

ARCHEOLOGY

DOI: <https://doi.org/10.32653/CH194989-1010>

Research paper

Artur I. Taymazov,
Cand. Sci., Senior Researcher
Institute of History, Archeology and Ethnography
Dagestan Federal Research Center of RAS, Makhachkala, Russia taymazov_artur@mail.ru

TOOL ASSEMBLAGE OF THE MUKHKAI I CAMP, LAYER 7C: DISCUSSING THE CULTURAL CONTENT OF THE END OF THE EARLY PLEISTOCENE OF THE NORTHEASTERN CAUCASUS

Abstract. The paper examines the tool assemblage from one of the key late Early Pleistocene sites of the North-Eastern Caucasus – the Mukhkai I camp, layer 7c. The tools constitute three differentiated clusters in terms of planigraphy. Despite this division, there are no significant differences in the typological composition of tools among the clusters. Each cluster encompasses both heavy-duty impact tools and small retouched pieces on flakes. Choppers, displaying various modifications of the working edge, particularly those with a narrow cutting edge, predominate in the tool assemblage. Additionally, the assemblage comprises picks (triangular and flat), chisel-like tools, heavy-duty scrapers, knives, notched tools, scrapers, and retouched flakes. The typological composition of the tools at Mukhkai I, layer 7c, generally corresponds to the Oldowan assemblage. Notably, the prominent tool types of the Acheulian technocomplex – handaxes and cleavers – are absent from the lithic industry of layer 7c. However, the production of large flakes and their utilization as blanks for large tools is recorded within this layer. Despite this, such practices did not gain widespread prevalence. Within the excavated area of layer 7c, only three large flakes were unearthed, and each underwent transformation into morphologically complete objects. Examining the collection's debitage composition suggests that the primary objective of lithic reduction remained the production of small flakes. Mastering large flake production did not precipitate a decisive transformation in the technical and typological characteristics of the industry. From a periodization standpoint, this camp corresponds to the Oldowan industry while exhibiting distinct indicators of the Early Pleistocene large flake industry of the Caucasus, marking the transitional stage between Oldowan and Acheulian. It is plausible that this camp pertains to the initial phase of this transitional period.

Keywords: Early Pleistocene; Northeastern Caucasus; Early Paleolithic; Oldowan; Early Acheulian; large flake industry

For citation: Taymazov A.I. Tool Assemblage of the Mukhkai I Camp, Layer 7C: Discussing the Cultural Content of the End of the Early Pleistocene of the Northeastern Caucasus. *History, Archeology and Ethnography of the Caucasus*. 2023. Vol. 19. N.4. P. 989–1010. doi.org/10.32653/CH194989-1010

АРХЕОЛОГИЯ

DOI: <https://doi.org/10.32653/CH194989-1010>

Исследовательская статья

Таймазов Артур Исрапилович
к.и.н., старший научный сотрудник
Институт истории, археологии и этнографии
Дагестанский федеральный исследовательский центр РАН, Махачкала, Россия
taymazov_artur@mail.ru

**ОРУДИЙНЫЙ КОМПЛЕКС
СТОЯНКИ МУХКАЙ 1, СЛОЙ 7В:
К ПРОБЛЕМЕ СОДЕРЖАНИЯ КУЛЬТУРЫ
КОНЦА РАННЕГО ПЛЕЙСТОЦЕНА
СЕВЕРО-ВОСТОЧНОГО КАВКАЗА**

Аннотация. В статье рассматривается орудийный состав коллекции одного из наиболее значимых памятников Северо-Восточного Кавказа конца раннего плейстоцена – стоянки Мухкай 1, слой 7в. Планиграфически орудия образуют три дифференцированных скопления. Существенных различий в типологическом составе орудий между скоплениями не имеется. Каждая из них содержит как крупные ударные орудия, так и мелкие ретушированные изделия на отщепах. В составе орудий преобладают чопперы, представленные различными модификациями рабочего края, в основном, с узким лезвием. Орудийный набор также включает пики (трехгранный и плоский), долотовидное орудие, скребки высокой формы, скребла, ножи, орудия с выемкой, скребки, отщепы с ретушью. Типологический состав орудий в целом соответствует олдованскому набору изделий. Ведущие типы орудий ашельского технокомплекса – рубила и кливеры – в каменной индустрии слоя 7в отсутствуют. Но, при этом, здесь фиксируется производство крупных отщепов и их использование в качестве заготовки для крупных орудий. Однако этот процесс не получил широкого распространения. На раскопанной площади слоя 7в было обнаружено всего три крупных отщепа, и все они были превращены в морфологически завершенные изделия. Судя по составу сколов коллекции, основной целью первичного расщепления все еще оставалось производство некрупных отщепов. Овладение техникой получения крупных отщепов не повлекло за собой решающей трансформации технико-типологического облика индустрии. С точки зрения периодизационных категорий, данный памятник соответствует индустрии олдована, но содержит явные признаки раннеплейстоценовой крупнотщеповой индустрии Кавказа, относящейся к стадии перехода от олдована к ашелю. По всей вероятности, данный памятник относится к самой начальной фазе этой переходной поры.

Ключевые слова: ранний плейстоцен; Северо-Восточный Кавказ; ранний палеолит; олдован; ранний ашель; крупнотщеповая индустрия

Для цитирования: Таймазов А.И. Орудийный комплекс стоянки Мухкай 1, слой 7в: к проблеме содержания культуры конца раннего плейстоцена Северо-Восточного Кавказа // История, археология и этнография Кавказа. 2023. Т. 19. No 4. С. 989-1010. doi.org/10.32653/CH194989-1010

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Introduction

One of the most discussed issues in paleolithic archaeology centers around the transition from the Oldowan to the early Acheulian and the identification of the typological and technological facets during the initial stage of the Acheulian period. Sites possessing materials suitable for framing and resolving these issues are exceedingly scarce on the Paleolithic global map. Until recently, the examination of this transition problem has predominantly relied on African materials. Expanding the scope of this problem beyond its traditional African context has consistently proven challenging, primarily due to the scarcity of sites in other regions featuring enduring sections of Early Pleistocene deposits with extensive and well-stratified cultural layers. An essential prerequisite for archaeological materials has been the quantitative representativeness of the analyzed collections and the functional homogeneity of the sites whose collections are involved in comparative analysis.

Recent developments in ancient Paleolithic research have unveiled sites from the corresponding period outside the African continent. Presently, investigation efforts are underway in the southern regions of Europe, specifically in Spain, Italy, and the Mediterranean region of France. Remarkable progress in this context is particularly evident in the North-Eastern Caucasus and Ciscaucasia. Regarding the Caucasus, the assessments of identified materials by different experts is currently contradictory. Examining conclusions about the cultural landscape from 2 to 1 Ma reveals the coexistence of five distinct industries in the region during this timeframe: Pre-Oldowan, classical Oldowan, micro-industry, macro-industry, and early Acheulian. Notably, some researchers suggest that the latter is older than the local Pre-Oldowan industry.

As previously mentioned, addressing the evolution of cultural stages in the Early Paleolithic necessitates a focus on sites endowed with extensive Early Pleistocene deposits possessing numerous and well-stratified cultural layers. Within the Caucasus, the sites situated in Central Dagestan fulfill these criteria (Fig. 1). The Central Dagestan sites stand out in the Early Pleistocene context due to the unique combination of sediment thickness and chronological scope. Few sites in Eurasia can compare with them in terms of these indicators. The Early Pleistocene deposits in the sections of certain studied sites exhibit a remarkable thickness, surpassing 70 meters. Throughout the entire vertical sequence, numerous layers with archaeological finds are discernible. Among the three most extensively investigated camps (Ainikab I, Mukhkai I, and Mukhkai II), a minimum of 100 layers containing archaeological remnants has been identified. The entirety of these cultural layers spans a chronological period of 1.4 Ma, encompassing the timeframe from approximately 2.3 Ma (but not less than 1.95 Ma) to 0.8 Ma [1].

