Edited by

Boris GASPARYAN

Makoto ARIMURA

Stone Age of Armenia

Kanazawa University

2014

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Kanazawa University

Institute of Archaeology and Ethnography of
the National Academy of Sciences of
the Republic of Armenia

Gfoeller Fund of America Corporation, Armenian Branch

Center for Cultural Resource Studies, Kanazawa University

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A Guide-book to the Stone Age Archaeology in the Republic of Armenia

Edited by

Boris GASPARYAN

Makoto ARIMURA

Scientific advisory board:

Pavel AVETISYAN, Sumio FUJII

Monograph of the JSPS-Bilateral Joint Research Project

Center for Cultural Resource Studies,
Kanazawa University

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And finally, but most importantly, we extend our profond thanks to all the colleagues spending their energies, times and efforts to make this publication a reality.

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CHALCOLITHIC

Introduction

Our initial reason for producing this volume was to publish the proceedings of the workshop titled “Stone Age in Armenia”. This workshop was organized by staff at the Institute of Archaeology and Ethnography of the National Academy of Sciences of the Republic of Armenia, and Kanazawa University, Japan, with the support of the Armenian Branch of the Gfoeller fund of America Corporation. The main aim of the workshop was to share and exchange a growing body of knowledge emerging from archaeological investigations by researchers in Armenia. Additionally, organizers – who included the authors of this paper – invited young researchers and graduate students to make presentations at the workshop, since it was thought their involvement would be indispensable to the future development of the field of archaeology. The workshop was held in the library at the Institute of Archaeology and Ethnography, Republic of Armenia, on 5 March 2013 (Figure 1). Fifteen talks were given, introducing the latest results from field studies and scientific analyses dating from the Paleolithic, Neolithic, and Chalcolithic periods. Although the workshop was quite long and tiring, participants filled the room with a palpable sense of excitement (Figures 2-8).

Figure 1
Announcement posters for the workshop in Armenian and English.

Since some authors prepared their papers after the workshop's conclusion, and others not in attendance expressed interest in contributing to the series of papers, we decided to prepare a monograph presenting recent findings of archaeological research conducted on the Stone Age sites in the Republic of Armenia.

By means of this publication, we hope that readers will become aware of our achievements to date, and come to understand the future prospects for Stone Age archaeology in Armenia. In addition, this workshop marks the beginning of cooperative efforts between Armenian and Japanese archaeologists - after all, both countries have unique and long-standing historical-cultural traditions in this field.

Pavel Avetisyan
Director of the Institute of Archaeology and Ethnography, the National Academy of Sciences of the Republic of Armenia

Sumio Fujii
Director of the Center for Cultural Resource Studies, Kanazawa University, Japan

Figure 2
Participants and audince in the workshop.

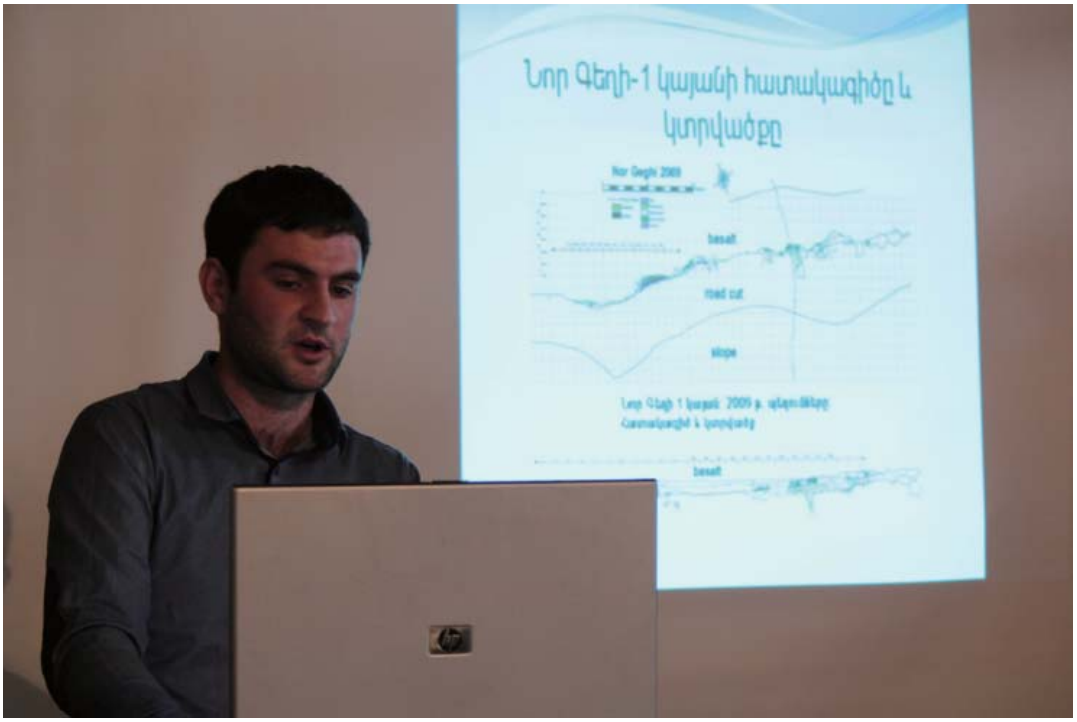

Figure 3
Presentation by Karen Azatyan.

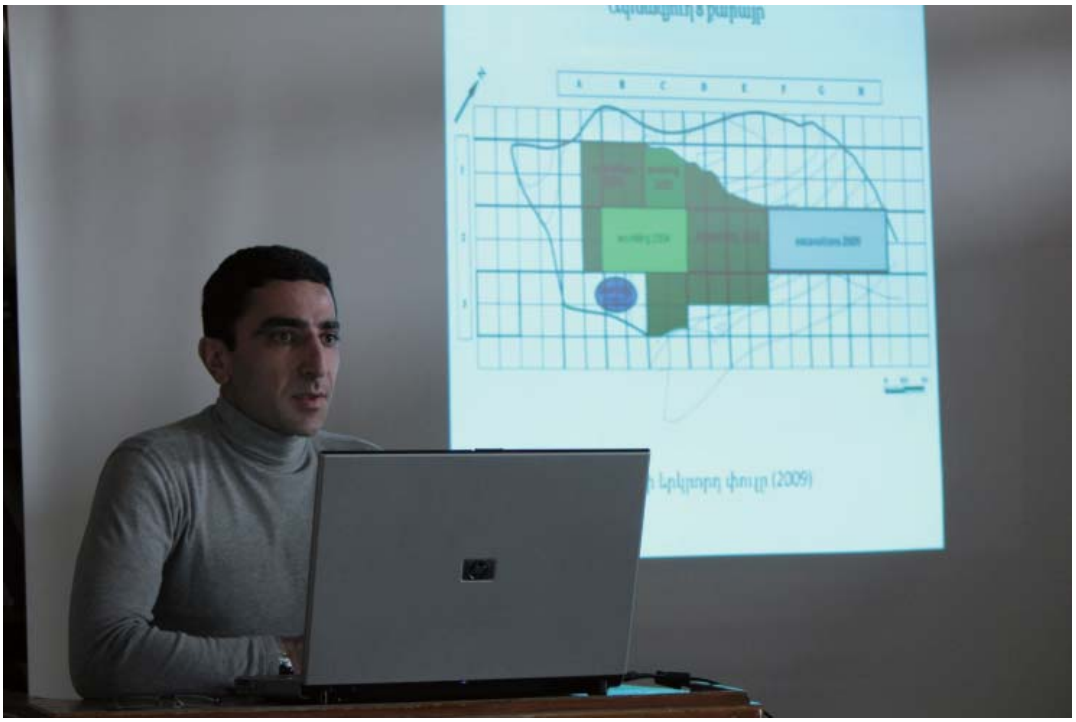

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Figure 6
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Figure 7
Young participants.

Figure 8
Participants and audience in the workshop.

The Middle Paleolithic Occupation of Armenia: Summarizing Old and New Data

Boris Gasparyan, Charles P. Egeland, Daniel S. Adler, Ron Pinhasi, Phil Glauberman and Hayk Haydosyan

1. Introduction

The Middle Paleolithic is the mot studied prehistoric period in the Republic of Armenia. Many open-air and cave sites with Middle Paleolithic occupational phases are located either in close proximity to or directly on obsidian outcrops of the Hrazdan-Kotayk Plateau and along the canyon of central Armenia's Hrazdan River. The Hrazdan canyon caves of Yerevan-1 and Lusakert-1 are particularly well known for their excavations from the late 1960s through mid 1970s, which produced hundreds of thousands of lithics and faunal remains. While these two sites became widely recognized in both Soviet and Western circles as being among the most important localities in the Caucasus, the absence of detailed chronometric and stratigraphic information has rendered these and many other Armenian sites of limited value in reconstructing hominin lifeways during the Middle Paleolithic. This is unfortunate given that Armenia's geographic position between Africa, Europe, and Asia and its favorable climate and rich natural resources meant that it had played a major role as a demographically complex region throughout the Paleolithic. Here, we summarize Middle Paleolithic data from the Soviet period and highlight a growing body of research conducted over the past decade which, in addition to reevaluating previously known sites, has identified and excavated new *in situ* sites applying modern methods and techniques.

2. Background on Middle Paleolithic research in Armenia

The first lithic artifacts representing the Middle Paleolithic of Armenia were discovered by the French archaeologist Jacques de Morgan at the end of the 19th century. De Morgan visited the

sources of obsidian and areas adjacent to them (Mt. Arteni, Hrazdan and Kasakh Rivers valleys) and made limited surface collections. Unfortunately he was not able to evaluate the finds correctly, thinking that Armenia, and the Caucasus as a whole, were not populated during the Paleolithic period, which he termed the "first or initial industries". Instead, he attributed those finds to the "Archaeolithic" period, or the "Upper Paleolithic" by his definition. Unfortunately, de Morgan's opinion played a negative role in development of the future study of the Paleolithic of Armenia, even though there were some Paleolithic artifacts found by A. Demyokhin and M. Ghukasyan in Arzni in the middle reaches of the Hrazdan River and in Pemzashen on the western slopes of Mt. Aragats in 1933 and 1935 (de Morgan 1909; Bayburtyan 1937; 1938, pp. 195, 216, Figure 3). It was not until 1944-1949 that S. Sardaryan (Armenian SSR Academy of Sciences) and M. Panichkina (Leningrad State Hermitage), while revisiting the areas investigated by de Morgan, surveyed the middle reaches of the Hrazdan River canyon (Arzni, Nurnus, Chatkeran, Ashirabat, Tezhrabak, Argel, etc.) and Mt. Arteni (Satani-dar, Areguni blur, Yerkaruk blur). This work amassed impressive surface collections of Paleolithic artifacts from numerous open-air sites located in close proximity to obsidian raw material sources. More than 1,000 artifacts from these collections, including small handaxes, Levallois and discoidal cores, discoidal tools, flakes and blanks, side scrapers and end scrapers, and Levallois and Mousterian points, were considered by Sardaryan (1954, pp. 102-123; 1967, pp. 61-75) and Panichkina (1950, pp. 12-14, 80-89, 99-101; 1951) on detailed typological grounds to be characteristic of the Middle Paleolithic. Based on comparison of the finds with similar ones from Crimea, Syria, Iraq, Levant and Western Europe, Panichkina and Sardaryan concluded that the Middle Paleolithic of Armenia was more similar in its cultural attribution to the materials from sites of the Caucasus, Western Mediterranean basin and southwestern Asia, than to the Middle Paleolithic of Western Europe. Moreover, Panichkina proposed the first comparative chronology for the Paleolithic of Armenia, placing the finds from Arzni into the Early Middle Paleolithic (Early Mousterian by her definition) and the Ashirabat complex into the Developed Mousterian, noting that Late Middle Paleolithic or Late Mousterian sites were as yet unknown. Sardaryan, based on the western European chronology, meanwhile dated the Middle Paleolithic or Mousterian of Armenia between 100,000 – 40,000. Both scholars were deeply convinced that the future of Middle Paleolithic study of Armenia was related to the archaeological investigations of the volcanic caves, which are widely distributed along the slopes of Mt. Aragats and in the middle reaches of the Hrazdan River valley, or under the existing lava flows within the extent of the same region (Panichkina 1950, pp. 87-89, 100-101; 1951, pp. 76, 84-86; Sardaryan 1954, pp. 122-123, 169-171).

Between 1950-1969 a number of studies by different scholars (M. Hasratyan, A. Aslanyan, K. Karapetyan, V. Lyubin. S. Balyan, Yu. Sayadyan, B. Yeritysan and many others) recorded numerous Middle Paleolithic sites all over Armenia. These sites differed from the known ones in their exploitation and types of utilized raw materials, altitude, location and preservation. Among these the most important are: the find of a Mousterian point by M. Hasratyan during the excavations of a cave situated in the canyon of the Zorzor River, a tributary to the Vorotan (Syunik Region of southern Armenia) in 1950 (Hasratyan 1985, p. 168), the find of a Mousterian point made from green jasper by A. Aslanyan on the slope of Mt. Kaylik (Gilik) of the Papakar Range (Noyemberyan district of northeastern Armenia) in 1952 (Sardaryan 1954, pp. 109, 114, 119, Table XXX: 2a), Gilik open-air site discovered in 1967 by B.G. Yeritsyan at the same location (Yeritsyan 1970a), Verin Talin open-air site discovered by S. Balyan and V. Lyubin on the southern slopes of Mt. Arteni with surface collection of Acheulo-Mousterian obsidian and basalt implements in 1958 (Lyubin and Balyan 1961), Lusagyugh open-air site discovered by S. Barkhudaryan with surface collection of Acheulo-Mousterian obsidian implements in the Aparan Depression in 1969 (Petrosyants 1988, p. 37).

