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PALEOENVIRONMENT. THE STONE AGE

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PALEOCHANNEL STUDIES IN ARCHAEOLOGY: THE CASE OF THE VYCHEGDA RIVER, NORTHEASTERN EUROPEAN RUSSIA*

Geological and geomorphological settings are often taken into account when choosing strategy in archaeological studies. In the Vychegda River valley (Archangelsk Province, Komi Republic), at the end of the Late Pleistocene and in the Holocene, lateral channel migrations were the dominant process of riverine landscape changes and hence directly influenced human occupation of the valley. Therefore, to assess the physical settings of archaeological sites we employed paleochannel analysis, a geomorphological technique aimed at reconstructing river channel transformations in the historical and geological past. The potential application of paleochannel analysis in archaeology includes designing archaeological surveys and predicting destructive river actions at archaeological sites located in river valleys.

Keywords: *Archaeology, adaptation, paleochannel studies, geomorphological mapping, geochronology, paleoenvironment, Holocene, northeastern European Russia, Vychegda River.*

Introduction

Human life has always been inseparable from rivers as sources of food and water, as well as transportation pathways. Therefore, the solution of the problems of adaptation to the environment is in most cases related to the reconstruction of the paleolandscapes of river valleys formed through channel processes. It is these processes that serve as the subject of paleochannel analysis – a field of science placed at the junction of geomorphology and hydrology aimed at the study of the formation and behavior of river channels (Chalov, 2008; Chernov, 2009). Paleochannel studies and historical fluvial studies focused on the deformation of river channels in the geological and historical past are of especial importance for archaeology (Chalov, 1996).

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To varying degrees, the results of fluvial studies are used in almost all types of archaeological research. For example, the description of the location of an archaeological site inevitably contains information concerning its spatial relationship with parts of the river landscape (most commonly, "fluvial terrace," "modern day channel" or "oxbow lake"). In the two recent decades, the results of this field have been actively used in alluvial archaeology (Alluvial Archaeology..., 2003) and fluvial geoarchaeology (Goldberg, Macphail, 2006: 117), operating from the viewpoint of environmental studies, landscape archaeology, and geoarchaeology. Four main trends have emerged in the application of riverbed geomorphology, primarily aimed at the reconstruction of the history of river landscapes and its correlation with the chronology of important paleoecological events: (1) the impact of fluvial processes and floodplain formation on the settlement of human groups and their adaptation to local landscapes (e.g., (Waters, Raversloot, 2001; Brunet et. al., 2004; Bronnikova et al., 2010)); (2) the environmental impact of human activities, particularly the food-producing economy with systems of irrigation and deforestation, including the nature and rate of erosion and accumulation processes associated with river valleys (e.g., (Chester, James, 1991; Bessonova, Klyuev, 2010)); (3) estimation of the region's potential for its subsequent research, including evaluation of the state of preservation of archaeological objects (areas of river erosion are estimated at different time intervals) and identification of potentially interesting sites which may yield buried deposits containing culturally significant objects; this is important not only in research but also for planning preservation measures for archaeological heritage (e.g., (Turnbaugh, 1978; Allen, Hey, Miles, 1997; Howard et al., 2008)); and (4) the reconstruction of local paleolandscapes and natural environments contemporaneous to sites associated with floodplain deposits, as well as establishing the origins of culture-bearing deposits (e,g., (Murasheva, Panin, Fetisov, 2009)).

Study area and the history of archaeological and geomorphological studies

The Vychegda River which is the largest tributary of the Northern Dvina, is a typical lowland river. Its basin is located in the northeast of the East European Plain (the southern regions of the Komi Republic and Arkhangelsk Province); the greatest part of the river flows through the Vychegda-Mezen lowlands, and only in its upper reaches crosses the folded and faulted structures of the southern slope of the low Timan Ridge. The total length of the Vychegda is 1131 km (Fig. 1).

Highly dynamic channel processes constituted the main factor of terrain formation during the Late Pleistocene/Holocene. These processes along with global and local climate change had a direct impact on the human occupation and settlement development of these territories. As far as geomorphology is concerned, the Vychegda channel and valley are distinguished by high changeability. The river is characterized by an intensively meandering alluvial channel lacking any lithological confinement of lateral migrations. In the Late Pleistocene and Holocene, just as at the present time, the river constantly changed its position at the bottom of the valley, eroding the floodplain, the adjoining terrace scarps and the sides of the valley. At the same time, the river formed new areas of floodplain, whose morphology was determined by the morphological type of the channel and the river's hydrological regime.

The area of field works conducted by 2011 covered two sections of the Vychegda valley characterized by the highest concentration of archaeological sites: (1) from Kortkeros village to Nebdino village (42 km); and (2) from Pozheg village to Lebyazhsk village (90 km). As a reference section, we selected an area stretching for 26 km from Kortkeros to Vazhkurya (Kortkeros Region of the Komi Republic). For this section, verified data on river channel geomorphology are supplemented by radiocarbon dates and the results of detailed analysis. In total, 17 archaeological sites of different periods and different cultures were discovered and researched to varying degrees. Most are associated with the surfaces of sandy fluvial terraces. The only exception is the site of Pezmog IV, where cultural remains were located in oxbow lake sediments buried under the modern alluvium at a depth of 3.8 m from the modern surface (Fig. 2).

