

# Landscape, seasonality and natural resources use in the 3<sup>rd</sup> millennium BC by pile-dwelling communities (NW Russia)

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## Introduction

Particularities of the landscape surrounding the Middle and Late Neolithic sites in the Dnepr-Dvina region were first studied in the 1980s by A.M. Miklyayev and P.M. Dolukhanov. It was suggested that the choice of the place for Stone Age settlements was determined by a proximity to three types of landscapes: moraine plateaus overgrown by mixed deciduous forests, fluvio-glacial plains overgrown by mixed forests with a dominance of pine, as well as lakes, swamps and weakly-developed river valleys (Dolukhanov and Mazurkevich 2000; Dolukhanov and Miklyayev 1986, 1983). It was conditioned by several factors (Dolukhanov and Miklyayev 1986, 1983), including the choice of the territories where animals dwelt during different periods of time in the vicinity of the whole-year-inhabited site. Although the hunter-fisher-gathering economy remained the basis of the ancient economy in this region for a long period from the 7<sup>th</sup> to the 3<sup>rd</sup> millennium BC (Early-Late Neolithic), different hunter-gathering economical models can be reconstructed for this region. A comparison of landscape particularities where Early-Late Neolithic sites were erected allows describing differences in settlement systems and landscape use based on different economic strategies. Seasonal base camps as well as temporal sites can be traced for the 7–5<sup>th</sup> millennium BC (Early Neolithic/Subneolithic, Mazurkevich and Dolbunova 2011, 2015) in the Sertevsky microregion within the Dnepr-Dvina region. Such a system of sites location might be a marker of a high seasonal and 'local' mobility, reflecting an economic model typical for small societies and the climatic/ecological conditions of the Atlantic period.

Another settlement system can be traced in the Middle Neolithic, whereby settlements became inhabited all year round and the population increased, which led to another model of economic activity (Mazurkevich and Dolbunova 2011). Changes in ideology reflected in architecture (pile-dwelling appearance) and art objects can be traced in the Middle Neolithic, along with contacts with agricultural and cattle-breeding societies (Mazurkevich 2013). Pile dwellings in general are regarded as not only a new form of architecture, but a reflection of a new way of life involving changes in ideology (Pfahlbauten 2016). However, the society inhabiting the Dnepr-Dvina region remained a highly efficient community of hunter-fisher-gatherers who rarely practised a productive economy.

Several groups of resources can be distinguished: food resources comprising gathering products, fishing and hunting, and households, aiming to supply different activities (buildings, pottery making, fishing constructions, etc.), where the season might serve as an important factor determining both the accessibility and availability of resources. It is difficult to estimate the input of each of the components in ancient economy. The latter can be regarded from the perspective of resources' accessibility and

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Figure 1: Location of the Serteya II site (NW Russia).

the expenses spent on their procurance, depending on the local milieu and ecological niche in each archaeological microregion. A reconstruction of the economic model of pile-dwelling site inhabitants is suggested in this article, based on household activities and the spatial distribution of available resources used by local inhabitants living in the Serteytsky microregion in the middle of the 3<sup>rd</sup> millennium BC. Archaeological materials, faunal, and ichthyologic collections, palynological data, macroremains analysis, analysis of wood species, and lacustrine sediments served as the main source for the reconstruction of ancient economic activity. They were gained during an investigation of pile dwelling dated to the early/mid-3<sup>rd</sup> millennium BC Serteya II (Figure 1), as well as the study of Serteytsky peat bog (Figure 2, Figure 3) (Mazurkevich et al. 2012).

