

Pile dwellings in the Circum-Baltic area

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ABSTRACT – *The phenomenon of northern pile dwellings has been found in different geographical zones and landscapes of the Circum-Baltic region: in sea landscapes and on the shores of inland lakes and rivers. Inland sites were established in specific lacustrine landscapes, appearing within former post-glacial basins. The pile dwellings revealed here are characterized by different types of wooden buildings, including structures with raised floors. They are dated to the 4th millennium BC to 4th century BC in Central Europe and the Baltics, and to the end of the 4th to end of the 3rd millennium BC – in NW Russia and Belarus. They appeared in major cases independently and followed different cultural trajectories. The article presents an overview of a number of sites which can be attributed to pile dwelling settlements distributed in the Circum-Baltic area. It discusses particular features of their construction, traits of material culture, and site location patterns.*

KEY WORDS – *pile dwellings; Eastern Europe; Circum-Baltic; Neolithic; limnic landscapes*

Kolišča ob Baltskem morju

IZVLEČEK – *Fenomen severnih kolišč je bil odkrit v različnih geografskih območjih in pokrajinah ob Baltskem morju, tako ob morju kot na obalah jezer in rek v notranjosti. Najdišča v notranjosti ležijo na posebnih jezerskih območjih, ki so se oblikovala znotraj nekdanjih bazenov po ledenih dobah. Za ta kolišča so značilni različni tipi lesenih stavb, med njimi tudi strukture z dvignjenimi tlemi. Te stavbe so na območju Srednje Evrope in Baltika datirane v čas med 4. tisočletjem pr. n. št. in 4. stoletjem pr. n. št.; na območju SZ Rusije in Belorusije pa v čas med koncem 4. in 3. tisočletjem pr. n. št. Stavbe so se v večini primerov pojavile neodvisno in so sledile različnim kulturnim trajektorijam. V članku predstavljamo pregled koliščarskih najdišč na območju Baltskega morja. Razpravljamo tudi o posebnih značilnostih pri njihovi gradnji, sledovih materialne kulture in vzorcih poselitve.*

KLJUČNE BESEDE – *kolišča; Vzhodna Evropa; območje Baltskega morja; neolitik; limnične krajine*

Introduction

The first lake dwellings in the Circum-Baltic region were discovered and investigated in the second half of the 19th century. Starting with the works made by Johannes Heydeck in the early 20th century, the investigations and surveys were carried out by East Prussian researchers inspired by the discoveries of the settlements found in Switzerland and what was then German territory (Heydeck 1909). Land-recla-

mation works held in the 1930s–1960s led to a significant increase in the discover of lake dwellings. New examinations of prior investigations and new studies started in the 1990s (Gackowski 1998; Łapo, Ossowski 2000).

In Russia, the first peat-bog sites were found in the 19th century in the Ural Mountains, when gold depo-

sits were mined. Gold mining conducted on the eastern slope of the Middle Ural Mountains led to uncovering the Shigirsky peat-bog site (Tolmachev 1914; Savchenko 1999). Some of the constructions found on the sites located in Shigirsky and Gorbunovsky peat-bogs were interpreted as the remains of platforms left on marshy areas (Bryusov 1951). Land-reclamation works carried out in the 1960s in NW Russia led to the uncovering of a number of Neolithic pile-dwelling sites (Mazurkevich, Dolbunova 2011).

More than 100 peat-bog sites dated to the Mesolithic – Bronze Age were found in Estonia, Latvia, Belarus, and in the forest zone of Eastern Europe (North-Eastern Russia – Eastern Onega: sites of the Veretie 1 type and Modlona, Visky peat-bog; Volga-Oka basin – Ivanovskaya, Moskovskaya and Ryazanskaya Regions; and in North-Western Russia – Pskovskaya, Smolenskaya, Leningradskaya Regions). Some of these sites were attributed to pile-dwelling settlements (Oshibkina 1996) (Fig. 1).

The phenomenon of northern pile dwellings has been found in different geographical regions and landscapes of the Circum-Baltic Region: in sea landscapes and on the shores of inland lakes and rivers. Inland sites of this type were established in specific lacustrine landscapes, appearing within former post-glacial basins. These sites were situated on lakeshores located in front of the morainic formations of the Würm Glaciation (Dolukhanov, Mazurkevich 2000).

A particular type of prehistoric lake shore dwellings dated from the end of the 6th to 1st millennium BC, including structures with raised floors (Martinelli 2014), were regarded mainly as a Southern and Western European phenomenon (Schlichtherle et al. 2013). In this article, we want to emphasize that these specific building techniques and types also existed in the Circum-Baltic area. They appeared in major cases independently and followed different cultural trajectories, which will be shown through an analysis of the number of sites, distri-

bution in various regions and different prehistoric periods. Contextualization of each case is thought to be crucial to obtain the full variety of this phenomenon.

Regional studies

Lithuania

In Lithuania pile dwellings have been recorded from the Stone Age and Early Metal periods. However, among the many wetland settlements that have been explored, only a few of them have dwellings with raised floors.

Neolithic and Early Bronze Age

More than 60 sites dating from the late Mesolithic to the Late Bronze Age were discovered in the Šventoji marshlands on the Baltic coast of Lithuania. The sites contained remains of dwelling zones, refuse layers and fishing stations (Rimantienė 2005; Piličiauskas 2016a). Šventoji 6 site is suggested to be a pile-dwelling settlement (Girininkas 2005; Piličiauskas 2016a). It was located at a transitional zone between a narrow channel and a wide lake. Various fishing items made from bone and wood, pottery (Narva and Globular Amphora culture wares), amber ornaments, and flint tools were found here. Most of the ¹⁴C dates from the site pointed to the