Conducting extensive archaeological investigation at the multilayered camps Mukhkai I and Mukhkai II has facilitated the formulation of questions regarding the archaeological content of North Caucasus culture in the final phase of the Early Pleistocene and the determination of its cultural-stage status. Excavations conducted over a wide area in 2018 and 2019 in the upper strata of the deposits at these sites yielded a wealth of

archaeological material. This material enables the tracing of the transition process from Oldowan to Acheulean and a detailed analysis of the nature and characteristics of this process in the Caucasus. The archaeological materials obtained are particularly valuable, as some originate from layers where cultural remains deposited exclusively *in situ*, preserving ancient habitation surfaces.

The examination of the assemblage collected during the 2018-2019 excavations remains ongoing. The focus of the present work is to examine the complex of artifacts with secondary treatment from the Mukhkai I camp, specifically in layer 7c, as well as to unveil the typological and technological characteristics of the culture represented by the materials of this layer. In a collaborative effort, the lithic industry of layer 7c has previously been discussed in a joint article by Kh.A. Amirkhanov and the present author [2]. This earlier work primarily emphasized planigraphy, the spatial distribution of flint artifacts, and the determination of the camp's functional type.

Mukhkai I camp, layer 7c: general information

Mukhkai I is a multilayered camp dating back to the Early Pleistocene and is part of the Ainikab-Mukhkai-Gegalashur group of sites situated in Central Dagestan. It was discovered in 2006 by the North Caucasus Paleolithic expedition of the Institute of Archaeology of the Russian Academy of Sciences, led by Kh.A. Amirkhanov. Excavations started in 2007 and spanned intermittently until 2019. Situated 3 km south of the village Ainikabmakhi in the Akushinsky district, the archaeological site resides at an absolute altitude of 1620 m. Its relative elevation above the Akusha River bed is 235 m. The camp is nestled in the rear part of the watershed of the Akusha and Ushisha Rivers, and is linked to the sediments on the side of the Tsianshuri River valley, a tributary of the Ushisha River (Fig. 1). The loose Early Pleistocene sediments at the site have a thickness of 65.5 m. According to lithological-facial characteristics, the deposits of the Mukhkai I are divided into five members. The section of the site clearly demonstrates the alternation of three thick strata of coarse-sized material with equally impressive members of silt. In these deposits, taking into account the latest excavations, 48 layers with archaeological finds were identified in the upper part of the section. Through a comprehensive analysis of geological-geomorphological, paleomagnetic, and comparative data from adjacent sites of Mukhkai II and Ainikab I, it is discerned that the cultural layers within this camp span different time periods of the Early Pleistocene [1; 3].

In 2019, the archaeological site denoted as Mukhkai I camp, layer 7c, was identified and thoroughly investigated in the area of Excavation 3, dug in the upper segment of the site's deposits (Fig. 2). The layer was excavated across an area of 35 square meters. It rests at a depth ranging from 4.30 to 4.90 meters from the ground surface of the slope overlooking the valley of the Tsianshuri River. In relation to the zero reference point, common for Mukhkai sites, its occurrence is situated between 7.30 and 7.90 meters in depth. The layer's orientation is sub-horizontal, featuring a slight slope toward the northeast. Lithologically, it manifests as a dense pale-yellow loam with occasional

inclusion of isolated pebbles, along with sporadic boulders and blocks of limestone. The primary component of the layer is slit.

The described horizon holds distinct archaeological significance as it embodies a category of cultural deposits associated with authentic residential sites. Unlike archaeological finds in a state of “suspension”, the artifacts in the cultural layer present themselves as a homogenous complex preserved *in situ*, which is evidenced by comprehensive stratigraphic and microstratigraphic observations, the material found in the form of a lithologically consistent thin horizon at a uniform level, and the presence of numerous “connections” between flint artifacts deposited in the layer [2].

Another distinctive feature of Mukhkai I, layer 7c, contributing to its significance, lies in the identification within the cultural layer of the site of various functional areas of ancient relief. Within the structure of layer 7c, three planigraphic zones have been documented, each revealing a specific pattern in the occurrence of archaeological material. The composition of cultural remains within these three clusters indicates that clusters 1 and 2 served as sites where finished tools were utilized, while cluster 3 functioned as a location where ancient hominines both used and actively crafted tools [2]. Based on its functional attributes, the Mukhkai I, layer 7c, can be classified as a base camp [2].

Lithic inventory

The collection of lithic tools uncovered from Mukhkai I, layer 7c, comprises a total of 186 items. The concentration of lithic tools is predominantly observed at the base of the layer. The vertical distribution of the majority of finds spans no more than 15 cm over the extensive excavated area [2, p. 75, fig. 2, B]. The average artifact density stands at 5.31 items per square meter. The state of preservation for the finds is notably high, with edges exhibiting no signs of rolling. For artifacts associated with the upper boundary of the layer, the upward-facing side is covered with a continuous milky patina.

Raw material. In terms of primary raw lithic material, the industry at the Mukhkai I, layer 7c, is characterized as a mono-raw material industry, predominantly utilizing chalk flint of various shades of gray. Notably, the deposits within the layer itself, where the site is situated, do not contain flint. However, sources of raw materials were in close proximity to the camp. Flint deposits, in the form of veins and interlayers, are present in the chalk limestones that compose the nearby ridges. As these limestones eroded, flint raw material was carried from the ridge slopes by proluvial flows, along with other coarse-sized material, into the basin. Additionally, ancient pebble and gravel outcrops near the site served as another source of flint raw materials. These loose coarse deposits contain flint nodules and their fragments, potentially gathered and utilized in tool production.

The proximity of flint raw material sources near the camp is evident from the substantial weight of individual artifacts discovered in the layer. For instance, the flint anvil actively used at the camp (Fig. 3, 3) weighs 22.2 kg, and measures 34.5×35×15 cm. Similarly, one of the cores (Fig. 3, 2), measuring 31×13×15 cm, has a weight of 10.325 kg. This suggests that these tools were unlikely to have been transported from

a considerable distance. The transfer distance of these objects, seemingly, did not exceed several hundred meters.

Primary flaking. The assemblage of lithic tools originating from the Mukhkai I, layer 7c, exhibits a well-organized structure encompassing the entire technological chain of lithic tool production. The assemblage includes cores, tool blanks in the form of flakes and fragments, tools, as well as production waste, featuring chips (~1 cm) and stone debris (~1 cm in diameter). Notably, a distinctive feature of this collection is the considerable group of tools related to primary reduction. These items require individual and specialized examination.

A noteworthy aspect of the assemblage is the presence of unmistakable and distinctive cores. There were no pieces that could be confused with a chopper or any other tool. The cores exhibit simplicity and a relative lack of typological heterogeneity. Among the specimens presented, two primary varieties can be identified. The majority of cores identified at the site are single-platform with a flat working surface. Additionally, one core can be categorized as an end core. The striking platform for these cores was the natural planes of the flint, along with the splitting platform of the flint pieces. Notably, one core displays the correction of the frontal part of the striking platform through fine reduction.

A technologically significant feature in the characteristics of the described category of artifacts is the size of the tools. According to this indicator, the cores of the Mukhkai I, layer 7c are divided into large and normal. There are two large cores in the collection under study (Fig. 3, 1, 2). The dimensions of one of them are shown above. The second has the following parameters: weight – 5.47 kg, dimensions – 26.5×18×9 cm. Large flat flint nodules served as blanks for both objects. With similar parameters of the primary blank, these objects demonstrate different principles of splitting. “One of the blanks (the larger one) was adapted for splitting along the long end side of the nodule, and the second was used as the basis of a core with a flat, wide striking platform in the direction transverse to the long axis of the natural blank. That is, with the primary blanks, which were more or less the same in shape and dimensions, the first was intended to produce large blanks, and the second assumed the production of a series of chips, the length of which could not exceed the thickness of a given nodule, i.e. they initially could not be large” [2, p. 77–78].

Thus, the ancient hominines that left behind the industry in layer 7c mastered the skill of crafting large flakes. However, the widespread production of large flakes was uncommon, as suggested by the overall composition of flakes present in the assemblage. The collection is overwhelmingly comprised of small flakes, with only a limited number of large flakes (3 specimens). Notably, all three large flakes were discovered solely in the form of morphologically complete tools.