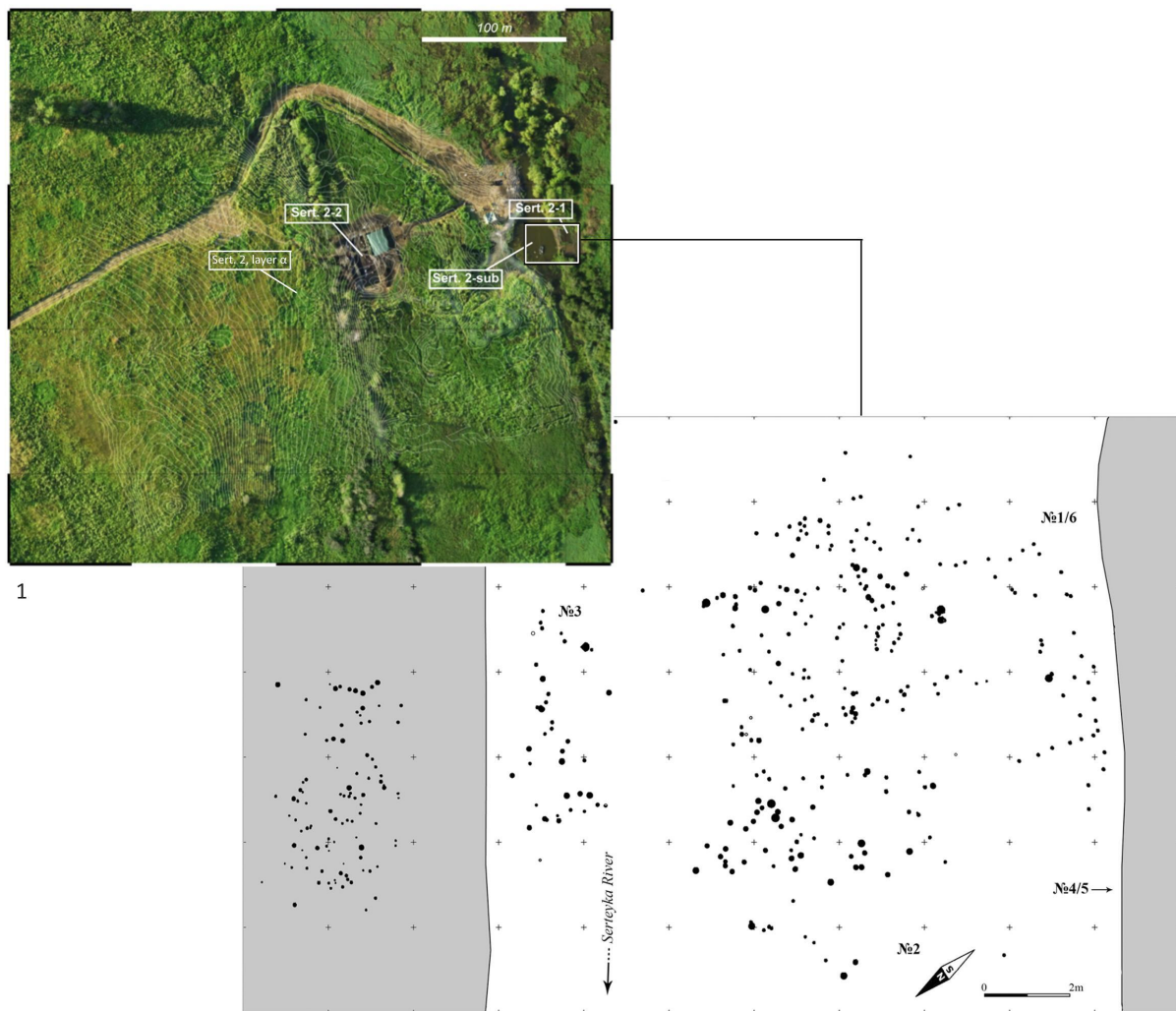


Figure 2: Piles' distribution and location of central pile-dwelling part (Sert. 2-1, sub), area with butchering zone and ground constructions (Sert. 2-2) and site on a mineral cape (Sert.2, layer α).

## Landscape description

Serteysky basin is a part of a subglacial channel previously occupied by lake basins and replaced in the Holocene by a river system. Until the modern period, declining lake basins were connected by sections of streams. The Serteyka River subsequently drained all water bodies as an effect of headward erosion (Kalicki et al. 2015; Kittel et al. 2016). Nowadays, the Serteyka River flows in the Serteysky basin, elongated from the north to the south. Numerous biogenic plains within the present-day Serteyka River valley are remnants of former palaeolakes. The lakes that previously existed to the north in the Atlantic period became completely overgrown in the Subatlantic period, and the pile-dwelling site Serteya II was erected. Based on palynological and stratigraphical data from the Rudnya Serteyskaya site (Dolukhanov et al. 1989) located to the north from the Serteya II site, waterlogged areas with a forest and small rivers towards

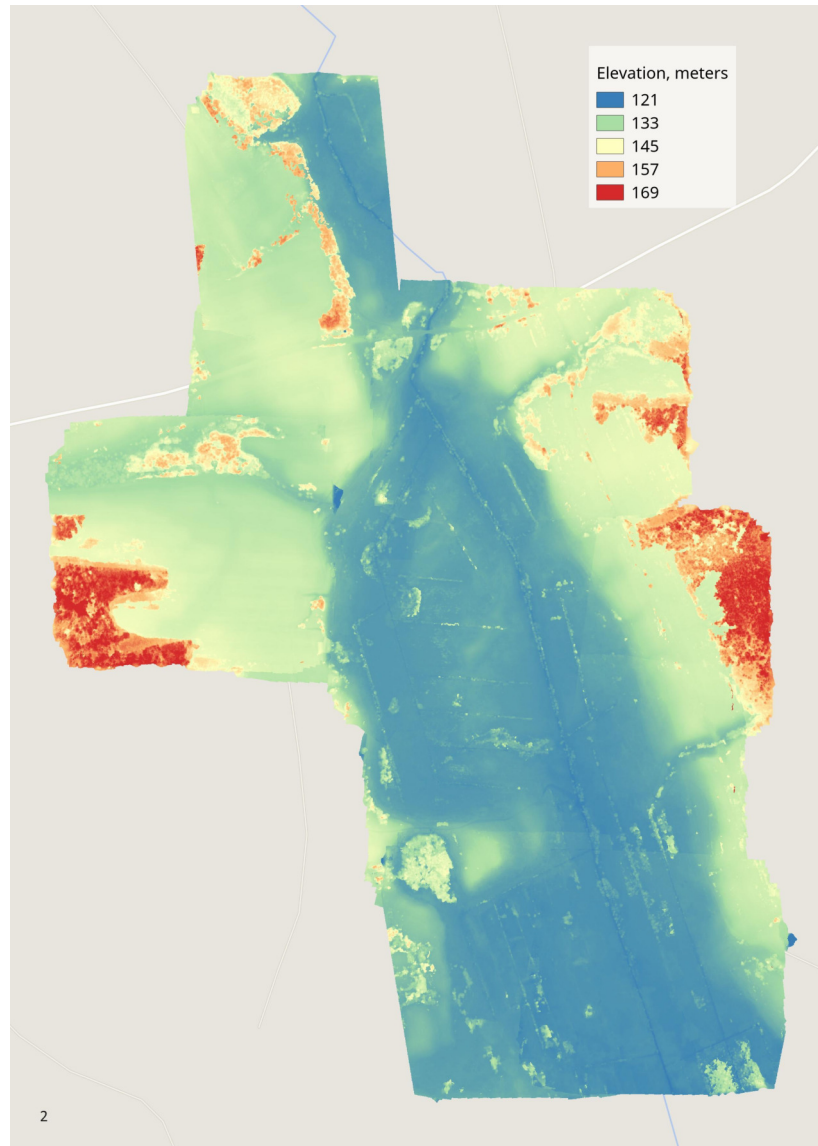


Figure 3: Digital elevation model of the Serteya II site and its surroundings.

the Western Dvina River were distributed in the Rudnya Serseyskaya palaeolake basin.

The Serteya II site is located inside the hollow basin, whose slopes are at a  $27^\circ$  angle (Figure 4). This place is located in a morainic zone, where the following forest can be reconstructed (basing on palynological data from core 62, located at the Serteya II site): coniferous trees dominating along with deciduous species and alder, whereby fir trees were replaced by alder, birch, oak and elm at the end of the Subboreal period. Fir trees almost had completely disappeared by  $3200 \pm 60$  BP (LU-4878), i.e. 1621–1306 BC, and forest renewal started only 200 years afterwards (Arslanov et al. 2009; Mazurkevich et al. 2012). Initially, the site was located in the zone of mixed coniferous-deciduous forest. Nearby on a slightly inclined surface of the fluvio-glacial hill of the crevasses filling from the western side, there was an open woodless space, which corresponds with meadow and meadow-chnozemic soils (Aleksandrovsy 2014). Shrubs (predominantly alder) grew on the lake shores, and alternation of the wa-

