ENVIRONMENT OF THE RAZDORSKOYE MULTILAYER SETTLEMENT (ROSTOV REGION, SOUTHERN RUSSIA)

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The area of southern Russia between the northern shore of the Black Sea and Caspian Sea includes steppe and desert-steppe belts which form a contact zone between the forests of the Caucasus and Eurasian steppes. The climate is dry and continental. The mean annual temperature is $+ 5°C$, the January temperature varies between $-3°C$ and $-7°C$ and the mean July temperature between $+ 19°C$ and $+ 23°C$. The annual frost-free period is 165–195 days and annual precipitation 400–600 mm. A major part of the area is occupied by arable and pasture land.

Site description

The *Razdorskoye multilayer settlement* (47°33'N, 40°40'30"E) in the lower part of the River Don valley was excavated in 1984–1985 by an expedition from Rostov State University led by Dr. V. Ya. Kiyashko (Kiyashko 1987). The settlement is situated close to the Razdorskaya stanitsa, on the right bank of the River Don which belongs to an area of herb-grass steppes. The River Don floodplain, near the Razdorskoye settlement, is vegetated mainly by poplars (Populus). Black alder (*Alnus glutinosa* Gaertn), hazelnut (*Corylus avellana* L.) and oak (*Quercus robur* L.) also grow there up to the mouth of the Severskiy Donetz River about 40 km northward from the Razdorskoye settlement. Scots pine is now absent in the Rostov region. There are birch forests and a few artificial pine plantations on the sandy terraces of the River Don. The nearest natural pine forest is situated on the sandy terrace of the Severskiy Donetz River in the Kharkov region of the Ukraine (ca 49°N, 37°E).

The slopes of the Don valley near the settlement area are covered by herb vegetation typical of disturbed land, particularly Chenopodiaceae and wormwood (Artemisia). Overgrazing by sheep and cattle has led to an increase of disturbed land and a decline in the pollen productivity of the vegetation. Reed-mace (*Typha*) grows in wet areas near springs. The River Don floodplain is used for crops.

Cultural layers of the Razdorskoye settlement lie on deluvial deposits. The land surface is 8 m above the river stream level. In cross-section the layers resemble a puff pie with a gradual transition from dark to light brown. Dark brown cultural layers with artefacts (ceramics, flint tools and flakes, animal bones) alternate with light brown sterile layers. In 1984–1985 the excavated area ran 30 m along the river, the thickness and degree of preservation of different cultural layers varying markedly in different parts of the settlement. Figure 1 summarises the stratigraphy of the settlement section. Archaeological identification of layers and age estimation from archaeological data were made by Dr. V.Ya. Kiyashko with reference to published data (Kiyashko 1987). Two radiocarbon samples were dated in the Isotope Laboratory of the Institute of Geography in Moscow.

	N of layer	Depth, cm	Lithology	Archaeological culture	Age, years BP
	1	0-20	Sandy loam	sterile	
	2	20-68	Sandy loam	Saltovskaya	1000-1100
	3	68-108	Loam	sterile	
	4	108-195	Sandy loam	Scythian-sarmatian	2200-2400
	5	195-217	Sandy loam	sterile	
	6	217-240	Sandy loam	Belozerskaya	2900-3100
	7	240-275	Sandy loam	sterile	
	8	275-295	Sandy loam	Srubnaya	3200-3400
	9	295-310	Loam	Katakombnaya	3700-3800
	10	310-330	Loam	sterile	
	11	330-350	Loam	Late Yamnaya	4000-4200
	12	350-375	Loam	sterile	
	13	375-405	Loam	Konstantinovskaya	4300-4600
	14	405-424	Loam	sterile	
	15	424-445	Loam	Maikopskaya	4490$\pm$180
	16	445-475	Loam	sterile	
	17	475-495	Loam	Maikopskaya	4500-5000
	18	495-525	Loam	sterile	
	19	525-540	Loam	Srednestogovskaya	5000-5200
	20	540-564	Loam	sterile	
	21	564-576	Loam	Khvalynskaya	ca 5500
	22	576-608	Loam	sterile	
	23	608-624	Loam	Mariupolskaya	5500-6500
	24	624-640	Loam	sterile	
	25	640-656	Loam	Mariupolskaya	5500-6500
	26	656-670	Loam	sterile	
	27	670-690	Loam	Rakushechnoyarskaya	9470$\pm$310

