

# THE WOODEN CONSTRUCTION OF THE OKHTA 1 SITE IN ST PETERSBURG

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## Abstract

The Okhta 1 Neolithic-Early Metal site is the first archaeological object in the St Petersburg region with a well-preserved wooden construction. The site was occupied by ancient people several times during the Neolithic Age, in the Early Metal Age periods, from 7,000 to 3,000 years ago. The remains of wooden structures (stakes, treated wooden slats and rails, and piles) were found. Features of the micro-relief of the site, its stratigraphy and archaeological observations have allowed us to locate an earlier coastal fishing zone located on the shore of the gulf, and a second fishing and living area connected to river channels. The archaeological collection includes archaeological finds: pottery, stone tools, products of organic matter and wood, and amber ornaments.

Key words: Neolithic sites, Early Metal Age, wooden construction, pottery, stone tools, coastal fishing zone, living area.

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## Introduction

Primitive studies of the archaeology of the Neva region began in the early 20th century. From 1908 to the 1930s, Stone Age sites were studied on the east shore of the Gulf of Finland (Sestroretsk sites, Lakhta, Tarkhovskaya, Glinyany Ruchei, Sosnovaya Gora, etc) (Gurina 1961; Sorokin 2009).

The Okhta 1 Neolithic-Early Metal Age site was found while workers were carrying out protective archaeological research on the fortresses of Landskrona (13th century) and Nyenskans (17th century) in the coastal area where the River Okhta joins the River Neva in the centre of St Petersburg (Fig. 1).

The cultural remains of the ancient monument were excavated in a square with an area larger than 10,000 square metres (Fig. 2). Excavations in the central and southern parts of the study area in 2008 and 2009 covered a square of about 6,700 square metres. The cultural layers of the Prehistoric settlements are situated under alluvial sandy sediments one to 1.50 metres thick, which lie under the buried soil of the Middle Ages. So far, this is the only monument from the Neolithic-Early Metal Age in St Petersburg (Sorokin et al. 2009; Gusentsova, Sorokin 2011).

The results of earlier investigations enabled a reconstruction of the environmental conditions of the cultural layer sedimentation (Kulkova et al. 2010; Kulkova et al. 2014a). The Neolithic-Early Metal Age cultural layers belong to horizons of aleurite with thin layers of sand, which were formed in the shallow littoral marine basin during the development of the river mouth. Variations in the water level of the basin were registered.

The cultural layers formed under subaerial conditions (beach), and they are separated by sediments deposited during transgressive stages (Sergeev et al. 2014) This is confirmed by the distribution of the archaeological finds. The accumulation of deposits, and connected with them, the remains of material culture, occurred in general *in situ* as a result of the sedimentation processes. It may be noted that there is insignificant rewashing of sediment layers on the square of their distribution, as a result of the rise in the water level.

The stratigraphy of layers and archaeological complexes of different periods is supported by a series of radiocarbon dates (more than 200) from different labs on different types of materials: wood, charcoal, food crust from ceramics, and other organic materials (Kulkova et al. 2010; Gusentsova, Sorokin 2012). The investigations allowed us to establish that at the time of the maximum Littorina transgression in 6459–5666 cal BC, the area around the mouth of the River Okhta was an open, shallow desalinated Littorina Sea gulf, which had a free connection with the sea. During the lowering of the Littorina water level, the partial isolation of Okhta Bay occurred, and its coastal zone became waterlogged. Data show a good correlation with the developmental stages of the Littorina Sea, as has been discussed by several authors (Kulkova et al. 2014a). The first cultural-chronological complex at Okhta 1 belongs to the Neolithic period, which is confirmed by radiocarbon dates ranging from 4261 to 3633 cal BC (Gusentsova, Sorokin 2012). This was a period when the land became dry after the Littorina transgression. A sandy beach formed on the shallow bay. Prehistoric people of the Early and Middle Neolithic with Typical Comb Ware ceramics used this area first as an area for

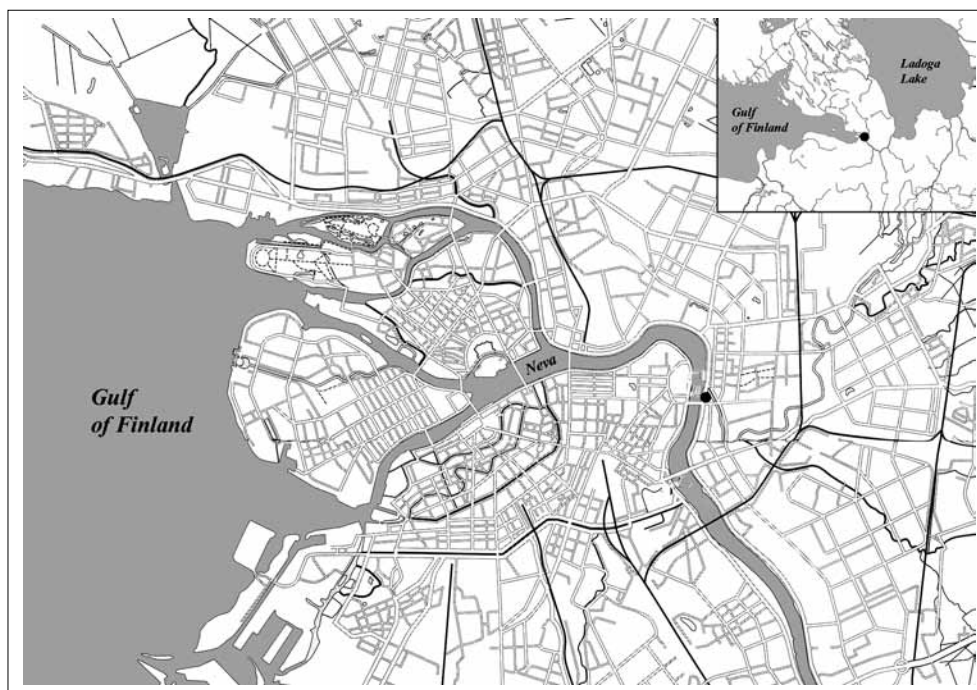


Fig. 1. A map of the investigated area.