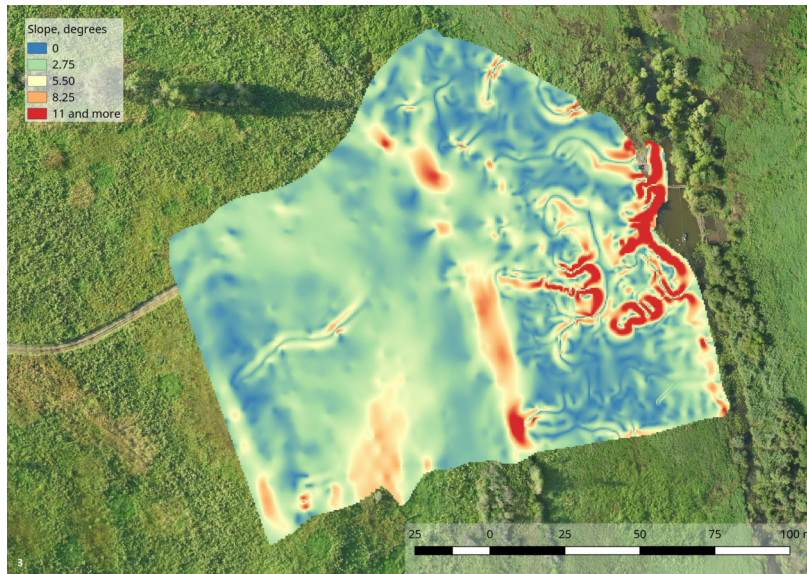


Figure 4: Corresponds to Figure 2, Slopes angle.

ter level can be traced during the Subboreal period (end of the 4<sup>th</sup>–3<sup>rd</sup> millennium BC), which led to periodic flooding of shore vegetation (Arslanov et al. 2009; Mazurkevich et al. 2012). Changes in vegetation can be traced approximately 1–1.5 km to the north of the site. Fluvioglacial sediments with coniferous-birch forests can be recorded here. Oak forest can be reconstructed in proximity, based on palynological data from the core at the Rudnya Serteyetskaya site (Dolukhanov et al. 1989, Figure 1).

### Settlement structure

The Serteya II site has a rather vast chronology for a pile-dwelling settlement, even taking into account a wide period provided by radiocarbon dates, which can evidence both rather long inhabitation of this site and multiple visits to this place (Mazurkevich et al. 2017). The most ancient dwelling is dated to about 2900–2570 BC. After this, the site could have been uninhabited for some time, whereby the next construction period could be dated to 2570–2330 BC. The settlement was most actively populated during 2470–2270 BC. We might suppose that during this period a small society lived here and successively constructed pile dwellings and/or reconstructed them at the same place. The Serteya II site (period of the dwellings 1/6–3 existence) might have been the only inhabited site in the middle of the 3<sup>rd</sup> millennium BC in the Serteytsky archaeological microregion. The remains found at the site are attributed to Zhizhitsa culture, which was formed at the turn of the 4<sup>th</sup>–3<sup>rd</sup> millennium BC based on different cultural components (Mazurkevich et al. 2017). Material culture includes various traits typical of preceding Usviatskaya culture, Funnel Beaker culture, Globular Amphora culture, probably Corded Ware culture and the late stage of the Dnepr-Donets culture (Mazurkevich 2013). Amber artefacts provide evidence of connections with the Baltics area. Reconstruction of the economic system represented in this article was created for the time slice of the middle of the 3<sup>rd</sup> millennium BC.

Several inhabitation areas located near the eastern part of the mineral cape attributed to the Middle–Late Neolithic were traced at Serteya II (Fig-

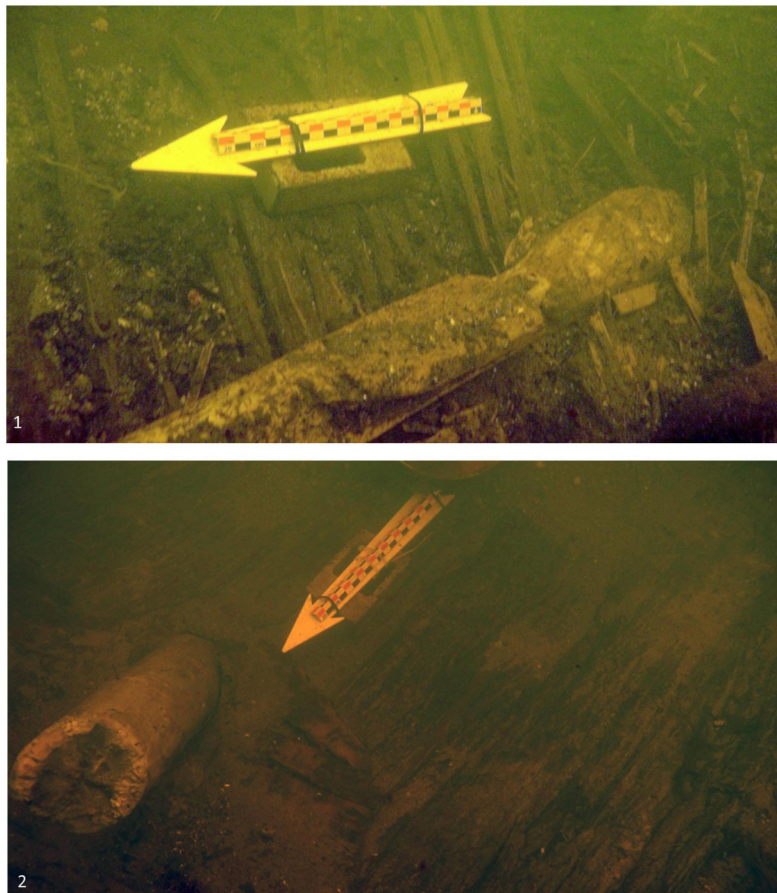


Figure 5: Serteya II. Part of a wall (?) made of wooden treated splinters (1); wooden pile and remains of a bark floor of the dwelling #1 (2).

ure 2). More than 200 m<sup>2</sup> was investigated at the site. Dwelling constructions with raised floors were found 70 m from the top end of the cape. Several building horizons were distinguished in the central part within dwelling №1 (Figure 5). The cultural layer is located both under water and in peat bog. It was situated on the shore of the lake or mire and partly in the swampy area of the lake margin. Neolithic artefacts were found both below and within coarse-detritus gyttja. Based on the results of core analysis and excavations, this part of the site spreads from the modern left shore of the Serteyka River in the eastern direction, and it disappears in the western direction. Inhabited areas were distinguished at 40 m to the west from dwelling №1, near the base of the mineral cape. Another accumulation of materials was also traced on a mineral cape, where pottery similar to that found in the pile-dwelling site can be traced, named Serteya II, layer α (Figure 2).

