ARCHEOLOGY

DOI: https://doi.org/10.32653/CH192414-434

Research paper

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# LITHIC TECHNOLOGY OF THE SOSRUKO ROCKSHELTER EARLY HOLOCENE INDUSTRIES

*Abstract*. The paper discusses the emergence and spread of pressure blademaking in the Elbrus region of the North Caucasus. The results of the lithic technology analysis of the key stratified site of the Mesolithic Layers M-1 and M-2 of the Sosruko Rockshelter are presented. The materials from the excavations of 1955-1957, conducted by S.N. Zamyatnin and P.G. Akritas, were considered. There are few but unquestionable signs of the pressure blademaking use in Layer M-2 dated to the second half of the 10th mil. BC. The full operational chain of bladelet production with the use of pressure technique was revealed in Layer M-1 dated to the second quarter of the 9th mil. BC – the beginning of the 8th mil. BC. The pressure Mode 1 (manual pressure) was used to produce the microbladelets and narrow bladelets with the flint heat treatment. Moreover, the pressure cores had a wide flaking surface with the linear distal end and a slightly inclined facetted platform. The blades in the industries of Layers M1 and M-2 were produced with the direct percussion. The studied Early Holocene industries of the Sosruko Rockshelter differ significantly from the partly synchronous industries of the North-Western Caucasus. The studied tradition had presumably local distribution. It finds analogy in the lithic industries of Layer 7 of Horizons 1-4 of the Badynoko Rockshelter (the Elbrus region). The correlation between the emergence of the simplest mode of the pressure blademaking in the Elbrus region in the Early Holocene and the distribution of the innovation in the neighboring regions is disputable. The possibility of the independent invention of the pressure blademaking in the Elbrus region cannot be completely rejected. On the contrary, the Elbrus Early Holocene industries could have been the source of the Mode 1 pressure technique distribution in the South Caucasus.

*Keywords*: Mesolithic; North Caucasus; Elbrus region; lithic technology; pressure technique; chronology

**For citation**: Eskova D.K. Lithic technology of the Sosruko Rockshelter Early Holocene industries. *History, Archeology and Ethnography of the Caucasus*. 2023. Vol. 19. N. 2. P. 414-434. doi.org/10.32653/CH192414-434

АРХЕОЛОГИЯ

DOI: https://doi.org/10.32653/CH192414-434

Исследовательская статья

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# ТЕХНОЛОГИЧЕСКИЙ АНАЛИЗ КАМЕННЫХ ИНДУСТРИЙ РАННЕГО ГОЛОЦЕНА ГРОТА СОСРУКО

*Аннотация*. ВВ статье обсуждается проблема появления и распространения в Приэльбрусье техники отжима пластинчатых сколов. В научный оборот вводятся результаты технологического анализа каменных индустрий мезолитических слоев М-1 и М-2 опорного стратифицированного памятника региона – грота Сосруко. Были проанализированы материалы из раскопок 1955–1957 гг. С.Н. Замятнина и П.Г. Акритаса. Признаки использования отжимной техники скалывания пластинчатых сколов присутствуют в слое М-2, датируемом второй половиной 10 тыс. до н.э., немногочисленны, но несомненны. Полный технологический контекст отжима выявлен в слое М-1, датируемом второй четвертью 9 – началом 8 тыс. до н.э. В рамках рассмотренной технологической традиции используется Мод 1 (ручной отжим) для получения микропластинок и узких пластинок. Кроме того, в индустрии применяется тепловая обработка кремня. Скалывание производилось с нуклеусов с широким фронтом расщепления и линейным окончанием, фасетированной скошенной площадкой. Пластины в рассмотренных индустриях слоев М-1 и М-2 получены при помощи прямого удара. Индустрии раннего голоцена грота Сосруко имеют выраженную специфику относительно частично синхронных индустрий северо-западного Кавказа. Индустрия, вероятно, имела локальное распространение. Технологическая традиция слоев М-1 и М-2 грота Сосруко находит близкие аналогии в индустриях горизонтов 1–4 слоя 7 навеса Бадыноко (Приэльбрусье). Связь появления в Приэльбрусье в раннем голоцене техники отжима в его наиболее простом варианте с распространением инновации в соседних регионах дискуссионна. Нельзя исключать независимое изобретение техники отжима в Приэльбрусье. Напротив, индустрия могла быть источником распространения технологической традиции, в рамках которой использовался ручной отжим (Мод-1) в Закавказье.

Ключевые слова: мезолит; Северный Кавказ; Приэльбрусье; технология расщепления камня; техника отжима; хронология

**Для цитирования**: Еськова Д.К. Технологический анализ каменных индустрий раннего голоцена грота Сосруко // История, археология и этнография Кавказа. 2023. Т. 19. No 2. С. 414-434. doi.org/10.32653/CH192414-434

## Introduction

The Sosruko Rockshelter Early Holocene lithic industries are key materials for the pressure blademaking emergence chronology in the Elbrus region of the North Caucasus and the neighboring territories. Due to the core morphology typical for pressure technique use, the lithic industry of Sosruko Rockshelter uppermost layer has long been part of the discussion of the pressure blademaking emergence routes in the Early Holocene[1; 2]. It was suggested earlier that the Sosruko Rockshelter industry could have been the source of the pressure technique diffusion to Eastern Anatolia [2] or, conversely, could have been the intermediary in the innovation diffusion from the Central Zagros (the M'lefaatian) to the northwest [1]. The Sosruko Rockshelter upper layers have lately been radiocarbon-dated which enabled to define their absolute chronology [3; 4]. The purpose of the paper is to present the results of the Sosruko Rockshelter upper layers (M-1 and M-2) lithic technology studies. The data on the lithic technology combined with the previously obtained absolute chronology and the revisited typology [4] allows to define more accurately the position of the Elbrus region industries in the cultural geography of the Greater Caucasus and the neighboring regions and partly reconsider it.

## Materials and Methods

Sosruko Rockshelter is located on the right bank of the Baksan river in the Elbrus region of Kabardino-Balkaria. The site was excavated in 1955–1957 by S.N.Zamyatnin and P.G.Akritas. The excavations of Sosruko Rockshelter were resumed in 2017 by L.V.Golovanova (Laboratory of Prehistory) [6; 3].

Sosruko Rockshelter is a well-stratified site. Eight anthropogenic layers divided by thick sterile sediments were identified by S.N.Zamyatnin and P.G.Akritas[4–6]. The analysis of the uppermost layers lithic collections from the 1955–57 excavations is presented in the paper. The uppermost layers M-1 and M-2 were explored at ca. 30 m2. The 20-40 cm-thick ashy grey anthropogenic layer M-1 was identified at the contact of sediments labeled A and B at the depth of 1.80–2.10 m from the surface. The overlying 100 cm-thick sediments A comprised the medieval and the Iron Age deposits. The M-1 layer was identified at the entire excavated area. It produced the animal bones, numerous Helix sp. shells, lithic and bone artefacts. Layers M-1 and M-2 are divided by 100 cm-thick clay sediments. M-2 layer was identified as the lenticular-shaped burnt reddish sediments about 1.5 m. across and 8-20 cm thick comprising lithic artefacts, chipped animal bones and Helix sp. shells. The M-2 and M-3 anthropogenic layers are divided by sterile 120 cm-thick light brown clay sediments [4; 5]. The upper M-1 and M-2 layers were dated to the Early Holocene based upon a robust series of both conventional and AMS radiocarbon dates [3; 4].

The lithic collection of M-1 layer comprises 292 pieces. There is also a small collection of 46 pieces labeled 'the contact between sediment A and layer M-1'. In order to prevent the possible admixture of the later material this part of M-1 collection is not presented in the paper. The lithic collection of M-2 layer comprises 86 pieces. The materials from the 1955–57 excavations of the Sosruko Rockshelter are kept at the archaeological department of Russian Academy of Science's Peter the Great Museum of Anthropology and Ethnography.

The lithic technology was studied following the 'operetional chains' approach. The 'operational chain' identification involves the study of the lithic production chronological sequence from the stage of raw material procurement to final stage of the finished pieces abandonment with a focus on the aim products [7; 8].

