Some Results of the Multidisciplinary Approach to the Study of Archaeological Sites of Staraya Ladoga

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Abstract

In recent years, a multidisciplinary approach has been applied to the results of archaeological excavations in Staraya Ladoga. This article provides a short list of works that have been carried out in the investigations of the occupation layers and findings. The article also provides references to publications based on the results of interdisciplinary research.

In memory of Anatoliy Nikolaevich Kirpichnikov

1 Introduction

Using multidisciplinary methods of investigation is an essential part of modern archaeological research. Not only have the study of occupation layer of archaeological sites and the research of findings found there advanced to a new level, but so has the very important study of the structure of archaeological finds, as well as the process of their deposition. This approach to archaeological material and contexts allows us to answer questions that would be difficult to resolve using only archaeological methods. A multidisciplinary approach makes it possible to construct a detailed multidimensional model of the everyday life of ancient societies, attest changes in environment and landscape, and evaluate the degree of mutual influence of different communities.

Staraya Ladoga, or Ladoga as it was called before 1703, is located 128 km to the east of St. Petersburg, on the left bank of the Volkhov River and 12 km from the southern shore of Lake Ladoga. In the early medieval period Ladoga was one of the most important towns in the border region between northern Russia and the lands to the west.

The focal area of settlement was situated to the south of the cape by the Ladozhka River, on the lower part of the plateau, hidden from the waters of the Volkhov by a coastal dune. This site was investigated during the excavations of E. A. Ryabinin in 1975. The dendrochronology method was used to date the floorings and details of wooden structures from these excavations, located on virgin soil. According to the dendrochronological data, the first buildings appeared here no later than 753 AD (Chernykh 1996: 105-112).

Scandinavian, Slavonic and Finnic findings were found in the occupation layers of the settlement (Ryabinin 1985: 27-75; Kirpichnikov 2014: 215-230).

According to the Hypatian Codex, the legendary Varangian leader Rurik arrived at Ladoga in 862 AD (The Hypatian Codex 1923: 16), and the town was used as a military outpost. This settlement remained attractive for Scandinavian traders, craftsmen and farmers throughout the Viking Age. An

Figure 1. Zemlyanoye gorodishche. View from the south. Photo by S. Vasiljev 2021.

important mention of Ladoga is dated 1019 AD in the chronicles, when Princess Ingegerd Olofsdotter of Sweden married the Grand Prince of Kiev, Yaroslav Mudryy (Yaroslav the Wise). As part of their marriage agreement, Yaroslav ceded Ladoga to his wife, who appointed her father's cousin, the Swedish earl Ragnvald Ulfsson, to rule the town (Melnikova 2013: 533). There was a separate jarlsriki of Ladoga. From the beginning of the 12th century onwards, Ladoga came under the cultural and political influence of Novgorod.

According to Anatoliy N. Kirpichnikov, the first stone fortress was built here at the end of the 9th century (Kirpichnikov 1984: 23-34). However, the chronicle mentions the building of a second stone fortress in 1114 (The Hypatian Codex 1923: 273). During the later periods the fortifications underwent numerous reconstructions. The last of these was conducted in the middle of the 17th century.

The settlement area expanded considerably at the beginning of the 9th century. The houses were built on the right bank of the Ladozhka River. By the end of the 16th century, a part of the settlement was surrounded by earthen walls and merged with the fortress (Selin 2010: 334-344). For this reason, this place started to be called Zemlyanoye Gorodishche (Earthen Hillfort).

The stone fortress and Zemlyanoye Gorodishche continue to be the centre of Ladoga up to the present day. Archaeological excavations are now undertaken in the stone fortress and at Zemlyanoye Gorodishche and other areas of the medieval settlement (Fig. 1). The Staroladozhskaya Archaeological Expedition of the Department of Slavic-Finnish Archeology of the Institute of the History for Material Culture of the Russian Academy of Sciences is working in Ladoga every year. From 1972 to 2013, the head of the expedition was Anatoly N. Kirpichnikov (Fig. 2). All the works that will be discussed

Figure 2. The remains of a wooden building in the cultural layer of the middle of the 9th century. Anatoly Kirpichnikov photographs the hearth. Excavations in 2009. Photo: S. Beletckiy.

in this text were carried out in the southern part of Zemlyanoye Gorodishche during the excavations of 1999-2013.

