have shown that the structures are not simultaneous, and the precise determination of their simultaneity requires similar studies in the areas investigated between 1979 and 1982.

Among the structures of the Žemaitiškė 2 settlement, the largest sequence consists of ash piles, which indicates that around the lake which existed at Žemaitiškė there was sufficient humidity and fertile, humus-rich soils.

In the course of an analysis of the annual rings of ash trees, it was found out that mostly trees up to 40 years old were used for the construction; however, quite a large number of ash trees 50 to 70 years old were also felled. Trees older than 70 years old are found in the structures, but rarely. Very slow growth is typical of most trees; their annual ring sequences are quite long. A different type of tree growth indicates different growth conditions: different habitats or a different composition of species and density of standing timber, which determine the competition among the trees for light and other resources.

Discussion of the results of the studies of the Žemaitiškė 2 settlement

On the basis of archaeological and dendrological studies of the Žemaitiškė 2 settlement, it was possible to determine that people lived in the settlement the longest in the Late Neolithic. This fact is confirmed by the radiological dates and archaeological material from the settlement. The piles which supported the platform are larger, and from six to eight to 14 to 16 centimetres in diameter. Other vertically driven poles were used for catching fish, that is, for supporting fishing barriers and creels. This shows that there were both dwellings and installations for fishing in the settlement. Dendrological studies carried out on part of the area of the settlement indicate that people lived there at different times, because radiological analyses of the piles and poles cover quite a broad chronological spectrum. However, the archaeological material from the Late Neolithic period is compact. It shows that people lived and caught fish there constantly in the Late Neolithic only, while they caught fish there from the Mesolithic to the end of the Bronze Age.

The settlement's platforms, on which structures were erected, were arranged along the shore of the now disappeared Lake Žemaitiškė, at the point where a rivulet flowed out of it and into Lake Kretuonas. The structures reached the rim of the lake's sandbar, which passed into the first underwater terrace. This makes it possible to claim that both the buildings and the fishing installations were next to each other. People living next to the channel could get fish regularly. The osteological material from the settlement shows that not only fish but also hunted fauna was used for food. The latter data, and the archaeological material (devices for making tools, pieces of art, the abundant pottery, the rubbish heap in the water next to the buildings), might indicate that people lived there not only during an individual fishing period but also permanently.

In the course of dendrological studies, it was found that, more often than not, pile structures were built or repaired in May and June, when the spawning season of the fish that were most commonly used for food was nearly over, and the water level had stabilised after the spring thaw. There was a pile platform placed on poles eight to 14 centimetres in diameter which were driven into the lake argil. There were buildings erected on the platform. The platform was made of thin logs ten to 15 centimetres in diameter, in which holes would be cut; the holes would be placed on vertically driven piles with shouldered tops. The piles were replaced just like individual structures of the platforms. Therefore, dendrological studies make it possible to determine that the structures of the buildings covered each other a number of times.

The latest archaeological and dendrological studies make it possible to claim that from the Late Neolithic, people lived and engaged in economic activities in buildings placed on piles in Lithuania without interruption: they caught fish, hunted and started breeding livestock.

This tradition of pile construction still existed in the Bronze Age. Pile structures erected in a similar manner in Lithuania have been found in Lake Luokesai (in the Molėtai district).

What circumstances made people build pile structures? There is no clear answer to this question. Pile structures were built by dwellers of various archaeological cultures; therefore, an ethnocultural interpretation of pile structures is not adequate. Most likely, the main reasons were economic, defensive and natural factors. Fishing was very important as a source of food. The regular consumption of fish for food is reflected in the conclusions of the stable isotope analysis (Daugnora, Girininkas 2004, p.32). Furthermore, as mutual relations between individual communities deteriorated because of food resources, territory, and so on, which can be seen in studies of the ideological dimension to society at that time (Daugnora, Girininkas 2004, p.149), it was safer to dwell surrounded by water.

Fluctuations in the water level at the time when pile structures were used would be far more noticeable than they are today, because this fact is reflected in material from a number of Stone Age settlements in Lithuania, which was related to the transgression and regression of the Baltic Sea in the Subboreal period.

Translated by Vidmantas Štilius

Abbreviation

ATL – Archeologiniai tyrinėjimai Lietuvoje / Archaeological investigations in Lithuania. Vilnius, from 1967.

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Received: 4 September 2010; Revised: 7 December 2010; Accepted: 28 December 2010.