The pressure technique of debitage is traditionally identified due to the presence of the characteristic products: cores, rejuvination flakes and blades/bladelets/microbladelets having specific morphological features [9–11]. The pressure cores are characterized by the 'fluted' flaking surface 'resembling of an antique column' formed with the scars of extremely regular uni-directional products [9; 11]. The correlation of a particular blade/bladelet/microbladelet with the pressure technique use is much more problematic. The issue was discussed in detail earlier [12]. Only the blades/bladelets/microbladelets that could not have been possibly produced with direct and indirect percussion might be accuratly identified as definitely produced with pressure. The experiments with percussion and pressure blademaking allowed to define certain criteria: 1) only pressure technique allows blade production from the angle exceeding 90° [13]; 2) it is impossible to produce with percussion blades/bladelets/microbladeles having thin section, even thickness in proximal and mesial parts, straight or very slightly curved profile and a regular dorsal pattern at the same time [14]; 3)the limit of thickness/length ratio for blades/bladelets/microbladeles produced with percussion is 1: 30 [13, P. 69]. The listed above criteria were used in this work to identify bladelets/microbledelets as 'definitely produced with pressure'. The fragmented bladelets/microbladelets with identifiable features correlating to pressure use were labeled as 'probably produced with pressure'.

## Results

*Layer M-1*

The raw materials used at the site in the layer M-1 are obsidian and flint. Based on visual features several types of flint were identified: opaque dull burgundy flint, shiny opaque grey flint, semi-translucent beige flint, shiny opaque grey and yellow flint, opaque dull light brown flint, shiny opaque pink flint, semi-translucent white flint, opaque dull grey flint, semi-translucent yellow flint. The initial size and shape of flint nodules cannot be determined due to the present material. Only one type of obsidian was identified based on visual features. It is translucent brownish-black coming in shape of small pebbles at least 5 cm long (Fig. 1, *10*).

The explored area of the site in the layer M-1 produced the whole reduction sequence of the obsidian from pre-cores, cores and core rejuvenation flakes to retouched tools. Flint pre-cores and core rejuvenation flakes, on the contrary, are absent (Table 1). However, due to the flint bladelet and microbladelet refitting it is evident that at least two types of flint were knapped directly at the site to produce laminar blanks (Fig. 4, *1, 2*). Interestingly, both obsidian and the flint flakes make up only 6.5% и 0.8% respectively. The percentage of laminar blanks, largely predominated by microbladelets (> 8 mm wide), is extremely high. They make up 72.6% of the flint artefacts and 66% of the obsidian ones. The proportion of the retouched tools is somewhat higher for the flint. In spite of the mentioned above particularities the two raw material types, flint and obsidian, were in general used in a similar way. The reduction of both was aimed at bladelet and microbledelet production. Bladelets and microbladelets were eventually used as blanks for tool manufacture or utilized without retouching.

**Table 1. Sosruko Rockshelter (1955-1957 excavations by S.N. Zamyatnin and P.G. Akritas). The layer M-1. General technological structure of lithic assemblage and raw material representation.**

**Табл. 1. Грот Сосруко (раскопки 1955–57 гг. С.Н. Замятнина и П.Г. Акритаса). Слой М-1. Категориальный состав каменного инвентаря по видам сырья.**

| **Category** | | **Flint** | | **Obsidian** | |
|---|---|---|---|---|---|
| Pre-cores | | 0 | | 1 (0.5%) | |
| Cores | | 4 (3.2%) | | 7 (4.1%) | |
| Core platform rejuvination flakes | | | | 2 (1.1%) | |
| Crested flakes | | - | | 1 (0.5 %) | |
| Flakes | | 1 (0.8%) | | 11 (6.5%) | |
| Blades (>12 mm width) | Entire | - | | 5 (3%) | - |
| | Proximal fragments | | | 3 | |
| | Mesial fragments | | | - | |
| | Distal fragments | | | 2 | |
| Bladelets (8–12 mm width) | Entire | 12 (9.6%) | 1 | 22 (13%) | - |
| | Proximal fragments | | 9 | | 16 |
| | Mesial fragments | | - | | 2 |
| | Distal fragnents | | 2 | | 4 |
| Microbladelets(<8 mm width) | Entire | 78 (63%) | 12 | 84 (50%) | 16 |
| | Proximal fragments | | 43 | | 25 |
| | Mesial fragments | | 12 | | 22 |
| | Distal fragments | | 10 | | 11 |

| | | |
|---|---|---|
| Laminar flakes | 2 (1.1%) | 10 (5.9%) |
| Microflakes | - | 1 (0.5%) |
| Retouched tools | 27 (21,7%) | 24 (14.2%) |
| **Total:** | **124 (100%)** | **168 (100%)** |

Currently, it is questionable whether there existed one or two operational chains. Note that alongside with the numerous microbladelet cores with the 'fluted' flaking surface (Fig. 1, *1-4, 7*, Fig. 2, *1-3*) there are two cores made of obsidian (Fig. 1, *9*) and flint (Fig. 2, *4*) with irregular flaking surface; the last scars on their flaking surface correspond to the bladelet removals.

The main operational chain is aimed at narrow bladelet and microbladelet production (Fig. 3, *1-23*, Fig. 4, *1-22*) with pressure. The whole reduction sequence is present at the site. The metric variability of the laminar blanks is limited, their width varying from 4 to 15 mm and thickness varying from 0.5 mm to 5 mm (Fig. 5). Most laminar blanks are narrower than 8 mm and are no thicker than 2 mm. Note that the width of flint laminar blanks identified as certainly or probably produced with pressure does not exceed 8 mm in most cases (one being 9 mm wide). The width of obsidian laminar blanks certainly and probably produced with pressure does not exceed 10 mm in most cases (one being 11 wide)(Fig. 6, *B*). None of the larger laminar blanks have even thickness, straight or slightly curved profile or the regular dorsal pattern (Fig. 3, *31-33*). The described trend corresponds to the physical limitations of the pressure mode 1 or hand pressure, identified for fine-grained flint and obsidian [15] (Fig. 6, C). The length of exhausted cores being always under 5 cm, the use of a complementary holding device is probable thus corresponding to mode 1b [15, p. 469].

The significant percent of the microbladelets have pronounced curvature in distal part (14.5%), curved (4.5%) (Fig. 3, *26, 27)* or twisted profile (Fig. 3, *16, 25*) (Table 2). Most laminar blanks have feather terminations (96 %), few have plunged ones (4 %).

**Table 2. Sosruko Rockshelter (1955-1957 excavations by S.N. Zamyatnin and P.G. Akritas). The layer M-1. The profile of blades, bladelets and microbladelets and their fragments.**

**Табл. 2. Грот Сосруко (раскопки 1955-57 гг. С.Н. Замятнина и П.Г. Акритаса). Слой М-1. Характер профиля пластинчатых заготовок и их фрагментов.**

| **Profile of blades /bladelets/ microbladelets** | **Number** | **%** |
|---|---|---|
| Straight | 85 | 46% |
| Slightly curved | 43 | 23% |
| Straight or slightly curved with a pronounced curvature in distal part | 27 | 14.5% |
| Curved | 8 | 4.5% |
| Twisted | 22 | 12% |
| **Total:** | **185** | **100%** |

A few techniques of the pressure zone preparation were used: overhang reduction was almost always used, overhang abrasion was often used. Platform polishing or flaking surface isolation were never used (Table. 3).

**Table 3. Sosruko Rockshelter (1955-1957 excavations by S.N. Zamyatnin and P.G. Akritas). The layer M-1. The techniques of the pressure point zone preparation of the microbladelets and bladelets definitely and probably produced with pressure**

**Табл. 3. Грот Сосруко (раскопки 1955-57 гг. С.Н. Замятнина и П.Г. Акритаса). Слой М-1. Приемы подготовки зоны расщепления, фиксируемые на проксимальных частях пластинок/микропластинок определенно и вероятно полученных отжимом**

| **Bladelets and microbladelets** | Overhang reduction | Overhang abrasion |
|---|---|---|
| Definitely produced with pressure | 100% | 81% |
| Probably produced with pressure | 93% | 80% |

The method of bladelet and microbladelet reduction implied the minimal preparation at the stage of pre-core manufacture: the creation of the inclined platform and the installation of the two-sided frontal crest (Fig. 7). In obsidian pebble reduction the rear and side surfaces were unprepared and natural surface stayed intact (Fig. 1, *1-4, 6, 7*). Flint pre-core preparation was more complex and could imply installation of the asymmetric rear crests (Fig. 2, *1-3*).