## Food resources

*Animal hunting* is always suggested to be the main source for food and different household activities. Analysis of faunal remains from the Serteya II site shows that elk was the main hunting species. Spatial analysis of elk bones' distribution on the site and in different constructive horizons demonstrates that butchering was conducted on the site, between the

Table 1: Animal species on the site Serteya II.

Species	Serteya II		
	species	bones	%
Beaver - <i>Castor fiber</i>	25	301	22.62
Squirrel - <i>Sciurus vulgaris</i>	4	5	0.38
Hare - <i>Lepus timidus</i>	1	1	0.07
Fox - <i>Vulpes vulpes</i>	1	6	0.45
Polecat - <i>Mustela putorius</i>	1	1	0.08
Marten - <i>Martes martes</i>	18	131	9.84
Badger - <i>Meles meles</i>	3	19	1.43
Otter - <i>Lutra lutra</i>	7	17	1.27
Lynx - <i>Lynx lynx</i>	3	3	0.23
Bear - <i>Ursus arctos</i>	6	19	1.43
Wild boar - <i>Sus scrofa</i>	8	124	9.32
Elk - <i>Alces alces</i>	31	699	52.51
Total amount	108	1326	99.63
Dog - <i>Canis familiaris</i>	2	5	0.37

dwelling or in a particular zone 40 m remote to the west. Three to five elk species were found in each constructive horizon of dwelling №1, including adults, sub-adults and young ones 3–5 months old. The latter prompts suggesting that late summer–early autumn was a hunting season. Thus, during summer hunting was conducted on marshy areas and deciduous mixed forests, located in a morainic area in proximity of the site, within a radius of 1 km. Winter elk hunting was conducted in another landscape, namely mixed coniferous forests where elk migrated. Such a landscape zone was recorded 1 km to the north, north-east, north-west and further to the Western Dvina River and Mezha River. Such a landscape can be also traced on a left shore of the Western Dvina River (urochishche Petrovsky mokh) and it continues on right shore of the Mezha River.

Wild boar is the second most important species (8 species, 2–4 for each constructive horizon/construction) (Table 1, 2). Whole or parts of carcasses of only adult species can be found on the site. Wild boar hunting was conducted throughout the whole year in mixed deciduous forests with small marshy areas and open spaces, located near the site.

The same number of bear bones was recorded (6 species, 1–2 for each constructive horizon/construction) (Table 1, 2). Remains of adult animals were found here. We might suppose that the whole carcass was not brought to the site, but rather its butchering was undertaken outside. Bear hunting was most possibly conducted during winter, whereby the places of bears' lairs might be located in deciduous forests.

The amount of fur game is rather high and prevails over 'meaty' species. However, the total number of fur animals found at the site is rather small and could not supply the needs of inhabitants of this long-term settlement neither in terms of meat or the necessary number of skins (Table 1, 2). Marten and beaver are the most widespread. Almost the whole carcasses of fur animals found on the site testify that butchering was undertaken there. These animals could have been hunted during autumn–winter, in case the main aim was fur procurement. Beaver could also be hunted for meat. Beavers jaws were used for tools utilised for wood treatment (Maigrot 2014). These animals were hunted in coastal landscapes,

Table 2: Serteya II. Animal species in Dwellings 1 and 3.

Bones	Dwelling 1											Dwelling 3										
	Beaver	Squirrel	Fox	Marten	Badger	Otter	Lynx	Bear	Wild boar	Elk	Beaver	Squirrel	Marten	Badger	Otter	Lynx	Bear	Wild boar	Elk			
Cranium	7	-	-	4	2	-	1	-	4	15	7	-	5	1	1	-	-	-	1	1		
Maxilla	2	-	-	-	-	-	-	-	1	8	-	-	-	-	-	-	-	-	-	2		
Mandibula	1	1	-	10	2	1	-	-	3	7	4	-	8	-	-	-	-	-	1	11		
Teeth	30	-	-	-	-	-	-	4	7	22	6	-	1	-	-	-	3	5	4	4		
Antler	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-		
Os costae	-	-	-	-	-	-	-	-	-	20	4	-	-	-	-	-	-	-	-	1		
Vertebrae	17	-	-	2	15	-	-	-	-	36	3	-	4	-	-	-	-	-	-	16		
Sacrum	1	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-		
Scapula	5	-	-	3	1	-	-	-	-	2	2	-	4	-	-	-	1	-	8	8		
Humerus	13	-	-	7	2	-	-	-	2	11	4	-	6	-	1	-	-	1	5	5		
Ulna	6	1	-	1	-	-	-	-	-	3	4	-	-	-	-	-	-	-	1	1		
Radius	8	1	2	-	-	-	-	-	1	9	1	-	4	-	-	-	-	-	-	9		
Ilium	4	-	-	2	-	-	-	-	-	5	4	-	3	-	-	-	-	-	-	-		
Femur	17	-	-	3	-	-	-	-	1	4	6	1	4	-	-	-	-	-	3	3		
Patella	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	1		
Tibia	19	-	-	3	-	1	-	-	2	6	8	-	7	-	1	-	-	1	3	3		
Fibula	2	-	-	2	1	-	-	-	1	-	1	-	-	-	-	-	-	-	1	-		
Carpalia/tarsalia	2	-	-	-	-	-	-	-	2	42	-	-	-	-	-	-	-	-	18	18		
Astregalus	1	-	1	1	-	-	-	1	4	5	1	-	-	-	-	-	-	1	2	2		
Calcaneus	2	-	-	-	-	-	-	-	1	8	1	-	-	-	-	-	-	-	3	3		
MC/MT	8	-	-	3	-	-	-	-	4	28	4	-	1	-	1	-	-	7	13	13		
Phalanges	6	-	3	-	-	-	-	1	6	62	2	-	-	-	-	-	-	2	46	46		
MNI	15	2	1	5	1	1	1	2	4	14	4	1	4	1	1	1	1	1	2	7		



Table 3: Serteya II. Birds species.

