Living on the Edge: The Earliest Modern Human Settlement of the Armenian Highlands in Aghitu-3 Cave

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Abstract

Aghitu-3 Cave is the first stratified Upper Paleolithic (UP) cave site discovered in Armenia. The site is situated at an elevation of 1601 m in the southern Armenian Highlands and has yielded three intact archaeological horizons. The site has an excellent preservation of paleoecological archives, which allow for a comprehensive interpretation of the climate and environment at the time when the first modern humans populated the region.

Twelve geological horizons were identified, and correlate with seven archaeological layers (AH); three of these, AH III, VI and VII, yielded substantial UP assemblages. Dates of these layers range from 39 to 24,000 cal BP, so that Aghitu-3 offers a glimpse into the settlement patterns of modern humans during the early and middle UP of Armenia.

The lithic technology is based mainly on the unidirectional production of laminar blanks, with bladelets always predominating. Moreover, bladelets make up about 90% of all tool blanks. The most common lithic tool type is a bladelet with fine retouch along one lateral edge. Burins, scrapers and perforators are rare, as are cores. However, the overall tool count is high. These results suggest that the cave was used for making tools during short term stays, rather than as a basecamp. Rounding out the toolkit, bone tools from AH III include one eyed needle and two awls. These finds suggest that people fabricated clothing, nets or bags onsite, which is especially interesting when considering the high altitude of the site. The lithic raw material exploitation patterns show a clear shift from the earliest UP to later phases: whereas in AHs VII and VI local materials predominate, the spectrum broadens in AH III, showing obsidian from sources up to 200 km away.

In terms of comparison, the data from similar aged Georgian and Iranian UP sites will help in reconstructing the nature of the first modern human settlement in the southern Caucasus and Zagros. In Armenia, Aghitu-3 Cave can serve as a benchmark for understanding the early and middle UP. Full analyses of the site will make a crucial contribution to developing a frame of reference for the so-called Caucasian Upper Paleolithic.

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Early Upper Paleolithic • Armenian highlands • Southern Caucasus • Lithic technology • Bladelet industry • Dispersal of modern humans

9.1 Introduction and Background

Aghitu-3 Cave is situated at an elevation of 1601 m a.s.l. in the Vorotan River valley of the Syunik region of southern Armenia. The Vorotan River cut down through the Pleistocene basalt flows of the volcanic Armenian Highlands, forming a valley that constitutes a corridor of movement for people as well as game (Kandel et al. 2014). The basalt flow that forms the cave erupted from nearby Mount Bugdatapa between 126,000 and 111,000 years ago (Ollivier et al. 2010).

Archaeological excavations at Aghitu-3 started in 2009 and continued through 2013. During five campaigns, the Paleolithic excavations covered a total surface area of 40 m^2. The stratigraphy includes three intact Upper Paleolithic (UP) horizons, each of which yielded archaeological materials such as lithic artifacts, faunal remains and combustion features. This article focuses on the lithic artifacts and their significance to the understanding of UP behavior. Aghitu-3 is of particular interest for studying the Paleolithic archaeology of Armenia, as it is one of only two stratified UP sites in the country (Gasparyan et al.2014). The other one is Kalavan-1, a late UP open-air site in northeastern Armenia (Montoya et al. 2013). Aghitu-3 is the only site in Armenia spanning the early and middle UP, a fact which emphasizes the importance of this site to archaeological research in the southern Caucasus (Kandel et al. 2014). Besides these two stratified UP sites, Armenia offers a rich heritage dating to the Lower Paleolithic and the Middle Paleolithic (MP) (Fig. 9.1; see Gasparyan and Arimura 2014).

Apart from Aghitu-3 and Kalavan-1, UP occupations in Armenia were hitherto known only as remains from unstrati-

Fig. 9.1 Aghitu-3 Cave. Middle (red) and Upper (dark blue) Paleolithic sites in Armenia and adjacent areas

fied open air sites and surface collections; many of these purported sites were later interpreted as workshops located near raw material sources of Neolithic or Chalcolithic age (Gasparyan et al. 2014). The mechanisms behind the process and progress of the peopling of the Armenian Highlands and the southern Caucasus are as yet unclear. Thus the finds from Aghitu-3 Cave will help shed light on these questions. Outside of Armenia, a handful of stratified and well-dated UP sites exist. In Georgia, sites in the Imereti region such as Dzudzuana Cave and Ortvale Klde provide a good picture of occupation to the north (Adler et al. 2006a, 2008; Bar-Yosef et al. 2006, 2011). In Iran, sites such as Yafteh Cave, Ghar-e Boof and Garm Roud 2 offer a complementary view from the south (Chevrier et al. 2006; Otte et al. 2011, 2012; Tsanova 2013; Ghasidian 2014). Therefore, Aghitu-3 puts Armenia on the map in the quest to reconstruct the routes traveled by the first UP people. Furthermore, the UP layers of Aghitu-3 span 15,000 years and yield valuable information about diachronic developments in human behavior as well as the environment.

Important questions guiding our analyses include:

- *Where did the first Upper Paleolithic settlers in the southern Caucasus region come from, and what route did they take?*
- *What are the connections of Aghitu-3 with regard to landscape use and its Pleistocene inhabitants?*
- *Did the first modern humans in the region meet Neanderthals, and if so, how did they interact?*
- *What advantages did the first modern human settlers have over their predecessors?*
- *Can we see a diachronic pattern of adaptational development in the Upper Paleolithic settlement?*

Ultimately, the goal of our research is not only to determine the character of the Aghitu-3 UP occupations, but also to envision the pattern, direction, timing and dimension of the early UP colonization of Armenia and the southern Caucasus region as a whole.

9.2 Stratigraphy and Dating

The cave stratigraphy was divided into twelve geological horizons (GH) and seven archaeological horizons (AH). For this paper, three layers are of interest, namely AH III, VI and VII, as these contain the majority of Upper Paleolithic finds (Fig. 9.2). AH III is further divided into four more or less continuous sublayers, each documenting intense occupation of the site with combustion features and hearths (Gasparyan et al. 2014). We consider units AH IV and V to be sterile because they yielded so few artifacts. Radiocarbon dating samples taken from the layers indicate an occupational timespan of 15,000 years, from about 39,000 to 24,000 cal BP (Fig. 9.3). The lower layers AH VI and VII date from 39,000 to 33,000 cal BP, while the occupation horizons of AH III date between 29,000 and 24,000 cal BP (Fig. 9.3).

