Human palaeontology and prehistory

Early Humans at the eastern gate of Europe: The discovery and investigation of Oldowan sites in northern Caucasus

Premiers hommes de la porte orientale de l'Europe. Recherches et découvertes sur les sites d'Oldowan, Nord du Caucase

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ABSTRACT

This article presents the results of excavations and multidisciplinary investigations of the extraordinaire Oldowan site of Muhkai II in the northern Caucasus (Republic of Dagestan, Russia) from 2008 to 2012. Archaeological and palaeontological materials are summarized together with data from palaeomagnetic and palynological analyses, obtained from 34 cultural layers at the site. This gives an opportunity for a new approach to the question of the timing and route of the first human settlement of the middle latitudes of western Eurasian, including south-eastern Europe. Judging by the data obtained, this occurred around 2 million years BP and a route of migration was located along the western shore of the Caspian Sea.

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RÉSUMÉ

Cet article présente les résultats de fouilles et de recherches multidisciplinaires sur le site extraordinaire Muhkai II d'Oldowan, dans le Nord du Caucase (république du Dagestan, Russie) de 2008 à 2012. Les matériaux archéologiques et paléontologiques, de même que les résultats d'analyses paléomagnétiques et palynologiques obtenus à partir de 34 niveaux du site, sont ici présentés. Tout ceci fournit l'opportunité d'une nouvelle approche à propos de l'itinéraire et de l'époque des premiers peuplements humains dans les moyennes latitudes de l'Europe occidentale, incluant l'Europe sub-orientale. D'après les résultats obtenus, leur

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installation remonterait à environ 2 Ma BP et la trajectoire de migration a été localisée le long du rivage occidental de la mer Caspienne.

1. Introduction

Three decades ago the discovery of Dmanisi in the western Eurasia reliably established the earliest traces of human settlement in southern Eurasia, where remains date back to ca. 1.85 million years BP (Ferring et al., 2011). Also there was other evidence of human presence in this region even earlier than Dmanisi (Ronen, 2006). Regarding the North Caucasus and the steppes of the North Caucasus piedmonts, the region has been the gateway from western Asia to south-eastern Europe since the remote past, but Lower Palaeolithic archaeological sites were unknown there until recently. It was considered self-evident that "À l'est, nos ancêtres arrivent à Dmanisi, à 1,7 Ma maximum [. . .] mais ils ne dépassent pas le Caucase puisque derrière ces montagnes les biotopes sont très différents et la temperature plus froide. Ce qui explique l'absence de fossiles au nord du Caucase datés du Pléistocène inférieur" (Jibert et al., 2008).

In this context, the discovery and investigation of Early Palaeolithic sites in northern Caucasus (Amirkhanov, 2007; Amirkhanov et al., 2012) are important scientific events of the last decade. As a result, the Oldowan, the longest archaeological epoch, can be included in the earliest prehistory of this region for the first time. From the view of general human history, the results of these multidisciplinary researches have shown that the historical process in the region began one million years earlier than was previously recognized. Equally importantly, the material discovered sheds new light on the question of the chronology and route of the initial dispersal of people from their ancestral home—East Africa—to Asia and southeastern Europe.

Regular excavations aimed at searching for Early Palaeolithic sites in the North Caucasus were begun in 2003 by expeditions from the Institute of Archaeology of the Russian Academy of Sciences (RAS) in Moscow and the Institute of Archaeology and Ethnography of the Siberian Branch of RAS (Novosibirsk). In 2009 the Institute of History, Archaeology and Ethnography of the Dagestan Scientific Centre of RAS (Makhachkala) joined the project and since then has actively participated in the investigations.

The most impressive results of the decade-long archaeological researches were obtained from the territory of Dagestan (Fig. 1). It must be stressed that in the central mountainous part of the region no Palaeolithic sites with finds originating from an undisturbed geological context were previously known. However, ten sites containing archaeological material deposited in layers with excellent stratigraphy have now been discovered and are under investigation. An indirect result of this archaeological research is the fact that specialists in related sciences (such as geomorphology, palynology, palaeozoology, palaeopedology, and magnetostratigraphy) have at their disposal first-rate data from the region, which has remained practically unstudied by modern science.

