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E.V. Doronicheva[1], A.G. Nedomolkin[2], A.A. Muriy[3], M.A. Kulkova[4], T.V. Sapelko[5], and E.S. Nosevich[6]

[1]ANO "Laboratory of Prehistory", 14-ya liniya 3, St. Petersburg, 199034, Russia
E-mail: edoronicheva@hotmail.ru
[2]National Museum of the Republic of Adygea, Sovetskaya 229, Maykop, 385000, Russia
E-mail: nedomolkinandrei@mail.ru
[3]Sergeev Institute of Environmental Geoscience, Russian Academy of Sciences, Ulansky per. 13, bldg. 2, P.O. Box 145, Moscow, 101000, Russia
E-mail: amuriy@gmail.com
[4]Herzen State Pedagogical University of Russia, Nab. r. Moyki 48, St. Petersburg, 191186, Russia
E-mail: kulkova@mail.ru
[5]Institute of Limnology, Russian Academy of Sciences, Sevastyanova 9, St. Petersburg, 196105, Russia
E-mail: tsapelko@mail.ru
[6]Saint Petersburg State University, Universitetskaya nab. 5, St. Petersburg, 199034, Russia
E-mail: katenosevich@mail.ru

Hadjoh-2: A Middle Paleolithic Workshop-Camp in Northwestern Caucasus

This article outlines the results of a multidisciplinary study of stratified Middle Paleolithic site Hadjoh-2, northwestern Caucasus, situated at the outcrop of high-quality Shahan flint. During five field seasons, more than 6-meter deep deposits were excavated over an area of ca 33 sq. m. Ten lithological strata and four habitation-horizons were identified. Excavations focused on bottom layers 6 and 7. During their accumulation, the site occupied a floodplain terrace on the right bank of the Sredniy Hadjoh River, a right tributary of the Belaya. Because the terrace dates to the Middle/Late Pleistocene boundary, the site is no earlier than the beginning of Late Pleistocene, 130–120 ka BP. Results of pollen-analysis suggest that the climate was cold and dry, and subalpine and alpine meadows prevailed around the site at that time. The study of lithic assemblages shows that the bottom layers accumulated when the site was a workshop near the flint outcrops. In both layers, knapping debris such as cores, chips, and small fragments predominate. Most tools are unfinished bifacial forms. These assemblages are paralleled by the Eastern Micoquian industries of Mezmaiskaya, Barakaevskaya, Monasheskaya, and Ilskaya.

Keywords: *Paleolithic, workshop site, stone industries, Caucasus.*

Introduction

The sites situated on sources of stone raw materials allow us to obtain a lot of new data, not only concerning use and transportation of the raw materials, but also about organization by humans of various site types, human mobility, and subsistence strategies (Shchelinsky, 2005; Nekhoroshev, 1999: 29–32; Kovalenko, Ketraru,

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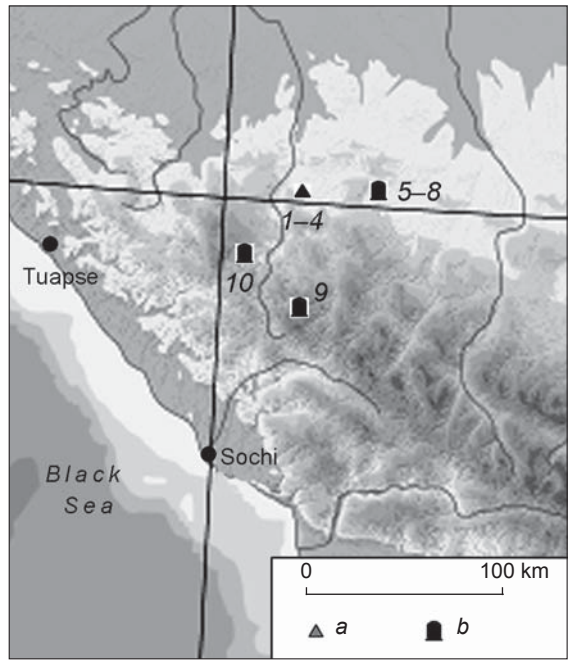

Fig. 1. Location of sites mentioned in the paper in the northwestern Caucasus.
a – open-air sites; *b* – cave sites.
1–4 – Sredniy Hadjoh, Shahan, Hadjoh-2, -3; *5–8* – Barakaevskaya, Monasheskaya, Autlevskaya, Gubs Rockshelter 1; *9* – Mezmaiskaya, *10* – Matuzka.

2010; Matyukhin, 2010; Fedyunin, 2011; Neruda, Nerudová, 2010; Gopher, Barkai, 2011; Dawson et al., 2012). Until recently, ten multi-layered stratified Middle Paleolithic sites were known in the northwestern Caucasus: Ilskaya I, II, Monasheskaya, Barakaevskaya, Autlevskaya, Mezmaiskaya, Matuzka, Dakhovskaya caves, Gubs Rockshelter 1, and Baranakha-4 (Fig. 1). According to most researchers, these belong to a special cultural tradition—the Eastern Micoquian, and have analogies in the sites of Central and Eastern Europe (Golovanova, 1993; Golovanova et al., 1998; Lioubine, 1998; Golovanova, 2015). According to modern data, this tradition appeared in the northwestern Caucasus ca 70 ka BP, and existed until the end of Middle Paleolithic in this region (ca 40 ka BP). But during surveys in 2007–2014, there were discovered the new open-air sites of Besleneyevskaya-1, Hadjoh-2, and Hadjoh-3, located on sources of raw materials.

