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From the Late Upper Paleolithic to the Neolithic in north-western Armenia: Preliminary results

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The collaboration between the Institute of Archaeology of Yerevan (Academy of Sciences of Armenia) and the French “Caucasus” mission (MAEE - CNRS) is focused on the study of the cultures that developed in Armenia between the Palaeolithic and the end of the Chalcolithic, and on the definition of the exchanges which may have existed in these periods between this territory and the regions which surround it.[1]

The surveys carried out over the last ten years have enabled the discovery of prehistoric sites (Fig. 1) that present cultural variants thus far unknown: the late Chalcolithic of the Vorotan valley (Godedzor); the Neolithic and the Chalcolithic of the plain of Ararat (Aratashen and Aknashen-Khatunarkh); and three new cultural facies ranging from the Late Upper Palaeolithic to the Chalcolithic, discovered in north-western Armenia (Kalavan-1, Kmlo-2 - also named Apnagyugh-8 and Tsaghkahovit-1).

These sites give evidence of relationships with the neighbouring regions, Georgia in the north and Near East in the south, and show to what extent the Armenian territory was a zone of convergence in the prehistory for influence from Europe and from Asia. Moreover Kalavan-1 and Kmlo-2, which belong respectively to the end of the Pleistocene and the beginning of the Holocene, provide new insights into these periods, which are very poorly known in Armenia.

Kalavan-1

The open air site of Kalavan-1 is located in the Aregunyats mountain range, which dominates the northern shore of Lake Sevan. The relief is not very steep and the highest slopes are covered with alpine meadows. Kalavan-1 is situated at 1630 m u.s.l.; the upper limit of the forest is today at about 2100-2200 m, but during the cold episodes of the late Pleistocene it would have been some hundreds meters lower (Adler, Tushabramishvili 2004). Kalavan-1 is located in a narrow valley whose river (Barepat) is a tributary of the Getik, which flows into the Aghstev, then the Kura. All these valleys are in fact ways of access into the Lesser Caucasus from the alluvial plain of the middle Kura.

In the present state of our knowledge, Kalavan-1 appears to present the first evidence of human re-colonisation in the Lesser Caucasus after the Last Glacial Maximum (20,000-18,000 BP). Part of the glaciers

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in the Lesser Caucasus retreated and allowed the opening of new territories. Information on the vegetation of the Lesser Caucasus mountains at the end of the Pleistocene is still inexistent, but palynological studies, carried out recently on the neighbouring high plateaus of southern Georgia (Djavakheti) have enabled the restitution of a cold steppe consisting of Chenopodiaceae (Artemisia and Ephedra), between 13,000 and 10,000 BP (Connor, Kvavadze 2008).

The geomorphological analyses, carried out on the Kalavan territory (Ollivier, Nahapetyan 2008) have shown that the first occupants of the site installed themselves on an old alluvial terrace of the Barepat river, whose sub-horizontal surface includes a slight slope towards the water course. This terrace was then covered by colluvial deposits, in which tombs were dug during the early Bronze Age. The site was discovered during the enlargement of a pathway along the river; the excavated zone now covers about 35 m^2 (Fig. 2).

The Late Upper Palaeolithic level (level 7) is composed of several successive occupations separated by fine sterile strata. The largest zones with vestiges were brought to light within horizons 7d1 and 7d3. The composition of the assemblages (lithics and fauna) differs between these two occupations, as well as the structuring of the inhabited space (Montoya et al. 2008).

In the lower horizon (7d3), a heap of faunal remains is associated with a large ashy stain, which includes no heated element (burned stone or faunal remains). In this heap are a large number of Caprinae mandibles (Fig. 3). The butchering treatment of the bones indicates that this feature was a rubbish pit, the ashy stain possibly being where a hearth was emptied.

In horizon 7dl, the faunal remains are much less abundant and the vestiges are made up of four parts (Fig. 4):

- a small circular concave hearth surrounded by a few stones which had been heated
- near the hearth, a concentration of lithic tools (almost exclusively rough bladelet products) in a slight depression; this is perhaps a zone for waste?
- a heap of faunal remains and lithic elements (especially flakes), only in black obsidian
- and a third concentration of lithic elements, with nuclei and many bladelets, in black obsidian or green rock. There was no retouched tool. This is perhaps a spot where debitage took place.

Dating. The dates determined for bones coming from different strata of occupation (7b to 7d3) show a high homogeneity at around 14,000 BP or 15,000-14,000 cal BC (Fig. 5). This is situated, on the diagram of the climatic fluctuations at the end of the Upper Pleistocene, at the beginning of the warm period of the Greenland Interstadial 1. The climatic improvement during this period probably played a major role in the re-colonisation of the Lesser Caucasus by mammalian fauna and by prehistoric humans.

A single date, from a charcoal sample from horizon 7d1, gave 11,500 BP (that is 11,500-11,300 cal BC) (Fig. 5). It is possible that the successive occupations of the Kalavan-1 camp were separated by large gaps; however the objects are very homogenous throughout the horizons. Therefore, this date has to be verified with future radiocarbon datings.