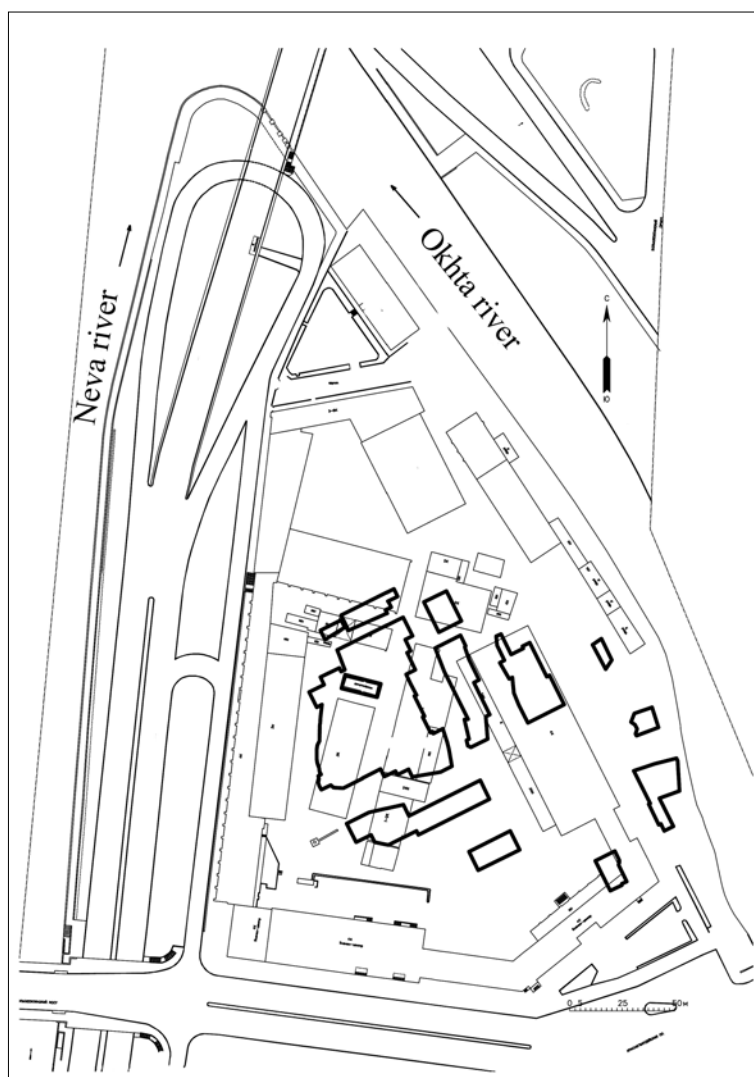


Fig. 2. Scheme of investigated sites in the cape area (2008–2009).

hunting and fishing, because numerous tools for fishing were found associated with these pottery types. During this time, a coniferous forest developed with some broadleaf trees (lime, elm, oak, beech and sycamore). A warm and humid climate prevailed in the area. At the same time, hazel and alder were spreading. Hazelnuts were found in the cultural layer from this period. In the next period, around 3500 cal BC, the sedimentation conditions changed: the water level in the bay lowered, and a system of shallow streams formed. This time is characterised by climatic deterioration. Traces of streams were detected in strips of middle-to-coarse grain sand and hollows in the aleurite layer. In the following centuries (3400 to 3000 cal BC), landscape-climatic conditions continued to change, and human groups occupied the area more intensively. The coast of a shallow basin sometimes turned into a swamp. Birch woods spread. The climate was warm and humid (Kulkova et al. 2014a).

The peculiarities of the micro-relief, as well as the location of archaeological sites and finds, allow us to single out an earlier coastal fishing zone located on the coast of the lagoon; there was also another inhabited fishery zone connected to branches of the river.

Some ground structures were discovered in the upper cultural layer: debris of pottery and stone tools, dwelling sites, and burials. Wooden constructions are located in the lower cultural layer, together with some pottery, stone tools, and objects made of organic materials. The collection of artefacts (over 12,000 units) consists mostly of pottery that belongs to Neolithic culture, Typical Comb Ware, and bubbly and asbestos ware that dates back to the Late Neolithic-Early Metal Age. The collection of tools includes arrowheads made of flint and slate, slate axes and adzes, slate plummets, plummets wrapped in upper birch bark, and amber adornments (Gusentsova, Sorokin 2011). It is essential to note the almost complete absence of finds made of bone, which may be caused by the geochemical properties of the layer. A large area yielded just a few badly preserved bones of fish and animals. There were no fishing tools made of bone, which had previously been found on other sites from the period.

## Materials and methods

The lower cultural layer of grey and beige aleurite with interlayers of light and reddish-brown sand is located at a level of 0.70 to 0.44 metres according to the Baltic Altitude Scale measured with a Kronstadt depth gauge (Fig. 3). An analysis of hypsometry marks showed that the ancient surface was sloping gradually westwards and northwards (Sergeev et al. 2014).

The lower cultural layer contains over 30 concentrations of structures with well-preserved converted wood: stakes and masses of splinters. Most structures were located in hollows of various shapes and sizes. The hollows may have been left over in former branches of the river flowing into the lagoon, or may have formed on the river bed. The hollows and related structures were located in the northwest part of the excavated area, with an orientation from southwest to northeast of the cape. No such structures were found at the centre of the cape; in the east, the structures are associated with the Bolshaya Okhta riverbed (Fig. 4). The contours of the hollows could be clearly seen along strips of light-grey aleurite with organic and carbon-bearing inclusions or wood chips. Narrow hollows (delves) were studied, their length and width being six to 17 metres, and one to 2.50 metres respectively (Fig. 5). The round and elongated pits had an area of four to 65 square metres. Their depth was 0.40 to 1.20 metres. The walls of the pits are sloping or cup-shaped; the bottom is flat and uneven. Apart from the wooden structures, the finds from the pits included some fragments of Neolithic ware made of clay, stone flakes, fishing plummet wrapped in birch bark, containers (baskets) made of bark, and scarce ornaments. According to radiocarbon tests and dendrochronology tests on the wooden structures, these structures date from the mid-fourth to the mid-third millennium BC (Table 1). The stakes in structures located outside the ditches follow a pattern (Fig. 4). In some cases, there were groups of five to seven stakes driven in in circles with diameters of 0.80 to 2.50 metres (Fig. 4). In most cases, there were one or two rows of stakes adjacent to the stakes mentioned above; they were located in a straight line, diagonally or in a zigzag, four to 8.70 metres long. The stakes in these lines were 0.50 to two metres apart.

