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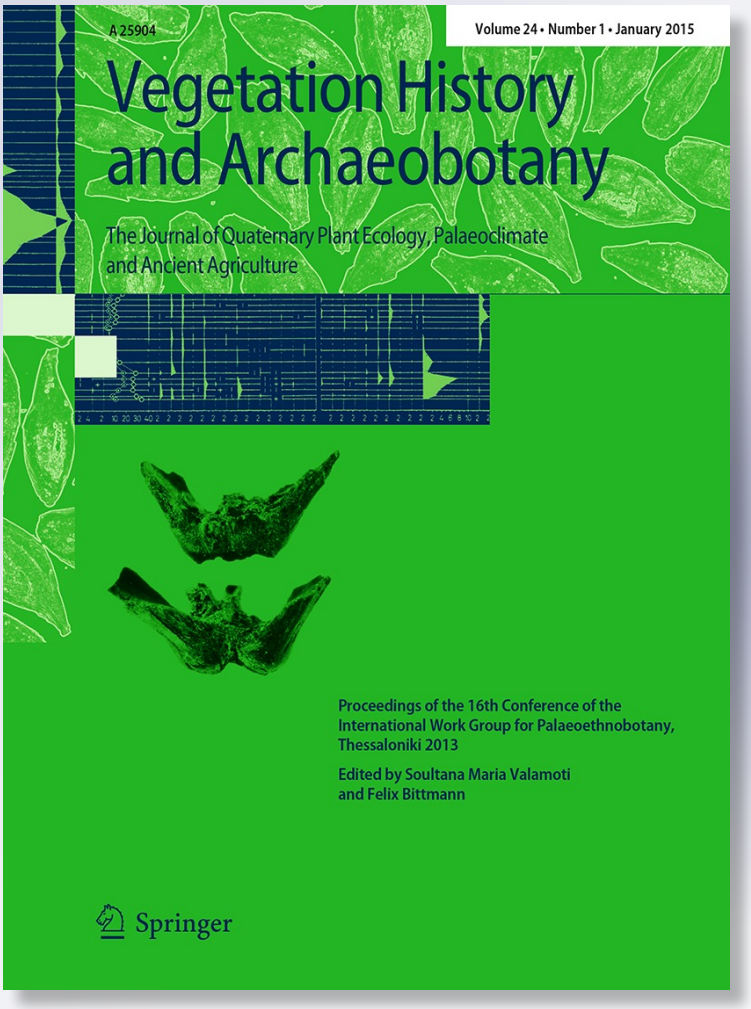

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ORIGINAL ARTICLE

Archaeobotanical finds from the Nadymsky Gorodok medieval settlement in the forest-tundra of Western Siberia, Russia

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Abstract The article presents archaeobotanical records from a cultural layer of the medieval settlement Nadymsky Gorodok located in the West Siberian forest-tundra. The obtained plant macrofossil complexes reveal the natural environment at the time of colonization, as well as housekeeping peculiarities of the indigenous inhabitants in the study region. According to archaeological and tree-ring analysis data, people founded the Nadymsky Gorodok settlement in the 12th century AD and stayed there till AD 1730. Ruderal plant macrofossils prevail in the majority of complexes. The absence of cultivated and segetal plants proves that agriculture was not practiced at this site during the Middle Ages. Abundant remains of edible wild plants indicate the important role of gathering in the life of the Nadymsky Gorodok inhabitants.

Keywords Plant macrofossils · Middle Ages · Nadymsky Gorodok · Indigenous people · Forest-tundra · Western Siberia

Introduction

Subarctic Western Siberia is well known for well-studied archaeological sites dated from the Mesolithic to the Middle Ages (Aleksashenko and Kosintsev 2010). Cultural layers dated from the Mesolithic to the end of the Bronze Age so far have not contained animal or plant macrofossils since organic material decayed quite rapidly due to the physical and chemical properties of these cultural layers. In Early Iron Age and medieval archeological sites however, macrofossils have been found in abundance. All Early Iron Age sites and the majority of the medieval sites retain records of indigenous people. Since the study area is affected by permafrost, many of these cultural layers are frozen, which permitted their comprehensive, multidisciplinary study involving zooarchaeological, helminthological, anthropological and archaeobotanical approaches. The medieval settlement Nadymsky Gorodok is the first archaeological site of indigenous people to be studied with the implementation of these methods. This settlement was one of the administrative centres of the indigenous inhabitants of Subarctic Western Siberia (Kardash 2009).

According to the modern administrative divisions, the territory of the Nadymsky Gorodok belongs to the Nadym district of the Yamal-Nenets Autonomous region. The site is located 60 km north of Nadym city, 25 km upstream of the mouth of the Nadym River (66.03° N, 72.00° E; Fig. 1). The Nadym lowlands belong to the Turukhansk–Tazovsky district and are situated in the subarctic zone of the West Siberian Plain. The Nadym River is a typical lowland stream with a large floodplain and a developed delta. According to the geobotanical subdivision of Western Siberia, the study area is covered by open *Larix* forests with a small proportion of *Picea* and *Betula* sect. Albae, interspersed with tundra and wetland vegetation (Richter 1963). The floodplain near the Nadymsky Gorodok is covered by *Salix*, *Alnus* and *Betula*.

