

E.V. Belyaeva

*Institute for the History of Material Culture,
Russian Academy of Sciences,
Dvortsovaya nab. 18A, St. Petersburg, 191186, Russia
E-mail: biface@mail.ru*

Early-Middle Acheulean Occupation of the Northern Transcaucasian Highland

In the northern part of the Transcaucasian Highland (Lori Depression, Armenia), three stratified sites dating to the Early-Middle Acheulean—Karakhach, Kurtan I, and Muradovo—have long been subject to archaeological studies. On the basis of absolute dates and paleomagnetic records relating to the first two sites, their age falls in the interval between the mid-Early and initial Middle Pleistocene. All three sites yielded a uniform industry with a peculiar toolset (various choppers, picks including chisel-ended ones, handaxes, large scrapers, macro-chisels, and macro-knives), manufactured mostly on natural tabular fragments of local volcanic rocks. Certain indicators of this industry, such as subrectangular and fan-shaped choppers, slab-like chisels, etc., are described. Information on 28 other localities with Acheulean artifacts, including 11 stratified ones, recently discovered in various parts of the Lori Depression and in adjacent areas of the Shirak Depression and the Debed River valley, is provided. It is demonstrated that the lithics from all these sites belong to the Karakhach tradition. Data are cited suggesting that three sites (Yagdan, Agvi-canyon, and Agvorik) are over 2 mln years old, and two more (Kurtan II and Dzhradzor) are at least 1.5 mln years old. It is concluded that people associated with the Karakhach Acheulean tradition had appeared in the northern Transcaucasian Highland ~2.0 Ma BP, then settled widely in this area, and remained there for several hundred thousand years. In my view, this may be explained by the very favorable environmental conditions of the region during the Early Pleistocene, and by the abundance of large rock fragments suitable for tool manufacture.

Keywords: Transcaucasian Highland, Early and Middle Acheulean, geochronology, paleoenvironmental data, occupation range, industrial tradition.

Introduction

The issues of the origins and dispersal of the carriers of the most ancient Acheulean traditions in various regions of the Old World have constantly been in the focus of attention for modern researchers of the Early Paleolithic. In the discussion of this topic, the author relies on the currently widespread understanding of the Acheulean, which is briefly set out in the following definition: "...Acheulean represents a more complex industry than the previous (and pene-contemporary)

Oldowan industry (which consists mostly of small flakes, flaked cobbles and percussive tools) based on the technological ability to produce large flake blanks and to recurrently shape large cutting tools (LCTs)" (Diez-Martin et al., 2015). In this definition, it would be more correct, however, to use the concept of "technocomplex" introduced by J.D. Clark (1970: 78), since this concerns not two separate industries, but two types of industries distinguished by the listed features. The main categories of large tools marking the emergence of the Acheulean technocomplex are considered to be handaxes, picks,

and cleavers. Such tools were prepared on specially selected rocks of appropriate dimensions (pebbles, nodules or tabular fragments), as well as large flakes produced through special techniques (Semaw, Rogers, Stout, 2009; Beyene et al., 2013; Diez-Martin et al., 2015; Galotti, Mussi, 2018). Generally, the Acheulean is not regarded as a single cultural tradition. Acheulean-type industries can be related, but they can also emerge independently from one another, as a result of convergent technological development based on different types of large-sized raw material. This concept also implies spatial and chronological variability within the Acheulean technocomplex (Belyaeva, 2022: 16–17). It is this approach that makes it possible to attribute to the Acheulean a group of sites discovered in the latest two decades in the northern part of the Transcaucasian Highland (Armenia). These sites yielded sets of various artifacts, including handaxes, picks, and large flake-blanks. As is justified below, their chronological range covers the second half of the Early through early Middle Pleistocene (Belyaeva, Lyubin, 2014; Belyaeva, 2020). According to the currently most accepted ideas about Acheulean periodization (Clark, Schick, 2000), this range corresponds to the Early Acheulean and the initial Middle Acheulean.