Pit X (65 square metres) on the southern edge of the inner moat of the Landskrona fortress as studied (Fig. 6, 7). It was elongated, and went from northwest to southeast, with a depth of up to 1.20 metres. The pit is filled with dark grey aleurite, with interlaying organic material and splinters. A layer of reddish brown sand is visible along the northern wall. The finds in the pit included 11 fragments of pottery and four animal bones. A solid mat-shaped mass of splinters and several stakes were studied along the northern border of the pit; the size of the 'mat' is 2.40 by 0.60 to one metre (Fig. 6). The size of the second mass of six thick layers of splinters was 3.60 by one to 1.20 metres. A stake 4.40 metres long and 0.18 metres in diameter was lying on the mass. Between the rows of splinters, there were fir cones, some nut shells and wood chips. Two dates could be established as a result of research into a piece of splinter and a wooden fragment: 4004–3636;



Fig. 3. Stratigraphy of the cultural layer.

3823–3645 cal BC ( $2\sigma$  probability) (Table 1). In the western part of the pit, a processed plank of wood was discovered with square and rectangular holes (length two, width 0.10) (Fig.8.7). Next to it, a chip of a flat squared wooden fragment, six centimetres thick, was found. In the eastern part of the pit, there were several masses of splinters lying at the edge of the pit. In the centre of the pit, some fragments of splinters covered debris of several poles up to 3.80 metres long. Three containers (baskets made of birch bark) were discovered in the space. In the southeast part of the pit, two more baskets were discovered, together with a piece of ‘rope’ that consists of several rows of large rings made of willow. A mass of over ten splinters located vertically, 0.80 to 0.90 metres high, was discovered in the northeast sloping area of the pit. A large squared stake was lying next to them. These finds could have been the remains of a fishing structure.

Inside the pit and along its borders, 20 stakes made of various species of wood were driven into the ground (Fig. 7). The distance between paired stakes was 0.20 metres; the distances between other stakes were one to 1.40 metres. A row of ten stakes was located along the long axis of the pit with a dislocation westwards; three stakes were driven in by the northwest wall. Two of them date from 2934–2856 and 3390–3300 cal BC. A double row of stakes was found in the northwest part of the pit; one of them is dated as 2817–2656 cal BC (Table 1). A row of five stakes ran along the outer northwest edge of the pit. A stake from this group dates back to 3390–3300 cal BC. The data indicate that the constructions found in the pit and dated from 4004–3646 to 2817–2656 cal BC had been in use for a long time (Table 1).

Table 1. Okhta-1 site wood C 14 dates

Lab ID of Herzen State University, Centre of Isotopic Geocology	<sup>14</sup> C Date BP	Calib. date BC (2σ)	Material	Archaeological context
SPb_186	4537±50	3488–3089	wood pile 15/5 No 2	46–60 inner tree-rings
SPb_185	4482±50	3359–3013	wood pile 15/5 No 2	31–45 tree-rings
SPb_184	4417±50	3330–2912	wood pile 15/5 No 2	16–30 tree-rings
SPb_183	4433±50	3334–2919	wood pile 15/5 No 2	0–15 outer tree-rings
SPb_198	4503±50	3361–3026	wood pile 6/1 No 56	46–57 inner tree-rings
SPb_197	4443±50	3335–2925	wood pile 6/1 No 56	31–45 tree-rings
SPb_196	4447±50	3338–2926	wood pile 6/1 No 56	16–30 tree-rings
SPb_195	4454±50	3340–2931	wood pile 6/1 No 56	0–15 outer tree-rings
SPb_202	4543±50	3492–3089	wood pile 6/1 No 112	46–55 inner tree-rings
SPb_201	4531±50	3369–3030	wood pile 6/1 No 112	31–45 tree-rings
SPb_200	4547±50	3494–3089	wood pile 6/1 No 112	16–30 tree-rings
SPb_199	4548±50	3494–3089	wood pile 6/1 No 112	0–15 outer tree-rings
SPb_191	4232±50	2920–2634	wood pile 7/2/3/3 No 28	0–15 inner tree-rings
SPb_190	4433±50	3334–2919	wood pile 7/2/3/3 No 28	16–30 outer tree-rings
SPb_208	4300±50	3087–2759	wood pile 15/5 No 1	51–60 inner tree-rings
SPb_207	4290±50	3083–2703	wood pile 15/5 No 1	41–51 tree-rings
SPb_206	4278±50	3025–2696	wood pile 15/5 No 1	31–40 tree-rings
SPb_205	4257±50	3011–2676	wood pile 15/5 No 1	21–30 tree-rings
SPb_204	4241±50	2928–2633	wood pile 15/5 No 1	11–20 tree-rings
SPb_203	4210±50	2908–2630	wood pile 15/5 No 1	0–10 outer tree-rings
SPb_115	4306±70	3264–2672	wood	excavation section 15/1, square TH'14.75m, fireplace
SPb_117	4308±100	3333–2625	wood	excavation section 15/1, square C'14.89m
SPb_116	4270±100	3321–2574	wood	excavation section 15/1, square TH'14.75m, fireplace
SPb_159	4250±100	3104–2565	wood	excavation section 15/1, square I'15, 124–139m
SPb_194	4178±50	2893–2619	wood pile 15/2 No 6	31–45 inner tree-rings
SPb_193	4196±50	2900–2629	wood pile 15/2 No 6	16–30 tree-rings
SPb_192	4178±50	2893–2619	wood pile 15/2 No 6	0–15 outer tree-rings
SPb_436	5113±100	4077–3612	wood splinter	section 6–1, 103–106m, hole XX
SPb_435	5160±100	4234–3758	wood splinter	section 5, square G'24.114–110m
SPb_433	5200±100	4261–3781	wood splinter	section 5, square M'24.116m
SPb_431	5300±100	4346–3947	wood splinter	section 7–2, 80–125m, hole XVII
SPb_437	4450±100	3258–3091	wood splinter	section 16–3, square U'21'–22'
SPb_432	4564±70	3385–3084	wood splinter	section, 7–2, hole X
SPb_434	5990±100	5209–4683	wood splinter	section 7–2, 111m, hole XI
Spb_75	5100±100	4071–3656	bark	section 16–1, 105m
SPb_76	5050±60	3963–3708	wood splinter	section 16, 80m
SPb_73	5000±60	3946–3660	wood splinter	section 16, 70m
SPb_98	4970±65	3823–3646	wood splinter	section 7–2, hole X
SPb_99	5050±100	4004–3646	wood	section 7–2, hole X