The climate of West Siberian river valleys differs from that of upland areas inasmuch as the floodplains are characterized by a prolonged frost-free period and a lower daily, monthly and seasonal temperature gradient. The

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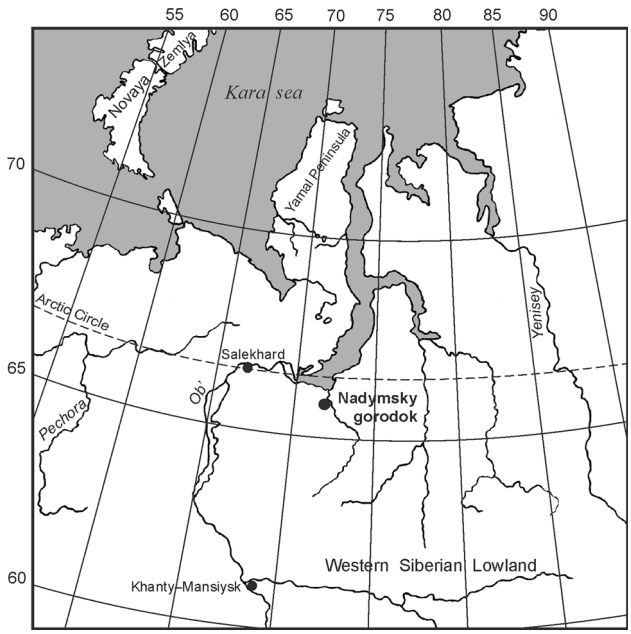

Fig. 1 Location of the Nadymsky Gorodok archaeological site

study area is located in a transition zone of maritime arctic and continental subarctic climate. Winters last for about 7–8 months (from October to May) and are severe and snowy. The mean January temperature ranges from −24 to −26 °C whereas the mean July temperature is between +14 and +16 °C. The mean annual precipitation is around 300 mm (Treshnikov 1985).

The earliest written records describing the study area are dated to the 17th century (Kardash 2013). *Notes on Muscovite Affairs* (*Rerum Moscoviticarum Commentarii*) (1549) is a book in Latin written by Baron Sigismund von Herberstein, in which the Nadym River is mentioned for the first time (Herberstein 1988). Besides these sources, various administrative materials dated to 1636–1679, as well as data from Russian Academic expeditions of the 18th century are well-known. The Nadymsky Gorodok and its location were described in full detail for the first time by G. Miller in 1740 (Elert AKh 1996). Aside from written records, there are Russian cartographical materials. Among them, an 18th century plan entitled "More Mangazeisko s urochische" (The Mangazeya Sea with neighbouring lands) is of great interest. This is the first plan where the location of the Nadymsky Gorodok is shown. The available cartographic materials not only give information on locality, but also complement written records with information on its status as an administrative and trade centre (Kardash 2013).

G. Dmitriev-Sadovnikov, an employee from the Tobolsk Provincial Museum, arrived at the remains of the Nadymsky Gorodok on July 3, 1916. He described the site and gathered a small collection of artifacts there. L. Khlobystin, an employee from the Leningrad division of the Institute for Archeology at the Academy of Sciences of the USSR, studied the Nadymsky Gorodok in 1976 (Kardash 2013). G. Gracheva described the finds brought by L. Khlobystin from the site (Gracheva 1986). She also made assumptions about their ethnic origin, as well as the activities of the indigenous people. Interdisciplinary research on the Nadymsky Gorodok started in 1998 and has been directed by Oleg Kardash ever since.

According to the archaeological investigation, the first settlement was dated to the end of the 12th century AD (Kardash 2013). This date is supported by the dendrochronology data. The settlement functioned until AD 1730 (Elert AKh 1996). In the course of recent archaeological excavations, deposits dated from the end of the 15th century until the start of the 18th century were studied. The site covers an area of about 1,200 m^2. The excavated part is 650 m^2, of which 350 m^2 represent an area with 16 dwellings and household structures. The thickness of the frozen cultural layer is 0.5–1.65 m (Kardash 2013).

The Nadymsky Gorodok represents a defensive and residential complex surrounded by a wooden wall which formed an oval and is divided along its long axis into two equal halves by a central passage. According to the planigraphic structure, within the settlement there were wooden rectangular constructions of different dimensions with diverse functions, among them housing and utility premises (Fig. 2). Remains of the dwellings and other structures are well-preserved. Constructions located within the complex were subject to repeated renewal throughout the whole period under study. Each new construction was built over the remains of the preceding one with the latter being its foundation. Thus, these constructions formed a continuous cultural layer representing the remains of all renewal stages of the Nadymsky Gorodok settlement. Elements of the constructions and other wooden remains such as logs, boards and household items collected within the settlement area yielded about 1,350 specimens of transverse cuts used for tree-ring analyses. About 600 specimens of the total number were suitable for dating, but only about 340 specimens could be dated with certainty (Goryachev 2003). The tree-ring analysis of the wood specimens taken from the settlement constructions allows the division of the cultural layer into chronological horizons, i.e., periods between the renewal of constructions (each horizon covering around 50 years) (Table 1).