Reference sites and their geochronological and paleoecological context

The sites under consideration are located in the north of Armenia, in the Lori Depression and the adjacent areas of the upper Debed River valley and the Shirak Depression

(Fig. 1). In 2005–2015, three sites were excavated in the Lori Depression—Karakhach and Muradovo at the southeastern foothills of the volcanic Javakheti Range, and Kurtan I on the slope of the Bazum Range.

The deposits studied in the Karakhach quarry (Fig. 1) turned out to be the most informative and rich in lithics. Two deposit units have been identified in the walls of the quarry. The upper one (unit I, up to 9 m), consisting of non-layered sandy loams with poorly rounded boulder-pebble debris, was formed by slope processes, including mudflows. The unit tops show reversed polarity (Matuyama epoch), the bottoms normal polarity (Jaramillo episode?). Unit II consists of compressed volcanic ash with pyroclasts, or tuff (~5 m) with reversed polarity. Using zircons extracted from the ashes, U-Pb dates were generated for it: 1.944 ± 0.046 Ma BP for the bottom of the northwestern wall, and 1.826 ± 0.02 Ma BP for the upper part; 1.750 ± 0.02 and 1.804 ± 0.03 Ma BP for the bottom of the southeastern wall, and 1.799 ± 0.044 Ma BP for the lower part (Presnyakov et al., 2012; Trifonov et al., 2016). Three test pits uncovered the bottoms of unit II and revealed Acheulean artifacts made of andesite-dacite. Most of them were found in pit 3 (616 spec.).

The older unit III was exposed at five localities. The deepest profile (~8 m) was established in excavation 2, where 14 layers were identified. Layers 1, 2, and 11 are redeposited paleosols (Khokhlova et al., 2018), while layers 3–6, 8, 10, and 12–14 are sandy loams with variously-sized rounded detritus, the color of which varies from yellowish to dark gray, depending on saturation with volcanic ash. Layers 7 and 9 are large ash lenses (Trifonov et al., 2016). For layer 7, the U-Pb date of $1.947 \pm$

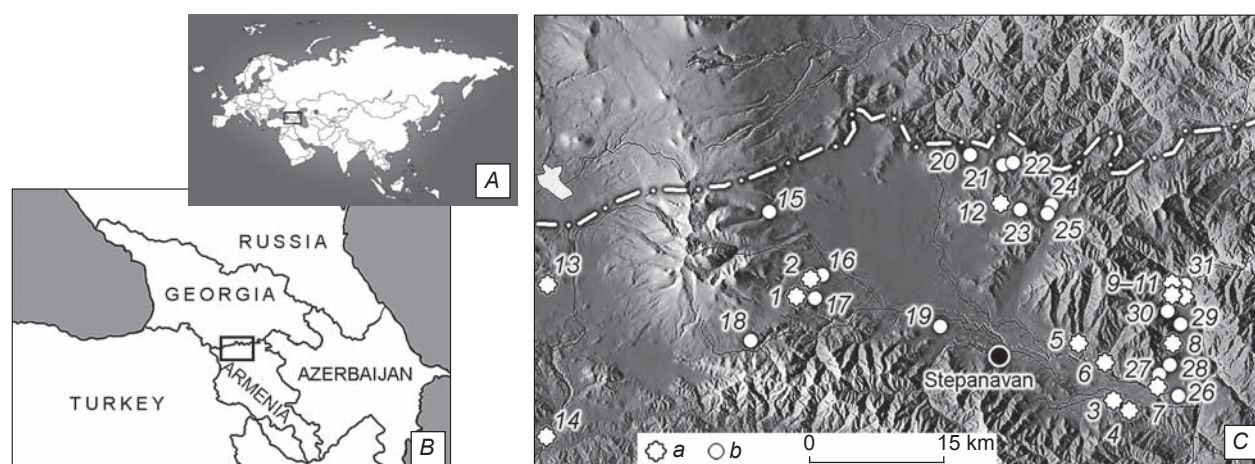


Fig. 1. Location of the area under study on the maps of Eurasia (A) and the Caucasus Territory (B), and location of sites with Early and Middle Acheulean artifacts of the Karakhach tradition (C).