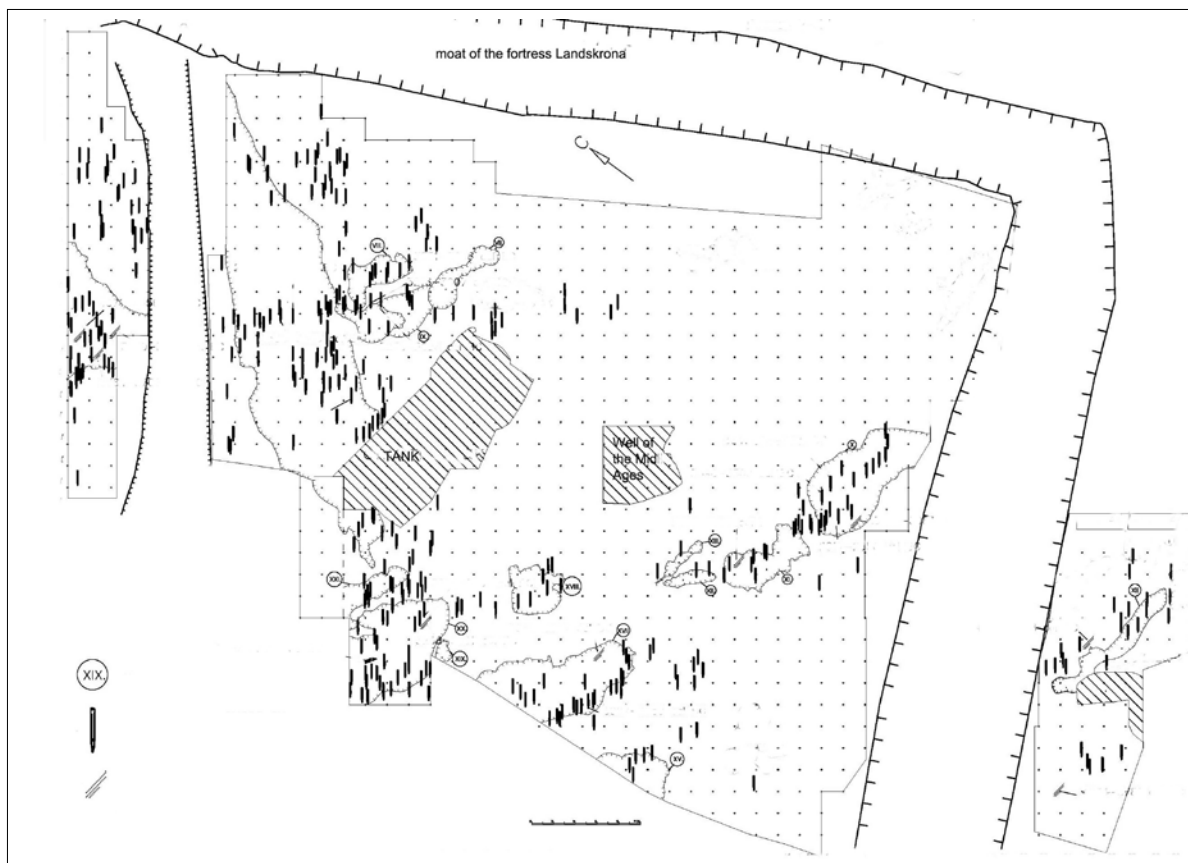


Fig. 4. Wood pile constructions.



Fig. 5. A pit with a driven-in pile.



Fig. 6. A pit with the remains of wood constructions and driven-in stakes.



Fig. 7. Vertical stakes in a hole.

Another pit (XI) is located by the northwest edge of the pit described above; it is actually a continuation of the pit. The size of this pit is 8.20 by 2.60 metres. The walls are cup-shaped; the bottom is flat. The maximum depth is 0.65 metres. The pit was filled with an organic layer intermingled with tree leaves, fir cones and nut shells. At the bottom, there was a layer of coarse-grain sand with a power of 0.02 to 0.08 metres, with lenses of clay and stones; there were also some planks of wood and fragments of pottery. An amber pendant was also discovered (a button and interwoven hazel branches 0.20 metres in diameter). The pit also contained fragments of poles, primarily made of birch, and splinters of various lengths. Most of the poles were laid parallel to each other and across the patella. Their length is 1.60 to 3.60 metres. Large pieces of bark, birch bark and fragments of splinters were found between the poles. Six stakes forming a rectangle were driven in at the bottom of the pit. One of the stakes is dated 3390–3300 cal BC (Table 1).

#### The technique for processing and dating the stakes

About 400 stakes driven into the ground were studied. The ends of the stakes are dug 0.50 to 1.20 metres into the lower-lying aleurite layers. The height of the stakes is 0.50 to 2.50 metres; the diameter is seven to 16 centimetres. Fallen stakes were four to five metres long. The stakes were made of coniferous and broadleaf trees:

pine (50%), fir (18%), alder (17%), aspen (7%), birch (5%), willow (2%), and juniper (1%). Rowan was used in one case.

