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The Peopling of the Baraba Forest-Steppe in the Neolithic: Cranial Evidence

On the basis of statistical analysis of craniometric data relating to Mesolithic and Neolithic samples from northern Eurasia, we discuss the peopling of the Baraba forest-steppe in the Early Holocene. This region is represented by samples from Sopka-2/1 (early sixth millennium BC), Protoka (late fifth to early fourth millennia BC), Korchugan (early-mid sixth millennium BC), and Vengerovo-2A (late sixth millennium BC). The results of the principal component analysis are interpreted in the context of debates over the role of autochthonous traditions in the Neolithic. During the Preboreal period (10 ka BP), large parts of the Baraba forest-steppe were flooded by the transgression of lake systems during climatic warming. This may have caused depopulation, lasting for at least a millennium. The Early Holocene people of Baraba were an offshoot of Meso-Neolithic populations of the northwestern Russian Plain. On that basis, the Early Neolithic populations of Baraba were formed. Direct population continuity is traceable only through the Chalcolithic. Since the late sixth millennium BC, however, the local population had incorporated migrants from the Pit-Comb Ware area in the central Russian Plain and, indirectly (via the Neolithic Altai), from the Cis-Baikal area.

Keywords: *Holocene, Neolithic, Baraba forest-steppe, migrations, craniometry, prehistoric reconstruction.*

Introduction

The earliest traces of human occupation of the Baraba forest-steppe, as evident from the radiocarbon dates for the mammoth bones from Volchya Griva, fall into the period between 14–11 ka BP (Zenin, 2002; 2003: 23). At this site, among bone remains of large mammals—mainly the mammoth—thirty-seven bone tools were found. Some lithic artifacts were also excavated at sites with faunal remains of Novy Tartas (8 spec.) and Vengerovo-5 (10 spec.), whose age is estimated to be similar to that of Volchya Griva (Zenin, 2003: 16). It is suggested that the archaeological layers of those sites containing the fauna had formed at the location of a natural mineral animal salt lick, which attracted animals coming to compensate for the deficiency of important macro- and microelements and dying from natural causes. Such a source of nutrients and valuable mammoth bone could attract Paleolithic humans, and ancient hunters were likely visiting the site as well.

This time was a part of the late glacial period that followed the Sartan glaciation, whose maximum stage is dated to the 23–16 ka BP, while its peak occurred between 20 and 18 ka BP (Arkhipov, 1997). A modern reconstruction of the environmental conditions of the Sartan period in the central West Siberian Plain has shown that lakes of thermokarst origin were an important component of the terrain. Such lakes were formed, not owing to the retreat of glaciers, but as a result of the melting of underground ice-sheets (Kuzmin et al., 2006). It is plausible that during this period the vast wet plain provided good living conditions for large herbivores—an important resource for human subsistence.

In the territory of Baraba, no Early Holocene sites containing traces of human presence have been detected. Probably, the change of climate from cooling (Younger Dryas) to warming (Preboreal period) led to a transgression of lake systems and flooding of vast territories, which resulted in migration of the population to other areas (Orlova, 1990: 100).

The climate of the central West Siberian Plain in the Boreal period, 9–8 ka BP, was similar to the modern. During the whole Boreal period, the proportion of birch in the composition of the woody vegetation was increasing (up to 85–95 %), and birch forest-steppe was forming (Ibid.: 112). This was the time of the first appearance of humans in the region.

The beginning of the Neolithic can be dated to the 7th millennium BC, according to radiocarbon dates obtained for the Neolithic assemblage of the multilayered site of Tartas-1 (Molodin, Reinhold, Mylnikova et al., 2018; Molodin, Nenakhov, Mylnikova et al., 2019). Similar archaeological artifacts were excavated at Ust-Tartas-1 (Molodin, Kobeleva, Mylnikova et al., 2017). Studying those items has led to the separation of an Early Neolithic Barabinskaya archaeological culture, which is specific to the southern West Siberian Plain. An important marker of the culture is flat-bottomed ceramic vessels.

The pottery from Tartas-1 and Ust-Tartas-1, according to the researchers who studied the sites, finds direct parallels in the ceramics found at the Avtodrom-2/2 settlement, located in close proximity to Tartas-1 and Ust-Tartas-1, on the very same terrace of the Tartas River. However, Avtodrom-2/2 was assigned to the Boborykino culture of the Tobol-Ishim region and is considered as evidence of infiltration of populations from the middle Trans-Urals to Baraba (Bobrov, Marochkin, Yurakova, 2012). The radiocarbon dates obtained from the carbon deposits on the pottery from Avtodrom-2/2 fit into the period from the early 5th millennium BC to the middle thereof (Mosin, Bobrov, Marochkin, 2017). According to V.I. Molodin, these dates are biased (too late) because of the imperfections of the dating method. He considers the origin of flat-bottomed vessels in Baraba as autochthonous and convergent. This view is based on the wide prevalence of this pottery tradition throughout Neolithic Eurasia (Molodin, Kobeleva, Mylnikova et al., 2017: 175; Molodin, Reinhold, Mylnikova et al., 2018: 49). The upper dates of the Early Neolithic complexes of the Baraba forest-steppe reach the turn of the 6th millennium BC. No Early Neolithic human skeletal remains have been found in Baraba to date.

A marked similarity between artifacts (stone, bone, and pottery) from Baraba and from the Tobol-Ishim region was noticed by V.A. Zakh (2018: 25). This author admits the possibility of attributing the Boborykino-Koshkino finds to the second half of the 7th millennium BC on the basis of the dates obtained from the human and animal remains and pottery found at the Mergen-6 settlement (Ibid.: 26). This confirms the hypothesis of the existence of genetic connections between the populations of Baraba and the Tobol-Ishim region.