In accordance with the global climatic trend for the time span in question, paleoclimatic data from Aghitu-3 show a corresponding warming trend during the deposition of AH VII and especially VI and V, followed by a cooling trend observed after the deposition of AH IV and III. These results were mainly determined from analyses of micromammals (L. Weissbrod) and pollen (A. Bruch). This means that modern humans who first entered the region around 39,000 cal BP experienced a warm and humid climate up to about 31,000 cal BP, followed by increasingly cooler and drier climatic conditions.

9.3 Archaeology

9.3.1 Lithics and Technology

The distribution of lithic artifacts in the strata is shown in Table 9.1. It is clear that AH III is by far the richest layer in terms of the number of finds. We consider AH IV and V to be archaeologically sterile, with a total of 15 lithic artifacts.

One feature that unifies all of the UP layers is the technology of lithic blank production. The lithic technology aims at the production of laminar blanks,[1] with most of these blanks being bladelets. The vast majority of blanks were produced following a unidirectional mode of detachment; just a few artifacts from AH VII show evidence of bidirectional removals on their dorsal surfaces. This may relate to the fact that we observe a higher percentage of blades in AH VII, almost twice as high as in AH III or VI; this contrasts with the predominance of bladelets in AH III and VI. It is as yet unclear if this early trend is evidence of a real cultural signal; however, it should be kept in mind that the number of artifacts in AH VII is low. Thus, the explanatory power of quantitative findings from AH VII should be regarded with caution when compared to those from AH III and VI.

Bladelets were clearly the desired blanks in the lithic production sequence of all UP layers. This is evident not only because bladelets are the most common blanks in all assemblages, but also because they are by far the dominant blank form among modified (retouched) pieces. In all of the UP horizons, about 90% of the tools are manufactured on bladelets. These tools are in turn surprisingly uniform throughout

[1] A blade is defined as a laminar blank with parallel sides whose length is at least twice the dimension of its width. A bladelet meets these criteria and is smaller than 10 mm in width (Floss 2012).

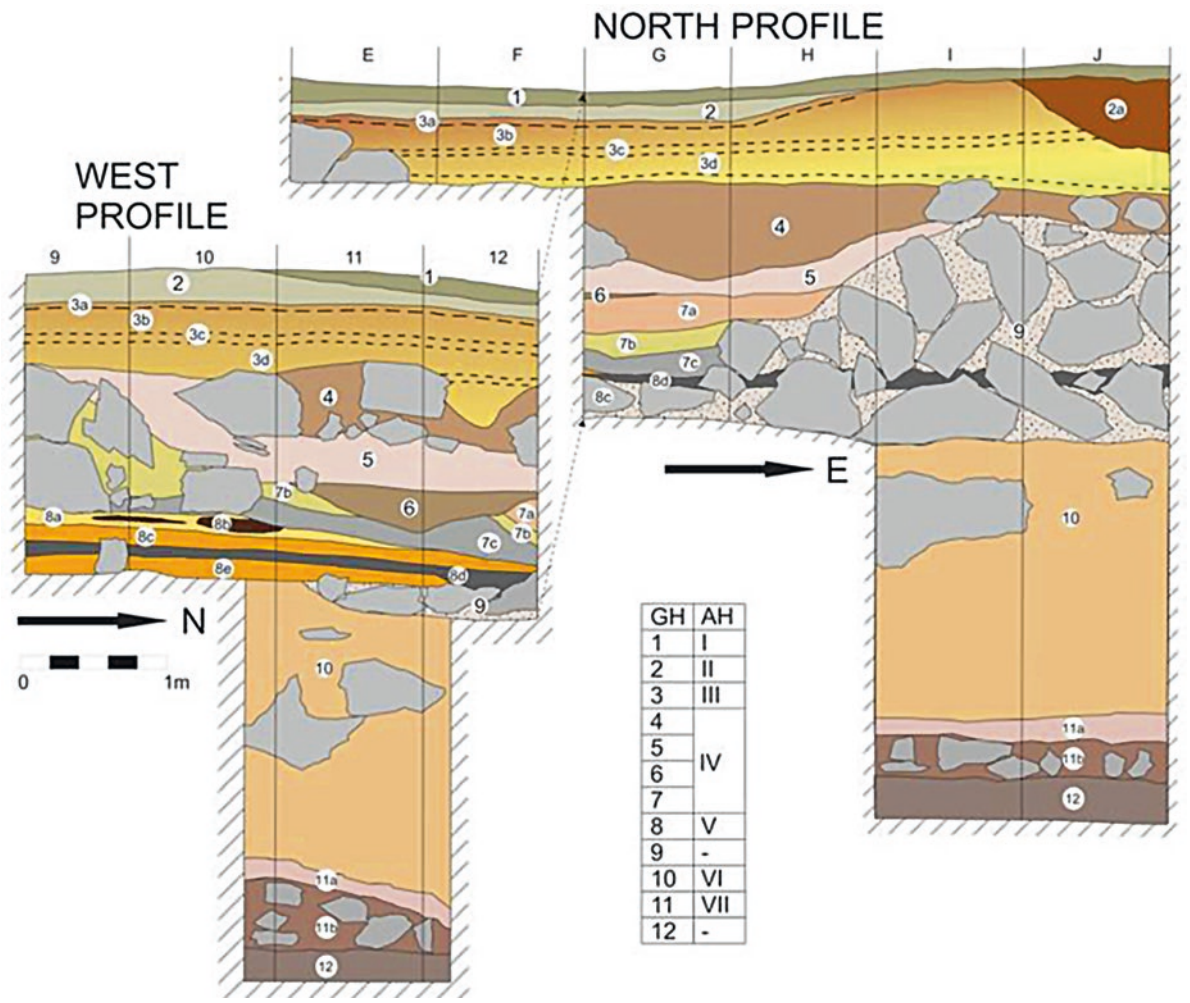

Fig. 9.2 Aghitu-3 Cave. Drawings of the main profiles with chart correlating geological horizons (GH) with archaeological horizons (AH) (graphic: after S. Nahapetyan and D. Arakelyan)

the stratigraphic sequence, even in the limited dataset available from AH VII. Most of the modified pieces sport fine retouch along one lateral edge. While some semi-abrupt retouched pieces occur, true backed pieces are rare (Fig. 9.4). We interpret these laterally modified bladelets as parts of a highly mobile, certainly modular toolkit. It is well imaginable that these standardized pieces were designed for multiple uses, for instance as inserts in composite projectile heads or as cutting edges in other tools. The results of functional analyses on such small, laterally modified or backed pieces usually show a pattern of diverse possibilities of use (e.g., Caspar and De Bie 1996; Christensen and Valentin 2004; Robertson et al. 2009; Bolus 2012; Taller et al. 2012). Whether these findings hold true for the artifacts from Aghitu-3 will have to remain unanswered until functional analyses on the artifacts are completed.