G.M. Burov was the first to introduce methods of fluvial research into the study of the antiquities of the Vychegda basin. Burov conducted extensive reconnaissance activities in the river valley and gave a detailed physical geographical description (Burov, 1965: 12–45). Later, he presented a reconstruction of the Holocene history of the landscape and the natural environment of the ancient population inhabiting the area of Lake Sindor (Burov, 1967: 8–36). Floodplain deposits in the valleys of the rivers of Vis and Simva were studied in detail, pollen diagrams were made, and the development stages of the river channels were reconstructed on the basis of studies by I.S. Schukin (1960) and M.A. Velikanov (1958). Changes in landscape and climate were compared to archaeological events, periods when early human groups settled in the area.

Later, data on river channel geomorphology were only used in the archaeology of northeastern European Russia as rare exceptions. Only in the early 2000s, did A.V. Volokitin and Yu.A. Tkachev make an attempt to reconstruct how a section of the Vychegda channel

Fig. 1. Study area on the map of Eastern Europe.

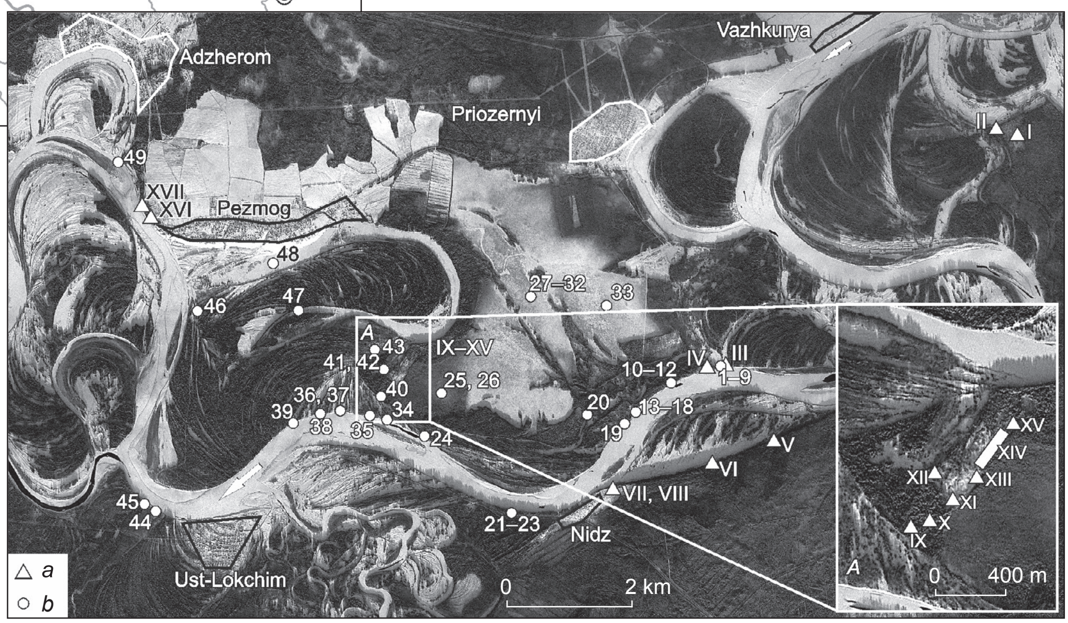

Fig. 2. Examined section of the Vychegda valley (satellite image Alos / Prism, resolution 2.5 m).
a – archaeological sites: I – Vazhkayag II, II – Vazhkayag I, III – Pezmog IV, IV – Pezmog II, V – Mortshuyaty II, VI – Mortshuyaty I, VII – Nidz II, VIII – Nidz I, IX – Pezmogty-1, X – Pezmogty-2, XI – Pezmogty-3, XII – Pezmogty-6, XIII – Pezmogty-4, XIV – Pezmog burial ground, XV – Pezmogty-5, XVI – Pezmog I, XVII – Pezmog III; *b* – sampling sites for radiocarbon analysis (the numbers correspond to the numbers in Table).

had developed with the purpose of determining the character of the formation of culture-bearing deposits and reconstructing the landscape surrounding Parch-1 and 2 which represent unique floodplain Mesolithic sites (Volokitin, Maiorova, Tkachev, 2003; Volokitin, Tkachev, 2004). In his study, Yu.A Tkachev used the findings of E.V. Shantser concerning the structure and formation of the alluvial suites of lowland rivers (Shantser, 1951, 1966).

As a result of systematic research conducted in the Vychegda valley between Priozernyi and Pezmog in 1999–2009 (Volokitin, Zaretskaya, Karmanov, 2006; Karmanov, 2008), questions arose that could not be solved solely by archaeological methods. Great interest was provoked by the location of the Early Neolithic floodplain site of Pezmog IV (Fig. 2, 3) and the topography of the Middle Neolithic dwellings of Pezmogty-1, -3–5 (Fig. 2, 4) located in depressions between dunes and separated by a ridge of the highest dunes from the marshes. Attempts to reconstruct the local paleolandscapes inhabited by the Neolithic population grew into a multidisciplinary study of the natural habitat where the ancient communities lived and their adaptation to the changing Holocene landscapes in the Vychegda valley (Karmanov et al., 2011).

