Marcel Otte, Sonia Shidrang & Damien Flas (eds.) - *L'Aurignacien de la grotte Yafteh et son contexte (fouilles 2005-2008) / The Aurignacian of Yafteh cave and its context (2005-2008 excavations).* Liège, ERAUL 132, 2012, p. 137-160.

# VII - THE EARLY UPPER PALEOLITHIC OF THE CAUCASUS IN THE WEST EURASIAN CONTEXT

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Beginning in the mid 1990s, new data has begun to emerge, changing our knowledge of the character and origin of the Early Upper Paleolithic (EUP) in the Caucasus (Meshveliani *et al.* 2004; Bar-Yosef *et al.* 2006, 2011; Adler *et al.* 2006a, 2006b, 2008; Golovanova *et al.* 2006, 2010a, 2010b; Tushabramishvili *et al.* 2012). Modern excavation techniques, including total sediment water screening and an expanded series of absolute dates (table 1) from recently excavated sites (fig. 1) have revolutionized the perception of the EUP in this region, with important implications for our understanding of regional developments and spread of the EUP in Western Eurasia.

## 1. The Early Upper Paleolithic in the northern Caucasus

### 1.1. Mezmaiskaya Cave

Mezmaiskaya Cave is situated in the northwestern Caucasus, on the Lago-Naki plateau, in the Sukhoi Kurdjips River valley (a tributary of Belaya River, Kuban River basin) (fig. 1). The cave is located at an elevation of 1310 m above sea level, at 440 N and 400 E. It is more than 500 square meters and faces southwest. Since 1987, about 100 square meters have been carefully excavated to a maximum depth of 5 m, yielding thousands of lithic and organic artifacts, and a rich faunal assemblage. Currently the stratigraphic sequence of the cave consists of 3 Holocene and 20 Pleistocene strata. Until recently, Mezmaiskaya was widely known as a Middle Palaeolithic Micoquian occupation, in which a Neanderthal newborn skeleton is found (Golovanova *et al.* 1999; Golovanova & Doronichev 2003). Since 1997, in the interior part of the cave, eight stratified Upper Palaeolithic layers (UP, from top to bottom): 1-3, 1-4, 1A-1, 1A-2, 1A-3, 1B-1, 1B-2, and 1C are being excavated.

The earliest UP layer 1C is excavated so far in about 25 square meters. Layer 1C (10 to 20 cm in depth) is replete with ash, charred wood, and bone fragments, and shows evidence of intensive human occupation: about 390 lithic artifacts and 300 bone fragments are found per one square meter. Also, layer 1C is unique in the Early Upper Paleolithic (EUP) of the Caucasus in its high level of preservation of organic materials and human-made structures. Remains of several artificial structures are carefully excavated in the layer. They include two scooped out pits intruded into the underlying deposits and three fireplaces. The latter include a small (48x30 cm) fireplace and a large (105x90 cm) fireplace surrounded by limestone blocks. The most interesting structure is the third fireplace that represents a real hearth (88x60 cm) having a complex construction: first, a small pit was scooped out to the depth of 20-30 cm; then the southwestern edge (those facing to the cave entrance) of the pit was ringed by limestone slabs slightly inclining toward the interior of the pit.

**Dating**

There are now 11 radiometric (mostly accelerator mass spectrometry, AMS) dates obtained by 5 different laboratories for the EUP layer 1C of Mezmaiskaya Cave (table 1). Layer 1C has an AMS date of 32,010 ± 250 BP (uncal., Beta-113536) on wood charcoal from a hearth in quadrant M-17. The Geological Institute RAS (GIN) in Moscow obtained a conventional date of 32,900 ± 900 BP (uncal., GIN-10946) on a sample of small bone fragments. The University of Arizona laboratory obtained an AMS date of 36,100 ± 2.300 BP (uncal., AA-41856) on a long bone fragment found in quadrant M-17 near the above hearth. The University of Colorado laboratory again obtained a series of three dates from a single charcoal sample divided into three parts: 33,000 ± 240 BP (uncal., CURL-5760), 33,100 ± 270 BP (uncal., CURL-5761), and 33,000 ± 260 BP (uncal., CURL-5762). These radiocarbon results estimate the onset of the EUP in layer 1C at ~33 ka $^{14}$C BP or about 38–37 ka cal BP applying CalPal_2007_HULU (Adler *et al.* 2008; Golovanova *et al.* 2010b).

More recently 5 AMS determinations using ultrafiltration, which are obtained at the Oxford Radiocarbon Accelerator Unit (ORAU) from humanly modified cut-marked bones from layer 1C at Mezmaiskaya (Pinhasi *et al.* 2011: table S2), are more variable, from 20.640 ± 130 BP (uncal., OxA-21819) to 34.750 ± 650 BP (uncal., OxA-21820), than the previous AMS estimates for this layer, and one of Oxford results (OxA-21819) is significantly younger compared with all other dates and the site stratigraphy. In our opinion, this may be due to the small sizes of these dating samples.

The total series of $^{14}$C results (excluding the aberrant date OxA-21819) using the IntCal09 dataset (Pinhasi *et al.* 2011: Table S2)

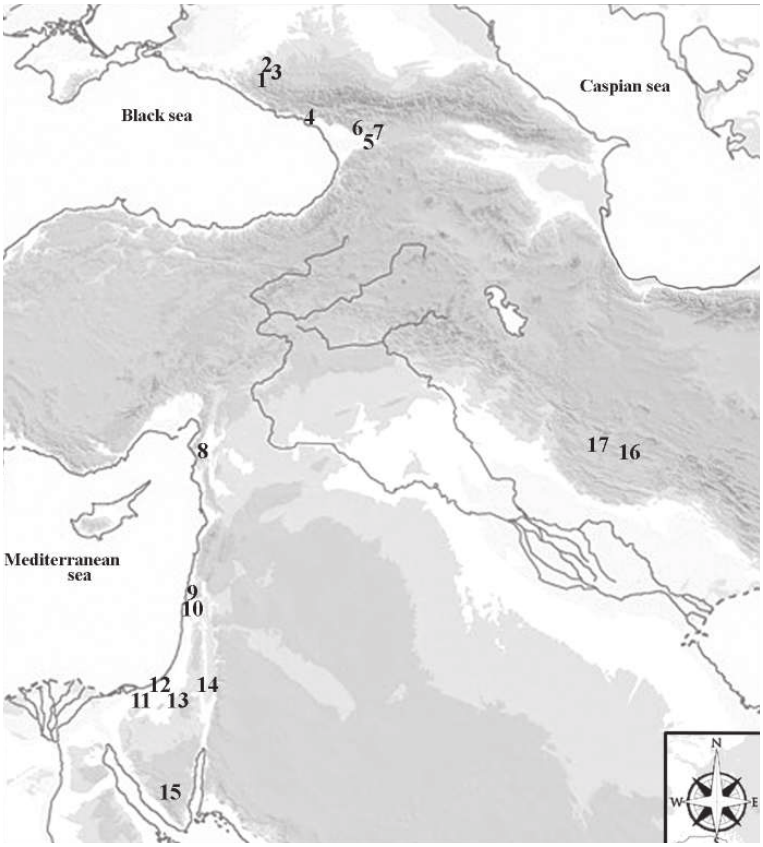


Figure 1 – Map showing EUP sites in the Caucasus, Levant, and Zagros. 1 – Mezmaiskaya; 2 – Korotkaya; 3 – Kamennomostskaya; 4 – Apiancha; 5 – Bondi; 6 – Ortvala Klde; 7 – Dzudzuana; 8 – Ucagizli; 9 – Qufzeh; 10 – Kebara; 11 – Lagama VII, VIII and IIID; 12 – Nizzana XIII; 13 – Boker A; 14 – Tor Sadaf, Ain al-Buhayra, Multaqa al-Widyan; 15 – Abu Noshra 1, II, VI; 16 – Yafteh; 17 – Warwazi

defines with 95.4% probability the calendric age of the EUP occupations in layer 1C at Mezmaiskaya from about 39-36 ka cal BP (for the earlier seven dates from 36 to 32 ka $^{14}$C BP) to about 33-31 ka cal BP (for the younger three dates from 29 to 27 ka $^{14}$C BP).

**Lithic industry**

The large assemblage of 9564 lithic artifacts was found in layer 1C in total, including material derived from water sieving (table 2). The bulk of this assemblage was made on a local gray flint. However, the collection of layer 1C includes a large number of colored flint pieces that were transported to the cave from distant sources located 60 km and more from the cave (Doronicheva 2009). There are many obsidian artefacts. The nearest natural outcrops of obsidian today are known in Zaiukovo, north-central Caucasus, but there are also sources in the southern Caucasus. Once the obsidian from the Mezmaiskaya assemblage is sourced, we will be able to develop hypotheses of migration routes through the mountains. Obsidian artifacts from the EUP layer 1C were analyzed by S. Shackley (Golovanova *et al.* 2010a). The study suggests that these EUP artifacts may have been produced from obsidian procured from the Kojun Dag (Paravan) source located to the southwest of the Caucasus in southern Georgia. These results suggest that the inhabitants of the EUP layer 1C at Mezmaiskaya had some contact with areas quite distant from the cave, including the southern Caucasus.

Most of the collection (49.8%) of layer 1C is composed of chips (5-10 mm) and micro-chips (1-5 mm), and also small flint debris (13.5%) found by water screening of excavated sediments. This data testifies to active tool production and rejuvenation in the site. Most cores are heavily used and represent exhausted pieces (fig. 2:4-8). A large quantity of technical (i.e., core trimming) debitage (table 2) points to the important role of core preparation and modification in this industry. Most of the technical debitage (153 pieces), such as crested blades (fig. 2:9, 12), result from the preparation or modification of flaking surfaces, while core tablets (fig. 2:10, 11) result from the preparation of striking platforms.