The most significant Middle Paleolithic localities, however, were discovered by the Expedition for the Study of Stone Age Sites in Armenia implemented by the Presidium of the Academy of Sciences of the Armenian SSR in 1967 and headed by Professor H.A. Martirosyan. During two years of intensive investigations (1967-1968) the expedition studied the canyons of the Hrazdan, Azat and Ughtakunk Rivers (all tributaries of the Araxes River), the southern, eastern and western slopes of Mt. Aragats, the eastern slopes and highlands of the Gegham Range, and the slopes of the Areguni and Vardenis Ranges overlooking Lake Sevan. While recording numerous Bronze and Iron Age fortress settlements and graveyards, as well as petroglyphs in the foothills and alpine zones, the expedition studied dozens of caves in Voghjaberd, Geghadir, Ayrivank, Garni, Ughtakunk and Daraband. Special efforts were spent on the study of the Hrazdan River gorge and the surroundings of Mt. Hatis, bringing to light many Stone Age open-air and cave sites from the different periods (Lower to Middle Paleolithic, Mesolithic, Neolithic) among which Jndrakhach, Nurnus I and II, Arzni, Abovyan, Getamej, Kaputan I, Hatis, Akunk, Aramus, Geghashen, Yerablur, Tacharabak, Kamaris, Nor-Nork open-air sites and clusters of caves in Karmir Blur, Shengavit, Kanaker and Zovuni are listed. The most important achievement of the expedition was the discovery of Yerevan and Lusakert caves containing well preserved Middle Paleolithic sequences (Azizyan 1982; Karapetyan 1983a; 1983b; Martirosyan 1968; 1969; 1970; 1974, pp. 25-28; Karapetyan and Yeritsyan 1969; Yeritsyan and Semyonov 1971, p. 32).

Beginning in 1967 and continuing intermittently until 1990, systematic excavations at the caves of Yerevan and Lusakert were conducted under the direction of B.G. Yeritsyan (Institute of Archaeology and Ethnography of NAS RA). These excavations yielded hundreds of thousands of lithic artifacts, faunal remains and geoarchaeological samples, not to mention the country's first radiometric Middle Paleolithic dates, all of which fundamentally changed our understanding of Armenia's Middle Paleolithic occupation (Ghazaryan 1979; 1983; Golovanova and Doronichev 2003; Karapetyan 1977; 1978; Lyubin 1984, pp. 65, 90-91, Fig. 33-34; 1989, pp. 64-67, Fig. 20; Pinhasi *et al*. 2008, p. 812, Table 3; Yeritsyan 1970b; 1970c; 1971; 1972; 1975; 1976a; 1976b; Yeritsyan and Semyonov 1971; Yeritsyan and Ghazaryan 1977; Yeritsyan and Korobkov 1979, Yeritsyan and Tadevosyan 1986, Yeritsyan and Gasparyan 1996). As a result the Hrazdan River canyon became the "center of gravity" for the Paleolithic study of Armenia, where, between 1970-1976, in parallel with Lusakert, small scale excavations were conducted in numerous caves – Karmir Blur, Kanaker, Hamo, Zovuni, Karashamb, some of which yielded Paleolithic finds, including Middle Paleolithic (Azizyan 1979; 1982; Azizyan *et al.* 1975; Chagharyan *et al*. 1972; Yeritsyan and Ghazaryan 1977). In addition many new open-air sites were discovered and studied in the middle reaches of the Hrazdan River starting from Arzakan to Arzni and along the boundaries of the Hrazdan-Kotayk Plateau. Especially starting from 1983 H.P. Ghazaryan (Institute of Archaeology and Ethnography of NAS RA) excavated a series of open-air sites situated between the villages of Akunk and Zar on the southern slopes of Mt.Hatis in direct proximity to obsidian raw material sources. As a result around ten open-air sites were discovered and studied – Late Acheulian (Hatis-1-4 and 6-9), Mousterian (Hatis 5) and Neolithic (Hatis-10). The special methodology, the spectrum of scientific questioning and the scale of the investigations of the Hatis open-air sites constituted a new step in the history of study of the Stone Age of Armenia (Ghazaryan 1986; 1991)[1].

During the last decade of the 20th century (1990-2000) consequent to the collapse of the Soviet Union and lack of funding, intensive study of the Middle Paleolithic sites of Armenia, and the Stone Age as a whole, all but ceased. The new strategy was of small-scale surveys and reconnaissance investigations, having an aim to re-examine the location, geomorphological and cultural distribution of previously known sites and to discover new and prospective landmarks for future investigations. These were implemented by B. Gasparyan in the Hrazdan River Gorge and its tributaries, the Hrazdan-Kotayk Plateau, Mt. Arteni and its environs, the Ararat, Shirak and Lori Depressions, the Tashir Plateau, the Kasakh River basin and the Aparan Depression (Gasparyan

1. Unfortunately, most of the research implemented by H. Gazaryan at Hatis remains unpublished.

1998; 2007a; 2007b; Gasparyan and Sargsyan 2003; Gasparyan *et al*. 2003; 2004; 2005). Most of the data collected during this work served as a base for future investigations involving international collaborative projects in commencing in the early 2000s (see Gasparyan and Arimura, this volume). Both new and previously known (e.g., Lusakert-1) Middle Paleolithic sites are currently being excavated and studied implementing modern archaeological and analytical methods, and we present the results of these studies here.

3. Lower to Middle Paleolithic transition in Armenia at Nor Geghi-1 open-air site

Our understanding of the timing and nature of the Lower to Middle Paleolithic transition in Armenia was aided by the discovery of the Nor Geghi-1 open-air site during a 2008 survey of the Hrazdan Gorge, with excavations conducted in 2008 and 2009. The site has a long exposed section following the construction of a narrow road in the late 1990s and is located at the uppermost deposits of the Hrazdan Gorge. The artifact-bearing deposits are sandwiched between two Middle Pleistocene basaltic lava flows from Gutanasar. Geoarchaeological research yielded considerable new data critical to our understanding of the Hrazdan Gorge's evolution, and new archaeological data are improving our understanding of the Middle Pleistocene landscapes and the environments and the hominins who inhabited them (Adler *et al*. 2012).

Preliminary analysis of the Nor Geghi-1 lithic assemblage indicates that the site dates to the Late Acheulian (late Middle Pleistocene), sometime between 400 and 200 ka. Geological samples from surrounding sediments (OSL, tephra) and basalts (Ar/Ar) are currently under analysis and will soon help verify the absolute age of the site, which is preliminary dated to >300 ka. All of the artifacts are produced on obsidian, several sources of which are found near the site (e.g., Hatis, Gutanasar) (Frahm *et al.* 2014a; 2014b). Hierarchical core techniques predominate, and débordants and overpass flakes document variable methods of core preparation and rejuvenation. The assemblage contains a high frequency of small debitage and shatter, and both flakes and blades, the platforms of which are typically plain or faceted and often large. Therefore it appears that all stages of manufacture are present at the site. Typologically the assemblage is dominated by denticulates, followed by notched pieces, scrapers (all varieties), bifaces (thin and ovate, thick and triangular, short and thick on Kombewa), burins, and thick end scrapers (Figure 1). Single and alternate notching is the primary form of retouch followed by truncated faceting, and scaled and stepped retouch (Adler *et al*. 2012). Continued analysis of these finds will allow us to delineate the

role Nor Geghi-1 played in the mobility, settlement, and foraging behaviors of hominins within the Hrazdan Gorge prior to the Middle Paleolithic in comparison to other sites in the Caucasus and southwest Asia (e.g. Lyubin 1998; Barkai *et al*. 2005; Doronichev 2008; Slimak *et al*. 2008; Taskiran 2008; Kolpakov 2009; Doronichev and Golovanova 2010; Gasparian 2010; Gopher *et al*. 2010; Shimelmitz *et al.* 2011).

4. Bagratashen-1 open-air site

The group of Bagratashen open-air sites consists of five lithic scatters, all of which are associated with ancient terrace structures of the Debed at elevations between 435 and 549 m asl. A majority of the diagnostic surface material, the frequency of which ranges from a low of three at Bagratashen-5 to a high of 52 at Bagratashen-1, is Middle Paleolithic in character. The most noteworthy site, Bagratashen-1, was initially recognized when a well-made handaxe was recovered from the surface. Soon after, additional artifacts were observed eroding from a road cut dug only the year prior to the survey, in 2008 (Egeland *et al.* 2010; 2011; 2014)[2]. Excavations in 2010 and 2011 revealed a discrete, ca. 60 cm-thick archaeological horizon about 1.5 meters below the modern ground surface. As of 2011, a total of 6 m^2 of this horizon has been exposed and over 500 lithic artifacts were surveyed in and plotted. Small chipping debris (currently uncounted) was also common among the screened materials (Egeland *et al*. 2013).

Preliminary typological considerations suggest that Bagratashen-1 represents an early Middle Paleolithic occupation. Specifically, the retouched points recovered from the site (Figure 2) compare favorably to laminar technologies associated with late Middle Pleistocene or early Late Pleistocene chronometric dates from Armenia (Hovk-1: ~104 ka BP; Pinhasi *et al*. 2008), Georgia (Djruchula: ~230 ka BP and ~140 ka BP; Mercier *et al.* 2010), and the Levant (Hayonim: ~200 ka BP; Mercier *et al.* 2007). Whether the handaxe is associated with this laminar industry or from an as yet unidentified cultural component is not known. Preliminary examination indicates that a majority of the lithic material is flaked from (probably local) dacite and other fine-grained volcanogenic raw materials. Obsidian is represented by 12 pieces. The presence of flaking debris, cores (mostly cobbles), and finished tools indicates that all stages of reduction were carried out on-site. Unfortunately, the find horizon is devoid of faunal material.

2. This encounter underscores the serendipitous and sometimes paradoxical nature of archaeological discovery: the construction of the road, while destroying some of the original site, was likely the only reason the deeply buried finds were exposed in the first place.

While the archaeological deposit no doubt experienced some post-depositional disturbance, the presence of small chipping debris, the fact that the artifacts themselves show very little evidence of rounding or preferential orientation, and the identification of at least one refitting lithic set all suggest that the material is largely in situ. Further excavations and paleoenvironmental, geoarchaeological and dating work are currently ongoing at Bagratashen-1 and promise to reveal key aspects of early Middle Paleolithic adaptations in the area (Egeland *et al*. 2013).

5. Hovk-1 cave

Discovered in 2005, Hovk-1 cave is located in the northeasterly Tavush province of Armenia, 20 km east of Dilijan, the provincial capital, and 100 km northeast of Yerevan. The cave is at an elevation of 2040 m asl and exposed in an east-west orientated cliff which has developed as a result of faulting on the southern flank of the Ijevan Mountain Range. Hovk-1 cave developed in Jurassic dolomitic limestone as a result of karstic dissolution along a bounding plane between two limestone beds, and along a fault crack perpendicular to the cliff line. The net result is a hollow in the limestone measuring a maximum of 14 m in length, 2 m in width and 3 m height. The cave is divided into three zones: the main gallery which is exposed to light through the present cave entrance; a rear gallery that does not receive light from the cave mouth, but which is the location of a blocked karstic chimney; and a 1.5 m deep infilled karstic hollow (a “karren”) located immediately below the present cave entrance (Pinhasi *et al*. 2008; 2011; 2012).

The site was excavated during five fieldwork seasons between 2005 and 2009. The 0.80 and 4.40 m of infilling sediment that lie above the limestone platform forming the base of the cave have been divided into 13 sedimentary units. A combination of U-series, OSL and AMS 14C dating provides a chronology for the infilling events. Thus Unit 8 formed at and before 104 ± 9.8 ka BP (OxL-1001), flowstone formation of Unit 6a ceased soon after 94.2 ± 4.9 ka BP (BIG-UTh-A243) and was followed by a hiatus before Unit 6 accreted at 54.6 ± 5.7 ka BP (OxL-1000). Unit 5 was originally dated to 33.8 ± 0.5 14C ka BP (Poz-14674), but the *Capra aegagrus* (Bezoar goat) astragalus originally used for AMS 14C dating was reanalysed using the ultrafiltration technique and an age of >46 ka BP was obtained (Poz-23097). An *Ursus* bone from Unit 4 was AMS dated by ultrafiltration to 35.6 ± 0.7 14C ka BP (OxA-24504). Medieval ceramic fragments (1,000 – 500 BP), as well two Iron Age beads (one of carnelian and one of glass) dated by cultural attribution to ca. 500 BC – AD 0, were found in Units 1 and 3. This indicates that these units are of Holocene age and that an unconformity exists at the contact between Units 4 and 3 (Pinhasi *et al*. 2008; 2011; 2012).