Fauna. The faunal remains belong almost exclusively (99%) to wild Caprinae (Ovis/Capra sp.). Because of the fragmentation of the bones, few fragments could be identified: they were attributed to Ovis sp., which could be Ovis orientalis gmelini, the Armenian mouflon. Such a dominance of wild Caprinae suggests a targeted hunting.

The study of age profiles of the Caprinae shows that the Late Upper Palaeolithic human group hunted animals between 1 and 4 years of age, that is prime-age adults, which had reached a maximum weight (Balasescu et al., in press).

Most of the faunal remains present longitudinal fractures, which may be related to taphonomic processes, but also to fragmentation for extraction of the bone marrow and grease. Several bones present percussion notches, which would support this interpretation (Balasescu et al., in press).

Available data on wild caprinae migratory behavior indicate their abundance at lower elevations during winter when herds aggregate for breeding. During spring, the caprinae move to higher elevations to exploit alpine pastures, and herds fission into solitary males and small maternal groups. As it has been showed for the Middle and Upper Palaeolithic site of Ortvale Klde in Georgia (Adler et al. 2006), the dominance of prime-age adults in a species-specific hunting is indicative of ambush, the hunters lying in wait along the migration routes of the animals and not in the rocks where the animals were beyond their reach. This scenario can serve as a hypothesis for Kalavan-1, as the valley of the Barepat probably corresponds to a migration route between the peaks dominating Lake Sevan and the valleys of the Kura basin.

Chipped stone. At Kalavan-1, it is remarkable that most of the tools are in obsidian (about 60 %), which is not local, while the siliceous rocks washed down in abundance by the river Barepat only played a supplementary role.

The provenance analyses carried out on 18 obsidian artefacts have shown that this material came from several deposits located west of Lake Sevan (mainly Hatis and Gutansar, then Geghasar), only one sample being from a source south-east of Lake Sevan (Sevkar). The modelling, thanks to a GIS, of the time necessary to cover the distance between the site of Kalavan and the sources of obsidian over the relief, shows that 24 to 30 hours (that is, 4 to 5 days' walk) would have been necessary to reach the main deposits (Fig. 6). The abundance of obsidian artefacts at Kalavan-1 suggests that the human group went first to supply himself with obsidian, in order to prepare arms for hunting. As the obsidian outcrops at Geghasar and Sevkar lie at high altitudes, in regions which are today covered by snow 6 months of the year; obtaining obsidian could take place only during the summer. As a result, hunting probably took place at the end of the summer or in the fall, when the herds descended into the valley.

The lithic objects of Kalavan-1 present a great technical homogeneity. The production was oriented towards obtaining three ranges of blanks: bladelets, large bladelets and sometimes blades, the seeking of a rectilinear profile for these products being a constant (Fig. 7).

The bladelet debitage is represented by different elements in the operational sequence: cores, by-products and rough products with full debitage. This debitage, which is unipolar in type, was oriented mainly towards the production of backed bladelets, truncated backed bladelets, backed points (microgravets). In addition, for the large bladelets there is the production of burins, retouched pieces and end-scrapers.

The rare blade blanks served to prepare similar pieces, as well as truncated or notched blades. In the absence of any blade cores and by-products, it is probable that the obsidian blades were brought to Kalavan-1 in the form of a few blanks.

This lithic assemblage is related to the Epigravettian tradition which spread across southern and eastern Europe between 20,000 and 10,000 BP (Montoya 2004). It is in evidence occasionally in southwestern Turkey (Oküzini) (Otte et al. 2003), but also in western Georgia, for example at Gvardzhilas Klde (Nioradze, Otte 2000; Nioradze 2001), as well as at Dzudzuana layer B (Meshveliani et al. 2007). Kalavan-1 could be the first evidence for the extension of the Epigravettian culture into Armenia, during the final phase of the Pleistocene.

Kmlo-2 (or Apnagyugh-8)

The beginning of the Holocene, which corresponds to the transition from hunting and gathering to farming and herding, is a poorly understood period in Armenia. The local Mesolithic and initial Neolithic data is lacking. The "oldest" Neolithic sites are Aratashen and Aknashen-Khatunarkh, established in the Ararat plain at the very beginning of the 6th millennium cal BC, with an economy already based on farming and herding (Badalyan et al. 2004). Therefore, the insights into the 10th-7th mill. cal BC, provided by the Kmlo-2 cave, are invaluable.

Kmlo-2 is situated east of the Aragats massif, in the middle valley of the river Kasakh, at the jonction with a small tributary (Fig. 1). The absolute elevation of this cave, dug in a basaltic lava flow, is about 1700 m u.s.l. Degradation of the cave walls and roof was due to internal erosion, but also to several earthquakes, the last of which caused a collapse of the entrance (Fig. 8a).

This site was found in 2002 during a systematic survey in the Kasakh valley. A test sounding revealed the presence of obsidian artefacts in the cave (Fig. 8b). The excavations organized by our joint mission started in 2003; during three field seasons, about 10 square meters have been excavated.