The following development of the Neolithic traditions in Baraba had been taking place from the 6th to the 5th millennia BC (Marchenko, 2009; Molodin, Mylnikova, Nesterova, 2016). The cultural attribution of archaeological sites belonging to this period remains a matter of debate. Human skeletal data were excavated at Protoka, Sopka-2/1, Korchugan, and Vengerovo-2A cemeteries. According to N.V. Polosmak, the Protoka site can be attributed to the Middle Irtysh culture (Polosmak, Chikisheva, Balueva, 1989: 29). Molodin upholds the view according to which the synthesis of elements typical of the archaeological cultures of Baraba reflects their composite nature (2001: 27). But he considers all the cultural traditions to be parts of the same historical and cultural community ranging from the Trans-Urals to the Ob region. The Protoka, Sopka-2/1, and Korchugan sites, according to Molodin, display a similarity to Neolithic sites of the Ob region, and might belong to the Upper Ob culture (Molodin, Chikisheva, 1996: 186). The Neolithic Vengerovo-2/A burial site has been the subject of a complex multidisciplinary survey, including studies of its burial tradition, grave goods, skeletal morphology and mitochondrial genome of the deceased. Nevertheless, the cultural affiliation of the site has not yet been clearly determined and is only considered as a result of the interaction of different cultural traditions (Molodin, Mylnikova, Nesterova, 2016).

At the Avtodrom-2 settlement in Baraba, manifestations were detected of the Artyn culture, which existed in the middle to late 5th millennium BC. Its area also included the Middle Irtysh and the southern part of the Vasyugan region (Bobrov, 2008;

Bobrov, Marochkin, 2011; Bobrov, Marochkin, Yurakova, 2017). No cranial data representing the population of this culture are available for study.

Thus, the differentiation between indigenous and introduced cultural traditions has always been the focus of the discussion about the formation of the Neolithic cultural system in the Baraba forest-steppe. An ethno-cultural peculiarity of this region is that it was populated late as compared to many other parts of Eurasia, owing to the flooding that lasted at least a thousand years. Humans undoubtedly migrated to Baraba from the outside, bringing with them cultural traditions formed in their places of origin. These traditions, including pottery-making, were then transformed under new conditions. The dominating thesis of the conception of the genesis of Mesolithic and Early Neolithic cultures of Western Siberia is the indigenousness of the populations making flat-bottomed pottery (Molodin, Reinhold, Mylnikova et al., 2018) If this thesis is viewed at the scale of Western Siberia as a whole, it is almost indisputable. The first groups of people that began to populate Baraba during the Boreal might have come from neighboring areas of Western Siberia, where ecological conditions did not preclude human occupation. However, migrations from other Eurasian regions that were not depopulated in the Mesolithic and not separated from Baraba by impenetrable geographical barriers were potentially feasible as well.

The formation of the ethno-cultural and anthropological (racial) structure of the population of the Baraba forest-steppe during subsequent phases of the Neolithic might have been based on the interaction between relatively isolated local populations originating from the Early Neolithic people (i.e. autochthonous component) and migrants. Those migrations might, in turn, have had stable or varying origins. In the present study, we aimed at reconstructing the picture of human colonization of Baraba employing methods of analysis of complexes of cranial metric traits in the samples from the Neolithic sites of the region. Such morphological complexes are chronologically stable. This thesis is confirmed, first, by the observed temporal dynamics of the modification of traits. Substantial changes require a long time to occur. For instance, the trend towards gracilization (i.e. decrease in the robustness of cranial vault and the total size of facial skeleton) is evident when Mesolithic and Neolithic cranial samples are compared with those of the Late Medieval period. But another trend, towards the spread of brachycephalization (i.e. increase in cranial index), can only be traced from the Middle Ages to the Modern period (Alekseev, 2007: 495–505). Second, it is established that migration itself cannot lead to a change in the physical type of a population if the migrating group has not experienced a substantial gene flow from other populations (Khrisanfova, Perevozchikov, 1991: 289). Also, a small group of migrants cannot seriously affect the gene pool of an indigenous population owing to a number of social barriers (Alekseev, 1976). On the basis of these patterns, we hypothesize that the human groups that migrated to Baraba could have retained the anthropological type of their father populations during at least the whole Neolithic period. Placing craniometric data for these groups into the context of modern radiocarbon dates of Eurasian Neolithic sites and the results of recent archaeological studies will make us closer to understanding the system of population affinities of the Neolithic Baraba people, which system is the key to describing the process of peopling of this region of Western Siberia.

Material and methods

Any analysis of paleoanthropological samples from the Neolithic sites of the Baraba forest-steppe is complicated by the fact that the specimens are highly fragmentary. Only single skulls are preserved enough to measure a sufficient set of variables. A possible solution could have been to combine all the specimens into one sample and then compare this sample with other cranial series compiled in a similar way, or with representative samples from large burial grounds. But such an approach does not match up to the purpose of our study, which is aimed at exploring the vectors of connections of the populations of the Neolithic archaeological cultures in chronological and territorial aspects. Taking into account these issues of preservation, we decided to use principal component analysis (PCA), which is well suited for studying individual variation. The analyses were carried out in Statistica 8.

Our comparative analysis included previously published data on the Neolithic sites from northern Eurasia more or less synchronous with the samples from Baraba. Unfortunately, not all of the Mesolithic and Neolithic sites from different regions contained human cranial remains. The output of PCA is a scatter plot where each specimen has particular coordinates (PC scores), and morphologically similar individuals lie close on the plot and form clusters. In order not to overwhelm the plots with excessively numerous units of analysis, we employed sample means of the variables for large samples. The choice of variables for the analysis was dictated by the state of preservation of the material, including single skulls, as cranial morphological features of individual ancient specimens are often extrapolated onto populations of vast areas. The set of variables employed in the present study includes: cranial index, minimal frontal breadth, forehead profile angle, bizygomatic breadth, upper facial height, nasal index, orbital index (from *maxillofrontale*), nazomalar and zygomaxillary angles, and general facial angle.

An important aspect of the anthropological study of ancient humans who created archaeological cultures is the reconstruction of their facial appearance. In this paper, the appearance of representatives of the Neolithic cultures of Baraba is illustrated in two different ways: by contour sketches of the skulls, and by graphical reconstructions using the method of M.M. Gerasimov.

Included in the statistical analysis were well-preserved skulls from four Neolithic sites from Baraba: Sopka-2/1, the first half of the 6th millennium BC (Marchenko, 2009); Protoka, the second half of the 5th to the first half of the 6th millennium BC (Orlova, 1995: 214); Korchugan, the second quarter to the middle of the 6th millennium BC (Molodin, Novikov, Chikisheva, 1999; Marchenko, 2009); and Vengerovo-2A, late 6th millennium BC (Molodin et al., 2012). Full craniometric data for the samples from those sites have been published previously (Chikisheva, 2012: 200–208; Chikisheva, Pozdnyakov, Zubova, 2015).