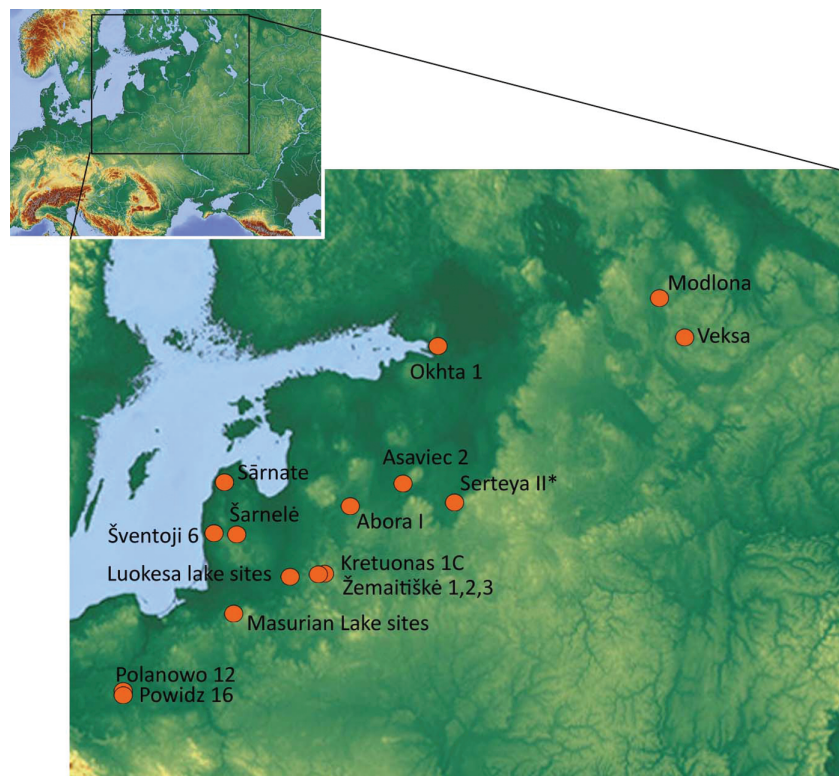


Fig. 1. Map of the sites mentioned in the text (* including sites Usviaty IV, Naumovo, Dubokray V, X) (drawing by E. Dolbunova).

period 3000–2500 cal BC (*Piličiauskas et al. 2012*). In the excavated area 66 piles were registered, most of which constituted pile dwellings. However, some of the piles are believed to belong to stationary fishing constructions (*Piličiauskas 2016b*).

In the basin of Lake Kretuonas (Eastern Lithuania) approximately 60 archaeological sites from the Stone and Bronze Age have been found so far (*Girininkas 1990; Šatavičius, Marcinkevičiūtė 2013*). A few sites, Kretuonas 1C site and the Žemaitiškė 1, 2, 3 sites have been interpreted as pile dwellings.

In Žemaitiškė 2 site, which dates back to the Late Neolithic, more than 1000 pieces of wooden constructions were recorded in the excavated areas. The site was located on the shore of a former lake, near the source of a stream flowing from the lake (*Girininkas 2004; 2010*). Some of the wooden piles with a small diameter were identified as fishing traps. Groups of larger piles were arranged in separate parallel lines perpendicular to each other. These lines of piles coincided with the distribution of finds, marking the form of the dwelling platform. The largest concentration of archaeological finds indicates areas behind the platform where they might have fallen down. According to Algirdas Girininkas, this pile-dwelling settlement was established above water. This site was ascribed to the Late Narva culture (*Girininkas 2005*). Archaeological finds, including bird and fish bones, indicate the importance of hunting and fishing for the community.

At the Kretuonas 1C site (*Girininkas 1984*) pile-dwellings were constructed on a low, seasonally flooded terrace. They are dated to the Early Bronze Age, manifesting the continuity of pile constructions (*Brazaitis 2003; Girininkas 2005*). However, a clear plan of the distribution of piles cannot be reconstructed. The remains of fishing baskets and fishing fences were also found next to them.

Žemaitiškė 1, 3 sites were also interpreted as sites with pile constructions, although the data is not yet sufficient (*Pranckėnaitė 2011*). Both sites were found on the shore of a former lake. Perpendicular groups of piles, which did not form any clear construction, were recorded. Both sites were ascribed to the Middle and Late Neolithic Narva culture (*Girininkas 2005*).

In the western part of Lithuania, the Šarnelė site was detected in shallow water near the source of the river at the lake (*Butrimas 1996*). Over 400 verti-

cal piles have been detected (*Girininkas 2005*). Certainly, some piles, especially those which are small in diameter, should be ascribed not to pile buildings but to fishing traps (*Girininkas 2010*). Ceramics found on the site were attributed to the Narva and Corded Ware cultures. The importance of fishing is exemplified by the discovery of such archaeological finds as harpoons, nets, net-sinkers and net floats made of birch-bark. There were also bone points, amulets, and an amber ornament among the discoveries (*Butrimas 1996*).

Late Bronze to Early Iron Age

Two pile dwellings are known in the Lithuanian territory dating from the Late Bronze Age to the Early Iron Age. Lake Luokesa dwellings I and II were discovered in 2000–2001. The remains of two lake-settlements were located underwater in morainic shoals, at a depth of 2m. Two sites were built at the opposite sides of the lake (*Pranckėnaitė 2014*). The Lake Luokesa dwelling I consisted of a double or triple fence, and a central part. Together with these fences, the settlement occupies an area of 60x40m. Dwelling I of Lake Luokesa has one layer, 35–110cm thick, and consists of 5–7 layers of horizontal wooden structures (*Pranckėnaitė 2016*). The archaeological and archaeobotanical material testifies to agriculture and animal husbandry, but on the basis of the available data it is rather complicated to assess the contribution of the production economy and gathering-fishing and hunting economy at Luokesa I (*Pollmann 2014; Pranckėnaitė 2014*) (Figs. 2–3).



Fig. 2. Plan of the site Luokesa 1 (drawing by E. Pranckėnaitė).

The pile distribution at Luokesa site II shows a construction resembling a fairly large platform, linked to the shore by a walkway. During archaeological excavation, no clear cultural layer or archaeological artefacts were discovered (*Baubonis, Pranckėnaitė 2012*). The data of the Lake Luokesa dwelling II does not enable us to interpret it as a dwelling used for habitation, and its ultimate interpretation and purpose remain unclear (*Pranckėnaitė 2014*).