Figure 1. Summary stratigraphy of the multilayer settlement Razdorskoye

Results of pollen investigations

Figure 2 shows a pollen diagram for the Razdorskoye settlement. The numbers of each layer are given in the first column of Figure 1. The uppermost sample in the diagram fits well with the general composition of present day vegetation in the settlement area. The percentage of arboreal pollen of the total pollen spectrum is only 0.5%, which is normal for a steppe belt. A single pollen grain of *Alnus* was probably brought in by the wind. Chenopodiaceae (85.5%) and *Artemisia* (8%) predominate among the non-arboreal pollen. Other taxa are represented by several or single pollen grains.

In the pollen diagram (zones 1 and 2) the relative tree pollen frequency, mainly *Pinus* pollen, is relatively high. Pollens of birch, alder, hazel, oak, linden, hornbeam and elm are also registered. The structure of pollen spectra suggests a larger forest area than exists today in the lower part of the River Don basin. Among herb frequencies Compositae exceeds that of Chenopodiaceae.

The lowermost sample (pollen zone 1; Fig. 2) corresponds to the layer of the Neolithic Rakushechnoyarskaya culture (9470±310; IGRAS -722) (layer 27). In this zone tree (mainly pine) pollen reaches its maximum value and herb pollen frequencies are correspondingly low. Pollens of Brassicaceae, Poaceae, Ranunculaceae and some other herbs are registered occassionally.

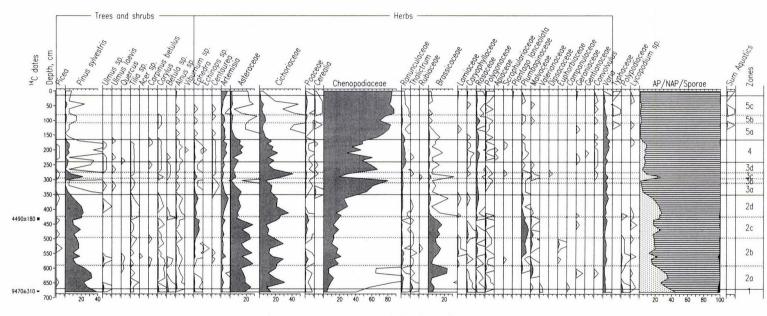A long hiatus exists between pollen zones 1 and 2.
Subzone 2a corresponds to the layers of the Neolithic Mariupolskaya culture (6500–5500 BP) (layers 23–26). The arboreal pollen frequencies are somewhat lower than in pollen zone 1. There are no major differences in the herb pollen composition compared with pollen zone 1. Maximal numbers of Brassicaceae and Malvaceae pollen grains are registered. Subzone 2b (layers 18–22) corresponds to the layers of the Srednestogovskaya and Khvalynskaya cultures (5500–5000 BP) and shows a decline in the *Pinus* pollen curve. Relative pollen frequencies of broad-leaved trees are higher than in subzone 2a. Pollens of *Quercus*, *Carpinus betulus*, *Corylus*, and *Alnus* are registered. In the herb pollen spectra the Brassicaceae pollen curve declines and that of Plumbaginaceae rises. Subzone 2c (layers 15–17) corresponds to the layers of the Maikopskaya Eneolithic culture (5000–4500 BP). Layer 15 is dated to 4490±180 (IGRAS–723). The ratio between arboreal and herb pollen remains the same as in subzone 2b, but pollen of deciduous trees is less abundant. In the herb pollen spectra maximum contents of Plumbaginaceae and *Ephedra* are registered. Subzone 2d (layers 12–15) corresponds to the layer of the Eneolithic Konstantinovskaya culture (4600–4300 BP) and shows a slight rise in the pine pollen curve.