Lithic tools. The lithic tool assemblage in layer 7c is both substantial in quantity and diverse in morphological types (Table 1). Among the tools, **choppers** occupy a dominant group, constituting approximately 33%, or 14 out of the 43 items displaying signs of secondary treatment. If we exclude typologically unclear tools, such as retouched flakes, the proportion of choppers in the tool composition of layer 7c would be even higher.

These findings align with a pattern observed in many Oldowan sites in Africa, the Arabian Peninsula, and the Caucasus, where choppers constitute the majority of tools, and in some instances, surpass half of all tools with secondary treatment [4–13].

Fragments of nodules (12 specimens) primarily served as blanks for crafting choppers. Notably, two cases (Fig. 4, 1, 2) stand out for the technologically significant use of a blank in the form of a large flake. The resulting tools exhibit a varied morphology, featuring sub-quadrangular, sub-triangular, and sub-oval choppers. The defining criterion for this tool category, regardless of its shape, was the presence of a sharp cutting edge, unilaterally or bilaterally knapped, and an opposing butt – either natural or artificial. In some instances, the sides of the choppers were also formed using the striking or reduction. This technique, however, simultaneously constrained the width of the working edge of the tool.

Table 1. Typological composition of finds from Mukhai I camp, layer 7c

Seq. No.	Tool type	Qty.
1	Bifacial choppers	1
2	Bifacial choppers on large flakes	1
3	Unifacial choppers	1
4	Unifacial choppers on large flakes	1
5	Choppers with narrow cutting edge	8
6	Pointed choppers	1
7	Picks	1
8	Flat picks	1
9	Two-edged tool (chopper with narrow cutting edge + flat pick)	1
10	Heavy side-scrapers on fragments	1
11	Side-scrapers on flakes (medium sized)	1
12	Notched side-scrapers	1
13	Heavy-duty scrapers	5
14	Scrapers	4
15	Naturally backed knives	2
16	Knives with a butt on the side	1
17	Chisel-like tool on large flakes	1
18	Tools with a narrow retouched notch	2
19	Tools with a wide retouched notch	2
20	Awls	1
21	Retouched flakes	5
22	Anvils	1
Tools in total		43
23	Unidirectional cores with a flat working surface	3
24	Narrow faced cores, large	1

26	Core-shaped fragments	3
26	Medium-sized flakes (excluding tools on flakes)	71
27	Fragments	12
28	Stone debris	13
29	Chips	4
30	Fragments and nodules with single removals	36
Artifacts in total		186

Noteworthy variations in tool sizes are evident both within the chopper group itself and in comparison with materials from other layers. A distinctive characteristic of the items in layer 7c is the relatively small size of a significant portion of the tools and the absence of finds meeting the criteria for large choppers and gigantoliths [14]. For instance, within the collection under consideration, the sizes of five choppers do not exceed 9 cm in one of the dimensions, nine tools have values ranging from 9 to 15 cm in diameter. Interestingly, tools measuring more than 15 cm are absent within this collection.

Choppers present a captivating typological composition. Conventional unifacial (Fig. 4, 2, 3) and bifacial (Fig. 4, 1) choppers with various modifications of the cutting edge (straight, convex, beveled), most characteristic of the Oldowan industry of Central Dagestan, are represented by four specimens in the collection of layer 7c: two on fragments of nodules and the same number on large flakes. One chopper, based on the shape of the cutting edge, can be classified as a pointed chopper (Fig. 6, 3). First identified by M. Leakey on the materials of the Oldowan sites of the Olduvai Gorge [4], this type of chopper has a wide territorial and chronological coverage. Beyond the African continent, pointed choppers are recorded in the materials of the Oldowan sites in the southern Arabian Peninsula (Al-Ghuza and Sharhabil caves, Jidfira) [5]. In the South Caucasus, particularly in Dmanisi, this type is referred to as “chopper à bords convergents” (“choppers with convergent edges”) [15, p. 52–53, 59]. On the Taman Peninsula, they are observed in the industries of Bogatyri/Sinaya Balka, Rodniki I, and Rodniki II sites [16, p. 15–16, fig. 5, 5; 12, p. 44–47, p. 126, fig. 55, 1, p. 127, fig. 56, p. 130, fig. 59, 2; 17, p. 22, p. 24, fig. 6, 1, 5]. In the North-Eastern Caucasus, this type is present in the industry of neighboring Oldowan sites of Ainikab I and Mukhkai II [1; 7, p. 114, 140, p. 251, fig. 49, 2, p. 277, fig. 75; 8, p. 69, p. 71, fig. 4, 2; 9, p. 11, p. 13, fig. 2, 4]. Within the mentioned sites, including the industry of Mukhkai I, layer 7c, pointed choppers are not systematically grouped but are instead sporadically found in various layers. The predominant type in the site’s collection consists of choppers with a narrow cutting edge (9 specimens; fig. 5, 1-3). For most tools of this type (6 specimens), the width of the working edges is constrained by the thickness of the primary blank. In three tools, the working edges are formed on the narrowest edges of nodule fragments. In this case, the width of the working edges is not dictated by the dimensions of the primary blank but results from a deliberate choice of a narrow edge for its design. When a wide cutting edge was needed, it was sufficient to locate it on one of the extended edges of the primary blank. The size of the working edges for choppers of this type ranges from 1.9 to 5.5 cm. In comparison, the width of the working edges for conventional choppers from layer 7c measures 6–8 cm.

It is also noteworthy that the working edges of the majority of narrow cutting edge choppers exhibit a sub-triangular or ogival shape, closely resembling the configuration of the end of flat picks. The distinctions lie in the fact that flat picks have a narrower and more pointed working end. Notably, one item in the collection combines a narrow working edge with a flat point, each shaped on opposite edges of the blank.

The prevalence of choppers with narrow cutting edges over other types likely reflects the specific nature of domestic activities at the site. Given the resemblance of the working elements of most tools of this type to the shape of the tip of flat picks, it is plausible to suggest their potential use not solely as chopping tools, characteristic of choppers, but also in a function akin to picks – specifically for splitting, crushing, and cutting through the bones of animals brought to the site.

The collection from Mukhkai I, layer 7c, also features a distinct category of large tools – **picks** – represented by two finds. Typologically, these picks exhibit notable differences. One of them (Fig. 6, 2) aligns with the definition of picks with a triangular cross-section [18]. This particular tool was crafted from a large nodule fragment, with the maximum thickness concentrated in the lower (heel) part of the tool. The pick with a triangular cross-section (Fig. 6, 2) in Mukhkai I, layer 7c, exhibits distinctive features. The natural butt is covered in a nodular cortex, which envelops the lower plane of the tool. Knapping along the side edges creates a pointed end at the top, although these edges themselves remain unsharpened and were not cutting edges. On the front of the tool, a central longitudinal edge spans from the heel and results from knapping originating from the right side edge and the splitting surface of the blank. Notably, the formation of the middle longitudinal edge involved fashioning from both one of the sides and the edge. The left side edge displays negatives of vertical edge reduction, strategically implemented to achieve edge convergence and obtain a pointed distal end. The dimensions of the tool measure 14 cm in length, 8.4 cm in width, and 10.0 cm in thickness.

The second pick (Fig. 6, 1) is flat, utilizing a small flat nodule as its blank. The reduced longitudinal edges of the nodule converge, forming a pointed end. The right edge is processed along its entire length, while the left edge is processed in the upper third. Additional sharpening on the lower side enhances the working end. The dimensions of the tool measure 11 cm in length, 7.3 cm in width, and 3 cm in thickness.

A fairly representative category within the collection of layer 7c comprises **heavy-duty scrapers** (Fig. 7, 2-4), totaling 5 specimens. These artifacts exhibit variations in shape and size, crafted from fragments of nodules (3 specimens) and flakes (2 specimens). The large and massive specimens measure 9.8×5.4×5.2 cm and 9.2×5.0×4.5 cm. Conversely, the smaller specimens measure 4.8×8.0×1.4 cm, 5×4.3×2.7 cm, and 5×2.5×2 cm. A distinctive characteristic of these tools is the presence of a high scraping working edge, achieved through steep retouch on the narrow, substantial edge of the blank. The working edge width spans from 1.3 to 3.5 cm. The remaining edges exhibit no signs of secondary treatment.