There are 61 cores in varying stages of reduction – from testing cores with cortex and few scars, prismatic cores with bladelet or micro-bladelet removals (fig. 2:1,2,4) to heavily reduced and exhausted cores (fig. 2:5-8). Some cores may be defined as carinated items (fig. 2:4). Cores in total demonstrate a high level of reduction.

| Site | Stratum | Lab. No | Method | Material | Age $^{14}$C BP | Source |
|---|---|---|---|---|---|---|
| **NORTHERN CAUCASUS** | | | | | | |
| Mezmaiskaya | Layer 1C | OxA-21821 | AMS | Bone | 27,070 ± 250 | Pinhasi *et al.* 2011 |
| | | OxA-21820 | AMS | Bone | 34,750 ± 650 | |
| | | OxA-21819 | AMS | Bone | 20,640 ± 130 | |
| | | OxA-21105 | AMS | Bone | 28,880 ± 140 | |
| | | OxA-21104 | AMS | Bone | 28,510 ± 140 | |
| | | Beta-113536 | AMS | Wood charcoal | 32,010 ± 250 | Golovanova *et al.* 2010 |
| | | CURL-5762 | AMS | Wood charcoal | 33,000 ± 260 | |
| | | CURL-5760 | AMS | Wood charcoal | 33,000 ± 240 | |
| | | CURL-5761 | AMS | Wood charcoal | 33,100 ± 270 | |
| | | GIN-10946 | Conven. | Bone | 32,900 ± 900 | |
| | | AA-41856 | AMS | Bone | 36,100 ± 2,300 | |
| Korotkaya | Layer 2, horizon 8 | LU-5601 | Conven. | Bone | 30,200 ± 2,400 | Blajko 2009 |
| | | SPb-87к3 | Conven. | Bone | 32,800 ± 2,000 | First publication |
| **SOUTHERN CAUCASUS** | | | | | | |
| Dzudzuana | Unit D | RTT-4336 | AMS | Charcoal | 26,320 ± 260 | Bar-Yosef *et al.* 2011 |
| | | RTT-4340 | AMS | Charcoal | 26,925 ± 255 | |
| | | RTA-3436 | AMS | Bone | 27,150 ± 300 | |
| | | RTA-3437 | AMS | Bone | 27,400 ± 300 | |
| | | RTT-4338 | AMS | Bone | 27,450 ± 275 | |
| | | RTT-4701 | AMS | Charcoal | 32,140 ± 500 | |
| | | RTA-3438 | AMS | Bone | 30,350 ± 400 | |
| | | RTT-4747 | AMS | Bone | 29,445 ± 1,015 | |
| | | RTT-5745 | AMS | Bone | 27,260 ± 775 | |
| Ortvale Klde | Layer 4C | AA-38193 | AMS | Charcoal | 30,660 ± 430 | Adler *et al.* 2008 |
| | | AA-38197 | AMS | Charcoal | 30,260 ± 490 | |
| | | RTT-4207 | AMS | Charcoal | 31,900 ± 780 | |
| | | RTT-4210 | AMS | Charcoal | 31,700 ± 500 | |
| | | RTT-4209 | AMS | Charcoal | 31,800 ± 400 | |
| | | RTT-4208 | AMS | Charcoal | 32,200 ± 550 | |
| | | RTT-4211 | AMS | Charcoal | 32,300 ± 550 | |
| | | AA-45865 | AMS | Charcoal | 32,510 ± 530 | |
| | | RTT-4214 | AMS | Charcoal | 34,100 ± 800 | |
| | | RTT-4213 | AMS | Charcoal | 34,600 ± 600 | |
| | | AA-45864 | AMS | Charcoal | 33,700 ± 620 | |
| | | RTT-4212 | AMS | Charcoal | 34,300 ± 650 | |
| | Layer 4d | RTT-4725 | AMS | Bone | 38,100 ± 935 | |
| Bondi | Layer Vb | Beta-270161 | AMS | Bone | 21,550 ± 120 | Tushabramishvili *et al.* 2012 |
| | | SacA-12068 | AMS | Bone | 24,620 ± 300 | |
| | Layer VI | SacA-12069 | AMS | Bone | 31,270 ± 640 | |
| **LEVANT** | | | | | | |
| Ucagizli | Above B | AA-35258 | AMS | Charcoal | 31,060 ± 140 | Kuhn *et al.* 2003 |
| | Layer B | AA-38203 | AMS | Aragonite | 29,130 ± 380 | |
| | Layer BI | AA-38201 | AMS | Aragonite | 32,670 ± 760 | |
| Qafzeh | Layer 9 | Amino-Acid racemization | | Bone | 31,950 | Bar-Yosef & Belfer-Cohen 2004 |
| | | Amino-Acid racemization | | Bone | 38,950 | |
| | | Amino-Acid racemization | | Bone | 46,950 | |
| | | GifA-97337 | AMS | Charcoal | 28,340 ± 360 | |
| | | AA-27291 | AMS | Charcoal | 28,020 ± 320 | |
| | | GifA-98230 | AMS | Charcoal | 29,060 ± 390 | |
| | | AA-27292 | AMS | Charcoal | 28,380 ± 330 | |
| | Layer 11 | GifA-97338 | AMS | Charcoal | 31,520 ± 490 | |
| | | AA-27290 | AMS | Charcoal | 29,320 ± 360 | |
| Kebara | Level IIIA | Pta-4263 | AMS | Charcoal | 31,400 ± 480 | Gorring-Morris & Belfer-Cohen 2003, Appendix; Rebollo *et al.* 2011 |
| | Lev. IIIBf | Pta-5002 | AMS | Charcoal | 42,500 ± 1,800 | |
| | | Pta-4987 | AMS | Charcoal | 42,100 ± 2,100 | |
| | | OxA-3977 | AMS | Charcoal | >43,800 | |
| | | OxA-1567 | AMS | Charcoal | 35,600 ± 1,600 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kebara | Lev. IIIBf | Pta-4267 | AMS | Charcoal | 36,000 ± 1,100 | Gorring-Morris & Belfer-Cohen 2003, Appendix; Rebollo *et al.* 2011 |
| | | OxA-3976 | AMS | Charcoal | 43,500 ± 2,200 | |
| | | OxA-18425 | AMS | Charcoal | 41,200 ± 450 | |
| | | RTO 5590 | AMS | Charcoal | 42,600 ± 500 | |
| | | RTOX 5796-2 | AMS | Charcoal | 42,800 ± 650 | |
| | | OxA-18424 | AMS | Charcoal | 40,350 ± 400 | |
| | Level IIIB | RTO 5679-1 | AMS | Charcoal | 40,500 ± 400 | |
| | | RTO 5679-1 | AMS | Charcoal | 40,600 ± 400 | |
| | | RTO 5589 | AMS | Charcoal | 42,850 ± 550 | |
| | | RTOX 5589-2 | AMS | Charcoal | 41,400 ± 1,200 | |
| | | Pta-4267 | AMS | Charcoal | 36,100 ± 1,100 | |
| | Level IVB | OxA-3978 | AMS | Charcoal | 28,890 ± 400 | |
| | | Pta-5002 | AMS | Charcoal | 42,500 ± 1,800 | |
| | | Pta-4987 | AMS | Charcoal | 42,100 ± 2,100 | |
| | | OxA-3978 | AMS | Charcoal | 28,890 ± 400 | |
| | Level IV | RTO 5680-1 | AMS | Charcoal | 41,650 ± 450 | |
| | | RTOX 5680-2 | AMS | Charcoal | 40,400 ± 400 | |
| | | RTO 5681-1 | AMS | Charcoal | 43,600 ± 600 | |
| | | RTOX 5681-2 | AMS | Charcoal | 40,300 ± 550 | |
| | | RTOX 5797-2 | AMS | Charcoal | 35,160 ± 310 | |
| | | RTO 5799-1 | AMS | Charcoal | 36,110 ± 330 | |
| | | RTOX 5799-2 | AMS | Charcoal | 40,500 ± 1,200 | |
| | Lev. IV/V | Pta-5141 | AMS | Charcoal | 43,700 ± 1,800 | |
| | | OxA-2800 | AMS | Bone | 33,500 ± 930 | |
| Boker A | | SMU-187 | AMS | Charcoal | >33600 | Monigal 2003 |
| | | SMU-260 | AMS | Charcoal | >33420 | |
| | | SMU-578 | AMS | Charcoal | 37,920 ± 2,810 | |
| Abu Noshra I | | B-12125 | AMS | Charcoal | >30,440 | Gorring-Morris & Belfer-Cohen 2003, Appendix |
| | | B-13897 | | Sediment | 25,950 ± 360 | |
| | | SMU-1824 | AMS | Charcoal | 31,330 ± 2,880 | |
| | | SMU-2254 | AMS | Charcoal | 35,824 ± 1,090 | |
| Abu Noshra VI | | SMU-2371 | AMS | Charcoal | 31,100 ± 300 | |
| Lagama VII | | SMU-172 | AMS | Charcoal | 34,170 ± 3,670 | |
| | | SMU-185 | AMS | Charcoal | 31,210 ± 2,780 | |

Table 1 – Radiometric dates of EUP in the Caucasus and Early Ahmarian in the Levant.

Blades, bladelets, and micro-bladelets predominate (62.2%) among total flakes. Bladelets and micro-bladelets are most common among laminar blanks (table 2 & 4), while blades are relatively infrequent (16.7% of laminar blanks). The overwhelming prevalence of tools manufactured on blades, bladelets, and micro-bladelets – 75.8 percent of the tool set – is a significant characteristic of the lithic industry from EUP layer 1C. However, more than half of the end-scrapers are made on core trimming flakes or plain flakes often having cortex areas (fig. 3:2, 4). Also, burins are produced on core trimming flakes (fig. 4:7) or plain flakes often with cortex areas (fig. 4:3), and crested blades (fig. 4:6).

Most end-scrapers are made on thick flakes by abrupt retouch (fig. 3:2, 3, 4), and some are similar to carinated (fig. 3:6) or rounded scrapers (fig. 3:5). Only 3 end-scrapers are made on blades (Fig. 3-1, 8), including a scraper on a large and long (12.7 cm) blade (fig. 3:1), and 5 end-scrapers are made on blade fragments (fig. 3:7). Indeed, a few Aurignacian retouched end-scrapers on blades and no typical Aurignacian carinated or nosed scrapers are found in the EUP layer 1C at Mezmaiskaya.

Burins are less represented (5.9%) than end-scrapers (6.6%) in layer 1C and quite variable – dihedral axial (fig. 4:1, 8), dihedral angled (fig. 4:7), angled, a burin on a straight retouched truncation (fig. 4:4), a double burin on blade (fig. 4:5) combining one similar to the Noailles burin (after Brezillon 1971) and angled burin, and few multifaceted burins (fig. 4:2, 3, 6). Very rare pièces esquillées are made on flakes (fig. 3:9) or blade fragments (fig. 3:10).

Backed bladelets (fig. 5:17, 18, 19, 21) are most common (48.2%) among tools (table 3), while bladelets with bilateral backed retouch (fig. 5:22) are rare. Blades and bladelets with fine direct retouch (fig. 5:20) are also quite numerous (17.1%).

Points are the second most common group of tools (17.5%) and are dominated by Gravette points (after Brezillon 1971:318; Demars & Laurent 1992) – 52.5 percent (fig. 5:12, 13, 14), including Gravette point fragments (fig. 5:15) and some micro-Gravette points (fig. 5:5). Also numerous (22.5%) are symmetrical points with abrupt or semi-abrupt retouch, all found in distal fragments (fig. 5:6-10). There are some needle-like double points made on micro-bladelets by abrupt retouch (fig. 5:1-4), and points with oblique retouch (fig. 5:11, 16).