The evidence for Middle Paeolithic human presence at Hovk-1 is based on a small number (n=50) of Mousterian stone tools, flakes and lithic debris (defined here as flakes <15 mm), some of which were made from local limestone, but some (n=26) were made on non-local obsidian and chert. In addition, several ash spreads were excavated in Pleistocene Units 12, 10, 9, 8, 6, 5 and 4, although no burnt bones or burnt lithic artifacts were recovered. The techno-typological analysis of the Hovk-1 Unit 8 artifacts (Figure 3) highlights some typological similarities with assemblages from the Kudaro-Djruchula group (Meignen and Tushabramishvili 2006), for example those from Djruchula Cave (Imereti, Republic of Georgia), Kudaro I and III, and Tsona (southern Osetia). However, the absolute age of these assemblages is not known due to a lack of reliable chronometric determinations for the relevant strata. The lithic assemblages from all these sites contain a high frequency of elongated Levallois points and blanks with low frequencies of debitage, cores and other tool forms. The elongated Levallois points and blades share techno-typological similarities with Levantine and other Near Eastern early Middle Paleolithic industries such as those from Tabun D, Hayonim E, Abu Sif, Rosh Ain Mor, Ain Difla, Doura and Hummal and are dated between 250 and 90 ka BP (Beliaeva and Lioubine 1998; Lyubin 1984; 1989; Rink *et al*. 2004).

The bone assemblage of Hovk-1 exhibits an exceptional preservation which does not vary considerably among the stratigraphic units or taxa. Evidence for low rates of *in situ* bone attrition includes the presence of porous and low-density skeletal parts of both immature and adult animals and the fresh appearance of most bone surfaces. The taxonomic composition of the Hovk-1 large faunal assemblages is rich and diverse. The bone assemblage includes a total of 1,090 complete and fragmentary bone specimens that were identified to taxon. The ungulate assemblages of Hovk-1 are dominated by Bezoar goat (*C. aegagrus*) which constitutes over 70% of total ungulates in each of the stratigraphic units. Red deer (*Cervus elaphus*) is the second most abundant ungulate taxa, their proportion ranging between 20% in Units 8, 6 and the karren and 10% or less in other units. Other ungulate species are represented by isolated bones and include wild boar (*Sus scrofa*), Caucasian bison (*Bison caucasicus*) and roe deer (*Capreolus capreolus*). The ratio of carnivores also varies according to stratigraphic unit. Cave bear (*U. spelaeus*) is the most abundant carnivore taxon in Units 7, 6, 2 and karren (>70%). In all other units the proportions of cave bears are <50% and the assemblages also include high proportions of small carnivores and wolves (*Canis lupus*). Among the small carnivores foxes (*Vulpes vulpes*) are the main taxon. Other small carnivores represented are common badger (*Meles meles*), pine marten (*Martes foina*), marbled polecat (*Vormela peregusna*) and lynx (*Felis lynx*). The remains of small carnivores also include deciduous teeth and unfused bones of neonatal specimens which could not be identified to species. However,

their presence indicates that the cave was in use by small carnivores as a den during certain periods. In spite of the high quality of bone surface preservation there is no evidence for human modification by hammerstone percussion marks, butchery or consumption marks with the exception of two modified bear sacra with evidence of percussion marks and several modified bear canines. The completeness of bones also indicates little if any human breakage for marrow extraction, and there are also no signs of burning. The limited evidence for human modifications of bones together with the remarkable state of preservation is strong evidence that the assemblages represent natural accumulations with minimal anthropogenic influence (Pinhasi *et al*. 2008; 2011; Bar-Oz *et al*. 2012).

Both the pollen and the microfauna show some notable shifts which indicate significant paleoenvironmental variations. The large mammal fauna of Hovk reflects the high elevation environment of the cave and is indicative of general continuity in the composition of large-animal communities in this region throughout the Late Pleistocene. Wild goats, boars, bears and wolves are among the most common species in mountain environments above the tree line. Other species such as roe deer, red deer, bison, fox and marten typically inhabit forested areas of lower altitudes and occur in high-elevation environments on a more sporadic basis. The presence and dominance of the Bezoar goat throughout the stratigraphic sequence, however, shows a distinct difference from Late Pleistocene assemblages in northern areas of the Greater Caucasus, where the predominant ungulate is typically the Caucasian goat (*C. caucasica*). It appears that humans occupied Hovk-1 during periods of varied vegetation and fauna which correlated with warm episodes of the Late Pleistocene (MIS 5d-c and early MIS 3). If lithic density is taken as an indicator of the frequency and intensity of human occupation, then evidence for human use of the cave is more noticeable in Unit 8, i.e. during MIS 5d-c, than in any of the other units (Pinhasi *et al*. 2008; 2011; Bar-Oz *et al*. 2012).

It is possible to provide at least two explanations for human presence in Hovk-1 and its environs. Mountains provide a diversity of biotopes that change rapidly with elevation. Mountain plateaus and rugged terrain can be advantageous to capable hunters who rely on ambushing, trapping and hunting of game which is abundant in such regions, such as the Bezoar goat. Humans may have exploited this habitat during relatively regular short-term incursions (and during mild climatic periods), possibly for seasonal hunting of game at and below the plateau in the vicinity of the cave. The advantage of the Hovk mountainous habitats (and others) is that the steep terrain provided easy means to hunt mountain animals such as the mountain goat by ambushing and trapping. The plateau above Hovk-1 cave provides an ideal terrain for this activity. Another scenario is that the use of Hovk-1 by humans indicates rare and infrequent incursions by humans to high

altitude regions, perhaps following their expansion into new habitats. The two scenarios are not mutually exclusive, and it is not at present possible to test which of these is most plausible. An intriguing aspect of Hovk-1 is the presence of elongated Levallois points in Unit 8 and the karren which are made from low quality local limestone. The lack of raw material sources in the Hovk region suggests that human occupation in Hovk-1 was not associated with the utilization of raw material sources. In fact, the production of highly standardized Levallois points from local coarse-grained raw material shows ingenuity and flexibility. The study of Hovk-1 can only provide a limited glimpse into the nature and timing of human occupation in this high-altitude region, but it clearly demonstrates the need to critically examine similar habitats in the context of understanding Neanderthal and modern human behaviour, subsistence and mobility (Pinhasi *et al*. 2008; 2011; 2012; Bar-Oz *et al*. 2012).

6. Cave sites of the Hrazdan River canyon (Yerevan-1 and Lusakert-1)

6.1. Yerevan-1 cave

Yerevan-1 cave is situated within the city limits of Yerevan on the right bank of the Hrazdan River at the beginning of the Yerevan reservoir. The cave is formed at the base of a Middle Pleistocene andesitic basalt flow with a total thickness of 20 m, and rests on doleritic basalt flows of Upper Pliocene age. The site, which is a small niche covering about 40 m^2 originated as a result of mechanical weathering of the basalts. The platform in front of the cave is the 15 m high erosional terrace of the Hrazdan and is covered by river cobbles (Karapetyan 1977). It was excavated between 1969-1975 by B.G. Yeritsyan of the Institute of Archaeology and Ethnography, Armenian National Academy of Sciences. Cultural remains in the front of the cave cover an area of 250 m^2. During nine seasons of excavation around 100 m^2 was uncovered, which represents about one third of the area occupied by the site (Yeritsyan 1970b; 1971; Yeritsyan and Semyonov 1971; Yeritsyan and Gasparyan 1996).

The excavations uncovered 11 lithostratigraphical units or horizons with a total thickness of three meters (from bottom to top: 7-6, 5A, II, Z, 5-1, A). Based on sedimentological and granulometrical, mineralogical and geochemical analyses, the Pleistocene stratigraphic sequence was divided into three cycles, described as follows: lower cycle (units 7, 6, 5A) consists of angular basaltic debris which was formed by mechanical weathering of the cave roof during very cold climatic conditions (end of Würm I); middle cycle (units 5-4) – alluvial silt formed during mild cold and wet climatic conditions (interstadial Würm I-II); upper cycle (units 3-1) – fine sands of aeolian

origin formed during dry continental climatic conditions (Würm II). The palynological data also supports these observations, showing that the vegetation around the cave changed in three cycles. The palynological spectrum of the lower units contains tree pollens of cold tolerant taxa (*Pinus*, *Picea* and *Betula*) dominated by *Pinus*. The second cycle is characterized by a low percentage of trees with *Betula* dominant and an abundance of herbaceous plants dominated by *Sonchus*. Meanwhile, for the upper cycle an abundance of herbaceous plants (mainly *Chenopodiaceae*) and a low frequency of thermophilic tree taxa (*Quercus*, *Corylus*, *Juglans*, *Castanea*, *Elaeagnus*) is also recorded, indicating the existence of an open landscape. The composition of the Yerevan-1 large faunal assemblage consists of over 24 taxa of ungulates, carnivores, birds and reptiles. The osteological materials of the lower units (7-6, 5A) are represented by the following species – elk, Northern deer, gazelle, rhinoceros, wild horse and onager. The middle stratigraphic units (5-4) contain rhinoceros, wild horse, onager, elk, bison, wild sheep, Bezoar goat, cave bear, wolf, jackal, fox and hare. Finally, the upper units (3-1) yielded bison, wild sheep, wild horse, onager and turtle (Yeritsyan 1970b, pp. 7-14; Karapetyan 1977; 1978).

While excavating the front platform of the cave in 1973 at its southern side in unit 4 a molar and a skull fragment were recovered and identified by the Soviet anthropologists A.I. Zubov and V.P. Alekseev as the postcranial remains of an 8 year old Neanderthal. In addition, in 1974 one molar and one incisor were recovered from unit 2, belonging to an anatomically modern humans[3].

Units 7, 6, Z, 5, 4, 3 and 2 are rich in archaeological features[4] including small and large hearths, areas of knapping with noticeable concentrations of flaking products, hammerstones and basalt anvils, as well as lithic finds, with over 30,000 pieces produced overwhelmingly (98 %) from obsidian. Artifacts from other types of raw materials such as basalt, dacite, jasper and chert are limited. As an initial flaking material, including the rhyolithic hammerstones, the cobbles of the Hrazdan River were used. Those include Levallois and non Levallois cores, flaking products of different categories, angular debris, blanks (both flakes and blades) and tools modified on their bases. The main tool types (Figure 4) are different side scrapers, Levallois and Mousterian points, notched tools, backed knives, burins, pièces esquillées, and bifacial forms. Based on typological observations (typical Mousterian, Quina, Tayacian) the Middle Paleolithic industry of the cave is a representative for the Late Mousterian of Armenia and the Lesser Caucasus. Most significant are the materials from the upper units (3-1), which reflect the development of microlithic tendencies

3. These finds were never published. They were transported to Moscow, and their location remains unknown (B. Yeritsyan, personal communication).

4. In unit 4 traces of floor belonging to an artificial construction were recorded.

and specific features of tool preparation (Figure 5). These are reflected by the wide use of various methods of thinning for tool production, including the truncated-faceted technique. The most specific are so-called "Yerevan" or "Yerevan-type" points (retouched triangular points with truncated-faceted bases) and side scrapers with two or three truncated-faceted sides ("side scraper with thinned body") (Figure 6). This tradition of tool manufacturing, noted at numerous sites, forms the Late Mousterian regional cultural group known as the "Yerevan-type industry". Consequently, the invention of these new types of tools and the presence of new methods of fabrication enabled intensive use of the available raw materials (Beliaeva and Lioubine 1998; Fourloubey *et al*. 2003; Ghukasyan *et al*. 2011; Golovanova and Doronichev 2003; Liagre *et al*. 2006; Yeritsyan 1970b, pp. 14-30; 1971; 1972; Yeritsyan and Gasparyan 1996).

Functional and use-wear analyses by S.A. Semyonov, A.E. Shchelinskiy and H.P. Ghazaryan, suggest that the abrasion traces on the tools resulted from activities such as wood and bone processing (the most frequent type of abrasion), hide processing (traces of abrasion on scrapers) and the butchering (Ghazaryan 1993; Yeritsyan 1970b, p. 31; Yeritsyan and Semyonov 1971).

Radiocarbon dates obtained from Groningen (Netherlands) laboratory yielded dates ranging between >49,000 – 32,000 uncalibrated BP for units 4 and 3. Two dates from Unit 7 contradict these data with results of 28 – 27,000 uncalibrated BP, which indicates that the site is still in need of reliable chronometric dating (Cohen and Stepanchuk 1999, pp. 281-282; Pinhasi *et al.* 2008, p. 812, Table 3). While there can be no doubt that Yerevan-1 cave is among the most important late Middle Paleolithic sites in Armenia and, indeed, the entire region, our knowledge of its occupational history would benefit greatly from renewed excavations with modern analytical techniques as is currently being done at Lusakert-1.