Stratigraphy. On a mass of fallen rocks from the collapse of the vault, wind-blown sediments were deposited. The 4 upper levels, lying sub-horizontally, correspond to a medieval occupation, which unfortunately had strongly disturbed the upper part of the underlying level, level 5, which produced the prehistoric material. In places in layer 5, there are lumps of hardened floor full of obsidian artefacts and faunal remains, which are probably the only evidence in place of the Prehistoric occupation.

In this layer, the floral and faunal remains belong to wild species, with the only exception of the sheep. But the stratigraphic position of the few sheep bones is not sure, because following the earthquake which caused the collapse of the porch, the material "percolated" between the blocks of stone and came to rest in the interstices down to more than 1 m in depth. The objects of this level 5 are thus mixed together and displaced.

Dating. This is all the more unfortunate as the C14 dating, carried out by several laboratories give matching results which suggest the succession of 4 occupations (Fig. 9): a first group of results points toward the 11th-10th millennia cal BC; a second group dates to the 8th millennium cal BC; a third group to the 6th-5th millennium BC; then, the medieval period.

However, the potential errors caused by contamination must be kept in mind. A bone sample (UGAMS-4076 and -4076a), whose both fractions (organic and mineral) have been analyzed, has yielded with bioapatite date about 1.7 ka radiocarbon years younger than collagen; it may be due to isotope exchange of bioapatite carbon with dissolved younger carbon (Cherkinsky, Chataigner, in press).

The oldest date, from a fish bone, must be taken with caution because of the radiocarbon reservoir effect due to the "old carbon" stored in freshwater resources (Lillie et al. 2009). Moreover this fish bone does not perhaps come from an anthropic context, as according to the archaeozoologists, part of the fish remains would have come from the regurgitation pellets of birds of prey, which could have occupied the cave before the arrival of humans.

Chipped stone. The lithic industry tends to confirm this partition into 3 early phases of occupation:

- the most frequent types of microliths are the backed bladelets and scalene (straight-backed and obliquely truncated) bladelets, which are related to the Late Upper Palaeolithic tradition of Kalavan-1, but are found also on Mesolithic sites of the 10th - 9th millennium BC in Georgia, for example at Kotias Klde (Meshveliani et al. 2007);
- other artefacts ("Kmlo tools"), which carry a very particular retouch (Fig. 10), are reminiscent of the pre-pottery Neolithic (8th - 7th millenia BC), both of the Near East and of north-western Transcaucasia;
- transverse arrowheads of elongated shape are characteristic of the late Neolithic and the Chalcolithic of a very large region, as they appear in the Near East at the end of the 7th millennium (Sabi Abyad, in Syria) and spread then over northern Near East and southern Europe (Copeland 1996; Wechler 2001); in Armenia, a large number of transverse arrowheads have been found on a 5th millennium site (Tsaghkahovit) located not far from Kmlo-2, on the northern flank of the Aragats (Arimura et al. 2008).

But whatever the cultural phase, all of the lithic objects of Kmlo-2 present some common features: a) obsidian is almost exclusively the raw material used: more than 6000 pieces in obsidian, less than 10 in

flint; b) cores are generally small; the main core reduction strategy was based on unidirectional knapping and direct percussion; c) the microlithic component is predominant; some larges blades, more than 2 cm wide and 10 cm long, are also present but they are very few.

"Kmlo tools". This tool type is defined as having lamellar parallel retouch, created by the pressure technique, forming a steeply-angled edge with a dentate outline. The position of retouches is sometimes on dorsal face, sometimes on ventral face. Often, the retouch stops before a proximal part, which has the form of a hook or presents two accentuated ridges (Fig. 10).

"Kmlo tools" versus "Çayönü tools". This tool is very similar to artefacts from the northern Near East, referred to as "Çayönü tools" after the pre-pottery Neolithic site in south-eastern Turkey, where they were first described. They are also named "Çayönü rods" or "beaked blades" or "tools with a steep lamellar retouch" (Redman 1982; Fuji 1988). Chronologically, Çayönü Tools appeared in the 8th millennium BC, during the Pre-Pottery Neolithic B, in The Upper Euphrates and Upper Tigris regions. These artefacts spread across the northern Near East, from west to east, during the 7th millennium BC (Fig. 11).

In order to determine whether a relationship exists or not between the tools of Kmlo-2 and those of Çayönü, a specialist in Neolithic chipped stone, L. Astruc, who is carrying out a study on Çayönü tools from Turkey, northern Syria and Iraq (Cafer, Çayönü, Magzalia, etc.), carried out a traceological analysis on some twenty tools from Kmlo-2, for comparison. Her conclusions are as follows:

a) the blanks on which they are made are different: Kmlo tools are made on elongated flakes; Çayonu tools on regular blades;
b) the wear traces are different: traceological studies have shown that the "Çayönü tools" were used essentially for working stone objects softer than obsidian, such as limestone bowls and marble bracelets; on the other hand, the selected specimens of Kmlo tools wear traces from various activities, in particular from plants;
c) the methods used differ: Kmlo tools are retouched with a Cervidae antler; Çayönü tools, with a copper point;
d) the secondary uses differ: Kmlo tools are reused as a burin; this transformation into burins was probably a technique for refreshing the working edges; Çayönü tools are reused as "pieces écaillées".