Trace evidence analysis showed that the stakes had been treated with stone tools. The tools used for making the stakes had straight, convex or channelled blades 1.80 to four centimetres long (Fig. 9). The various approaches to treatment depended not only on the stakes' end use, but also on the quality and condition of the timber. Several differences were found in the preparation of the timber and the final treatment of the stakes. The stakes were made of both dressed and undressed tree trunks. The upper part of the tree trunk was sharpened more often than the lower one. Several variants of the stakes' final treatment were discovered, from the most primitive to thorough refined treatment. The following treatment methods were used: splitting with the detachment of long large splinters, trimming and hewing. Hewing was, as a rule, done in facets; the number of facets was from five to 15, predominantly 11 (Fig. 8.4, 5, 6). Trimming was more often used on small pegs. Hewing could start and finish at different levels of the stake's surface, at a height of 0.30; 0.40 to 0.50 metres; 0.70 to one metre; 1.10 to 1.50 metres. The sharp ends are hewn circle-wise or partly. Notches on the stake's perimeter ('pyramids') were often made at a level of 0.03 to 0.07 metres. The timber structure is often damaged (broomed) at the ends of the stakes, which is caused by driving in. Alder stakes were a special group, where, instead of smooth facets, there



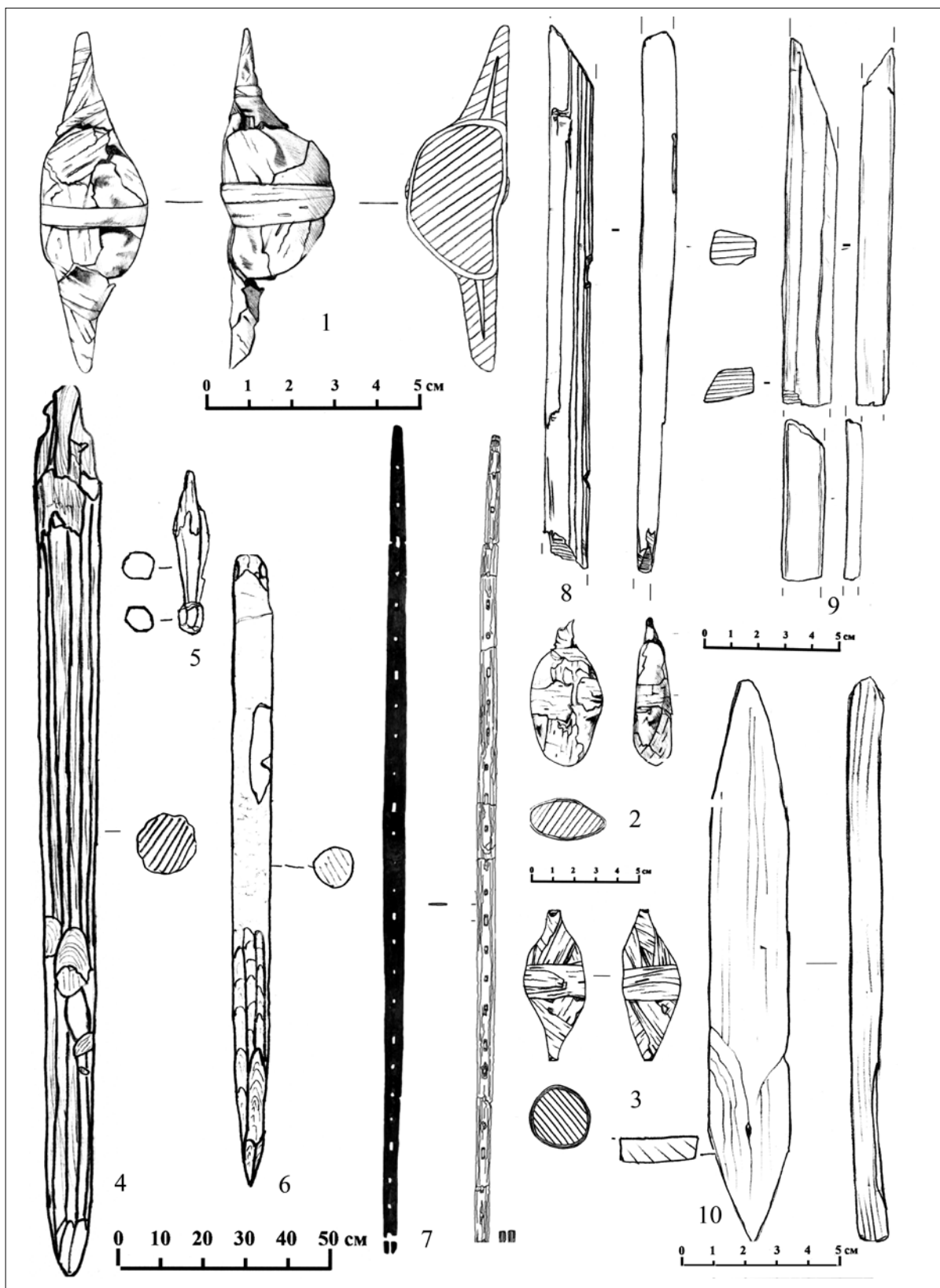


Fig. 8. 1-3 plummet from birch bark; 4-6 wooden stakes; 7 a strip of wood with punched holes; 8-10 fragments of splinters.



Fig. 9. Flat axes made from slate.

were imprints left by the removal of three or four large splinters and the stake's undercut; only the sharp ends were hewn.

Radiocarbon dating of the wooden stake specimens from the constructions helped to determine the calendar age of the trees used for the stakes. Overall, 40 dates were determined for ten tree saw cuts (Marianna Kulkova, Herzen State Pedagogical University). Dendrochronological data for 39 saw cuts allowed us to define the biological age of certain trees used for construction, which ranges from 70 to 20 years. Trees aged 30 to 40 were mostly used for the construction. The structure of the excavated timber at the saw cuts is well preserved. The structure of the annual rings is not distorted by a flattened trunk or other damage to their original appearance.

Dendrochronological studies were performed on the timber, which was still rather wet and free from any deformations. The 'wiggly matching' method helped us to reduce the interval of calendar age, and get a more precise date for the tree cutting and stake hewing. As a result of the juxtaposition of dendrochronological data for 39 samples and calendar dates, scientists were able, using the 'wiggly matching' method, to plot three 'floating dendrochronology scales' for various wooden structures from certain areas of the excavation pit that range from 3660-3590 cal BC to 2817-2656 cal BC (Gusentsova et al. 2013, Fig. 2).

#### The technique of splinter constructions and their dating

About 20 fragments of constructions made from splinters were discovered. Some of them were left at the bottom or along the edges of the pits; others were de-

stroyed or relocated. Two predominant types of constructions were preserved.

Some constructions look like a fossilised bundle of splinters (from ten to 20 units) 3.50 to four metres long (Fig. 3). Their width ranges from two to 3.50 centimetres; their thickness is 0.50 to one centimetre. Some horizontal stakes were lying under the splinters and next to them. Other constructions, which constitute the majority, are fence-shaped or mat-shaped. Some of them are rather narrow: their width is 0.40 to 0.80 metres, and their length is 1.40 to 2.40 metres.