6.2. Lusakert-1 cave

Excavations at Lusakert-1 cave were first conducted from 1971–1990 and headed by B. Yeritsyan. These efforts produced over 200,000 lithic artifacts (Figures 7-10) and a small assemblage of vertebrate fauna. An Armenian-French team conducted small-scale re-excavation of Lusakert-1 in the early 1990s (Fourloubey *et al*. 2003). In 2008 an Armenian-American team focused their efforts outside the cave where Yeritsyan, and later the Armenian-French team had worked and where collapsed sections were still visible and easily accessible. The Armenian-American team exposed new sections, clarified the original stratigraphy, collected a variety of chronometric and paleoenvironmental samples, recovered several thousand lithic artifacts, and

began a geoarchaeological assessment of the site and the formation processes that influenced its development. Unfortunately, faunal preservation in this area of the site is extremely poor and very few identifiable specimens were recovered. In 2009 the team deepened the excavation outside the cave and began a test excavation in the interior of the cave where *in situ*, stratified archaeological horizons rich in well-preserved lithics, fauna, microfauna and combustion features were immediately encountered. Between 2010–2011 these interior excavations were deepened to bedrock and extended several meters to the north, thus producing a continuous section linked to the exterior deposits. Twelve new lithostratigraphic units containing well-preserved lithics, fauna, hearths and other features were documented inside the cave. Archaeological and faunal data from these new layers are still under study (Adler *et al*. 2012).

Initial observations indicate that the 2008–2009 lithic assemblage can be characterized as Levallois (flake and blade), with facetted and plain platforms, few cores, a moderate frequency of formal tools (denticulates, side scrapers, burins, end scrapers), and a very low frequency of cortex. However given the distinct taphonomic histories and site formation processes observed between the exterior and interior deposits, it is necessary to treat the assemblages from these two areas separately. Technological and typological analyses reveal that the studied sample from the exterior includes a high frequency of flakes with notches; a similarly high frequency of damage on the opposite or alternate surface to the "notches" suggests that this pattern is more likely due to edge damage rather than tool manufacture (Adler *et al*. 2012).

Within the interior assemblage the predominant flaking technique is Levallois and Kombewa (or Janus flakes). The high incidence of Kombewa flaking and its application to a wide variety of artifact sizes and forms is of note given that, when present in other assemblages, the technique is typically applied much less frequently, and then usually for the primary purpose of thinning bulbs or the application of truncated-faceting (Dibble and McPherron 2006; Inizan *et al*. 1995). Truncated-faceting and the removal of the exterior central ridge are very common. Both techniques are typically coupled with the thinning of the dorsal surface just beneath the platform regardless of platform type. Detailed analysis of the artifacts by stratigraphic level is ongoing and inclusion of the large sample of material from the 2010–2011 excavations will help further substantiate the patterns reported here (Adler *et al*. 2012).

The faunal assemblage (interior and exterior) is heavily fragmented. Bones identified to size class (small, medium, large ungulate) comprise about 2/3 of total NISP and include almost all of the postcranial elements. Taxonomically the assemblage is dominated by *Capra* sp. and *Equus* sp., however several bovine specimens, probably *Bison* sp., have also been identified.

Percussion marks, including pits, micro-striations and conchoidal notches, were documented on many specimens, and the high frequency of long bone epiphyses with green breaks attests to the routine exploitation of long bones for their marrow. Almost half of the shaft fragments from all size class categories display fresh fractures, and nearly all shafts retain less than half of their original circumference. While some specimens exhibit probable carnivore gnaw marks, evidence of butchering and processing by hominins (e.g., cut marks, impact fractures, green breaks) is much more common. Faunal analyses are ongoing and comparisons between the content and taphonomic history of the exterior versus interior assemblages are planned (Adler *et al.* 2012).

At present Lusakert-1 is the only Middle Paleolithic cave site in Armenia with stratified deposits of well preserved archaeological material currently under study. As such it provides the best opportunity to conduct a variety of technical and behavioral studies in the region. For example, the quality and quantity of the faunal assemblage is allowing us to conduct detailed zooarchaeological and taphonomic analyses and to assess regional Late Pleistocene hominin foraging behaviors in a manner similar to that already attempted in Georgia (Bar-Oz and Adler 2005; Adler *et al.* 2006; Bar-Oz *et al*. 2008; Adler and Bar-Oz 2009) and southern Russia (Cleghorn 2006; Golovanova *et al*. 2006). Lithic analyses are providing insights into technological and processing behaviors, and the sourcing of raw materials (obsidian) is allowing us to assess patterns of mobility and land use. Paleoenvironmental and geoarchaeological studies are providing data on the formation of the Lusakert-1 deposits and the site's proper geomorphological and ecological contexts. Chronometric estimates are allowing us to build an absolute chronology for the site based on three independent techniques (OSL, AMS, tephra). While OSL results for Unit D are pending, estimates for Unit C (OxL-1836: 36.6 ± 2.8 kya; OxL-1837: 35.3 ± 2.8 kya; OxL-1838: 23.9 ± 1.9 kya) suggest a preliminary age of ~36,000 BP OSL; the true age of each layer can only be assessed following completion of our dating program which remains ongoing. The AMS analysis from the French team excavations of a single equid tooth from Unit C (Mousterian) produced an age of 26,920 ± 220 14C BP ([GRA-14949/Lyon-1006], Fourloubey *et al*. 2003) and can be calibrated to 31,692 ± 190 Cal BPHulu (CalPal online calibration, 2011). The coordinated analysis of these data is allowing us to test a variety of behavioral hypotheses and compare results from Armenia with contemporaneous finds from the wider region (Adler *et al*. 2012).

6.3. Angeghakot-1 cave

In 2003, during a systematic campaign of surveys conducted by the Armenian-French team in the Vorotan River basin, a concentration of artifacts providing evidence for the presence of a

Mousterian site was discovered on the left bank of the Vorotan River at an altitude of 1800 m in the district of the village Angeghakot. Diagnostic pieces (cores, flakes, Levallois tools), as well as several Mousterian points allowed a typological attribution of the archaeological material to the late Mousterian industry of the so-called "Yerevan points". The artifacts were found in an area of about 100 m^2 on a steep slope. On the upper part of the slope were the remains of several eroded rock-shelters and caves whose entrances had collapsed. It is probable that erosion removed all the sedimentary facies corresponding to the occupation periods of the caves. The building of a chapel at the foot of the site during historical times and the digging of several tombs further down the slope are probably the cause of the unearthing of the artifacts, which are in a good state of preservation (Liagre *et al*. 2006).

The lithic assemblage collected from the surface of Angeghakot-1 consists of 84 artifacts, of which 68 are obsidian, nine basalt, two jasper and five limestone. This collection is not exhaustive, and because the artifacts were found a secondary position, their stratigraphic location remains unknown. During the fieldwork all diagnostic pieces were systematically selected. The nearest primary deposits for the supply of obsidian are located about 40 km to the northwest where the Vorotan volcanic group outcrops spread at an altitude of 2500-2800 m. However, the makers of these artifacts preferentially exploited raw material in secondary position in the form of small pebbles collected along the Vorotan valley below the shelters. The reduced dimensions of the lithic artifacts are in part related to the small size of these pebbles.

Typological study and technological observation show that the collection contains cores, tools on flakes, tools on pebbles, side scrapers and points. The points enabled attribution of the series to a late phase of the Middle Paleolithic. The assemblage of points consists of 21 pieces, of which ten are "Yerevan points" (Figure 11: 5, 7-8), five are points on Levallois flakes, and six are "classic Mousterian" points (Figure 11: 1-3). The "Yerevan points" have a symmetry, a continuous scalar retouch and highly retouched bases. Four of them are whole, with sizes varying between 2.5-3.6 cm in length and from 1.5-2.9 cm in width, with a thickness not greater than 1 cm. The other six are proximal fragments (Figure 11: 4, 6). The points made on Levallois flakes have scalar Quina retouch which is more or less steep and regular. These pieces are thick and small in size, never longer than 4 cm. The classic Mousterian points are retouched mainly on the distal end, and the retouch is scalar and often irregular. These points are all fractured, and their thickness varies between 1.3-2.2 cm.

The assemblage includes a large amount of point resharpening debris (19% of the objects), including seven pieces from thinning, all left lateral and corresponding to a detachment of the

proximal part of the points (Figure 11: 9). Their width varies between 2.6-3.4 cm and their thickness between 0.7-1.1 cm, corresponding to the dimensions of retouched whole points found on the site. Six other pieces indicate the lateral maintenance of the points. The detachment of thinning flakes on the lower face of the points is also a feature characteristic of this industry. Finally, three tools made on fragments of reused points shed light on the method of exploitation of lithic resources, as well as the procurement strategy of raw material used by the hunters who frequented the site of Angeghakot-1. These proximal fragments of "Yerevan points" were transformed into a microlithic "beak" at the flake butt. These pieces are no larger than 2.3 cm by 3.6 cm wide (Liagre *et al*. 2006). The typological characteristics of the tools (particularly the points) are similar to those of pieces found in the upper layers of the cave of Yerevan-1, which relates them to the Late Mousterian culture of Armenia, characterised mainly by the presence of "Yerevan points" with thinned bases. The discovery of a Mousterian site in the Vorotan Basin is the first evidence for the presence of Middle Paleolithic human groups in the southern highland region of Armenia in a key area between the plains of Ararat, the mountains and steppe of Karabagh and northwest Iran. Angeghakot-1 confirms the occupation of the high plateaus and provides a link between the geography and archaeology of the region. The site belongs to the group of "Yerevan-type point" sites identified in the Caucasian Mousterian by various authors. Finally, the particularities of this "microlithic" industry, present at Angeghakot-1 and at other Middle Paleolithic sites of the Lesser Caucasus, raise new questions about the economic strategies of these hunter-gatherers and the variability of the facies of lithic industries present in this region at the end of the Middle Paleolithic (Liagre *et al*. 2006).

6.4. Kalavan-2 open-air site

A recent archaeological survey conducted by an Armenian-French team in 2005 in northeastern Armenia in the forested northern slopes of the Areguni Mountains, which dominate the northern shore of Lake Sevan, brought to light the open-air site of Kalavan-2. Two seasons of test excavation (2006 and 2007) have revealed a sequence of deposits belonging to the final phase of the Middle Paleolithic. Kalavan-2 open-air site is located at 1630 m asl on the left bank of the Barepat River valley. At least five Pleistocene terraces can be distinguished in this area, providing evidence of Quaternary landscape changes caused by climatic and/or geodynamic factors in northeastern Armenia. Kalavan-2 is situated on the third alluvial terrace, corresponding to the Late Pleistocene level at the confluence of the Barepat River and a small tributary. Today this terrace is evolving into a perched hydrographic system 30 m above the main river (Ghukasyan *et al*. 2011).

The main excavation area (trench 2) was established on the longitudinal axis of the spur near its northern extremity where the rocky substratum shows through due to regressive erosion. This sector was occupied in the Late Bronze Age and in the Iron Age, as indicated by the presence of a cemetery, of which several tombs have been robbed by clandestine excavations. The area of trench 2 was enlarged to 7 m^2. The whole area was excavated to a depth of 99–115 cm (layer 11) and a deep trench was dug in square L22 to a depth of 380 cm (layer 20). At the same time, two other trenches were made on both sides of the edge of the slope: trench 1 in the east and trench 3 in the west. Kalavan-2 yielded 20 principal stratigraphic layers which represent particular sedimentary units with both paleoclimatic and geomorphological information. Eight layers have produced variable quantities of archaeological remains comprising about 3/4 lithics and 1/4 fauna. The archaeological material from the modern soil horizon (layer 1) contained colluvial elements from higher up the slope, as well as artifacts from nearby Iron Age tombs (Ghukasyan *et al*. 2011).

The diversity of the lithic raw materials found at Kalavan-2 provides evidence of the geological complexity of this region of the Lesser Caucasus at the juncture of two geological complexes, volcanic and sedimentary. In fact, three different groups of raw material are found at the site. The first two groups represent local raw materials: sedimentary rocks (34 % of the artifacts, silicified limestone, chert, flint or jasper) of various colors, which are present in the alluvium of the rivers bordering the site, and volcanic rocks (basalt) that are rare (2 %) coming from ancient eruptive formations of the mountain chain which separates Lake Sevan from the basin of the Getik River, into which the Barepat flows. The third and largest group (64 %) consists of obsidian, volcanic glass usually black in color, sometimes brown, red or transparent. These rocks are not found in the Barepat basin. The closest sources of obsidian are located to the west and south of Lake Sevan, about 80 to 90 km as the crow flies (Ghukasyan *et al.* 2011).

The rare lithic artifacts from the lower levels 9-11 suggest the presence of the Mousterian. Layer 7 is the richest layer in the Kalavan-2 sequence. It contains 214 artifacts including 130 specimens made of obsidian. It is interesting to note the high proportion of small pieces (61.7 % less than 20 mm in length) which are mainly obsidian, unlike the pieces made on mauve or green local flint which are mostly longer than 20 mm. The production of the largest elements was carried out using the Levallois method and is exclusively recurrent convergent unidirectional. The main products are laminar flakes; less numerous are Levallois points (Figure 11: 13, 16) and oval pieces which are clearly laminar elements or points aborted by a shift in the wave of percussion due to poor convexity on the flaking surface. The tendencies that emerge from the layer 7 sample show the exclusive use of the recurrent convergent unidirectional Levallois method in the production process.

Half of the tool kit is composed of side scrapers and retouched Levallois points. However, layer 7 at Kalavan-2 seems devoid of "Yerevan points".