Although the percentage of modified pieces is high for all UP layers (18% in AH III, 21% in AH VI, 7% in AH VII), tools associated with domestic use, such as burins, scrapers, pointed blades or splintered pieces, are rare. Cores are relatively infrequent in the UP horizons (Table 9.1). Most cores (n = 66) come from AH III and represent 2% of the lithics in that layer. The number of cores from AH VI (n = 3) and AH VII (n = 5) is quite low. In AH VI, the frequency of cores is less than 1%, but in AH VII, they represent 4% of the lithic assemblage.

Based on these observations, we interpret the lithic assemblages as indicating short, focused stays rather than as occupations with the character of a base camp. Most of the cores we found are highly reduced to maximize the yield of blanks. Some of the cores measure just 2 cm in maximum dimension, which shows that laminar blanks of quite minute dimensions were produced (see inset photos in Figs. 9.5 and 9.6). The lithics furthermore show a low cortex-cover index, regardless of the raw material, meaning that prepared blocks and cores must have been preferentially carried onto the site.

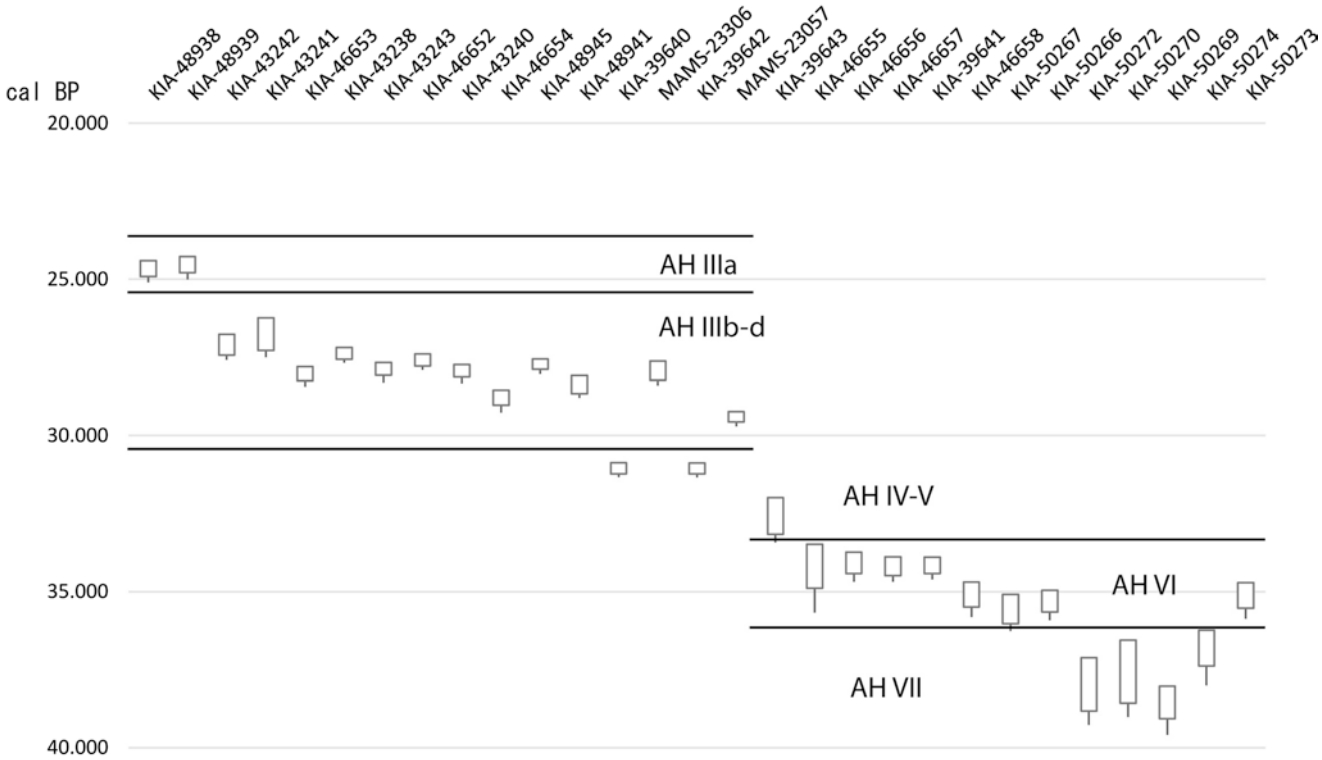

Fig. 9.3 Aghitu-3 Cave. Dating of the Upper Paeolithic

Table 9.1 Distribution of lithic artifacts per archaeological stratum

Archaeologicalhorizon	III	IV	V	VI	VII	Total	%
Area excavated (m^2)	40	12	12	12	4	–	–
LITHICS							
Blanks	2408	2	6	250	94	2760	51%
Retouched tools	564	3	4	72	9	652	12%
Cores	66	–	–	3	5	74	1.4%
Angular debris (chunks)	128	–	–	17	4	149	2.8%
Small debitage (chips)	1739	–	–	32	–	1771	33%
LITHIC Total	4905	5	10	374	122	5416	100%
Retouchindex (excludingchips)	17.8%	–	–	21.1%	7.4%	–	–
Core index (excludingchips)	2.1%	–	–	0.9%	4.1%	–	–

9.3.2 Lithic Raw Materials

In the volcanic Armenian Highlands obsidian is the most common raw material used for the manufacture of lithic artifacts. At Aghitu-3 this is true as well. The lowest percentage of obsidian was observed in AH VI, where it comprises 64% of raw material (Fig. 9.7). Other raw materials include local and regional varieties of chert, and rarely other materials such as local dacite and basalt.