**Organic artifacts**

Bone tools form a significant component of the layer 1C artifact assemblage and are quite variable. They include 5 massive awls (fig. 6:9, 10), a borer-polisher (fig. 6:4), a fragment of needle with eye

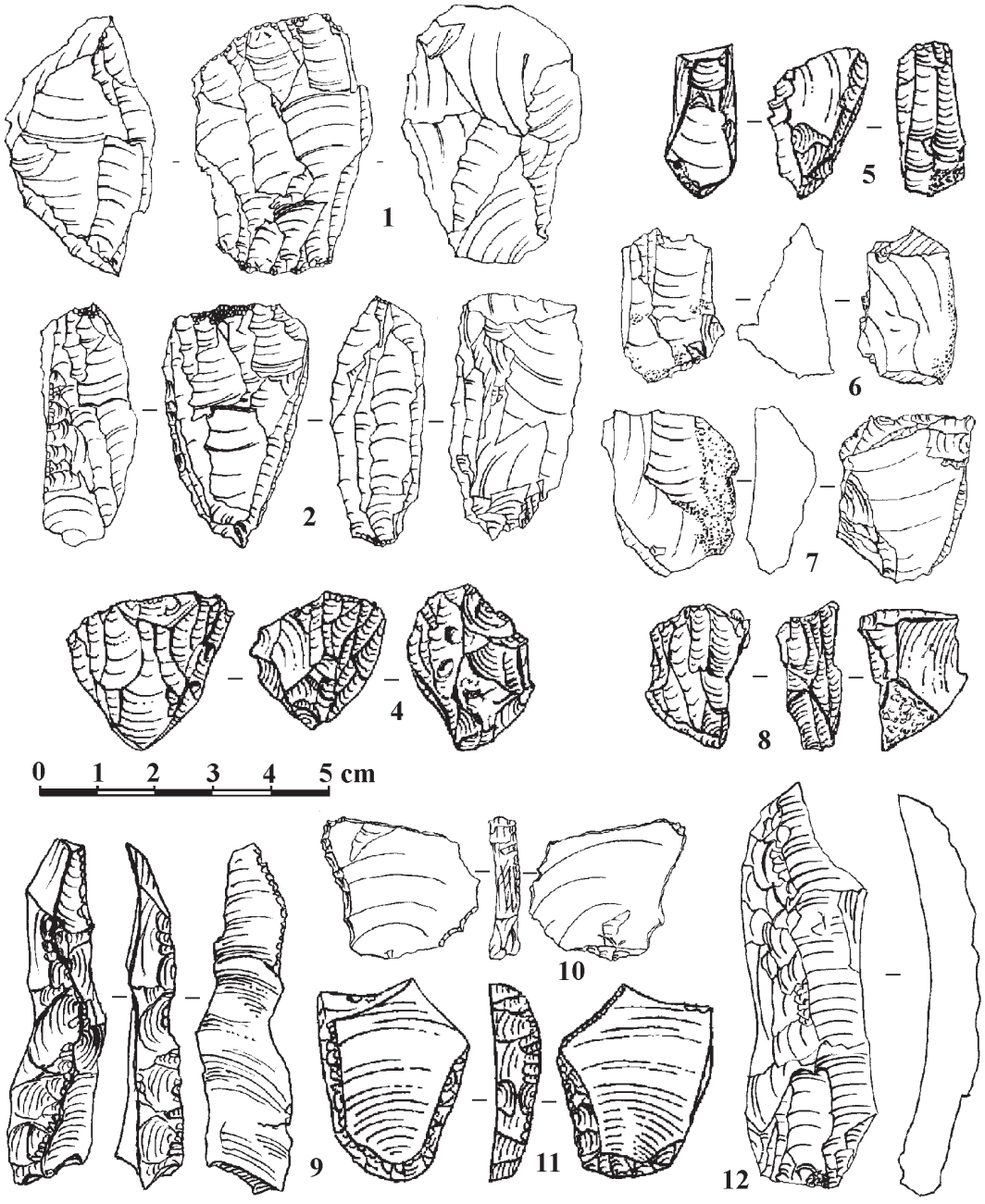


Figure 2 – Mezmaiskaya Cave. Layer 1C. 1-8 – blade/bladelet cores; 9, 12 – crested blades; 10, 11 – core tablets

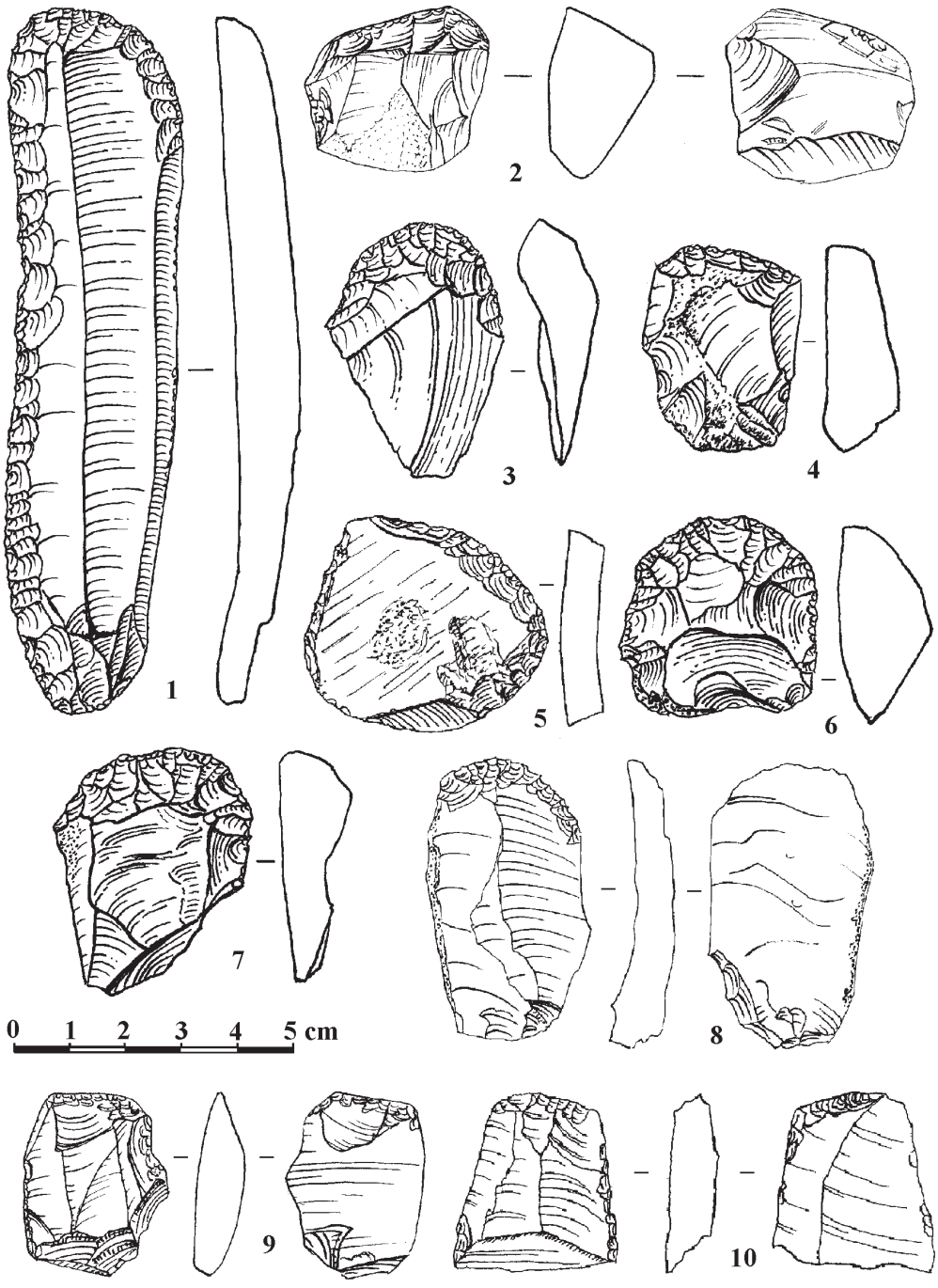


Figure 3 – Mezmaiskaya Cave. Layer 1C. 1-8 – end-scrapers on blades and flakes; 9, 10 – pièces esquillés on blade fragments

| Site/layer | Cores | Plain flakes/ cortex flakes | Blades/ cortex blades | Bladelets | Micro-bladelets | Technical flakes/CTE | Chips/burin spalls | Fragments | Tools | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Mezmaiskaya layer 1C | 61 | 987 | 313 total | 902 | 663 | 153/- | 4805/- | 1311 | 455 | 9650 |
| Dzudzuana Unit D, upper excav. | 53 | 938/189 | 279/48 | 490 | ? | -/209 | 2624/38 | 77 | 309 | 5000 |
| Dzudzuana Unit D, lower excav. | 55 | 768/245 | 188/51 | 379 | ? | -/197 | 3945/34 | 276 | 271 | 6083 |
| Bondi layer V | 28 | 381 | 326 total | 147 | ? | ? | 1431/- | 57 | 73 | 2443 |
| Bondi layer VI | 4 | 26 | 15 total | 2 | ? | ? | 8/- | 5 | 5 | 65 |

Table 2 – Composition of EUP assemblages in the Caucasus.