This article presents results of complex research in the multi-layered site of Hadjoh-2. It is located in the Kuban River area (Fig. 1), on the right bank of Sredniy Hadjoh River (Belaya River valley), at about 60 m above the river, and 503–507 m above the sea level; 44°18′46.9″ N, 40°14′30.2″ E. E.V. Doronicheva discovered the site in 2008. During five (2009–2010, 2013–2015) excavation campaigns, deposits with thickness more than 6 m were studied on an area of 33 m^2 (Fig. 2). The lower cultural layers 6 and 7 are the most rich in artifacts. This article focuses on describing these materials.

Results of geological and geomorphological research

Geological and geomorphological research showed that the area of Sredniy Hadjoh River valley is composed of Jurassic and Cretaceous deposits (Gosudarstvennaya geologicheskaya karta…, 2004: L–37–XXXV). According to the scheme by S.A. Nesmeyanov (1999: 177) and field observations by A.A. Muriy (in 2014), the terrace, on which the Hadjoh-2 site is located, is preliminarily correlated with the Late Hadjoh geomorphological level (Fig. 3). Because of a fuzzy morphological manifestation of terrace formations in the area, we can assume that the site may belong to either the Late Hadjoh, or to the very beginning of the subsequent Early Vyushat erosion-accumulation cycle. The Hadjoh geomorphological level is dated to the Late Middle Pleistocene period. The formation time of the terrace where the site is located can be estimated as the boundary between the Middle and Late Pleistocene: about 130 ka BP according to modern data (Paleoklimaty…, 2009: 4).

Stratigraphy

At the site, ten lithological layers were identified (see Fig. 2, *2*).

Layer 1. Humus sandy loam, black in color, without inclusions. The contact with the underlying layer is fuzzy, 15–20 cm.

Layer 2. Beige loam with numerous inclusions of small corroded sandstone pebbles, 50–80 cm.

Layer 3. Light brown loam with a large number of highly corroded limestone pieces, 40–60 cm.

Layer 4A. Dark brown, dense loam with numerous inclusions of decomposed limestone. The contact with the underlying layer is fuzzy, 20–30 cm.

Layer 4B. Light beige, dense loam with a large number of decomposed limestone pieces and rare corroded sandstone pebbles, 30–50 cm.

Layer 4C. Gray-brown, dense loam with rare inclusions of corroded limestone. The contact with the underlying layer is fuzzy, 60–80 cm. Bones of steppe bison (*Bison priscus*, definition by Y.N. Spasovsky) are found.

Layers 1–4C lie with a slight slope towards the edge of the terrace.

Layer 5. Red-gray, sandy loam with few small and medium-sized corroded fragments of sandstone and limestone. The surface and bottom of the layer lie

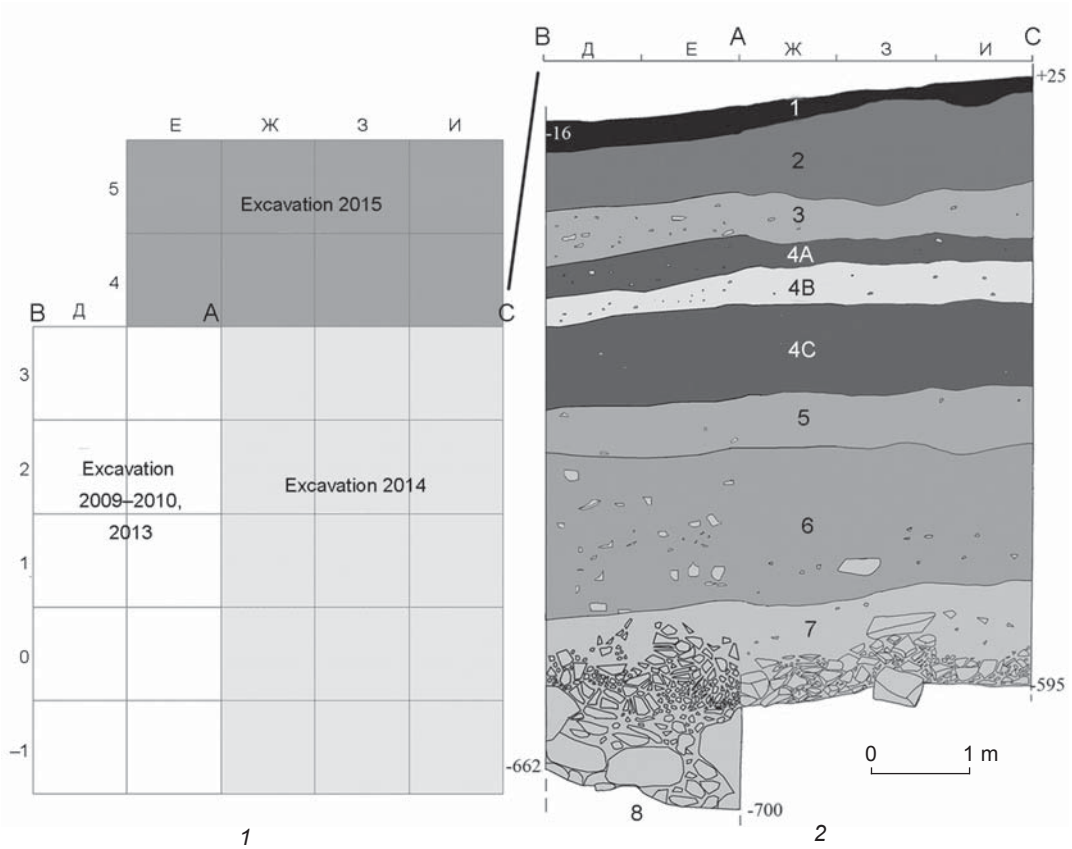

Fig. 2. Excavation plan (*1*) and section (*2*; see description in the text) of the Hadjoh-2 site.