In the lowermost layer AH VII, obsidian is the dominant raw material comprising 87% of the lithic assemblage. However, in AH VI a noticeable change in behavior occurs. The share of chert increases considerably from 2% in AH VII to 28% in AH VI. This could indicate a diachronic change in the raw material procurement strategy, or may show connections of Aghitu's inhabitants to different parts of the region. This being said, the relatively low numbers of artifacts in AHVI and VII should be remembered. For raw material percentages per stratum see Fig. 9.7.

To pinpoint the obsidian sources E. Frahm used portable x-ray fluorescence spectrometry (pXRF) to conduct elemental analysis of the chemical properties of the different obsidian varieties recovered from the excavation (Fig. 9.5). Using this method he can test many artifacts quickly to determine where a given piece of obsidian originates, provided that reference samples of the source materials are known (Frahm

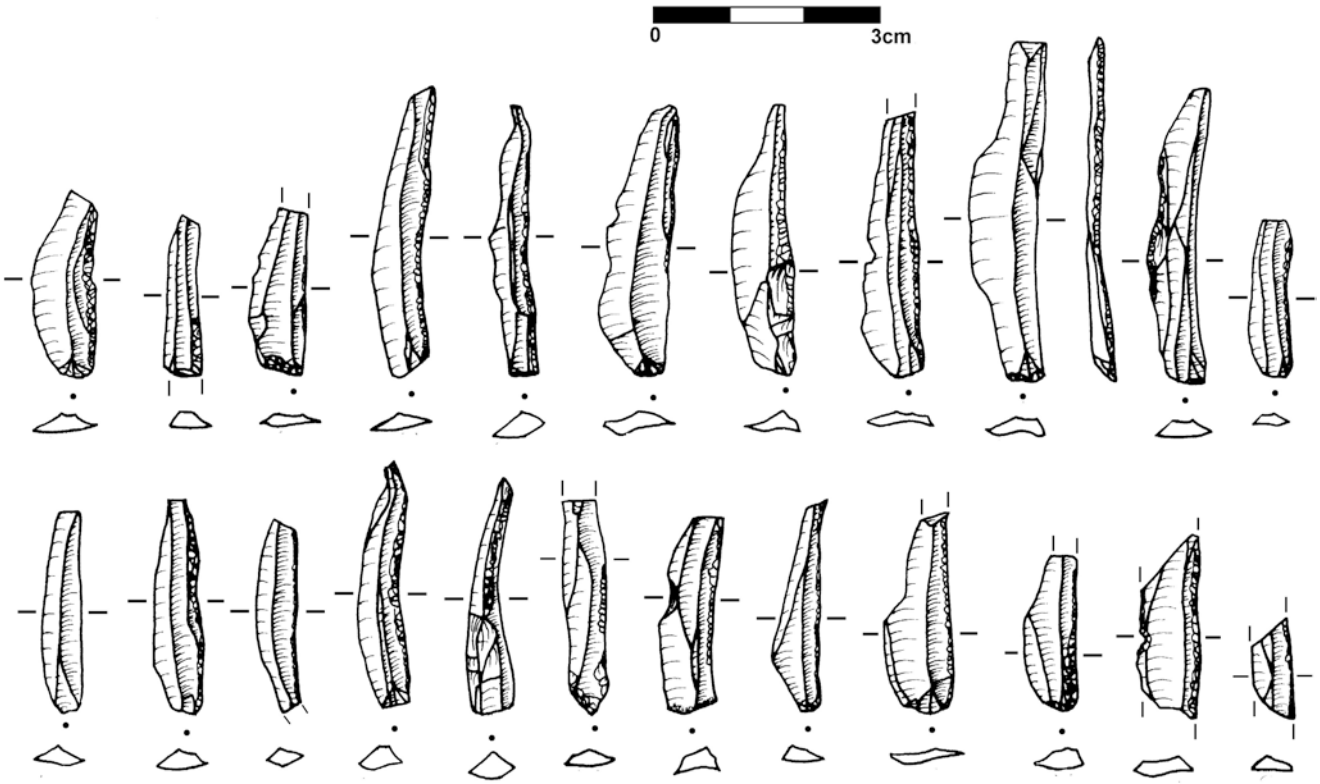

Fig. 9.4 Aghitu-3 Cave. Examples of laterally modified bladelets (drawings: E. Ghasidian)