1 – Muradovo; 2 – Karakhach; 3 – Kurtan I; 4 – Kurtan II; 5 – Agorak; 6 – Yagdan; 7 – Karmir-Akhek; 8 – Ardvi; 9–11 – Agvi-1–3 (Agvi-terrace, Agvi-quarry, and Agvi-canyon); 12 – Lernahovit-quarry; 13 – Agvorik; 14 – Dzhradzor; 15 – Dashtadem-1; 16 – Blagodarnoye; 17 – Karakhach-bridge; 18 – Karakhach-pass; 19 – Katnakhyur; 20 – Dzoramut; 21 – Norashen; 22 – Sarchepet; 23 – Lernahovit; 24, 25 – Privolnoye-1, -2; 26 – Arevatsag; 27 – Kokhes; 28 – Mgar; 29 – Odzun; 30 – Amozh; 31 – Agvi-4.

a – stratified sites; b – non-stratified sites.

± 0.045 Ma BP was derived (Presnyakov et al., 2012). Layers 2–10 show a normal polarity; taking into account the date, this suggests that unit III was accumulated during the Olduvai paleomagnetic episode (1.95–1.77 Ma BP). Since the underlying lavas produced the K-Ar date of 1.87 ± 0.10 Ma BP, the age of this unit is estimated in the range of 1.77–1.85 Ma years. The poor sorting and varying degrees of roundness of the detritus, as well as the presence of lenses, indicate the proluvial origin of the sediments (small temporary streams, slope microflows) (Trifonov et al., 2016; Belyaeva, 2022: 79).

In excavation 2, all layers of unit III, except for the first layer, yielded the total of 2968 Early Acheulean artifacts made of rhyolite and rhyodacite. A significant number of such artifacts (131 spec.) were found in a small trench 1, where layers 1–7 were exposed. In pits 5, 6, and 8, where only layers 1–3 were exposed, the finds were rare. The proluvial origin of the deposits, as well as the moderate or weak degree of roundness of most items, suggest that the artifacts are unlikely to have been deposited *in situ*. However, in the Karakhach profiles, there are no signs of heavy watercourses that could have transported lithics from afar, i.e. these were rolled in small streams, without significant transportation. The accumulation of finds in excavations 1 and 2 can only be explained by human activities. The site is classified as a habitat, i.e. a piece of terrain occupied by a certain population (Reimers, 1988: 166), where separate zones of human activities can be identified (Belyaeva, Lyubin, Trifonov, 2019; Belyaeva, Shchelinsky, 2022). Analysis of paleosols and phytoliths found therein suggests a subtropical climate and a savanna-like landscapes (Lyubin et al., 2015; Khokhlova et al., 2018).

The site of Muradovo was found 3.5 km eastwards of Karakhach (Fig. 1), on the terrace of a stream flowing from the Javakheti Range. The excavations exposed deposits with a total thickness of ~ 7 m, subdivided into nine stratigraphic layers. Layers 1 and 2, representing horizons of the Holocene soil, contained redeposited Late Acheulean artifacts of hyalodacite (flattened handaxes, Levallois flakes). Layer 3 is a buried Pleistocene soil, containing ca 100 more archaic and weathered hyalodacite artifacts, including choppers and picks. Layers 4, 5, and 7–9 are alluvial-proluvial sandy loam deposits with pebbles, gravel, and individual boulders; and layer 6 is volcanic ash with weakly rounded detritus (Belyaeva, Lyubin, 2013, 2014, 2019). In terms of their lithological features and shapes of artifacts, layers 4–9 are similar to unit III of Karakhach, and are apparently of a similar age (Trifonov et al., 2016). Items from these layers (more than 900 spec.) are moderately or weakly water-rolled, but are not severely damaged. These obviously did not occur *in situ*, nor were they transported from afar by strong streams. The site of Muradovo, like localities 1 and 2 at Karakhach,

is described as a habitation site. Taking into account that the stream valley near the site is widened and forms a basin, and that there are traces of a small channel in the lower part of the profile, during the accumulation of layers 4–9 humans probably lived on the shores of the paleolake and the inflowing streams (Belyaeva, Lyubin, Trifonov, 2019; Belyaeva, 2020).