The investigations are multidisciplinary in nature. The use of a range of scientific analytical methods has enabled us to obtain various data, which shed light on the sites' chronology, the formation of geological and archaeological layers, and the environmental and climatic characteristics of the period when early humans inhabited the territory. These data include palaeozoological and palaeobotanical materials essential for establishing the chronology of the phytoplankton remains, and the results of palaeomagnetic, palynological and sedimentological analysis. These studies have not been completed, since we have not yet finished sampling of the site's sediments. Nevertheless, the available data allow us to shape an idea of the principal characteristics of the site, concerning its chronology, material culture and the environmental conditions during the period of formation of its cultural deposits. The results of these studies have been partially published in publications in Russian (Amirkhanov, 2007, 2010, 2012; Amirkhanov and Ozherel'ev, 2011; Amirkhanov et al., 2012). But until now there was no publication summarizing the results from all the excavations, and especially taking into account data from the 2011 and 2012 excavations. This article largely rectifies this state of affairs.

2. Methods

While studying the site of Muhkai II, palaeomagnetic, palynological and palaeontological as well as archaeological methods were employed.

Samples from 74 microlevels of the section of Muhkai II from depths of up to 34 meters below the modern ground surface were used for palaeomagnetic analysis. To separate the most stable (primary) component of natural remanent magnetization (NRM–In^0) the samples underwent temperature cleaning (heating in unmagnetic space in 50 °C increments up to 600 °C and in 30 °C increments between 300–400 °C). Natural remanent magnetization was measured using the spin magnetometer JR-6 in the Palaeomagnetism Laboratory of the Geological Institute, RAS (Moscow).

Palynological analysis was carried out in accordance with standard procedures based on a modified Grichuk method. 64 samples were studied, deriving from the section at depths of up to 25 meters below the modern ground level.

Paleontological studies were performed in accordance with the usual approaches used for identification of osteological material based on morphological study.

3. Results

3.1. General geological characteristics

The Early Palaeolithic sites under discussion are Ainikab I-V, Gegalashur I-III and Muhkai I-II (Fig. 2). They are located
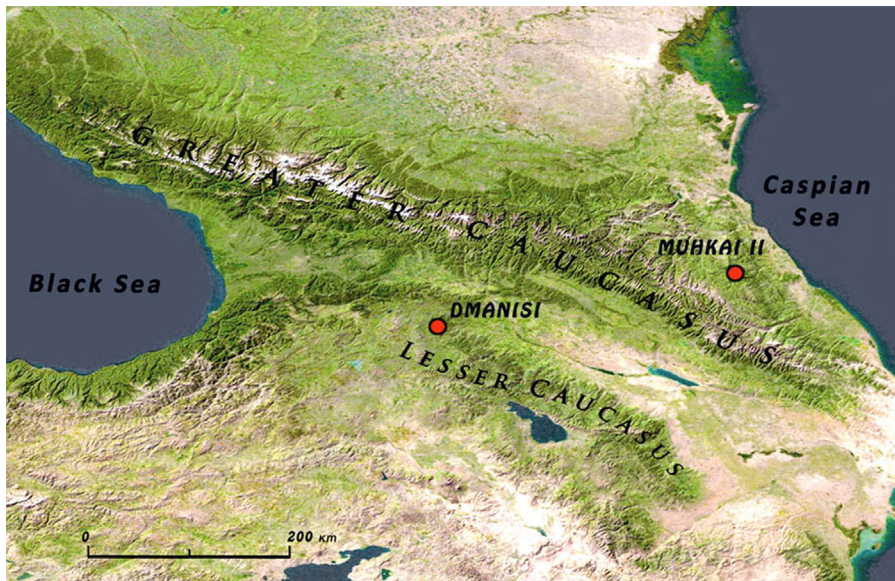
Fig. 1. (Color online.) Location of Dmanisi and Muhkai II sites.
Fig. 1. (Couleur en ligne.) Localisation des sites Dmanisi et Muhkai II

in the Akusha District of the Republic of Dagestan, Russian Federation. The area consists of a large intermontane basin. The valleys of the rivers Akusha and Usisha are the major landforms here. Both rivers flow northward and have their confluence approximately three kilometres to the north of the village of Akusha, and further on flow into the Kazikumukh Koisu River—a tributary of the Sulak. The watershed of the rivers Akusha and Usisha forms a mountain range, running from the South to the North of the basin along its longitudinal axis, and which is the dominant landform of the Akusha basin. The watershed altitude in the surveyed area averages 1500–1600 m above sea level (Vardanyants, 1943). The Earliest Palaeolithic sites of the region are mostly associated with the watershed deposits.