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ŽEMAITIŠKĖS 2-OJI POLINĖ GYVENVIETĖ

ALGIRDAS GIRININKAS

Santrauka

Lietuvos teritorijoje apie polinių statinių egzistavimą akmens ir bronzos amžiais žinoma gana nedaug. Šiuo metu Lietuvos teritorijoje neolito laikotarpio polinėmis gyvenvietėmis galima būtų laikyti Žemaitiškės 1-ąją, Žemaitiškės 2-ąją, Žemaitiškės 3-iąją, Kretuono 1C (Švenčionių r.), Šarnelės (Plungės r.), Šventosios 4-ąją, Šventosios 6-ąją (Palangos m.) gyvenvietes, kurios priklausė Narvos, virvelinės keramikos ir rutulinių amforų kultūrų bendruomenėms. Iš bronzos amžiaus laikotarpio žinomos Luokesos 1-oji, Luokesos 2-oji gyvenvietės. Visos tyrinėtos gyvenvietės yra prie protakinių ežerų ar pajūrio lagūnų, kurios jungėsi su įtekančiomis ar ištekančiomis upėmis ir jūra. Gyven-

viečių kultūrinių sluoksnių aptinkama išilgai kranto buvusių ir esančių ežerų atabraduose prie pat įtekančių ar ištekančių upelių vagų. Didžioji dalis polinių gyvenviečių aptikta po durpių sluoksniais, todėl apie šio tipo gyvenamuosius būstus prabilta pradėjus intensyviau tyrinėti durpynų pakrantes ne tik Lietuvos, bet ir Latvijos, Pskovo srities, Lenkijos, Šveicarijos bei Vokietijos teritorijose, ypač paskutinio Skandinavijos ir Alpių apledėjimo galinių morenų ruože, kur susidarė daug protakinių ežerų.

Iš minėtų polinių gyvenviečių Lietuvoje detaliausiai tyrinėta Žemaitiškės 2-oji gyvenvietė (Švenčionių r.). Žemaitiškės 2-oji gyvenvietė buvo tyrinėta 1979–1981 ir 2000–2001 metais. Kasinėjimų metu buvo rasta daug medinių konstrukcijų, kurios tyrinėjimų pradžioje buvo interpretuotos kaip antžeminių „ilgųjų pastatų“ liekanos. Visas gyvenvietės inventorius laikytas chronologiškai vienalaikiu, priklausiusiu vėlyvajam neolitui. Tik vėlesni tyrimai patvirtino, kad ši gyvenvietė yra buvusi polinė.

Gyvenvietės kultūrinis sluoksnis yra 2–25 cm storio sapropelinių durpių sluoksnelis, susiformavęs buvusio ežero dugne. Jo apatinėje dalyje buvo žvyras su gausiomis vandens moliuskų kiautų liekanomis. Po kultūriniu sluoksniu visur slūgsojo ežerinis šlynas. Viršutinis šlyno horizontas neolito statytojų buvo išmaigytas statant gyvenvietės statinius, jame pasitaikydavo medžio anglių, nuodėgulių, akmenų, medienos skiedrų, tačiau archeologinių dirbinių nebuvo rasta. Giliau šlynas buvo vientisas, be jokių žmogaus veiklos pėdsakų. 2000–2001 m. tyrimai patvirtino spėjimus, kad ši gyvenvietė yra polinio statinio, kuris buvo pastatytas vandenyje, buvusio ežero pakrantėje, prie iš ežero ištekančio upelio, vieta. 1979–1982 ir 2001–2002 m. rasta 1089 statmenai įkalti kuolai ir medinių konstrukcijų fragmentai. Kuolai į ežerinį šlyną buvo įkalti vidutiniškai apie 1,2 m, o ilgiausi ir stambiausi kuolai – net 2 metrus.

Deja, viršutinės polių dalys yra nunykusios, todėl spręsti apie virš vandens buvusius konstrukcijų technologinius elementus kol kas negalime. 1980–1983 m. tyrimų metu buvo aptikti keli kuolai, kurių viršutinės dalys buvo išlikusios. Jos atrodė tarsi turinčios petelius, ant kurių buvo užmaunama kita statinio, tikriausiai platformos, konstrukcija. Dalies kuolų smaigaliai smailinti smulkiomis facetėmis kirveliais. Kai kurių konstrukcijų smaigaliai dėl tvirtumo buvo apdeginti, vieno stambaus kuolo galas buvo nudegintas ir be jokio papildomo apdorojimo įsmeigtas į gruntą. Kelių geriau išlikusių kuolų viršūnės buvo apdegusios. Kultūriniame sluoksnyje rasta daug anglių ir nuodėgulių, todėl galima manyti, kad polinis statinys buvo sunaikintas gaisro.