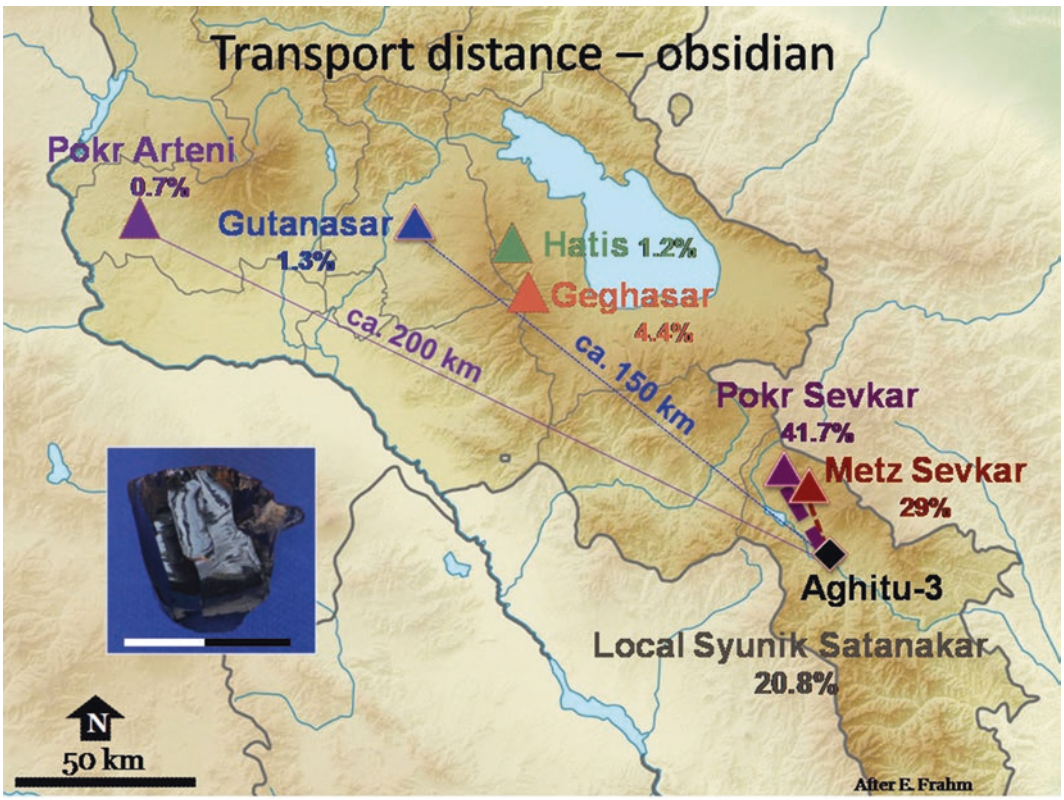

Fig. 9.5 Aghitu-3 Cave. Map showing the provenience of obsidian raw materials in layer AH III (graphic: after E. Frahm)

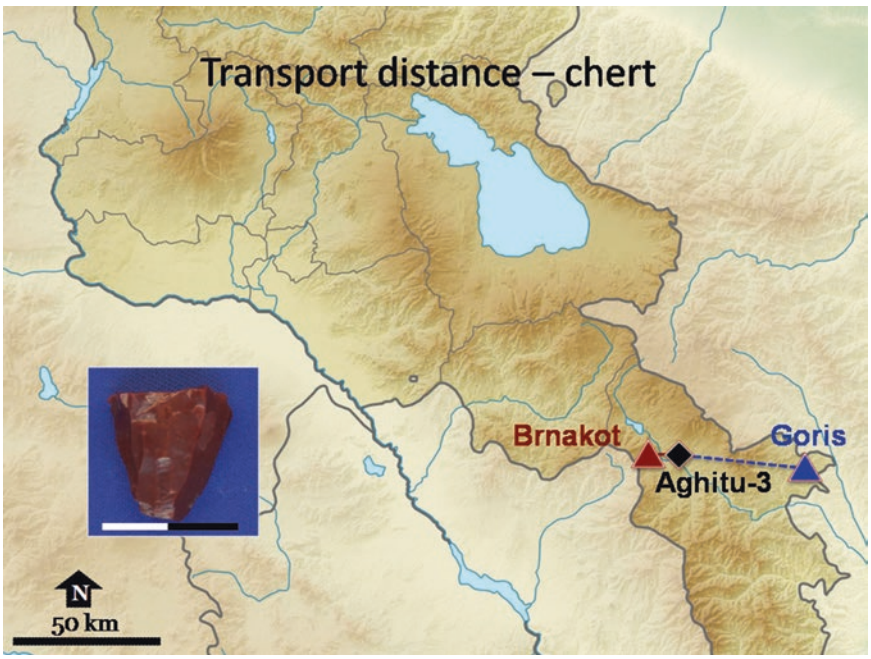

Fig. 9.6 Aghitu-3 Cave. Map showing the provenience of chert raw materials in layer AH III

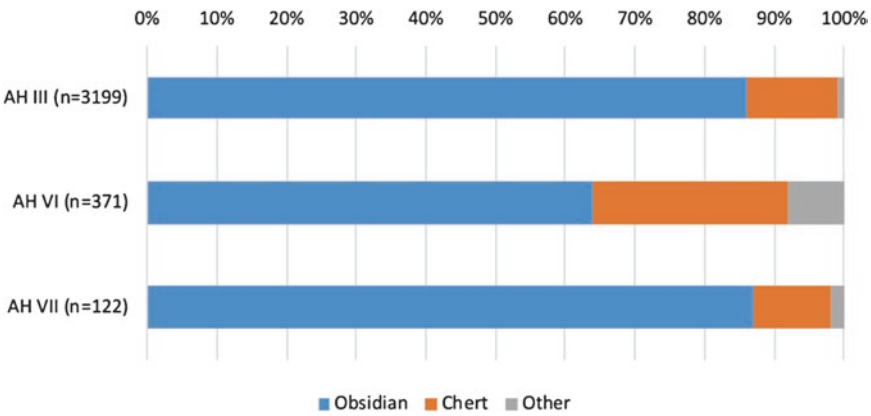

Fig. 9.7 Raw material percentages of the Upper Paleolithic layers

2014; Frahm et al. 2014). The method is especially practical for obsidian due to the distinct chemical and mineralogical nature of each volcanic source.

Based on the pXRF analysis, the obsidian sample from AH VI was found to consist only of local to regional variants from around Satanakar. Based on geological studies, the chert sources also appear to be local or regional, originating no more than 35 km away (Fig. 9.6). These results indicate that only local and regional raw material sources were exploited at Aghitu-3 from 35,000 to 31,000 cal BP.

With several thousand pieces, the lithic assemblage from AH III is the largest and most representative sample, and therefore best suited for analysis. AH III has the same share of obsidian (86%) as in AH VII (87%), although chert is more common and other raw materials are rare in AH III. With regards to transport distance, it is exciting to note that some of the obsidian from AH III comes from the Gutanasar volcanic region, about 150 km northwest, and from Pokr Arteni, about 200 km northwest (Fig. 9.5). Although the percentage of these exogenous raw materials is small, these sources demonstrate that UP hunter-gatherers were roaming across large areas of the Armenian Highlands starting about 29,000 cal BP. This finding contrasts with the situation in AH VI, where only local and regional obsidian sources were used. This could indicate that the earliest UP hunter-gatherers were not yet familiar with the surrounding regions; perhaps they were newly arrived, or their population density was simply low. In summary, the pattern of raw material procurement appears to have changed, so that during the time of AH III, people

were exploiting considerably larger territories or had more contact with groups further away.

In addition to obsidian, chert from local and regional sources up to 35 km from Aghitu is also present in AH III. The types of chert that were brought to the site are high quality, very fine grained to microcrystalline varieties. Still it is surprising that chert was even used as a raw material, given the fact that obsidian of excellent quality abounds in Armenia.