Three of the sites are currently under excavation. These are Ainikab I, Muhkai I and Muhkai II. The latter is the best studied to date. The Early Pleistocene loose deposits here

are 78 m thick. By 2012, the depth of investigated deposits reached 56 m below the surface, containing 30 cultural horizons bearing artefacts, mostly stone tools. Within the investigated part of the section there were two bone-containing horizons and at least three levels of ancient soil formation. The cultural remains were associated with different levels of the section, and, consequently, represented different time periods, providing a rare opportunity to study the process of cultural development over a period of nearly one million years within the Early Pleistocene.

Taking into account data from both the excavated part of the section and natural exposures nearby, we conclude that the whole mass of deposits of the geological formation under consideration consists of three massive beds. The uppermost and lowermost beds (14 m and 29 m thick respectively) are formed mostly of coarse-sized material, waterworn to various degrees. In contrast, the middle part

Fig. 2. (Color online.) Relative positions of the Muhkai and Gegalachur groups of sites.
Fig. 2. (Couleur en ligne.) Positions relatives des groupes de sites de Muhkai et Gegalachur.

of the section (about 14 m thick) consists mostly of fine soil layers, varying from clayey-loam and loam to sandy-loam sediments. Evidently, the upper and lower sediment beds are of proluvial and fluvioglacial genesis. However, in the formation of the middle fine-grained soil bed eluvial processes (the decomposition of limestone and its transformation into the clay fraction) and the accumulation of wind-borne deposits were crucially important.

Detailed laboratory investigations of the site's sequence are continuing. Studies of sedimentation processes, lithological composition, granulometry, magnetometry and magnetostratigraphy are being carried out in the Geological Institute, RAS and in the Institute of Geography, RAS. Only after the studies are completed shall we be able to present a generalized lithological characterization of the investigated deposits. At present we can state with confidence that within the depth of 57 m from the ground surface 118 lithologically heterogeneous horizons can be determined, which together form the three above-mentioned beds. Thirty horizons contain archaeological remains. As mentioned above, the artefact-bearing deposits continue below the level reached by the excavations, and we are confident that the number of cultural horizons will increase considerably after the stratigraphical trench is finished.

When discussing the correlation of geological and cultural layers, an important fact should be mentioned. Namely, the cultural deposits in the section (and in the sections of the other neighboring sites – Ainikab I and especially Muhkai I) are mostly associated with the layers formed of coarse-size material, whilst the horizons of exclusively fine-soil genesis contain no or extremely rare archaeological finds. In one case an animal bone (horse maxilla) was found in such a context.

The overwhelming majority of cultural horizons were revealed in the 1 m-wide sondage (Fig. 3). In several cultural layers, an area of 20–26 m² was excavated. The density of finds varies between layers. In some cases the number of finds does not exceed ten items per square meter, but quite often this index reaches some tens of artefacts. Layers 25, 34, and 80, among others, are especially rich in cultural remains.

3.2. Archaeological remains

Layer 80 is of special interest archaeologically. It lies at a depth of 34 m below the surface, and by 2012 26 m² had been excavated.

Judging by the archaeological and faunal remains discovered in the layer, as well as from the landform restored in the course of the excavations, the ancient inhabitants of the site represented by level 80 lived on the shore of a small natural dam, or a small lake that began as a wide water-eroded gully. Traces of tool production and, probably, domestic activity in the excavated area are concentrated around the lake. The cultural deposit beyond the water body does not exceed 10 cm in depth, taking into account its taphonomic changes (Amirkhanov and Ozherel'ev, 2011; Ozherel'ev, 2010, 2012).