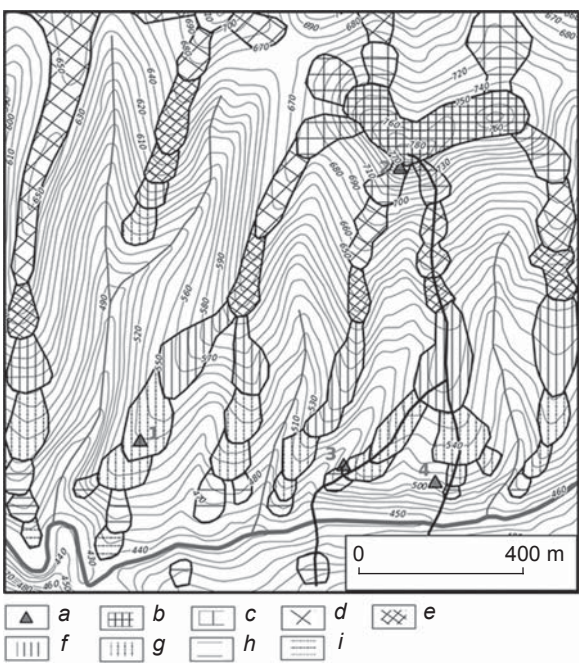

Fig. 3. Structure-geomorphological scheme of the Hadjoh-2 site area.
a – sites; *b*–*i* – geomorphology levels: *b* – Shahan, *c* – Makhoshevsk, *d* – Early Kurdzhips, *e* – Late Kurdzhips, *f* – Early Hadjoh, *g* – Late Hadjoh, *h* – Vyushat, *i* – Maikop.

relatively horizontally towards the terrace backside, 40–60 cm.

Layer 6. Light brown loam with numerous small, medium-sized, and rare large fragments of sandstone and limestone, 160–190 cm. Several unidentified bones were found.

Layer 7. Reddish loam with medium and large limestone debris and blocks, the number of which increases sharply in the lower part. The layer slopes to the edge of the terrace, up to 200 cm.

Layer 8. Brown loam with numerous small and large blocks of limestone, visible thickness 200 cm. The layer apparently lies on the terrace pedestal.

Artifacts are not found in layers 2, 5, and 8. Rare reworked small flint artifacts are found in layers 1, 3, and 4B. Layers 4A, 4C, 6, and 7 are sufficiently rich in stone tools, which are dated to the Middle Paleolithic. A slight planar erosion of artifacts within the terrace is not excluded for these layers.

Palynological data

15 samples were analyzed from layers 7 and 6. Technical processing was carried out according to the improved standard method (Grichuk, 1940; Berglund, Ralska-

Jasiewiczowa, 1986; Sapelko, 2014). All the samples were found to be strongly carbonate.

In samples from layer 7, pollen of grasses (*Asteraceae, Chenopodiaceae, Cichoreaceae, Polygonaceae, Rosaceae, Linaceae, Rubiaceae, Cyperaceae*, and others) prevails. Pollen of *Polygonum* and *Geranium* occurs. The tree species are represented mainly by birch; a few pollen grains of pine are mostly torn and crumpled. There is a significant content of phytoliths and coals. In the lower part, decrease in the number of phytoliths and appearance of faunal remains were noted.

In layer 6, pollen of tree species quite disappears. Pollen of herbs (*Asteraceae* and *Rosaceae*) is found. Pollen grains of *Geranium* and spores of fern are found. The saturation with phytoliths is less than in layer 7. In the lower part, their number decreases, and faunal remains are present.

According to the results of the analysis, it is incorrect to draw conclusions about the character of the vegetation because of the low pollen-content. The unfavorable conditions for fossilization of pollen grains were likely associated with the cold and dry climate in layer 6. The environment was better during the accumulation of layer 7. Apparently, at the time of layer 7, there was woody vegetation, which disappeared during formation of layer 6. The spread of the flax family, which also disappeared in layer 6, may testify to a warmer, but dry climate during accumulation of layer 7. Flax is usually found in the mountain steppes, subalpine and alpine meadows (Zernov, 2006: 365–366).

Lithic raw materials

Five flint sources (called Shahan-1–5) have been detected in the Sredniy Hadjoh River valley. They are not indigenous, but represent flint in the secondary occurrence in clays. Flint nodules originate from a destroyed stratum of the Oxford-Kimmeridgian (Upper Jurassic) limestones. One of the important characteristics of this raw material is the size of the nodules, whose length can reach 90 cm (rare cases), but is mostly 20–40 cm. The Hadjoh-2 site is located directly on the flint exposure—the Shahan-4 source. M.A. Kulkova conducted petrographic and geochemical analyses of flints from the natural outcrops and the site in the Fersman laboratory of environmental geochemistry (the Herzen State Pedagogical University of Russia), using the standard method (Doronicheva, Kulkova, 2016).