Constructions found at Lake Luokesa were pile dwellings raised above the damp ground (about 1m from the surface). Lake Luokesa dwelling I was situated on the exposed swampy shoal of the northern shore (*Ismail-Meyer 2014; Pollmann 2014*). Luokesa sites I and II are dendrochronologically dated to the period 625–353 BC, and site II was built 25 years earlier than site I. Lake Luokesa site I was established around 600 BC (*Bleicher 2014*). It is not possible to suggest that these two dwellings were part of one complex that was used at the same time (*Baubonis, Pranckėnaitė 2012*).

There is no indication for a specific purpose or unusual function of the dwelling. The inhabitants made full use of the surrounding territories and food sources. At the same time period during the Late Bronze Age hillforts appeared in Lithuania. Further research into the connection between lake dwellings and hillforts, and the possible seasonality of this, could reveal more inland-water inhabitation and complexity.

Latvia

Neolithic

There are large wetland areas which were inhabited during the Neolithic period in Latvia. The most important are those near Lake Babite, Lake Kaņieris, the Lubāns wetlands and a coastal peatland area in Sārņate (*Loze 2011*). The Sārņate settlement is located in the north-western part of the Kurzeme Peninsula of western Latvia, 2km from the present coast. Sites were installed on a former lakeshore and possibly lay near the former outlet of the Sārņate River. The earlier period at the Sārņate sites is dated to 4365–3780 cal BC, and the next period to 3630–2850 cal BC. The houses of the Sārņate complex were quite substantial post-built structures, and cannot be regarded as pile dwellings (*Vankina 1970; Bērziņš 2008*). Comb Ware, Early Sārņate Ware (c. 4365–3780 cal BC) and Late Sārņate Ware (c. 3630–2850 cal BC) were recorded here (*Vankina 1970; Bērziņš 2008*). The dwellings with Early and Late Sārņate Ware have produced a range of net fishing

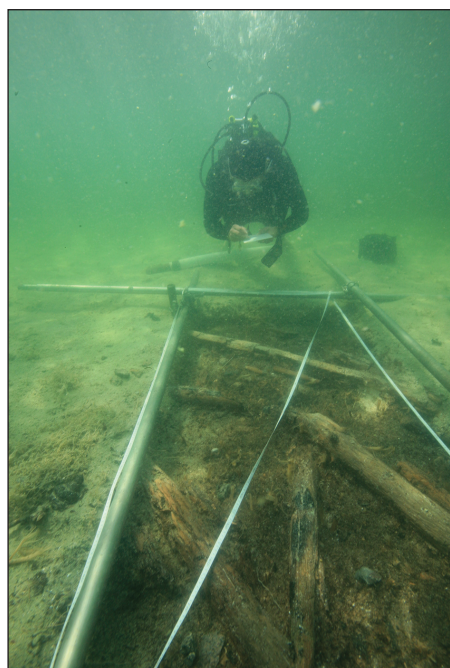


Fig. 3. Underwater excavation at Luokesa 1 site (photo by G. Krakauskas).

gear, as well as components of eel clamps and fish-screens. The hearths consisted of a bed of sand, with a substructure of timber and bark. For the Early and Late Sārņate phases, the subsistence pattern was based on a diverse range of subsistence resources, mainly those of the eutrophic lagoonal lakes, and a semi-sedentary or sedentary way of life, with permanent occupation at Sārņate. A similar mode of subsistence and settlement was probably practiced at other lagoonal lakes along the East Baltic coast (*Bērziņš 2008*).

Sixteen settlements have been explored in the Lake Lubāns wetlands with a broad periodization from the Late Mesolithic to Early Bronze Age (6600–5510 cal BC to 2350–1750 cal BC) (*Loze 2011*). Possible evidence of pile dwellings from the Late Neolithic period in the Lake Lubāns wetlands is ascribed at the Abora I site. Lines of piles were preserved on a sloping riverbank, and buildings were suggested to be placed on wooden platforms (*Loze 1978; 2011*).

No lake dwellings dated to the Early Metal periods have yet been found on the territory of Latvia (*Apals, Apala 2005*). For now the only known lake dwellings built on the artificial islands were discovered in the Vidzeme region the Central Latvia and dating back to the 2nd half of the 1st millennium AD (Āraiši lake dwellings (*Urtans, Rains 2003*)). Possible lake dwellings dated to Iron Age were detected in Lake Sāviena (*Urtans 2016*).

Estonia

The earliest attempts at pile dwelling research could be traced to the 17th century in the territory of Estonia, but the existence of prehistoric pile-dwellings at the bottom of the lake was only traced in the 1960s (Roio 2020). The only construction remains of a pile settlement in Estonia were ascertained in Koorküla Valgjärv Lake (Kriiska, Roio 2011). Three inhabitation stages of Koorküla Valgjärv Lake settlement were specified: (1) Neolithic period (Late Comb Ware, c. 3300–3200 cal BC (Roio 2007)); (2) Early Metal period (313–246 BC based on dendrochronological dates, and a single metal ring was also found typologically of the same period); (3) absolute dating of archaeological artefacts also show 7th–9th century inhabitation of the site (Roio 2020). Until now, no archaeological excavations have taken place at this site. Two other prehistoric wetlands sites with the remains of wooden piles are known: Stone Age settlement sites in the prehistoric lake of Kunda, and on the shore of Tamula Lake (Roio 2020).

Poland

Bronze Age to Early Iron Age

Dwellings of grate-and-beam construction were built on horizontal beams strengthened by vertical piles and stones, forming the so-called artificial islands – the main feature of lake dwellings in the Masurian Lake district, e.g., Orzysz, Mołtajny, Pieczarki, Bogaczevo, and Rybno settlements (Gackowski 2000; Pydyn 2007). Over 40 sites of this type are known in Masurian Lake district and are attributed to West Baltic Barrow culture (Pydyn, Gackowski 2011).