Thus, at all stages of fabrication and use, differences exist. There is a similarity of shapes, due to a similar purpose, but no relationship between the "Kmlo tools" and the "Çayönü tools".

"Kmlo tools" versus Paluri "hook-like tools". In Armenia, similar obsidian tools were recently collected from the surface (Gegharot-1 - Upper Kasakh valley, Shirakavan-1 - Akhurian valley, Vahagni-1 and Aruch-1 - Ararat depression) and from some cave sites and rock-shelters in Northern Armenia (Kuchak-1, Yenokavan-2 and Kruglaya Shishka-1). Judging from the retouch technique, theses specimens are identical with "Kmlo Tools" (Fig. 12). Again burin facets are observed on some cases. These finds indicate that "Kmlo Tools" were probably a common tool in this region.

Moreover, in Georgia, a culture attributed to the early Neolithic, the Paluri-Nagutny culture, is characterised by a similar type of denticulated tool, referred to as "lekala" or "hook-like tool" (Grigolia 1977) (Fig. 12). In the Paluri-Nagutny culture, the lithic assemblage is very similar to what is found at the sites of the Kmlo-2 tradition, with a large microlith component, a few large blades, small unipolar nuclei, and a few elements of grinding tools.

Geographically the Paluri-Nagutny tradition sites tend to concentrate in the highland zone of north-western Georgia, South and North Ossetia, Kabardino-Balkaria, where the objects are in flint, but also on the high plateaus of southern Georgia where the objects are in obsidian, the source probably being the large obsidian deposit of Chikiani ("Paravani group") (Kiguradze, Menadbe 2004). Most of the sites of

this culture are found in altitude and several are caves or rock shelters; all have produced only one level of occupation, and none has been dated by ^{14}C.

Provenance of the obsidian. The study of the provenance of the obsidian used at Kmlo-2 has not enabled the establishment of a link with the Chikiani deposit. In fact, analysis of some thirty artefacts from this site, including 20 Kmlo tools, has shown that the sources of supply were diversified (Fig. 13):

- Gutansar, which lies at a distance requiring about 7 hours of walking, or 1 day
- Tsaghkunyats, at the same distance; but several pieces found at Kmlo-2 have a cortical surface, indicating that original blocks were river cobbles; therefore, they were probably collected in the Kasakh River, which carries many obsidian blocks from its upper course along the Tsaghkunyats range;
- Arteni, which lies at about 16 hours' walk from Kmlo-2, that is 2 to 3 days;
- one sample came from the region of Kars (Sarikamish) and was probably sampled in the secondary deposits accumulated by the Kars river at its confluent with the Akhurian;
- a last sample came from Geghasar, south-west of Lake Sevan.

In any case, the obsidian is exclusively of local origin; there is no material imported from the Lake Van region, near Çayönü, nor from Chikiani in Georgia.

Conclusions

The prehistoric cultures that developed on Armenian territory, between the Last Glacial Maximum (20,000-18,000 BP) and the settlement in the Ararat plain about 7000 BP (or 6000 cal BC) of Neolithic populations that had mastered agriculture and herding ("Aratashen culture"), remain very poorly known. The sites of Kalavan-1 and Kmlo-2 shed some light on this period.

The camp at Kalavan-1, established in the mountains overlooking the north shore of Lake Sevan, provides evidence for the reoccupation by humans of the middle altitude regions (about 1600 m) at the beginning of the Greenland Interstadial I warming (15,000-14,000 BC). It demonstrates that these populations were familiar with the migration circuits of wild Caprinae, as well as the location of obsidian sources around Lake Sevan. The technical methods used for knapping and for the transformation of blanks into tools, in particular the many backed pieces and backed points, are typical of the Epigravettian tradition. They relate Kalavan-1 to the Epigravettian culture, known thus far to stretch towards the East to Dniepr basin and Don basin, to western Georgia (Dzudzuana) and southwestern Turkey (Öküzini).

The site of Kmlo-2 is evidence for the presence of human groups at the beginning of the Holocene in the region of the Aragats massif. With a cave occupation and a tool kit of microlithic tradition, the culture represented at Kmlo-2 is related to the Mesolithic. But a particular category of artefacts (the "Kmlo tools"), with abrupt, very regular pressure retouch, is reminiscent of both the "Çayönü tools", present in northern Mesopotamia between the 8 and the 6th millennia BC, and the "hook-like tools" of the Paluri-Nagutny culture which developed on the south-west flank of the Greater Caucasus and then on the high plateaus of southern Georgia in an adjoining period. The relations that existed between Kmlo-2 and these cultures will be the subject of a thorough study.

Moreover, research should especially be continued in order to bring to light the sites of the beginning of the Holocene, which will enable a better understanding of human occupation of Armenia in this period, as well as the origin, for this region, of the domestication process of the flora and the fauna.