The planigraphical distribution of flint objects within the excavated area shows a clear regularity (Fig. 4). Lithic

Fig. 3. (Color online.) Muhkai II. The middle part of the stratigraphical trench.
Fig. 3. (Couleur en ligne.) Muhkai II : partie moyenne de la fosse stratigraphique.

finds are densely concentrated around the water body: 15 items per square metre on average. By contrast, bones are deposited within the depression. Several big tubular bones are oriented along the lake axis. However, few bones show uniformity in their orientation. The bones are mostly deposited horizontally. Those located close to the depression's edge accurately follow the bank slope. The water body shore is well distinguished by differences in sediments: the depression formed in greyish clay, and was then filled up with brownish loam.

Fig. 4. (Color online.) Muhkai II, layer 80. The flint tool finds are marked by small red spots.
Fig. 4. (Couleur en ligne.) Muhkai II : niveau 80. Les découvertes d'outils en silex sont matérialisées par de petits points rouges.

Fig. 5. (Color online.) Bifacial pointed chopper. Muhkai II.
Fig. 5. (Couleur en ligne.) Chopper biface pointu. Muhkai II.

In total the excavated area of layer 80 has yielded 892 flint artefacts not including small flakes and retouching flakes. Flint is of local origin and is the only type of raw material used for production of all tools of the collection obtained from the layer under consideration. Flint could have originated from the proluvial sediments near the site in the form of redeposited nodules and their fragments. The primary outcrops of flint of that kind were probably located 1–2 km from the site in the slope exposures of the Cretaceous limestone ridge.

In terms of general statistics the most numerous categories are ordinary blocks, blocks with removals which do not form tools of morphologically definite shapes, and nodules with single removals. The total number of such objects makes up nearly 63% of the collection. Such a high rate of objects which must formally be attributed to waste products should be explained by the low quality of the raw material. The flint used at the site was highly fractured and contained numerous internal cavities.

The excavations of the site are not yet finished, therefore the typological investigation of the lithic artefacts has not been completed either. At present we must restrict ourselves to outlining the most general statistical and typological features of the collection. With that in mind, we may state that in layer 80 the proportion of tools (defined as objects that acquired morphologically definite shape after purposeful processing), is slightly over 10% of all finds. Approximately 30% of them are tools produced on nodules and blocks. These are mostly choppers of three types: unifacial, bifacial and double-edged unifacial (Figs. 5 and 6). This category also includes single picks (Fig. 6) (Amirkhanov, 2006, 2010, 2012; Leakey, 1971).

In the collection the objects made on flakes occupy a noticeable but not particularly significant place in relation to tools made on nodules. Common small scrapers and spurred scrapers are of morphologically definite appearance. Flakes with partial retouch at the side are rather numerous. However, as they lack a completely worked form, it is difficult to attribute them to any particular tooltype (Fig. 6).

Overall, the great number of finds, their rather dense distribution, as well as the typological, technological and functional diversity of the flint artefacts give grounds for defining the discussed site as a base camp, where early people's tool production and domestic activity took place. With regard to the general cultural stage characterized by the stone industry, it fits the Classical Oldowan.

3.3. Faunal remains

The collection of remains of large mammals from layer 80 of the Muhkai II site includes 301 bones; 181 bones have been identified and 120 (60, 1% and 39.9% of the total) are unidentified. Most unidentified items are fragments of long bones. Besides the bones of large mammals, the skeletal remains of amphibians, reptiles, rodents, and shells of small land molluscs were found, as well as the bones of freshwater fish. The remains of small mammals are of special interest; this category of finds deserves special publication after detailed study is completed.

Palaeontological remains from the discussed layer were concentrated in the clay deposits, which filled up the above-mentioned depression. Only a small part of it was preserved and it was almost completely excavated. The majority of bones had a coating of thin clay material. This clay material filled the depression and did not extend beyond its limits.

The palaeontological findings from the concerned layer are sufficient to reconstruct in detail the environmental situation in this region at the time of the site's occupation. It looked like savannah steppe dotted with basins of lake type and small insulae of forest vegetation. The climate was warm and humid, and the site was situated approximately 500 m above sea level, rather than the present 1600 m.

The material under consideration is also of great importance from another perspective: it provides an opportunity to establish the chronology of the discussed part of the site's cultural deposits. It is highly significant that the suggested dating can be verified by the cross-checking of data from the osseous remains of small mammals obtained from the site and especially with the results of palaeomagnetic analysis.