Only two sites in central Poland were attributed to the pile construction type, Polanowo 12 and Powidzo 16, belonging to the Lusatian culture (Pydyn 2010). Archaeological finds (*i.e.* ceramics), dating and building techniques confirm that these two pile settlements were inhabited in the 6th century BC (Pydyn 2007). Pile dwellings were constructed in the direct vicinity of the shoreline, on marshy and presumably periodically flooded areas. More than 500 wooden architectural elements and archaeological artefacts were detected in an area of 40x60m, at a depth of 0.6–2m under water in the Polanowo 12 settlement. The Powidzo 16 settlement consists of around 100 wooden elements. The settlements do not have a clear scheme while the settlements' size was set according to the concentration of the vertical piles. The remains of the bridges or fences were not found (Pydyn, Gackowski 2011). Animal husbandry and developed agriculture were recorded. The content of two vessels found in the Polanowo

12 settlement provided remains of 120 species of plants and presumably can be attributed to votive offerings (Latalowa, Pinska 2010).

Belarus

Different wetland sites were found in Northern Belarus, in Kryvina peatbog, including Neolithic and Bronze Age settlements (e.g., Asaviec 1, 2, 3, 4, 5, 6, 7 and Kryvina 1, 2, 3). The remains of rectangular wooden constructions consisting of poles and sharpened stakes were found at the Asaviec 2 site, dated to the time period of the Usviaty culture (Middle Neolithic) and North-Belarusian culture (Late Neolithic) (Charniauski, Kryvaltsevich 2011; Charniauski 2020). Flint artefacts are rather rare due to the absence of such outcrops in the area. Rich antler and bone industry included hunting and fishing tools, household items, ornaments, musical instruments and items interpreted as ritual ones (Charniauski, Charniauski 2010). A number of amber ornaments were also found. Similar materials were found on other sites which were supposed to be established on the dried peaty lakeshore during a regression phase (Asaviec 7 site). The remains of wooden constructions with more than 100 piles (with a diameter from 5 to 30cm) and a number of wooden fragments lying horizontally were uncovered. Inclined poles driven into the ditch were interpreted as the remains of the wall. The location of wooden construction corresponds to the concentration of finds and sandy filling. A large number of animal bones was found on the sites with moose, wild boar, marten and beaver predominating. A quite high number of domesticated animals was also noted (16% at Asaviec 7 site). One particular feature of the latter site is a large number of burnt bones, some of which are human. The remains of a skeleton, scattered human bones and their fragments were also found here. Traits of different archaeological cultures were traced in the ceramic complex of the Late Neolithic phase: Globular Amphora culture, Corded Ware, and Middle Dnieper culture. One of the earliest bronze and copper awls was recorded here (Charniauski, Kryvaltsevich 2011). The remains of fishing net floats made from birch bark, fragments of fishing traps and paddles were found on the site. The dominance of a hunting-gathering subsistence strategy has been suggested for this region.

Several wetland sites of the Neolithic-Bronze Age, some with the remains of wooden constructions, were also discovered in Southern Belarus (e.g., Kuzmichy 1, Aziaroye 2B, Kamen 8, and Voikavichy 1) (Charniauski, Kryvaltsevich 2011).

NW Russia

A range of sites with dwellings with raised floors located on marshy areas of paleolakes were found in the Upper Western Dvina River at the beginning of the 1960s by Alexander M. Miklyaev (1969; 1995; Mazurkevich 2014). Today, 30 pile settlements are known in this region (e.g., Serteya II, Usviaty IV (Fig. 4), Naumovo, Dubokray V, X, etc.). Pile dwellings appeared c. 3700–3450 cal BC (Usviaty culture), and were concentrated in a very restricted area within NW Russia, surrounded by other types of sites and archaeological cultures. To the east and north there were sites with Pit-Comb pottery and Volosovo culture, to the south there were sites with Rhomb-Pit pottery. Pile dwellings existed until the end of the 3rd millennium cal BC (Zhizhitsa and North-Belorussian cultures) (see the detailed chronology in Mazurkevich et al. 2017).

The form of the pile constructions changed over time: oval construction was found at an earlier stage,

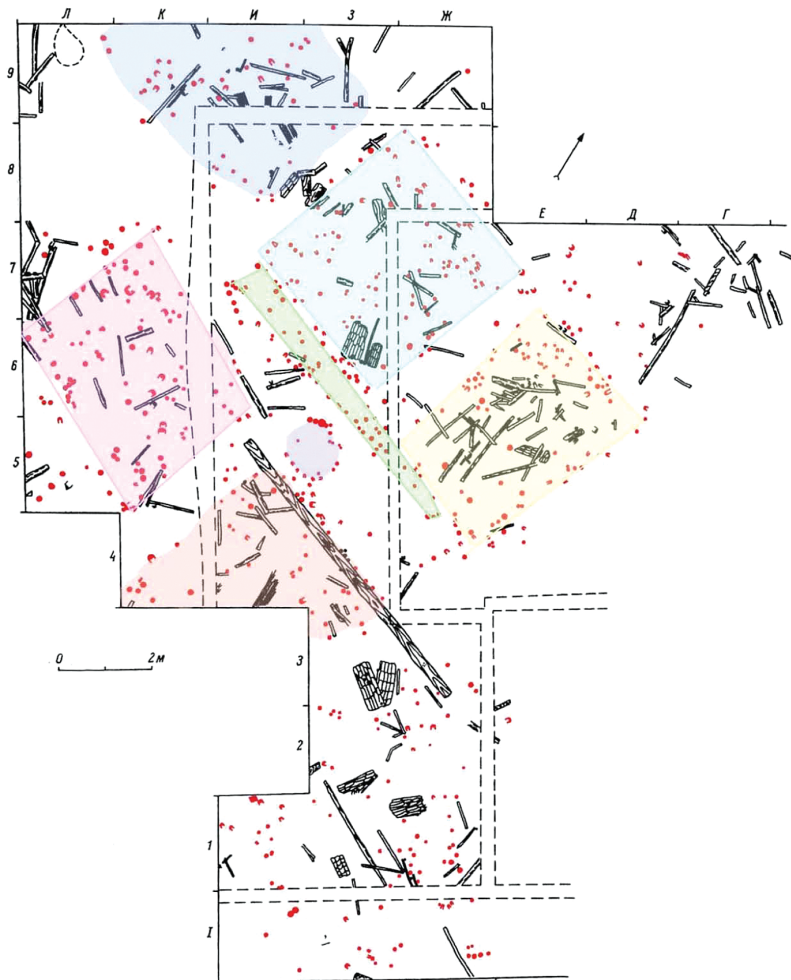


Fig. 4. Plan of the Usviaty IV site with piles distribution, remains of wooden structures and objects found (after Miklyaev 1969, modified by E. Dolbunova).