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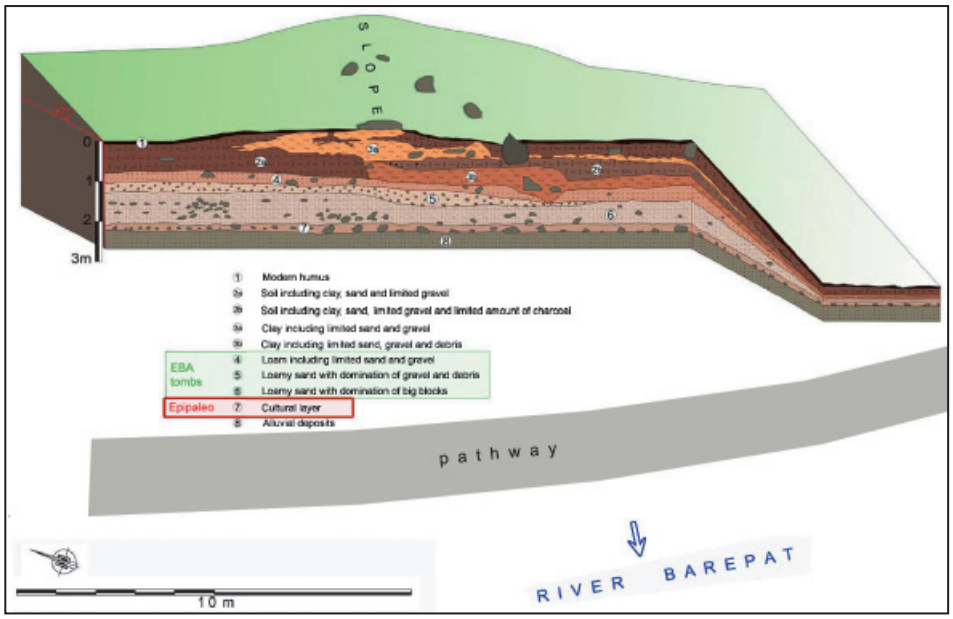
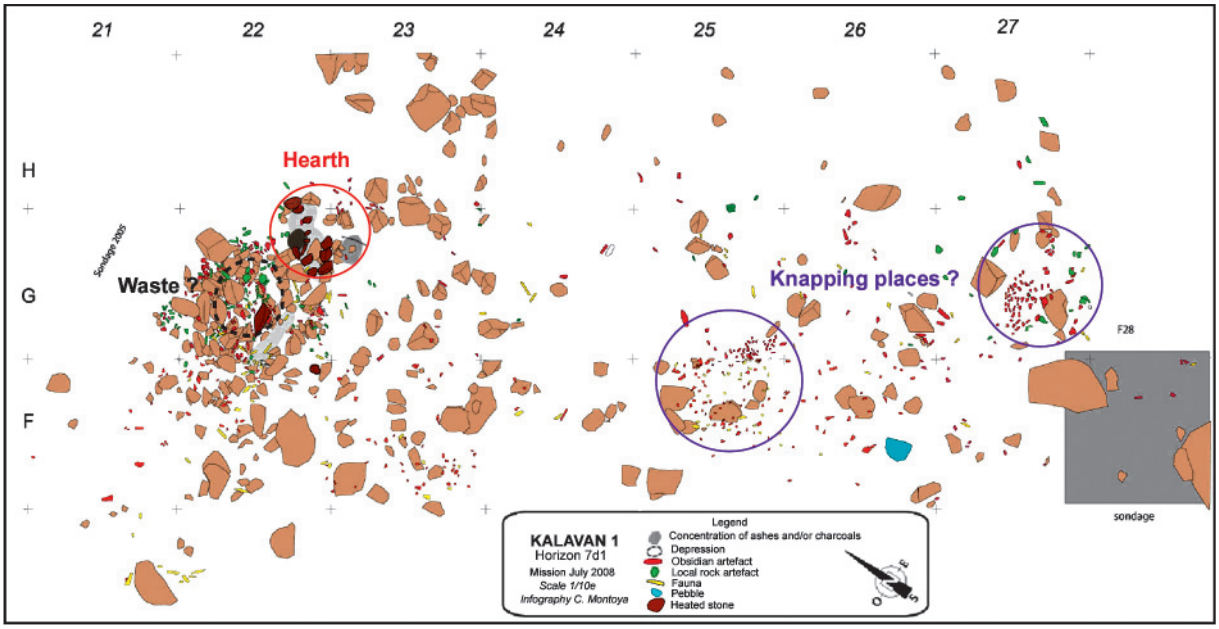
Lake Çildir
Kars
Debed
Agstev
KURA
Mingechaur lake-reservoir
AZERBAIJAN
Chalcolithic
Tsaghkahovit
APARAN
Epipalaeolithic
Genk
Kalavan-1
ARAGATS
Kmlo-Apnagyugh
Mesolithic/Neolithic
Akhurian
Kasakh
Razdan
Lake Sevan
Terter
ARAXES
Aratashen
YEREVAN
Aknashen-Khatunarkh
Neolithic/Chalcolithic
ARARAT
Arpa
Vedi
Chalcolithic
Godedzor
SISIAN
Nakhichevan
TURKEY
IRAN
0
50 km
Lake Van