Species	bones	%
<i>Gavia stellata</i>	1	0.9
<i>Anser anser</i>	4	3.8
<i>Anas platyrhynchos</i>	58	54.2
<i>Anas strepera</i>	2	1.9
<i>Anas penelope</i>	4	3.8
<i>Anas crecca</i>	6	5.6
<i>Anas clypeata</i>	3	2.8
Anas sp.	1	0.9
<i>Mergus albellus</i>	4	3.7
<i>Oxyura leucocephala</i>	2	1.9
<i>Bucephala clangula</i>	1	0.9
Mergus sp.	1	0.9
Anatidae indet.	11	10.3
<i>Milvus migrans</i>	1	0.9
<i>Tetrao urogallus</i>	5	4.8
Galliformes indet.	1	0.9
<i>Fulica atra</i>	1	0.9
<i>Gallinula chloropus</i>	1	0.9
<b>Total amount</b>	<b>107</b>	<b>100</b>

including rivers, streams, which did not freeze over, with wood-shrubby vegetation and grassland vegetation on the shores and in the lake. Such zones were located within the periphery of the whole Serteyky lacustrine paleosystem. Badger indwelled on sandy and sandy loam soils in field woodlands, gulleys, the terraces of the lakes and above the slopes of the subglacial channel. Such landscapes are located approximately 1 km to the north and further on from the site. Marten, squirrel and lynx indwelled in coniferous forests, which were located near the site and further on far to the south, east and west. Weasel also indwelled there, on the margins and fells.

*Birds hunting.* Mostly waterfowls and partly migrant species (loon, heron, goose, river ducks, white-tailed eagle, bald-coot, etc.) were found at the site (Table 3–4) (Sablin 2014; Sablin et al. 2011). They were hunted during spring–autumn on the lakes and their shores, i.e. within a radius of 1–2 km to the south and 1 km to the north of the site. Blackcock and partridge were hunted during late autumn–early spring in small groves, field woodlands, sparse forest with berrying ground, in large river valleys, on the edges of raised bog and transition bog, as well as bottomland meadows with birch predominance. Such natural zones might be reconstructed for the northern part of the valley, probably to the east and west, at a distance of 1 km and further on in northern-eastern direction up to the Western Dvina River and Mezha River, as well as in north-western direction up to the Western Dvina River and Selezni village. Such landscapes are also located on a right shore of the Western Dvina River, at the place called urochishche Petrovsky moss.

*Fishing.* Analysis of ichthyologic collection was conducted by E. Lyashkevich. Fish bones were found predominantly in sand, located under the fireplace, as well as in garbage piles and pits, located within the perimeter around the dwellings. The main species include pike, perch, tench, cru-

Table 4: Fish species on the site Serteya II.

Species	bones	%
Acipenseridae indet.	2	0.01
<i>Anguilla anguilla</i>	8	0.05
<i>Esox lucius</i>	4867	38.5
<i>Rutilus rutilus</i>	124	1
<i>Leuciscus idus</i>	28	0.2
<i>Scardinius erythrophthalmus</i>	43	0.3
<i>Aspius aspius</i>	4	0.02
<i>Tinca tinca</i>	80	0.6
<i>Abramis brama</i>	21	0.2
<i>Carassius carassius</i>	76	0.6
Cyprinidae indet.	2809	22.2
<i>Silurus glanis</i>	18	0.2
<i>Perca fluviatilis</i>	4462	35.3
<i>Sander lucioperca</i>	11	0.1
<i>Gymnocephalus cernuus</i>	31	0.2
Percidae indet.	74	0.6
<b>Total amount</b>	<b>12658</b>	<b>100</b>

cian carp, roach, pike perch, bream, orfe, red-eye, eel, and catfish. Fishing was conducted within two lacustrine basins. Some fish species might have been caught during night with a pole or with nets, fish traps, and other implements. Such finds were made in a cultural layer of the site. Moreover, specialised places for fishing were uncovered, one of which was called Serteya I site, located 800 m to the north in a narrow part of the lake basin and small river (Mazurkevich et al. 2017). It was made on the shore of a small river that connected two lakes: the southern Great Serteya palaeolake basin (2.7 x 1.4 km) and northern Rudnya Serveyskaya palaeolake basin (1.1 x 0.3 km). A fence made from pine chips and a fishing net with a mesh 3.5 x 3.5 cm were found here. The main fish species were caught in nearby lakes located within the Large Serteya basin. Specifics of habitats of some fish species and particularities of the lakes during this period in the Serteya lake basin (low flow basins, streams, and rivers with silty shores) (Kul'kova and Savel'eva 2003) prompt the suggestion that catfish could not have dwelled in such water basins, and they possibly dwelled in the Western Dvina River. It is located more than 5 km away from the site, which would mean elaborating of specialised fishing activity.

*Gathering products* are not very numerous and they include water and forest products. Numerous shellfishes were found in garbage pits (Figure 6). They might have been gathered in the surrounded lake basins during the spring–autumn period. They could have also been used as a temper material for pottery making. A great number of *trapa natans* can be found in a cultural layer, garbage piles, and pits. It could have been gathered during August–September in the lake basins on silty ground or in lakes with a ditch or low flow water. Finds of *trapa natans* without any other evidence of a cultural layer might simply indicate zones of its growing. Water-lily grows in lakes with a ditch or low flow water, at a depth of approximately 2 m. Young roots of water-lily are edible and can be used for flour. It might have also been used as antiphlogistic. A great amount of hazelnut (parts of shells and whole ones) was found in garbage pits

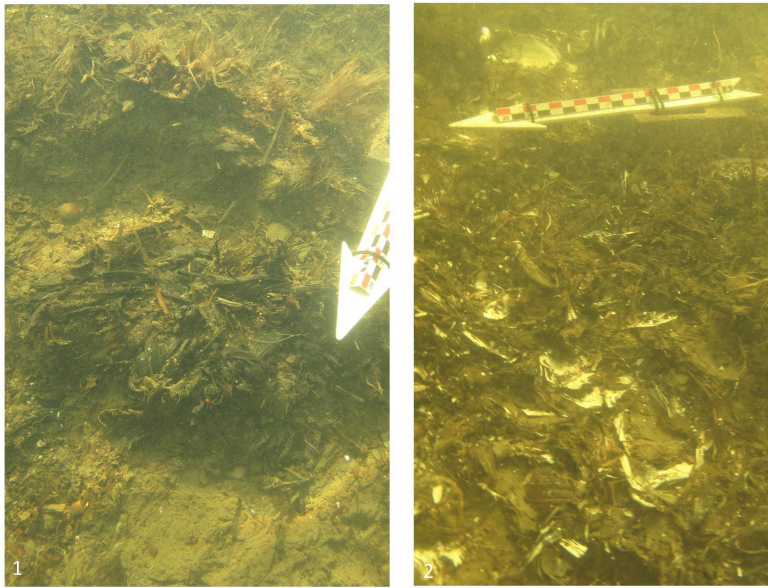


Figure 6: Serteya II. Accumulation of lime bast (1) and shell pile (2) within the dwelling #1. Underwater photo.

or the cultural layer with other food remains. Hazelnut and *trapa natans* were sometimes burnt, which might be evidence of heat treatment. Hazel might have grown on the margins of mixed, coniferous, and broad-leaved forests and gulleys. It was distributed between 500 m and several kilometres to the south, east, and west. Hazelnut could have been gathered during early autumn. Moreover, acorns can be found in garbage piles. Oak forests might have grown in the vicinity of the site (within a 1 km radius) and gathered during early autumn. Guilder grows on the margins, meadows, felling sites, and in fir-broad-leaved forests. Fruits were primarily used and they are found in cultural layers, while seeds and bark might have also been used in physiotherapy. It was gathered during second half of September and the beginning of October.