Others were located horizontally, and had an almost rectangular shape; their sizes are 1.05 by 2.30, 1.40 by 1.60, 1.80 by 1.80, two by two, and 2.20 by two metres (Fig. 10). The number of splinters in such arrays is from 27 to 40 units. The splinters were lying in one to five rows. The distance between the splinters in a construction between 1.50 and 2.50 centimetres. They were bound together either with 'ropes' or black willow twigs (Fig. 10.3). One array, 1.60 by 1.20 metres in size, contained over 80 splinters lying in eight layers. They have traces of bindings with bark straps. Fragments of these bindings can sometimes be found in the upper and lower parts. The preserved length of the splinters varies from 1.50 to 2.80 metres. Their width varies from 1.20 to 4.50 centimetres. Their thickness is from 0.20 to 1.8 centimetres. Unfortunately, most units are found in a form of debris, so their minimal width cannot always be considered as complete. The splinter ends are often broken; they are sometimes straight or diagonally cut (Figs. 8.8, 9, 10). Some splinters have sharp ends made intentionally. According to their ruggedness, the splinters can be divided into three groups: thinner, flattened and flexible splinters, splinters of medium thickness, and thick splinters whose section

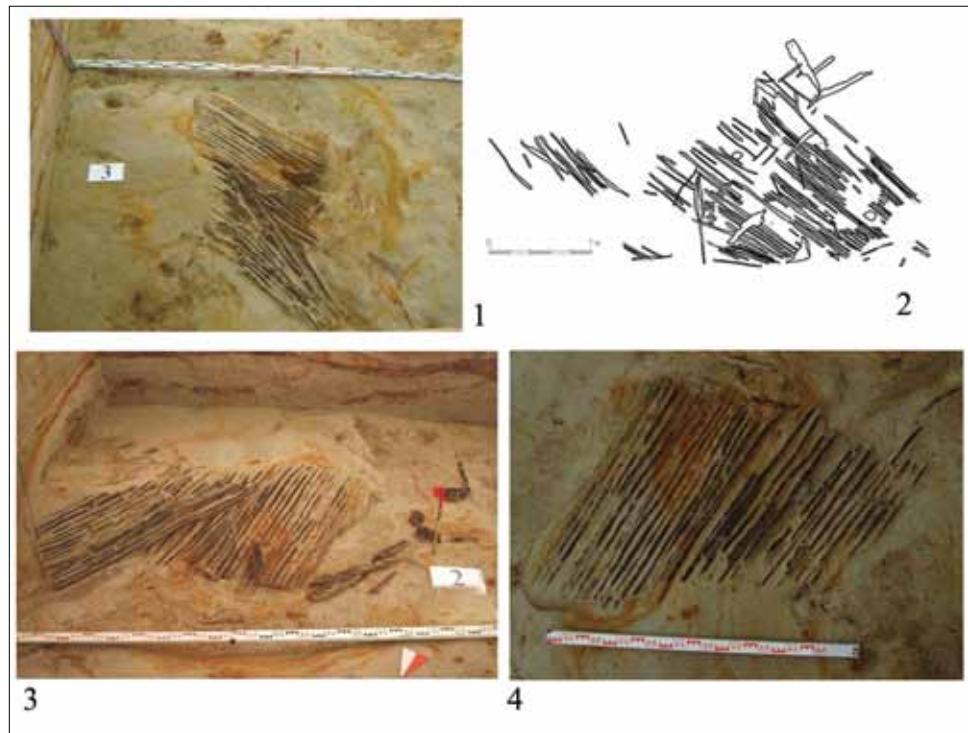


Fig. 10. Fragments of wooden fences.

is almost square (definition by Tamara Sharovskaya, Institute of Material Culture, Russian Academy of Sciences). The section of the items is usually convex, but it is close to straight. However, there are also triangular sections, trapeze-shaped sections, and rhombus-shaped sections; this happened because a whole round-shaped tree was splintered, and the width of the outer surface was not always equal to that of the inner surface. Besides, the section's shape could vary in different areas. One end of a trunk (where it began) was, as a rule, thicker and wider than other areas. The end where the trunk ended was often thinned. In order to make splinters, pine trunks of maximum thickness were used; only their outer layers were employed. The trunk was splintered both radially, with intervals corresponding to the splinter width, and along the year rings, when a layer of necessary thickness was detached. This was done with the help of small wedges made of stone and wood. The purpose was to produce workpieces of maximum length. In order to facilitate the process, the timber could be prepared in a special way: temperature and humidity could be altered in order to facilitate its splintering.

Radiocarbon dating of the splinter constructions provides evidence of a more ancient age than the date of most of the stakes. The remains of older structures are located at the western and southwest ends of the cape. Ten radiocarbon dates were received: from 5209–4683 to 3823–3646 cal BC (Table 1). They are synchronised

with the dates obtained after the analysis of burnt food deposit from comb ware: 4230–3900 cal BC (Kulkova et al. 2012). Only two plank constructions have dates, 3385–3084; 3258–3091 cal BC, and can be correlated with the dates of stakes and ware with organic and asbestos admixture from the Early Metal Age: 3340–2800 cal BC (Kulkova 2014b, Table 2).

Fishing was conducted in this area not only with the help of fences and traps; other fishing devices, including nets, were used. Over 50 plummets made of small stones wrapped in birch bark straps in several layers were found in the cultural layer and in the pits. The ends of the birch bark were rolled and lengthened, which was probably necessary to attach them to a net. The plummets are six to eight centimetres long; their thickness and width at the section is about 2.50 centimetres (Fig. 8.1, 2, 3). Fourteen such plummets were found on one spot, near one of the fences in an organic area; they were probably attached to a net that has not survived. The way of producing plummets by wrapping them in birch bark or bast is similar to the plummets found at the Särnate site (Vankina 1970, Table XVI–XVIII). A series of such plummets were found on the Podolye 1 turf moor site in the south Ladoga area (Gusentsova et al. 2014). Over 60 plummets made of slate look like flat or three-dimensional polished bars that narrow down from their centre to the edges, with shallow grooves for attaching the straps (Fig. 11). Their length varies from five to 14 centimetres. The