1


SLOPE
0
1
2
3m
1 Modern humus
2a Soil including clay, sand and limited gravel
2b Soil including clay, sand, limited gravel and limited amount of charcoal
3a Clay including limited sand and gravel
3b Clay including limited sand, gravel and debris
EBA tombs
4 Loam including limited sand and gravel
5 Loamy sand with domination of gravel and debris
6 Loamy sand with domination of big blocks
Epipaleo
7 Cultural layer
8 Alluvial deposits
pathway
10 m
RIVER BAREPAT

2

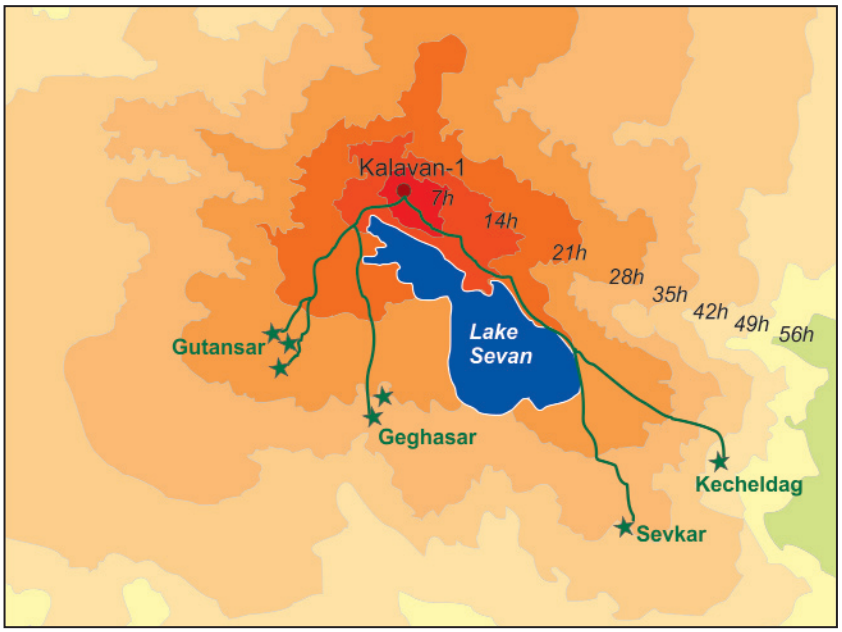
3



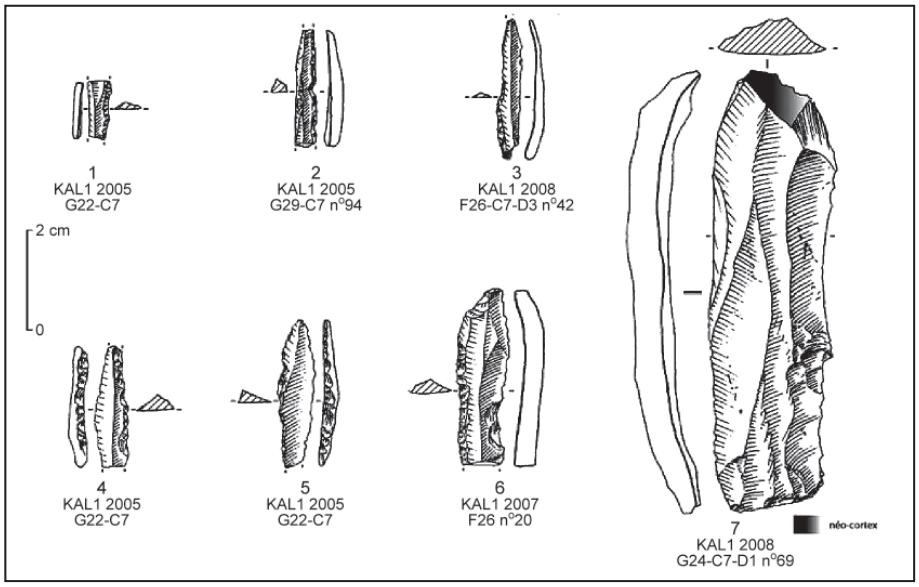
4

Code	Level	Locus	Material	Date BP	Date cal. BC (1 sigma)
Ly-3537 (GrA)	7b	H29	Bone	14,070 ± 60 BP	15,032-14,628 cal. BC
Poz-19665	7d	GH33	Bone	14,060 ± 70 BP	15,024-14,611 cal. BC
Poz-19664	7b	F22-2	Bone	13,800 ± 60 BP	14,686-14,280 cal. BC
Ly-3538 (GrA)	7d	H29	Bone	13,750 ± 60 BP	14,619-14,218 cal. BC
UGAMS-03486	7d3	G24	Bone	13,450 ± 40 BP	14,207-13,843 cal. BC
UGAMS-03414	7d1	G22	Charcoal	11,520 ± 50 BP	11,455-11,353 cal. BC

5


Kalavan-1
7h
14h
21h
28h
35h
42h
49h
56h
Lake Sevan
Gutansar
Geghasar
Kecheldag
Sevkar