Some vegetation oils were used for cooking along with fish/meat based on lipids analysis of pottery (Kulkova et al. 2015).

### Resources for household activities

**Wood.** Ash and other broad-leaved species were used for the construction of dwellings, and later on dwellings were made from fir (Hookk 2007). The diameter of piles was 6–8 cm, 9–11 cm, and 12–28 cm, corresponding to the wood age of 10–14, 20–45, and 70–94 years. Fir piles grew in a secondary forest with stable ecological conditions, on a waterlogged area, and in a forest under constant anthropogenic influence. Pines were taken from the forest, which was not under anthropogenic influence, and broad-leaved species grew in the forest with stable ecological conditions without anthropogenic influence or at the forest margins (Hookk 2007). Broad-leaved species (maple, oak, and ash), elm, alder, horn-beech, and beech were used as the main fuel material based on anthrochological analysis, with a very small amount of fir, pine and birch (Aleksandrovsky 2014).

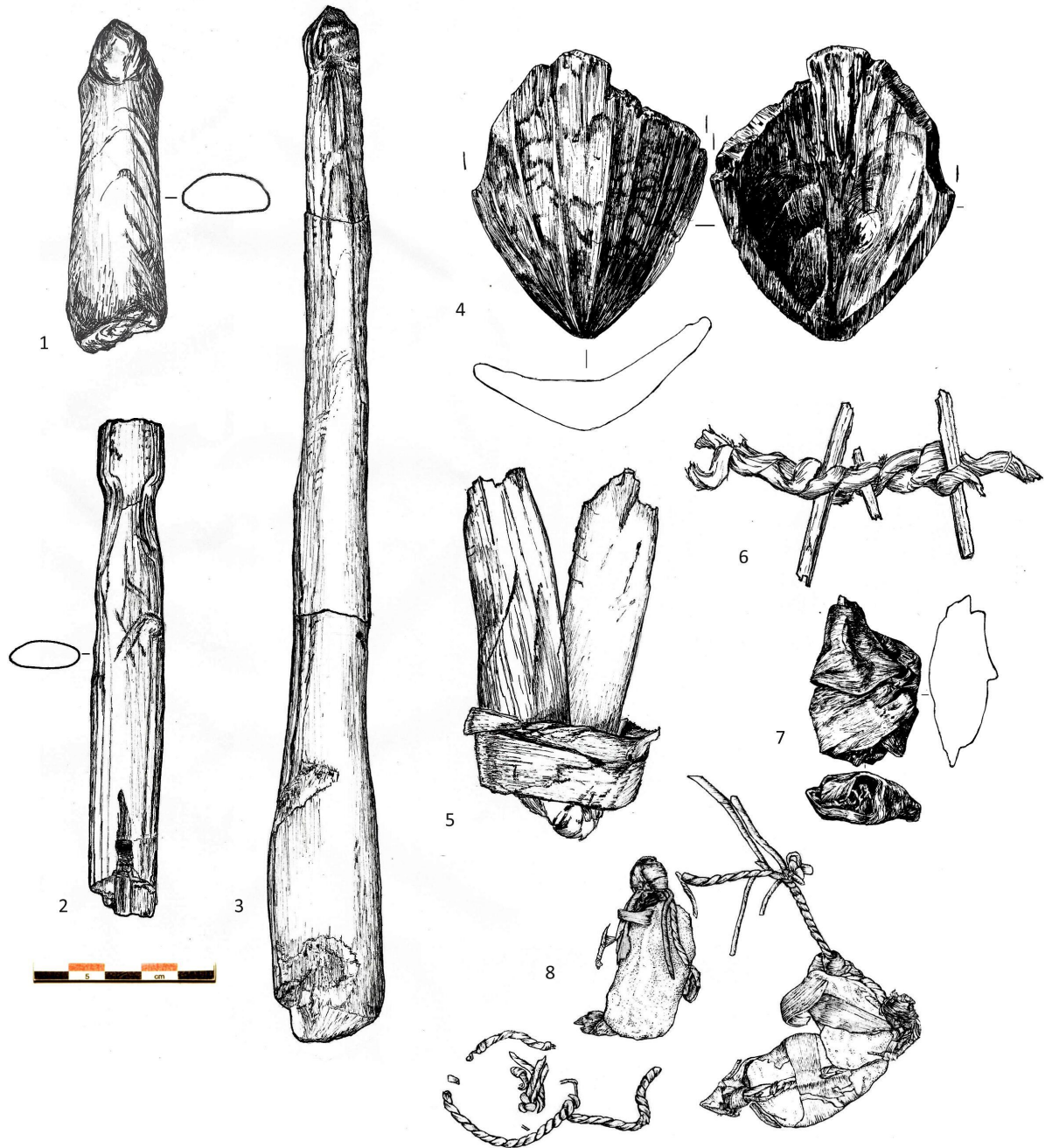


Figure 7: Serteya II. Parts of wooden bows (1-3); wooden vessel (4); lime bast knot (5); 6 - wooden splinters connected by ropes; 7 - fish sinkers. Serteya I: 8 - fish sinker.



Figure 8: Serteya I: fishing construction (1). Serteya II: part of a cloth (2). Underwater photo.

Broad-leaved species (ash, elm, oak, rare-pine, hazel, guildler, alder, juniper, lime, lime bast, birch bark, blueberry roots and sedge) were used for various tools and implements (Kolosova and Mazurkevich 1998) (Figure 7, Figure 8). Roots (black and brown colour), guildler berries (red) and their bark (blackish green) might have been used as colourants.