Pollen zones 3 and 4 correspond to the Subboreal chronozone.
Pollen zone 3 shows a sharp decline in the arboreal pollen curve, a steep rise in the Chenopodiaceae pollen curve, and a slight decrease in the Compositae curve. All these features are pronounced in subzone 3a (layers 10–11) which corresponds to the layer of the Late Yamnaya Bronze Age culture (4200–4000 BP). Here, for the first time, *Cerealia* pollen is registered. Subzone 3b (layer 9) corresponds to the layer of the Bronze Age Katakombnaya culture (3800–3700 BP). Here the content of arboreal pollen is minimal, but the amount of Chenopodiaceae pollen is instead at its maximum. Subzone 3c (layer 8) corresponds to the layer of the Bronze Age Srubnaya culture (3400–3200 BP). In this subzone peaks of pine pollen and Compositae occur, and a decrease in Chenopodiaceae pollen content is registered. Subzone 3d (layer 7) corresponds to a sterile layer above the layer of the Srubnaya culture.

Pollen zone 4 (layers 5–6) corresponds to the layer of the Bronze Age Belozerskaya culture (3100–2900 BP). and shows some increase in arboreal pollen content. *Quercus, Tilia, Ulmus, Carpinus, Corylus, Alnus and Viburnum* pollens are registered.

Figure 2. Pollen diagram of Razdorskoye settlement 47°33' N, 40°40'30" E

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Among herb pollens a rise in Rosaceae, Ranunculaceae, and a decline in Chenopodiaceae were observed. *Cerealia* pollen was identified.

Upper pollen zone 5 corresponds to the Subatlantic chronozone. The pollen spectra of this zone resembles the surface sample. Chenopodiaceae predominates among pollen taxa. Subzone 5a (layer 4 in Figure 1) corresponds to the layer of the Scythian-Sarmatian culture (2400–2200 BP). Subzone 5b (layer 3) corresponds to the sterile layer above the layer of the Scythian-Sarmatian culture. The pollen frequencies of Chenopodiaceae are lower than in subzone 5a. Upper subzone 5c (layer 2) represents the layer of the Saltovskaya culture (1100–1000 BP) and shows a permanent presence of *Cerealia* pollen.

Reconstruction of the environment

In the Boreal and Atlantic periods, up to beginning of the Subboreal chronozone (9500–4300 BP) pine forests including birch grew on the sandy terraces of the Rivers Don and Severskiy Donetz, and in the Donetsko-Kundriuchinski and Tsymliansky sand massifs. Birch and broad-leaved oak, linden, maple, elm (*Ulmus campestris, U. laevis*) and hazelnut grew in the floodplain of the River Don, while black alder forests grew in wet planes. The presence of *Carpinus betulus* L. pollen suggests that it was directed into the lower parts of the Don and Severskiy Donets river basins. Taxa of the Compositae family as a whole are more exigent of humidity than those of the Chenopodiaceae.

At the beginning of the Boreal chronozone (9500 BP) the spread of pine forest with birch was maximal on the sandy terraces of the Rivers Don and Severskiy Donets. Broad-leaved elm, linden with hazelnut, black alder and birch forest grew in the floodplain of the River Don. Grass-herb steppes grew on watersheds. Herb vegetation with a high content of taxa typical of a disturbed environment grew near the settlement.

In the second half of the Atlantic and the beginning of the Subboreal chronozone (6500–4300 BP) grass-meadow vegetation with a high content of taxa typical of disturbed land has normally been found near the settlement. Pine forest with birch grew on sandy terraces of the Rivers Don and Severskiy Donets. Broad-leaved linden and elm with hazelnut and black alder dominated in the River Don floodplain. The period between 5500–5000 BP was less favourable for pine forests growing on sandy terraces. Oak and hornbeam were present in broad-leaved forests. Within 5000–4600 BP the area of forests in the River Don floodplain diminished slightly. The period between 4600 and 4400 BP was more favourable for pine and broadleaved trees.