Methods and approach

The application of geomorphological data on river channels in archaeological studies is most effective when applied within a wide geographical and chronological framework. Valid conclusions concerning the chronology and history of river channel development could only be made after examining of a comparatively long section of the valley. In our case, the reconstructed sequence of floodplain generations corresponded to the Late Glacial–Holocene and thus covered the entire history of the human occupation of the river valley.

According to recent data, the Vychegda River valley was periodically inhabited by small groups of ancient population starting from the Mesolithic (Arkheologiya..., 1997). Each period is characterized by the settlement of new groups in unpopulated or sparsely populated areas, which makes it possible to trace the forms and mechanisms

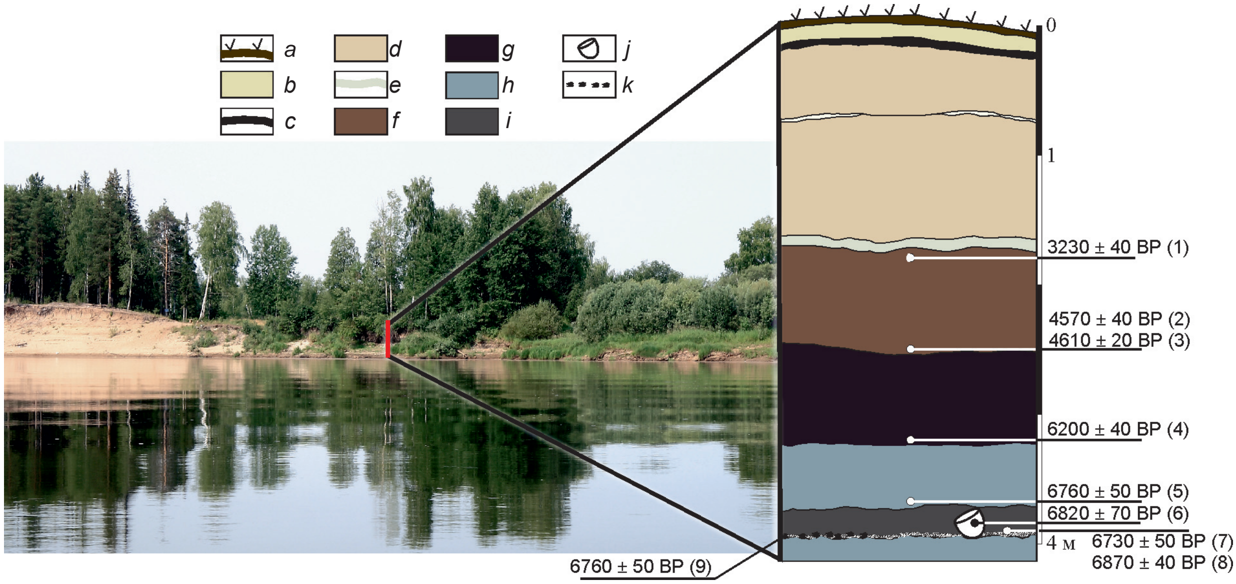

Fig. 3. Pezmog IV. View of the terrace and floodplain exposure, stratigraphy of the cross-section, and the results of the radiocarbon dating (the numbers correspond to the numbers in Table).
a – top soil; *b* – sand resulted from flooding; *c* – buried soil; *d* – sandy loam; *e* – clay loam; *f* – peat; *g* – loam with low peat concentration; *h* – clay; *i* – loamy peat with sand (culture-bearing sediments); *j* – fragments of ceramic vessel; *k* – charcoal pieces.

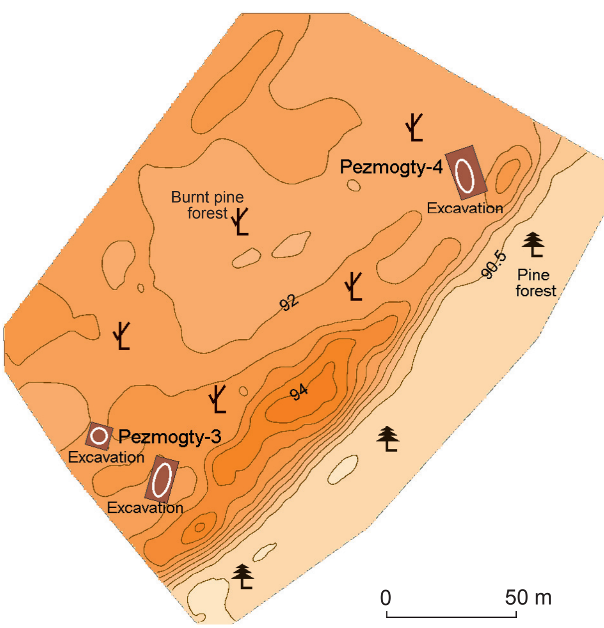

Fig. 4. Topography of the Neolithic dwellings at Pezmogty-3 and -4. Contour lines at 0.5 m interval.

of adaptation to changing climatic conditions used by newly arriving groups. Favorable opportunities for the reconstruction of adaptation mechanisms are provided by river landscapes since they retain the sequence of ancient landforms, thus creating a kind of chronicle of their development.