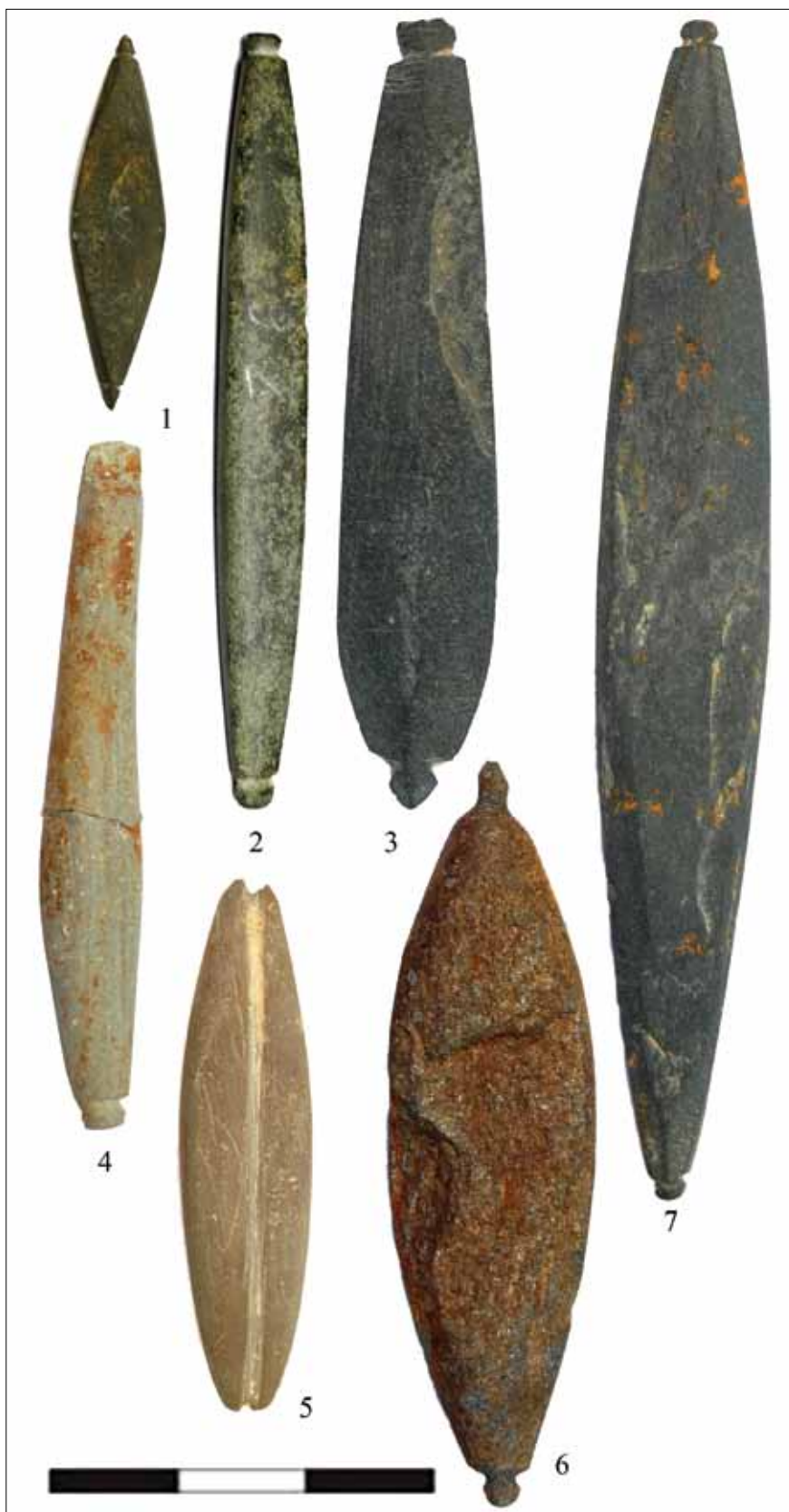


Fig. 11. Plummet made from shale.

items vary in weight: some of them weigh from 1.70 to 5.70 grams. Most plummets weigh seven to 15.60 grams, others reach 17 to 23 and 28 to 28.70 grams. Plummets were part of complex fishing devices. Large and heavy plummets could be used for fishing in deep waters or in winter. Similar plummets were found in southern Karelia and Finland, in the Neolithic sites at Kaukola, Viipuri and Kirkijoki (Naskali 2004, Table 2, Figs. 6, 10, 12).

The various areas of human activity discovered as a result of complex archaeological and scientific studies (trade zone and residential zone) are evidence that wooden constructions were used for household or economic purposes. One such zone was discovered near a minor ancient river bed 12 to 14 metres wide that crossed the cape's central part in a latitudinal direction (Fig. 4). Most of the stakes driven into the ground were discovered near the duct. It was blocked by a row of large stakes. Some tree trunks were lying on the bottom; one of them was a fir tree, and another was a leaf-bearing tree. A lot of cones were preserved near the fir tree. A container made of birch bark, pottery fragments, and plummets wrapped in birch bark strips were found at the bottom of the duct. The remains of an inhabited zone were found at the northwest edge of the duct: stakes driven into the ground, the remains of a hearth with burnt scattered stones and burned pieces of timber, burnt fish bones and animal bones, pieces of pottery with the remains of burnt food ornamented with comb-shaped and hole-shaped patterns, some abrasive materials, and stone tools. A geochemical study of the layer revealed abnormal values (compared to background figures) of P<sub>2</sub>O<sub>5</sub>, CaO/(CaO + Na<sub>2</sub>O), Fe<sub>2</sub>O<sub>3</sub>, Mn, connected to ancient anthropogenic activity in this area (Nesterov, Kulkova 2009). At the southeast border, in a higher part of the duct, stakes were driven into the ground in groups of two and three; some pieces of poles and bark were lying nearby. Pieces of broken vessels were found a small distance away. The dates received for specimens of burnt firewood from the hearth, stakes, and burnt food deposits allow us to date the remains of the objects in the duct area to 3116–2574 cal BC (Table 1).