The studied material does not include entire animal skeletons, which means that the site of Muhkai II should not be regarded as a place of animal mass death caused by mudflows or floods. At the same time, some bones are preserved in anatomical order. Consequently, we may conclude that not only separate bones were deposited, but also fragments of animal limbs bearing muscles and sinews. After the limb fragments had been buried in the silt, their parts did not change their positions in relation to one another. Notably, in the bone-containing layer the remains of different animal species were deposited in succession (Amirkhanov et al., 2012).

The palaeontological material from Muhkai II is presented in Table 1.

To date the total number of identified animal individuals from the site of Muhkai II totals 26, including four species of carnivorous mammals and six species of herbivorous mammals (Fig. 7). The dominant species are those inhabiting open and semi-open landscapes. In the palaeontological collection bones of *Equus (Allohippus) stenonis* (38.7%) and *Eucladoceros sp.* (28,2%) predominate, together constituting 66.9% of the total number of identified bones. Both species of ungulate animals are normal for savannah landscapes (Kaiser and Croitor, 2004). It is evident that the faunal remains from Muhkai II do not include representatives of the forest landscapes proper, but there is a resident of the foothills—*Gallogoral meneghini*. It is worth mentioning in
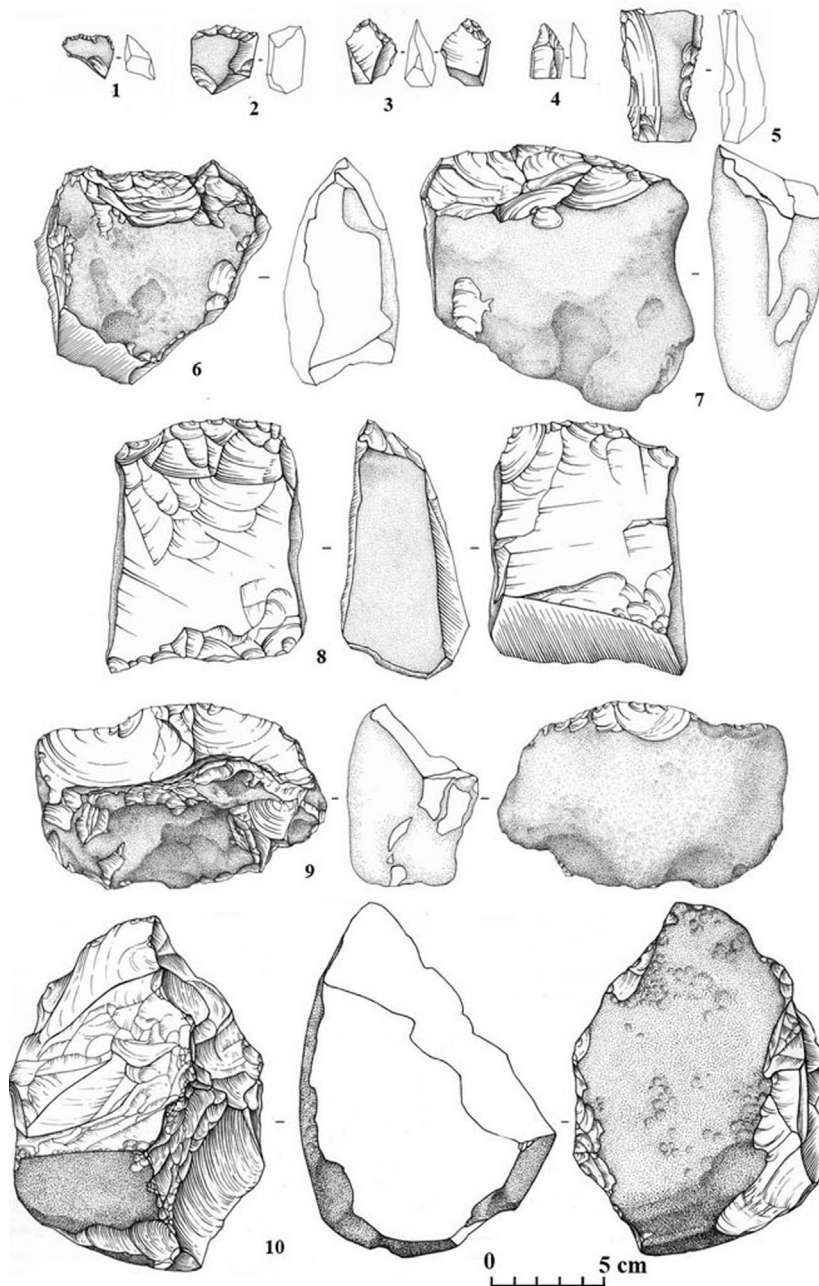
Table 1
Large mammals from layer 80 of site Muhkai II.
Tableau 1
Grands mammifères du niveau 80 du site Muhkai II.