A relatively wide range of methods is used in paleochannel and, simultaneously, archaeological reconstruction. The modern trend is the further development and application of radiocarbon and luminescence dating of alluvial sediments in establishing a reliable chronology of natural events (e.g., (Howard et al., 2009; Housley et al., 2010)) and then synchronizing them with known historical events, as well as geophysical surveys (georadar sounding, electrometry), analysis of satellite imagery, aerial photographs, and cartographic material, usually with the help of GIS-technologies (e.g., (Bates M.R., Bates C.R., 2000; Rajani, Rajawat, 2011)). Generally, the set of methods and their hierarchy depends on the specific character of geographical and geological setting as well as on the historical development of the region under study.

Establishing the intense dynamics of channel processes in the Vychegda valley as the main factor for terrain formation in the Late Pleistocene–Holocene required a specific set of methods and techniques in terms of the geographical and chronological framework:

(1) mapping heterochronous archaeological objects and analysis of their spatial distribution;

(2) evaluating the information value of the available source base and the prospects for its further examination;

(3) analyzing satellite imagery and topographic maps;

(4) making geomorphologic maps showing the generations of various ages, floodplain segments, floodplain terraces, and locations of paleochannels at every stage of their development;

(5) field studies involving the excavation of archaeological sites and search for new objects, visual

examination of significant landscape components, in particular, dunes, paleochannels, natural levees, hollows, etc., the study of alluvial stratigraphy (drilling and inspection of exposures), sampling for radiocarbon dating from sediments significant to paleoecological reconstructions, particularly, from the base of peat layers (indicating the beginning of peat formation) and from the paleochannel infill (providing a date for when the channel was abandoned), taking samples for palynological and botanical analyses, OSL-dating, geophysical surveys for studying the morphology of paleochannel beds and stratigraphy of sand terraces;

(6) radiocarbon and OSL-dating of sediments forming floodplain and river terraces. Radiocarbon analysis of organogenic samples of different origin was used in particularly large scale. In our study, we used the results of dating for Late Glacial and Holocene sediment from oxbow lakes (mainly peat and peaty loam buried by younger generations of alluvium), the deposits of peat-bogs (fen peat and sphagnum peat from hand cores made in the swamp of Kalya-Nyur), and archaeological samples (soot on Early Neolithic potshards, charcoals from bonfires). During the subsequent analysis, we took into account the fact that peat accumulation in the abandoned paleochannels and hollows might not have begun immediately, but at some later date (depending on local conditions), so we selected a series of dates obtained for several samples to determine the age of each floodplain generation and the first fluvial terrace.

This set of methods ensures the mutual verification of results, warranting that reliable data is obtained. Moreover, the proposed set is not strictly limited; it may be supplemented with other methods and techniques which would be required by the materials obtained during the field studies.

Unless otherwise stated, all dates are given in uncalibrated radiocarbon years.

Results

The analysis of satellite imagery and large-scale topographic maps made it possible to identify seven heterochronous surfaces (generations) whose relief and structure captured the subsequent stage of river channel development in the Holocene, in the floodplain and on the lower terrace of the middle Vychegda (Fig. 5, 6). To determine the absolute age of these generations, the sediments were radiocarbon dated. A total of 49 dates were obtained (Table, Fig. 2). Working with the outline of the inundated low ridges and oxbow lakes as well as their location, it was possible to reconstruct the position of the river channel during the formation of six out of seven generations. A fragment of the seventh generation