A **chisel-like tool** (Fig. 7, 1) was crafted from a wide, short, and massive sub-quadrangular flake. The tool features a chisel-like blade, 1.7 cm wide, fashioned on the narrow edge of the flake with bilateral large and medium marginal retouch. One side of the blade is truncated with removals. Apart from the working surface, no secondary treatment is evident on the

remaining edges of the flake. The tool measures 7.5 cm in length, 4.2 cm in width, and 3.7 cm in thickness.

Side-scrapers are represented in two specimens. One of them was crafted from a massive nodule fragment. The working surface is limited to the elevated edge of the nodule, with secondary treatment not extending across the entire width of the edge. The working edge was shaped with medium and fine steep retouch. No treatment is observed on the remaining edges of the blank. The dimensions of the tool measure 14.5 cm in length, 10.8 cm in width, and 8.7 cm in thickness.

The second side-scrapers (Fig. 8, 9) was made on a small secondary flake of a sub-quadrangular shape. The striking platform of the flake is wide and covered with a nodular cortex. On the left steep and convex edge of the flake there is secondary treatment in the form of fine retouch. Secondary treatment does not cover the entire width of the edge, but is carried out approximately half of its length. The length of the tool measures 5.4 cm, 3.5 cm in width, and 1.5 cm in thickness.

A **notched scraper-tool** (Fig. 8, 10) is characterized by a massive natural butt of an arcuate shape and an opposing slightly concave working edge. The working edge is achieved through fine semi-steep retouch on the thin longitudinal edge of the flake. While the tool's morphology shares similarities with knives featuring a natural edge, the key difference lies in the concave and semi-steep nature of the blade. The tool measures 6.2 cm in length, 3.2 cm in width, and 2.5 cm in thickness.

Conventional **scrapers** (Fig. 8, 2-5) are represented by 4 specimens. Flakes served as blanks for three of them. One specimen was made on a small fragment. The tools have sub-quadrangular and sub-triangular shapes. The working edges of the products are mostly straight, obtained by fine marginal retouch. One of the tools has a working edge with a spur-like protrusion in the center (Fig. 8, 5). With the exception of the working elements, the remaining edges of the tools are not treated. Tools measurements are as follows: 4×7.4×1.3 cm; 4×4.5×1.2 cm; 3.7×3.3×1.5 cm; 5×4.7×1.3 cm.

A group of three **knives** (Fig. 8, 6-8) is represented in the collection. These knives were knapped from medium- and small-sized flakes, including primary flakes. Two of the tools exhibit a sub-quadrangular shape, while one knife has an outline resembling that of an elongated oval. Regarding the butt type, the products can be categorized into two types. In two knives, the butt is natural, covered in nodular cortex (Fig. 8, 7, 8). In these instances, the butts consist of robust longitudinal edges of the flakes. The third knife features a smooth butt (Fig. 8, 6), utilizing the massive face of a flake fragment as the accommodation part. Regardless of the butt type, a common feature among these knives is that the edge is consistently formed by relatively robust edges of the blank, with the sharpest edges serving as the blade. The working edge is always opposed to the butt and, when necessary, further sharpened through retouch. All knives reviewed underwent secondary thinning treatment on the edge. One knife has a working edge treated along its entire length with one-sided fine marginal retouch. The second knife features double-sided retouch on the working edge. The third knife, with a 2 cm wide cutting edge, showcases one-sided sharpening retouch in the proximal part of the flake. Tools measurements are as follows: 6.7×4.0×2.2 cm; 6.7×3.8×1.9 cm; 4.7×2.3×1.5 cm.

Notched tools are represented by 4 specimens. Two of them are made on flakes (Fig. 8, 11, 12), another two – on nodule fragments. The notches on all tools are retouched. Those on flakes have narrow notches – 2.5 and 2.9 cm. They were obtained by fine marginal retouch on the extended edges of the blanks. At the same time, the working element itself is not designed along the entire length of the edge. The described tools are also distinguished by their small size. The first measures 3.0×7.5×3 cm, the second – 4.7×4.6×1.5 cm.

Notched tools on nodule fragments are much larger in size (8.8×11×5 cm, 7×9.4×4.8 cm) and have a wide, retouched, slightly concave working edge obtained on the high steep edge of massive blanks. The working edge width of these tools is 5.5 and 6 cm, obtained by large and medium vertical retouch.

Awl is crafted on small heavy-duty flake. The end is emphasized with steep retouch in the proximal part of the flake. The tip is broken. The tool measures 4 cm in length, 3.3 cm in width and 1.4 cm in thickness.

Retouched flakes form a group of 5 specimens. Typologically, these items cannot be examined in more detail. Morphologically, some of them bear similarities to scrapers. The dimensions of the retouched flakes in question do not exceed 4 cm.

Conclusion

The tool assemblage analyzed from Mukhkai I, layer 7c, reveals its significance as a substantial component of the lithic inventory within the layer. Comprising a morphologically diverse assemblage, the tools are crafted from locally available flint raw materials transported to the camp from nearby sources. The tool set encompasses choppers with various cutting edge modifications, single picks, heavy-duty scrapers, as well as retouched pieces on fragments and flakes (side-scrapers, end-scrapers, knives, notched tools, and awls). Overall, this typological series aligns with the characteristics observed in classical Oldowan sites. The major form of the Acheulean technocomplex, handaxe, in the materials of Mukhkai I, Layer 7c, is notably absent. Furthermore, another significant category within the Large Cutting Tools (LCT) group, the cleaver, commonly found alongside handaxes in Early Acheulean sites in Africa and the Middle East, is also missing [4, 19–26]. The presence of “picks” in the tool collection from this layer does not unequivocally establish evidence supporting an Early Acheulean or Acheulean affiliation of the lithic industry, contrary to the suggestions of some researchers in the Paleolithic field in the Caucasus [27, p. 5].

The picks found in the Central Dagestan sites of the Early Pleistocene typically exhibit a triangular cross-section [18]. These tools are characterized by their large size, featuring a distinctively massive heel (either natural or partially worked) and a pointed distal end. The shaping of the sides of the picks aimed at creating a narrowed end in the upper part of the tool. Notably, the side edges themselves were not sharpened and were not cutting edges. The formation of the middle longitudinal edge on the front side of the tool resulted from the intersection of planes created by complete or partial working of the blank’s edges. In some instances, the working point of the tool was achieved through knapping from the longitudinal

edge towards the margins. The underside of the tools is either flattened, preserving the natural nodular surface of the blank, or shaped through flat removals.

The second type of picks observed in the Early Pleistocene sites of Central Dagestan are flat picks. Crafted from flattened nodules or debitage, these picks lack the formation of a median longitudinal edge on the back through processing of the lateral edges. Steep knapping on the sides is directed at achieving a sharp end at the distal part of the blank, with the working element of the tool being the sharp end rather than the side edges.

Individual picks from layer 7c typologically correspond to the two types of picks described above. The tools under consideration have little in common with the category of bifaces into which they are included [28; 4; 29] and, according to S.A. Kulakov, are large heavy-duty pointed tools [30, p. 90–92].

However, the lithic industry revealed in layer 7c exhibits a more advanced technology when compared to typical Oldowan sites. A notable characteristic of this layer's industry is the inhabitants' mastery in the technique of obtaining large flakes. The shift to utilizing large flakes as blanks for systematically crafting heavy-duty tools proportionate to their size is regarded as one of the key criteria distinguishing the early Acheulian of Africa from the preceding Oldowan, or the initial transition from one industry to another [31; 4]. Nevertheless, the widespread production of large flakes did not occur. Within the excavated area of layer 7c, only three large flakes fashioned into morphologically complete objects were uncovered. Based on the composition of the flakes, it appears that the initial purpose of primary reduction was still the production of small flakes. The mastery of the technique for obtaining large flakes did not bring about a decisive transformation in the technical and typological character of the industry. Thus, in terms of periodization categories, this site corresponds to the Oldowan industry, but exhibits distinct signs of the Early Pleistocene large flake industry of the Caucasus, indicative of the transitional stage from Oldowan to Acheulian [32; 33]. It is likely that this archaeological site belongs to the very early phase of this transitional period.