For many years, the studies of the Ladoga settlement and of the archaeological finds discovered here were comprised of systematic cooperation with specialists of various branches of natural science.

2 The investigation of soil formation of the Neolithic and early medieval period

The study of buried soil (Fig. 3) under the earliest occupation layer of the Ladoga settlement and the features of the early landscape has been carried out together with researchers of the Institute of Geography of the Russian Academy of Sciences. Based on the study of selected samples and the literature data, the several stages of soil formation of Ladoga have been identified, from the Neolithic through the Ladoga transgression and accumulation of sapropel (maximum of transgression 4000 calBP), to the appearance of the Ladoga settlement in the middle of the 8th century AD (Aleksandrovskiy & Aleksandrovskaya 2018: 168-180; Aleksandrovskiy et al. 2010; Aleksandrovskiy et al. 2017; Aleksandrovskiy et al. 2018; Aleksandrovskiy et al. 2019: 21-24). The excavations at Zemlyanoye Gorodishche and the open settlement area revealed traces of farming in the upper part of the soil. This discovery sends us back to the question of the period when the settlement existed. It also opens a discussion of its possible cultural affiliations (Lapshin 2019). Over the course of the study, small pieces of coal from the upper part of the buried soil layer associated with agricultural cultivation were dated from excavations located in the southern and southeastern part of Zemlyanoye Gorodishche. Judging from the results, economic activity and intensive

excavations of the site could have been carried out from the beginning of the 5th century AD to the middle of the 8th (Aleksandrovskiy 2012: 60. Tabl. 1).

3 The investigation of archaeobotany

The archaeobotanical studies of the cultural layer of the Ladoga settlement have been traditional ones. At the end of the last century, the Staraya Ladoga archaeological expedition worked in close cooperation with Finnish researchers. The work was carried out in the northwestern part of Zemlyanoye Gorodishche (Aalto & Heinäjoki 1997). Samples were taken from the lower part of the cultural layer from cultural horizons of the 9-10th centuries. A number of industrial crops (common hops (Humulus lupulus), common millet (Panicum miliaceum L.), hemp (Cannabis sativa L.)), grain crops (barley (Hordeum vulgare L.) and emmer (Triticum dicoccum, Triticum aestivum compactum)), as well as individual grains of rye (Secal cereale) and oats (Avena sativa), were discovered from the samples. These excavations made it possible to get an idea of the natural environment of Ladoga in the 9-10th centuries. Archaeobotanical work in recent years has been carried out in the southeastern part of Zemlyanoye Gorodishche and focused primarily on the study of the buried soil. Together with experts of archaeobotanical studies of the N. I. Vavilov All-Russian Institute of Plant Genetic Resources (VIR), 15 samples were obtained from the buried soil and the lower part of the occupation layer, from which almost 19000 fruits and seeds (and their fragments) of cultivated and wild plants were isolated using the flotation method (charred plant remains gathered from wet-sieved soil samples). Samples for

Figure 3. Excavation of the buried soil layer. Excavations in 2010. Photo: S. Beletckiy