Analizuojant medines konstrukcijas nustatyta, kad dalis jų yra nesusijusios su poliniu pastatu. Tai pasakytina apie plonas, 3–4 cm storio, įvairiausių medienos rūšių kartis. Dalies tokių karčių viršutiniai galai buvo aptinkami gana giliai šlyne. Greičiausiai šios kartys yra žvejybos užtvarų, įrengtų dar prieš statant ar jau esant pastatytam poliniam pastatui, liekanos. Tokio tipo žvejybos įrenginiai yra gerai žinomi iš etnografinių tyrinėjimų ir buvo plačiai naudoti Baltijos jūros regione neolito laikotarpiu ir kitose Europos vietose.

Tyrinėjant Žemaitiškės 2-ąją gyvenvietę pastebėtas dar vienas įdomus reiškinys. Gyvenvietės teritorijoje, kur būta daug statmenai sukaltų kuolų, židinių nerasta. Tai rodo, kad židiniai yra buvę ant platformos, tikriausiai pastatų viduje, specialiai tam įrengtose vietose, kur platformos pagrindą dengė žemių ir molio sluoksniai. Židinių neaptikta ir kitose polinėse gyvenvietėse: Šarnelėje, Šventosios 4-ojoje, Šventosios 6-ojoje, Žemaitiškės 3-iojoje.

Polinių statinių laikotarpiui priklauso tinklo plūdės, pasvarai, meškerių kabliukai, kaulinių, raginių ir akmeninių dirbinių šlifavimui skirti akmenys, eglutės formos žeberklai, titnaginiai peiliai, kaltai, pleištai ir kt. Kultūriniame sluoksnyje, be vėlyvajam neolitui priklausančios storasienės keramikos, rasta ir plonasienės narviškos keramikos, kuri chronologiškai turėtų būti ankstyvesnė. Taip pat rasta viena puodo šukė, liesinta smėliu ir puošta šukiniu ornamentu. Greičiausiai ji sietina su šukinės duobelinės keramikos kultūra. Tai rodo, kad gyvenvietės teritorijoje trumpą laiką gyventa ir ankstesniu laikotarpiu.

Aptikta ir gyvūnų kaulų. Iš jų matyti, kad polinės gyvenvietės žmonės medžiojo bebrus, elnius, briedžius, lokius, šernus, antis, žąsis. Pasistatę žvejybos įrenginius gaudė stambias lydekas ir šamus bei kitas žuvis.

Tyrimų duomenys rodo, kad iš auginamų gyvulių didelę reikšmę turėjo arkliai, o to paties Kretuono apyežerio aplinkoje, vienalaikėje Kretuono 1D gyvenvietėje, gyvenę žmonės augino kiaules.

Vėlyvojo neolito gyvenvietėje poliams naudotų medžių rūšys buvo nustatomos pagal makropožymius. Archeologinė medžiaga, išskyrus atvejus, kai mediena labai suirusi, buvo skirstoma į tris medienos grupes: spygliuočiai, kietieji lapuočiai, minkštieji lapuočiai. Kietųjų lapuočių grupės mediena pagal makropožymius buvo identifikuota iki medžio rūšies. Medienos rūšis buvo nustatoma remiantis medienos diagnostiniais požymiais trijuose pjūviuose: skersiniame, tangentiniame ir radialiniame. Medienos rūšys buvo identifikuojamos šiuose trijuose pjūviuose mikroskopu taikant 56–250 kartų padidinimą.

Medienos rūšims identifikuoti buvo pasirinkta daugiau kaip 300 polių pavyzdžių, kurie rasti 2000–2001 m. tyrinėjimų metu. Didžiausią dalį konstrukcijų sudarė paprastojo uosio (*Fraxinus excelsior L.*) poliai (57,1 %) (1 il.). Uosiniai poliai ir kuolai išsidėstę beveik tolygiai po visą 2000–2001 m. kasinėjimų plotą. Uosiniai buvo įvairių matmenų konstrukciniai elementai: pradedant 3 cm skersmens kartimis, baigiant 14 cm skersmens skeltais poliais.