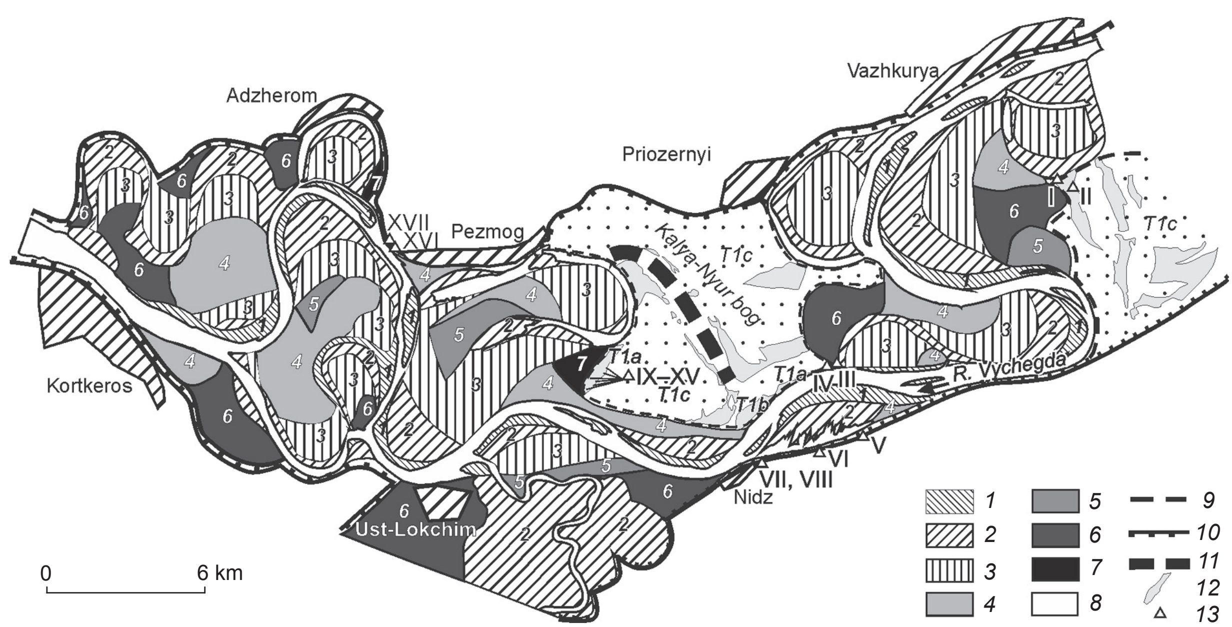

Fig. 5. Geomorphologic map of the Vychegda valley (Vazhkurya –Kortkeros) verified by radiocarbon data.
1–7 – floodplain segments: *1* – modern (late Sub-Atlantic, 1–0 ka BP), *2* – middle Sub-Atlantic (2–1 ka BP), *3* – early Sub-Atlantic (2.5–2.0 ka BP), *4* – Sub-Boreal (2.5–5.0 ka BP), *5* – middle–late Atlantic (7–5 ka BP), *6* – early Atlantic (8–7 ka BP), *7* – Boreal – Pre-Boreal (10–8 ka BP); *8* – modern river channel and oxbow lakes; *9* – scarp of the first fluvial terrace T1 (8–14 m, Late Valdai period, MIS 2) with age generations: T1a (9–10 m, 10.5–10.0 ka BP), T1b (13–14 m, 14.0–10.5 ka BP), T1c (8–10 m, > 14 ka BP); *10* – scarp of the second fluvial terrace (25–35 m, the end of the Moscow glaciation, MIS-6); *11* – paleochannels on the first terrace; *12* – non-waterlogged surfaces of the first terrace; *13* – archaeological site.

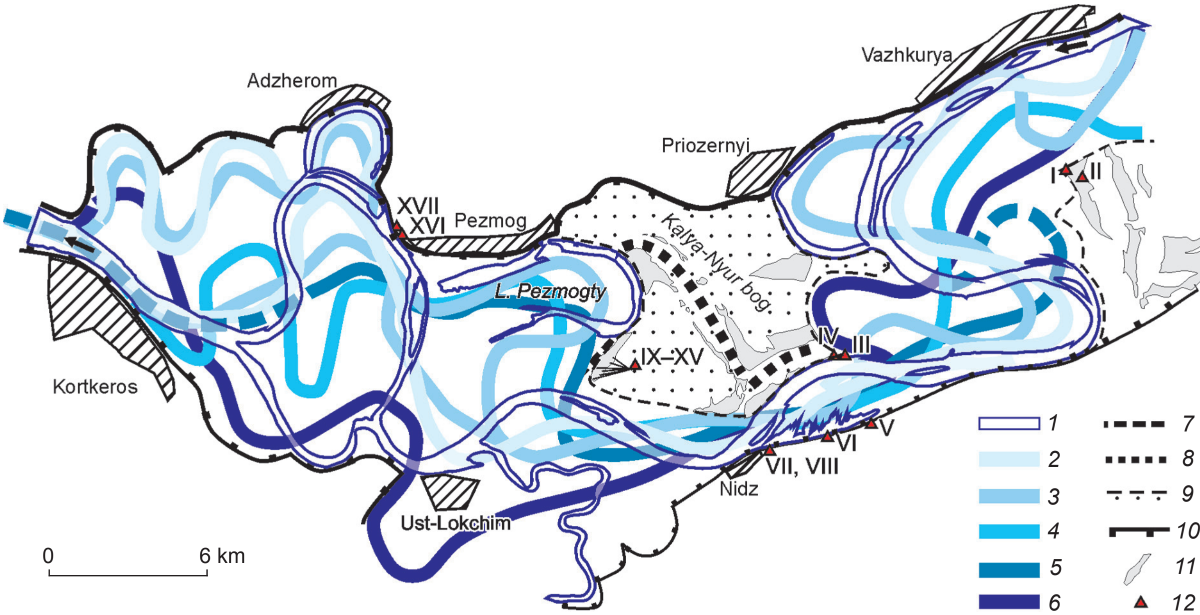

Fig. 6. Reconstructed locations of the Vychegda channel during the formation of different floodplain generations.
1 – modern channel of the Vychegda; *2* – second paleochannel generation (P2); *3* – third generation (P3); *4* – fourth generation (P4); *5* – fifth generation (P5); *6* – sixth generation (P6); *7* – seventh generation (P7); *8* – fragments of the pre-Holocene channels; *9* – scarp and surface of the first fluvial terrace; *10* – scarp of the second fluvial terrace; *11* – non-waterlogged surfaces of the first fluvial terrace; *12* – archaeological site.

was only found in one area of the floodplain, making it impossible to use it for the purpose of reconstruction. The same can be said of the scattered traces of an even more ancient channel on the remains of the first fluvial terrace. These stages in the development of the river landscape were compared with the data of a pollen analysis (Golubeva, 2010; Karmanov et al., 2011), resulting in the establishment of the space-time relationship of its various components and archaeological sites; in some cases the findings were unexpected (Fig. 7). The most interesting points are discussed below.