The industry of layer 6 provides evidence for three methods of production. There is production of middle-sized flakes (30 to 50 mm), produced by the discoid method to obtain products having mainly convergent cutting edges; some of these products are typical pseudo-Levallois points. A very rare bladelet production is represented by a complete object and a fragment, while laminar flakes were obtained by a convergent unipolar method of Levallois type, very similar to those recorded in layer 7, but their badly preserved surfaces suggest secondary deposition. The tools are exclusively retouched and number only 12 pieces: four retouched points of obsidian of similar size (27 to 37 mm long, 17 to 23 mm wide, 6 to 9 mm thick), a flint point slightly larger than the latter (55 × 19 × 10 mm), two end scrapers and an atypical burin, a scraper with abrupt peripheral retouch, a *pièce esquillée*, and two miscellaneous retouched pieces. The predominance of the technology involving unidirectional preparation of the cores, laminar flaking, a high frequency of convergent pieces (retouched points, convergent side scrapers), and the presence of truncated-faceted pieces are characteristic of the Mousterian of the Zagros-Taurus (Figure 11: 10-12, 14-15, 17). This Mousterian assemblage group extends from western Iran (Kunji Cave, Warwasi) to Central Anatolia (Karain Complex I) where it is dated to OIS-3 (60,000 – 25,000 BP) (Ghukasyan *et al*. 2011).

From the entire excavated area of Kalavan-2, only 129 bones were found with a low rate of identification to species and/or skeletal element (14 %). Most of the elements belong to Mousterian layer 7. Some of the bones are poorly preserved, with a white porous or chalky appearance. The outer surface is usually missing, often rendering identification impossible and fragments of spongy bone are rare. All the faunal remains have suffered strong weathering, including the teeth, which are highly altered and split where the enamel has been unable to withstand various cycles of freezing and thawing. The identified faunal remains of Kalavan-2 include aurochs (*cf. Bos primigenius*), wild goat/ibex (*Capra* sp.), horse (*E. caballus*), and red deer (*C. elaphus*). The aurochs is an animal of open spaces. Wild goats live in rocky, open spaces and are resistant to cold climatic conditions. The wild horse is synonymous with open environments, and red deer inhabit open wooded zones and are resistant to cold conditions. Several types of modification have been identified on the surface of the bones which attests to the site's complex taphonomic history. It should be noted that most bones have traces of root etching on their external surfaces. These traces indicate that the bones remained in the active zone of vegetation for a long period before being buried. The anthropogenic origin of

the material is also indicated by the presence of a typical cutmark made by a stone tool on a small fragment of bone and by seven bones (e.g. the caudal diaphysis of the tibia of a large bovid) which show traces of burning. Finally, some fragments of large bovid bones have green breaks (Ghukasyan *et al*. 2011).

Four samples from trench 2 were radiocarbon dated. The sequence of dates obtained raises many questions. Sample UGAMS-2295 (layer 19) gives a date of 42,040 ± 400 BP (~43,500 ± 800 cal BC) which is at the limit of the method and thus should be taken as a minimum age. Sample Poz-22181 can be omitted due to its young age and layer 7 can be dated to 34,200 ± 360 BP (~37,700 ± 880 cal BC). The 14C dates for the horse tooth between layers 6 and 7 indicate the last glacial maximum between 20 and 16 ka (OIS-2), but this seems particularly late and raises issues concerning contamination as well as stratigraphy. Finally, these dates appear too young, given the techno-typological characteristics of the lithic artifacts (Cherkinsky and Chataigner 2010; Ghukasyan *et al*. 2011).

The issues explored above suggest the need for a new assessment of the Kalavan-2 deposits, making it a prospective site for understanding the early population history of Armenia and the Lesser Caucasus. Layer 7 represents the classic Mousterian of Armenia, with a reduction aimed at the production of Levallois laminar flakes and points. This industry is associated with fauna composed of aurochs, wild goat and red deer, with 14C dates falling in OIS-3 (34,200 ± 360 BP). The presence of some artifacts of Mousterian fabrication in the lower layers (9 and 11) seems promising. In addition, its proximity to a probable seasonal migration route for ungulates, moving upslope towards summer pastures in spring, and downslope in autumn for mating and feeding supports the same reasoning. Indeed, on the opposite bank of the Barepat River, the site of Kalavan-1 is located approximately several hundred meters from Kalavan-2 and dates to the end of the Upper Paleolithic. It is probable that the Kalavan territory occupied a strategic location from which Mousterian and Upper Paleolithic hunters could plan and launch hunting forays.

6.5. Barozh-12 open-air site

The newly discovered (2009) site of Barozh-12 promises to yield significant data on late Middle Paleolithic technology, land use, and lithic economy in a region that has heretofore been little explored. The lithic assemblage appears similar to those from other later Middle Paleolithic sites in the region, as described earlier. Based on the results of survey, test excavation and preliminary analysis of sample artifact assemblages, the locality presents exceptional opportunities for collecting data on long-term patterns of land use and technology. The results of future chronometric and

geological sampling will yield important data that can serve as a basis for evaluating hypotheses and theories on regional Middle Paleolithic hominin behavior.

To collect data on Paleolithic occupation in western Armenia on the plateaus at the northern edge of the Ararat Depression, surface walkover survey, test excavation, and analysis of surface and excavated lithic assemblages were conducted, including obsidian sourcing with portable X-ray fluorescence (pXRF).

Barozh-12 is a large (ca. 100 × 200 m surface area), high density Middle Paleolithic site at 1,360 m asl. Artifacts are made predominantly on obsidian (Figure 12), but faunal material has not been recovered. A large sample of artifacts was randomly collected from the surface at the Barozh-12 locality. Due to the sheer amount of artifacts and time constraints, a small test trench was excavated. The trench measured 50 cm × 50 cm × 95 cm in depth, and was excavated down to the tuff bedrock. Profiles were cleaned and drawn, and their lithology was described. All artifacts were collected in roughly 10 cm levels. Samples of 102 artifacts from the surface and 340 from stratified sediments were analyzed according to ca. 30 metric and qualitative attributes. A total sample of 1,174 artifacts from both the surface and test trench were counted and categorized to class (cores, flakes, tools, bifaces).

The elemental composition of a sample of artifacts from the surface and individual excavation levels (n = 52) was analyzed using pXRF to characterize raw materials and determine source areas. Artifact geochemical signatures were statistically compared to those from reference collections from obsidian sources throughout Armenia.

Preliminary analysis of stratified deposits exposed in the test trench suggests that the artifacts were deposited on intermittently stable surfaces amid fluvial, followed by aeolian depositional processes. Based on preliminary analysis of artifacts from the surface and excavated contexts, both samples display techno-typological characteristics of the Middle Paleolithic in the region. Flake scar patterns on cores and flakes indicate triangular Levallois and discoidal core reduction. Numerous retouched pieces, mainly classified as elongated, Levallois and retouched Levallois points, blades and a variety of unifacial scrapers are observed in the tool assemblage. Surface and excavated artifacts are of all size classes and technological categories, including tool resharpening flakes and core trimming elements. Artifact class frequencies and cortex analysis also suggest that all stages of core reduction and tool use, maintenance and discard occurred on site. Preliminary results of pXRF on a sample of obsidian artifacts (mainly retouched pieces) indicate that most were manufactured from local (1-2 km) Mount Arteni material, while a smaller number of artifacts were manufactured on material originating from 80 km to more than 100 km away. Varying

frequencies of local and "imported" raw materials observed in small samples from stratified archaeological levels suggests dynamic raw material transport patterns over time. The extent of a "raw material exploitation territory" is suggested by obsidian sourcing, though only to the east of the site. Further pXRF study of obsidian raw materials (following Frahm *et al*. 2014) in conjunction with further analysis of artifact manufacture and discard patterns will elucidate regional-scale technological organization and land use behavior. These first results of survey, lithic assemblage analysis, and test excavation indicate that Barozh-12 was frequently re-occupied over time for a variety of purposes, and is tentatively considered a "persistent place" (cf. Schlanger 1992) in the diachronic regional settlement and mobility system. Its geomorphic position on a plateau bounded by two stream valleys overlooking the Ararat Depression probably represents an optimal location for repeated occupation, at the boundary of upland and lowland biotopes, near abundant lithic raw material sources.

Ongoing research includes excavation with chronometric, geological and palaeoenvironmental sampling, and techno-typological and geochemical analysis of a large sample of surface and excavated artifacts. These efforts also include further survey in the area of Barozh-12, and in northeastern Turkey to document Paleolithic sites and assemblages and expand the view of raw material transport patterns to the west.

7. Concluding remarks

During the last century, in addition to the Yerevan and Lusakert caves, several well stratified Middle Paleolithic sites have been recorded allowing us to divide the Armenian Middle Paleolithic into three chronological sub-periods – early, middle, and late. Among the early Middle Paleolithic sites are Bagratashen-1 in the Debed River valley and Aghavnatun-1 in the Ararat Depression. Both sites are open-air and preliminary analyses suggest that they may represent multi-purpose camps with lithic industries based mainly on dacite raw materials. Such sites are very rare in the southern Caucasus and one can discern parallels with the elongated points of the "Djruchula-Kudaro" tradition of the Caucasian Middle Paleolithic sites. If typological similarities are any indication, the Bagratashen-1 occupation may fall within the penultimate glacial cycle (MIS 7-6). This assessment, however, must be tested further with chronometric age determinations. Traces of slightly later Middle Paleolithic settlement has been recorded at the high altitude cave site of Hovk-1, where a sparse lithic assemblage indicates a short-term human visit during the early glacial period (MIS 5). Hovk-1 cave is the only middle Middle Paleolithic site currently known in Armenia, and it is likely that humans exploited such high altitude ecological niches for seasonal hunting. The late Middle

Paleolithic sites discovered or re-excavated during the last decade, Lusakert-1 cave, Angeghakot-1 cave, Kalavan-2 and Barozh-12 open-air sites have a wider geographic and functional distribution. Coinciding with the beginning of MIS 4 and the early part of MIS 3, they vary by means of environmental diversity, raw material source exploitation strategies and socio-economic behaviors and permit us to reconstruct the lifeways of late Middle Paleolithic hominins within the territory of Armenia.

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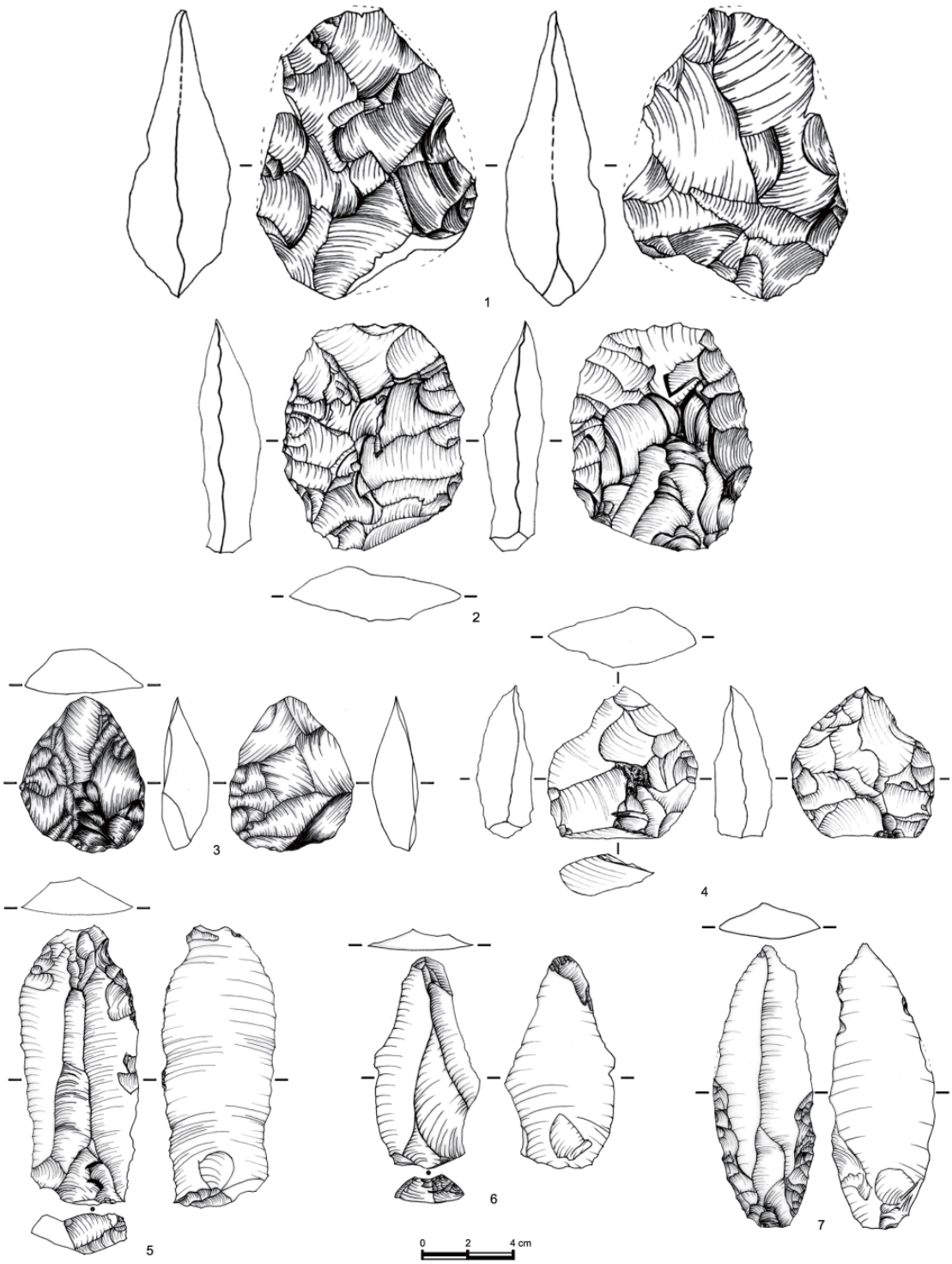

Figure 1
Nor Geghi-1 open-air site. 1-4. Bifaces (obsidian); 5. Blade with retouch (obsidian); 6. Blade (obsidian); 7. Point with retouched base (obsidian).