The platform was created by a single blow or a few of them and was eventually locally facetted (Fig. 1, *1-5, 7, 8*, Fig. 2, *1-3*). Cores had slightly inclined platforms until the end of reduction.

A core used in bladelet and microbledelet production with pressure had single platform, wide and locally flattened flaking surface created by parallel unidirectional removals and a linear distal end. Only one core resembles a sub-conical one but it is in fact a completely exhausted (Fig. 1, *1*).

According to the scheme proposed by D.Binder [2], the majority of laminar blanks in M-1 layer have scar the pattern «1-2-3» or «3-2-1», there are less laminar blanks with the pattern «2-1-2'» (Table 4). Scar pattern analysis of both core flaking surfaces and laminar blank dorsal pattern indicate that the rhythm of debitage involved alternation of removals from the center of the flaking surface to the periphery and backward (Fig. 8). A secondary crest could be installed, but secondary crested bladelets and microbladelets ( Fig. 4, *24*, Fig. 7) make up no more than 1% of all laminar blanks.

**Table 4. Sosruko Rockshelter. The Layer M-1. The patterns of the pressure bladelets/ microbladelts**

**Табл. 4. Грот Сосруко. Слой М-1. Последовательность негативов у пластинок/ микропластинок, полученных отжимом**

| Bladelets/ microbladelets | 2-1-2’ | 1-2-3 | 3-2-1 | Other | Total |
|---|---|---|---|---|---|
| Definitely produced with pressure | 10 (40%) | 7 (28%) | 7 (28%) | 1 (4%) | 25 (100%) |
| Probably produced with pressure | 25 (37%) | 23 (34,5%) | 20 (29%) | 3 (4,5%) | 67 (100%) |

Part of the flint used in the pressure reduction was probably heat treated. One core and two bladelets (a crested bladelet and a bladelet with scars from the crest) have glossy scars corresponding to the last removals in the present sequence (Fig. 9). Flint was probably heat treated after the preparation of a pre-core and before the start of bladelet and microbladelet reduction.

There are few blades in the lithic assemblage, all of them are fragmented. They are irregular and have uneven thickness, therefore, are produced with percussion (Fig. 1, 30-34). There is no evidence to suggest a possible indirect percussion use in blade reduction as there are no regular blades.

*Layer M-2*

The raw materials used in the layer M-2 are obsidian and flint. The obsidian pieces predominate making up 80% of the lithic assemblage (Table 5). All flint varieties identified in the layer M-1 are present in the layer M-2 as well.

The structure of the lithic assemblage is completely different from the one described in the uppermost layer. Both pre-cores and cores are absent, there are few retouched tools, flakes and chips make up a significant proportion of the assemblage (Table 5). Note that the number of blades is comparable to the number of bladelets and microbladelets.

**Table 5. Sosruko Rockshelter (1955-1957 excavations by S.N. Zamyatnin and P.G. Akritas). The layer M-2. General technological structure of lithic assemblage and raw material representation.**

**Табл. 5. Грот Сосруко (раскопки 1955-57 гг. С.Н. Замятнина и П.Г. Акритаса). Слой М-2. Категориальный состав каменного инвентаря по видам сырья.**

| Category | Flint | Obsidian |
|---|---|---|
| Pre-cores | | - |
| Cores | - | - |

| | | | | | |
|---|---|---|---|---|---|
| Core platform rejuvenation flakes | | - | | 4 (5.7%) | |
| Flakes | | 11 (65%) | | 19 (27.5%) | |
| Chips | | - | | 9 (13%) | |
| Blades (>12 mm width) | Entire | 1 (6%) | 0 | 6 (8.6%) | - |
| | Proximal fragments | | 1 | | 3 |
| | Mesial fragments | | 0 | | 3 |
| | Distal fragments | | 0 | | - |
| Bladelets (8–12 mm width) | Entire | -<br>3<br>1<br>- | | 4 (5.7%) | - |
| | Proximal fragments | | | | |
| | Mesial fragments | | | | |
| | Distal fragments | | | | |
| Microbladelets (< 8 mm ) | Entire | 2 (12%)<br>1<br>1<br>- | - | 6 (8.6%)<br>3<br>2<br>1 | - |
| | Proximal fragments | | | | |
| | Mesial fragments | | | | |
| | Distal fragments | | | | |
| Laminar flakes | | 2 (12%) | | 8 (11.6%) | |
| Microflakes | | 1 (6%) | | 4 (5.7%) | |
| Retouched tools | | 1 (6%) | | 9 (13%) | |
| Total: | | 17 (100%) | | 69 (100%) | |

Due to the incomplete reduction sequence at the site, only a few preliminary conclusions on the lithic technology could be made. There is one obsidian 'tablet' – a core platform rejuvenation flake bearing the remnants of the characteristic 'fluted' flaking surface of a core (Fig. 11, *1*). Futhermore, there is a small series of highly regular bladelets and microbladelets. Among them there is one long fragment of a microbladelet with light section, even thickness and straight profile; its estimated length exceeds 30 times its thickness (Fig. 1, *3*). The thickness of the sediments between layers M-1 and M-2 make it improbable for the pieces from the uppermost layer to admix to the assemblage of the underlying one via natural disturbance processes. Thus, the existence of the bladelet and microbladelet reduction with pressure in the layer M-2 is highly probable in spite of the small number of characteristic products. There are several relatively large irregular blades with curved profile in the layer M-2 lithic assemblage (Fig. 11, *12-17*). The number of irregular blades is higher than the number of fragmented regular bladelets and microbladelets. This could be explained by the functional character of the excavated area of the site or, conversely, by the evolution of the lithic industry towards more active use of the pressure technique in the later period.

## *Discussion*

The lithic technology analysis of the Sosruko Rockshelter M-1 and M-2 layers assemblages allowed to identify the earliest evidence of the pressure blademaking use in the layer M-2 (9658–9296 cal. BC); the whole reduction sequence of pressure blademaking was identified in the layer M-1 (8252-7962 cal. BC)[4]. The lithic assemblage of the underlying layer M-3 dated to the Final Pleistocene [3; 4] did not produce any evidence for the pressure technique use[12; 16].

The issue of the pressure blademaking earliest emergence in the Elbrus region is problematic as the data from Sosruko Rockshelter turned out to be in a partial contradiction with the data from Badynoko Rockshelter. On the one hand, the Sosruko Rockshelter M-1 and M-2 layers lithic assemblages and the Badynoko Rockshelter layer 7 horizons 1-4 lithic assemblages have several technological features in common. These are the use of the hand pressure technique (or mode 1); microbladelets and narrow bladelets as the aim products of reduction; the use of the flint heat treatment [17; 18; oral communication by M.V.Seletsky]. On the other hand, the estimation of these industries chronology diverges. The Badynoko Rockshelter layer 7 horizon 4 dates to 13547–12339 cal. BC, while the layer 7 horizon 2 dates to 6821–6392 cal. BC [17]. Unlike the stratigraphic sequence of Sosruko Rockshelter, the cultural deposits of Badynoko Rockshelter are not divided by sterile sediments, the artefacts occur continuously without apparent interruptions [17; 19]. Currently, it seems justifiable that it is the Sosruko Rockshelter chronocultural sequence that should be considered as the reference one for the Elbrus region.

The Sosruko Rockshelter M-2 and M-1 layer industries are partly synchronous to the ones of the uppermost Mesolithic layer of Dvoynaya Cave (layer 4/5) and the layers 3-5 of Chygai Rockshelter (northwestern Caucasus) [20]. Despite certain typological similarities[4], the Early Holocene lithic industries of the Elbrus region differ a lot in technological features from the northwestern Caucasus industries. For instance, the use of a more complex pressure mode – mode 3 (or pressure using short crutch in the sitting position) – was identified at Dvoynaya Cave and Chygai Rockshelter; the use of heat treatment was not attested; the pressure reduction products were both bladalets (up to 12 mm wide) and microbladelets; the large blades were produced with indirect percussion there [12; 20]. As for the northeastern Caucasus, there is no evidence so far on the pressure technique emergence there in the Early Holocene[21].