The formation of the first fluvial terrace occurred during the Younger Dryas 10,500–10,000 years BP under cold climate conditions. At that time, the surface of the terrace was covered by sparse patches of forest and was partly affected by wind action that constructed dunes parallel to the river channel of the time and perpendicular to the modern channel. The fundamental question is when these surfaces became stable. The OSL-date of 5850 ± 670 BP (GdTL-1167, astronomical years) obtained for upper horizons of the fluvial terraces indicates that a relatively thick layer of terrace alluvium was affected by wind action as early as in the second half of the Holocene.

However, a site of the Middle Vychegda Mesolithic culture – Pezmogty-6 (ca 9000 BP) – remained on one of the aeolian dunes running along the edge of the terrace which at that time adjoined the river channel (Fig. 5, 6, 7, *a*). Archaeological remains were found in the lower part of the podzolic layer and in the upper part of the illuvial horizon. The remains formed several clusters that reflect the structure of the ancient workshop-site. It should be noted, however, that most Mesolithic sites in the middle Vychegda valley are associated with the surface of the second fluvial terrace formed by fluvioglacial sands on the surface of the Vychegda (Moscow) moraine.

Thus, there were clearly several periods of aeolian reworking of sandy terraces at different sections along the terraces. It is possible that the activation of aeolian processes was fostered not only by general climatic conditions, but also by local conditions such as the exposure of some spaces to wind, which changed over the course of lateral river migrations. Targeted research would be required to establish the spatial and temporal patterns of such processes in the valley area.

Another example is the Early Neolithic site Pezmog IV located on the edge of the dead river channel of the Early Atlantic period of the Holocene, 15–20 m from the terrace slope cut by the channel (Fig. 5, 6, 7, *b*). Archaeological remains were found in the sediments of the oxbow lake facies of the alluvium (Fig. 3), which means that the paleochannel was already inactive at the time of the formation of the cultural layer. This layer lies just a meter above the low-water level and obviously reflects the seasonal (summer) activities of the ancient population, when river discharges were low. Only a portion of the site has been studied, but one can see that the main activities were carried out on the surface of the terrace. The exact position of the active channel of the

Radiocarbon dates for the study area*

No. on the map	Geomorphologic position	Lithology and stratigraphy	Depth, m	Dated material	Laboratory code (GIN)	^{14}C-date, BP
1	2	3	4	5	6	7
1	Pezmog IV, section of 2002	Paleochannel infill (top), horizon of brown peat	1.,75–1.8	Peat	12326	**3230 ± 40**
2	Same, floodplain, generation P6, paleochannel	Same	2.50–2.55	»	12325	**4570 ± 40**
3	Pezmog IV, section of 2009, floodplain, generation P6, paleochannel	Paleochannel infill, top	2.54–2.57	Peaty loam	14200	**4610 ± 20**
4	Same	Same, middle	3.25–3.28	Same	14201	**6200 ± 40**
5	Pezmog IV, section of 2002, floodplain, generation P6, paleochannel	Same, base	3.50–3.60	»	12324	**6760 ± 50**
6	Pezmog IV	Archeological context	3.6–3.8	Soot on the interior of potshards	11915	6820 ± 70
7	Pezmog IV, section of 2009, floodplain, generation P6, paleochannel	Paleochannel infill, base	3.58–3.90	Peaty loam	12322	**6730 ± 50**
8	Same	Same	3.58–3.90	Same	14202	**6870 ± 40**
9	Pezmog IV	Archeological context	3.70	Scattered charcoals	12324	6760 ± 50
10	Low terrace, generation T1b	Heavy loam interbedded with sand, channel inlet facies, top	12.5	Peaty loam	14189	**10,530 ± 80**
11	Same	Same, middle	12.8	Same	14190	**12,560 ± 80**
12	»	Same, base	13.2	»	14192	**13,890 ± 50**
13	»	Same	7.6–7.7	Wood	14019	**10,360 ± 30**
14	»	Same, top	6.78–6.80	Peat	14023	**11,430 ± 40**
15	»	Peaty loam, channel inlet facies, base	12.5	Peaty loam	14193	**11,000 ± 40**
16	»	Same	12.5	Wood	14194	**10,480 ± 50**
17	»	»	12.5	»	14195	**10,300 ± 50**
18	»	Same, top	10.8	Peaty loam	14198	**11,560 ± 50**
19	Floodplain, generation P5, inter-levee hollow	Peat filling the hollow, base	1.08	Peat	14199	**5150 ± 30**
20	Low terrace, generation T1a, paleochannel	Peaty loam of the paleochannel infill, base	3.55–3.7	»	14039	**10,400 ± 150**
21	Floodplain, generation P6, inter-levee hollow	Peaty loam, channel facies, base	4.40	Peaty loam	14203	**6550 ± 30**
22	Same	Same	4.9	Same	14204	**7,640 ± 40**
23	»	»	5.95	Wood	14205	**6,420 ± 140**

Table (end)