All of these wood species grew near the site, on the lake shores, slopes, and shores of lake basins. Changes in the ratio of broad-leaved and coniferous species for dwelling constructions and the disappearance of fir trees in the palynological spectrum by the end of the settlement's existence might testify active and strong anthropogenic influence. The only species remote from the site including pine, juniper and blueberry were spread 1 km to the north from the site or they grew on small felling sites near the settlement.

*Pottery* was made from hydromicaceous, smectite, and smectite-montmorillonite clays, according to petrographic analysis (Mazurkevich et al. 2014). Sediments in the vicinity of the site from the coastal part of the lake might have been used.

*Flint and stone raw materials.* A small number of nodules and nucleuses found at the site might provide evidence that the first stage of material treatment could have been conducted away from the site. Four types of raw materials were detected: two types of flints, mica slate, gaize, and erratics. Flint might have been brought from several outcrops in the Western Dvina River. These places are 10, 16, and 21 km away and more remote from the site. Part of the raw materials might have derived from tills of moraine plateaus located nearby. It is still unclear how flint raw materials were procured in the forests that covered these areas during the 3<sup>rd</sup> millennium BC, given that there were no stone pits or quarries found in this region. Stones might have been collected in gullies that cut morainic hills and in other open places.

*A range of artefacts made from animal bones, teeth and antler* were found on the site (Figure 9). Antlers, bones and teeth come exclusively from wild animals: elk (40 %), boar (8 %), beaver (6 %) and bird (1 %). Ulna, metacarpus, metatarsus, rudimentary metapodium, hyoid bone, teeth, and antler from elk were used, as well as beaver's lower jaw, boar's tusk and bird's humerus. Elk species supplied the main part of the raw materials devoted to bone tool production. Bone tools were used in many field activities, encompassing hunting, fishing, cooking, wood working, skin working, lithic production, etc. (Figure 10) (Maigrot 2014).

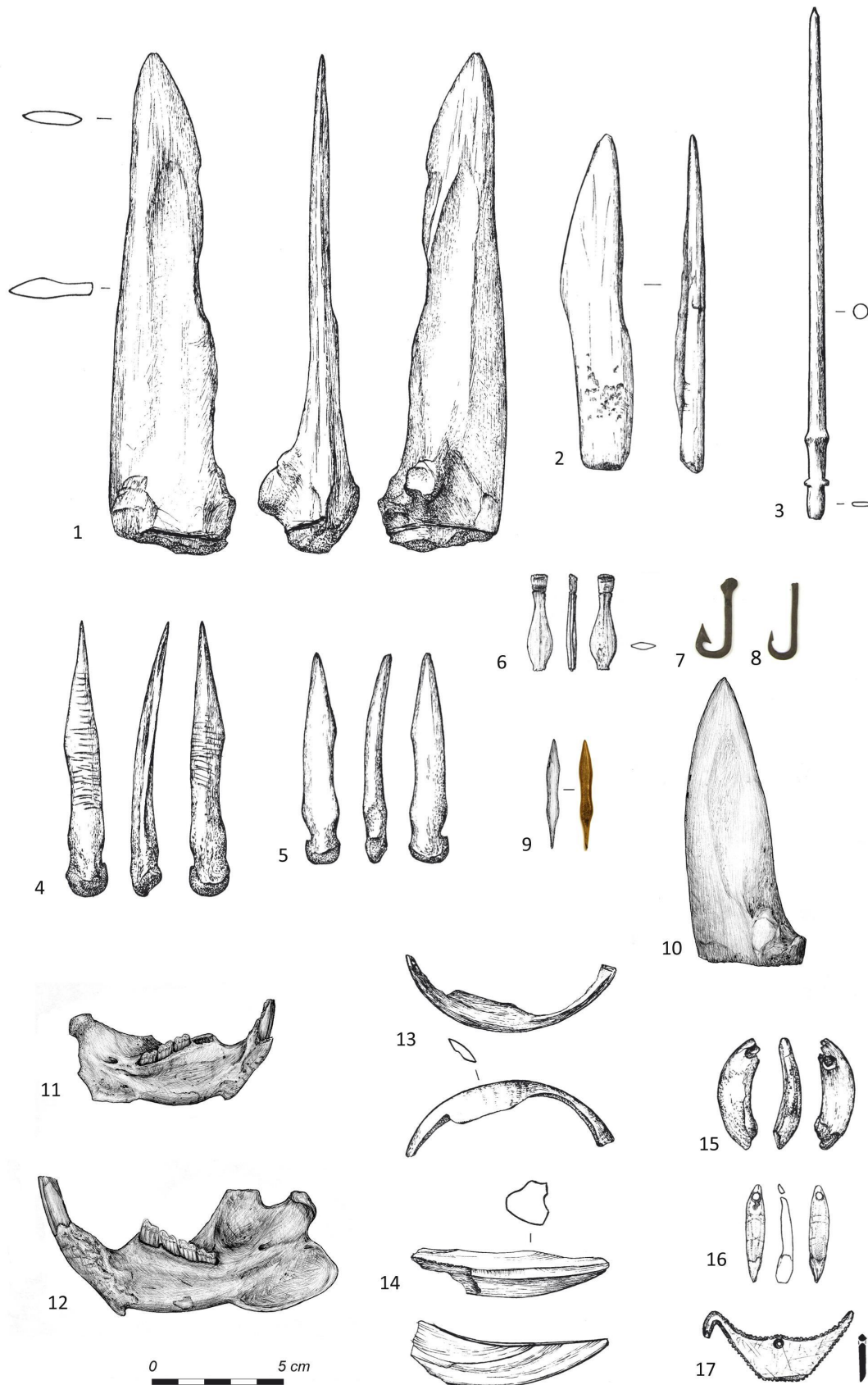


Figure 9: Bone tools from Serteya II: 1, 10 - knife on elk ulna; 2 - knife on elk metapodium; 3 - bone needle; 4-5 - points on elk's rudimentary metapodium; 6-8 - bone fishhook; 9 - arrowhead; 11-12 - scraper on beaver's jaw; 13-14 - scrapers on boar's tusk; 15-16 - pendants on elk's teeth; 17 - bone zoomorphic pendant.