research were taken in 2010 and 2013 from the bottom part of the cultural layer and buried soil. The results of the carpological analysis revealed complexes of weed-ruderal, forest-edge, meadow (including marsh-meadow and coastal meadow-marsh) and cultivated plants. Among the macrostates of wild plants (wild plant macrofossils), the seeds of 44 species were identified; some of the remains (2636 pcs) could not be identified due to the insufficient number of preserved morphological features defined only up to the genus or family. Seeds of cultivated plants (1628 pcs) were found in all samples and were assigned to nine taxa: cultivated barley (Hordeum vulgare L.), bread wheat (Triticum aestivum L.), emmer (Triticum dicoccon Schrank), oats (Avena sp.), common millet (Panicum miliaceum L.), hemp (Cannabis sativa L.), peas (Pisum sativum s. l.), flax (Linum usitatissimum L.) and common poppy (Papaver somniferum L.) (Chukhina et al. 2014; Chukhina et al. 2015). Additionally, the analysis of the occupation layer and buried soil which attested to the existence of phytoliths inside them was carried out together with the Department of Botany of Altai State University. Studies have identified several palynocomplexes that characterise vegetation for each of the periods of formation of soil deposits (Speranskaya et al. 2017). The stratigraphic distribution and composition of phytoliths of the occupation layers and virgin soil confirm the previously expressed concepts of the development of landscape and natural conditions in the Lower Volkhov Region, which are closely related to fluctuations in the water level of the Volkhov River. Phytoliths of cultivated cereals, thin-toothed sticks with long, often branching (dendric) teeth that are formed in the spikelet glums of cultivated cereals, were not found in the samples of buried soil. This may mean that, despite the traces of agricultural tillage discovered by soil scientists, no cereals were cultivated at the site of the future settlement. Excavating the soil and applying fertilisers is also common while cultivating garden plants (Platonova et al. 2018).

4 The investigation of osteology and archaeozoology

The study of animal bone remains was carried out by specialists in archaeozoology from the Institute of Plant and Animal Ecology of the Ural Branch of the Russian Academy of Sciences. They investigated the species composition of animals whose bones, ranging from the Viking Age to the Modern Age, were found in excavations in 2006-2013. As a result, it becomes possible to find out the ratio of domestic and wild species, herd structure, age, etc. Interesting results were obtained from materials dating back to the Viking Age. During the 2009 excavations, when the layers of the second half of the 9th century were examined, a significant osteological collection was assembled, including the bones of mammals, birds and fish (Bobkovskaya 2010). The overwhelming majority of mammalian bone remains belong to domestic animals. Most of them belonged to pigs, followed by cattle (cows). These two types were used to produce meat (pork, beef) and dairy products. It is possible that, when breeding cattle, dairy farming was predominant. Small cattle (sheep, goats) occupied the third place in the herd in terms of numbers, and, judging by the nature of bone fragmentation, their purpose was complex, e.g. wool and milk. Perhaps the sheep were used as a sacrificial animal. Fragments of horse bones were found in small amounts. The inhabitants' diet did not include horse meat; horses were kept for household purposes. There were very few cat and dog bones among the finds.

Though commercial mammal species were diverse in composition (ungulates, carnivores, rodents), they were very few among the finds. Beavers and hares could be eaten; the other species (beaver, hare, fox, elk, red deer, wolf, lynx, bear, marten, otter, squirrel) were hunted for their skins, and the Ladoga seal (Pusa hispida ladogensis) was most likely hunted for its fat (blubber). Hunting clearly played a supporting role, but the actual catch volume is likely to be underestimated, since the vast majority of animals caught

during hunting were butchered on site, thus their bone remains were not found on the territory of the settlement. Fishing played an important role in the town's economy. Several works by researchers from the Institute of Ecology and Subsoil Use (Kazan, Republic of Tatarstan) are devoted to the study of ichthyofauna from excavations of the 9th-10th-century occupation layer at Zemlyanoy Gorodishche. 23 fish species were identified, among which the most widely represented are the pike perch (Sander lucioperca), the sturgeon (Acipenser oxyrinchus), the bream (Abramis brama), the pike (Esox Lucius) and the catfish (Silurus glanis) (Galimova et al. 2015). Genetic studies of these species were also carried out. Part of the collection of finds of early medieval bird bones was also analysed at the Institute.