The direct migration of the population or the technological innovation diffusion from the Zagros region into the Elbrus region was unlikely to occur as a more complex version of the pressure technique – mode 3 - had already installed in the M'lefaatian Neolithic industry by the time span discussed. The pressure core types also differ, the conical/bullet cores were used there. The only feature in common is the use of the heat treatment of the flint[11; 15]. Conversely, the direct migration of the population or the technological innovation diffusion from the Elbrus region of the North Caucasus into the South Caucasus cannot be excluded. The lithic assemblage of Kobuleti site layer 2 could be evidence for it. The use of hand pressure was identified there. The industry is dated to a later period of the Early Holocene than the M-2 layer of Sosruko Rockshelter[22]. However, the Early Holocene Kobuletian industry is younger than the Eastern Anatolian EPPNB industry which provided evidence for the use of a more complex pressure mode 3 alongside with the pressure mode 1[2]. Thus, contrary to one of the previous hypotheses [2] the Elbrus region of the North Caucasus could hardly been the origin of the pressure techniques emergence in the Eastern Anatolia.

## Conclusion

The Elbrus region industries (Sosruko Rockshelter, Badynoko Rockshelter) differ from the partly synchronous industries of the northwestern Caucasus. Taking into account the reliability of the Sosruko Rockshelter stratigraphic sequence, the pressure technique had already emerged in the Elbrus region by 9658–9296 cal BC. The possibility of the pressure blademaking independent invention in the Elbrus region cannot be completely rejected considering that the most basic mode 1 (hand pressure) was used. The technological tradition was probably localized which does not exclude the possibility of its diffusion to the South Caucasus.

***Acknowledgement.*** The studies were supported by the Russian Foundation for Basic Research, project № 20-09-00388 ('Upper Palaeolithic and Mesolithic cultures of North-West and Central Caucasus: changes in stone tool-kits and lithic technology').

***Благодарность***. Исследования проведены при поддержке гранта РФФИ №20-09-00388.

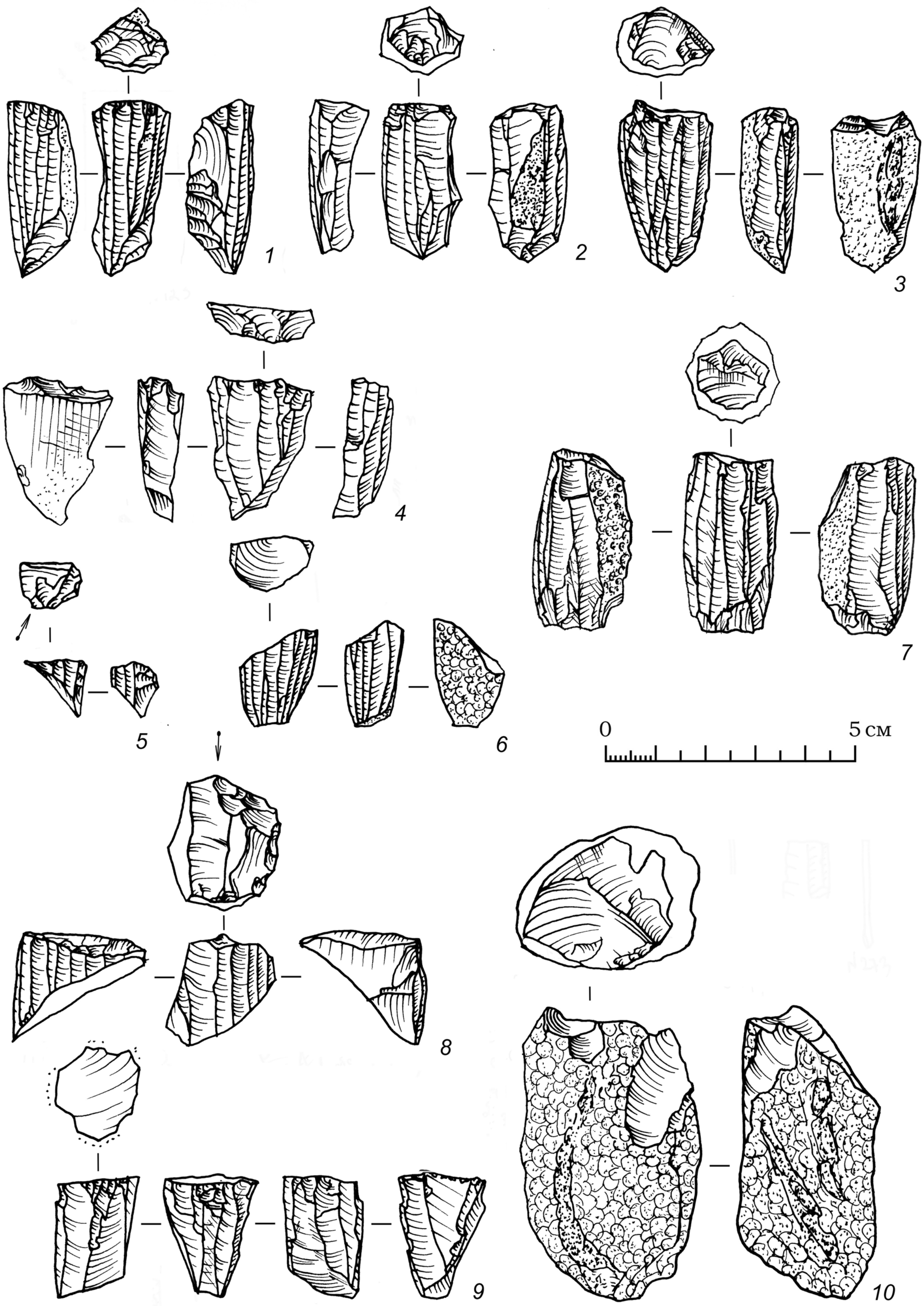



Fig. 1. The Sosruko Rockshelter. Layer M-1. 1-4, 7, 9 – obsidian cores;
5, 6, 8 – obsidian core rejuvenation flakes; 10 – obsidian core preform

Рис. 1. Грот Сосруко. Слой М-1. 1-4, 7, 9 – нуклеусы из обсидиана,
5, 6, 8 – сколы оживления нуклеусов из обсидиана, 10 – преформа нуклеуса из обсидиана