with rectangular constructions coming later. Pile dwellings of the Zhizhitsa and Northern Belorussian cultures consisted of one or several rectangular constructions measuring 5.5×4.5m (Fig. 5). Rectangular platforms formed the base of the pile dwellings, which were elevated 50–70cm above the surface of the shore. Logs were attached to piles with the aid of ropes and supported by ‘horned’ piles. Poles c. 5–8cm in diameter were densely laid transversely on top of the logs (Fig. 6.f); pine slabs c. 3–6cm thick (without bark) were placed above them (Fig. 6.c,e). The floor was covered by a layer of coarse white sand. Piles 14–22cm in diameter were placed around the periphery (Fig. 6.a). They served as a framework for walls that may have been made of branches and thin sticks (Fig. 6.d) covered by clay, as shown by daub fragments. The row of piles in the middle of the construction may indicate the existence of a pitched roof, covered by large bark pieces (Fig. 6.b). The platforms were encircled by garbage dumps (Mazurkevich, Dolbunova 2011). Dendrochronological analysis conducted for part

of the piles of the Serteya II site allowed establishing a floating dendroscale and suggested successive phases of dwelling construction, coexistence of several dwellings at a later stage, and periodic reconstruction of the dwellings (Hookk 2014). Today, 363 piles have been recorded for the Serteya II site.

The faunal and botanical records indicate that lacustrine dwellers relied heavily on wild resources, with year-round procurement of meat and fur animals as well as fishing. Food gathering was of considerable significance as well. At least 30 edible wild plants were identified at the Naumovo site (Guman 1978). Serteya II site allowed the reconstruction of various zones of inhabitation and household activities showing different areas involved in a pile-settlement area (Mazurkevich et al. 2020a). The palaeoenvironmental research conducted on this site showed a dynamic lacustrine-riverine system and important rebuilding of palaeoenvironmental conditions forced by

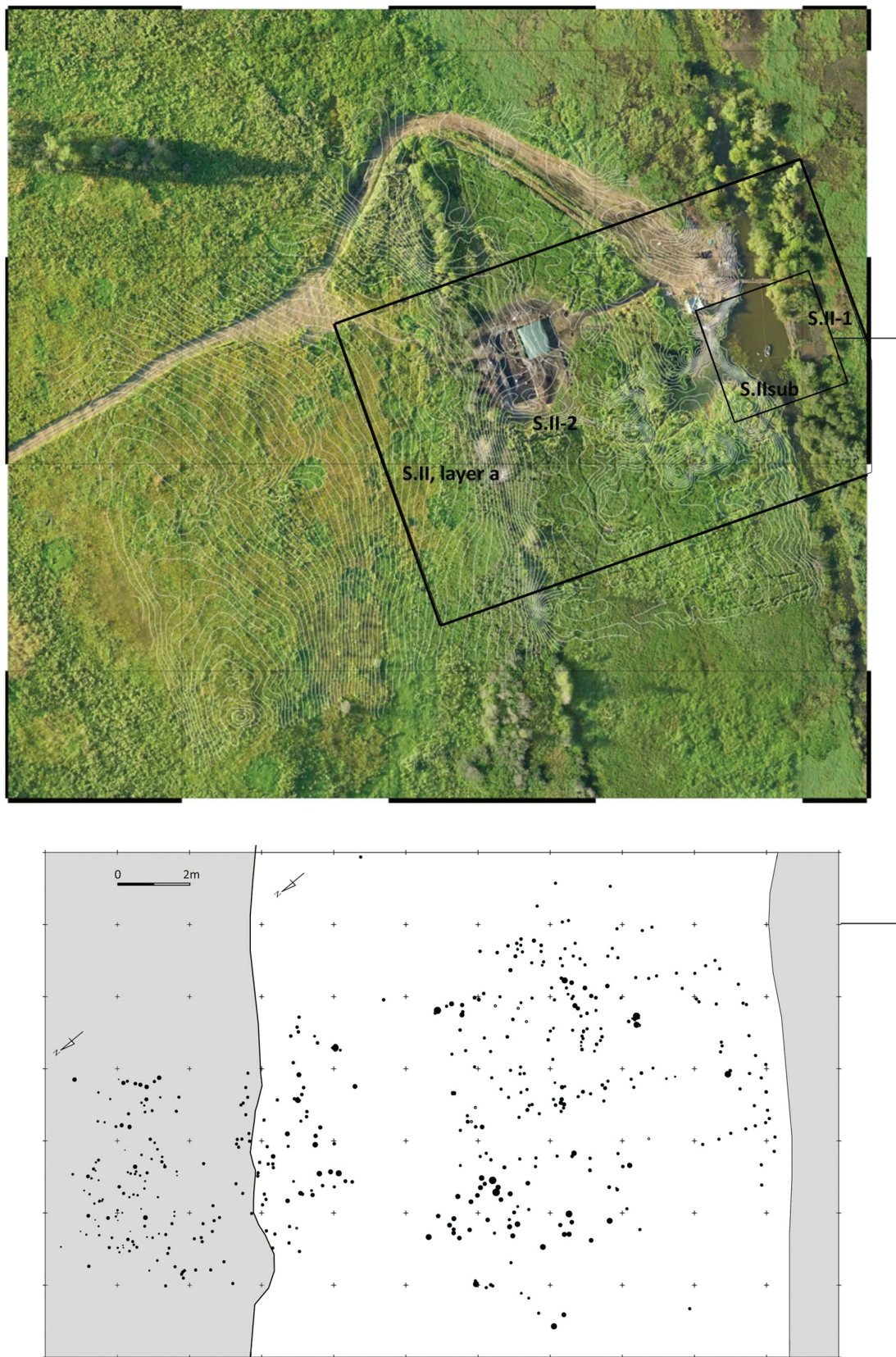


Fig. 5. Serteya II pile-dwelling site with different areas indicated (drawing by E. Dolbunova).

global climatic changes during c. 3900 and 2200 cal BC. The pile dwellings should be recognised here as an adaptation to the changeable ecological conditions (Kittel et al. 2020a). Renewal of the lacustrine system led to the devastation of the pile dwellings, the settlement moved to higher places, and Serteya II, layer *a* site appeared (Fig. 5) (Kittel et al. 2020b).