According to the petrographic analysis, the flint from Shahan-1 and Shahan-2 sources consists mainly of quartz with inclusion of chalcedony geodes. The composition includes a significant amount of siliceous skeletons of marine organisms (shells and spicules), and separate grains of olivine. The flint from Shahan-3 and Shahan-5 sources is somewhat more saturated with organogenic inclusions, and contains less limonite. The flint from Shahan-4 source is most enriched with siliceous skeletons of marine organisms, especially sponge spicules. The X-ray fluorescent analysis of flint samples with the "Spectroscan MAX" device showed an increased content of some trace elements, such as P_2O_5, Y, Zr, Ni, and MnO.

According to the results of research on the lithic assemblage from the Hadjoh-2 site, 99 % of artifacts are made from the flint (KR-9/10) coming from the Shahan-4 source, on which the site is directly located. The exceptions are two flakes, one from sandstone (in layer 6) and another from flint (in layer 7) derived from the Meshoko source, located at the distance of ~6–7 km from the site. Several quartzite, sandstone, and limestone pebbles were found in both layers. All these rocks are known in the modern pebble deposits of the Sredniy Hadjoh River.

Description of lithic industry

Layer 6. In total, 1639 artifacts have been found (Table 1); all have a good preservation (not battered or abraded). The most of the finds are covered with a white patina; 25 pieces are covered with limestone crust, and 7 pieces are burnt.

Core-like fragments (43 pcs) are pieces of flint (2–10 cm) with flake negatives on some portions of their surfaces. Apparently, most of these are fragments of cores.

Among 20 cores, unifacial single-platform cores (14 pcs) predominate (Fig. 4, *4–7*). Their sizes are 4–8 cm on average. The striking platforms on cores were made by one, more rarely two, large scars, and two cores have platforms prepared by a series of small removals. The flaking was carried out mainly in one direction on slightly convex surfaces. Convergent negatives are rare (Fig. 4, *6*). Angles of striking platforms are 70–80°.

Two- and three-platform (Fig. 4, *8*) cores are rare (3 pcs each), and unifacial and bifacial variants of opposite and orthogonal flaking are equally represented. The striking platforms on these cores are made mainly by large scars.

Flakes make up one third of the collection (Table 2), and most of them are fragmented. There are nine technical flakes (CTE) used for preparation of striking platforms (Fig. 4, *1*). More than half of the flakes (54 %) have cortex areas. Primary and semi-primary flakes are 20 %, and 15 % of flakes have cortical striking platforms. Flakes with negatives going in the same direction as the flake are 59 %; most of the negatives are parallel. Flakes with orthogonal (4.7 %) and opposite (10 %) dorsal patterns are few. Striking platforms are mostly flat, then punctiform (19.5 %), retouched (2.6 %), and dihedral (2.8 %) (Table 2). The collection includes only 35 (6.4 %) laminar

Table 1. **General composition of the collection from the Hadjoh-2 site**

Categories	Layer 6		Layer 7	
	N	%	N	%
Cores/core-like fragments	20/43	3.9	55/94	8.2
Broken nodules	49	3.0	73	4.0
Small fragments	664	40.5	440	24.2
Chips	301	18.4	233	12.8
Technical flakes (CTE)	9	0.5	19	1.1
Blades/laminar flakes	0/35	2.2	1/33	1.9
Flakes	502	30.6	839	46.2
Tools on chunks	2	0.1	2	0.1
Tools on flakes	10	0.6	20	1.1
Pebbles	4	0.2	8	0.4
Total	1639	100	1817	100