The site of Kurtan I is located in the southeastern end of the Lori Depression (Fig. 1), at the foot of the Surb-Sarkis Mountain (Bazum Range). The quarry was laid on the banks of the Gerger River, which flows into the Dzoraget River. In the quarry sides, loose deposits (5–20 m) are exposed, underlain by basalts of the Javakheti Range (K-Ar-date 2.08 ± 0.10 Ma BP), which flows spread along the Dzoraget valley and its tributaries. The noted sagging layers indicate that the quarry uncovered a buried gorge of a paleostream (Belyaeva, Lyubin, 2013). The deposits were studied by small excavations in three sections of the quarry walls where the number and thickness of the identified layers vary. The correlation of the stratigraphic profiles made it possible to compile a summary column consisting of seven main layers (Trifonov et al., 2016). Under modern soil, there are three loamy/sandy loamy paleosols with carbonate nodules (layers 1–3, up to 7 m), which are similar to Muradovo layer 3 (Khokhlova et al., 2018; Trifonov et al., 2016). Layers 1 and 2 show normal polarity; the bottom of layer 2 shows the change to reverse polarity, i.e., Brunhes-Matuyama transition (0.77 Ma BP). This means that the three upper paleosols at Kurtan I, as well as Muradovo layer 3, were deposited in the terminal Early to initial Middle Pleistocene. This age is supported by the teeth of rhinoceros (*Stephanorhinus hundsheimensis*) recovered therein, and a shoulder blade of southern elephant (*Archidiskodon* ex gr. *meridionalis Nesti*) found in similar layers in the nearby quarry of Kurtan II (Trifonov et al., 2016). At Kurtan I localities 1 and 3, these paleosols are underlain by volcanic ash (layer 4) with U-Pb date of 1.432 ± 0.028 Ma BP. Below lies a sequence of tuffaceous and pumice sands (layers 5 and 6, up to 8 m). The upper part of this sequence yielded U-Pb dates of 1.495 ± 0.026 and 1.496 ± 0.021 Ma BP and ^{39}Ar - ^{40}Ar dates of 1.49 ± 0.01 Ma BP (Presnyakov et al., 2012; Trifonov et al., 2016). At locality 3, below layer 6, another paleosol layer was recorded (layer 7, up to 25 cm), overlying basalts (Khokhlova et al., 2018).

Layers 1–3, excavated by step-trenches at localities 1 and 2 at the sides of the Kurtan I quarry, yielded more than 240 Acheulean artifacts made from local raw materials (rhyolite, basalt, and volcanic pebbles). In layer 5, locality 3, quite few artifacts have been found so far (flakes, a pick-shaped tool, and a side-scraper), which have been attributed to the Early Acheulean on the basis of the absolute dates of ~ 1.5 Ma BP. An even older layer 7 was recorded in a small area at locality 3;

only two dozen small pebble artifacts were found here, reminiscent of the Oldowan industry from Dmanisi (Georgia), located 30 km northwards. Features of the lower paleosol at Kurtan I (layer 7) are similar to those of the contemporaneous Early Pleistocene paleosols of unit III at Karakhach, indicating a subtropical climate and savanna-like landscapes (Khokhlova et al., 2018). Detailed analysis of pedisements and phytoliths from layers 1–3 at Kurtan I showed that in the terminal Early to initial Middle Pleistocene, the climate became more temperate (Lyubin et al., 2015; Khokhlova et al., 2018). The local inhabitants probably settled on the shore of a small lake that emerged ca 2 million years ago owing to the damming of the paleostream by basalt flows (Belyaeva, 2020).