Reference data representing several regions were compiled from the literature. The Volgo-Ural region is represented by measurements of a male from a burial of the Elshanka culture at Lebyazhinka IV (Khokhlov, 2017: 219–220), and a female from a burial on the Mayak mountain, belonging to the transition between the Paleolithic and Mesolithic. Calibrated dates for these burials are 7475 ± 213 years BC (Timofeev et al., 2004: 32), and 11,175 ± 75 years BC (Khokhlov, 2017: 219–220), respectively.

Samples from several Mesolithic and Neolithic sites from northeastern Europe were published. The earliest burials, according to calibrated radiocarbon dates, were detected near Lake Lacha (Kargopolsky District of the Arkhangelsk Region): Popovo, 9300–9200 years BC (Oshibkina, 2007: 44), and Peschanitsa, 10,785–10,662 years BC (Saag et al., 2020). The individual measurements of these skulls were published earlier (Gokhman, 1984; Gerasimova, Pezhemsky, 2005: 16–17). Representatives of the Pit-Comb Ware culture were buried at the Karavaikha-1 camp site (Vologda Region, Lake Vozhe basin, about 80 km to the south of Lake Lacha). The only radiocarbon data for this burial, obtained from charred remains on a ceramic fragment, matches the calibrated interval between 4486 and 4353 years BC (Kosorukova et al., 2016). Craniometric data for this individual were published by Akimova (1953). At a distance of ~100 km to the west of Lake Lacha, at Yuzhny Oleny Island of Lake Onega in Karelia, there is a cemetery dated to the late 6th millennium BC (Oshibkina, 2007: 38). This site is represented in our analysis by sample means (Yakimov, 1960; Alekseev, Gokhman, 1984). The cemetery at Zvejnieki (Eastern Baltic, Latvia) includes burials from various epochs, from the Mesolithic to the present. Two cranial samples from Zvejnieki were employed in our analysis: Mesolithic and Early Neolithic (Denisova, 1975: Tab. 1–3). The Mesolithic burials are dated to the 5th millennium BC, according to analogs in archaeological artifacts (Oshibkina, 2007: 46). Among those burials, there are even older ones belonging to the Late Boreal (Ibid.). One of the burials has a radiocarbon date of 5428–5262 cal years BC (Timofeev et al., 2004: 108). The Early Neolithic burials at Zvejnieki are dated to the interval from 4960 to 3998 years BC (Ibid.).

The reference samples of the Early Neolithic population of the central Russian Plain (Volga-Oka interfluve) represent the Upper Volga (Ivanovskoye VII) and Lyalovo (Sakhtysh II, IIa, Lovetskoye Ozero) cultures. We employed individual measurements of the skulls from these samples (Alekseeva et al., 1997: 34–41). The earliest radiocarbon dates fit into the calibrated intervals between 6016 and 5960 years BC for Ivanovskoye VII (Timofeev et al., 2004: 93), 6106 to 5884 for Sakhtysh II, and 5610 to 5360 for Sakhtysh IIa (Ibid.: 91). A burial at Berendeyevo Boloto, according to the results of radiocarbon dating (4447–4259 years BC (Saag et al., 2020)), belongs to the same group of burials. This individual has been measured and described by N.N. Mamonova (1969).

The Neolithic burials in the Middle Trans-Urals include: Shigir peat-bog, Dozhdevoy Kamen, and Omskaya site. Individual measurements of well-preserved skulls from these sites were employed in the analysis (Bagashev, 2003; Chikisheva, 1991). No radiocarbon dates are available for these sites, but the above-mentioned authors refer to archaeological publications suggesting their Early Neolithic age.

According to the results of direct dating, neighboring Neolithic complexes from the Trans-Urals were created between 6500 and 4100 years BC (Chairkina, Kuzmin, 2018).

In Altai, Neolithic burials belong to the final stage of the epoch (early to middle 4th millennium BC). In our analysis, we employed measurements of individuals from the following sites: Kaminnaya (female) and Nizhnetytkeskenskaya (male) caves in the Altai Mountains (Chikisheva, 2012: 200–208); Solontsy-5 and Ust-Isha (Ob Plateau) (Ibid.; Dremov, 1986), Vaskovo-4, Lebedi-2, and Zarechnoye-1 (Kuznetsk Basin) burial grounds (Chikisheva, 2012: 200–208; Dremov, 1997).

The Neolithic cranial samples from the Cis-Baikal area employed in the present study originate from burials belonging to the Kitoi and Serovo cultures dating to the 6th and 4th millennia BC, respectively (Mamonova, Sulerzhitsky, 1989). We used means for a composite sample of the Kitoi culture skulls from the Upper Lena basin and the Angara region (Mamonova, 1973); Serovo culture skulls from the Verkholensky burial ground (Levin, 1956); and a composite sample from the Angara region (Mamonova, 1980) were employed.

Results and discussion

The method of principal component analysis employed in the present study allows the combining of a large array of correlated variables into several integral indicators (factors) via transformations of the correlation matrix. The structural elements forming the factors (factor loadings) are the correlation coefficients between original and new variables. Using this method, it is possible to interpret the meaning of each factor on the basis of its respective loadings. The positions of objects of the comparative analysis in the coordinates of the first and second factors (PC1 and 2) were depicted in scatter plots. The two factors described about 50 % of the total variance: 46.8 % in males and 46.4 % in females (see *Table*; Fig. 1, 2).

Except for two angles (forehead profile and general facial), all the original measurements displayed similar modules of loadings on PC1 in both male and female samples, while the signs of the loadings were diametrically opposite in the two sexes. In males, the following variables exhibit high positive correlations with PC1: cranial index, upper facial height, nasal index, zygomaxillary and forehead profile angles. In females, equally high but negative coefficients are observed for cranial index, bizygomatic width, upper facial height, nasal index, and nasomalar angle. In both cases, an increase in cranial index is associated with a decrease in upper facial height, an increase in nasomalar angle, and an increase in nasal breadth. In addition to these, a decrease in forehead profile angle is observed in males, and increase in bizygomatic breadth in females.

In our interpretation of the PC1 loadings, we take into account that analysis deals with representatives at an early stage of racial differentiation who display some unconsolidation of trait combinations from the point of view of modern anthropological typology. It is possible, however, that the factor differentiates the objects according to the two directions of the subsequent transformation of their craniometric complexes: one towards a Mongoloid combination of features, and another towards a Caucasoid combination.