9.3.3 Organic Artifacts

Organic artifacts (Figs. 9.8 and 9.9) were only recovered from AH III and include a broken eyed needle and two awls made on bone, as well as six shell beads of *Theodoxus pallasi*. These finds are particularly interesting since they provide evidence for the fabrication of clothing, nets or bags. Clothing would have been essential for the colonization of the Armenian Highlands under cold temperate conditions, as human thermal physiology would not allow the exploitation of such regions without adequate body cover (Gilligan 2010). Furthermore, the eyed needle suggests the fabrication of complex clothing (*sensu* Gilligan 2010) in which multiple layers are sewn together to increase the insulating properties of a garment. Today the climate of Armenia is decidedly continental, with warm summers and cold winters, and this pattern is even more pronounced at the high elevation of Aghitu. The Pleistocene climate certainly did not make human settlement of the highlands any easier and may explain why there are more UP sites in lower-lying Georgia (e.g. Bar-Yosef et al. 2011; Pinhasi et al. 2014). Of course, this could also be due to a bias in the history of research. Nonetheless, sites in the Imereti region of Georgia are situated more than 1000 m lower than Aghitu-3 (Bar-Yosef et al. 2011).

We consider the ability to make clothes an absolute prerequisite for the settlement of the Syunik Highlands by modern humans. The eyed needle and the awls provide sufficient evidence for the fabrication of clothing. In addition to these organic tools we also consider lithic tools such as endscrapers, as well as the occurrence of blade technology. Taken together these findings are in accordance with features indicating the manufacture of complex clothing as proposed by

Fig. 9.8 Aghitu-3 Cave. Bone awl from layer AH IIIc (photo: M. Schaefers)

Fig. 9.9 Aghitu-3 Cave. Eyed bone needle from layer AH IIId (photo: M. Schaefers)

Gilligan (2010). Gilligan emphasizes the role of blade technology in yielding prime blanks for cutting, which of course is an absolutely necessary practice in the fabrication of clothing.

9.3.4 Fauna

Analysis of the large mammalian fauna is not yet complete, but we can present a picture of the distribution of the faunal size classes and some of the identified species (Table 9.2). With 1180 single pieces identified thus far (M. Schaefers), faunal remains are most common in AH III, followed by AH VI. The analysis of micromammals, bird, fish, reptiles and amphibians is also in progress. The large mammalian fauna is dominated by size class 2 (20–100 kg), such as wild goat and wild sheep, and size class 3 (100–300 kg), including equids. The largest size class 4 (300–1000 kg) consisting of large bovids is infrequent, while the smallest size class 1 (5–20 kg) is least common, represented mainly by hare. The remains from AH III yield the clearest evidence for a hunted fauna, with the presence of many shaft fragments of a variety of taxa including equids, wild sheep and goat, and cervids, some of which bear cutmarks and impact fractures. As with the lithics, AH IV and V yielded few faunal remains and are not discussed here in detail. Based on field observations, we hypothesize that the fauna from AH VI was accumulated largely by carnivores, based on body part representation, carnivore chewing and gastric etching. The faunal remains stress the short-term occupational character of AH VI and especially VII.

Table 9.2 Distribution of preliminarily identified faunal remains per archaeological stratum

Preliminary identified taxa	AH III	AH IV	AH V	AH VI	AH VII	Total
Vulpes vulpes	1	1	1	1	–	4
Canis lupus	1	–	1	2	–	4
Ursus sp.	1		–	–	–	1
Lepus capensis	4	6	–	5	1	16
Equus sp.	132	–	1	2	3	138
Cervus elaphus	19	–	–	–	–	19
Ovis sp.	20	–	–	1	–	21
Capra sp.	10	1	–	22	1	34
Gazella gazella	2	–	–	–	–	2
Bos/Bison	13	–	1	–	–	14
Subtotal identified	203	8	4	33	5	253
Small mammals (SC1)	6	1	–	9	1	17
Small medium mammals (SC2)	288	10	3	110	9	420
Large medium mammals (SC3)	403	6	6	14	9	438
Large mammals (SC4)	49	–	–	3	–	52
TOTAL	949	25	13	169	24	1180
Fish	15	–	–	1	24	40
Bird	37	2	11	52	153	255

SC Size class defined in text (Results: M. Schaefers)

9.4 Implications

The composition of the lithic assemblages from each layer of Aghitu-3 Cave indicates short, probably seasonal stays of a clear UP character likely connected with hunting expeditions in the vicinity. This interpretation is also backed by the faunal remains from the site. The very seasonal and steppic grassland environment of the Syunik Highlands was on the one hand a very rich hunting ground with abundant biomass and thus a desirable area of exploitation for Late Pleistocene hunters and gatherers. On the other hand, the seasonality and harsh climate that accompanies living at high elevation make subsistence more challenging. In this light, we feel our interpretation of the site as a short-lived hunting camp makes sense. Furthermore, even in AH III the density of finds is not very high, supporting periodic use of the site. The base camps of these groups may have been pitched at lower elevations in more agreeable surroundings with less demanding climatic requirements.

In terms of lithic raw material exploitation it is clear that obsidian is paramount; its lowest percentage is in AH VI with 64%. The other raw material of significance is chert, but its frequency is much lower; AH VI has the highest share of chert with 28%. As stated before, we consider that AH III is the layer with the most explanatory power when it comes to quantitative arguments, simply because it yielded the most lithic artifacts and faunal remains. It seems that as the deposit of AH III accumulated, Pleistocene hunter-gatherers were already roaming an area covering much of the Armenian Highlands, as indicated by the different sources of obsidian.

We postulate that the changes observed between AH VII and III document a process of learning. By this we mean that the bearers of UP technology became acquainted with their surroundings by becoming familiar with various factors including geography, topography, ecological zones, exploitation ranges, hunting grounds and other rewarding areas after they moved into the region about 39,000 cal BP. The requirements and preconditions to do so were no doubt in existence from the earliest phase of the colonization of Southern Armenia by modern humans. This development towards a better acquaintance with the supra-regional surroundings may also suggest that the inhabitants of Aghitu had contact with other UP groups which enabled faster learning about environment and territory. At the same time, indicators suggesting the making of clothing may show an adaptation of the Ice Age inhabitants to different environmental conditions. This capability may be due to the process of learning,

where the technology can be seen as a strategy developed to cope with a high altitude environment, or it may have simply arrived with these first modern settlers. However, we think that the technology and ability existed from the time of AH VII onwards, since there is so little change in lithic technology over time. Still, without any direct evidence for sewing like we have from AH III, this hypothesis remains more speculative for AH VI and VII.