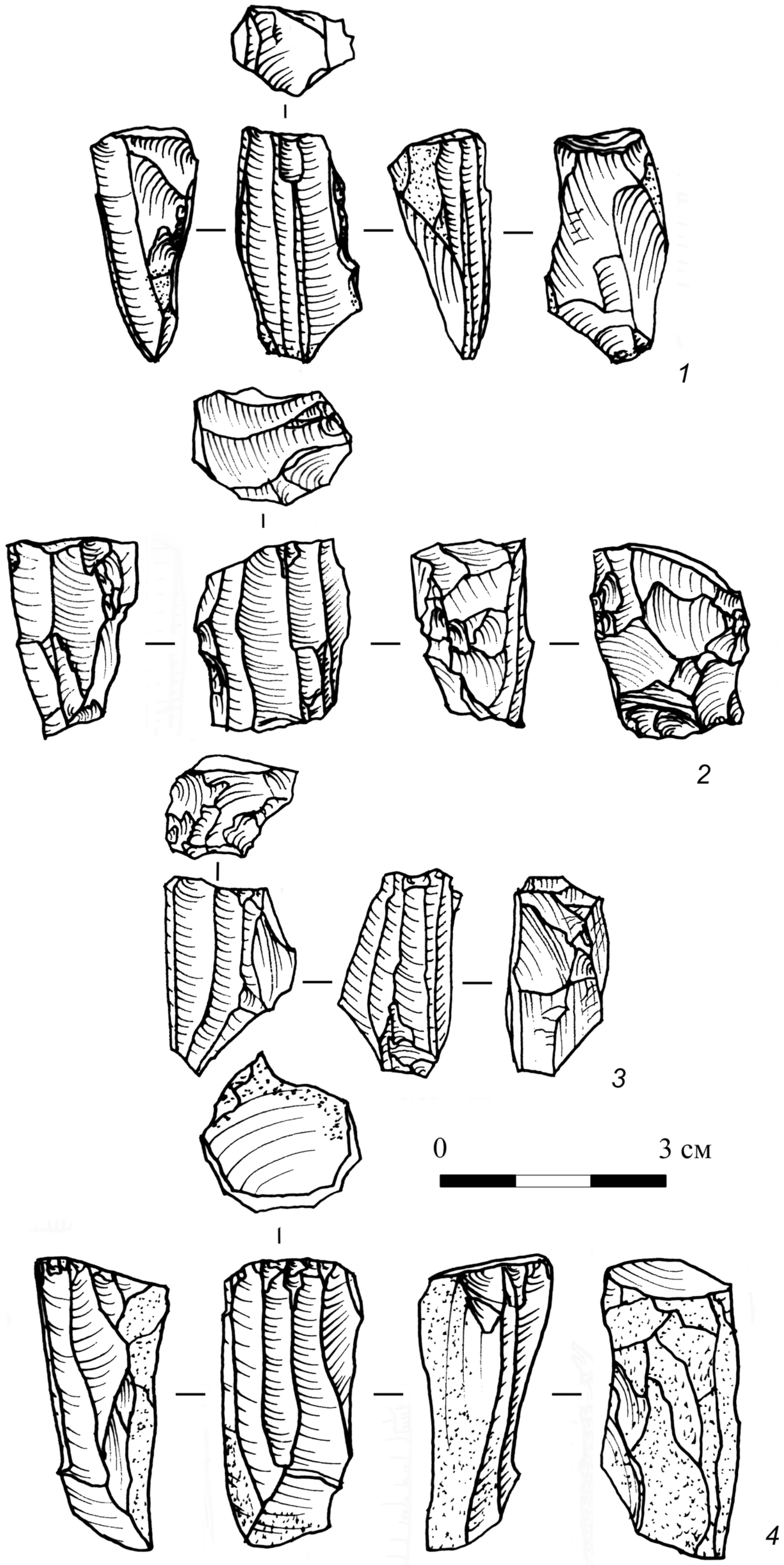



Fig. 2. The Sosruko Rockshelter. Layer M-1. Flint cores

Рис. 2. Грот Сосруко. Слой М-1. Нуклеусы из кремня

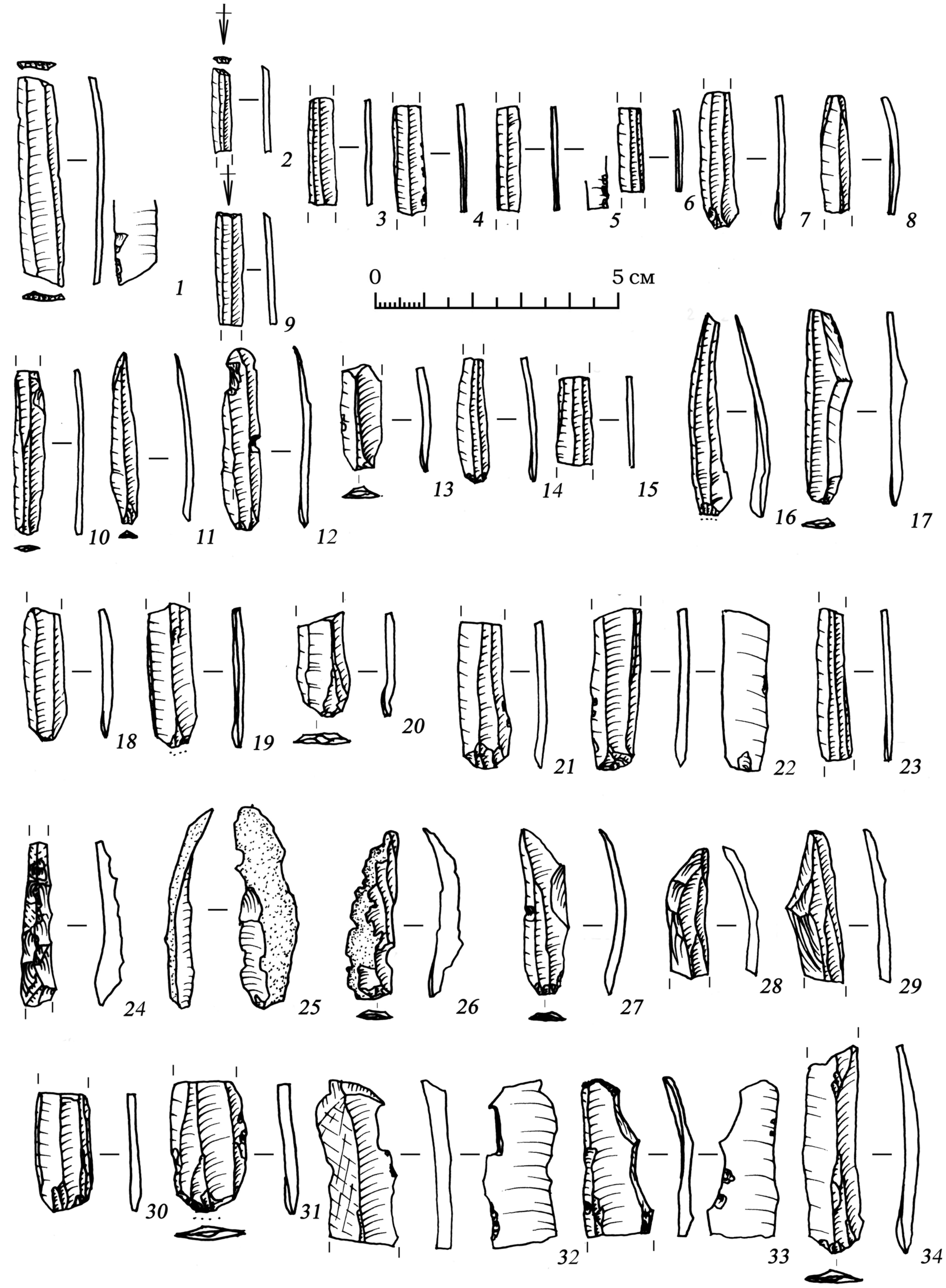



Fig. 3. The Sosruko Rockshelter. Layer M-1. 1, 2, 9 – obsidian microliths;
3-8, 10-34 – obsidian blades, bladelets and microbladelets

Рис. 3. Грот Сосруко. Слой М-1. 1, 2, 9 –микролиты из обсидиана,
3-8, 10-34 – пластинчатые сколы из обсидиана