Species	NISP	MNI
Canis etruscus	5	1
Vulpes alopecoides	8	1
Pliocrocuta perrieri	5	2
Megantereon cultridens	2	1
Archidiskodon meridionalis	1	1
Equus (Allohippus) stenonis	70	6
Palaeotragus priasovicus	3	1
Eucladoceros senezensis	51	9
Gazellospira torticornis	18	2
Gallogoral meneghinii	18	2
Total number of identified species	181	26
Total number of unidentified species	120	
	Coprolites	
Hyaenidae gen.	4	

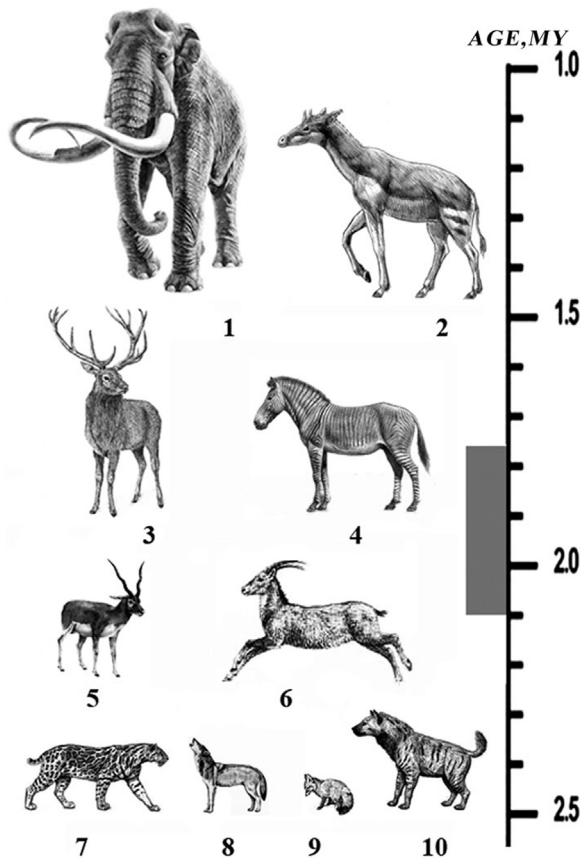NISP: number of identified specimens; MNI: minimum number of individuals.

Fig. 7. Large mammals from layer 80 of Muhkai II. 1 – Archidiskodon meridionalis, 2 – Palaeotragus priasovicus, 3 – Eucladoceros senezensis, 4 – Equus (Allohippus) stenonis, 5 – Gazellospira torticornis, 6 – Gallogoral meneghinii, 7 – Megantereon cultridens, 8 – Canis etruscus, 9 – Vulpes alopecoides, 10 – Pliocrocuta perrieri.
Fig. 7. Grands mammifères du niveau 80 de Muhkai II. 1 – Archidiskodon meridionalis, 2 – Palaeotragus priasovicus, 3 – Eucladoceros senezensis, 4 – Equus (Allohippus) stenonis, 5 – Gazellospira torticornis, 6 – Gallogoral meneghinii, 7 – Megantereon cultridens, 8 – Canis etruscus, 9 – Vulpes alopecoides, 10 – Pliocrocuta perrieri.

Lordkipanidze et al., 2007; Palombo and Sardella, 2007; Roger et al., 2000; Sablin, 1990, 2011; Sablin et al., 2010; Sinusia et al., 2004).