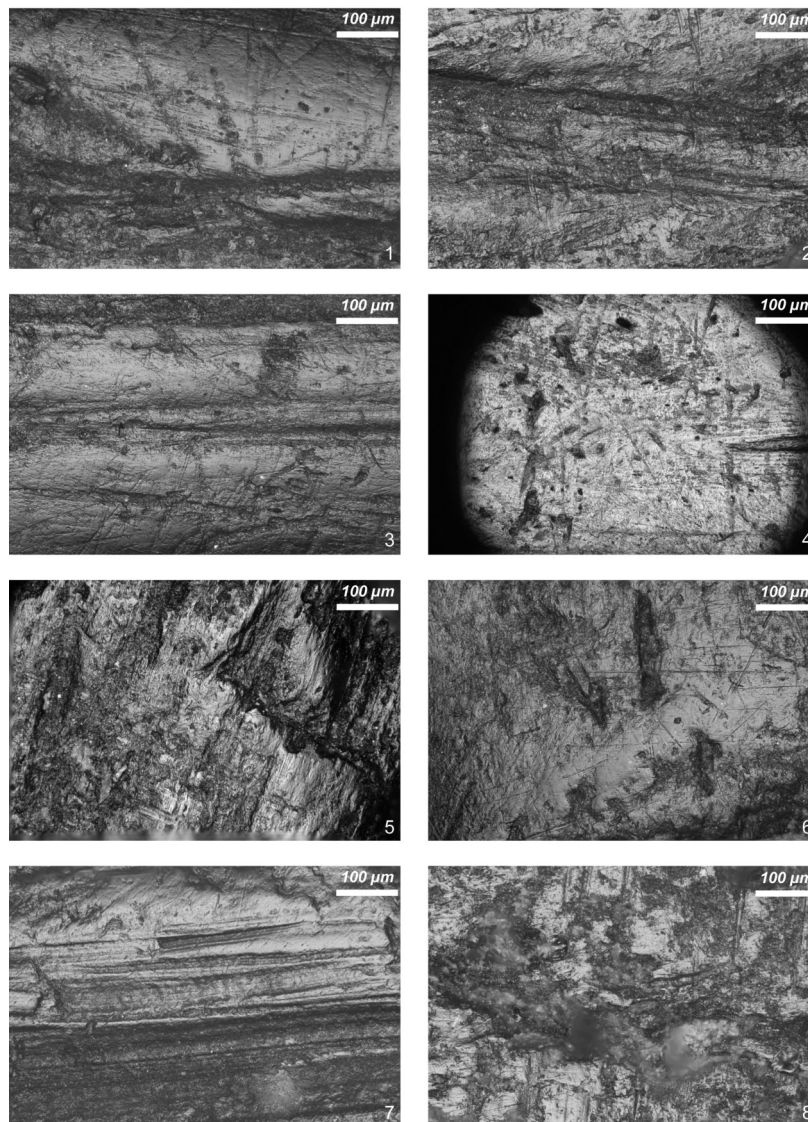


Figure 10: Wear traces on bone tools: 1 – perforating skin; 2 – basketry; 3 – hunting/shooting; 4 – fishing; 5 – retouching flint; 6 – timing/cutting wood; 7 – scraping wood; 8 – scaling fish. All photos were taken at 200x original magnification.

## Conclusions

Resources that maintained the life of the pile-dwelling settlement throughout the whole year had to be used according to some strategy, which might have included various factors, including the accessibility of resources, some of them ceasing, their maintenance and renewal over time, the choice of the place for permanent and temporal settlements/sites according to some factors, etc. The seasonality and time period of site occupation were also important factors that conditioned the availability and number of different resources.

The accessibility and distance to different resources might have changed over time or depending on the season. Fir was used as a building material but disappeared after a while near the site, whereby the distance to this resource strongly increased. Activities in forests can also be traced through single finds of stone axes of the Middle–Late Neolithic. Seasonality and some strategy in different animals hunting (primarily the most



meaty one, elk) can be also noted, based on faunal remains. Only parts of carcasses of large animals found on the site might provide evidence of remoteness of the area where the animals were caught. A small number of species recorded that could not supply the needs (in meat, raw materials for tools production, and skins) of inhabitants of this site during the whole period of its existence would provide evidence regarding the existence of other places where butchering was conducted. Single scrapers and arrowheads attributed to this time found in different parts of the valley might indicate temporal hunting and butchering sites or 'site satellites' of this permanent pile-dwelling settlement. Pottery similar to that one of the Serteya II site and remains of bones marking a butchering zone were found on the contemporaneous sites Serteya X and VIII. The remains of household constructions (without fire places) on the Serteya X and XIV sites might provide evidence regarding the existence of special storage and butchering places 500 m and about 4.5 km away from a basic settlement. They were located on the islands and shores of the lake.

Fishing and gathering products might have been the basis of a diet during spring and the beginning of autumn, whereas hunting took place during autumn–spring. Cattle-breeding and agriculture had not yet become the main source of food supply. Single bones of domesticated horse, cow, sheep and probably pig were found on the sites of this region (Sablin and Siromyatnikova 2009). Palynological data might indicate some agriculture activities (Arslanov et al. 2009; Dolukhanov et al. 2004).

Wood storage for building might have been the most effective during the winter period, due to the wood quality during this time and the ease of transportation. Wood for nets, ropes, textiles, baskets, and other basketry was most reasonable to be prepared during spring owing to the materials' quality.

Some of the resources were not available in the proximity of the site and specific campaigns had to be organised to the territories at least 10 km from the pile-dwelling settlement. 'Import' objects found on the site might have appeared here as a result of exchange with the territories up to 700 km away from the Upper Western Dvina basin, including amber raw material, some types of flint, and probably pottery.

All of these features are constituents of a very dynamic economic model that can be reconstructed for the community-inhabited pile-dwelling site Serteya II in the middle of the 3<sup>rd</sup> millennium BC. It broadens our understanding of multiple ways of hunter-gathering societies, including their economic and living choices.

## **Acknowledgements**

The palaeoenvironmental research at the Serteya II site surroundings was financed by grants from the 'National Science Centre, Poland' based on decision No. 2017/25/B/HS3/00274. The participation of ZIN RAS (state assignment № AAAA-A17-117022810195-3) to this research is acknowledged. Field excavations and the exchange of knowledge was supported by the SNSF-funded NEENAWA project.

Archaeological research was supported by grant of Russian Science Foundation (project 'Lacustrine sites of the 4th-3rd mill BC - the origins and

development of pile-dwelling settlements phenomenon in NW Russia' №19-78-00009). The archaeological mission 2NOR was supported by the French Ministry for Europe and Foreign Affairs.

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