Rich evidence of everyday life as well as the remains of art survived. The syncretic character of this ancient art reflects the intertwining of technical and ritual activities, aesthetic and psychological needs, as well as the worldview of the society. A new way of life could also influence the social structure and ritual culture (Mazurkevich 2013).

The pile-dwelling settlements were situated in the close vicinity of different landscapes that favoured sustaining a highly efficient hunting, fishing and gathering economy. This delayed the initiation of agriculture and cattle-breeding economy despite direct and/or indirect contacts with communities who practiced it, which is visible through new pottery styles and imported objects (amber pendants, flint daggers, copper items, etc.) (Mazurkevich, Dolbunova 2011; Mazurkevich et al. 2020a; Mazurkevich 2013). Pile settlements remained the major settlement pattern in NW Russia for over a millennium.

No pile dwellings from the Early Metal period were found in the Middle and Upper Western Dvina or Dnepr Rivers. The transgression in the first half of the 2nd millennium BC led to flooding of large wetland areas and the sites were moved to a mineral shore.

Wetland sites at the eastern periphery: one more pile-dwelling settlement?

Other Neolithic wetland sites known in NW Russia have remains of fishing fences and/or traps, e.g., Okhta 1 (3600–2700 BC) (Gusencova, Sorokin 2011), multilayer Veksa sites (Piezonka et al. 2020) and Karavaikha 4 (Bruysov 1951; Kosorukova et al.

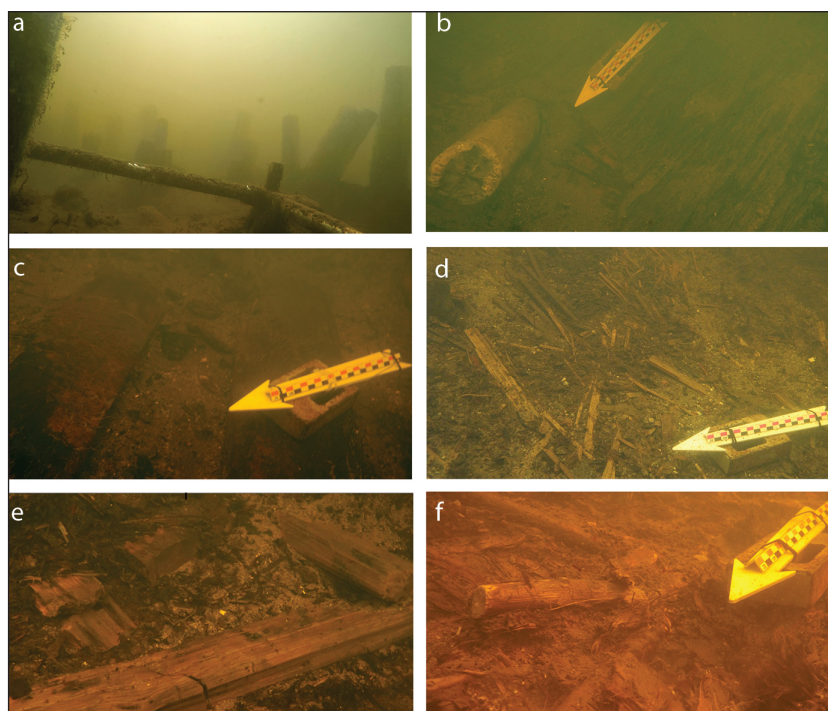


Fig. 6. Serteya II. Submerged remains of pile-dwelling constructions (photos by A. Mazurkevich, Y. Krotov, and E. Dolbunova).

2016). Only one site was interpreted as a pile-dwelling settlement, named Modlona (Bruysov 1952; Oshibkina 1978). It was excavated at the same time as key sites in the Baltics, when a wider scientific network existed which facilitated the exchange of knowledge about this new type of site, uncovered for the first time in this region. Aleksandr Yakovlevich Bruysov participated in excavations of the Sarnate site conducted by Lūcija Vankina (1970.12, Figs. 42, 45), and field seminars were organized on major peat-bog sites of Eastern Europe (Velichko et al. 1984).

The Modlona site (Fig. 7) is located on Lake Vozhe on a narrow and long cape. The archaeological layer of the Modlona site is deposited in a peat layer over sand, and part of the site is located under water, another part on the shore (Oshibkina 1978). Dwellings were connected by passages, which led to the shore (Fig. 7), where rafts were left (Oshibkina 1996.228). Buildings had wooden floors, vertically placed beams were covered by clay, with, probably, a double pitch roof, covered by birch bark, pressed by large stones. Buildings were up to 12m², probably, of log-house construction. Fireplaces were located inside the houses, and the remains of floors and piles were burnt in one building. Garbage piles were recorded mainly to the south, and less frequently to the east of the buildings. The remains of large fishing constructions, made from thin planks, were

found near some of the dwellings (Fig. 7) (*Bruysov 1951*).