The Karakhach Early Acheulean Industry: features and development

The comparative analysis of the collections of artifacts originating from various layers of Early Pleistocene unit III of Karakhach showed that this is a single Early Acheulean industry based on local stone raw materials (rhyolite and rhyodacite), with a rich set of large tools (choppers, picks, handaxes, macro-scrapers, macro-chisels, and macro-points) and a variety of small implements (side-scrapers, small handaxes, end-scrapers, points, chisels, push-planes, notched-denticulate, and combination tools). In the artifact collection of this unit (over 3000 spec.), debitage products account for no more than 3 %, but they include several large flakes, which are considered one of the main indicators of the Acheulean. Such flakes were used as blanks for the manufacture of certain large tools (macro-scrapers, two cleavers, and three handaxes). Cores (20 spec.) demonstrate simple single-platform reduction. Most of the large and small tools were made on natural blanks in the form of flattened tabular fragments of various shapes and sizes. These blanks were formed as a result of cracking of rhyolitic and rhyodacitic raw materials with a fluidal or layered structure. The rather regular shape of many such blanks ensured the geometrized outlines of a large proportion of the Karakhach tools (choppers, macro-chisels, partly picks and macro-scrapers, simple side- and end-scrapers).

Owing to the presence of very large tablets among the macro-tools (15–30 % of all the tools), there are many specimens longer than 15 cm, and some even exceed 20 cm. The shapes of the handaxes (about 60 spec.) are very diverse, but almost all of these tools show partial bifacial processing; these usually have a butt, and often a back. Choppers, macro-scrapers, and picks dominate and mainly show a flat-convex section; their outlines vary from subtriangular to lanceolate and pear-shaped.

Noteworthy is the significant proportion of picks with chisel-like edges, and other chisel-like tools. Fan-shaped and subrectangular choppers, handaxes in the form of a “gable roof house”, slab-like chisels and push-planes (Fig. 2, 1, 7–9, 14), as well as knife-hatchets, are the specific types, and can be regarded as indicators of the Karakhach industry (Belyaeva, 2022: 106–107; Belyaeva, Shchelinsky, 2022).

Muradovo layers 4–9 yielded a lithic industry that was similar in terms of toolkit and types of blanks (926 spec.) (Fig. 2, 2, 10, 15). The lithological-stratigraphic comparisons have shown that these layers correspond to the Early Acheulean layers at Karakhach, and should presumably be attributed to the close Early Pleistocene time (Trifonov et al., 2016). The younger Acheulean assemblages from Karakhach unit II, Muradovo layer 3, and three upper paleosols at Kurtan I quarry (Figs. 2, 3, 5, 11) belong to the same industrial tradition, despite the different varieties of volcanic raw materials used, the greater number of flake blanks, and the absence of certain types of tools (“gable roof house”-shaped handaxes, knife-hatchets). At the top layers of the Kurtan I quarry paleosols, the Matuyama-Brunhes paleomagnetic reversal (0.77 Ma BP) was revealed, which indicates the transition to the Middle Pleistocene. Consequently, the Karakhach tradition (Fig. 2) continued to develop in the Lori Depression until the initial Middle Acheulean (Belyaeva, 2022: 127).

Dispersal of people associated with the Karakhach Early Acheulean tradition in the Lori Depression and adjacent regions of the Transcaucasian Highland

The sites of Karakhach and Muradovo are located in the southwestern part of the Lori Depression, and Kurtan I in its southeastern end; the distance between the sites exceeds 30 km. In recent years, during the intense survey in various parts of this region and the adjacent areas, another 28 sites have been discovered (see Fig. 1), containing artifacts similar to those of the Karakhach Early Acheulean industry. Most of them are localities with surface occurrence of artifacts. Many of these sites provided quite few finds; but at Arevatsag, Privolnoye-1, -2, and Lernaovit, from 15 to 20 artifacts were collected from each. At Arevatsag, the finds were scattered over the side of the hanging valley of the paleostream that was previously a tributary of the Dzoraget River. The assemblage includes picks, handaxes, and choppers typical of the Karakhach Early Acheulean, including one fan-shaped (see Fig. 2, 13) and three subrectangular choppers, as well as large flakes. One of these flakes was fashioned as a cleaver. On the slopes of the terrace near the village of Privolnoye, chisel-ended picks,