The analysis of discovered artifacts revealed that, during the whole period of this settlement's existence, it was inhabited by indigenous people who might have belonged to two ethnic groups, namely Nenets and Khanty, also known as "Samoyad" and "Ostyaki" (Kardash 2013). As zooarchaeological data reveal, the inhabitants of the Nadymsky Gorodok settlement were mainly hunters and

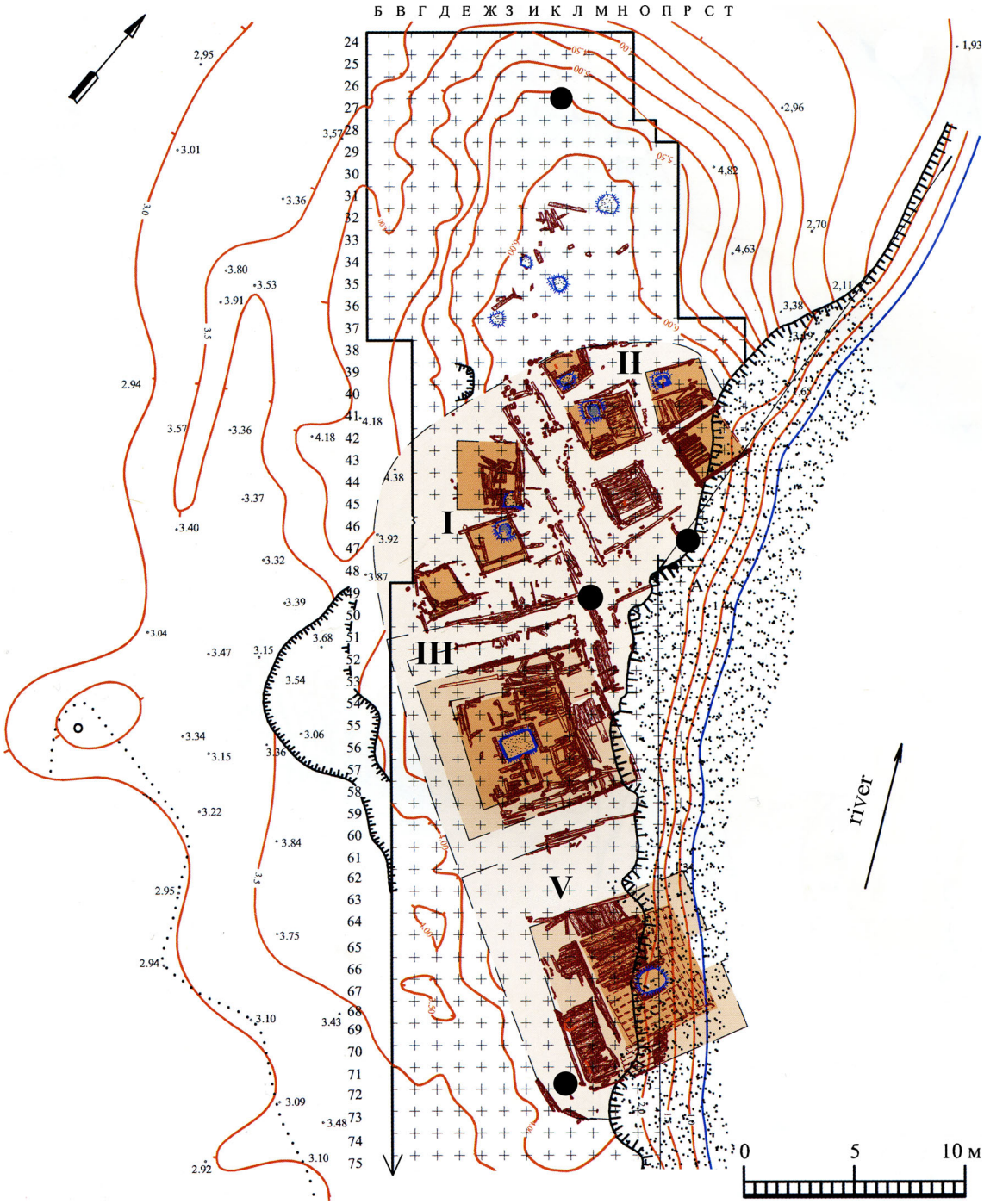

Fig. 2 Plan of the Nadymsky Gorodok (after Kardash 2009) *Black dots* (•) represent sample locations, *I* and *II*—Ostyak quarters, *III* and *V*—Samoyed quarters

fishers, and to some extent reindeer breeders (Kosintsev 2005).

This article presents the results of archaeobotanical studies of the Nadymsky Gorodok cultural layer with implications on natural environment and housekeeping peculiarities of the indigenous inhabitants living in the Western Siberia forest-tundra during the time of colonization.