Inhabitants of the site practiced hunting and fishing. A great amount of hunting gear, and bones of wild animals were found. Fishing gear included the remains of fish traps, fish hooks and harpoons. Thick-wall pottery was tempered by shell, sometimes asbestos, and the whole surface was decorated by short, oval and long comb impressions. A great number of diverse wooden artefacts were found, including the fragment of a paddle, ash water scoop with a handle with a carved dog head. Amber ornaments were also recorded (roundish buttons with V-drilling, pendants, and fragment of a ring). Analogies can be found within the ceramic assemblage of eastern Latvian sites of the Piestinya type, and some similarities can be traced with the materials of the Upper Volga (Volosovo culture). Amber ornaments are similar to the materials found at Eastern Baltics sites (*Oshibkina 1978*).

Dating (4850 ± 120 BP ($3819-3371$ cal BC) (Le-994)) was carried out on charcoal from the cultural layer,

other dates originated from layers lying above this (4360 ± 130 BP ($3370-2630$ cal BC) (Le-993), 3960 ± 150 BP ($2886-2125$ cal BC) (Le-992)). The remains of the site were covered by a thick sandy layer, left by a transgression, which could have led to abandonment of the settlement (*Bruysov 1951*).

The Modlona settlement differs greatly from other Neolithic sites in the Eastern Onega region and neighbouring territories. Newcomers who arrived here left a small number of very particular sites that existed for a short period of time (*Oshibkina 1996*). Sites of the late stage include Modlona II, Ol'skiy mys, Lisja Gorka sites, and Kargullino burial ground. The latter is located on dune elevations of the southern shore of the White Sea, where 160 amber ornaments and ochre spots were found (*Oshibkina 1996. 230*).

Settlements of the Modlona type were erected in marshy and riverine landscapes surrounded by large and dry areas with birch-coniferous forests inhabited by bearers of local Kargopolskaya archaeological culture (*Oshibkina 1978*).

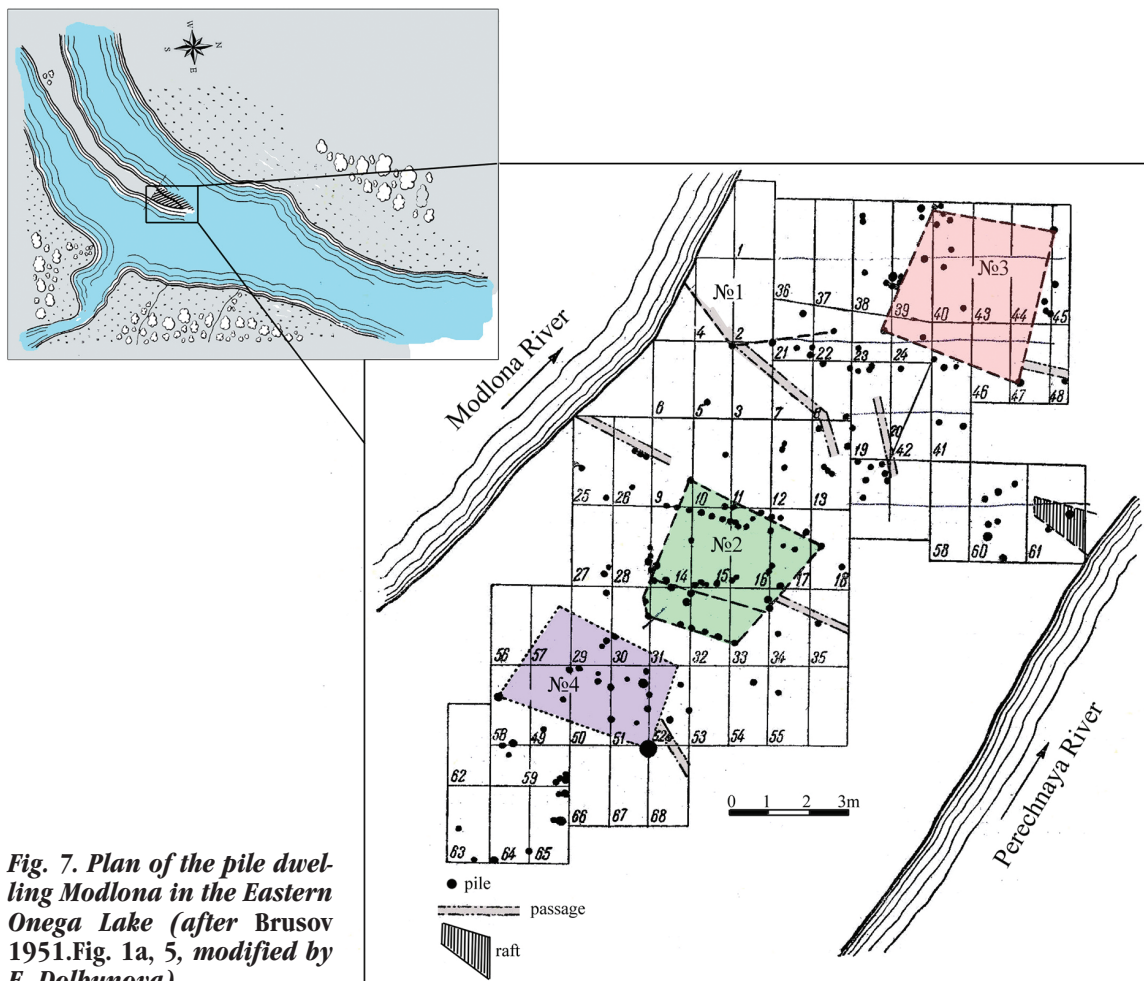


Fig. 7. Plan of the pile dwelling Modlona in the Eastern Onega Lake (after Brusov 1951, Fig. 1a, 5, modified by E. Dolbunova).

Discussion

Northern wetland settlements include sites with different types of constructions located in various limnic landscapes: seacoast, lacustrine and riverine landscapes. There are post-built structures with ground-level floors, constructions with raised floors and dwellings of grate-and-beam construction. Pile dwellings with raised floors appeared and existed within the end of the 4th millennium to the end of the 3rd millennium BC in the Circum-Baltic area manifesting a possible common cultural phenomenon. The Early Metal Period pile dwellings with raised floors in the Circum-Baltic region were found only in Lithuania and Poland. These lake dwellings were established during a transitory period – between the Late Bronze Age and Early Iron Age. According to ¹⁴C dates and dendrochronological research, they cover a time span between 700 to 400 cal BC. All of these sites were located in wetlands where rich organic finds were preserved, which could be crucial for pile-dwellings phenomenon. The choice of particular architectural techniques was caused by technological, cultural and environmental factors (*Martinelli 2014*).