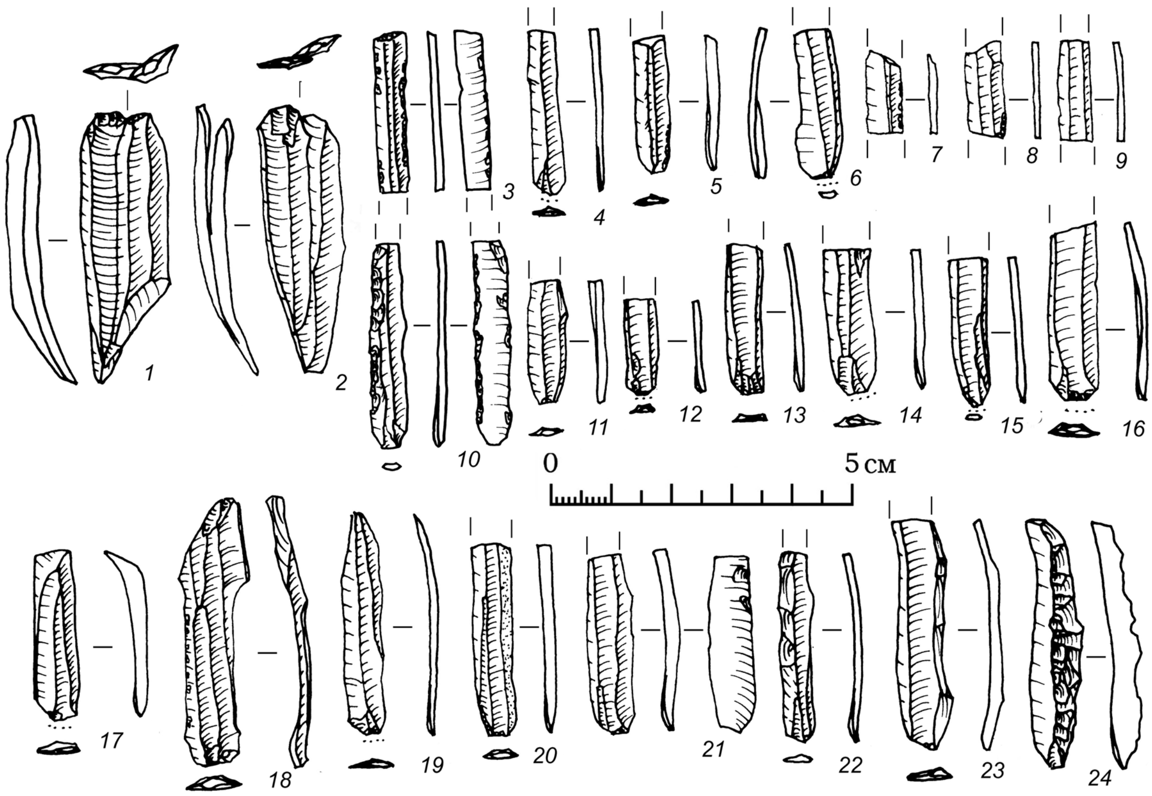



Fig. 4. The Sosruko Rockshelter. Layer M-1. 1, 2 – refitted flint bladelets; 3 – flint microlith; 4-9, 11-24 – flint bladelets and microbladelets; 10 – retouched flint microbladelet

Рис. 4. Грот Сосруко. Слой М-1. 1, 2 – ремонтаж кремневых пластинок, 3 – микролит из кремня, 4-9, 11-24 – пластинчатые сколы из кремня, 10 – микропластинка с ретушью из кремня

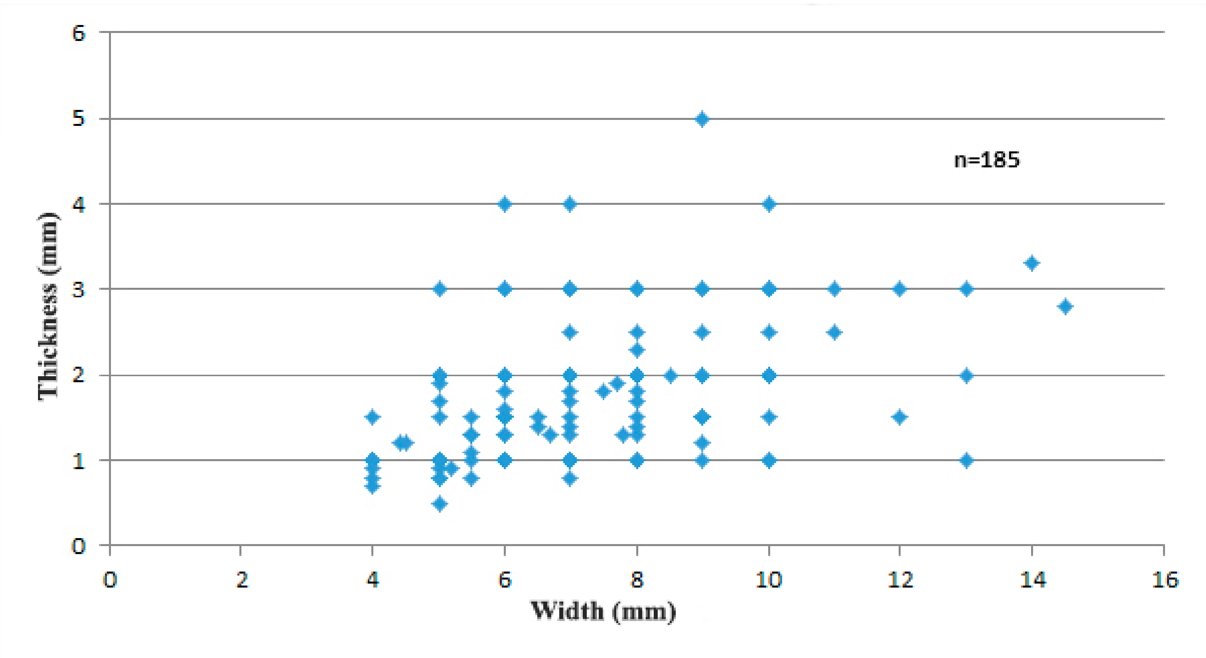
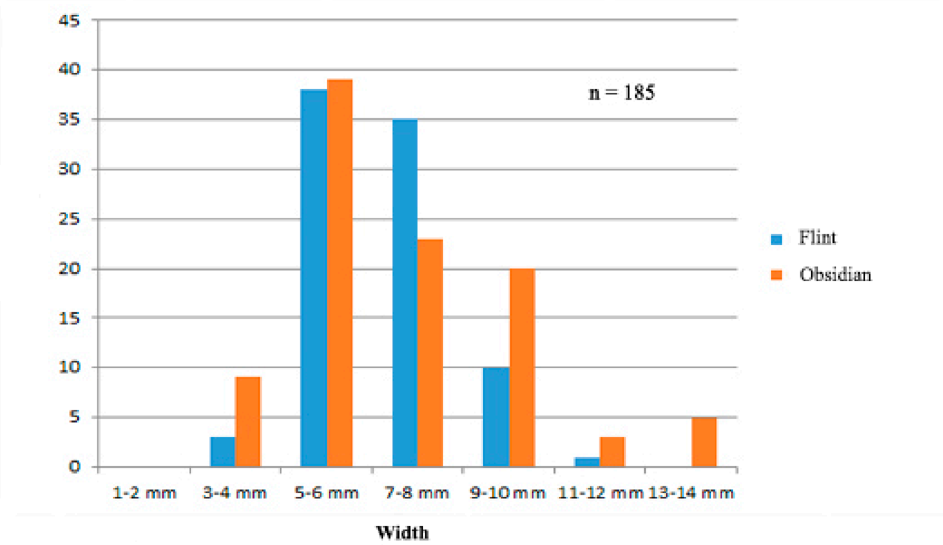
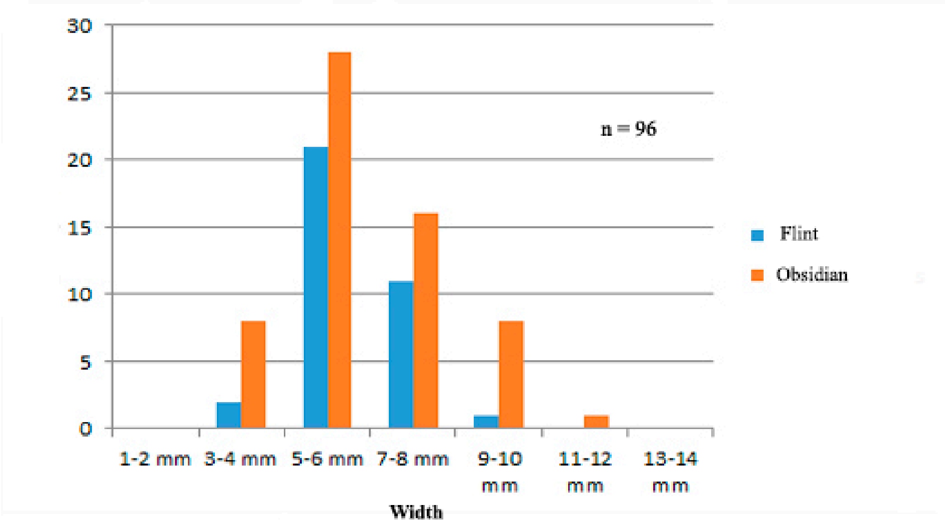



Fig. 5. The Sosruko Rockshelter. Layer M-1. Thickness/width ratio of blades, bladelets and microbladelets