Materials and methods

During recent archeological excavations of the Nadymsky Gorodok settlement, 15 samples from four cultural layer profiles were selected for archaeobotanical studies (Fig. 2), of which nine samples were taken from the profile on the border between squares 46 and 47 (Fig. 3), where the total cultural layer thickness of the Ostyak quarter is represented

Table 1 A list of the plant macrofossil complexes and samples, with their relative dates

Plant macro-fossil complex	Sample (*n*)	Sample location	Age (AD)	Taxa (*n*)	Macrofossils (*n*)
1	1	Squares 46–47, depth 200–180 cm	1450–1500	12	88
2	2	Squares 46–47, depth 180–140 cm	1500–1550	17	281
3	2	Squares 46–47, depth 140–100 cm	1550–1600	18	515
4	2	Squares 46–47, depth 100–60 cm	1600–1650	18	370
5	2	Squares 46–47, depth 60–20 cm	1650–1700	24	745
6	3	Section 3, square Л/50, depth 20–4 cm	1700–1730	20	5,009
		Section 7, square И/71, depth 16.5–1.5 cm			
		Section 5, square К/26, depth 17.5–3 cm			
7	3	Section 3, square Л/50, depth. 4–0 cm	Present time	22	2,981
		Section 7, square И/71, depth 1.5–0 cm			
		Section 5, square К/26, depth 3–0 cm			

Fig. 3 The profile of cultural layer of the Nadymsky Gorodok on the border between squares 46 and 47 (after Kardash 2009)

to its full extent. The collected material consisted of dark-brown humus except for a sample from a depth of 80–100 cm which was composed of tawny sabulous sediments. All samples contained fragments of wood and bark of coniferous trees and birch bark, as well as moss, coal, bones and fish scales. Some samples included fragments of insects and of rodent excrement. Large wood and birch bark fragments were found in the upper layers. Two other samples were selected from the profile of section three in square Л/50 located in the central built-up area of the Ostyak quarter from a podzolized gray-brown loose fine-grained layer and from sod. From the profile of section seven of square И/71 in vicinity of the built-up area of the Samoyed quarter, one sample was taken from a homogenous, humic, light brown layer and another one from turf. The last two samples were taken from a profile of section five in square К/26 located at the edge of the utility site outside the defensive structure (fence) of the Nadymsky Gorodok from a turf and light brown humus layer which included fragments of birch bark, wood and coal (Fig. 2).

All samples were prepared for plant macrofossil analysis using standard methods (Nikitin 1969). The sediments were sieved in water using a set of different mesh sizes (1–0.25 mm). Plant macrofossils were identified using a Zeiss Stemi 2000-C stereomicroscope at 10–40× times magnification. Macrofossils were identified using the seed reference collection at the Institute of Plant and Animal Ecology UB RAS (Yekaterinburg), and the keys of Dobrokhotov (1961), Katz et al. (1965), and Velichkevich and Zastawniak (2009). The nomenclature for the botanical material follows Czerepanov (1995). The classification of the wild plants into phytosociological groups and life forms was done using uniformitarianistic approaches (Dorogostajskaja 1972; Sekretareva 1999).

Results

9,989 plant macrofossils were found in the samples from the Nadymsky Gorodok cultural layer. 87.1 % of the total

Table 2 A list of plant macrofossil taxa identified from the cultural layer of the Nagymsky Gorodok settlement

Genus/species	Life form	Phytosociological group
Betula sect. Albae	Tree	Boreal, mesophyte
Picea obovata	Tree	Boreal, mesophyte
Pinus sibirica	Tree	Boreal, mesophyte, edible parts
Duschekia fruticosa	Shrub	Arctoboreal
Lonicera sp.	Shrub	Boreal, mesophyte, edible parts
Padus avium	Shrub	Boreal-nemoral, mesophyte, edible parts
Ribes sp.	Shrub	Boreal, hygromesophyte, edible parts
Sorbus aucuparia	Shrub	Hypoarctic, mesophyte, edible parts
Andromeda polifolia	Dwarf shrub	Boreal, mesohygrophyte
Empetrum nigrum	Dwarf shrub	Boreal, mesophyte, edible parts
Rubus arcticus	Dwarf shrub	Arctoboreal, mesophyte, edible parts
Rubus chamaemorus	Dwarf shrub	Hypoarctic, mesohygrophyte, edible parts
Vaccinium uliginosum	Dwarf shrub	Boreal, mesophyte, edible parts
Vaccinium vitis-idaea	Dwarf shrub	Boreal, xeromesophyte, edible parts
Adoxa moschatellina	Herb	Arctoboreal, hygromesophyte
Apiaceae gen. indet.	Herb	Polyzonal
Asteraceae gen.indet.	Herb	Polyzonal
Atriplex sp.	Herb	Polyzonal
Brassicaceae gen. indet.	Herb	Polyzonal
Calamagrostis sp.	Herb	Polyzonal
Carex sp. sp.	Herb	Polyzonal
Caryophyllaceae gen. indet.	Herb	Polyzonal
Chenopodium album	Herb	Polyzonal, mesophyte, ruderal, edible parts
Chenopodium sp.	Herb	Polyzonal
Chrysosplenium alternifolium	Herb	Boreal-nemoral, mesohygrophyte, ruderal
Comarum palustre	Herb	Arctoboreal, hydrohygrophyte
Cyperaceae gen. indet.	Herb	Polyzonal
Erysimun cheiranthoides	Herb	Boreal, xeromesophyte, rederal
Filipendula ulmaria	Herb	Arctoboreal, hygromesophyte
Hippuris vulgaris	Herb	Polyzonal, hydrophyte
Lactuca sp.	Herb	Polyzonal, mesophyte, ruderal
Lamiaceae gen. indet.	Herb	Polyzonal
Lamium album	Herb	Boreal-nemoral, mesohygrophyte, ruderal
Menyanthes trifoliata	Herb	Boreal, hydrophyte, edible parts
Myriophyllum verticillatum	Herb	Polyzonal, hydatophyte
Plantago sp.	Herb	Polyzonal
Poa sp. sp.	Herb	Polyzonal
Poaceae gen. indet.	Herb	Polyzonal
Ranunculus sp.	Herb	Polyzonal
Rorripa palustris	Herb	Boreal, hygrophyte, ruderal
Rumex sp.	Herb	Polyzonal
Scirpus sp.	Herb	Polyzonal
Scirpus sylvaticus	Herb	Boreal, hygrophyte
Solanum sp.	Herb	Polyzonal, ruderal
Thalictrum minus	Herb	Boreal, mesophyte, edible parts
Urtica dioica	Herb	Polyzonal, mesophyte, ruderal, edible parts
Selaginella sp.	Herbaceous	Boreal