Bird bones from the excavations, which were carried out in the area of the stone fortress, were processed by researchers from the Zoological Institute of the Russian Academy of Sciences and the Department of Genetics and Biotechnology of St. Petersburg State University. 158 bird bone samples from excavations in the stone fortress performed during 2014-2015 were analysed. We determined that 108 bone remains belonged to 37 individuals of 16 species. In terms of the number of bones and the number of individuals in the layers of different times, the remains of waterbirds and chickens prevail (Galkina et al. 2016).

Domestic chickens (Gallus gallus domesticus) were abundantly represented: more than 40% of all recognisable bones belonged to nine individuals of varying ages. We also found bones of wild galliform species that were probably eaten, such as black grouse (Lyrurus tetrix) and capercaillie (Tetrao urogallus).

Waterbirds were the most diverse group in terms of the number of species identified. We found bones (39%) belonging to the common swan (Cygnus cygnus), graylag goose (Anser anser), mallard (Anas platyrhynchos), common teal (Anas crecca), northern shoveler (Anas clypeata) and red-breasted merganser (Mergus serrator). It is worth noting that mallards were commonly present in excavated bone samples (20% of all bones) and one of the three graylag goose individuals found was a young bird, no older than 1 month. Still, it is hard to determine which were caught in the wild and which were domesticated.

There are bone remains of three individuals of the common eider (Somateria mollissima) among the material dated to the 10th-12th centuries. This species breeds in the Arctic and some northern temperate regions, and its nests can be found on the White Sea coasts, as well as on islands of the Baltic Sea and in the very west of the Leningrad region. Rare migrations of the common eider of the western population to St. Petersburg were recorded in May, and on non-freezing areas of the Neva in winter. The eider is an extremely rare species on Lake Ladoga, and it is not found in small inland waters. Birds of the northern population were registered only a few times in autumn in the north and west of Lake Ladoga. Perhaps in the 10th-12th centuries the habitat of this species was more favourable and it nested on the northwestern rocky islands of Lake Ladoga, and roamed the Ladoga area during the non-breeding period.

Exclusively in mixed layers, we found bones of birds of prey. The buzzard (Buteo buteo) is a medium-sized bird that could be hunted for meat. Sparrowhawks (Accipiter nisus) were probably buried entirely. They could be killed to protect domestic chickens or used as a hunting bird, and then buried after death. The bones of an eagle-owl (Bubo bubo) have also been identified.

In addition, bone remains of a jackdaw (Corvus monedula), a common raven (Corvus corax, Passeriformes) and a common crane (Grus grus, Gruiformes) were identified, which probably served as hunting trophies.

5 The investigation of anthropology

Recently, additional research was undertaken on skeletal remains excavated from a Christian burial site dating back to the 11th-

12th centuries. The cemetery is situated in the central part of Zemlyanoye Gorodishche near the church of Saint Clement (Ravdonikas 1949: 12; Platonova & Sankina 2018: 101-134). The special anthropological features of the people buried show their possible Scandinavian origin. The cemetery was discovered in 1938–1940 during an excavation by V. Ravdonikas and P. Grozdilov. Physical anthropologist Alexandr N. Yuzefovich, who participated in the excavations, wrote in 1941 that the cranial series discovered among the remains is different from those of Slavonic stock. In 1969 it was noted that the trait combination setting this group apart from the Eastern Slavonic one was paralleled by that observed in Iron Age groups of Scandinavia (Platonova & Sankina 2018: 107). A new study of Staraya Ladoga skeletons (both cranial and postcranial bones), undertaken by S. Sankina in the 1990s, demonstrated chronological and typological differences in another part of this cemetery. In this place (apparently the earliest one), there were young males (mostly below the age of thirty or juvenile) and children, including infants. Using the radiocarbon method of analysis, the bone remains of several burials were dated. As a result, several dates from the 10th-12th centuries were obtained. A strontium isotope analysis from 15 burials in this part of the cemetery was conducted in the Laboratory for Archaeological Chemistry at the University of Wisconsin-Madison. The isotope analysis of the teeth of buried persons has shown some distinction from local fauna samples and identified at least five non-local individuals with isotopic signatures that match the Mälaren region of east-central Sweden (Price et al. 2019).