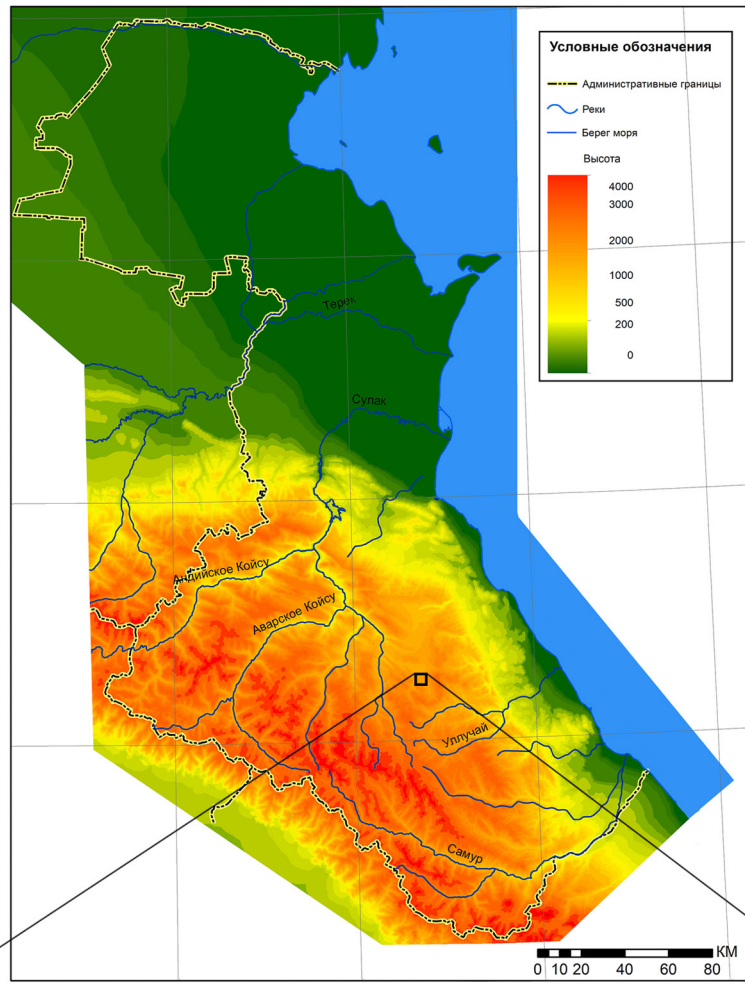


Fig. 1. Location and general view of the Early Pleistocene sites of Central Dagestan. The arrow indicates the location of the Mukhkai 1 camp, layer 7c

Рис. 1. Местоположение и общий вид памятников раннего плейстоцена Центрального Дагестана. Стрелкой обозначено местоположение стоянки Мухкай 1, слой 7в

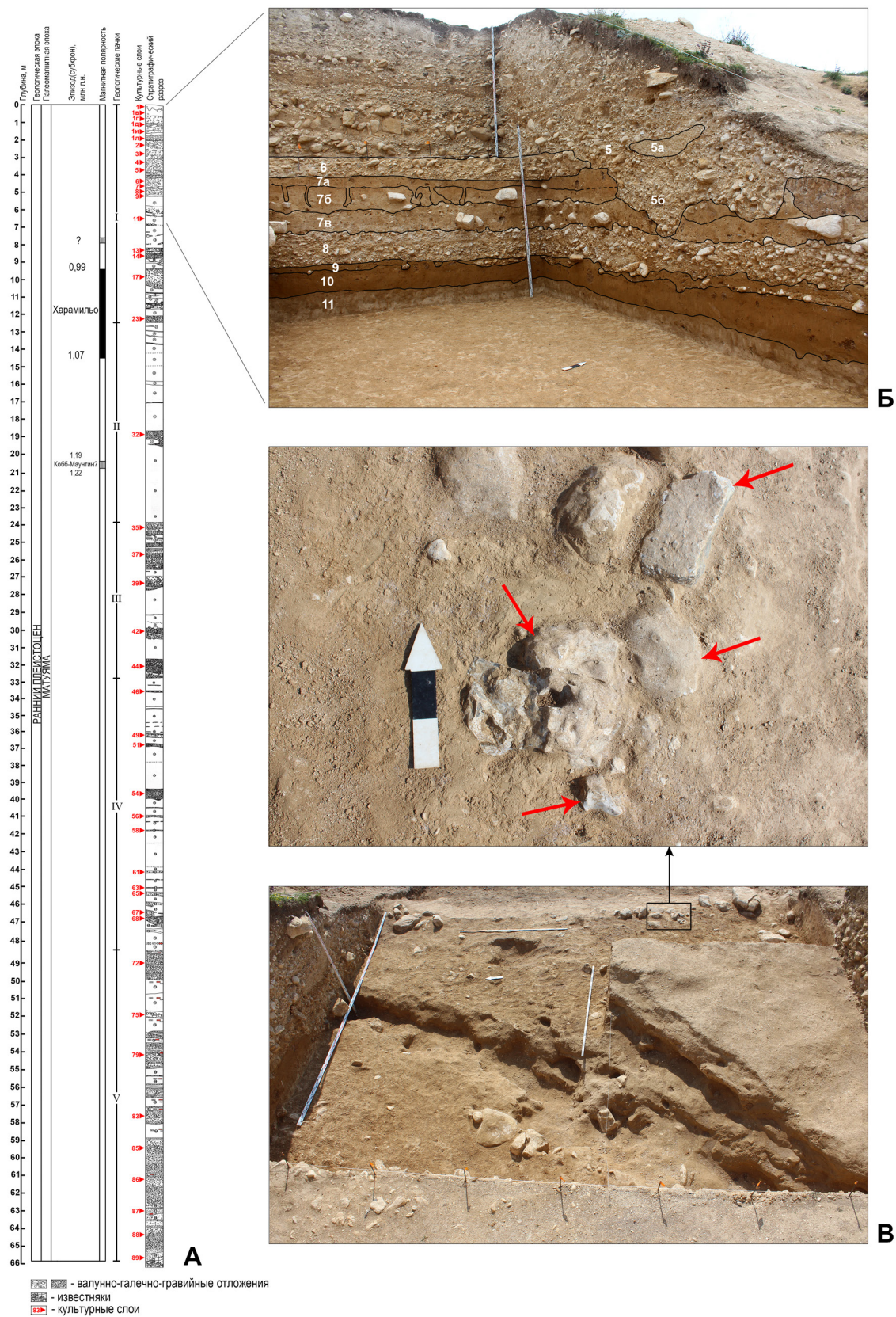


Fig. 2. A – generalized stratigraphic profile of the Mukhkai 1 section; B – position of the Mukhkai 1 camp, layer 7c on the geological profile; C – the nature of the occurrence of archaeological finds in one of the sections of layer 7c

Рис. 2. А – обобщенный стратиграфический профиль разреза Мухкай 1;
Б – позиция стоянки Мухкай 1, слой 7в на геологическом разрезе;
В – характер залегания археологических находок на одном из участков слоя 7в