Table 3 Composition of plant macrofossils from the profile of the Nadymsky Gorodok cultural layer on the border between squares 46 and 47

Plant macrofossil complexes	1	2	3	4	5
Depth (cm)	200–180	180–140	140–100	100–60	60–20
Age (AD)	1450–1500	1500–1550	1550–1600	1600–1650	1650–1700
Adoxa moschatellina				1	
Asteraceae gen. indet.			1		1
Atriplex sp.					1
Betula sect. Albae		6 + 1c*	4	9 + 1c*	3 + 1 s
Brassicaceae gen. indet.					3
Carex sp.	17	29	20	31	12
Caryophyllaceae gen. indet.				1	
Chenopodium album	6		9	4	9
Chenopodium sp.					5
Comarum palustre		1			
Cyperaceae gen. indet.			2		
Duschekia fruticosa	6 s	6 s	2	2 s	11 s
Empetrum nigrum	1 + 4v	2 + 32v	1 + 28v	6 + 15v	8 + 47v
Filipendula ulmaria					1 + 1*
Hippuris vulgaris	1		1		2
Lamiaceae gen. indet.	4	1			
Menyanthes trifoliata	1	1	1	1 + 1*	1 + 5*
Myriophyllum verticillatum		1			
Padus avium	6*	2 + 8*	10 + 19*	1 + 99*	10 + 291*
Picea obovata	5v	2v	5v	4v	5v
Pinus sibirica					1 + 1*
Poaceae gen. indet.			4	3	70
Ranunculus sp.				1	2
Rorripa palustris					1
Rubus arcticus			1	1	
Rubus chamaemorus	30 + 2*	132 + 8*	341 + 48*	38 + 6*	114 + 89*
Rumex sp.				1	
Scirpus sp.		1			
Selaginella sp.		1			
Solanum sp.	2		2	4	2
Sorbus aucuparia		37	7	2	10
Urtica dioica	3	1	7	138	33
Vaccinium uliginosum		4			1
Vaccinium vitis-idaea		5	2		4
Number of taxa	12	17	18	18	24
Number of macrofossils	88	281	515	370	745

v vegetative part, *s* scale, *c* catkins

* Fragment of macrofossil

remains represent whole fruits and seeds. Some taxa such as *Padus avium, Thalictrum minus, Rubus chamaemorus* and *Rubus arcticus* are characterized by significant concentrations of fragmented remains. The major part of the plant macrofossils is in a good state of preservation; no charred macrofossils have been found.

47 taxa of vascular plants from 27 families have been identified (Table 2). Trees are represented by *Picea obovata* (spruce), *Pinus sibirica* (Siberian pine) and *Betula* sect. Albae (tree birch) macrofossils. Additionally five shrub taxa were found (Table 2). The majority of identified species belong to mesophytes (32 %); small quantities of hygromesophytes, mesohygrophyte, hydrophytes (6 % for each group), as well as xeromesophytes and hygrophytes (4 % for each group) according to Sekretareva (1999). *Myriophyllum verticillatum* belongs accordingly to hydatophytes. In terms of modern distribution, boreal (32 %) and arctic boreal (13 %) groups are represented by the largest number of taxa. Ruderal plants are represented by 8 taxa of apophytes, which account for 17 % of the total

Table 4 Composition of plant macrofossils from the profiles of the Nadymsky Gorodok cultural layer from the 2002–2003 excavation