3.4. Pollen analyses

The samples were studied at the Geological Institute, RAS by N. Yu. Filippova (5 samples from the layers excavated at a depth of 3.47–19 m from the watershed edge) and by G.N. Shilova (21 samples from the top 8.5 m of the section). The principal pollen analysis work is yet to be carried out. The data available now characterize only separate parts of the section, and should therefore be considered preliminary. However, they are rather informative. According to N. Yu. Filippova's results, the pollen spectrum of the studied samples shows much similarity with materials from the Akchagyl-Apsheron deposits in the northwestern Caspian Sea region (dating back to the Late Pliocene–Early Pleistocene).

3.5. Phytoplankton remains

Samples taken from layer 9 (depth 4.37 m) were studied by N. Yu Filippova. She found remains of organic-walled phytoplankton (dinocysts), which are a variety of *Spiniferites ramosus*-group (of Pannonian type), and proximate indeterminate cysts. The researcher has come to the conclusion that "the presence of organic-walled phytoplankton in sample M-28 attests to the basin genesis of the rocks of that period". Details of the remains found and their habitat ranges suggest that in the area studied there existed a basin with brackish water. Taking that into consideration, the basin could be related to one of the episodes of the Akchagyl-Apsheron period, but not later.

These data are of special significance for establishing the chronology of the corresponding layers. Regardless of the genesis of the deposits in this part of the section, the presence of *Spiniferites* species typical of the Akchagyl-Apsheron deposits in the north-western Caspian Sea region indicates their chronological position. It is clear that even when the most rigorous criteria are applied to the interpretation of the obtained data we are dealing with a time period no later than the Early Pleistocene.

3.6. The data of palaeomagnetic analysis

The palaeomagnetic investigation of the samples taken from the upper part of the section (depth 1–24 m) was carried out by V.M. Trubikhin. Two intervals with positive magnetization were clearly present within the zone of general negative polarity at a depth of 1 m and between 6–12 m in depth. Notably, polarity transition zones adjoin the beginning and the end of the second revealed episode. This fact and the thickness of the deposits demonstrating negative polarity are convincing arguments for defining this palaeomagnetic episode as the Jaramillo (0.99–1.07 Ma). The above-mentioned remains of organic-walled phytoplankton discovered above the boundary of the episode with positive polarity may be regarded as complementary evidence of this fact. Hence, the overlying level with positive

polarity can be considered Kamikatsura (0.85 Ma) with a high degree of confidence.

The palaeomagnetic study of the discussed section down to the depth from 24 to 34 m was conducted by V.V. Semenov (the Institute of Geography, RAS). In total, 57 samples from 28 micro-levels from a 10 m thick section were analysed. As a result, steady reversed polarity was revealed in layer 61. An interval of normal polarity can be confidently defined: declination varies within the range 38°–345°; and inclination covers the range 57°–74°. The top and bottom boundaries of this interval are sharply expressed. All underlying deposits studied to present as far as layer 80 show reversed magnetization.

Thus, in the section below the Jaramillo level one more episode of normal polarity has been reliably established. At present it is impossible to relate it with one or another level of the general palaeomagnetic scale. Taking into account the available data of faunal remains from layer 80, it most probably correlates with the Gilsa or Olduvai episodes (1.95–1.82 Ma). A comprehensive chronostratigraphy of the site will be established after investigations are completed, in particular, after study of the microfaunal remains excavated in 2012. We must remember that half the Muhkai II section remains un-studied from a palaeomagnetic perspective.

Our immediate task for the near future is the investigation of the basal part of the section of the site's geological deposits. Future research will establish the chronology and origin of the culture represented at Muhkai II and a number of similar sites in north-eastern Caucasus. According to the information now at our disposal based on the incontestable data presented above, its dating to a period no later than 2–1.8 Ma is most likely.

4. Discussion

The results from the continuing excavations of the Oldowan sites of central Dagestan allow several conclusions, which are based on the analysis of archaeological material and the data from multidisciplinary laboratory investigations. The most important of them boils down to a statement of fact of human exploration of the North Caucasus and that the waves of migration of early hominids had reached the edge of southeastern Europe by about 2 Ma. Thus there appears a previously unknown West Caspian route of initial human dispersal from the south towards the mid-latitudes of Eurasia. The settlers of the North Caucasus were typical bearers of a classical Oldowan culture—a culture whose origins are rooted in northeastern Africa.

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