Different types of structures and settlements were formed as the result of intensive cultural contacts or the development of a local household strategy, influenced by both environmental factors and cultural choices. They appeared in some cases independently, and in others similarities between different complexes were traced (similarities between wooden artefacts, pottery and bone assemblage of the Late Narva culture sites in the Eastern Baltics and Usviaty culture in NW Russia (*Miklyayev 1998; Vankina 1970*)).

Research into several Neolithic pile-dwelling sites in NW Russia suggests that the population remained small, which is evidenced by the small number of synchronous dwellings found at one site. The lack of strong demographic pressure on resources, especially food resources, might not force the active development of a productive economy. Aquatic resources could play an important role both in food resources and the organization of the settlement, that was intentionally installed in a 'limnic landscape'. A wide diversity of natural substances was traced in the Middle Neolithic pottery of pile dwellings in Western Europe (*e.g.*, ruminant adipose fats, dairy products, plants substances and beeswax) along with a scarcity of aquatic products (*Drieu et al. 2020*), in contrast to what has been found in the pile-dwelling pottery in NW Russia (preliminary results see in *Kulkova et al. 2015*). The uneven emergence of a

productive economy in the regions under consideration can thus be traced. In recent years, more evidence has appeared that the skills needed for agriculture and a cattle-breeding economy penetrated this area from the 4th millennium BC onwards, but were not completely established in some regions (*Dolukhanov, Mazurkevich 2000; Tarasov et al. 2019; Alenius et al. 2017*).

Among the many wetland settlements that have been explored, only a few have been found with dwellings with raised floors. They have a set of particular features which allow such interpretation: location on periodically flooded wetland areas, definite sets of architectural elements which allowed raised floors to be sustained (fields of piles 5 to 30cm in diameter combined into rectangular platforms often manifesting several phases of inhabitation and reconstructions, 'horned' piles or wooden items used to support horizontal beams of a raised floor construction, traces of ropes used to attach wooden planks to piles), traces of clay or burnt adobe fragments – markers of clay used to cover the walls, a sandy layer used as floor covering under the fireplace, burnt stones, dwelling context testified by different household items, tools, pottery located within or along the platform, and the presence of coprolites beneath and nearby the remains of constructions. Several phases of construction and reconstruction can be traced by dendrochronological and ¹⁴C analysis and 3D recording of the upper part of the piles' depth and levels of the floors. Pits filled with bones, shells, water-chestnuts, chestnuts and acorns can also be traced nearby. Periodic drying out can be testified by a thin layer of shell and sand penetrating around piles. Some or all of these features can be traced on dwelling sites. Fishing structures show a particular difference, as manifested by the absence of a dwelling context, the presence of discarded thin planks – parts of fish traps or fences – a thin archaeological layer, often with clear traces of a shore or deep water area, and different sets of macroremains. The small diameter of the stakes driven in the bedrock used for fishing constructions has often been suggested to be another marker of a fishing structure. However, the smaller diameter of the piles used for the dwellings was also noted in ethnographical cases (*Pétrequin, Pétrequin 1984*).

Conclusion

Pile dwellings are regarded not only as a new form of architecture, but as a reflection of a new way of life, a 'symbol' of this society (*Begleiband et al.*

2016). The reasons of the formation of this type of architecture have been always in dispute. The great role of the surrounding waterscapes in the life of pile-dwelling cultures was suggested to be conceptualized as 'limnic cultural landscapes' (Mainberger et al. 2020). Ancient people had to take into account numerous factors when building settlements inhabited all year round. Leaving places suitable for agriculture and cattle-breeding could be one of the reasons for the construction of Central Alpine pile settlements (Monnier et al. 1991). Climatic changes, followed by regressions and the formation of peat-bogs, might have led to the construction of dwellings in close vicinity to the water, along a shoreline to avoid damage due to a freeze-up. Construction of pile dwellings could also make them independent of seasonal and gradual increases in the water level. Many theoretical approaches to explain the reasons for building in this manner have been raised in the Circum-Baltic area: defensive purposes (Pydyn 2007), 'easy' building (Menotti, Pranckėnaitė 2008), economic reasons (Dolukhanov et al. 2004) and as well as social ones (Pydyn, Gackowski 2011).

Though a variety of wetland sites has been found, only few pile-dwelling settlements with raised floors have a clearly determined architectural structure and features of building techniques. The criteria of pile-dwelling site determination, description of architectural remains, size and development stages are among the most complicated questions to be further elaborated. Further interdisciplinary research is needed for proper identification or reinterpretation of the remains of habitation sites. The major question remains as to whether the same factors could have influenced and triggered the formation of similar types of dwellings within societies that in many

cases practiced different methods of environment exploitation, and how different these constructions were.

The catchment area of pile dwellings was not restricted to wetlands, but encompassed also drylands, as is shown by a number of cases in different regions (Giagkoulis 2020; Mazurkevich et al. 2020b; Naumov 2020). Finding the connection between particular dwellings and dryland settlements will allow contextualizing of pile settlements and involving them into the larger landscape and historical context.

The earliest pile dwellings in the Circum-Baltic area were left by communities of hunter-gatherers who sustained their economy for a long period of time and chose to erect a completely new type of dwelling compared to the synchronous forms of architecture known on other sites nearby. This might have coincided with the formation of a new social structure, as testified by the distribution of weapons and prestigious artefacts. The latter include amber materials, flint daggers and copper items, which were found in Northern Belarus (Charniauskis 2020) and NW Russia (Mazurkevich, Dolbunova 2011). Such coincidence in the distribution of prestigious items and a new form of architecture – pile dwellings – should be stressed. The invention and implementation of this innovation in the Neolithic environment might have had a distinctly symbolic significance, in addition to its practical utility, which is yet to be fully understood.

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