Sample location	Section 3, square Л/50		Section 7, square И/71		Section 5, square К/26	
Depth (cm)	20–4	4–0	16.5–1.5	1.5–0	17.5–3	3–0
Age (AD)	1700–1730	present time	1700–1730	present time	1700–1730	present time
Andromeda polifolia		2				
Apiaceae gen. indet.		1				10
Betula sect. Albae	66 + 4 s	730 + 205 s	92 + 9 s	169 + 31 s	94 + 5*	116 + 15*
Calamagrostis sp.		11				
Carex sp.	24	6			4	2
Caryophyllaceae gen. indet		1				
Chenopodium album	96	4	35 + 4*	1*	1	
Chrysosplenium alternifolium					65	2
Empetrum nigrum	29v	5			6	
Erysimum cheiranthoides	7	11				
Lactuca sp.					2	1
Lamium album	6	1	334 + 88*	25 + 11*	155 + 56*	27 + 6*
Lonicera sp.	10	2				4
Menyanthes trifoliata			1		2 + 174*	
Padus avium	22*	14*	27*		53*	
Plantago sp.					1	
Poa sp.	21	309		150		8
Poaceae gen. indet.		60	1			
Ranunculus sp.					1	
Ribes sp.			2	2		
Rubus arcticus	2	1*	1 + 1*		21 + 42*	
Rubus chamaemorus	1	4 + 1*	1 + 6*		1 + 40*	
Scirpus sylvaticus						1
Thalictrum minus	7	193	25 + 57*	4*	25 + 14*	80 + 66*
Urtica dioica	198	302	2,600	330	470	55
Number of taxa	13	18	11	7	15	11
Number of macrofossils	493	1,865	3,284	723	1,232	393

v vegetative part, *s* scale

* Fragment of macrofossil

number of plant taxa. 14 taxa (30 %) belong to edible wild plants. On the whole, the floristic list of the Nadymsky Gorodok cultural layer is typical of the West Siberian forest-tundra zone.

The profiles of squares 46–47 (Table 3) gave 4,491 macrofossils of 34 plant taxa, mainly fruits and seeds of various species, as well as leaves of *Empetrum nigrum* and needles of *P. obovata*. The 9 studied samples from this profile represent five macrofossil complexes in accordance with the periods determined by the tree-ring analysis (Table 1). Besides the identified plant macrofossils, the studied samples contained a large quantity of fragments of wood and bark from birches and coniferous trees.

The lowermost plant macrofossil complex (200–180 cm depth) included the smallest number of macrofossils. Trees, shrubs and dwarf shrubs are represented therein by needles of *P. obovata*, stones of *P. avium*, scales of *Duschekia fruticosa*, as well as seeds and leaves of *E. nigrum*. Among herbaceous plants, abundant remains of *R. chamaemorus* stones, as well as macrofossils of different aquatic and wetland plants, such as *Carex* sp., *Hippuris vulgaris*, *Menyanthes trifoliata* and Lamiaceae gen. indet., were found. Seeds of the ruderals *Urtica dioica* and *Chenopodium album* occur sporadically. According to tree-ring analysis data, this complex accumulated between AD 1450 and 1500.

The next three plant macrofossil complexes (180–60 cm depth) are similar to each other in terms of species composition (Table 3). In addition to the remains of trees and shrubs found in the previous complex, winged seeds and scales of *Betula* sect. Albae, as well as seeds of *Sorbus aucuparia* could be found. Dwarf shrubs are represented by *E. nigrum*, *Vaccinium vitis-idaea* and *V. uliginosum*. The number of *R. chamaemorus* stones increases fivefold. As in the previous samples, *Carex* sp. is predominant among

meadow, aquatic and swamp plants though remains of other plants from this group (Poaceae gen. indet., *H. vulgaris*, *M. trifoliata*, *Solanum* sp., Asteraceae gen. indet.) occur sporadically. Ruderal plant remains, like those of *U. dioica* and *C. album*, are also rare, except for the complex from 100 to 60 cm depth, where the seeds of *U. dioica* significantly increased in numbers. These macrofossil complexes characterize the period between AD 1500 and 1650.

The composition of the fifth plant macrofossil complex (60–20 cm) is similar to that of the previous one in terms of trees and shrubs; also this complex is characterized by occasional remains of *P. sibirica* seeds. Macrofossils of meadow and aquatic and swamp plants grow in number due to the increase of the amount of Poaceae gen. indet. caryopses and the appearance of *Rorripa palustris*, Brassicaceae gen. indet., *Filipendula ulmaria* and *H. vulgaris* remains. *U. dioica* is predominant among the ruderal plant remains; seeds of plants from the Chenopodiaceae family occur sporadically. Large amounts of *R. chamaemorus* macrofossils have been found. As tree-ring analysis data show, this complex is dated to AD 1650–1700.

The sixth complex, dated to the period from 1700 till 1730, includes six samples from three profiles (Table 4). On the whole, 7,990 macrofossils of 25 plant taxa have been found. Samples corresponding to this period are similar to each other in terms of plant macrofossil species composition. Arboreal plant remains are represented by winged seeds of *Betula* sect. Albae and stones of *P. avium*. Among shrubs, seeds of *Lonicera* sp. in section 3 of square Л/50, and of *Ribes* sp. in section 7 of square И/71 have been found. In terms of composition of meadow, aquatic and swamp plants, the assemblages only differ in the quantities of their macrofossils. Weed plants, such as *U. dioica*, *C. album* and *Lamium album* occur in all profiles but their quantities vary significantly. Also seeds of *Erysimum cheiranthoides* were found in section 3, square Л/50, and seeds of *Chrysosplenium alternifolium* in section 5, square К/26.