Factor loadings of the principal components analysis

Variable	Males		Females	
	PC1	PC2	PC1	PC2
8 : 1. Cranial index	0.704	0.367	–0.799	0.245
9. Minimal frontal breadth	0.167	0.302	–0.444	–0.062
45. Bizygomatic breadth	0.122	0.751	–0.614	–0.595
48. Upper facial height	–0.728	0.452	0.658	–0.569
54 : 55. Nasal index	0.583	–0.499	–0.659	0.164
52 : 51. Orbital index (from *maxillofrontale*)	–0.101	0.518	0.347	0.412
77. Nasomalar angle	0.272	0.334	–0.502	–0.652
∠ zm. Zygomaxillary angle	0.681	0.373	–0.447	0.053
32. Forehead profile angle (from *nasion*)	0.752	–0. 305	0.113	–0.649
72. General facial angle	0.344	0.440	0.249	–0.352

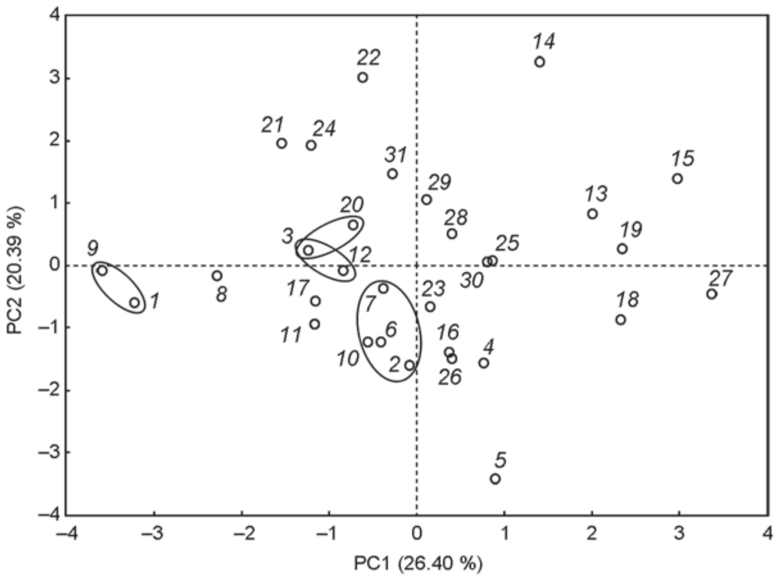

Fig. 1. Scatter plot of the Neolithic cranial data in the coordinates of PC1 and PC2. Males.

1 – Sopka-2/1, burial 51; *2* – Sopka-2/1, burial 61E; *3* – Protoka, burial 4B; *4* – Vengerovo-2A/2, burial 1, skeleton 17; *5* – Vengerovo-2A/2, burial 2, trench; *6* – Lebyazhinka IV; *7* – Yuzhny Oleny Island; *8* – Popovo, burial 1; *9* – Peschanitsa; *10* – Zvejnieki, Mesolithic; *11* – Zvejnieki, Early Neolithic; *12* – Berendeyevo Boloto; *13* – Lake Lovetskoye; *14* – Sakhtysh II, burial 19; *15* – Sakhtysh IIa, burial 22; *16* – Sakhtysh IIa, burial 42; *17* – Omskaya site, burial 3; *18* – Shigir peat-bog, No. 1-841; *19* – Nizhnetytkeskenskaya Cave; *20* – Ust-Isha, burial 4; *21* – Ust-Isha, burial 8; *22* – Ust-Isha, burial 9; *23* – Solontsy-5, burial 3; *24* – Solontsy-5, burial 4; *25* – Vaskovo-4, burial 3; *26* – Zarechnoye-1, kurgan 1, burial 1; *27* – Zarechnoye-1, kurgan 4, burial 6; *28* – Kitoi culture, Upper Lena basin; *29* – Kitoi culture, Angara region; *30* – Serovo culture (Verkholensky burial ground); *31* – Serovo culture, Angara region.

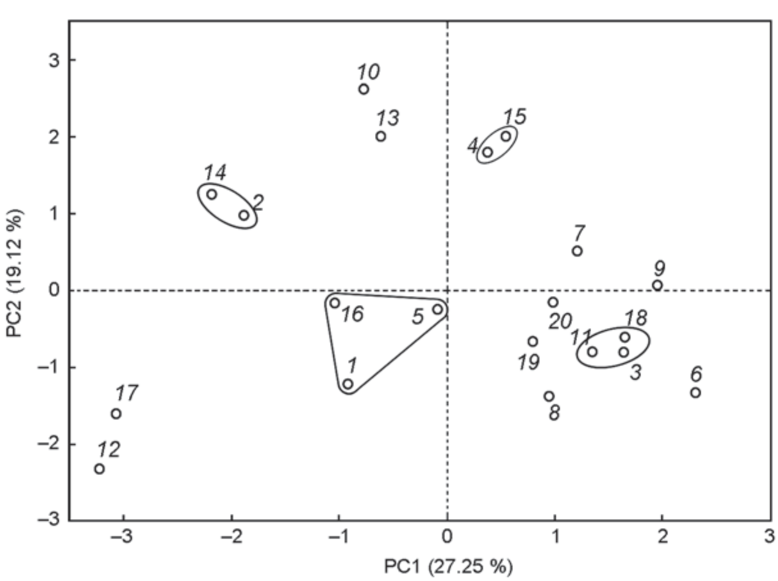

Fig. 2. Scatter plot of the Neolithic cranial data in the coordinates of PC1 and PC2. Females.

1 – Korchugan, burial 7; *2* – Vengerovo-2A/1, burial 1; *3* – Vengerovo-2A/2, burial 1, skeleton 2; *4* – Vengerovo-2A/2, burial 1, skeleton 10; *5* – Vengerovo-2A/2, burial 1, skeleton 12; *6* – Mayak mountain; *7* – Yuzhny Oleny Island; *8* – Popovo, burial 4; *9* – Zvejnieki, Mesolithic; *10* – Karavaikha, No. 9788; *11* – Karavaikha, No. 8763; *12* – Sakhtysh II, burial 20; *13* – Sakhtysh IIa, burial 11; *14* – Sakhtysh IIa, burial 61; *15* – Omskaya site, burial 2; *16* – Kaminnaya Cave; *17* – Solontsy-5, burial 9; *18* – Kitoi culture, Angara region; *19* – Serovo culture (Verkholensky burial ground); *20* – Serovo culture, Angara region.