1	2	3	4	5	6	7
24	Floodplain, generation P4, inter-levee hollow	Peat filling the hollow, base	1.38–1.4	Peaty loam	14044	**4100 ± 30**
25	Low terrace, generation T1c	Peat bog, base	3.0–3.6	Peat	14025	8900 ± 30
26	Same	Same, middle	2.1–2.2	»	14027	5970 ± 20
27	Same, paleochannel (older part), peat bog	Same	2.15–2.25	»	14035	3970 ± 40
28	Same	»	2.8–2.9	Wood	14033	4690 ± 40
29	»	»	3.15–3.25	Peat	14036	5020 ± 30
30	»	Same, base	3.4–3.5	Peaty loam	14031	5230 ± 50
31	»	Same	4.0–4.1	Peat	14037	5900 ± 40
32	»	Same, base	4.35–4.45	»	14038	8550 ± 40
33	Low terrace, generation T1c	Same	3.8–3.9	»	14034	7880 ± 60
34	Floodplain, generation P4, inter-levee hollow	Peat filling the hollow, base	1.03–1.05	Peaty loam	14043	1720 ± 20
35	Same	Same	0.42–0.44	Same	14182	840 ± 40
36	Same	Same, middle	0.6	Peat	14184	1700 ± 30
37	»	Same, base	0.95	Peaty loam	14185	**3200 ± 40**
38	»	Same	0.75	Same	14041	2270 ± 40
39	»	»	1.45–1.55	Wood	14186	940 ± 40
40	Pezmogty-1A	Archeological context	0.28	Coal fragments from the hearth	11914	5840 ± 100
41	Floodplain, generation P7, paleochannel	Peaty loam of the paleochannel infill, base	3.0–3.1	Peat	14029	**9490 ± 50**
42	Same	Peaty loam from the hollow infill, base	1.67–1.82	Peaty loam	14189a	**8860 ± 70**
43	Floodplain, generation P3, inter-levee hollow	Same	3.15–3.25	Same	14030	**2380 ± 130**
44	Floodplain, generation P4, inter-levee hollow	Peat filling the hollow, base	1.55	»	14048	3240 ± 40
45	Same,	Same	1.43–1.45	»	14047	3720 ± 70
46	Floodplain, generation P2, inter-levee hollow	Peaty loam from the hollow infill, base	1.8	Wood	14187	**1820 ± 110**
47	Floodplain, generation P3, paleochannel	Peaty loam of the paleochannel infill, middle	0.82–0.94	Plant remains	14183	860 ± 70
48	Same, oxbow lake Pezmogty	Silts of oxbow lake infill, base	2.9–3.0	Gyttja	14039a	**2170 ± 100**
49	Floodplain, generation P7, inter-levee hollow	Loam of overbank facies	0.15–0.24	Wood	14206	**9460 ± 40**

*Dates indicative of the age of the alluvial surface are set in bold.