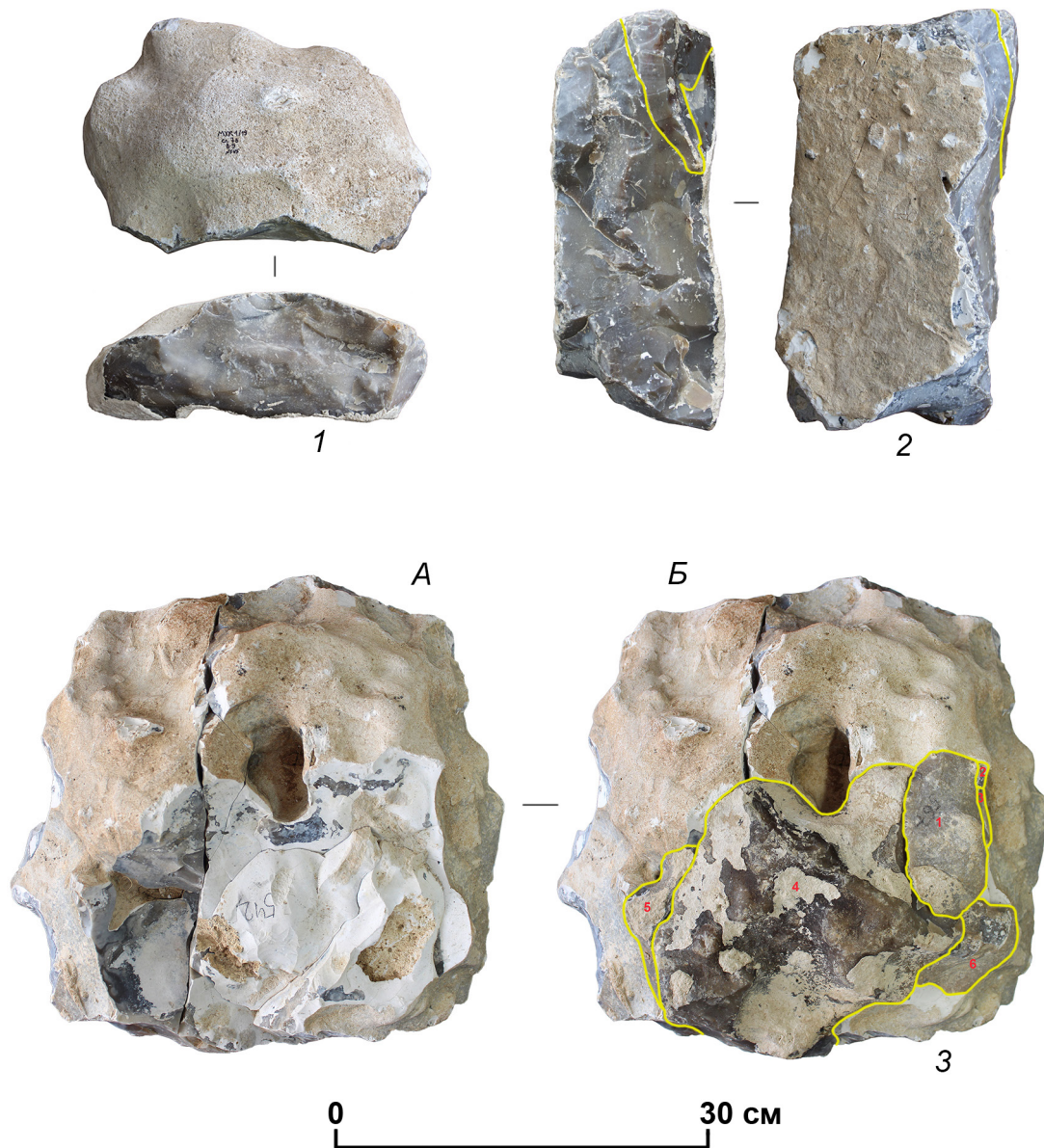


Fig. 3. Mukhkai 1, layer 7c. Flint pieces
 1 – large core for flaking normal sized flakes; 2 – narrow faced core for flaking large flakes (after refitting); 3 – anvil on a flint nodule (A – after discovery; B – after refitting)

Рис. 3. Мухкай 1, слой 7в. Образцы кремневых изделий
 1 – нуклеус крупный для скалывания отщепов обычных размеров;
 2 – нуклеус торцевого скалывания для скалывания крупных отщепов (вид после ремонта);
 3 – наковальня на кремневом желваке (А – состояние обнаружения; Б – вид после ремонта)

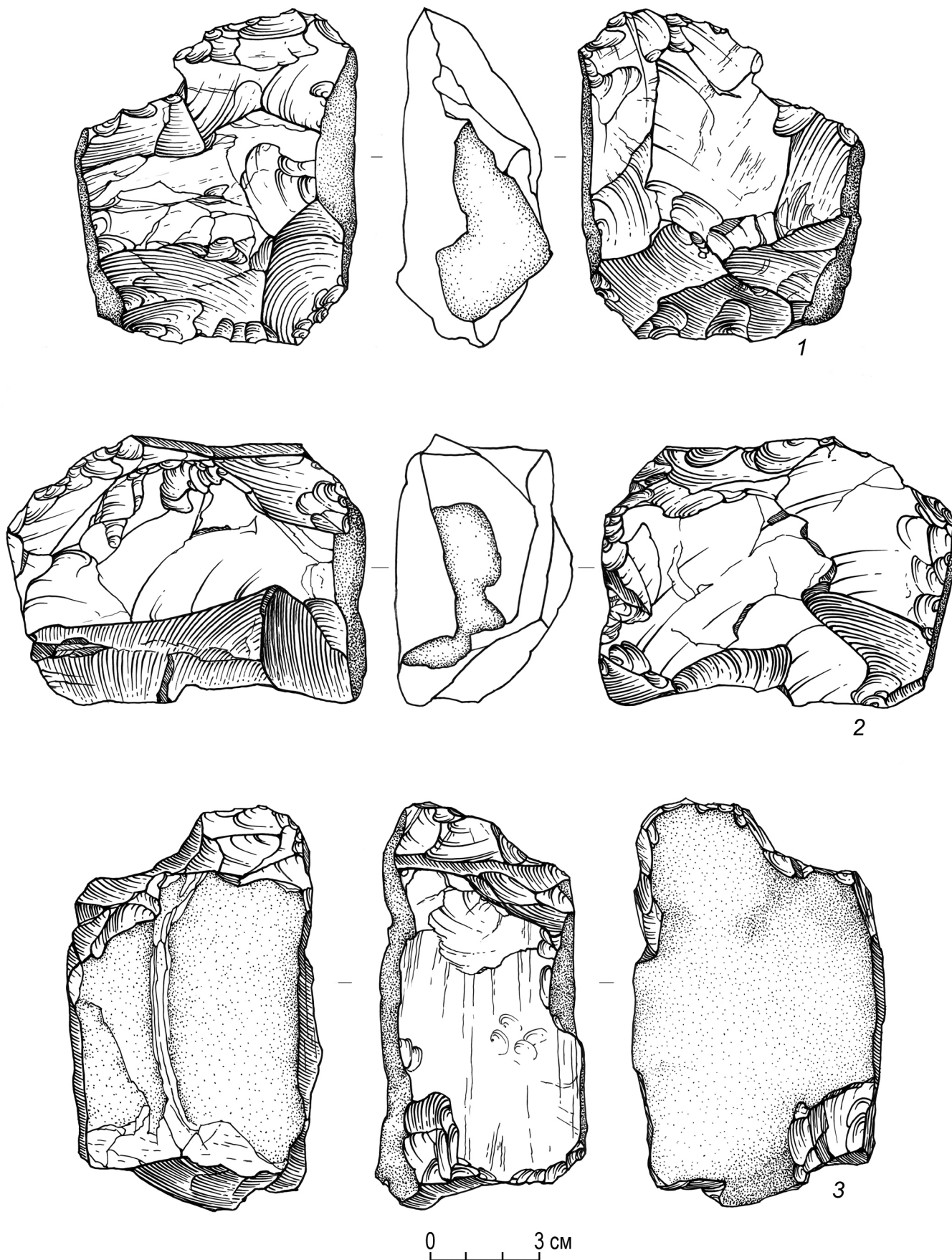


Fig. 4. Mukhkai 1, layer 7c. Unifacial (2, 3) and bifacial (1) choppers 1, 2 – on flakes, 3 – on a nodule fragment
Рис. 4. Мухкай 1, слой 7в. Чопперы односторонние (2, 3) и двусторонний (1) 1, 2 – на отщепках, 3 – на обломке желвака