In males, PC2 is positively and significantly associated with bizygomatic width. The other variables, except for nasal index and forehead profile angle, display correlations of the same sign, but of much lower values. It can be suggested that the second factor in the male sample differentiates the most consolidated Mongoloid combinations of craniometric variables. In females, PC2 exhibits high negative correlations with bizygomatic width, upper facial height, and nasomalar and forehead profile angles. Such a combination distinguishes a Caucasoid component in the female sample. The presence of a low negative correlation between this factor and general facial angle might suggest that a tendency towards prognathism was a specific feature of this particular Caucasoid variant.

In the morphospace of PC1 and PC2, the male skulls from Sopka-2/1 cluster together with Mesolithic specimens from Peschanitsa (Sopka-2/1, burial 51), Lebyazhinka IV, Yuzhny Oleny Island, and Zvejnieki (Sopka-2/1, burial 61E). The part of the plot where those individuals are located (see Fig. 1) represents negative values of both factors, i.e. is associated with western (European) cranial morphological patterns. The skull from Protoka also displays negative values of PC1, but is shifted to a positive area of PC2, thus exhibiting a tendency towards the complexes with eastward vectors of connections. The individuals from the burial at Berendeyevo Boloto and burial 4 at Ust-Isha lie close to the specimen from Protoka. The skulls from Vengerovo-2A are specific in displaying positive values of PC1 and negative of PC2. These are similar to the specimens of Lyalovo culture of the Volga-Oka interfluve (Sakhtysh IIa, burial 42), and to the Late Neolithic individuals from the Altai region (Salairsky Kryazh, Zarechnoye-1 – kurgan 1, burial 1).

Thus, our analysis of the male cranial sample using PCA has demonstrated that the vector of biological affinities of the earliest Neolithic inhabitants of Baraba (Sopka-2/1, the first half of the 6th millennium BC) exhibits a northwestward direction, pointing to the Mesolithic specimens. This result implies colonization of the Baraba forest-steppe at the early stage of the neolithization of the region by migrants from northwestern areas of the Russian Plain. But during the second half of the 6th millennium BC (Vengerovo-2A), the anthropological composition of the Baraba population became more complex owing to the infiltration of people of the Pit-Comb Ware culture from the central Russian Plain, represented by the Lyalovo populations from the Volga-Oka interfluve. Male individuals from Baraba dated to the 5th millennium BC (Protoka) displayed features of eastern anthropological complexes. This does not necessarily mean direct infiltration of populations or single individuals of the Neolithic cultures from the Cis-Baikal to Baraba. Their indirect influence via the Neolithic populations of Altai seems more plausible.

The arrangement of the female Neolithic skulls from Baraba in the PCAS scatter plot (Fig. 2) reflects, in general, the same vectors of population connections as in males. The female sample is composed only of specimens from burials dated to the second half of the 6th millennium BC (Vengerovo-2A, Korchugan), which suggests that the influence of the eastern anthropological component relating to the Kitoi populations of the Cis-Baikal began even earlier than the 5th millennium BC.

The possible vectors of the peopling of the Baraba forest-steppe were mapped (Fig. 3). As there are no substantial natural barriers to human dispersal between the Russian Plain and Siberia, the migration routes might have passed through the Polar Urals. The typical features of the relief of this part of the mountains

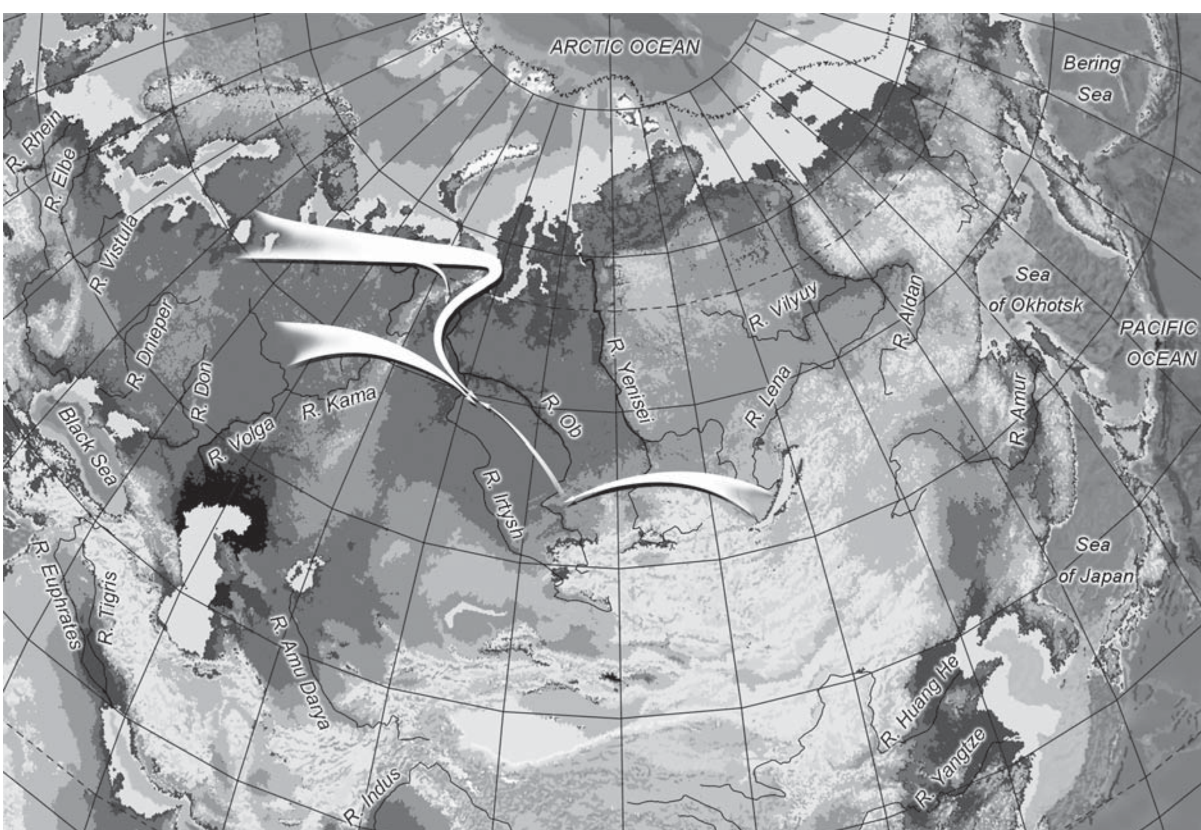

Fig. 3. Schematic map of possible routes of Neolithic migrations to Baraba forest-steppe.