The seventh plant macrofossil complex includes turf samples from three profiles (Table 4). This complex indicates changes in the composition of plant communities, which occurred after the inhabitants had abandoned the Nadymsky Gorodok settlement. Macrofossils of *Betula* sect. Albae increased in numbers, those of meadow, aquatic, swamp and weed plants changed in quantity and composition too.

Discussion

The macrofossil complexes described above are characteristic of floodplain vegetation in the forest-tundra around the Nadymsky Gorodok settlement. They contain remains of the major tree and shrub species as well as many dwarf shrubs and herbs still occurring in the modern vegetation of this territory. Differences in macrofossil composition indicate local variations that characterize different habitats.

Practically all studied samples from the profile on the border of squares 46 and 47 are abundant in tree remains in form of wood and bark fragments. Analyses of processed wood remains revealed that larch and spruce (and to a lesser degree Siberian cedar) were mainly used for construction purposes. The Nadymsky Gorodok inhabitants also used wood from remote forested areas, as the floodplain forests of their immediate surroundings had already been cut down. The Nadymsky Gorodok inhabitants must have widely used local and non-local woody plants as construction material and fuel, as well as for any other housekeeping and economic needs. According to Kardash (2013), they used their natural surroundings to the maximum extent possible for construction purposes. For example, they retrieved trees during the river flooding period or immediately after it. These were trees from the hollowed-out banks of the river, which had been washed far downstream. Some trees were cut down and laid in along the banks of the river to be taken to the settlement later on during the river flooding period.

There is a discrepancy in the insignificant amount of *Betula* sect. Albae fruits and scales and the large quantities of its wood and bark fragments. The sample site might have been situated indoors, which might have prevented the influx of birch seeds. Alternatively, it might indicate insignificant birch expansion in the vicinity of the archaeological site due to its active usage by the inhabitants. This is indicated by the increase of birch remains in the complexes after abandonment of the settlement.

The Nadymsky Gorodok inhabitants ate fruits of different trees and shrubs (*P. avium*, *Sorbus aucuparia*, *Ribes*, *Lonicera*). *Pinus sibirica* seeds and *P. avium* remains found here might be attributed to their edible qualities. A box made of birch bark with *P. avium* seeds was found in square A/63. Most of the *P. avium* stones are represented by fragments only. The fruits might have been crushed prior to eating, which is often the case for dried berries. Among remains of other edible plants, *R. chamaemorus* stones are abundant, while *V. vitis-idaea*, *V. uliginosum*, *R. arcticus* and *E. nigrum* seeds occur only sporadically. Thus, the Nadymsky Gorodok inhabitants used all edible forest tundra plants that might have played a secondary role in their nutrition.

Meadow, aquatic and swamp plants characterize floodplain communities in forest tundra similar to modern ones in the area around Nadymsky Gorodok. Stems and leaves of grasses and sedges might have been used for insulation and as ground litter within the buildings. After the Nadymsky Gorodok inhabitants had left the area, the amount of meadow plant remains increased indicating restoration of the natural vegetation.

Ruderal plants are represented by *U. dioica*, *C. album*, *C. alternifolium*, *L. album* and *E. cheiranthoides*. *Urtica dioica* seeds are abundant, and in some samples they occur in huge amounts (Table 4), which indicates its widespread occurrence within the territory of the archaeological site. It can be assumed that the Nadymsky Gorodok inhabitants used *U. dioica* as a cold-resistant textile plant. It is well known that native inhabitants in the north of Western Siberia used *U. dioica* for fabric weaving in the 18th century (Elert AKh 2006). The synchronous presence of *L. album* seeds might be attributed to similarities in growth conditions of these two species. The native habitats of both *U. dioica* and *L. album* are shaded floodplains in the forest zone, though *L. album* is distributed more to the south. Goworukhin (1937) notes that *L. album* was imported into the tundra by humans. Accordingly, *L. album* along with *U. dioica* might have been introduced by the people from Nadymsky Gorodok themselves (unintentionally), where it spread widely as indicated by the abundance of seeds in the cultural layer.

Remains of *C. album* and *C. alternifolium* are abundant in some samples of the cultural layer. Thus, different ruderal communities occurred in the vicinity of the archaeological site. The inhabitants might have used *C. album* and other local plants as food and medicinal raw materials (Medvedev 1957).

Macrofossils of cultivated and segetal plants have not been found in the Nadymsky Gorodok cultural layer. The indigenous people of Subarctic Western Siberia thus obviously did not practice agriculture in the Middle Ages. Even nowadays the indigenous inhabitants do not practice agriculture here due to severe subarctic climate conditions.

Summarizing, the Nadymsky Gorodok inhabitants intensively cut down trees and shrubs growing around the settlement for use as fuel and building material. This resulted in the extensive destruction of woody vegetation in the surroundings and the expansion of ruderal plants. Macrofossils of various wild edible plants found within the site indicate that the locals used plants growing in the vicinity of the archaeological site as a food resource. After the inhabitants abandoned the settlement, birch, meadow and swamp plants reestablished, resulting finally in the restoration of the natural vegetation.