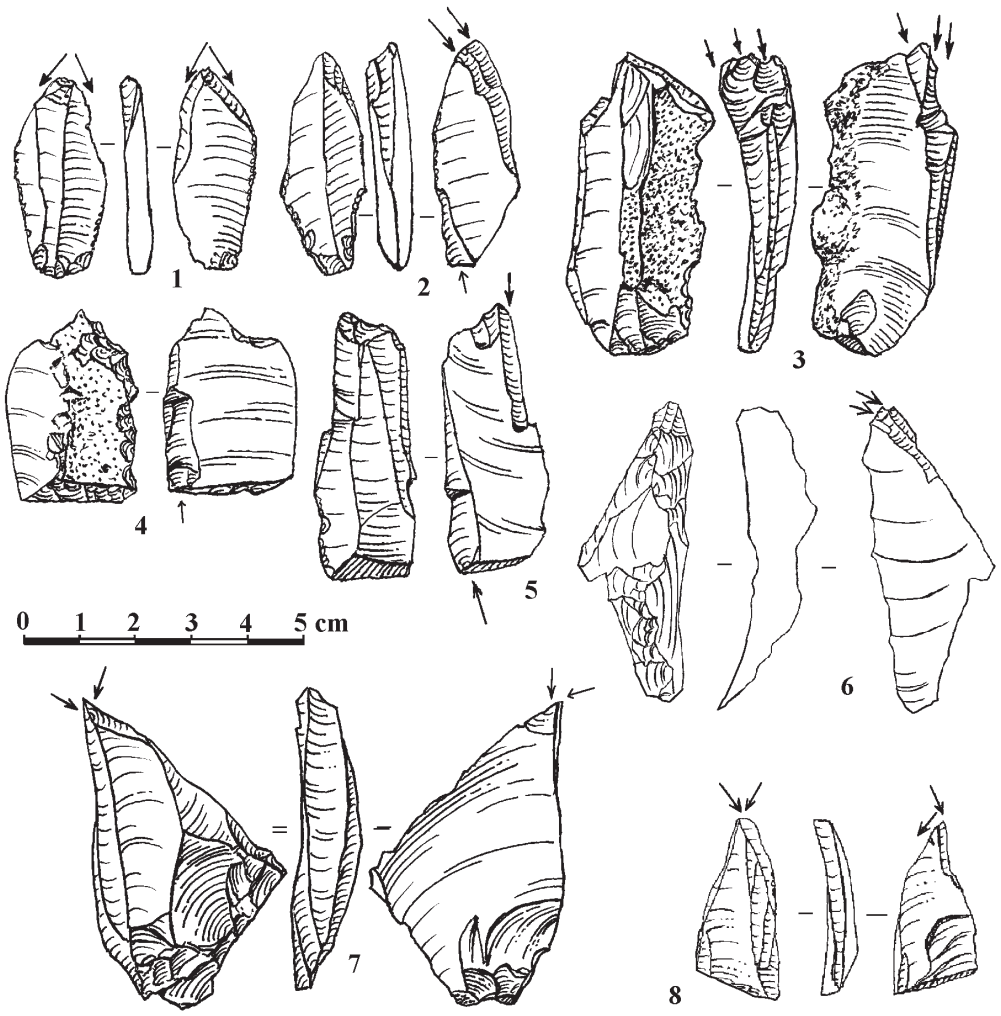


Figure 4 – Mezmaiskaya Cave. Burins from Layer 1C.

(fig. 6:3), and a tip fragment of flat point (fig. 6:2). One awl has red pigmentation, probably from ochre coloring within the layer, in the inner and part of the outer surfaces. Also, there are 8 bone points with rounded cross-sections – 2 nearly complete (fig. 6:5) and 6 tips with one refitting midsection (fig. 6:6, 7, 8). A unique pendant is made from a goat incisor notched from one side (fig. 6:1). Another unique item, which was found near the hearth in square M-17, is an unretouched flint bladelet fragment lodged in a small piece of burned unidentifiable bone (fig. 6:11).

### 1.2. Korotkaya Cave

Korotkaya Cave is located in the Khakodz River valley (a tributary of Belaya River, Kuban River basin), at an elevation of 550 m above sea level (i.e., 800 m lower than Mezmaiskaya) in the deciduous wood vegetation zone. The total area of the cave is nearby 50 sq. m. The cave was discovered in 1986 by L. Golovanova and then excavated in 2000 and 2006 by A. Blajko (2001, 2009). About 10 sq. meters excavation revealed a thick UP layer 2 excavated in eight horizons, but did not reach the bottom of the cave. The top UP horizons have close radiocarbon estimates of 24,900 ± 700 BP (uncal., GIN-10948b) and 24,500 ± 2.000 BP (uncal., GIN-10947a). The lowermost horizon 8 has two radiocarbon dates of 30,200 ± 2.400 BP (uncal., LU-5601) and 32,800 ± 2.000 BP (uncal., SPb-87k3).

The Korotkaya UP deposit produced an EUP industry dominated by bladelets, micro-bladelets, and other small tools (Blajko 2001, 2009). All lithic artifacts are manufactured from transported and mostly color flint, and no flint sources are found in the cave vicinity. The overwhelming majority of tools is made on bladelets and micro-bladelets, and backed bladelets are the most common tool group. Other bladelet tools include Gravette and Font-Yves points, bi-lateral backed bladelets, and truncated bladelets. End-scrapers or burins are not found. Organic artifacts are representing only by bone awls.

Based on the radiocarbon estimates, the lowermost UP horizon 8 at Korotkaya may be roughly synchronized with the EUP layers 1C and 1B at Mezmaiskaya cave. Consequently, the industry from Korotkaya Cave now presents the second site, after layer 1C of Mezmaiskaya, with reliable evidence of EUP occupation in the northern Caucasus. Significantly, the EUP assemblage of Korotkaya shows close similarity to the EUP of Mezmaiskaya.

### 1.3. Kamennomostskaya Cave

A. Formozov (1965) found Kamennomostskaya Cave in 1960 and excavated 24 sq. meters in 1961. The cave is located in the Meshoko River valley (a tributary of the Belaya River, Kuban River basin), at an elevation of 720 m above sea level (Fig. 1). The total area of the cave is more than 200 sq. meters, and the entrance faces to the southwest. In the cave, stratum 3 – a thick (from 1.0 to 1.9 m) yellow clay deposit – produced an UP assemblage.
Since the early 1970s, the assemblage recovered from layer 3 in Kamennomostskaya was interpreted (based only on its technological and typological characteristics) as the earliest UP Aurignacian industry in the northern Caucasus (e.g., Amirkhanov 1986; Cohen & Stepanchuk 1999). Recently, this assemblage stored in the Museum of Anthropology of Moscow State University was re-examined by Golovanova (2000; Golovanova *et al.* 2006) after Formozov's permission. The study shows major differences between the EUP of Mezmaiskaya and the Kamennomostskaya Cave material.

Flaking technology shows the most striking differences. In contrast to the Kamennomostskaya, the EUP technology at Mezmaiskaya is characterized by: a) core preparation using crests and tablets, b) production of blades and bladelets with predominantly punctiform striking platforms, and c) flaking technology oriented to the massive production of bladelets and micro-bladelets, which were then used for tool manufacture. Despite a few and minor similarities in burin and end-scraper types, the assemblages from Kamennomostskaya and Mezmaiskaya are also very different in tool typology. Layer 1C at Mezmaiskaya is dominated by micro-tools made on bladelets and micro-bladelets (57% of all tools), while only two such tools (a Dufour bladelet and a bladelet point) are found at Kamennomostskaya. On the contrary, the 'Aurignacian' characteristics of the Kamennomostskaya assemblage – blades (36%), tools on large blades (18.8%), as well as end-scrapers and burins (22.3% in total) are common, while blunted backed bladelets and bladelet points are rare (2.3%), and a Dufour bladelet is found (Golovanova 2000) – do not occur in the EUP industries from Mezmaiskaya and other sites in the Caucasus.

One can assume that most of the bladelets and other small lithics were lost during the 50-years old excavation at Kamennomostskaya because it did not involve water screening. Nevertheless, the 'Aurignacian' and some other characteristics– low percentage of punctiform platforms, absence of crested blades and core tablets, presence of Mousterian tool types – of the Kamennomostskaya assemblage contradict features observed in Mezmaiskaya and other securely excavated EUP sites in the Caucasus. This suggests that either the thick (1.0-1.9 m) lower layer 3 in Kamennomostskaya Cave contains admixture of Mousterian and UP artifacts or the UP assemblage of Kamennomostskaya totally or partially belongs to the later (post-EUP) stage of the Upper Paleolithic. Unfortunately, it is impossible to resolve this dilemma about this undated and likely inhomogeneous material by re-excavation of this site. Kamennomostskaya Cave was completely destroyed by explosive works in a limestone quarry in the end of 1980s.

## 2. The Early Upper Paleolithic in the southern Caucasus

### 2.1. Dzudzuana Cave

One of the largest caves in western Georgia – Dzudzuana Cave – is located at 440 N and 400 E and at an elevation of 560 m above sea level, in the Nekressi River gorge (Kvirila River Basin). It is about 750 sq. meters and has the entrance facing to the east. D. Tushabramishvili directed the first excavation (40 sq. m) in Dzudzuana Cave in 1966–1975, and then T. Meshveliani excavated Dzudzuana in 1983-1986. In 1996-2008, an international team led by researchers from Georgia (T. Meshveliani), USA (O. Bar-Yosef), and Israel (A. Belfer-Cohen) carefully excavated 24 sq. m. in this site using wet-sieving of the excavated deposits to retrieve the smallest artifacts. Now, the sequence of the cave is divided into four main stratigraphic units (A–D), the earliest of which (Unit D) is defined as the EUP occupation (Bar-Yosef *et al.* 2011).

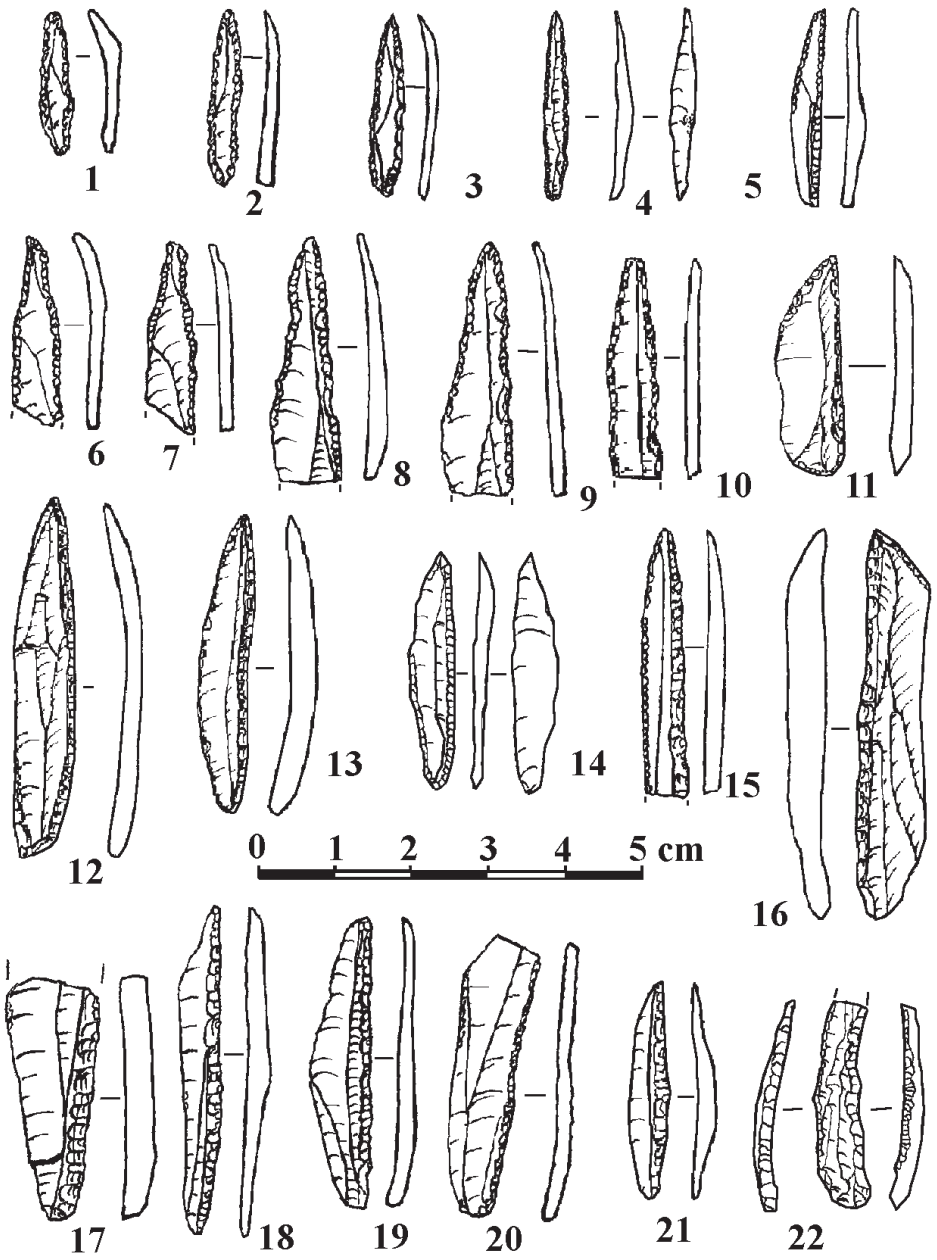


Figure 5 – Mezmaiskaya Cave. Layer 1C. 1-4 – 'needle-like' points; 5 – micro-Gravette point; 6-10 – points with symmetrical bi-lateral retouch; 11, 16 – points with oblique retouch; 12-15 – Gravette points; 17-19, 21 – backed bladelets; 20 – bladelet with fine retouch; 22 – bi-lateral backed bladelet