In the last decade, major archaeological work took place in the area of the stone fortress, which housed a parish cemetery near St. George's Chuch from the 18th to the early 20th centuries. The anthropological findings were investigated with anthropologists from the Peter the Great Museum of Anthropology and Ethnography (the Kunstkamera), Russian Academy of Sciences (Moiseev et al. 2016). The remains of more than 100 persons from the 18th-20th centuries were discovered. The finds are similar in their craniometric characteristics to those originating from the excavations of the northern part of the cemetery, dating to the 17th-18th centuries, on Zemlyanoye Gorodishche.

6 Geoarchaeological investigations

New surprising results were obtained during the study of the courtyard of the stone fortress in 2017 using high-precision gravimetry. The study was conducted with A.P. Karpinskiy, with support from the Russian Geological Research Institute (VSEGEI), in 2017. It allowed us to conclude that the coastal cape was initially much smaller than today (Grigor'yeva et al. 2018: 195). A stone wall with wooden pillars of the most ancient fortress (in the 9th century) stood along the border of the cape (Grigor'eva 2020). During the 11th and up to the beginning of the 12th century, the eastern side of the cape was augmented with earth brought from outside, which significantly increased the area of the medieval fortress. Without gravimetrical investigations, the complete picture of the changes would remain unclear.

7 The investigation of the chemical composition of finds

Every year, during excavations at the settlement, a large number of finds of various materials are discovered (glass, metal, iron, ceramics, stone, wood, leather). Different categories of archaeological finds made from glass and metal alloys were set up, using the methods of chemical, X-ray, structural and microprobe analysis. Due to the use of the spectral analysis method (Laboratory of spectral analysis of the IIMC RAS), it was found that a glass workshop for the production of glass beads from imported raw materials functioned in Ladoga from the second half of the 10th to the beginning of the 11th century. This conclusion is confirmed by the chemical composition of the glass belonging

predominantly to the soda-lime-silica type, which is specific for Byzantine glass composition. Cobalt was the principal colourant, but some yellow opaque lead-containing glass was also revealed. On the whole, the Staraya Ladoga glassworking is typical for Northern Europe at this time (Grigoreva & Lesman 2012; Grigoreva & Egor'kov 2020). In 2012, a spall of sintered quartz sand, covered at one side with a thin layer (less than 3 mm) of transparent colourless glass, was unearthed in excavations at the southeastern part of Zemlyanoye Gorodishche. This find allows us to suggest that the first attempts of glass melting from the local source materials were made in the Ladoga workshop (Grigorieva & Kulkova 2020).

Ladoga was a centre of redistribution of metal raw materials; a jewelry workshop was located and constantly functioned on the territory of the settlement. Tools (pincers, crucibles), metal ingots with traces of use, and semi-finished and defective products are widely represented among the archaeological finds. There are also fragments of melted metal that for some reason were not used in production. One such copper ingot was selected for lead isotope analysis. According to the results of the isotopic analysis of lead, the copper of the found ingot turned out to be close to the composition of lead from deposits in Austria and Germany (Grigoreva et al. 2021). Such finds confirm the high trade status of ancient Ladoga, and the unclaimed metal shows that there was no shortage of it.

8 Conclusion

Thus, close cooperation with researchers of various profiles allows us to clarify the facts of life in Ladoga, including details that we have not thought about before: when did poultry appear in Ladoga, or to what extent was poultry farming developed in the Northwest? How did human activities influence the formation of the surrounding landscape, and to what extent did the economy of Ladoga depend on spring floods? Did technological advancement allow for the production of glass from local quartz sand? As a result, such multidirectional studies contribute to the creation of a general picture of the world of medieval Ladoga and its inhabitants. Collaboration in close cooperation with specialists of different profiles provides a lot of new information that allows us to correct and expand on the existing notions. As part of the work of the Staraya Ladoga archaeological expedition, the plan is to continue and expand the existing cooperation with specialists in the natural sciences.

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