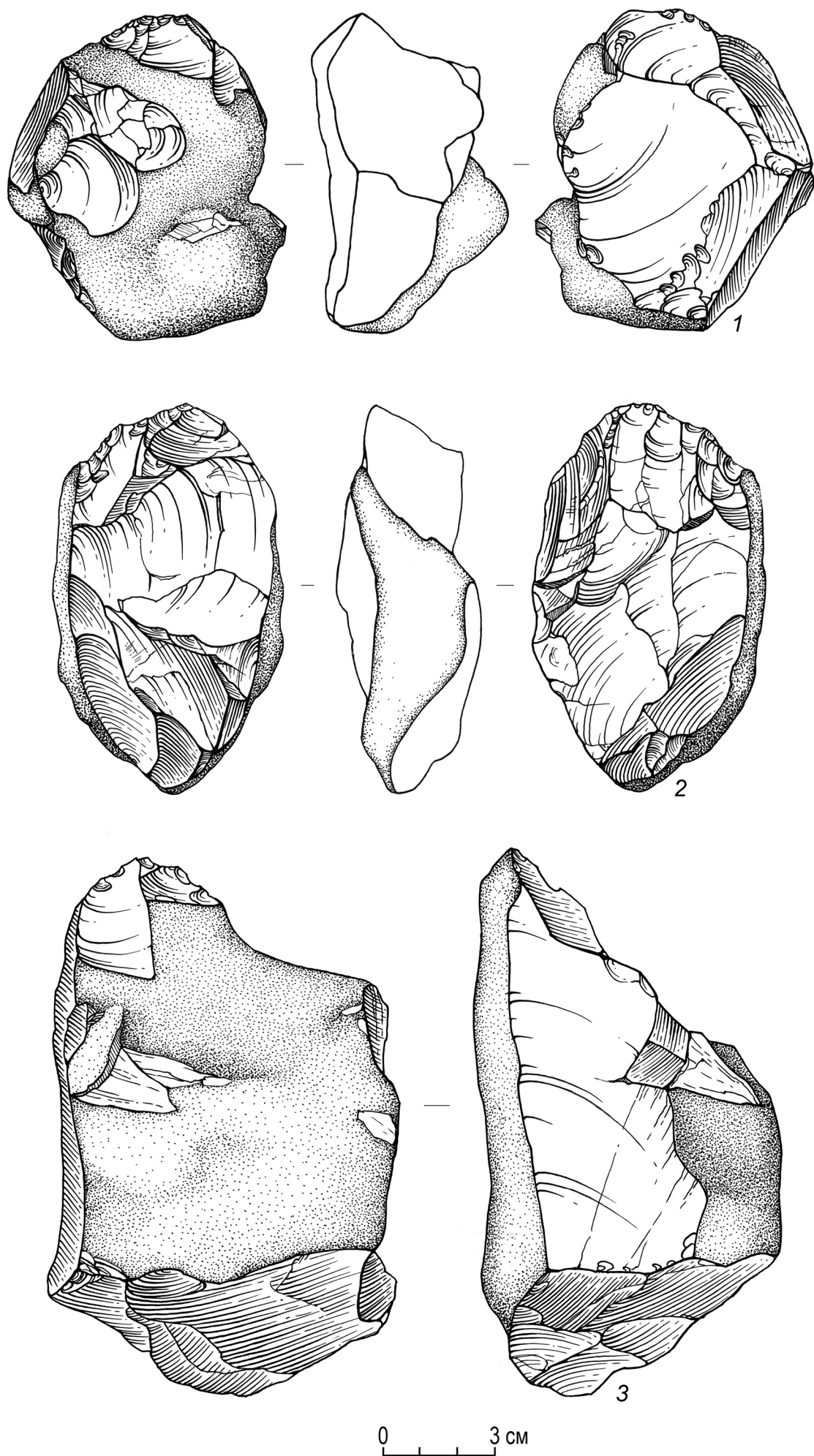


Fig. 5. Mukhkai 1, layer 7c. Choppers with narrow cutting edge 1, 2 – bifacial, 3 – unifacial
Рис. 5. Мухкай 1, слой 7в. Чопперы с узким лезвием 1, 2 – двусторонние, 3 – односторонний

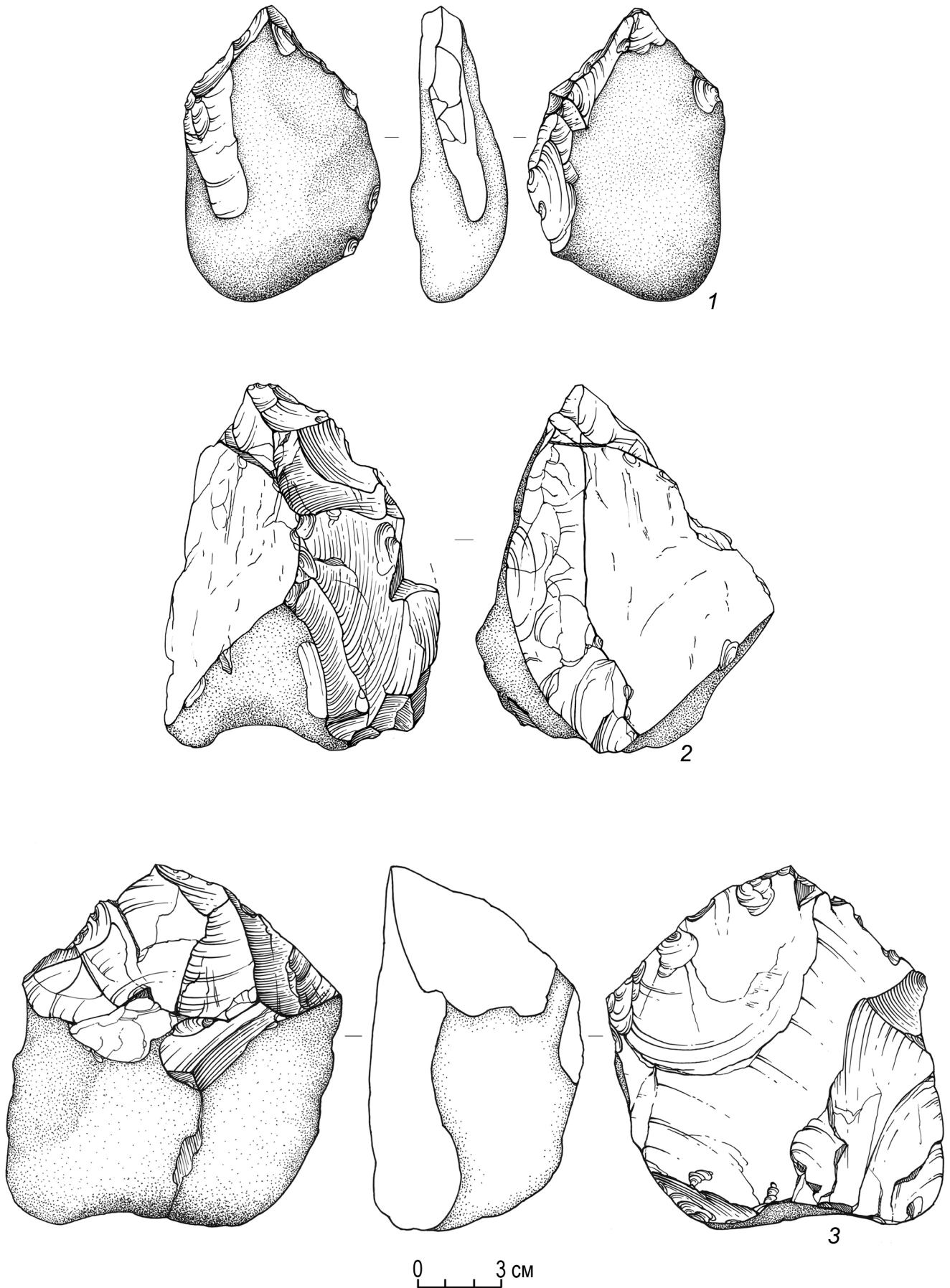


Fig. 6. Mukhkai 1, layer 7c. Flint tools
1 – flat pick, 2 – triangular pick, 3 – pointed chopper

Рис. 6. Мухкай 1, слой 7в. Образцы кремневых орудий
1 – пик плоский, 2 – пик трехгранный, 3 – чоппер стрельчатый