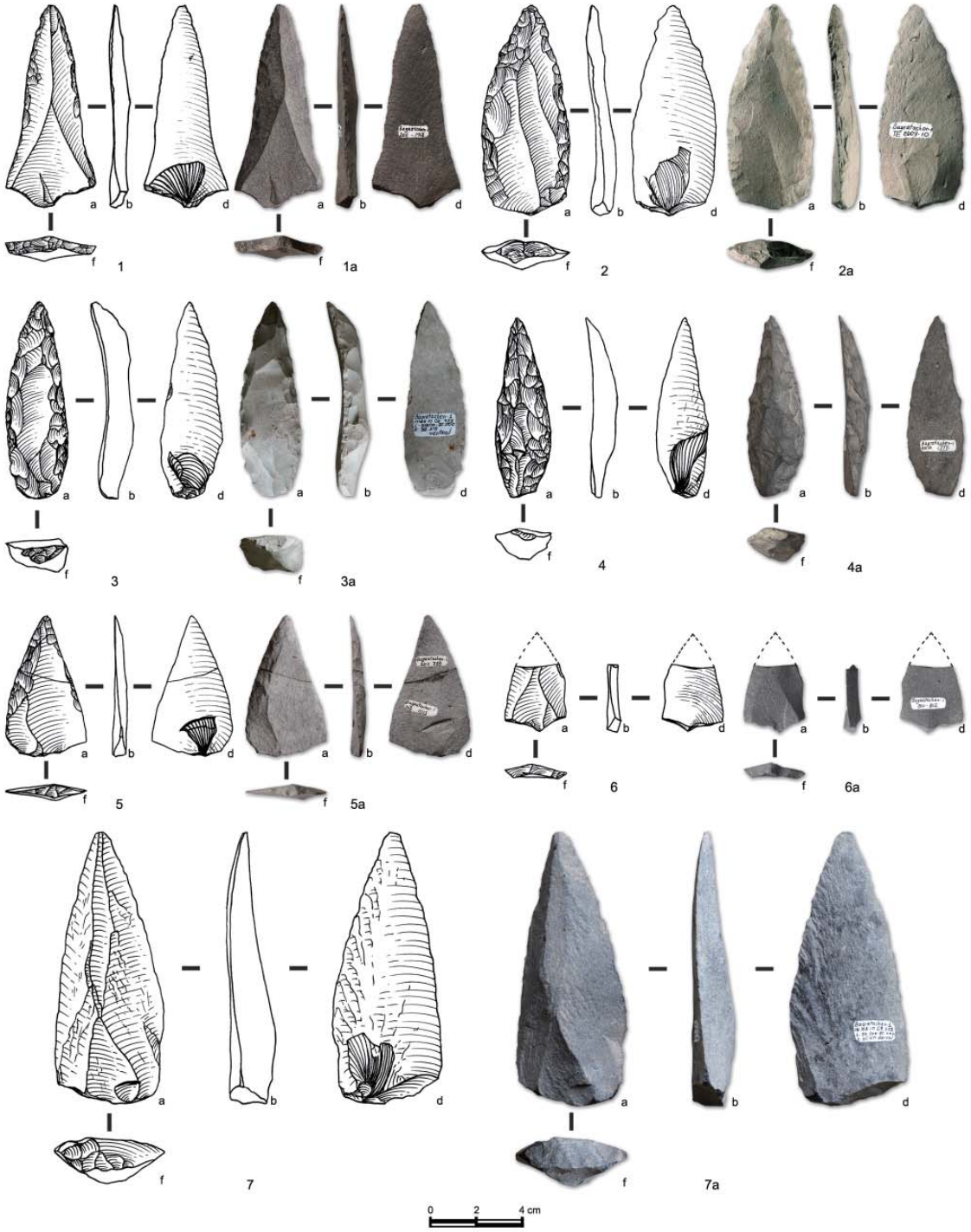

Figure 2

Bagratashen-1 open-air site. 1-1a, 6-6a. Levallois points with faceted bases (dacite); 2-2a, 5-5a. Levallois points (limestone, dacite); 3-3a – 4-4a. Mousterian points (flint, dacite); 7-7a. Levallois point with truncated and faceted base (dacite).

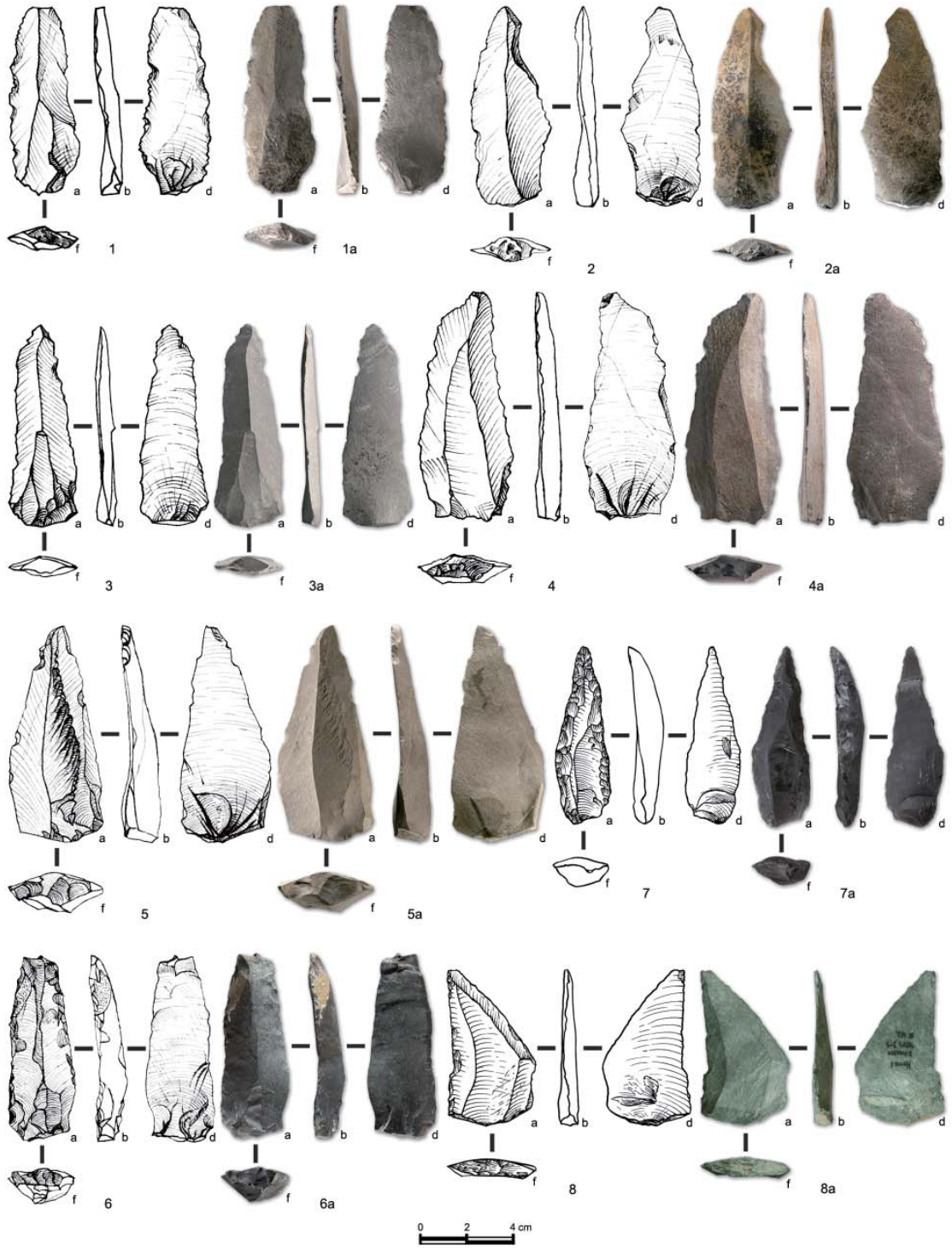

Figure 3

Hovk-1 cave. Levallois and Mousterian points from Unit 8 and "karren". 1-1a – 5-5a. Levallois points (limestone), 7-7a. Mousterian point (obsidian); 6-6a – 8-8a. Levallois points (flint).

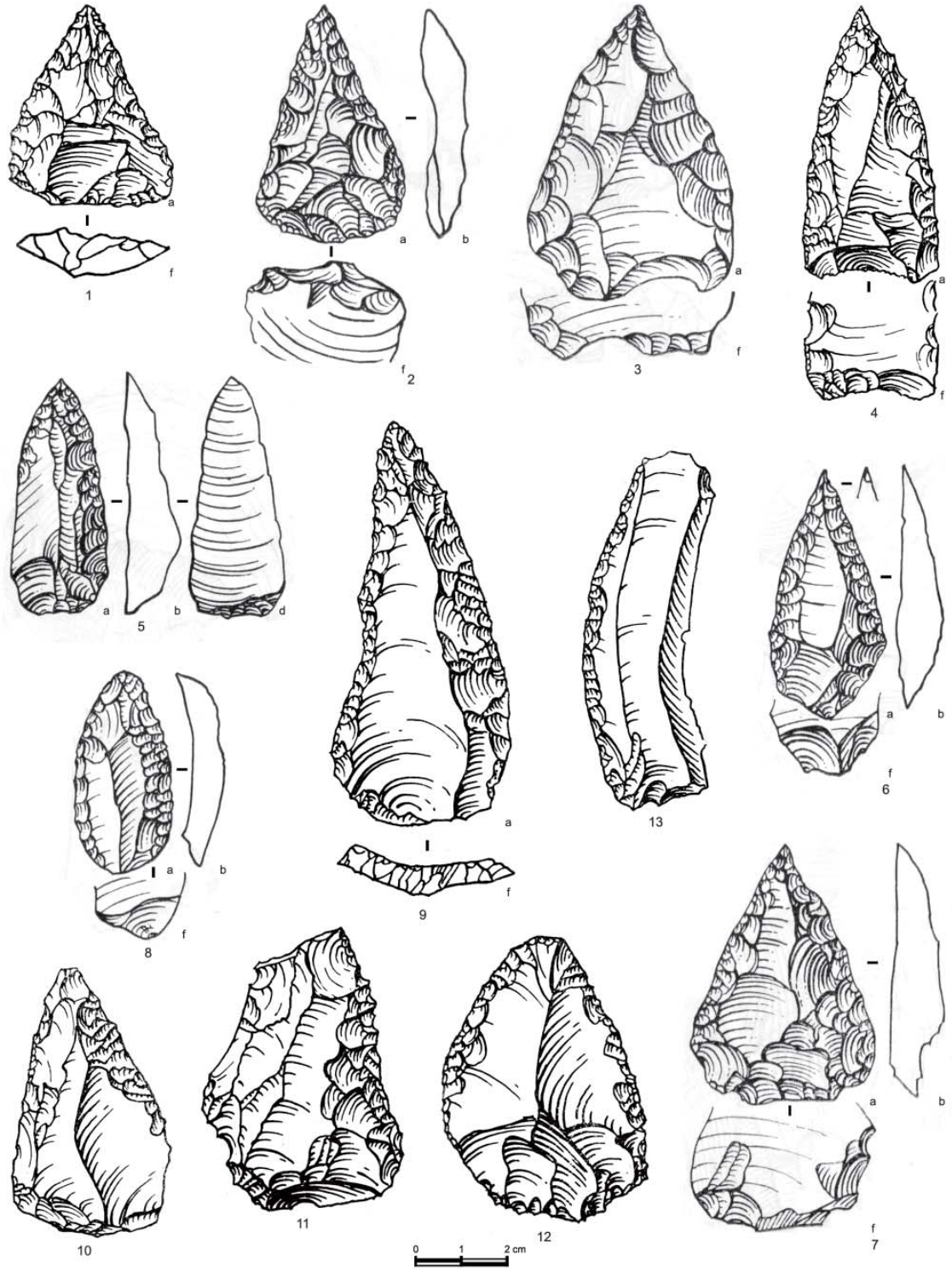

Figure 4

Yerevan-1 cave. Drawings of obsidian lithic artifacts from B.G. Yeritsyan's excavtions (after Yeritsyan, in: Lyubin 1984; 1989). 1-8. "Yerevan points"; 9. Levallois point; 10-13. Side scrapers.