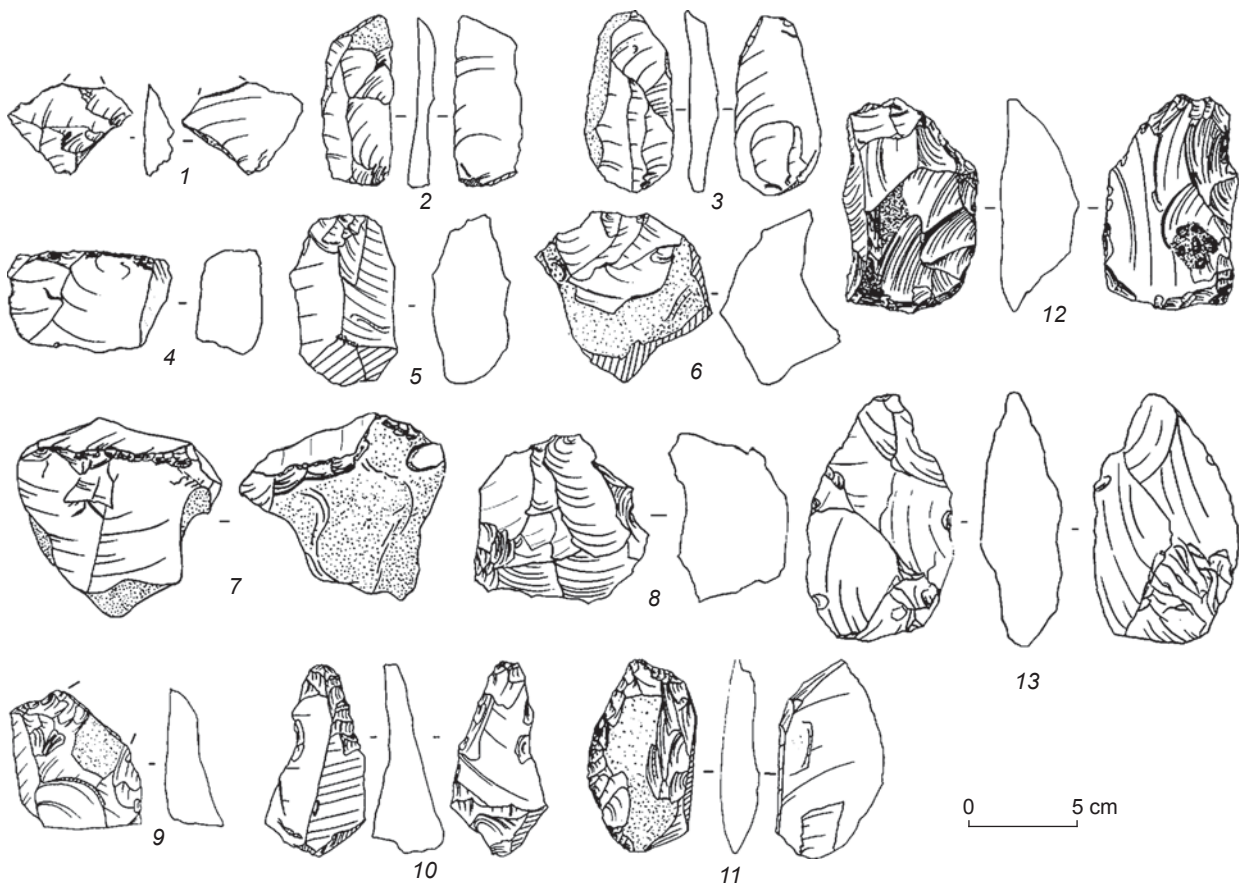

*Fig. 4.*Lithic artifacts from layer 6.
1 – technical flake (CTE); *2*, *3* – laminar flakes; *4–8* – cores; *9* – side-scraper fragment; *10–13* – tools.

Table 2. **Characteristics of striking platforms on flakes**

Flake groups	Total	Flat	Punctiform	Dihedral	Retouched	Cortical	Fragmented
Primary (100 % cortex)	54/68	15/19	7/9	–/1	–/1	15/26	17/12
Semi-primary (50–99 % cortex):							
with unidirectional removals	40/84	21/56	9/4	–	–/1	5/11	5/12
longitudinal-transverse	3/13	1/7	1/–	–	–	1/5	–/1
opposite	5/8	2/4	1/–	–	–	2/4	–
unidentifiable	8/10	4/3	1/–	–	–	1/3	2/4
Flakes with cortex (0–49 % cortex):							
with unidirectional removals	113/220	55/111	11/21	2/2	–/3	17/36	28/47
longitudinal-transverse	16/15	10/9	4/2	–/1	–	–/2	2/1
opposite	36/20	20/7	5/3	1/–	–	7/8	2/2
unidentifiable	18/45	7/11	3/3	1/–	–	4/2	3/29
Flakes:							
with unidirectional removals	162/261	72/133	29/20	6/18	8/7	3/4	54/79
longitudinal-transverse	7/6	6/4	–	–	–	–	1/2
transverse	–/3	–/2	–/1	–	–	–	–
opposite	14/18	10/8	2/6	–	–	–/3	2/1
unidentifiable	26/66	3/14	1/1	–	–	1/2	21/49
Levallois flakes with unidirectional removals	–/2	–	–	–	–/2	–	–
Blades with unidirectional removals	–/1	–/1	–	–	–	–	–
Laminar flakes with unidirectional removals	35/33	16/18	3/2	1/1	2/2	4/–	9/10
Technical flakes (CTE)	9/19	6/9	3/3	–	–	–/3	1/4
Total	546/892	248/416	80/75	11/23	10/16	60/109	147/253

Note. Before the slash the data for layer 6, after the slash the data for layer 7.

flakes (Fig. 4, *2*, *3*), with unidirectional dorsal patterns. Real blades are absent.

Only 12 tools were found in layer 6. Side-scrapers on flakes (3 pcs) are represented by fragments (Fig. 4, *9*). Bifacial tools are made on flakes (3 pcs) and chunks (2 pcs). Among these, there are two partly bifacial tools: a convergent tool (Fig. 4, *10*), and a scraper with thinned back and proximal part of the flake (Fig. 4, *11*). The bifacial backed scraper, similar to the Bockstein type (Fig. 4, *12*), indicates that the layer 6 assemblage belongs to the circle of Micoquian industries in Central and Eastern Europe. Unfinished bifacial convergent tools (2 pcs) are close to small sub-triangular bifaces, which are also typical of the Eastern Micoquian (Fig. 4, *13*). Besides these forms, an end-scraper on flake, two flakes with scale retouch, and a tool fragment were identified.

Some conclusions about the flaking technique can be reached on the basis of the analysis of cores (20 pcs) and flakes (546 pcs). The collection is also characterized by the presence of core-like fragments (43 pcs), fragments of flint nodules (49 pcs), and a large number of small indefinable fragments (664 pcs). The great number of waste products of flaking indicates that the stone-knapping was carried out directly at the site. Most flakes (54 %) have cortex areas, and 15 % of the flakes have cortical striking platforms.

The preparation of cores involved mainly the preparation of striking platforms by large removals. Flat platforms on flakes are 60.1 %. The flaking was carried out mainly in one direction, on slightly convex surfaces. Unifacial single-platform cores and flakes with negatives of removals struck in the same direction as the original

flake predominate. This flaking technique was not aimed at the production of blades. Real blades are absent, and laminar flakes are infrequent.