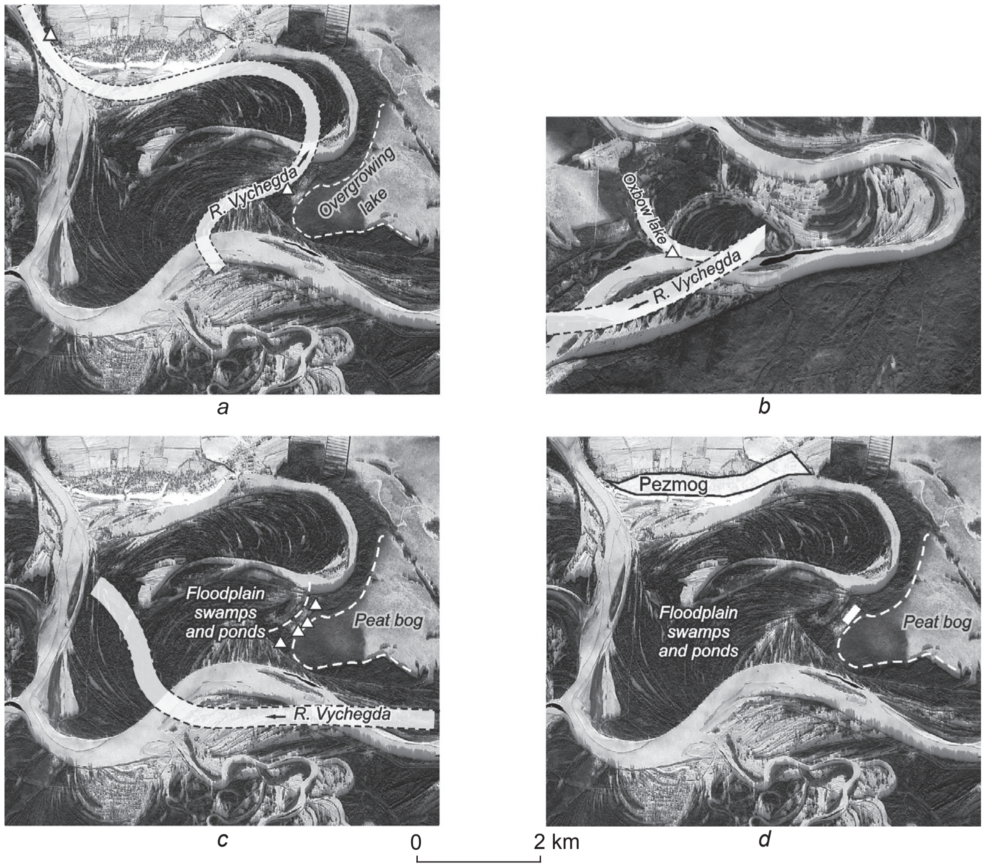

Fig. 7. Archaeological sites and concurrent positions of the Vychegda River.
a – Mesolithic site (9.0 ka BP); *b* – Early Neolithic site (6.8 ka BP); *c* – Middle Neolithic seasonal dwellings (5.9–5.8 ka BP) and the Early Bronze Age flint workshop (4.5–4.0 ka BP); *d* – Late Iron Age burial ground (12th–13th century AD) and the modern situation (Pezmog village founded at the end of the 16th century).

river at that time cannot be determined, however, it was evidently located within the zone of channel deformations during the past 2000 years. Since the site has been exposed at the floodplain bank as a result of present-day lateral erosion of the river, the channel might have been at some distance from the site (Fig. 7, *b*).

The Middle Neolithic population erected dwellings (Pezmogty-1, -3–5, Lyalovo culture, 5800–5900 BP) at the edge of the terrace adjoining a lake which had already become swampy at that time (Fig. 5, 6, 7, *c*). According to paleogeomorphological reconstructions, these dwellings were located at a significant distance from large bodies of water, indicating that the dwellings must have functioned in winter. If the proposed reconstruction is correct, it could change our understanding of the settlement of the region and the subsistence system of its Neolithic inhabitants. In similar conditions, the population of the Early Bronze Age (3rd millennium BC) created a flint workshop in an aeolian depression. However, it might have functioned at a distance from streams or other water sources using floodplain and wetland ponds as water sources even in the warm season.

In the Late Iron Age (12th–13th centuries AD), a cemetery was located on the surface of the dunes at the eastern edge of the terrace adjoining the waterlogged forest (Fig. 5, 6, 7, *d*). Geomorphological conditions in this area were similar to present-day conditions: oxbow Lake Pezmogty already existed, which emerged 2200–2100 years BP, and the channel of the Vychegda was located 1 km from the burial ground. The location of the burial ground is concordant with the ritual practices of the ancestors of the Komi-Zyryans, bearers of the Vym archaeological culture.

Discussion

In some cases, the results of the study were unexpected and so require verification in further studies. For example, establishing when terrace surfaces stabilized is of crucial importance, since the aeolian impact on the surfaces undoubtedly affected the preservation of archaeological objects. Generally speaking, data concerning the location of heterochronous floodplain generations enable the archaeologists to conduct targeted surveys of the areas in search of archaeological sites (for instance, a settlement contemporaneous with the burial ground) and especially those associated with alluvial deposits.

Certain “pitfalls” were identified in the process of overlapping research in the disciplines of archaeology, fluvial geomorphology, and geochronology, which should be borne in mind in the further research. Some discrepancies were observed between time resolutions in archaeological and paleofluvial studies. Whereas archaeological materials can indicate the existence of a settlement during a single season, or a one-act production complex, geomorphological and geochronological data do not allow for conclusions to be drawn with regard to such short-term events. However, this is balanced out by the fact that the chronology of archaeological sites, based on the comparative-typological method or radiocarbon analysis, is determined for the Stone Age and the Early Metal Age within at least a hundred year period.

Tight correlation between the spatial position of archaeological objects and contemporaneous landscape elements (typically, terrace shelves with surrounding abandoned and buried river channels or functioning streams and water bodies) is based on the stereotype, according to which prehistoric settlements, especially those of the Neolithic and Bronze Age, had to be located within the vicinity of streams or other water sources as essential components of the subsistence system. Our research reveals the possibility of finding Middle Neolithic dwellings located at a distance from water sources. Although so far such cases are only sporadic, they must be borne in mind in future research.

In some parts of the river valley heterochronous paleochannels may overlap. However, the likelihood that the river would flow exactly through an abandoned channel is negligible, since rivers change in hydrological regime, depositional environment, and vegetation. The particular topography of archaeological sites, such as their location on relatively narrow areas of terrace remnants or terrace promontories, may hinder drawing accurate conclusions concerning the spatial relationship between archaeological sites and a specific generation of the floodplain.

Conclusions

These are the results obtained from the study of a small section of the Vychegda valley. Undoubtedly, expansion of the research area would make it possible to reconstruct the paleogeographic background to settlement processes in the river valley in greater detail. The present findings may also be supplemented and possibly adjusted. However, it is clear that the use of paleofluvial methods (geomorphology of the river channel) in the archaeological study of the selected section effectively and significantly improves the quality of the source base.

Not all river valleys are characterized by such landscape changeability, but most rivers, particularly those located at the confluence of tributaries, have areas with active channel dynamics and, therefore, our approach may be applied to their study. Three main areas can be identified in which the data of fluvial studies can contribute to archaeological research: (1) issues surrounding early human adaptation to changes in natural habitat; (2) identifying areas of river valleys promising for the location of archaeological sites; and (3) planning programs for the preservation of archaeological heritage.

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