### Reconstructions

No whole construction of a fishing fence with stakes and splinters fastened to each other was found in the researched area in 2008 and 2009. However, some sections were discovered in the lower northern and eastern ends of the cape when excavations were continued in 2010 by the Institute of Material Culture of the Russian Academy of Sciences. The fencing structures were built as sections up to 4.50 metres high, and up to two

metres wide. They consisted of splinters two to four centimetres wide, and intermingled stakes (poles) up to five or six centimetres wide, bound together with bast-fibre 'ropes'. The bases of the stakes stood out beyond the edge by up to 15 centimetres (Bazarova et al. 2010).

Fishing structures consisting of stakes and splinters were widespread in many sites of the Eurasian forest area from the Mesolithic period onwards. Such structures, used for fishing, are also well known in ethnography. The structures fenced areas of rivers, lakes or lagoons. The first data concerning Neolithic fishing traps in Russia were obtained by Ivan Polyakov in the River Oka near the Plekbahovskaya site in 1878; the research results were published by Vasilii Fedorov (Fedorov 1937). The structures were discovered at a depth of 4.50 metres in miry lake sediments, covered with alluvial sediments. According to the data obtained by Polyakov, 'a fishing trap consisted of a row of flat sticks about one metre long; they all had the same length, both ends were sharp. The sticks were made of pine, and were produced of timber, just like splinters. The sticks were arranged in a semi-circle with a diameter of about one metre; the sticks stood next to each other forming a dense fence; they were connected to each other by transversal beams, so that when they were standing in water, they resembled baskets.' Fedorov described Finnish fishing traps. They were made of sticks driven into the bottom, and the pattern was shaped like an ace of hearts. The entrance to the trap was open; it was located in the middle part of the construction. On either side of the entrance, there were two fences that prevented fish from swimming past the trap (Fedorov 1937, 62, 65, Figs. 9.10). In the north of Russia, the remains of two portable fishing fences were found near the town of Veliky Ustyug on Marmounginsky moor I, on the River Yug. The fences were made of triple narrow boards and strengthening lines 0.50 to 2.50 centimetres wide and 220 centimetres long (Burov 1969, 133f., Fig. 50). Constructions similar to those found at Okhta 1 with stakes driven into the ground and masses of splinters were discovered in the Karavayikha 4 Early Neolithic site in the basin of Lake Vozhe (in the Vologda region) (Kosorukova 2008). Multiple fishing structures with stakes driven into the river bed and masses of splinters were studied at the Zamostye 2 site on the River Doubna in the Moscow region (Mesolithic to Early Neolithic) (Lozovskaya et al. 2012).

The constructions at Okhta 1 are similar to structures made of stakes and fences studied in Finland in the River Iijoki, the Purkajasuo site dated 3692–2876 cal BC (Koivisto 2011, 52–53; Koivisto 2012); to Neolithic constructions at the Kretuonas 1 and Žemaitišké



Fig. 12. Wares made from bark.

sites 1-3 in Švenčionys district in Lithuania, in the east Baltic region (Pranckėnaitė 2011); and to those found at a turf moor site in Sārņate (Latvia) (Vankina 1970; Bērziņš 2006, 2008). Scientists believe that the debris or clusters of wooden planks or splinters, rolled and tied up with ropes, must have been parts of portable fishing fences and traps. The reconstruction is based on Latvian ethnographic material. Local fishermen used similar ways of making and setting traps in the mid-20th century. The devices consisted of a fence strengthened by stakes that had round traps at the ends. Portable traps were assembled on the shore, then rolled up and delivered to the fishing site by boat (Bērziņš 2006, 49-58, Figs. 3-11). The remains of fishing fences were found together with a boat on the bottom of Lake Arend in Germany. They are dated as  $4078 \pm 50$  BP (Leineweber, Lübke 2006, 135).

Some finds discovered among wooden constructions (ten baskets made of black willow cortex, one of them a combination of willow and pine) must also have been connected with fishing. The baskets were roughly rectangular, had a length of 15 to 50 centimetres and a width of 20 to 22.50 centimetres; their side boards were five to ten centimetres high; one rounded basket

had a diameter of 30 to 40 centimetres (Fig. 12). Most of these baskets (five) were found in the pit described above (X). In one of the pits, a basket was pierced with a stake; it could have happened while the fishing structure was being renovated, or a new one was being designed. Similar baskets were found at the Sārņate site (Vankina 1970). Similar ethnographic examples include an image of a Finnish fishing construction; a rectangular basket was also found next to the structure on the coast (Fedorov 1937).

### Conclusions

The research has shown that the Okhta 1 site was actively engaged in fishing on the sea shore for several millennia. The fishing site was equipped with fishing devices, pile-supported platforms and buildings. A fishing system with fences was widespread across the whole world. Fishing devices were adapted to different hydrographic conditions and various types of fish. Fishing fences were placed in zones of high tides, not on open shores where storms could destroy them, but in closed bays. The existence of such lagoons in the Littorina Sea in the mouth of the Neva and in the area of the Sestroretsky overflow, which were protected from

waves, has been confirmed by scientific research (Ryabchuk 2014, Fig. 11). The most convenient sites for stake nets were the mouths of spawning rivers, which were easier to divide with fences. Neolithic and Early Metal Age sites are concentrated on the banks of these rivers. Fishing with fences could be performed with the help of forks and nets, and also with special basket traps that were placed in the river mouths; this is confirmed by ethnographic data (Zelenin 1991, 100-108).

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## MEDINĖS KONSTRUKCIJOS OCHTA 1 VIETOVĖJE, SANKT PETERBURGE

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### Santrauka

Ochta 1 yra pirmoji archeologinė vietovė Sankt Peterburge su puikiai išlikusiomis medinėmis konstrukcijomis, datuojamomis neolito – ankstyvojo metalo amžiais (1 pav.). Vietovė buvo apgyvendinta kelis kartus tarp neolito ir ankstyvojo metalo amžių, prieš 7000–3000 metų. Rasta išlikusių medinių struktūrų detalių: kuolų, polių, apdirbtų skersinių lentų ir turėklų (2–8 pav.). Mikroreljefas, stratigrafija ir archeologiniai stebėjimai leido lokalizuoti pakrantės žvejybos zoną įlankos krante, taip pat žvejybos ir gyvenvietės zonas, susijungiančias su upės kanalais. Rasta keramikos, akmeninių įrankių, organikos ir medienos likučių, taip pat gintaro dirbinių (9–12 pav.).