6


1
KAL1 2005
G22-C7
2
KAL1 2005
G29-C7 n°94
3
KAL1 2008
F26-C7-D3 n°42
2 cm
0
4
KAL1 2005
G22-C7
5
KAL1 2005
G22-C7
6
KAL1 2007
F26 n°20
7
KAL1 2008
G24-C7-D1 n°69
néo-cortex

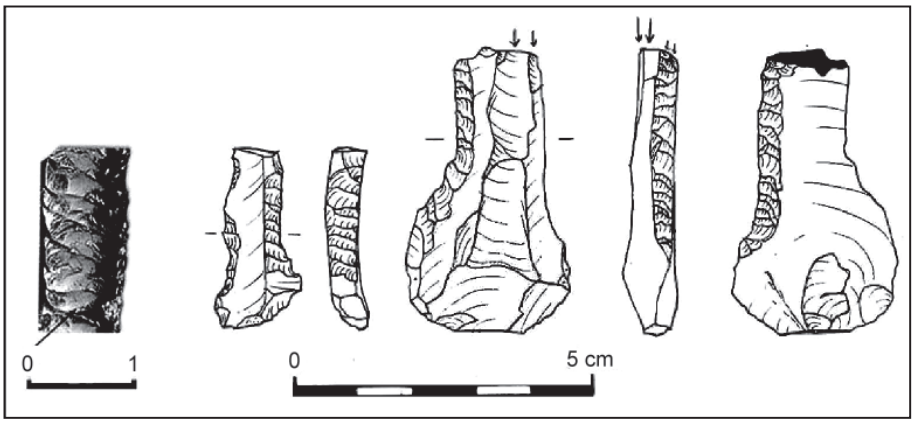
7


2002
test sounding

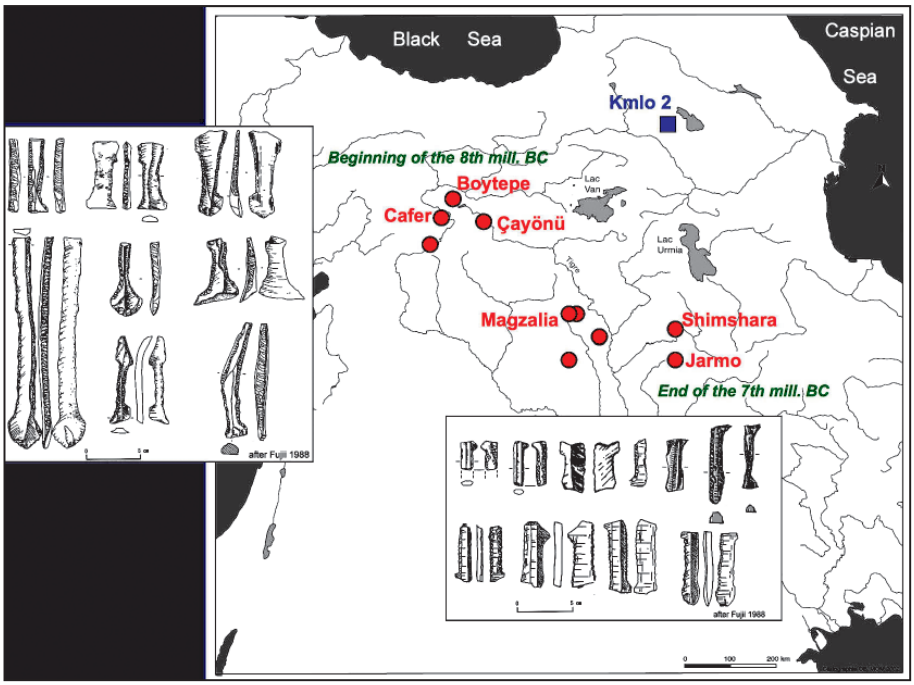
8

Lab. ref.	Material	Date BP	Date cal. AD or BC (2 sigmas)	Locus	Layer (horizon)
Ly-13663	charcoal	975 ± 30	1014-1155 AD	D2b	5 (1)
Ly-12512	charcoal	1095 ± 35	887-1017 AD	C2d	3 or 4
UGAMS-4077a	burnt bone (*Ovis*/*Capra*) (bioapatite)	5290 ± 30	4233-4041 BC	C2a	5 (7)
Ly-2761 (OxA)	burnt bone (*Ovis*/*Capra*)	5515 ± 35	4451-4327 BC	C2a	5 (7)
Ly-2817 (Sac1777)	charcoal	5555 ± 60	4520-4325 BC	C2d	5 (5)
UGAMS-4077	burnt bone (*Ovis*/*Capra*) (collagen)	5610 ± 30	4499-4360 BC	C2a	5 (7)
Ly-2762 (OxA)	burnt bone (*Ovis*/*Capra*)	6640 ± 40	5631-5509 BC	C2a	5 (7)
Poz-19666	bone (*Ovis*/*Capra*)	8500 ± 50	7596-7492 BC	C2a	5 (7)
UGAMS-4076a	bone (*Ovis*/*Capra*) (bioapatite)	8620 ± 30	7686-7581 BC	C2a	5 (7)
UGAMS-4076	Bone (*Ovis*/*Capra*) (collagen)	9840 ± 30	9325-9251 BC	C2a	5 (7)
AA-68562	bone (*Ovis*/*Capra*)	10024 ± 91	9880-9300 BC	D1a	5 (7/8)
AA-68563	bone (*Ovis*/*Capra*)	10184 ± 93	10236-9447 BC	E3b	5 (7/8)
Poz-20231	bone (fish)	10900 ± 50	10981-10872 BC	C1c	5 (9)