Conclusion

Archaeobotanical analyses of the cultural layer from Nadymsky Gorodok reveal that all proven plant species are characteristic of the modern local vegetation in the study area. Ruderal plants indicate massive anthropogenic disturbances of the vegetation. The absence of cultivated and segetal plants prove that agriculture was not practiced, which was to be expected under subarctic climate conditions. Abundant remains of edible wild plants indicate the important role of gathering in the life of the Nadymsky Gorodok inhabitants. Despite the fact that their main activity was hunting, they also actively used a variety of different plants.

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References

Aleksashenko NA, Kosintsev PA (2010) Khozyaistvo naselenia severa Zapadnoii Sibiri v epochu zheleza [Farming population of the north of Western Siberia in the Iron Age]. In: Alekseev VV (ed) Istoriya Yamala [History of the Yamal], Vol 1, Basko, Yekaterinburg, pp 156–182 (in Russian)

Czerepanov SK (1995) Vascular plants of Russia and adjacent states [in former USSR]. Cambridge University Press, Cambridge

Dobrokhotov VN (1961) Semena sornyh rastenii [Seed of weeds]. Selhozizdat, Moscow (in Russian)

Dorogostajskaja EV (1972) Sornye rasteniya Kraiinego Cevera SSSR [Weeds of the far North of the USSR]. Nauka, Leningrad (in Russian)

Elert AKh (ed) (1996) Sibir' XVIII veka v putevych opisaniiach G.F. Millera [Siberia of 18th century in travel notes by G.F. Müller]. Sibirsky Khronograf, Novosibirsk, pp 209–212 (in Russian)

Elert AKh (ed) (2006) Severo-Zapadnaya Sibir' v ekspedicionnych trudach G.F. Millera [North-Western Siberia expeditionary works by G.F. Miller]. NPMP Volot, Yekaterinburg, pp 345–388 (in Russian)

Goryachev VM (2003) Ispolzovanie ostatkov drevesiny Nadymskogo Gorodka dlya postroenia dlitelnych chronologiy i reconstrukciy temperaturnych usloviy [Using wood waste of Nadymsky Gorodok to build long chronologies and the reconstruction of temperature conditions]. In: Matveeva NP (ed) Ekologiya drevnich I sovremennych obschestv [Ecology of ancient and modern societies], Vol 2, Tyumen, pp 30–33 (in Russian)

Goworukhin WS (1937) Flora Urala (Flora of the Urals). Sverdlgiz, Sverdlovsk (in Russian)

Gracheva GN (1986) Paleoetnograficheskie issledovania v Arctice [Paleoethnografic research in the Arctic]. KSIA 200:21–26 (in Russian)

Herberstein S (1988) Zapiski o Moskovii [Notes on Muscovy]. MGU, Moscow (in Russian)

Kardash OV (2009) Nadymsky Gorodok v konce XVI—pervoii treti XVIII vv. Istoriya i materialnaya kultura [Nadymsky Gorodok at the end of XVI—first third of the XVIII century. History and Material Culture]. Magellan, Nefteyugansk-Yekatrinburg (in Russian)

Kardash OV (2013) Nadymsky Gorodok knyazey Bolchoy Karachey [Nadymsky Gorodok under Princes of Bolchaya Karacheya]. Magellan, Yekaterinburg-Salekhard (in Russian)

Katz NJ, Katz SV, Kipiani MG (1965) Atlas i opredelitel′ plodov i semyan, vstrechayushchihsya v chetvertichnyh otlozheniyah SSSR [Atlas and the identification keys of the fruits and seeds

occurring in the Quaternary deposits of the USSR]. Nauka, Moscow (in Russian)

Kosintsev PA (2005) Ecologiya srednevekovogo naseleniya severa Zapadnoii Sibiri. Istoshniki [Ecology medieval population north of Western Siberia. Sources]. Ural University Press, Yekaterinburg-Salechard (in Russian)

Medvedev PF (1957) Pishchevyye rasteniya SSSR [Edible plants of the USSR]. In: Il'in MM (ed) Rastitel'noye syr'ye SSSR [Vegetable materials of the USSR], Vol 2, Naturnye rasteniya [Wild plants]. Academy of Sciences USSR Press, Moscow-Leningrad, pp 5–151 (in Russian)

Nikitin VP (1969) Paleokarpologicheskyi metod [Plant macrofossil analysis]. Tomsk University Press, Tomsk (in Russian)

Richter GD (ed) (1963) Zapadnaya Sibir' [Western Siberia]. Academy of Sciences USSR Press, Moscow, pp 202–204 (in Russian)

Sekretareva NA (1999) The vascular plants of the Russian Arctic and adjacent territories. Pensoft Publishers, Sofia

Treshnikov AF (1985) Atlas Arktiki [Atlas of the Arctic]. GUGK, Moscow (in Russian)

Velichkevich FY, Zastawniak E (2009) Atlas of the Pleistocene vascular plant macrofossils of Central and Eastern Europe Part 2, W. Szafer Institute of Botany, Polish Academy of Sciences, Krakow