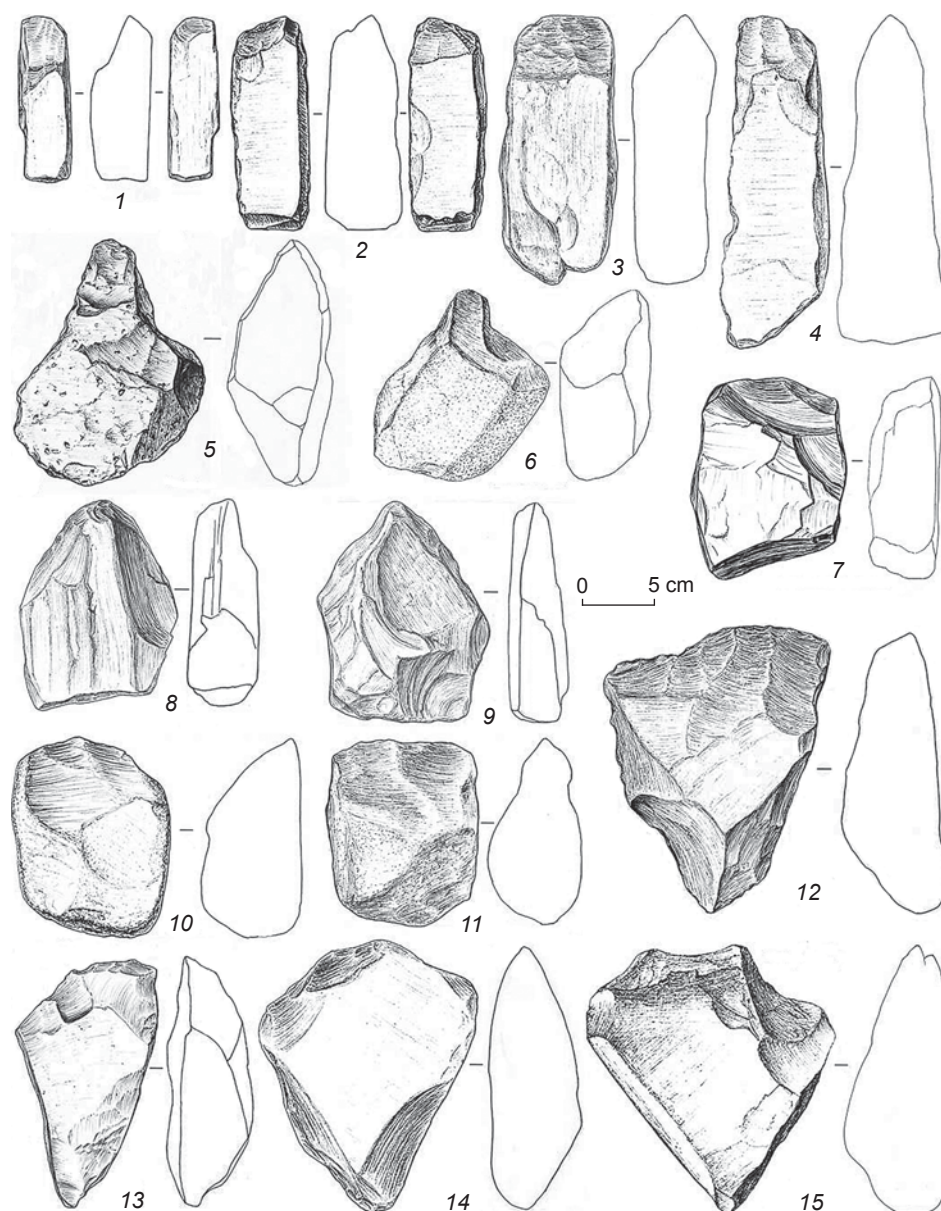


Fig. 2. Examples of Acheulean tools typical of the Karakhach tradition.