9



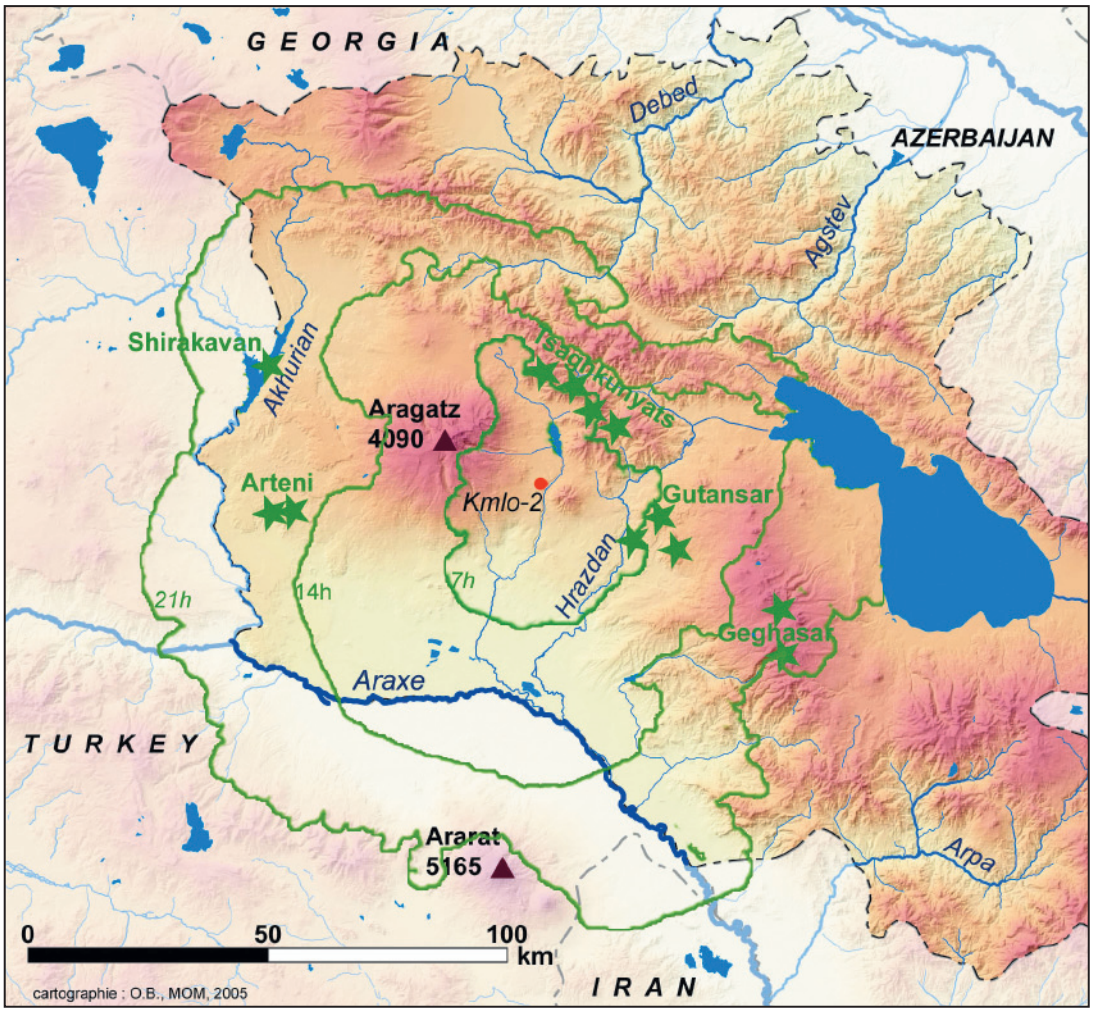
10



11


Lebiki
Paluri
Burgnari
Nagutny
BLACK
SEA
GEORGIA
Beshumi
Akhalkalaki
Gegharot
ARMENIA
Kmlo-Apnagyugh
Lake Sevan
Lake Van
CASPIAN
SEA
AZERBAIJAN
NAGUTNY
AKHALKALAKI
PALURI
GEGHAROT

12


GEORGIA
Debed
AZERBAIJAN
Agstev
Shirakavan
Akhurian
Tsaghkunyats
Aragatz
4090
Arteni
Kmlo-2
Gutansar
Hrazdan
21h
14h
7h
Geghasar
Araxe
TURKEY
Ararat
5165
Arpa
0
50
100
km
IRAN
cartographie : O.B., MOM, 2005

13