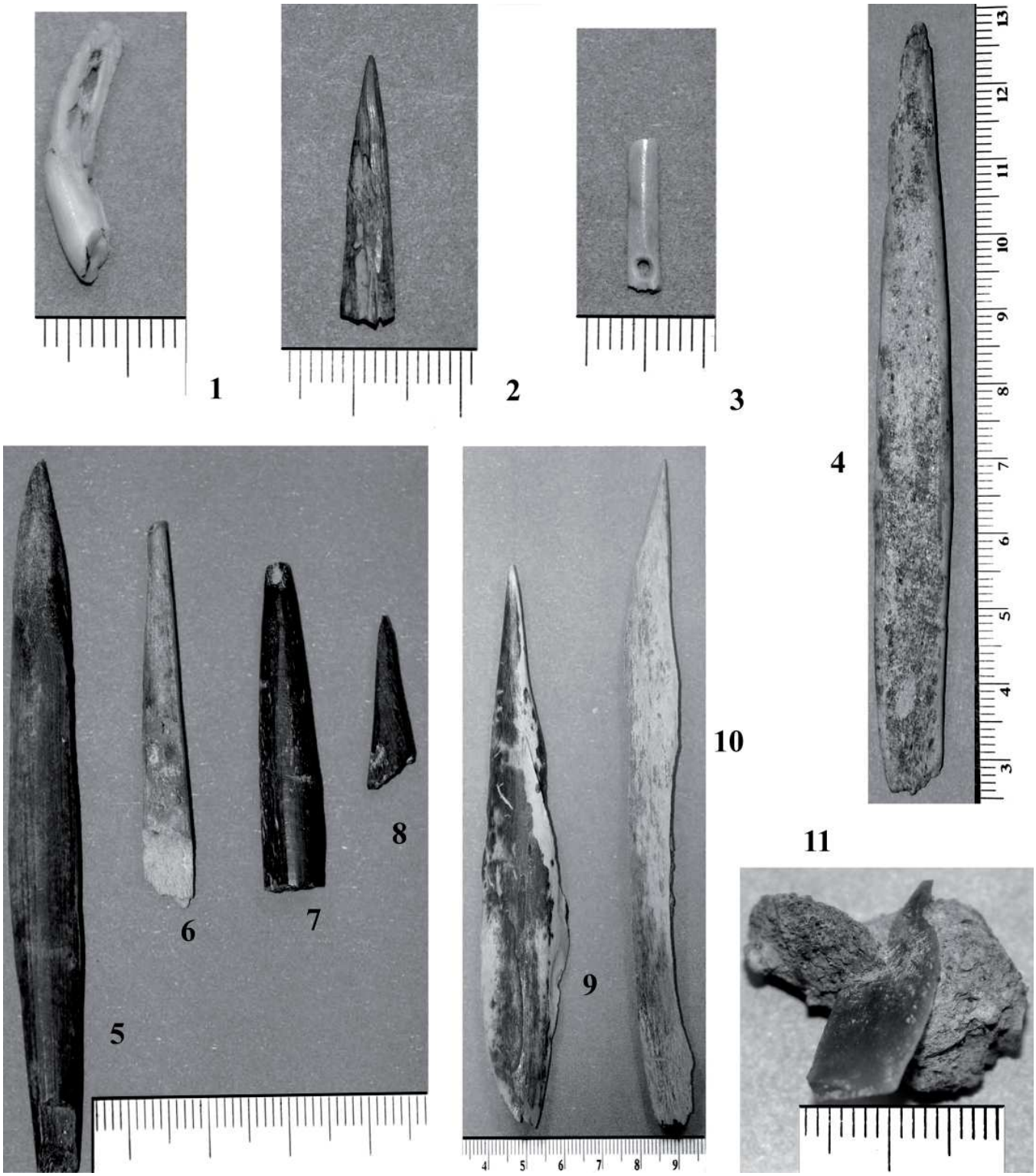


Figure 6 – Mezmaiskaya Cave. Layer 1C. 1 – tooth pendant; 2 – flat bone point fragment; 3 – bone needle fragment; 4 – bone polisher; 5 –bone point; 6-8 – bone point fragments; 9, 10 – massive bone awls; 11 - flint bladelet cut into a burned bone fragment.

**Dating**

Nine radiocarbon AMS dates from 32,140 ± 500 BP (uncal., RTT-4701) to 26,320 ± 260 BP (uncal., RTT-4336) have been obtained for the EUP unit D of Dzudzuana (table 1). The total series of dates defines (with 1σ, applying CalPal_2007_HULU) the calendric age of the EUP in Dzudzuana approximately between 35 and 32 ka cal BP. However, excluding three significantly aberrant dates (RTT-4747, RTT-4701, and RTT-3438), five dates within this series are overlapping or almost overlapping (RTT-4336) within a very narrow range between 31.8 and 31.5 ka cal BP.

**Lithic industry**

The total assemblage from Unit D comprises 11083 lithics recovered from the lower (near the cave entrance) and upper (inside the cave) excavation areas (table 2). Most of these lithics are made in a local chert variety (radiolarite). Obsidian artifacts, which were transported to the cave from sources located approximately 80–100 km away, compose only 0.8% and 2.3% of the total lithics in the upper and lower excavations, respectively. Most obsidian artifacts are flakes, bladelets, and chips, while tools are not numerous, and only 2 cores are found (Bar-Yosef *et al.* 2011).

In Unit D, cores compose about 1% of the total assemblage in both excavation areas (table 2). Chunks are not numerous (1.5% and 4.5% in the upper and lower excavations), while chips and burin spalls together compose a bulk of the total artifacts (53.2% and 65.4% in the upper and lower excavations, respectively). Total flakes, including plain and primary flakes, blades and primary blades, bladelets, and core trimming elements (CTE) comprise 43% and 30% of the total artifacts in the upper and lower excavations. Among total flakes, flakes and blades with cortex areas and CTE (fig. 7:21) are quite numerous (20.7% and 27% in the upper and lower excavations, respectively) that evidences active primary flaking in the site.

The total percentage of blades and bladelets varies between 38% and 34% of the total flakes in the upper and lower excavations at Dzudzuana and is almost twice less than in the Mezmaiskaya Cave. However, like Mezmaiskaya, bladelets strongly predominate (60% and 61% in the upper and lower excavations, respectively) in the total laminar debitage, which includes blades and bladelets, at Dzudzuana. This suggests that the laminarity parameter is apparently underestimated in Dzudzuana, in comparison to Mezmaiskaya, due to plenty of flaking debris in the former. Hence, differences in the debitage composition and laminarity between Mezmaiskaya and Dzudzuana may be related to various activity patterns in these sites.

The EUP industry of Unit D is characterized by a continuous production of blades and bladelets from unipolar (34% and 25.4% in the upper and lower excavations; fig. 7:20) and bipolar (22.6% and 27% in the upper and lower excavations; fig. 7:8) prismatic cores. Carinated cores (4% and 7% in the upper and lower excavations; fig. 7:22) are very rare (Bar-Yosef *et al.* 2011).

The most common tools in Unit D are various finely retouched bladelets (fig. 7:1-17) and blades, for which total percentage varies from 29,5% to 36% in the upper and lower excavations, respectively. Also, bladelet tools in total compose at least about 37-37.5% of all tools in both excavation areas. Backed bladelets and blades are quite numerous (16% and 7% in the upper and lower excavations; table 3), while points are extremely rare – 3 micro-Gravette points and a Sakajia point – and found only in the upper excavation (Bar-Yosef *et al.* 2006, 2011).

End-scrapers are manufactured on flakes and blades, and compose 23.3% and 21.4% in the upper and lower excavations, respectively (fig. 8:4). Thumbnail scrapers and double end-scrapers (fig. 8:5) are found in both excavations. Rounded scrapers (fig. 8:6, 7, 8) are rare. Burins are less numerous (6.8% and 14.8% in the upper and lower excavations) than end-scrapers, and represented mostly by dihedral burins (Fig. 8 – 2) and then burins on truncation (fig. 8:3). Some pièces esquillées (7.4% and 3.3% in the upper and lower excavations; fig. 8:1), and also rare truncations, awls or borers, notches and denticulates, and others are reported (Bar-Yosef *et al.* 2011).

**Organic artifact**s.

The bone industry of EUP Unit D includes 4 bone artifacts – awl, antler point, polished bone fragment, and decorated piece – from the lower excavation, and 8 bone artifacts – two awls and 6 bone points – from the upper excavation (fig. 7:22).

## 2.2. Ortvale Klde Rockshelter

Ortvale Klde – a large (about 300 sq. meters) rockshelter with two chambers opening to the east – is located at an elevation of 530 m above sea level in the Cherula River gorge (Kvirila River Basin), western Georgia. D. Tushabramishvili first investigated the site in

| Site/layer | Bladelet points | Backed bladelets/ blades | Retouched bladelets/ blades | End-scrapers | Burins | Pièces esquillé | Denticulates | Fragments | Varia | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Mezmaiskaya layer 1C | 80 | 187/- | 78/- | 30 | 27 | 3 | 18 | 8 | 24 | 455 |
| Dzudzuana Unit D, upper excav. | 4 | 39/10 | 73/18 | 72 | 21 | 23 | 1 | 6 | 42 | 309 |
| Dzudzuana Unit D, lower excav. | - | 18/1 | 82/16 | 58 | 40 | 9 | 3 | 3 | 41 | 271 |

Table 3 – Distribution of major retouched tool classes in the EUP assemblages in the Caucasus.