Išskyrus pušies ir kelis beržo (*Betula pendula Roth*) pavyzdžius, atstovaujančius spygliuočių miškų tipui, dauguma kitų pavyzdžių yra būdingi plačialapių miškų, vyravusių atlančio ir ankstyvojo subborealio laikotarpiu, atstovai. Antra dažniausiai konstrukcijoms naudota medžių rūšis buvo alksnis (*Alnus sp.*) (11,3 %). Lazdyno (*Corylus avellana L.*) (10,0 %) poliai grupavosi neryškiomis linijomis, skirtingomis kryptimis kertančiomis tyrimų plotą. Šios rūšies mediena, matyt, buvo naudojama žuvų užtvaroms statyti. Kitos gausesnės medžių rūšys yra tipiškos plačialapių miškų atstovės, pvz., guoba (*Ulmus sp.*) (5,3 %) ir klevas (*Acer platanoides L.*) (4,3 %). Tačiau vienas iš tipiškiausių plačialapių miškų atstovų – ąžuolas (*Quercus robur L.*) – konstrukcijoms statyti praktiškai nebuvo naudotas. Visose 2000–2001 m. tirto Žemaitiškės 2-osios gyvenvietės ploto konstrukcijose rastas tik vienas ąžuolinis kuolas. Tai ryškiai skiria tiriamąją gyvenvietę nuo polinių gyvenviečių Šveicarijoje ir Pietų Vokietijoje, kur ąžuolas yra viena iš dažniausiai naudojamų neolito konstrukcijose medžių rūšių, ir sudaro iki 75 % pavyzdžių. Pušies (*Pinus sylvestris L.*) pavyzdžiai visoje kolekcijoje sudaro 6,0 %. Kasinėjimų plote pušiniai konstrukciniai elementai išsidėstę salelėmis, gausiausia sankaupa yra 2000 m. kasinėjimų plote. Likusieji polinės gyvenvietės konstrukciniai elementai – pavieniai kuolai ir poliai iš smulkių medžių bei krūmų: šaltekšnio (*Rhamnus frangula L.*), drebulės (*Populus tremula L.*), sedulos (*Cornus sanguinea L.*), gluosnio (*Salix sp.*).

Paskutinės medžių rievės analizė rodo, kad didžioji dauguma polių buvo ruošti pavasarį, vegetacijos sezono pradžioje (36 %), arba vasarą (23 %). Net 36 % pavyzdžių paskutinėje rievėje yra tik ankstyvoji mediena. Dabartinio klimato sąlygomis uosių, guobų ir pušų ankstyvoji mediena pradeda formuotis gegužės mėnesį. Mūsų tyrimai rodo, kad birželio viduryje kai kurių uosių vėlyvoji mediena dar nebūna pradėjusi formuotis. Todėl galima teigti, kad intensyviausiai statybos ir pastatų rekonstrukcijos darbai Žemaitiškės 2-ojoje polinėje gyvenvietėje vykdavo gegužės–birželio mėnesiais.

Medžių polių datos (14C) išsidėsčiusios intervale nuo 3670+/-80 (alksnio polius Nr. 172, kalibruota data 2140–1930 m. pr. Kr.) iki 5970+/-60 (uosio polius Nr. 145, kalibruota data 4970–4790 m. pr. Kr.). Remiantis archeologiniais ir dendrologiniais tyrimais nustatyta, kad Žemaitiškės 2-ojoje gyvenvietėje ilgiausią laiką nuolat buvo gyvenama vėlyvojo neolito laikotarpiu. Tai patvirtina gyvenvietės radiologinės datos ir archeologinė medžiaga. Poliai, kurie laikė platformą, yra stambesni, jų skersmuo yra nuo 6–8 cm iki 14–16 cm. Kitos statmenai įkaltos kartys buvo naudojamos žvejybai: užtvarams, bučiams prilaikyti. Tai rodo, kad gyvenvietėje buvo ir gyvenamųjų statinių, ir žvejybos įrenginių. Dalyje gyvenvietės ploto atlikti dendrologiniai tyrimai rodo, kad gyventojų čia buvota įvairiais laikais, nes polių ir karčių radiologinių tyrimų chronologinis spektras yra gana platus. Tačiau vėlyvojo neolito archeologinė medžiaga yra kompaktiška. Ji rodo, kad šioje vietoje nuolat gyventa ir žvejota tik vėlyvajame neolite, o žvejota – nuo mezolito iki bronzos amžiaus pabaigos. Naujausi archeologiniai ir dendrologiniai tyrimai įgalina teigti, kad Lietuvos teritorijoje nuo vėlyvojo neolito ant polių stovėjusiuose pastatuose buvo nuolat gyvenama ir ūkininkaujama: žvejojama, medžiojama, pradedama auginti gyvulius.

Ši polių statymo tradicija išliko ir bronzos amžiuje. Lietuvoje analogiškai surėstų polinių statinių aptikta Luokesų ežere (Molėtų r.).