1–4 – slab-like macro-chisels; 5, 6 – pear-shaped picks with chisel-like edges; 7, 10, 11 – subrectangular choppers; 8, 9 – “gable roof house”-shaped handaxes; 12–15 – fan-shaped choppers. 1, 7–9, 14 – Karakhach; 2, 10, 15 – Muradovo; 3, 5, 11 – Kurtan I; 4, 6 – Agorak; 12 – Karmir-Akhek; 13 – Arevatsag.

subrectangular choppers, and slab-like chisels were found. At Lernahovit, artifacts were also collected at the paleostream terrace, and included macro-tools similar to the above.

The most interesting are nine new stratified sites (see Fig. 1). These were identified both in the Lori Depression and in the area of the left bank of the Debed River valley adjoining Lori from the east. The Lernahovit Quarry is located near the locality of Lernahovit. Excavations at the quarry exposed deposits similar to the Kurtan paleosols, which dated the site to the interval between the second half of the Early and the

initial Middle Pleistocene. At present, quite few artifacts have been found; however, the assemblage includes a pear-shaped chisel-ended pick, which has parallels in the collections of Karakhach, Kurtan I, and Agorak (see Fig. 2, 5, 6). The site of Yagdan in the gorge of one of the left-side tributaries of the Dzoraget is especially noteworthy. Several artifacts found (a single-platform core, flakes, a handaxe with traces of bifacial working, a subrectangular chopper, a macro-scraper, and picks), in terms of their appearance, should be attributed to the Karakhach tradition; these artifacts were recovered from paleosols overlain by a basalt flow and later exposed in

the eroded walls of the stream. The age of the stream can be ca 2 mln years, since this is the age estimation of the cover basalts in the Kurtan I quarry 5 km south of Yagdan. Although this age still needs to be confirmed by direct dating of the Yagdan basalts, the site suggests that the Karakhach Early Acheulean industry could have appeared in the north of the Transcaucasian Highland not 1.85 Ma BP, as follows from the established age range of Karakhach, but somewhat earlier (Belyaeva, 2022: 128). The site of Agorak (see Fig. 1) is located near Yagdan, in the valley of a neighboring stream that cut through the proluvial sediments. The finds (16 spec.) include picks characteristic of the Karakhach Early Acheulean, including chisel-like tools (see Fig. 2, 6), slab-like chisels (see Fig. 2, 4), push-planes, and subrectangular choppers. The site of Karmir-Akhek (see Fig. 1) is located in the southeastern end of the Lori Depression, not far from the Dzoraget canyon's edge. The deposits underlain by basalts are gravelly sandy loams with cementation horizons and interlayers of pedosediment type. A total of seven tools was found, including the varieties of picks and choppers typical of the Karakhach industry (see Fig. 2, 12).

A promising site was found in 2022 near Kurtan II quarry, on the right bank of the Dzoraget River; it was located about 2 km eastwards of Kurtan I quarry described above (see Fig. 1). At Kurtan I, the paleosols with the Acheulean industry at the late stage of the Karakhach tradition are underlain by pumice sand (ca 1.5 million years old), and still below, there is a basalt flow (ca 2 million years old) (Ibid.: 86). In addition, at one of the excavation areas in this quarry, under pumice sand, a thin but well-developed paleosol was recorded, directly overlaying the basalt (Khokhlova et al., 2018). A similar stratigraphy was identified in Kurtan II quarry. Next to this quarry, in the side wall of the road excavation, the same pumice sand, with two underlying layers of paleosol, was cleaned; the thickness of the lower paleosol layer and the underlying deposits have not yet been established. In the lower visible layer of paleosol, five Acheulean items were found, whose age should be older than 1.5 Ma BP, taking into account the age of the sand. The items include a very large pick and two subrectangular choppers, suggesting the Karakhach tradition.