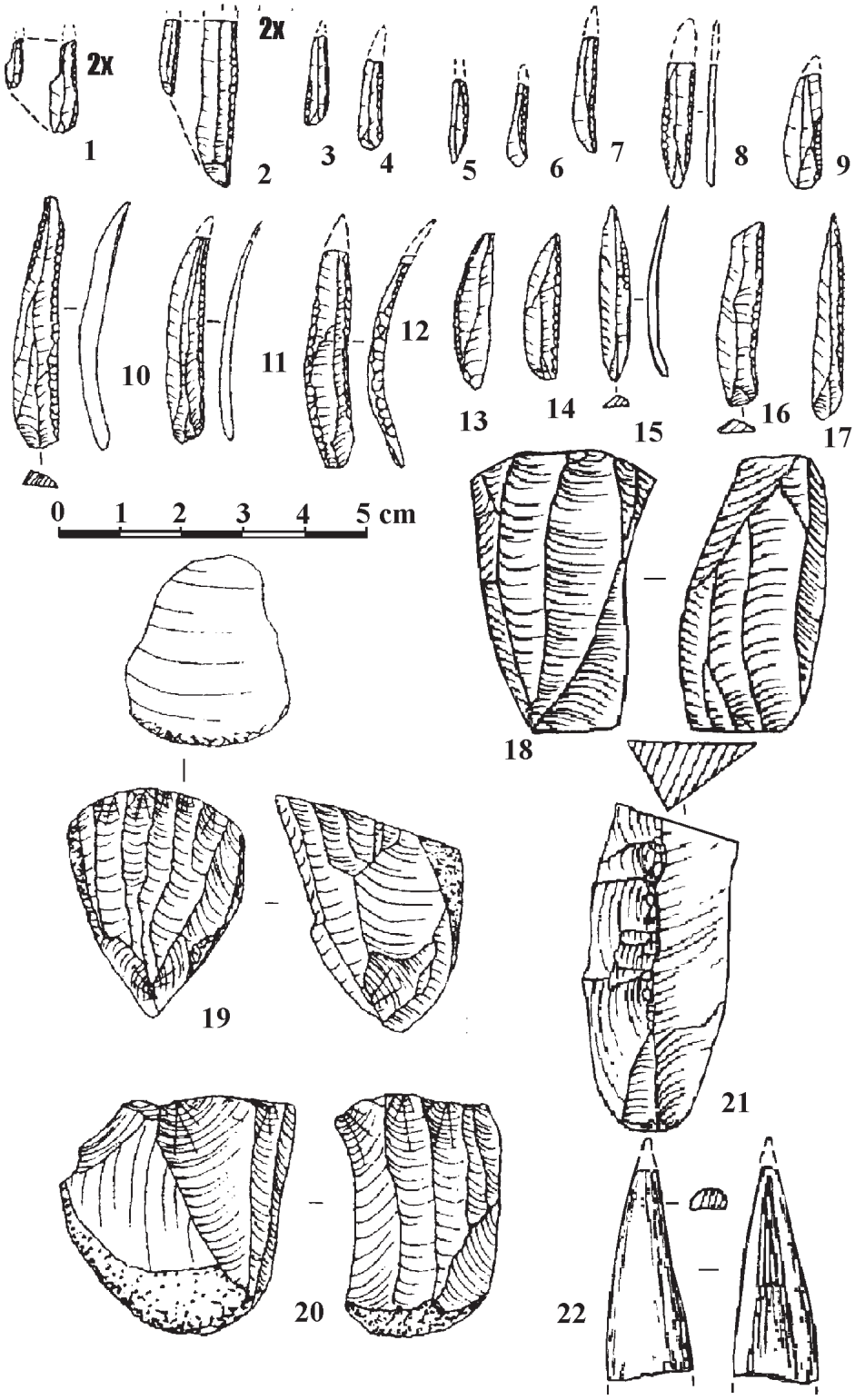


Figure 7 – Stone artifacts from Dzudzuana Cave, Unit D. 1-17 – retouched bladelets; 18-20 – blade/bladelet cores; 21 – crested blade; 22 – bone point/awl fragment (numbers 1 and 2 show real sizes and twice enlarged sizes). After Meshveliani *et al.* 2004; Bar-Yosef *et al.* 2011.

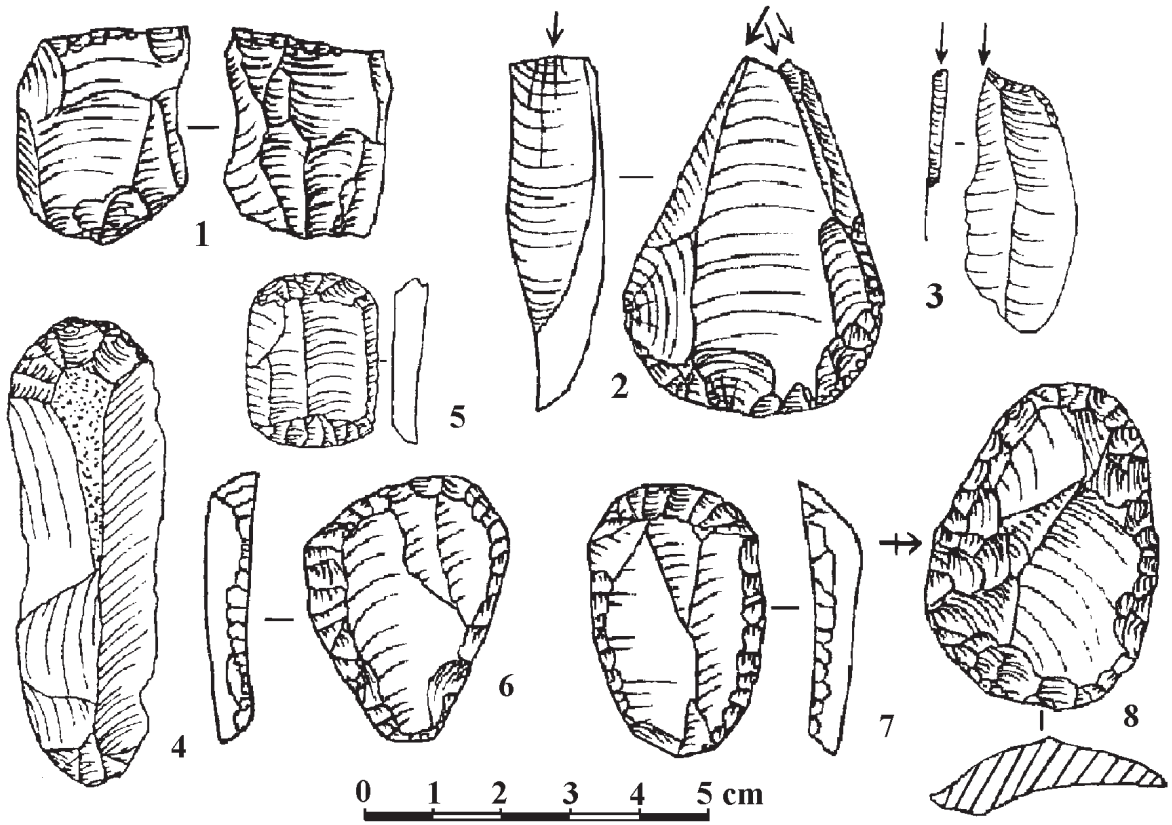


Figure 8 – Stone artifacts from Dzudzuana Cave, Unit D. 1 – splintered piece; 2, 3 – burins; 4-8 – end-scrapers. After Meshveliani *et al.* 2004; Bar-Yosef *et al.* 2011.

1973, and later N. Tushabramishvili excavated about 40 sq. meters in the southern chamber of this rockshelter (Tushabramishvili et al. 1999). More recently, work at Ortvale Klde was conducted in 1997-2001 by an international team leaded by researchers from Georgia (N. Tushabramishvili) and USA (D. Adler), excavating about 6 sq. meters next to the previous excavation area (Adler et al. 2006a, 2006b, 2008; Adler & Bar-Oz 2009).

In the earlier excavations, 11 strata were identified, of which two were defined as UP layers and seven as MP layers. In the recent excavations, stratum 4 assigned earlier to the Middle Paleolithic was re-defined as the EUP layer divided into four sub-layers (4a, 4b, 4c, and 4d, from top to bottom). All EUP levels produced rich lithic assemblages and faunal collections. In the earliest UP layer 4d, a scooped-out hearth, ringed by large fire-cracked limestone blocks and containing numerous burned backed microliths of flint and obsidian, was excavated. Layer 4c also contains evidence of fire activity such as a succession of black and gray ash lenses (Adler et al. 2006b, 2008).

**Dating**

During the recent excavations at Ortvale Klde, 15 AMS dates were obtained for layer 4C by two different laboratories, but only 12 dates were accepted as reliable estimates for the radiocarbon chronology of the layer (table 1). Also, 3 AMS dates were produced for the earliest EUP layer 4d, but two of them were rejected as aberrant estimates, while the single acceptable date of 38,100 ± 935 BP (uncal., RTT-4725) "must be treated with caution" (Adler *et al.* 2008:14). The total series of AMS results for layer 4C accepted by Adler and colleagues (2008) defines (with 1σ, applying CalPal_2007_HULU) the calendric age of the EUP in Ortvale Klde approximately from 40-39 ka cal BP (4 dates) to 37-35 ka cal BP (8 dates). A series of five TL dates obtained for layer 4C produced very consistent but significantly younger age estimate by 28.9 ka $BP_{TL}$ than the AMS calendric age for layer 4C, and "this deviation cannot be explained" (Adler *et al.* 2008: 823, table 3).

**Lithic industry**

Adler and colleagues (2006a, 2006b, 2008, 2009) report that over 3200 faunal remains and more than 12000 lithic artifacts were recovered during the recent excavation campaign of EUP layers at Ortvale Klde. Most of them are made from local flints, but a small part of the lithics is from transported obsidian. Recently, Le Bourdonnec and coauthors (2012) published results on two obsidian artifacts from the UP deposits at Ortvale Klde during the new 2006 excavation. They conclude that the obsidians originate from faraway sources located in eastern Anatolia or Armenia. Obsidians were brought to Ortvale Klde as unretouched and retouched flakes, while some obsidian cores were also flaked inside the site (Adler *et al.* 2006a, 2006b, 2008).

Unipolar cores for blade and bladelet production (fig. 9:14), numerous retouched bladelets (fig. 9:1-5, 8-9), some backed bladelets (fig. 9:6), end-scrapers manufactured on blade fragments (fig. 9:13), rounded scrapers on flakes (fig. 9:10), and various burins (fig. 9:9, 12, 15) are found in the EUP assemblages from layers 4d and 4c in Ortvale Klde (Adler *et al.* 2006a, 2006b; Bar-Yosef *et al.* 2006).