are a deep cut of their ridges by transverse valleys abounding in rivers and lakes, and low elevation of passages. Today, the Transpolar Mainline of the Northern Railway passes through the Polar Urals. During summer, the valleys are used by the Nenets, Komi, and Khanty for reindeer grazing. The eastern slope of the Polar Urals is gentle, gradually descending to the West Siberian Plain, ending in a wide strip of ridges. The way to the south along the eastern slopes of the Northern Urals is quite convenient, as numerous rivers of this region (tributaries of the Severnaya Sosva and Ob) are completely crossable. The rivers are fast but shallow and abound in fish, they flow along rocky channels and have numerous rapids. The middle Uralian Mountains are low, with convenient passages; their eastern slopes and the neighboring area of the Trans-Urals don't have any insurmountable barriers. The Northern Altai Mountains, with ridges and foothill plateaus, are open to the steppe and forest-steppe areas of the West Siberian Plain. Thus, these directions were permeable for ancient migrants as well.

It is of note also that the landscapes of the regions of origin of the migrants and those of the Baraba forest-steppe in the Early Neolithic were similar in major features: in both cases, there were plenty of lakes and rivers tending to get waterlogged. Routes of migratory waterfowl passed through the lakes abounding in fish. The swamps provided a variety of vegetation, including berries and medicinal plants. The modern faunal composition of Baraba can be cautiously extrapolated to previous archaeological epochs, though some species are highly endangered at present because of human activity. The Neolithic population could use animal meat for food and fur for clothing, and the environmental conditions were in general quite favorable for small groups of people. Baraba remained an attractive place to migrate to during the archaeological epochs following the Early Neolithic, since this region could provide ample natural resources for subsistence.

The prevailing craniometric complex of the Neolithic population of Baraba includes the following features: dolichomesocrania; high skull vault; wide and moderately tall face; mesognathia of the facial vertical profile; heteroprosopia of the facial horizontal profile (i.e. platyopia or mesopia of the upper level is combined with mesognathia or clynognathia of the middle level); weakly profiling nasal bridge; and small nasal protrusion angle. This complex of traits was described more than 30 years ago in a study of the first Neolithic skeletal samples excavated in Baraba from the Sopka-2/1 and Protoka cemeteries (Polosmak, Chikisheva, Balueva, 1989: 95; Chikisheva, 2012: 49–51). Subsequent research has shown the ubiquity of the complex in all the Neolithic skulls discovered later in Baraba (Chikisheva, 2012: 49–51; Chikisheva, Pozdnyakov, Zubova, 2015). The results of the comparative analysis of the cranial morphology of the Early Neolithic inhabitants of Baraba suggest that the peopling of the region during the Early Holocene was initiated by some groups of the Mesolithic and Neolithic populations from the northwestern Russian Plain. The Chalcolithic Age populations of Baraba were forming on the base of this anthropological layer, which can be called indigenous only with respect to these populations.

Gerasimov's method of facial reconstruction based on cranial data is an important way of visualizing the appearance of the Neolithic individuals from Baraba (Fig. 4–11). Most of these individuals display an angular shape of the contour of the cranial vault, which is large and tall and dominates over the face. The general impression of robustness is further emphasized by a greatly developed relief of the frontal and occipital bones, large mastoid processes, and a strongly pronounced bone ridge above the mastoid process. The faces of the individuals are of rectangular shape: vertically short, with wide cheekbones and angular mandibles. Their low, enclosed, and rectangular orbits form a marked overhanging of the fold of the upper eyelid and a deep position of the eyeball. Some anterior protrusion of the alveolar region is evident in the profile view, which might be explained by a general alveolar mesognatia (and even prognathism in some cases) and an intermediate protrusion of the relatively small nose. In addition, the labiodontic type of dental occlusion prevails in the population; thus, the lower lip is typically protruding. The features listed above are most clearly pronounced in the individuals buried at Sopka-2/1 and Protoka (see Fig. 4–6). These features are more smoothly manifested in the individuals from Vengerovo-2A; the cranial robustness is less pronounced, and the psalidontic type of dental occlusion is more common (see Fig. 7–9).

The two individuals from Korchugan display some specific morphological features. The shape of the frontal processes of their maxillary bones and nasal bones suggests the presence of an epicanthus. In combination with a more protruding zygomatic region, this gives the individuals a somehow Mongoloid appearance (see Fig. 10, 11).

The physiognomic similarity of all the portraits is due to the angular contour of the head in the frontal view, large size and rectangular shape of the face,

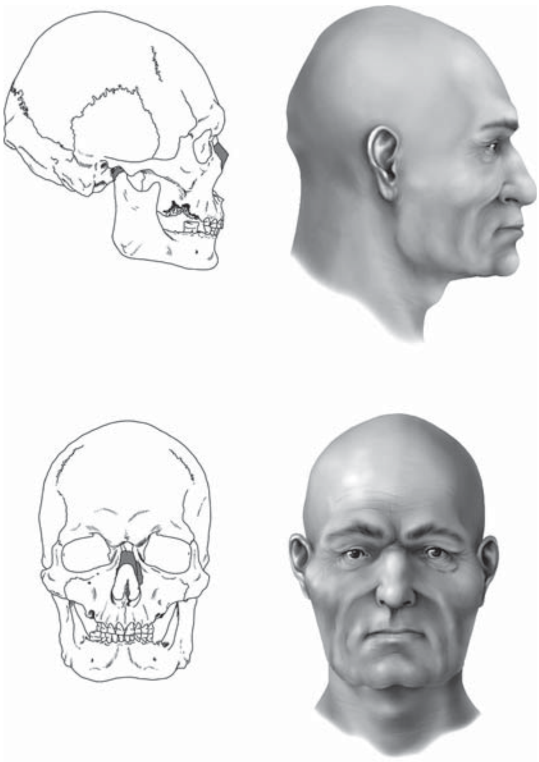

Fig. 4. Graphic reconstruction of the appearance of a male, 50–60 years old. Protoka, kurgan 5, burial 4.