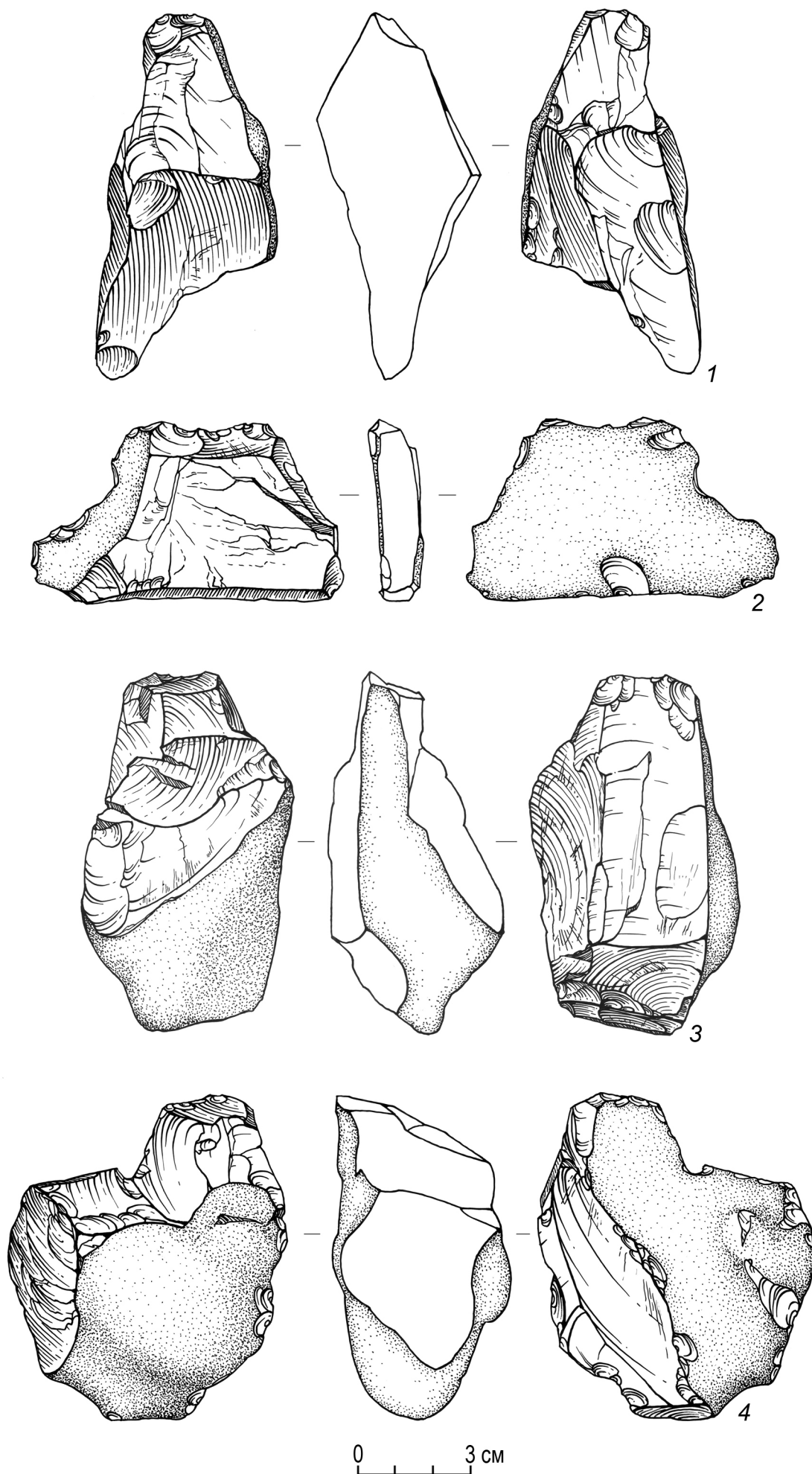


Fig. 7. Mukhkai 1, layer 7c. Flint tools 1 – chisel-like tool on a large flake, 2-4 – heavy-duty scrapers
Рис. 7. Мухкай 1, слой 7в. Образцы кремневых орудий 1 – долотовидное орудие на крупном отщепе, 2-4 – скребки высокой формы

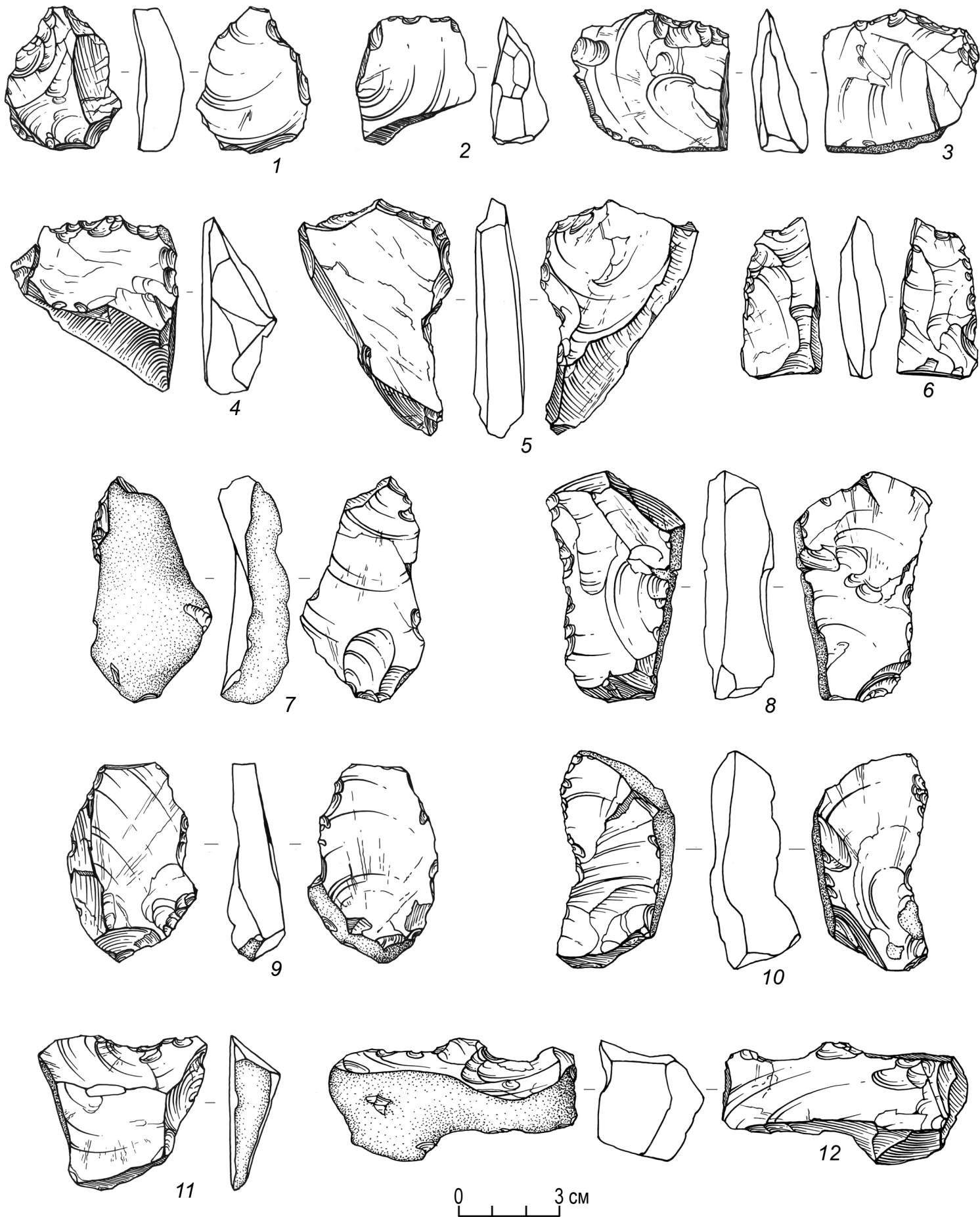


Fig. 8. Mukhkai 1, layer 7c. Flint tools

1 – awl, 2-5 – scrapers, 6-8 – knives, 9 – side-scraper, 10 – notched side-scraper-tool, 11 – notched tools

Рис. 8. Мухкай 1, слой 7в. Образцы кремневых орудий

1 – шиповидное орудие, 2-5 – скребки, 6-8 – ножи, 9 – скребло, 10 – скребло-орудие с выемкой, 11 – орудия с выемкой

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Received 19.09.2023
Accepted 08.10.2023
Published 15.12.2023

Поступила в редакцию 19.09.2023 г.
Принята в печать 08.10.2023 г.
Опубликована 15.12.2023 г.