Earlier, Adler and Tushabramishvili (2004: 104) reported that this EUP "[…] *assemblage is dominated by small, backed bladelets, bevel-based bone points* […] *and a general lack of Aurignacian elements*". Later, Bar-Yosef and coauthors (2006) noted similarities between EUP industries from Ortvale Klde and Dzudzuana. However, a detailed study of the EUP in Ortvale Klde is unpublished as yet.

**Organic artifacts**

In all UP layers of Ortvale Klde three bevel-based bone/antler points, two polished bone/antler abraders, and a polished bone with parallel linear incisions were found (Adler *et al.* 2006a, 2006b).

### 2.3. Bondi Cave

Bondi Cave is located at an elevation of 477 m above sea level in the Tabagrebi River gorge (Kvirila River Basin in western Georgia), and near the sites of Ortvale Klde and Dzudzuana. It is a gallery cave about 120 sq. meters in total area, opening to the south. Excavation of about 12 sq. meters was undertaken in 2007-2010 near the cave entrance (Tushabramishvili et al. 2012; Le Bourdonnec et al. 2012). The total section of Bondi Cave is more than 3 m and is divided into 8 distinct strata. The upper layers II, III, IV, and Va-Vd (about 150 cm in the total thickness) yielded abundant UP artifacts, while lower layers VII and VIII (more 60 cm thick) produced relatively fewer artifacts assigned to the Middle Paleolithic. These UP and MP deposits are divided by Stratum VI that contains limestone blocks representing the main roof collapse and sediments of the lower UP Layer Vd introduced among these blocks. Evidence of fire has been recovered in different layers.

**Human fossils**

A tooth assigned to *H. sapiens* (Tushabramishvili *et al.* 2012:183) was found in Layer Vb.

**Dating**

Tushabramishvili and coauthors (2012) report a sole conventional radiocarbon date of 31,270 ± 640 BP (uncal., SacA-12069) for the collapse Layer VI with certain UP artifacts, which dates the layer to about 35.4 ka cal BP (with 1σ, applying $Cal\_BP_{Hulu}$). The excavators suggest that Layer VI shows either the initial UP occupation of the cave, or a hiatus of several thousand years between MP and UP deposits. The lower UP levels Vd and Vc are undated as yet. At present, only two conventional radiocarbon dates for UP level Vb (table 1) provide the earliest age estimate of the UP deposits in Bondi Cave between 29.5 and 25.7 ka cal $BP_{Hulu}$.

**Lithic industry**

The 2007-2010 excavations in Bondi Cave produced 2851 faunal remains and more than 7000 lithic artifacts, most of which are made from local flints. Obsidian pieces are rare and occur only in UP layers II, IV and V (Tushabramishvili *et al.* 2012). A study of four obsidian artifacts from the UP levels (Le Bourdonnec *et al.* 2012) shows that one obsidian (LV-C4) from level V is likely derived from the Chikiani-Paravani source in southern Georgia located about 170 km away from the site, and other obsidians were likely procured from sources in northern Anatolia. However, other sources in eastern Anatolia, Armenia and Azerbaijan are also possible. These results suggest that the EUP inhabitants of Bondi Cave had some contact with areas about 350 km distant from the cave. Most obsidian artifacts were brought to Bondi Cave as small pieces, and evidence for their on-site retouching are rare.

Tushabramishvili and colleagues (2012) report that the assemblage from Layer VI includes 65 lithics only (table 2, 3), among which unretouched flakes, blades, and bladelets predominate (66%), and blades prevail over bladelets (table 4). The excavators combine lithics from the different sub-levels of Layer V that yielded 2443 artifacts in total. In the total UP assemblage from Layer V, chips and fragments comprise 61% of all lithics. Blades and bladelets predominate (55.4%) among total flakes, and blades are more common (31%) than bladelets. Retouched tools are only 3% of the total assemblage. Detailed descriptions and statistics for the UP Layer V are as yet unpublished. The excavators note orientation of flaking technology toward the production of laminar (blades and bladelets) blanks, presence of microlithic tools, as well as the absence of an obvious 'Aurignacian' component and rarity of carinated pieces (Tushabramishvili *et al.* 2012).

Organic artifacts include only a cockleshell bead found in level Vb.

A somewhat similar EUP industry from Apiancha Cave (fig. 1) located in the north-western part of the southern Caucasus, in Abkhazia (Korkia 1998), dated to >32.8 ka 14C BP (Bar-Yosef *et al.* 2011). However, data about the EUP industry of this site are poorly published.

## 3. The EUP of the Caucasus in West Eurasian Context

The recent data received from Mezmaiskaya, Dzudzuana, Ortvale Klde, and Bondi fundamentally changes our understanding of the origin and industrial peculiarities of the EUP in the Caucasus. All Caucasian EUP sites lack a period of transition from the Middle to the Upper Paleolithic, and instead clearly show the abrupt appearance of the EUP in the Caucasus as a fully developed technological tradition, and lithic and bone industry suggesting the arrival of a new biological population (i.e. *Homo sapiens*) and population replacement of local Neanderthals (for details see Meshveliani *et al.* 2004; Bar-Yosef *et. al.* 2006, 2011; Adler *et al.* 2006a, 2006b, 2008; Golovanova *et al.* 2006, 2010a, 2010b; Tushabramishvili *et al.* 2012).

The recent evidence also show that the Caucasian EUP is generally characterized by highly developed blade and bladelet industries (table 4) distinguished by the predominance of blades and bladelets among blanks, as well as prevailing (in Mezmaiskaya) or high (in Dzudzuana) value for different kinds of bladelet tools, among

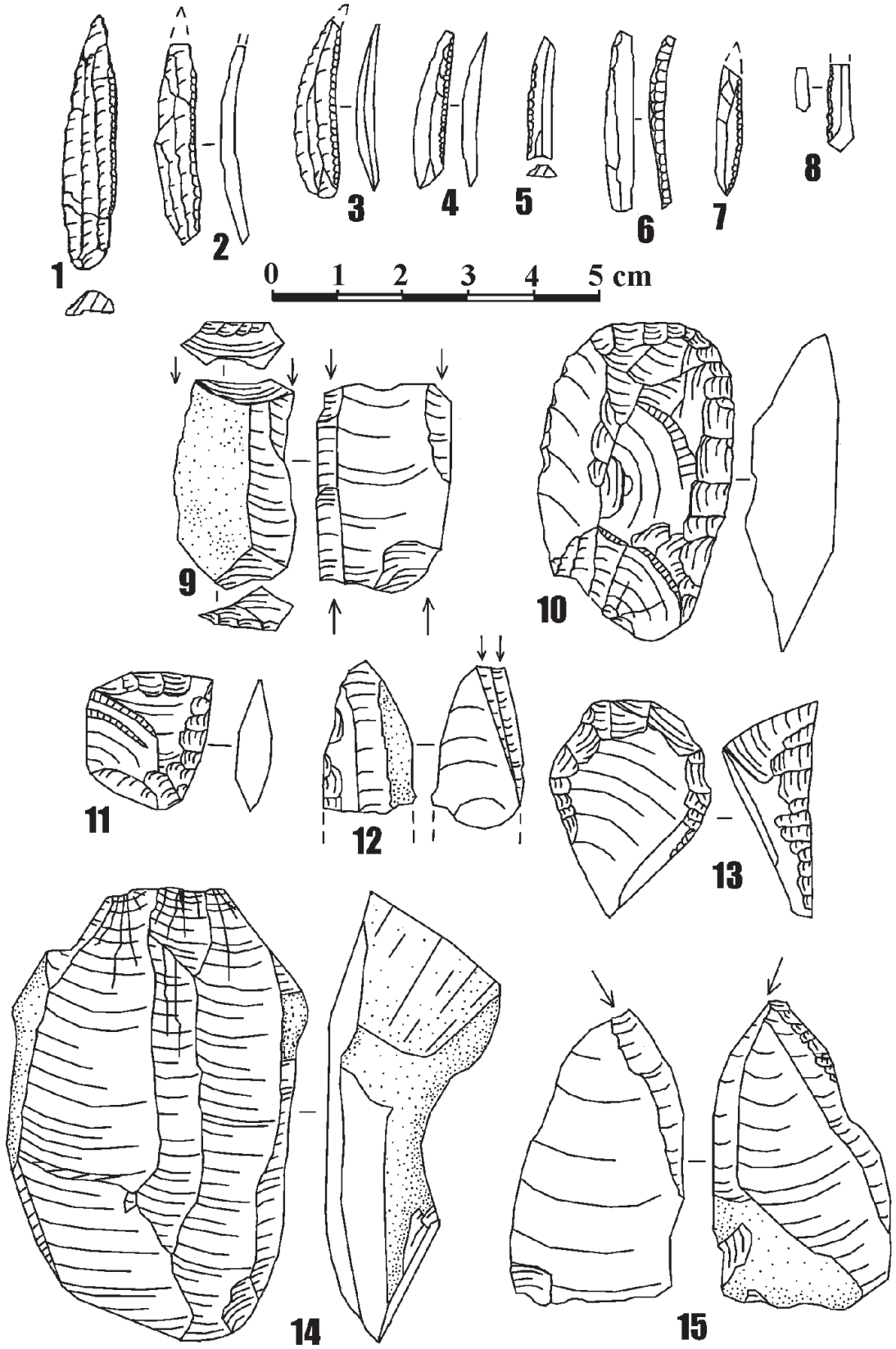


Figure 9 – Upper Paleolithic artifacts from Layer 4c (1-10, 13, 15), Layer 4d (11), and Layer 3 (14) in Ortvale Klde. 1-5, 7, 8 – retouched bladelets; 6 – backed bladelet; 9 – burin on truncation; 10 – end-scraper on flake; 11 – atypical scraper; 12 – burin on broken blade; 13 – end-scraper on retouched flake; 14 – unidirectional blade core; 15 – burin on oblique truncation. After Adler *et al.* 2006.

| Site | Layer | Blade Index % | Total % bladelets/ blades | Tools on bladelets/ blades % | Bone tools n | Decoration items n | Source |
|---|---|---|---|---|---|---|---|
| **CAUCASUS** | | | | | | | |
| Mezmaiskaya | 1C | 62,2 | 83,3 | 75,8/– | 27 | 1 | Golovanova *et al.* 2010b |
| Dzudzuana | D | 36,1 | 60,6 | min 37,2/– | 11 | 1 | Bar-Yosef et al. 2011 |
| Bondi | V | ~55,4 | ~31,1 | ? | – | 1 | Tushabramishvili *et al.* 2012 |
| **LEVANT** | | | | | | | |
| Ucagizli | B | 54,7 or 25,1 | ? | ?/57,7 | 14 | Shell beads | Kuhn *et al.* 2003 |
| | BI-IV | 57,1 or 26,2 | ? | ?/60,7 | | | |
| Quafzeh | E | 77,7 | 16,4 | 12/68 | – | – | Bar-Yosef & Belfer-Cohen 2004 |
| Boker A | | 62 | >50 | ~80 | – | – | Monigal 2003 |
| Abu-Noshra I | | ? | >45 | >45 | – | – | Becker 2003 |
| Abu-Noshra II | | ? | >45 | >45 | – | – | Becker 2003 |
| Lagama VII | | ? | 73,1 | >53 | – | – | Bar-Yosef & Belfer 1977 |