In the Subboreal chronozone the climate deteriorated and became drier. Aridity reached its maximum value between 4200 and 3700 BP. At that time the area of pine and broad-leaved valley forests sharply declined. Dry grass steppes progressed to the north and north-west. Saline soils also expanded. From 4000 BP onwards farming was practised in the River Don floodplain. A slightly better climate prevailed during the period 3400–3200 BP. Around 3100–2900 BP pine forests still persisted on sandy terraces. Hornbeam was still present in the broad-leaved valley forests. A brief phase of humid climate began, and finds of *Cerealia* pollen suggest that farming played an important role in the economy of the Bronze Age Belozerskaya culture. Present day vegetation and climate were established around 2500/2400 BP and pine forests disappeared. The area of floodplain forests diminished and the richness of species declined. Herb-grass steppes grew on watersheds. Human influence on ecosystems was highest during the periods of the Scythian-Sarmatian culture (2400–2200 BP) and in early Medieval times, during the epoch of the Saltovskaya culture (1100–1000 BP).

Human impact on vegetation

In the preagricultural period, human impact on the environment was very local. Although agriculture and the penetration of cattle-breeding into the Russian south plain began already in the first half of the Atlantic chronozone around 7500–7300 BP, their larger expansion did not occur before the second half of the chronozone. A complex economy was typical of Neolithic and Eneolithic cultures. Hunting, fishing and collecting held a significant position up until the Bronze Age.

During the Bronze Age, settlements of bronze-smelters and their workshops appeared in southern Ukraine. Bronze-smelters used local wood. Dwelling sites of Sabatinovska (3500–3200 BP) and Belozerska (3100–2900 BP) cultures have been excavated in the area of the Lower Dniepr sands (Berezanskaya, Sharafutdinova, 1985; Otroschenko, 1985). The Belozerska culture on the Lower Dniepr sands was obviously the centre of bronze working in southern Ukraine, which is understandable from the palaeogeographical point of view (Kremenetski, 1995). Another centre of metallurgy was in East Ukraine. Near the town of Artemovsk in the Donetsk region (approx. 48°40'N, 38°E) 10 Bronze-Age copper mines and six dwelling sites of bronze-smelters from the Srubnaya culture (ca 3200–3000 BP) have been investigated (Tatarinov, 1977). The decrease in forest area in the lower part of the Dniepr and River Don valley is conspicuously demonstrated in the pollen data (Kremenetski, 1997). This has been partly caused by human activity, particularly that of bronze-smelters. *Pinus sylvestris* diminished in the steppe zone in southern Ukraine and Russia largely because of increased human impact upon ecosystems.

References

Berezanskaya, S.S., Sharafutdinova, I.N. 1985. Sabatinovska culture. In: D.Ya. Telegin (Ed.), Archaeology of Ukrainian SSR, v. 1, "Naukova dumka", Kiev. 489–499 (in Russian)

Kiyashko, V.Ya. 1987. Multilayer settlement Razdorskoye I in low part of Don River valley. Kratkie soobschenia Instituta archeologii 192. 73–80. (in Russian)

Kremenetski, C.V. 1995. Holocene vegetation and climate history of the southwestern Ukraine. Review of Palaeobotany and Palynology, V. 85. 289–301.

Kremenetski C.V. 1997. Human impact on the Holocene vegetation in the South Russian plain. In: J. Chapman & P. Dolukhanov (Ed.), Landscape in Flux in Prehistoric and Ancient Europe. Oxbow Books, Oxford. (in press)

Otroschenko, V.V. 1985. Belozerska culture. In: D.Ya. Telegin (Ed.), Archaeology of Ukrainian SSR, v. 1, "Naukova dumka", Kiev, 519–526. (in Russian)

Tatarinov, S.I. 1977. On the Bronze age mine and metallurgic centre in Donbass region. Soviet archaeology 4. 192–207. (in Russian)