The multi-platform cores appear to reflect various stages of core-reduction. The renewal of cores was produced with opposite and orthogonal flaking. The number of cores and flakes with longitudinal-transverse (orthogonal) and opposite flaking patterns is small. A large proportion of flakes with cortex, predominance of single-platform cores, and the small number of multi-platform cores indicate that core reduction cycles were short: usually only a few flakes were struck from one striking platform, and the core reduction was mainly completed at the stage of single-platform flaking, after which the core was discarded. In Middle Paleolithic archaeological contexts, this feature is usually a reflection of the abundance of stone raw materials. The Hadjoh-2 site is located on flint outcrops. The marked characteristics of the materials, as well as the small number of tools, some of which are unfinished bifacial forms, allow us to conclude that layer 6 preserves the remains of a flint-knapping workshop, located on flint outcrops, where ancient people repeatedly came throughout the formation-period of the layer.

Layer 7. The collection comprises 1817 artifacts (see Table 1); all are well preserved (not battered or abraded). A part of the finds (15 %) is not patinated. Most artifacts (75 %) are covered with a white patina, many only on one surface. Five pieces are covered with limestone crust, and 13 pieces are burnt.

Among 55 cores, unifacial single-platform cores (34 pcs) predominate (Fig. 5, *6*, *7*, *11*). The striking platforms on cores are made by one, or rarely two, large removals. Eight cores have platforms prepared by a series of small removals (Fig. 5, *10*). The flaking was carried out mainly in one direction, on slightly convex surfaces. Angles of striking platforms are 70–80°. Especially interesting is the refitting of a unifacial single-platform core (Fig. 5, *9*) and a Levallois flake (Fig. 5, *8*), which were found in adjacent squares. The striking platform of the core is prepared by small removals, the platform angle is 78°. Negatives of two parallel scars are preserved on the production surface. The flake has a retouched convex platform.

Also, two-, three-, and four-platform unifacial cores (8, 3 pieces, and one piece, respectively) are represented. Less frequently, cores were reduced from two (5 pcs) or more (3 pcs) surfaces. The reduction from opposite and orthogonal platforms is present. The striking platforms are mostly flat. One highly reduced core (45 × 48 × 14 mm) can be defined formally as a disk-shaped core (Fig. 5, *5*); however, in this technological context, the core can be defined as a bifacial multi-platform residual core.

Flakes make up one third of the collection (Table 2), and most of them are fragmented. Core platform preparation technical flakes (CTE; 19 pcs) are identified. More than half (54 %) of the flakes have cortex areas, semi-primary (12.9 %) and primary (7.6 %) flakes are numerous, and 17 % of the flakes have cortical striking platforms. Flakes with negatives of removals struck in the same direction as the flake predominate (64 %), and the negatives are usually parallel (Fig. 5, *2*). Flakes with opposite (5.2 %) and longitudinal-transverse (3.5 %) dorsal patterns are rare, and flakes with the irregular dorsal pattern (Fig. 5, *1*) are represented by individual pieces. Two flakes can be defined as Levallois (Fig. 5, *8*), with unidirectional negatives and faceted striking platforms. Flat striking platforms prevail (65 %), and there are also punctiform (11.8 %), dihedral (3.6 %), and retouched (2.6 %) platforms. Only one blade (Fig. 5, *3*) and 33 (3.8 %) laminar flakes (Fig. 5, *4*) with unidirectional negatives were identified.

In layer 7, 22 tools were found. Unfinished bifacial forms prevail (12 pcs). These include the tool that can be defined as an oval biface or bifacial scraper (Fig. 5, *16*), and the tool similar to small triangular bifaces characteristic to the Micoquian industries (Fig. 5, *15*). The presence of leaf-shaped biface fragments (3 pcs; Fig. 5, *14*) is also indicative. Among 7 side-scrapers, 3 simple, 2 angled, a transversal (Fig. 5, *12*), a diagonal, and a thick scraper are identified. Also, there are three end-scrapers on flakes (Fig. 5, *13*).

All the characteristics of the materials indicate that the flint-knapping was carried out directly on the site. There are numerous waste products, including small unidentifiable fragments (24.2 %), core-like fragments (5.2 %), and fragments of broken nodules (4.0 %). A large part of the finds has cortex areas, and many flakes have cortical striking platforms. The large number of core-like fragments is explained by the fact that with the abundance of flint raw material the cores were exploited to the limit and, if defect, were discarded in the initial stages of reduction.

The technique of core preparation was primarily the preparation of striking platforms by large flakes. Most flakes have flat platforms, while carefully prepared platforms are rare (6.2 %). The flaking was carried out in one direction, from slightly convex surfaces. Unifacial single-platform cores (61.2 %) and flakes with negatives of removals, struck in the same direction as the original flake, prevail. The renewal of cores was produced using opposite and orthogonal flaking. Flakes with longitudinal-transverse and opposite dorsal patterns are rare.

In general, the flaking technology is similar to the technology described for layer 6. Some differences (for example, the presence of two Levallois flakes and one true blade in layer 7) are apparently explained by only the slightly larger representativeness of the collection from layer 7. The characteristics of the materials from this layer, as well as the presence of unfinished bifacial