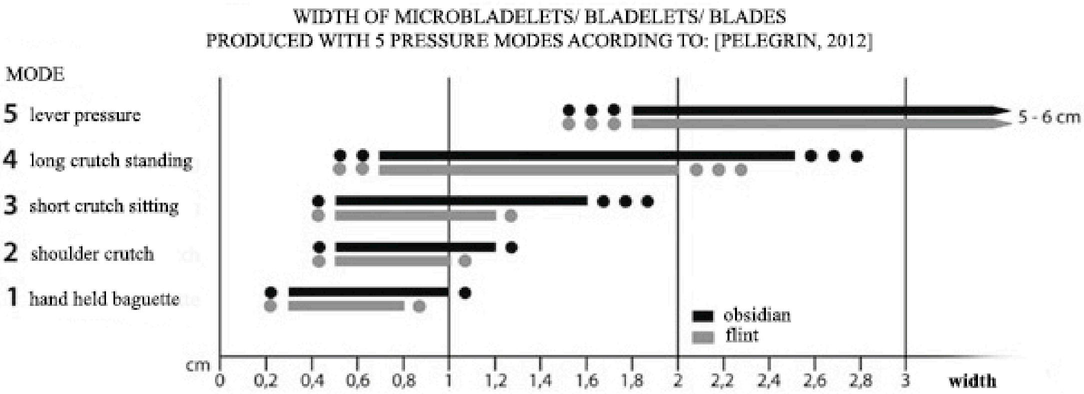
Рис. 5. Грот Сосруко. Слой М-1. Метрические параметры пластинчатых сколов




A




B




C

Fig. 6. The Sosruko Rockshelter. Layer M-1. A. Width of all flint and obsidian blades/bladelets/microbladelets; B. Width of flint and obsidian bladelets/microbladelets definitely/probably produced with pressure; C. Width of blades/bladelets/microbladelets produced experimentally with the pressure modes 1-5 according to: [15]

Рис. 6. Грот Сосруко. Слой М-1. А. Распределение по ширине всех пластинчатых сколов из кремня и обсидиана. Б. Распределение по ширине пластинчатых сколов из кремня и обсидиана, определенно и вероятно полученных отжимом. В. Ширина пластинчатых сколов из кремня и обсидиана, полученных экспериментальным путем при помощи Модов 1-5 отжимной техники по: [15]

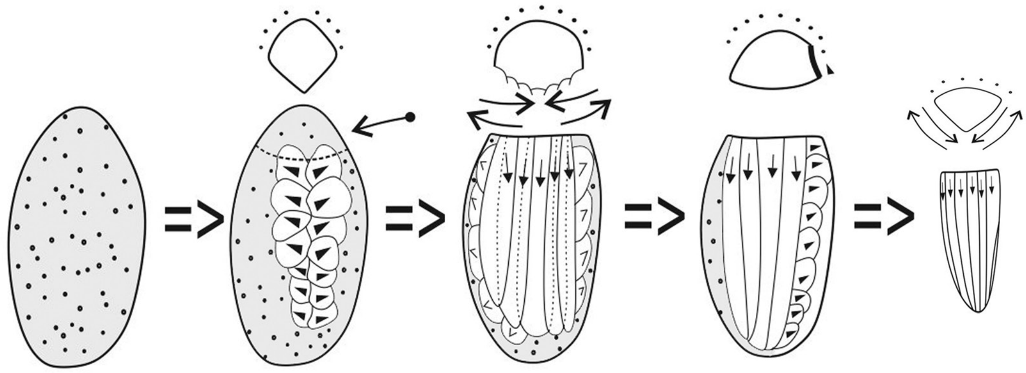


Fig. 7. The Sosruko Rockshelter. Layer M-1. Schematized method of bladelet/microbladelet production

Рис. 7. Грот Сосруко. Слой М-1. Схема метода получения пластинок и микропластинок

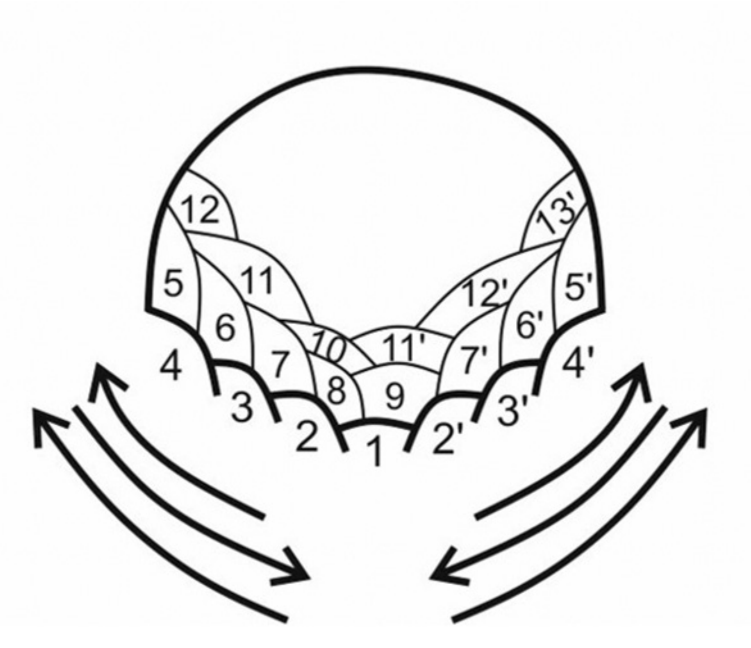



Fig. 8. The Sosruko Rockshelter. Layer M-1. Reconstruction of the pressure rhythm of debitage

Рис. 8. Грот Сосруко. Слой М-1. Реконструкция ритма расщепления при отжиме

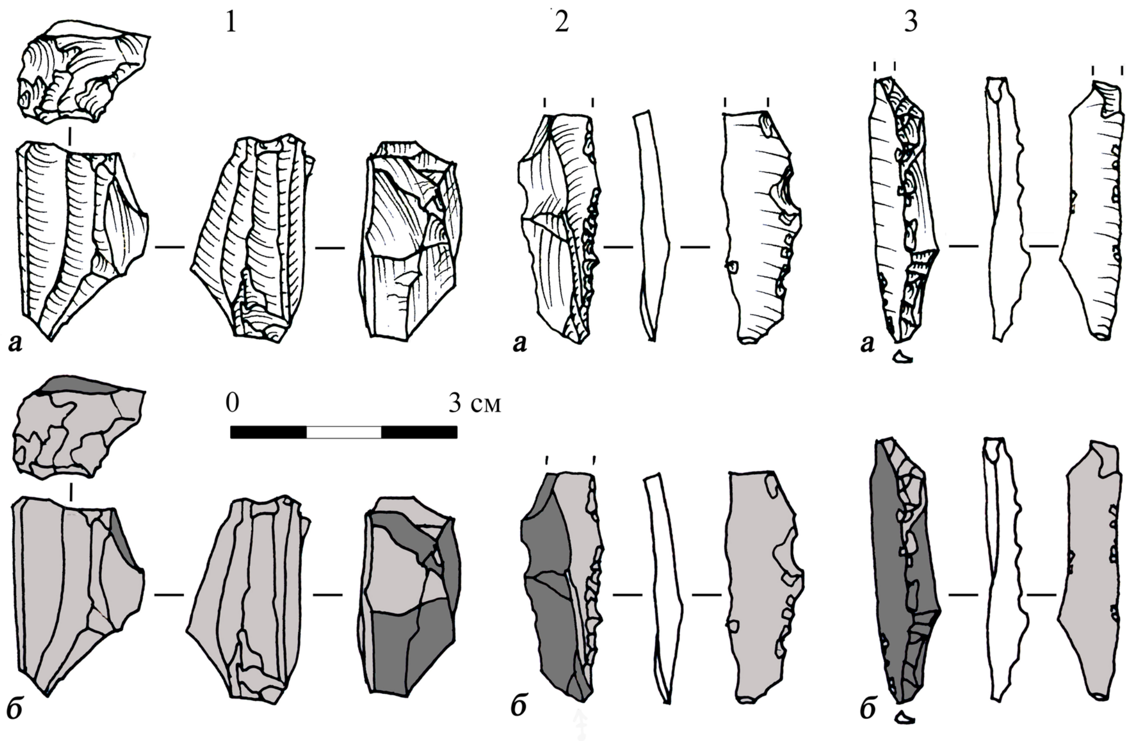



Fig. 9. The Sosruko Rockshelter. Layer M-1. Heat treatment of flint. 1 – flint core; 2, 3 – crested bladelets. a – drawings of flint debitage, b – schematic drawings: glossy shiny negatives are indicated in light gray, matte negatives – in dark gray