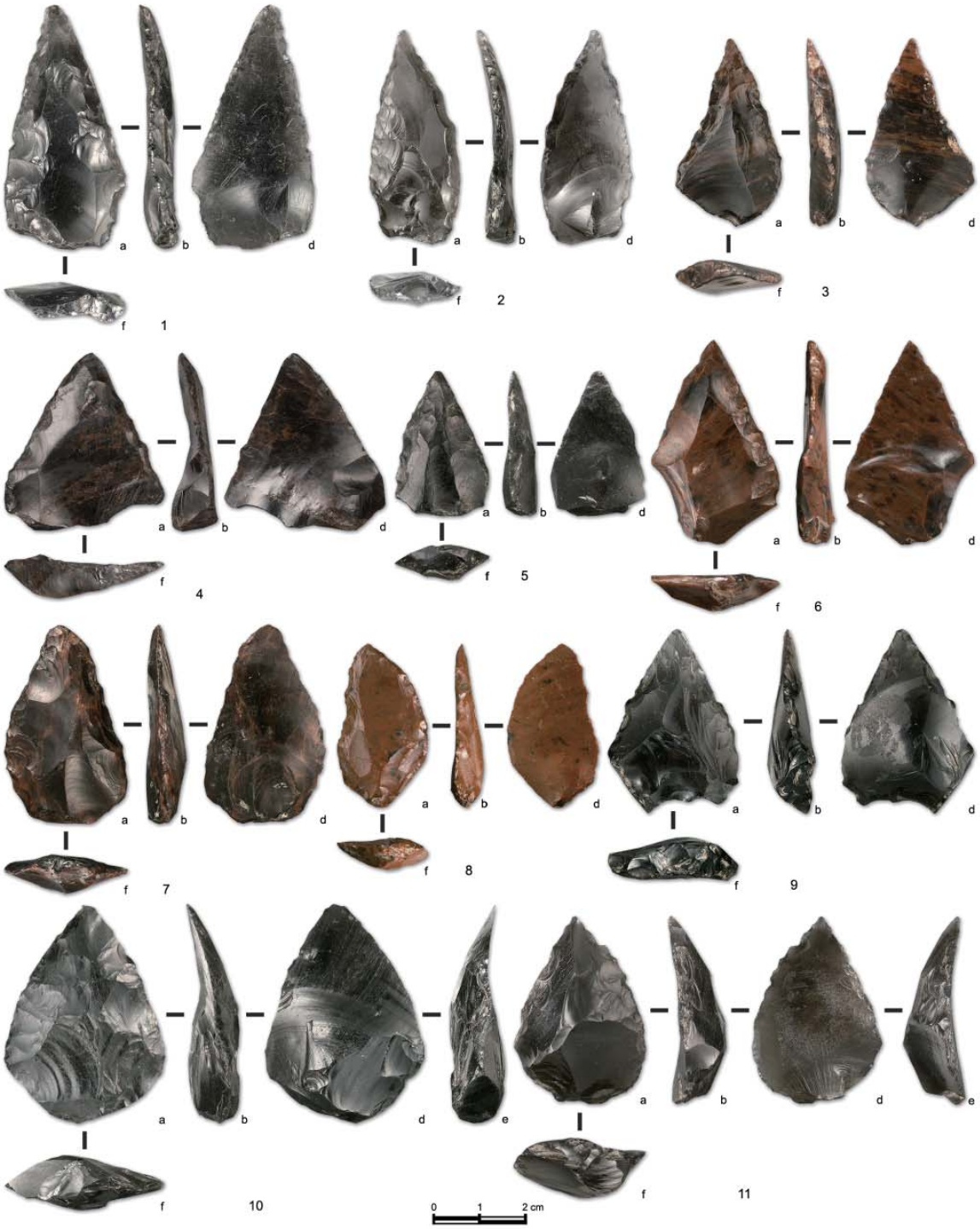

Figure 5

Yerevan-1 cave. 1-11. Small Levallois and Mousterian points (obsidian). B.G. Yeritsyan's excavtions (Units 3-1).

Figure 6

Yerevan-1 cave. 1-3. Proximal fragments of truncated Mousterian points (obsidian); 4-9. “Yerevan points” (obsidian); 10, 12-13. Truncated and recycled “Yerevan Points” (obsidian); 11, 14. “Yerevan points” with truncation and resharpening removals (obsidian). B.G. Yeritsyan’s excavations (Units 3-1).

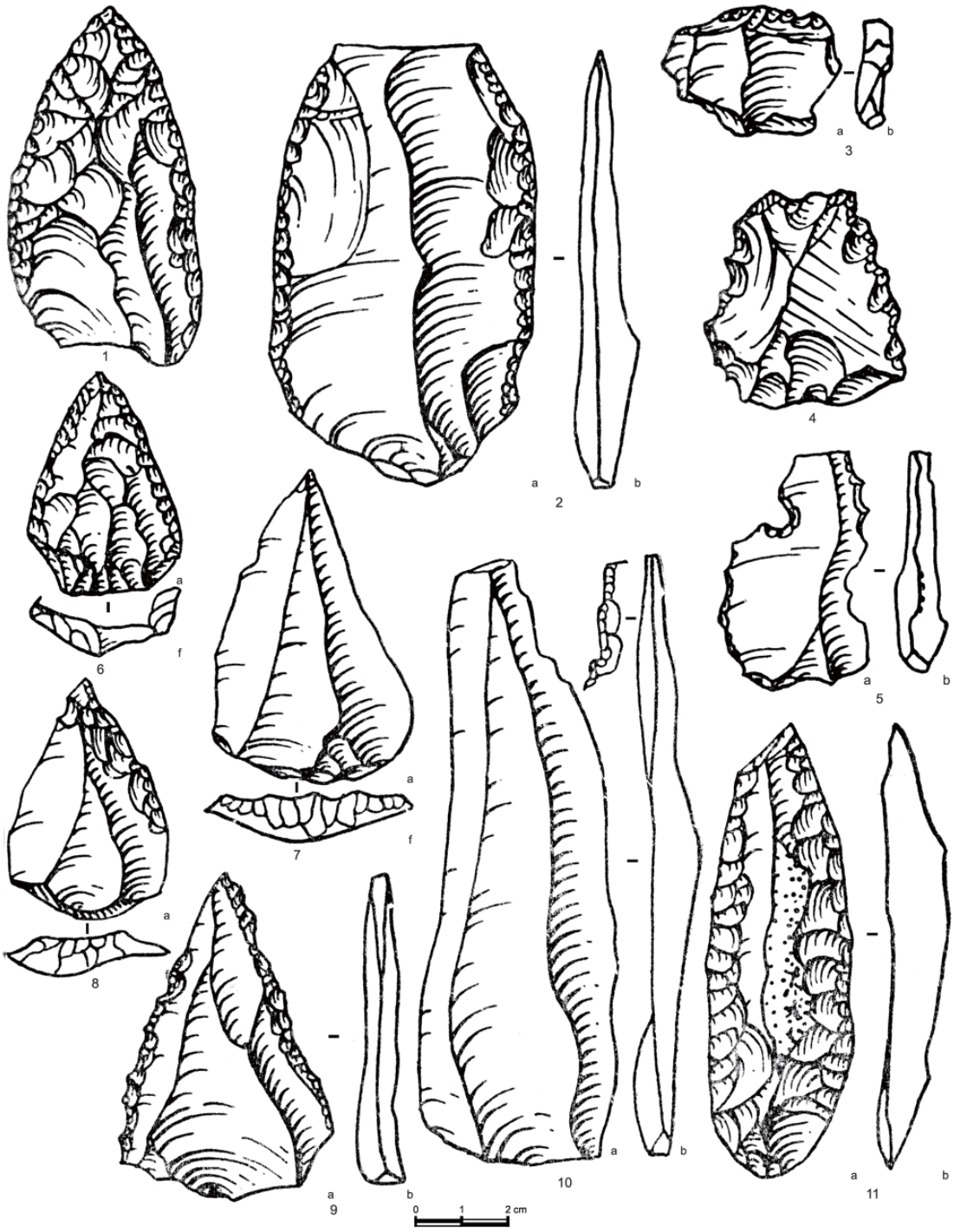

Figure 7

Lusakert-1 cave. Drawings of obsidian lithic artifacts from B.G. Yeritsyan's excavtions (Yeritsyan 1975).

1. Mousterian point; 2, 11. Side scrapers; 3-4. Denticulated tools; 5. Notched tool; 6. "Yerevan point"; 7-10. Levallois points (1-5: Unit B; 6-11: Unit CI).

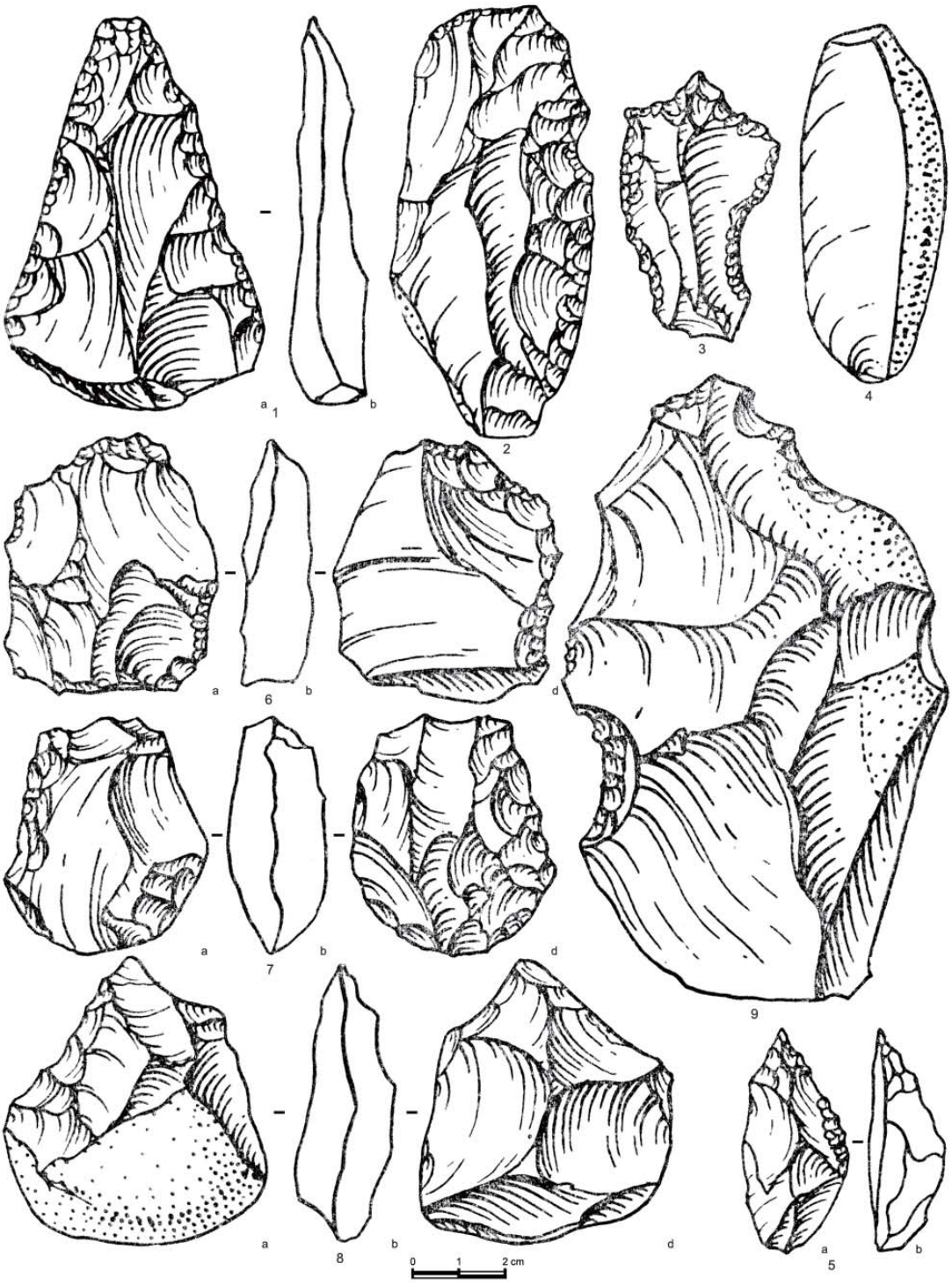

Figure 8

Lusakert-1 cave. Drawings of obsidian lithic artifacts from B.G. Yeritsyan's excavtions (Yeritsyan 1975).

1-2. Side scrapers; 3. Point; 4. Backed knife; 5. Limas; 6-8. Bifacial tools; 9. Notched tool prepared on massive flake (1-5: Unit CII; 6-9: Unit D).