9.5 Context

Aghitu-3 Cave is the only stratified site of the Early UP (EUP) in Armenia. Due to a lack of comparative sites in the region, we look beyond Armenia and examine the situation to the north. In Georgia we find a comprehensive and well documented period of settlement during the EUP, which might be related to the considerably lower elevation of these sites and their more favorable climate. Sites with UP layers include Dzudzuana Cave, Gvarjilas Klde, Ortvale Klde, Samertskhle Klde, Samgle Klde and Sareki Klde (Adler et al. 2008). All of these sites are situated in the Imereti region of Western Georgia in the middle reach of the Rioni River.

Starting about 29,000 calBP we know that the inhabitants of Aghitu-3 had contacts stretching as far as 200 km northwest to the Pokr Arteni region (Fig. 9.6). Thus it is fair to assume that contact with the hunter-gatherers of the Imereti region in Georgia would not only have been possible, but also likely. This is supported by the occurrence of obsidian artifacts at some Georgian UP sites. The obsidian comes from a source about 100 km southeast of the Imereti region (Adler and Tushabramishvili 2004), which means that the source lies in the direction of Armenia. This indicates the minimum radius of the area exploited, and in Aghitu we found obsidian from as far as 200 km away in to the northwest, pointing to contact between the groups settled in Armenia and Georgia. The best comparisons with Aghitu-3 Cave are the sites of Dzudzuana Cave (units D and C) and Ortvale Klde rockshelter (layers 4 and 3). Not only are these sites well studied (Adler et al. 2008; Bar-Yosef et al. 2011), they also show similarities in age, lithic technology and typology.

At Dzudzuana Bar-Yosef et al. (2011) defined units D (34.5–32.2 ka calBP) and C (27–24 ka calBP) as UP. The lithic assemblage of unit D includes burins and endscrapers, but also modified bladelets; obsidian is present as a raw material. While the dating of unit D corresponds well with AH VI of Aghitu-3, the lithic assemblages do appear somewhat dissimilar, as endscrapers outnumber the burins and modified bladelets have a significantly lower percentage. Of course this finding might also be due to respective differences in site function. Meanwhile, the lithic industry of unit C is characterized by the unidirectional fabrication of bladelets. Laterally modified bladelets dominate the tool assemblages (Bar-Yosef et al. 2011), and again, obsidian is present. In that respect, layer C of Dzudzuana compares well with AH III of Aghitu-3 Cave. However, at Dzudzuana endscrapers outnumber burins, whereas in Aghitu this relationship is reversed. However this difference in composition may be attributed to a difference in site function.

Units D and C of Dzudzuana are much richer than Aghitu-3 in terms of artifact numbers. Even though retouched bladelets dominate Dzudzuana's toolkit, there are also many tools of domestic use. With almost 27,000 finds from unit C alone and a wealth of organic tools to match, including an eyed needle, Dzudzuana seems to have been more intensively occupied than Aghitu-3. Dzudzuana is rich in faunal remains, mainly bison/aurochs, but also wild goat and red deer, which regularly show butchering or other processing marks (Bar-Oz et al. 2008; Bar-Yosef et al. 2011). With an elevation of 560 m a.s.l. and rich plant life including wild grape, oak and hazel from unit D, and nettle, chicory, walnut, oak, linden, alder, hazel, vine and pine from unit C, Dzudzuana offered a more inviting environment than Aghitu-3 (Adler et al. 2006a; Bar-Yosef et al. 2011).

At Dzudzuana researchers demonstrated that the EUP was brought in by foreign groups of modern humans who arrived at about 39,000 cal BP (Meshveliani et al. 2004; Adler et al. 2008; Bar-Yosef et al. 2011) and suggested that the MP culture of the Neanderthals was in fact replaced. This scenario seems probable for Armenia as well, since several examples of MP heritage exists, but no sites contain MP and UP in a single stratigraphy (see Gasparyan and Arimura 2014). This holds true for Aghitu-3 as well, where we have not found any MP layers below the UP sequence.

Ortvale Klde is another example of an EUP site in Georgia, a rockshelter situated about five kilometers west of Dzudzuana at 530 m a.s.l. (Adler et al. 2006a). Like Dzudzuana, this site yielded considerably more archaeological material than Aghitu-3, and served a different function, with longer stays and a more intensive settlement history. This is well documented by more than 12,000 lithics and 3200 faunal specimens from the EUP layers. The EUP lithic assemblage includes unidirectional laminar cores, and among the tools, laterally retouched and backed bladelets predominate (Bar-Yosef et al. 2006; Adler et al. 2008). Especially the laterally retouched bladelets show great similarity to those from Aghitu-3. Tools such as endscrapers and burins occur as well, and amongst the organic tools, bevel-based antler/bone points and abraders stand out (Adler et al. 2006b). As was the case in Dzudzuana, the majority of lithic artifacts were made on locally available flint, but there are also a significant number of obsidian pieces from a raw material source located more than 100 km to the southeast (Adler et al. 2008). At Ortvale Klde the dates range from

about 38,000–28,000 calBP for all subdivisions of layer 4 and 26,000–25,000 calBP for layer 3 (Adler et al. 2008). These dates clearly correspond well with Aghitu-3, despite the noticeable difference in settlement intensity. Finally, looking to the south, similarities can be observed with some of the Baradostian sites of Iran, especially the upper sequence of Yafteh Cave recently dated to ca. 30,000 cal BP (Otte et al. 2011, 2012).

According to Bar-Yosef et al. (2011) the MP assemblages of the southern Caucasus and those from the northern slopes of the Caucasus had different points of reference: Taurus and Zagros for the southern Caucasian MP versus European traditions for the northern MP. While that might have been the case for the MP of the Caucasus, it does not seem to apply to its UP assemblages. In fact EUP assemblages on both sides of the Caucasus show similarities and indicate a rapid and widespread dispersal of modern humans, and with it, the possibility of maintaining contact among different groups (Bar-Yosef et al. 2011).