Beyond the eastern border of the Lori Depression, four more stratified sites with Acheulean artifacts were found on the left bank of the valley of the Debed River, framed by the slopes of the Somkhet Range (see Fig. 1). At Ardvi, a quarry uncovered a 5–6 meter thick stratum of rubble deposits with interlayers of ash and paleosol. Among a dozen lightly-rounded finds, two slab-like push-planes typical of the Karakhach industry were found. Three more localities are situated near the village of Agvi. The first one is an exposure of a terrace of a small stream flowing into the Debed.

The deposits here are similar to those uncovered at Agorak. So far, only two slightly-rounded tools have been found at this locality (Agvi-terrace): a macro-push-plane and a macro-chisel, clearly pointing to the Karakhach tradition. At the next locality (Agvi-quarry), a road excavation cut in the lower part of the slope of the Somkhet Range, exposing rubble sandy loams with interlayers of paleosol. These yielded a dozen items, including the characteristic Karakhach forms (chisel-ended picks, subrectangular choppers, macro-push-planes). Northwards of Agvi-quarry, in the side-slope of a stream flowing into the Debed, an outcrop of pebble-gravel deposits underlying the basalts was recorded (Agvi-canyon). These deposits contained several lightly-rounded items of Early Acheulean appearance, including a large macro-chisel, which is similar to those found at the sites of the Karakhach tradition. Like Kurtan I and Yagdan, these blanket basalts should be ca 2 million years old, which supports the hypothesis of such an early arrival of the Early Acheulean people to the north of the Transcaucasian Highland.

Noteworthy are two more localities with similar finds. They were discovered in the Shirak Depression, adjacent to the Lori Depression from the west (see Fig. 1). At the locality of Dzhradzor, the finds were recovered from the deposits close in age to unit III at Karakhach (Olduvai episode (Shalaeva et al., 2019; Belyaeva, 2022: 128)); and at Agvorik, artifacts were found in the earlier layers, which were formed before the Olduvai episode, judging by the available paleomagnetic data (Ozhereliev et al., 2020). These localities are 70–80 km in a straight line from the easternmost sites of the Karakhach Early Acheulean tradition.

Conclusions

It has been established that artifacts typical of the Karakhach Early Acheulean industry occur at a large number of sites in various areas of the Lori Depression and in the neighboring regions of the Transcaucasian Highland. The discoveries of the mentioned sites provide the grounds for establishing the age range of the Karakhach industry (mid-Early to initial Middle Pleistocene) and for recording a fairly broad distribution of the carriers of this Acheulean tradition over the northern part of the Transcaucasian Highland. The latter seems to be explained by the very favorable environmental conditions of the region in the Early Pleistocene (low relief, subtropical climate, and predominance of savannah landscapes), and abundant sources of volcanic rocks, ensuring the development of Acheulean technologies and mass production of macro-tools (Lyubin et al., 2015; Trifonov et al., 2016; Belyaeva, 2020).

The noted features of the Karakhach Acheulean tradition are largely determined by the local raw materials. However, some tools resembling the Early Acheulean Karakhach ones (chisel-ended picks, slab-like chisels, and others) were found in deposits of a similar or even earlier age in the Armenian Highland regions adjacent to the Transcaucasian Highland (Ozhereliev et al., 2020). It can be assumed that the Acheulean tradition under consideration originated from these mountainous regions, where no later than in the middle of the Early Pleistocene the humans producing some more archaic Oldowan-type industries started to use large-sized volcanic raw materials, which contributed to the transition to the Acheulean. The next stage of occupation of the Transcaucasian Highland by the carriers of the Acheulean traditions corresponds to the second half of the Middle Pleistocene, i.e. after a long chronological gap. At that time, in the area under study, Late Acheulean industries existed, with developed Levallois technologies and the predominant fashioning of handaxes on large flake-blanks. The features of these industries do not suggest their direct connection with the Karakhach tradition (Belyaeva, 2022: 138).

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