Рис. 9. Грот Сосруко. Слой М-1. Тепловая обработка кремня. 1 – нуклеус из кремня, 2, 3 – ребристые пластинки. а – графическое изображение кремневых продуктов расщепления, б – схематичное изображение продуктов расщепления: глянцевые блестящие негативы отмечены светло-серым цветом, матовые негативы – темно-серым

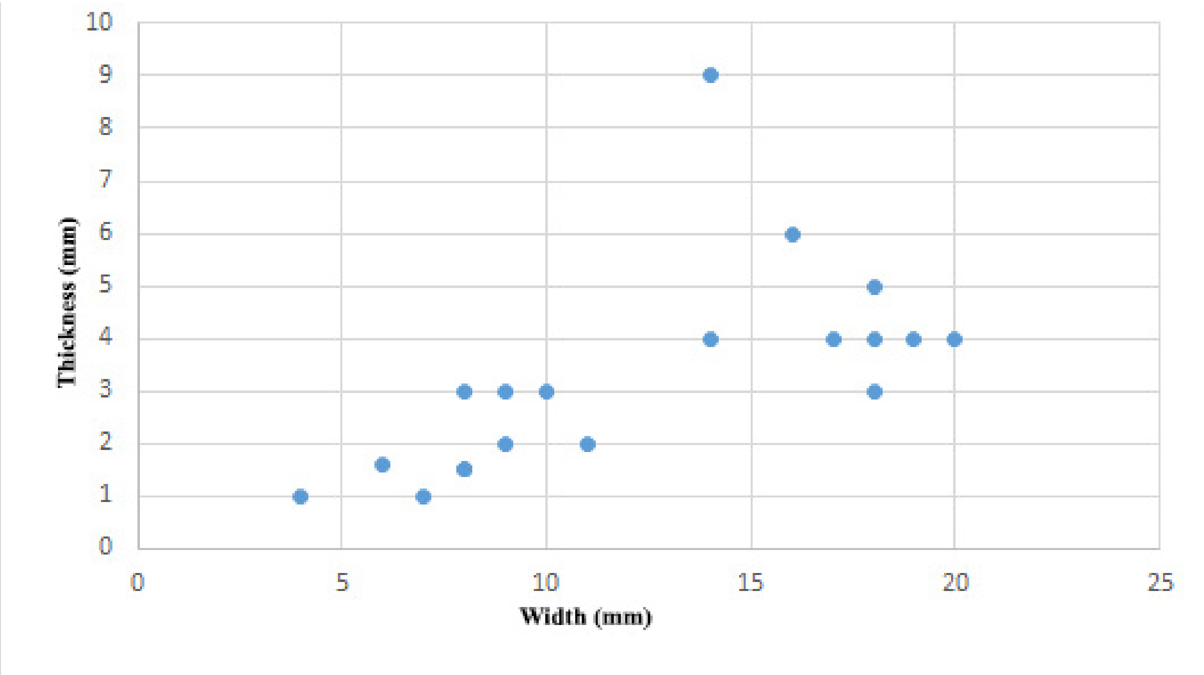



Fig. 10. The Sosruko Rockshelter. Layer M-2. Thickness/width ratio of blades, bladelets and microbladelets

Рис. 10. Грот Сосруко. Слой М-2. Метрические параметры пластинчатых сколов

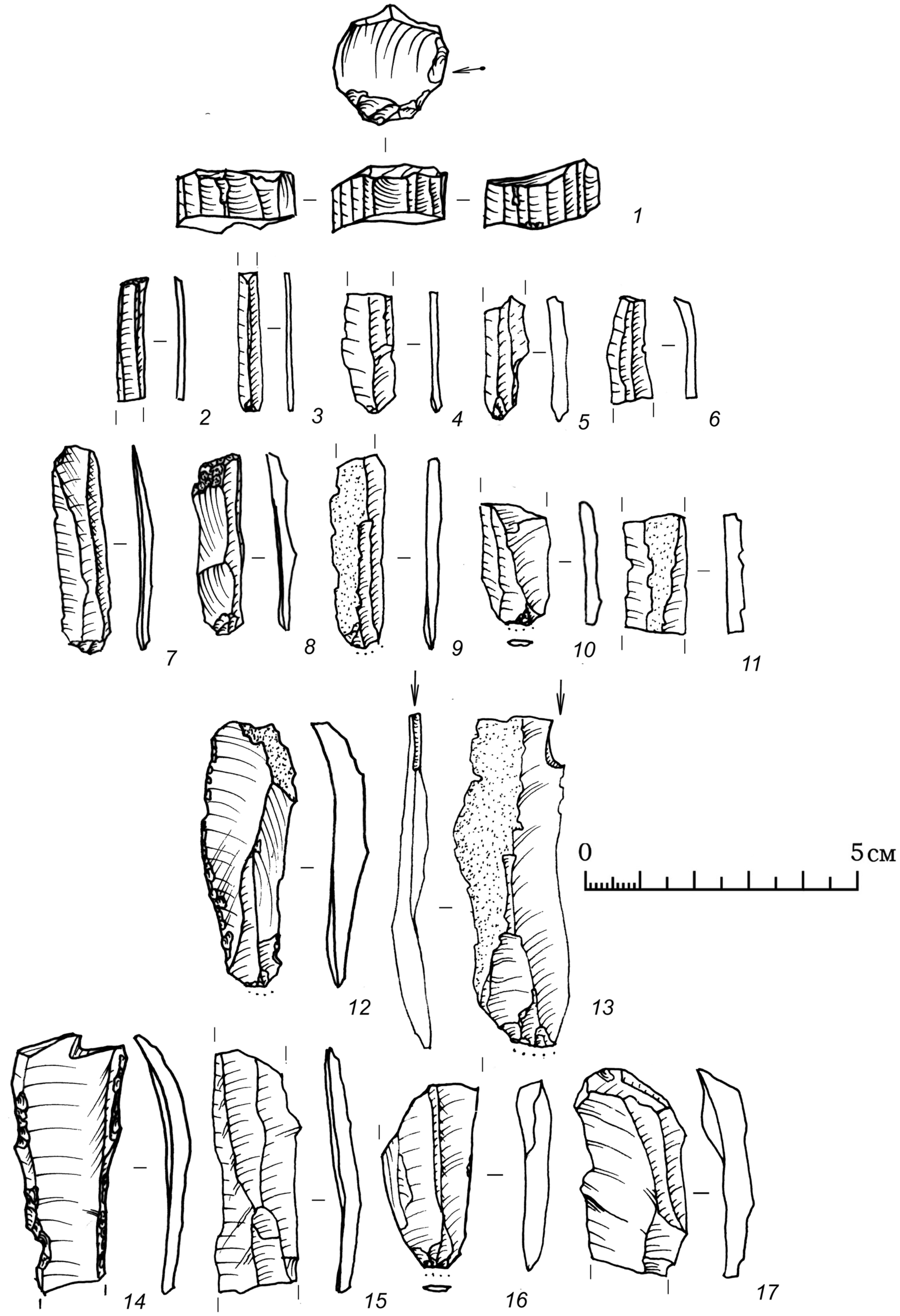



Fig. 11. The Sosruko Rockshelter. Layer M-2. 1 – obsidian core rejuvenation flake; 2 – obsidian microlith; 12 – obsidian retouched blade; 13 – obsidian burin; 3-11, 14-17 – obsidian blades/bladelets/microbladelets

Рис. 11. Грот Сосруко. Слой М-2. 1 – скол оживления площадки нуклеуса, 2 – микролит, 12 –пластина с ретушью, 13 – резец, 3-11, 14-17 – пластинчатые сколы из обсидиана

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*Поступила в редакцию 117.01.2023 г.*
*Принята в печать 11.02.2023 г.*
*Опубликована 15.06.2023 г.*

*Recieved 17.01.2023*
*Accepted 11.02.2023*
*Published 15.06.2023*