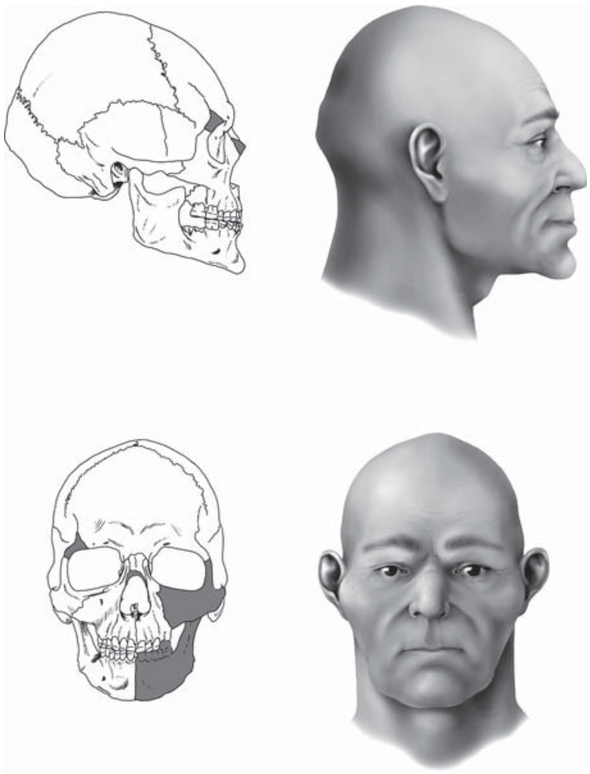

Fig. 5. Graphic reconstruction of the appearance of a male, 30–40 years old. Protoka, kurgan 5, burial 11.

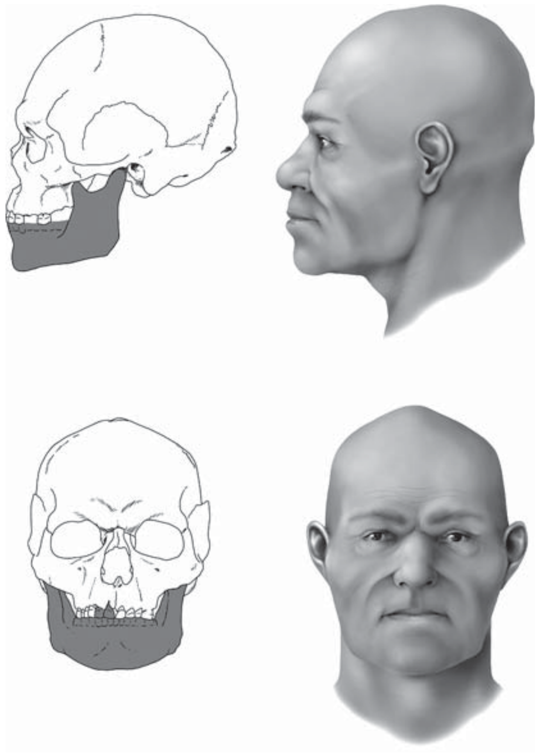

Fig. 6. Graphic reconstruction of the appearance of a male, 40–45 years old. Sopka-2/1, burial 61E.

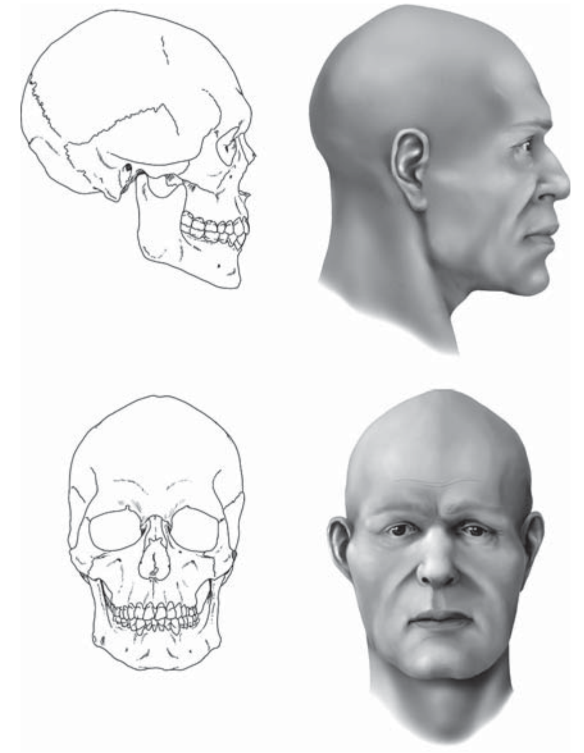

Fig. 7. Graphic reconstruction of the appearance of a male, 30–35 years old. Vengerovo-2A, funeral complex No. 2, burial 1, skeleton 17.

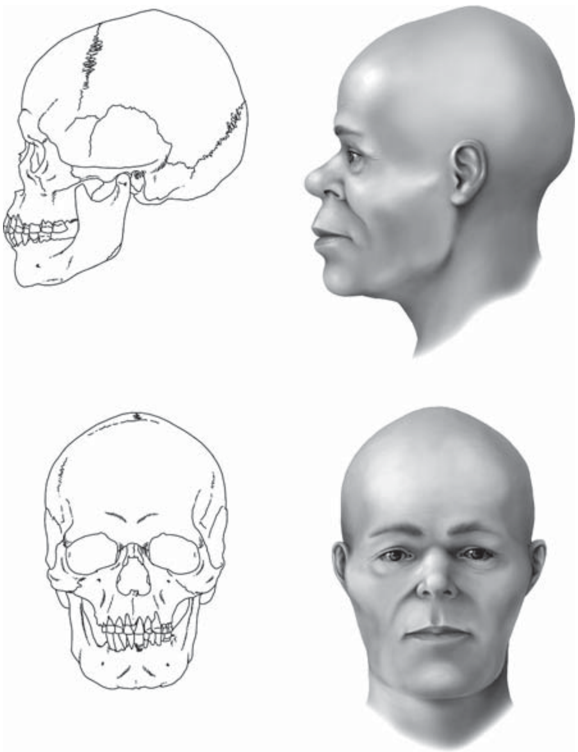

Fig. 8. Graphic reconstruction of the appearance of a female, 30–40 years old. Vengerovo-2A, funeral complex No. 1, burial 1.