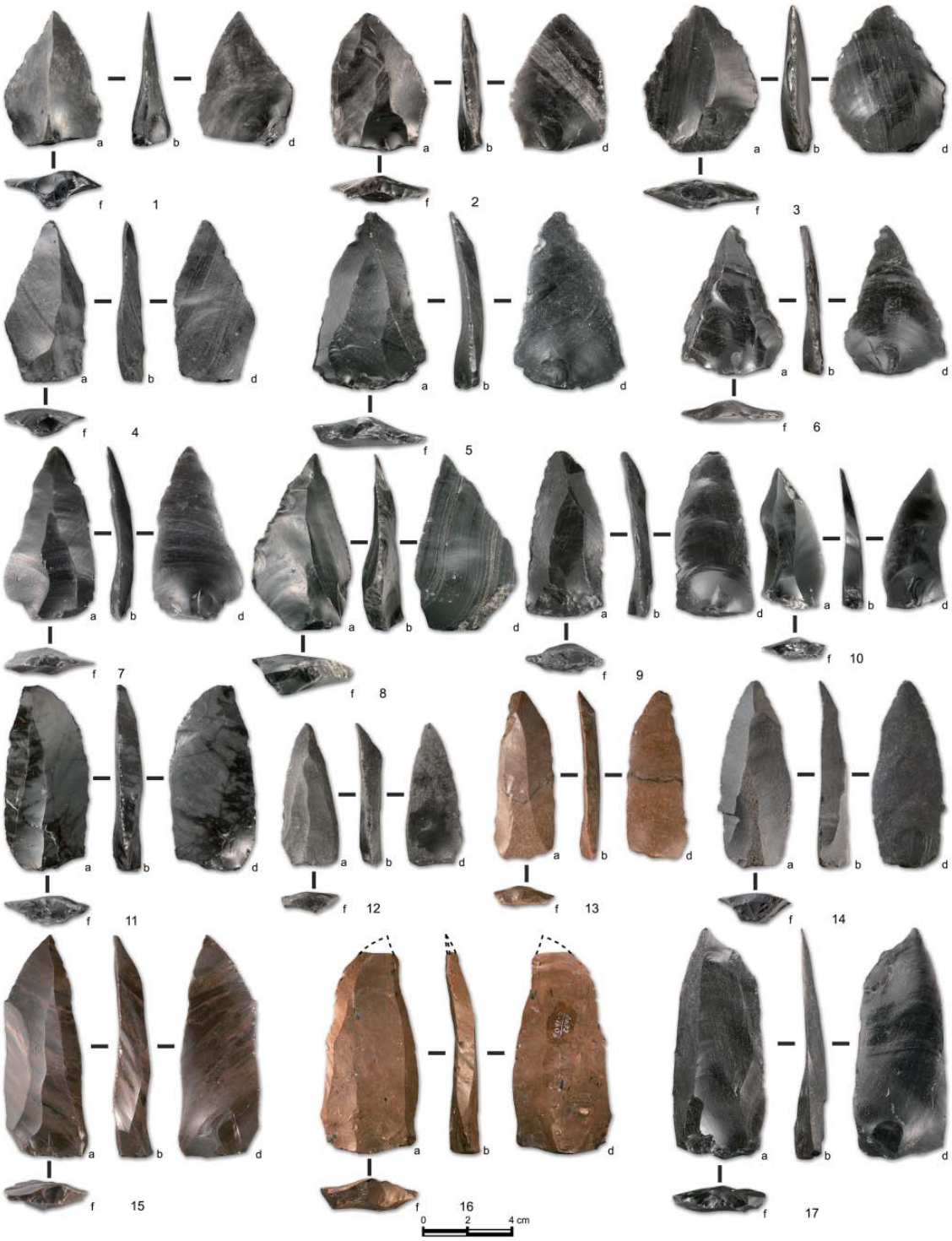

Figure 9

Lusakert-1 cave. 1-17. Levallois points and blanks (obsidian). B.G. Yeritsyan's excavtions (Units B and CI).

Figure 10

Lusakert-1 cave. 1. Massive Levallois flake with thinned base (obsidian); 2-4. Elongated Levallois points (dacite and obsidian); 5-6, 8. Levallois blades (obsidian); 7-9. Side scrapers (obsidian). B.G. Yeritsyan's excavtions (Units B and CI).

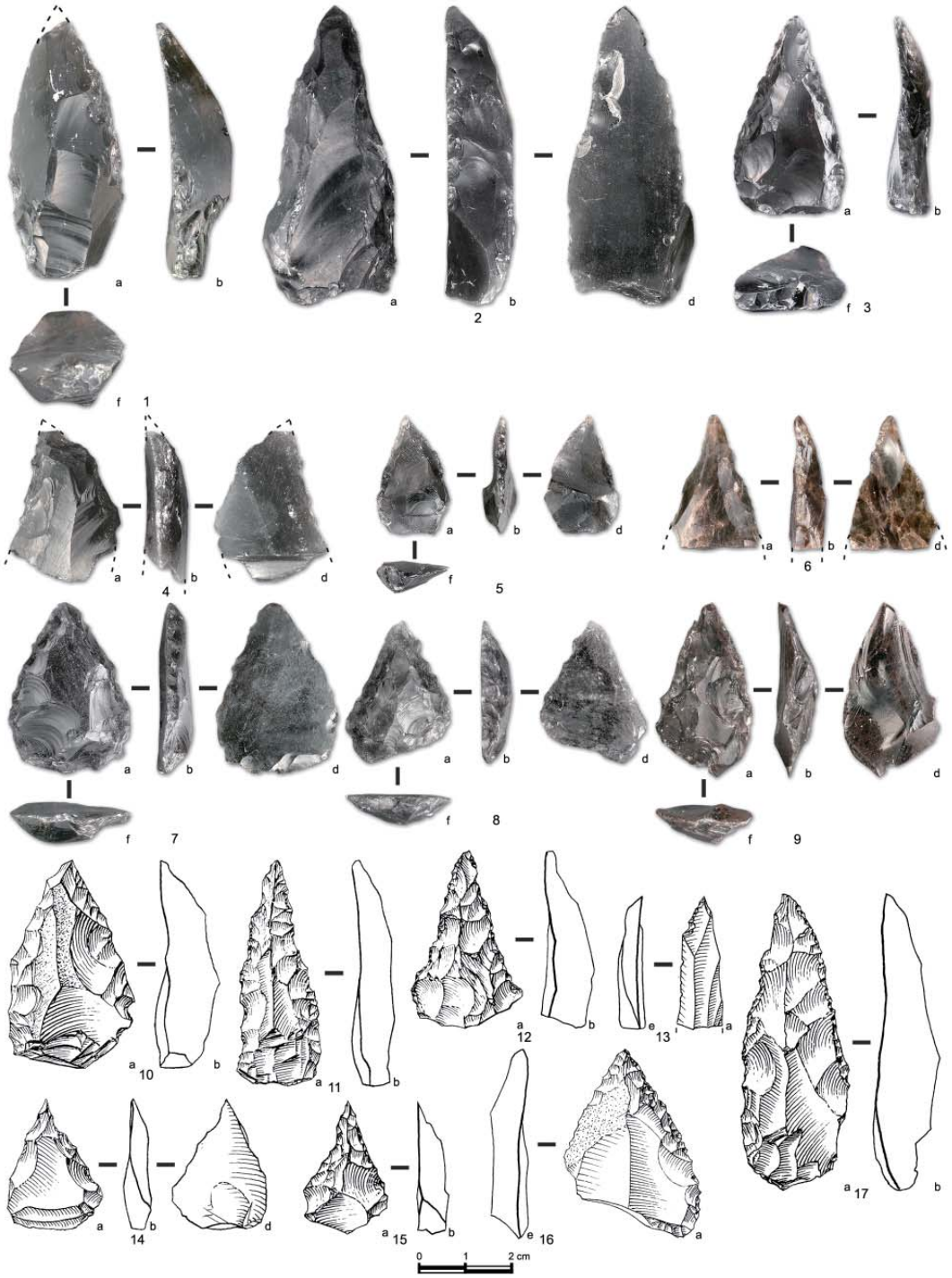

Figure 11

Angeghakot-1 cave. 1-3. Mousterian points (obsidian); 4, 6. Proximal fragments of truncated Mousterian points (obsidian); 5, 7-8. "Yerevan points" (obsidian); 9. Refreshing or resharpening flake (obsidian).

Kalavan-2 open-air site. 10-12, 14-15, 17. Small Mousterian points from layer 6 (obsidian and silicified limestone); 13, 16. Levallois points from layer 7 (silicified limestone).

Figure 12

Barozh-12 open-air site. 1. Side scraper (obsidian); 2. Levallois point (obsidian); 3. Mousterian point (obsidian); 4-7. Levallois and Mousterian points with truncated and faceted bases (obsidian); 8-9. Points with notches at the bases (obsidian).

List of Authors

Alphabetical order

Adler, Daniel S. (Mr.)
Department of Anthropology, University of Connecticut, 354 Mansfield Road, Unit 1176, Storrs, CT 06269, United States of America.
e-mail: daniel.adler@uconn.edu

Aghikyan, Levon (Mr.)
Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.
e-mail: aghikyan@mail.ru

Areshian, Gregory E. (Mr.)
Cotsen Institute of Archaeology, University of California, Los Angeles, Box 951510, Los Angeles CA 90095-1510, United States of America.
e-mail: gareshia@ucla.edu

Arimura, Makoto (Mr.)
Center for Cultural Resource Studies, Kanazawa University, Kakuma-machi, Kanazawa-shi, Ishikawa, 920-1192, Japan.
e-mail: arimura.mako@gmail.com

Avetisyan, Pavel (Mr.)
Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.
e-mail: pavetisyan@sci.am

Azatyan, Karen (Mr.)
Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.
e-mail: karenvayk@gmail.com

Badalyan, Ruben (Mr.)
Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.
e-mail: r.badalyan@yahoo.com

Bagoyan, Tamara (Ms.)
Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.
e-mail: tbagoyan@yahoo.com

Bobokhyan, Arsen (Mr.)
Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.
e-mail: arsenbobokhyan@yahoo.com

Chataigner, Christine (Ms.)
Archéorient, UMR 5133, CNRS/Université Lyon 2, 7 rue Raulin, 69007 Lyon, France.
e-mail: christine.chataigner@mom.fr

Egeland, Charles P. (Mr.)
Department of Anthropology, University of North Carolina at Greensboro, 426 Graham Building, Greensboro, North Carolina, 27402, United States of America.
e-mail: cpegelan@uncg.edu

Fujii, Sumio (Mr.)
Center for Cultural Resource Studies, Kanazawa University, Kakuma-machi, Kanazawa-shi, Ishikawa, 920-1192, Japan.
e-mail: fujiikun@staff.kanazawa-u.ac.jp

Gabrielyan, Ivan (Mr.)
Institute of Botany, National Academy of Sciences of the Republic of Armenia, 1 Acharyan Street, 0063 Yerevan, Republic of Armenia.
e-mail: ivangabrielyan@yahoo.com

Gasparyan, Boris (Mr.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: borisg@virtualarmenia.am

Glauberman, Phil (Mr.)

Settlement Archaeology Program, Middle East Technical University, Üniversiteler Mah. Dumlupınar Blv. No.1, Mimarlık Fakültesi, Yeni Bina, No.410, 06800, Çankaya, Ankara, Turkey.

e-mail: phil.glauberman@gmail.com

Harutyunyan, Armine (Ms.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: arm.harutyunyan@yahoo.com

Haydosyan, Hayk (Mr.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: haykhay@rambler.ru

Hayrapetyan, Armine (Ms.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: hnaget@mail.ru

Kandel, Andrew W. (Mr.)

The Role of Culture in Early Expansions of Humans (ROCEEH), Heidelberg Academy of Sciences and Humanities at the University of Tübingen, Rümelinstr. 23, 72070 Tübingen, Germany.

e-mail: a.kandel@uni-tuebingen.de

Khechoyan, Anna (Ms.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: annakhechoyan@yahoo.com

Margaryan, Lusine (Ms.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: margaryanlusine1989@yahoo.com

Martirosyan-Olshansky, Kristine (Ms.)

Cotsen Institute of Archaeology, University of California, Los Angeles, Box 951510, Los Angeles CA 90095-1510, United States of America.

e-mail: kristineolsh@ucla.edu

Meliksetian, Khachatur (Mr.)

Institute of Geological Sciences, Armenian National Academy of Sciences, 24a Marshal Baghramian Ave.0019, Yerevan, Republic of Armenia.

e-mail: km@geology.am

Montoya, Cyril (Mr.)

Aix Marseille Université, CNRS, Ministère de la Culture et de la Communication, LAMPEA UMR 7269, 13094 Aix-en-Provence, France and DRAC Picardie, 5 rue H. Daussy, 80 000 Amiens, France.

e-mail: cyril.montoya@culture.gouv.fr

Muradyan, Firdus (Mr.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

Nahapetyan, Samvel (Mr.)

Department of Cartography and Geomorphology, Yerevan State University, Alek Manukyan 1, 0025 Yerevan, Republic of Armenia.

e-mail: nahapetyan@ysu.am

Pernicka, Ernst (Mr.)

Curt-Engelhorn-Zentrum ArchäometriegGmbHan der Universität Heidelberg D5, Museum Weltkulturen, 68159 Mannheim, Germany.

e-mail: ernst.pernicka@cez-archaeometrie.de

Pinhasi, Ron (Mr.)

School of Archaeology, University College Dublin, Newman Building, Belfield, Dublin 4, Ireland.

e-mail: ron.pinhasi@ucd.ie

Petrosyan, Arthur (Mr.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: artur.petrosian@yahoo.com

Smith, Alexia (Ms.)

Department of Anthropology, University of Connecticut, 354 Mansfield Road Unit-1176, Storrs, Connecticut 06269-1176, United States of America.

e-mail: alexia.smith@uconn.edu

Stapleton, Lyssa C. (Ms.)

Cotsen Institute of Archaeology, University of California, Los Angeles, Box 951510, Los Angeles CA 90095-1510, United States of America

e-mail: lstapleton@ucla.edu

Zardaryan, Diana (Ms.)

Institute of Archaeology and Ethnography, National Academy of Sciences of the Republic of Armenia, 15 Charents Street, 0025 Yerevan, Republic of Armenia.

e-mail: dzardaryan@ymail.com