In sum, we agree with Golovanova and Doronichev (2012)—all EUP sites of the Caucasus region lack a transitional period after the MP, and the UP appears as a fully developed entity. They suggest a relatively sudden and widespread arrival of groups of highly adaptive hunters— modern humans with EUP culture who replaced Neanderthals (see also Adler et al. 2008; Bar-Yosef et al. 2011). All of the EUP industries of the Caucasus are characterized by a highly developed laminar lithic industry with high percentages of retouched bladelets, sometimes in total dominance depending on site function (Golovanova and Doronichev 2012).

9.6 Conclusion

The analyses of the UP archaeological remains from Aghitu-3 are a work in progress. Therefore, not all of the questions we introduced earlier can be answered at this time. However, we feel that we have reached a point where the conclusions we publish here can form a cornerstone for future research into the UP peopling of Armenia, as well as the southern Caucasus region. If we return to the questions formulated at the beginning of this paper, we can state the following as preliminary answers:

Where did the first Upper Paleolithic settlers in the southern Caucasus region come from, and what route did they take? This is difficult to answer at the moment, since radiometric dating results from the UP of Armenia, Georgia and Iran present quite similar ranges. This suggests that the first modern humans in the region arrived quickly and more or less in the same wave of expansion. Possible source regions to be considered include the Zagros, the Levant, and even the Russian steppe.

What are the connections of Aghitu-3 with regard to landscape use and itsPleistoceneinhabitants? Aghitu-3 is the only site of its kind in the region. We can safely say that the site served as a hunting camp which was used for short stays. Raw material procurement patterns show that at least during later stages of the UP, hunters who stopped at Aghitu-3 roamed a vast area covering much of the Armenian Highlands, and likely beyond. Despite the shared use of obsidian and similarities in lithic and osseous technologies, a physical connection to the Georgian UP sites has yet to be established.

Did the first modern humans in the region meet Neanderthals, and if so, how did they interact? This is doubtful, since a temporal overlap between MP and UP occupations does not exist in Armenia or Georgia. Aghitu-3 does not yield any direct information on the replacement process since there is no MP below the UP sequence. For now we assume that the "replacement" in Armenia consisted of the expansion of new groups of modern humans into a more or less empty area, with little chance for contact between Neanderthals and the newcomers. In the Imereti region of western Georgia the situation seems to have been similar (Adler et al. 2006b). If coexistence occurred in western Georgia, it was short-lived as UP populations ultimately prevailed, possibly due to social advantages (see below). Adler et al. (2006b) argue that two populations occupying the same ecological niche would not be able to exist very long parallel to each other.

What advantages did the first modern human settlers have over their predecessors? We can definitely say that the volumetric core reduction of these bladelet-dominated assemblages represents the epitome of an economically efficient system of blank production. While this is not a new insight with respect to UP assemblages, it differs noticeably from the preceding Levallois-based industries of the MP. In the younger strata of Aghitu-3, the eyed bone needle provides clear evidence for sewing. This kind of tool does not appear in the MP toolkit. The colonization of the southern Caucasus seems to have been a rather quick and widespread process, hence we assume that the first modern human colonists were quick to adapt and learn how to cope with new challenges. We agree with Adler et al. (2006b): even though the technologies of modern humans are more sophisticated, this does not necessarily mean they were better adapted. In the Caucasus we do not observe changes in hunting behavior with respect to prey species between the MP and UP. Rather the advantages for modern humans seem to lie within the social realm, for example, in long distance networks, trade and "social landscapes", as well as in terms of mobility (fast and frequent), rather than in superior technologies (Adler et al. 2006b).

Can we see a diachronic pattern of adaptational development in the Upper Paleolithic settlement? In terms of the lithic technology and toolkit from Aghitu-3, the findings from a stratigraphy covering 15,000 years are surprisingly consistent. Laterally modified bladelets prevail in every assemblage, and this consistency is something that we would not expect. What this exactly means is unclear; however, it seems that this particular toolkit offered the perfect solution for hunting lifeways during this entire time, otherwise it would not have been so dominant or persistent. Meanwhile raw material procurement patterns changed significantly: in layer AH VI we have only local obsidian, whereas in AH III, materials from sources up to 200 km away were found. This might indicate a broadening of the geographical range that these hunters explored. The discovery of the eyed needle in layer AH III definitely suggests sewing and has other implications. Since the technique of sewing was clearly mastered, everything from bags and nets to clothes could have

been produced. Since there is no evidence for sewing in the lower UP layers of AH VI and VII, this might indicate a development over time. Nonetheless, we suspect that the earliest UP inhabitants of Aghitu-3 also had the ability to fabricate clothing.

Summing up, it is clear that Aghitu-3 Cave served as a shelter for short stays, most likely associated with hunting trips; but it did so repeatedly over a timespan of 15,000 years. The assemblages from the UP layers show perfectly developed technologies and toolkits, both lithic and organic. Indirect proof for the manufacturing of clothes is tangible in the eyed needle, the awls and the sophisticated laminar lithic industry. The laminar lithic production chain is elaborate and fully developed; core exploitation shows a maximum of efficiency. The meaning of the uniformity of the lithic tool kit throughout time is thus far not clear, as we would expect more variation across so much time. It might, however, just show a technology perfectly adapted to the needs of Paleolithic hunting groups. Their technology met the requirements of these people exceedingly well, so that there was no need to change. Another possibility is the existence of a tradition that was handed down through the generations and survived unchanged. Since the toolkit consists of many small blanks and modified pieces, it is foremost a very mobile toolkit. Whatever their use, these small implements were easy to make and replace. We suggest multiple uses for the retouched bladelets, but this question will be addressed after we carry out functional analyses on these pieces.

Aghitu-3 Cave shares many technological and typological features with the Georgian sites of Dzudzuana and Ortvale Klde, as well as Yafteh Cave in Iran. Radiometric dates from these sites show considerable overlap in the periods of occupation. The earliest occupation of Aghitu-3 was probably a little earlier than Dzudzuana, but for the better part of the UP all of these sites were inhabited at the same time. Thus Aghitu-3 Cave fits well within the EUP settlement system of the broader Caucasus region, and presumably represents a first "link" between the Baradostian of Iran and the more northerly lying sites of western Georgia and beyond. Whether or not we can detect actual connections between all of these sites remains a challenge for future research.

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