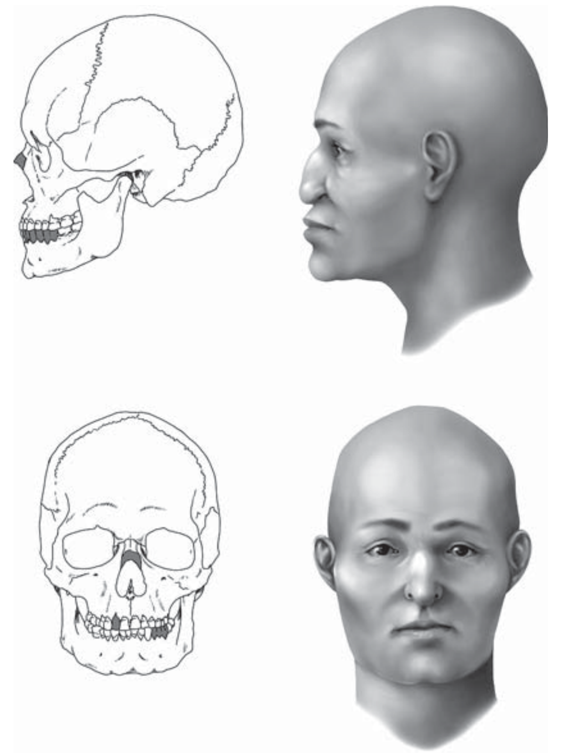

Fig. 9. Graphic reconstruction of the appearance of a female, 25–30 years old. Vengerovo-2A, funeral complex No. 2, burial 1, skeleton 12.

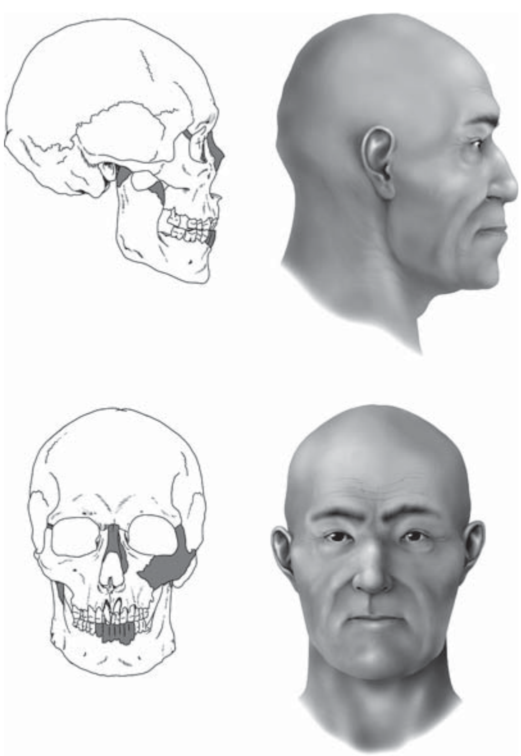

Fig. 10. Graphic reconstruction of the appearance of a male, 40–50 years old. Korchugan, burial 3.

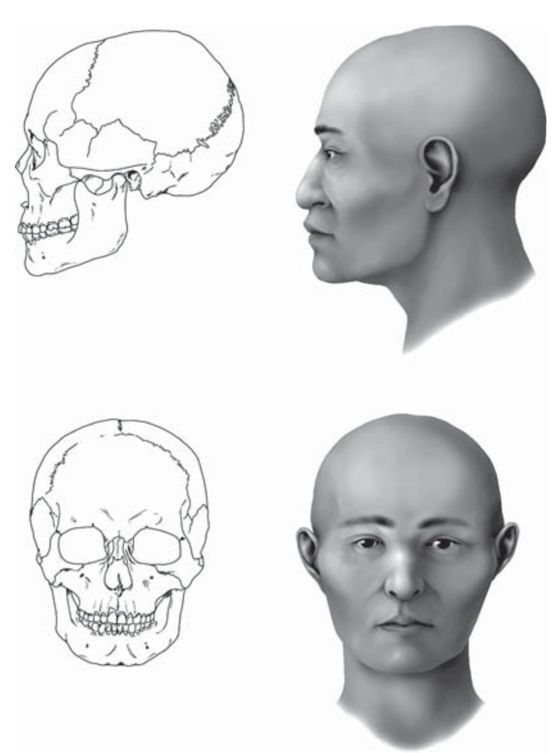

Fig. 11. Graphic reconstruction of the appearance of a female, 25–30 years old. Korchugan, burial 7.

strong protrusion of its parts (nose and lips), small and deep-set eyes, and the robustness of the chin (see Fig. 4–11). At the same time, different burial complexes exhibit their specific features. This applies mostly to the individuals displaying some Mongoloid traits in the shape of the upper face: a pronounced fold of the upper eyelid and epicanthus, and high cheeks, abundantly covered with soft tissues (Korchugan).

Conclusions

Our analysis of the craniometric data for the representatives of the Neolithic cultural traditions that existed in the Baraba forest-steppe has revealed the main vectors of the biological affinities of those ancient populations. The vectors were changing their directions during the transition from the early to late periods of the Neolithic epoch. The earliest inhabitants of Baraba (Sopka-2/1; first half of the 6th millennium BC) were morphologically similar to the individuals from Mesolithic burials in the northwestern Russian Plain. The hunters and fishers of that region, which was fairly similar to the Baraba forest-steppe from the landscape and biocenotic points of view, found a favorable ecosystem for their subsistence in Baraba. They arrived here in the Boreal period, between 9 and 8 ka BP, and formed the anthropological base (autochthonous substrate) for the developing population structure during the Neolithic. This substrate is particularly evident in the facial reconstructions of those people. The visualization of the appearance of people buried at the Neolithic Baraba cemeteries enables illustration of the conclusions arrived at during the study of cranial data to a wider circle of specialists. This is important, since the specific craniological approaches are aimed at describing skulls, not faces. Starting from the second half of the 6th millennium BC, the anthropological composition of the Baraba population began to get more complex, owing to the infiltration of migrants from the Pit-Comb Ware area in the central Russian Plain and, indirectly (via the Neolithic Altai), from the Cis-Baikal area. The craniometric and reconstructed somatological variation of the skulls inside the common anthropological type according to the affiliation with particular funeral complexes is important as well. This variation is in good agreement with the dates of the burials, and can be thus considered as a reflection of the migration from different regions in the process of human colonization of Baraba during the Neolithic.

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