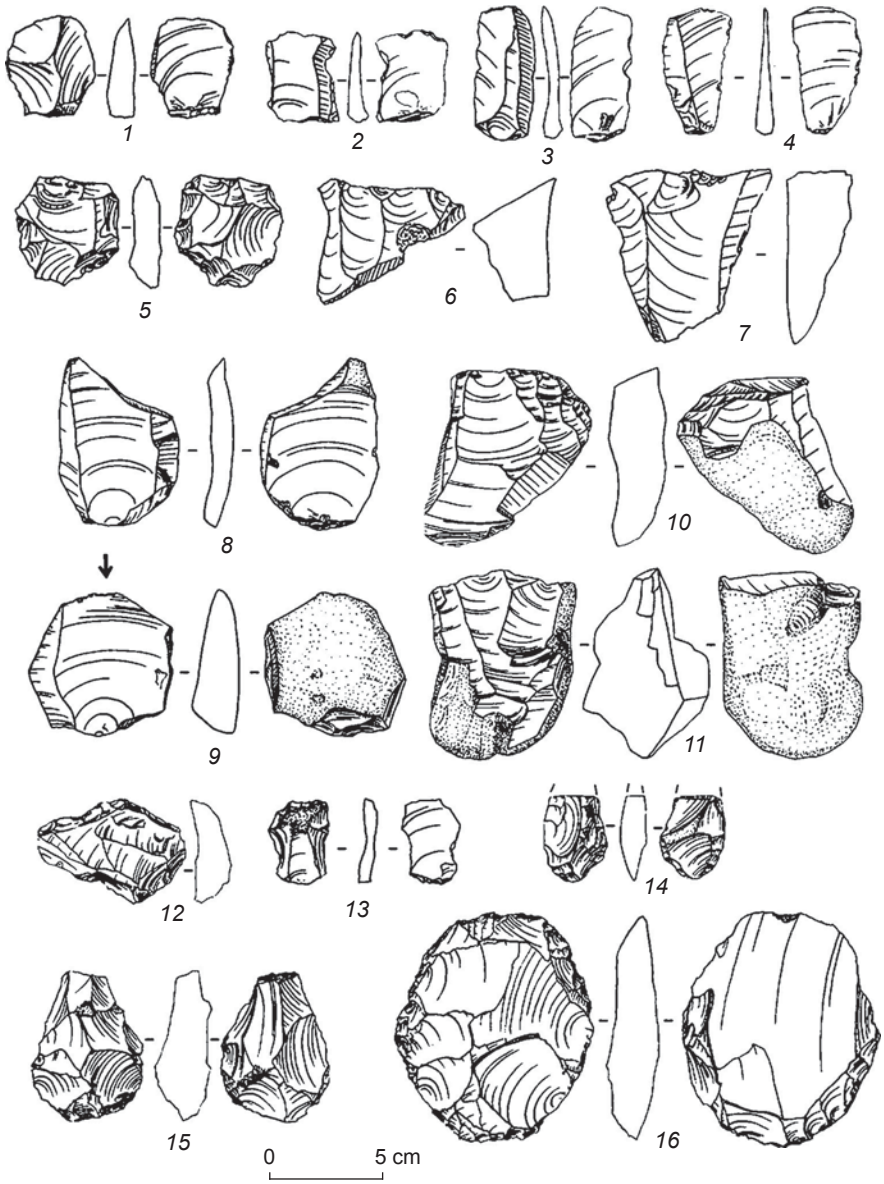

Fig. 5. Lithic artifacts from layer 7.
1, *2*, *4* – flakes; *3* – blade; *5–7*, *9–11* – cores; *8* – Levallois flake refitting with the core (*9*); *12–16* – tools.

tools, allow the conclusion to be made that during formation of layer 7 the site was used as a workshop located on raw material outcrops.

Conclusions

The results of a multidisciplinary research of the Hadjoh-2 site allow us to propose a preliminary reconstruction of paleorelief and paleoclimate. During the formation of layers 7 and 6, the site was located on the floodplain terrace on the right bank of the Sredniy Hadjoh River. The terrace's formation is dated to the boundary of the Middle and Late Pleistocene; consequently, the Hadjoh-2 site is not older than the beginning of the Late Pleistocene, 130–120 ka BP. According to the results of pollen analysis, cold and dry climate dominated at that time in the site area, and the environmental conditions were similar to subalpine and alpine meadows. Such a climate was reconstructed in the lower layer 3 at Mezmaiskaya Cave (Golovanova et al., 1998), whose age is ca 70 ka (Golovanova, 2015). Apparently, layers 6 and 7 in the Hadjoh-2 site can also be correlated with one of cooling periods at the end of MIS 5 or the onset of MIS 4.

The analysis of stone inventory indicates that layers 6 and 7 in the Hadjoh-2 site represent remains of workshops located directly on outcrops of high-quality flint. In both collections, products related to primary stone-knapping

predominate, including cores (3.9 and 8.2 %), flakes (33.3 and 49.2 %), and small fragments (40.5 and 24.2 %). Most of the finds have cortex areas. The technique of core preparation was based on preparation of the striking platform by large flakes; carefully prepared platforms are rare. The flaking was carried out in one direction, from slightly convex surfaces. Unifacial single-platform cores prevail (70 and 61.2 %). The renewal of cores was made using predominantly opposite and orthogonal flaking. The parallel dorsal pattern prevails on flakes. There is a series of laminar flakes. According to F. Bordes's method (1953), 33 laminar flakes, a blade, and two Levallois flakes can be assigned to the Levallois products (IL = 4.0) in layer 7. The flaking technique can be defined as non-laminar and non-Levallois. In layer 6, 35 laminar flakes can be assigned to the Levallois products (IL = 6.4). This, according to Bordes's method, indicates some presence of Levallois technique, but, nevertheless, does not allow us to define the industry as a Levallois one (IL > 20 is required for this definition).

In general, the flaking technique in the site of Hadjoh-2 is similar to that in Mezmaiskaya Cave (lower layers 3 and 2B-4). Primarily, this is reflected in the cores. In Mezmaiskaya Cave, flaking in one direction from slightly convex surfaces also predominates. The percentage of laminar flakes is not high, and the Levallois indexes are low (3.6 in layer 3, and 3.0 in layer 2B-4). However, the index of prepared platforms is higher in Mezmaiskaya Cave; Hadjoh-2 is similar to Barakaevskaya Cave on this index (Table 3).

The tools in layers 6 and 7 are represented predominantly by unfinished bifacial forms. On the basis of the technical and typological parameters of the collection (including the bifacial scraper similar to the Bockstein type, fragments of unfinished leaf-shaped forms, and sub-triangular bifaces), we conclude that the materials of the lower layers in the Hadjoh-2 workshop-camp are most similar to the Eastern Micoquian industries in the Mezmaiskaya (Golovanova et al., 1998; Golovanova, 2015), Barakaevskaya (Lyubin, Autlev, 1994), Monasheskaya (Lyubin, 1977: 144–173; 1989; Belyaeva, 1999: 71–143), and Ilskaya (Shchelinskii, 1998) sites.

The Shahan flint outcrops, on one of which the Hadjoh-2 site is located, were a kind of "silicon province", whence the flint was transported to other sites in the

Table 3. **Percentage of main categories of lithic artifacts and technical indexes***

Site	Cores and core-like fragments	Broken nodules and chunks	Small fragments	Chips	Flakes	Flakes**			Tools	IL	IF large
						with cortex	technical	laminar flakes and blades			
Hadjoh-2:											
layer 6	3.9	3.0	40.5	18.4	33.3	54.0	1.6	6.4	0.7	6.4	5.4
layer 7	8.2	4.0	24.2	12.8	49.2	54.0	2.1	3.8	1.2	4.0	6.2
Mezmaiskaya Cave***:											
layer 3	1.8	0.1	25.4	40.6	13.0	26.0	4.0	3.6	18.6	3.6	19.0
layer 2B-4	3.4	0	24.7	25.9	26.0	17.0	9.0	3.0	20.0	3.0	22.2
Barakaevskaya Cave:											
layer 2	0.3	…	…	…	…	…	…	…	3.7	1.8–6.2	24.4
Monasheskaya Cave:											
layer 4	1.2	7.1	…	13.1	73.7	…	…	4.6	4.2	…	53.0
layer 3A, hor. 3	0.9	4.3	…	16.7	75.8	…	…	7.8	2.3	…	48.5
" hor. 2	0.5	3.3	…	22.5	71.4	…	…	6.1	2.3	…	43.9
" hor. 1	0.5	1.9	…	9.2	84.7	…	…	3.7	3.7	…	37.5
layer 2	1.4	1.1	…	6.4	87.5	…	…	5.0	3.6	…	49.3

*The data collected by E.V. Doronicheva and according to: (Belyaeva, 1999: 71, tab. 2.; Lyubin, 1989: pp. 84–87).
**The percentage relative to the total number of flakes.
***Collections from 1987–2001 excavations.

northwestern Caucasus. The analyses of stone raw materials show that the flint from Shahan outcrops was transported in the Middle Paleolithic to Mezmaiskaya (30–40 km to the south-west) and Matuzka (about 30–40 km to the west) caves. Moreover, the data from Mezmaiskaya, where this flint was recorded in all Middle Paleolithic layers (dating to 70–40 ka BP), indicate that the Shahan outcrops were exploited throughout the entire period of the Neanderthal occupation of this region (Doronicheva, Kulkova, 2016; Doronicheva, Kulkova, Shackley, 2016).

A comparison between the materials from the lower layers of the Hadjoh-2 site and Mezmaiskaya Cave (Table 3) shows a number of differences. In the cave, the proportions of cores and flakes are less, and the percentage of technical flakes is higher. This, apparently, is related to a limited amount of raw materials and their maximum use, which is reflected in the renewal and maximum reduction of cores. At the same time, there are significantly more tools and chips in Mezmaiskaya Cave, which may indicate the production and rejuvenation of tools directly on the site. This ratio of major categories of inventory allows us to define Mezmaiskaya Cave as the camp-site of active habitation, where various tools were used and stone knapping was restricted; and the Hadjoh-2 site as the workshop-camp used for stone knapping and manufacturing of preforms for bifacial tools.

Comparing the Hadjoh-2 collections with materials from the active habitation workshop-camps in the Gubs Gorge (Lyubin, Autlev, 1994; Belyaeva, 1999), which are also located on a flint source, one can note that the percentage of cores in Monasheskaya and Barakaevskaya caves is lower, and the percentage of tools is higher than in the Hadjoh-2 site (Table 3). The technological indicators are higher in Monasheskaya Cave than at Hadjoh-2, and the cave-site has a later age than the Hadjoh-2 site (Golovanova, 2015). The significant feature of active habitation workshop-camps is the multi-raw-materials resource base of their lithic industries. The transported lithic raw materials are represented mostly by tools (Belyaeva, 1999: 72). In the Hadjoh-2 site, 99 % of artifacts are made of flint, on sources of which the site is located.

The Hadjoh-2 site functioned for quite a long time. Our studies indicate that the materials from layers 7, 6, and 4A represent workshops. Layer 4C is a camp where humans not only made tools, but also butchered game (details for layers 4A and 4C see in: (Doronicheva et al., 2016)). Further research will allow us to compare in more details the stages of human habitation at Hadjoh-2 and other sites, as well as to study economic variability among the sites, human life support strategies and mobility, cultural relations and exchange in the Middle Paleolithic of northwestern Caucasus.

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