Table 4 – Comparative features (technology and bone industry) of EUP in the Caucasus and Early Ahmarian in the Levant.

| Site | Layer | Points on bladelets/ blades % | Backed bladelets/ blades % | Bladelets/ blades with fine retouch % | End-scrapers % | Burins % | Pièces esquillées % | Total |
|---|---|---|---|---|---|---|---|---|
| **CAUCASUS** | | | | | | | | |
| Mezmaiskaya | 1C | 17,6/– | 41,1/– | 17,1/– | 6,6 | 5,9 | 0,7 | 455 |
| Dzudzuana | D | 0,7/– | 9,8/1,9 | 26,7/5,9 | 22,4 | 10,5 | 5,5 | 580 |
| Bondi | V | ? | ? | ? | ? | ? | ? | 73 |
| **LEVANT** | | | | | | | | |
| Ucagizli | B | ?/19,4 | ?/2,0 | ?/20,4 | 42,7 | 3,0 | 0,4 | 504 |
| | BI-IV | ?/16,4 | ?/2,7 | ?/23,1 | 43,0 | 2,7 | 0,8 | 862 |
| Quafzeh | E | 32,9 total | 0,9/– | –/14,4 | 27,6 | 7,2 | – | 319 |
| Boker A | | ~32 | ~10 | 25 | 2 | 16 | – | 102 |
| Abu-Noshra I | | ? | 25,8 total | 20,1 total | 0,6 | 16,4 | – | 159 |
| Abu-Noshra II | | ? | 25,5 total | 9,3 total | 5,2 | 7,9 | – | 463 |
| Lagama VII | | 46,7 total | - | 36,9/9,4 | 0,2 | 2,5 | – | 903 |

Table 5 – Comparative features (typology) of EUP in the Caucasus and Early Ahmarian in the Levant (sources see Table 4).

which many are retouched bladelets. End-scrapers, burins, and pièces esquillées are innumerous (table 5). Rounded scrapers are found in Mezmaiskaya, Dzudzuana, and Ortvale Klde, and a high variability of burins is reported in some EUP sites. All Caucasian EUP industries include a wide assortment of bone implements, mostly awls and points with rounded cross-sections. Also, personal ornaments are found in Mezmaiskaya and Bondi.

In comparing the EUP industry of layer 1C at Mezmaiskaya with the EUP in nearby regions, Golovanova (2000: 175) finds the Mezmaiskaya materials to be most similar to the earliest fully-fledged UP industry in the Levant, the Early Ahmarian, and particularly in Ahmarian assemblages from Abu Noshra and Lagama in Sinai, dating between 35 and 30 ka $^{14}$C BP (Gilead 1991). Nowadays, there is a wide consensus among researchers that the Caucasian EUP resembles the Early Ahmarian in the Levant while differing from Typical Aurignacian in Europe (Adler *et al.* 2008; Bar-Yosef et al. 2006, 2011; Golovanova *et al.* 2006, 2007, 2010b; Meshveliani *et al.* 2004; Tushabramishvili *et al.* 2012).

The Early Ahmarian is generally characterized by a highly developed technology for the production of slender blades and bladelets, distinguished by an overwhelming blade/bladelet component among blanks and tools (table 4, 5; both tables show the main techno-typological features of selected Ahmarian sites having well-preserved occupational layers, representative total assemblages, and tool inventories more than 100 items). The Ahmarian industries from the southern Levant, such as Abu-Noshra I, II and Lagama VII in Sinai and Boker A in Negev are particularly similar to the EUP assemblages from Mezmaiskaya and Dzudzuana in the highest blade/bladelet component among blanks and tools, as well as a high value of slender blades and bladelets with lateral retouch in the tool set. Backed pieces are abundant in Abu-Noshra I, II and Layer 1C at Mezmaiskaya, and quite numerous in Boker A and Dzudzuana (table 5). However, the rarity or absence of some tool groups, such as backed pieces or bladelet points, in other EUP

sites in the Levant or Caucasus may be partly explained by different typology approaches applied by researchers. The percentage of end-scrapers is low in most sites, excluding Ucagizli, Qafzeh and Dzudzuana, in which this percent is higher. Burins are not numerous and variable in most sites. Some Early Ahmarian industries (Boker A and Qafzeh) are distinguished by high values of end-scrapers and burins made on primary flakes, primary blades, and core trimming pieces; this feature is also characteristic for the EUP of Mezmaiskaya. Rare rounded scrapers, *pièces esquillées*, bone implements, and personal ornaments are found in Ucagizli and Caucasian EUP sites, but absent in most EUP sites in the Levant.

While there are strong similarities between the Caucasian EUP and the Early Ahmarian in the Levant, the inter-assemblage variability within these regions is also becoming obvious. The variability within the EUP in the Levant may resulted from different reasons (Phillips & Saca 2003; Belfer-Cohen & Goring-Morris 2003). Also, other factors should be taken into account, such as provenance and preservation of cultural remains within the occupational layer (i.e., is it a real 'living floor' with dense artifact accumulation, fireplaces, and other artificial constructions or just a deposit with dispersed artifacts); and excavation methods that can result in abundance (e.g., applying dry screening or water screening of archaeological deposits) or loss of small lithics. Also, it is important to pay attention to the common admixture of artifacts from various strata and loss of the micro-industry in the majority of old excavations. The application of more recent lithic study methods, including analysis of core or tool reduction sequences, is one of the most important issues in Paleolithic research. For example, the core/tool reduction approach resulted in redefinition of carinated scrapers produced by bladelet removals as bladelet cores (Belfer-Cohen & Grosman 2007). Many laminar industries are traditionally analyzed using F. Bordes's 'Blade Index'. While the 'Blade Index' is obviously important, the ratio of blades and bladelets is often more indicative for comparisons of the UP micro-laminar (bladelet) industries, such as the Caucasian EUP or Early Ahmarian. However, this ratio is not reported in many publications.

The extremely significant issue of EUP typology is the differentiation of point types manufactured on blades and bladelets in various EUP industries. For example, el-Wad points made on slender blades/bladelets by fine lateral retouch are the most common point type in EUP assemblages in the Levant and the key tool of the Levantine Early Ahmarian (Belfer-Cohen & Goring-Morris 2007). A strict and clear definition of el-Wad points was discussed in detail by Bar-Yosef and Belfer (1977). However, researchers now assign very different tools to el-Wad points (examples see in figure 10). Only a part of these tools are 'classic' el-Wad points, while other tools are closer to Font-Yves points or should be designated as special point types. Following a 'broad' definition, el-Wad points may be found in many UP industries, including Mezmaiskaya Cave. On the contrary, following the 'strict' definition as in Bar-Yosef and Belfer (1977), el-Wad points are absent in Mezmaiskaya and other EUP sites in the Caucasus. This example shows that only the application of strict definitions of tool types alongside detailed descriptions and statistics for each tool group can provide the basis for defining similarities or distinctions among EUP industries of the West Asia.

The problem of strict definitions sharply rises especially in comparing the Caucasian EUP with coeval or slightly earlier EUP industries of the West Eurasia – Typical Aurignacian, Levantine Aurignacian, Zagros Aurignacian, Mediterranean Aurignacian, and Ahmarian – that demonstrate highly variable technological and typological characteristics, most of which are quite different from those typical for the 'classic' Aurignacian in the Perigord (table 6, 7). Again, following a 'broad' definition, the term 'Aurignacian' becomes almost synonymous with the term 'Early Upper Paleolithic'. This results in the picture, which we have now, when at least five roughly contemporaneous and different 'Aurignacian' variants, each having different distribution and apparently different origins, are identified in Western Eurasia.

The earliest EUP industries in Southern Europe and Western Asia – Mediterranean Aurignacian ('Proto-Aurignacian') and Early Ahmarian – show similar technologies oriented toward continuous production of slender blades and bladelets from unipolar narrow-fronted and prismatic cores, while differing significantly in tool sets. The Mediterranean Aurignacian assemblages are characterized by serial carinated pieces, including carinated scrapers and carinated burins, Dufour bladelets, and split-base bone points. Points made on blade/bladelet blanks, such as el-Wad points representing the 'key fossil' of the Early Ahmarian, are absent in the Mediterranean Aurignacian. While the oldest dates are between 42–36 ka 14C BP, most radiocarbon estimates of the Mediterranean Aurignacian fall between 36.5 and 34 ka $^{14}$C BP (table 6, 7), overlapping with chronological ranges of the early Typical Aurignacian in France (35–32 ka $^{14}$C BP) and the early 'Swabian' Aurignacian in Germany (35.5–33 ka $^{14}$C BP). Both early Typical Aurignacian and early Swabian Aurignacian demonstrate some level of typological continuity marked by the production of carinated pieces and split-base bone points with apparently slightly earlier Mediterranean Aurignacian, but a different technological tradition based on production of thick 'Aurignacian' blades from unipolar prismatic cores and a different tool manufacture tradition based on common use of tools made on 'Aurignacian' blades.

The Early Ahmarian in the Levant shows a great range of radiocarbon dates (table 1). Most of them fall between 37 and 31 ka $^{14}$C BP, while the oldest dating series for Units IV-III at Kebara is between 42-43 ka $^{14}$C BP. The Early Ahmarian is distinguished by common production of el-Wad points and virtual absence of Dufour bladelets, carinated scrapers, and split-base bone points. The Zagros Aurignacian or 'Baradostian' in Iran is now dated between approximately 35-29 ka $^{14}$C BP (table 6, 7). The more recent studies of the Zagros Aurignacian assemblages from Yafteh and Warwazi show a general similarity of technologies oriented toward continuous production of slender blades and bladelets and common use of blades/bladelets as tool blanks between the Zagros Aurignacian and two EUP entities in the Levant – 'classic' Levantine Aurignacian and Early Ahmarian. These three industry types are separated mostly on typological grounds, but demonstrate a mosaic combination of diagnostic features. The Zagros Aurignacian is distinguished by common production of carinated pieces and Dufour bladelets (both feature are also typical for the Levantine Aurignacian), and rarity of el-Wad points (more common in the Levantine Aurignacian). Arjeneh points, which are defined a key component of the Zagros Aurignacian, are similar to Font-Yves points and some varieties of el-Wad points made on bladelets (fig.

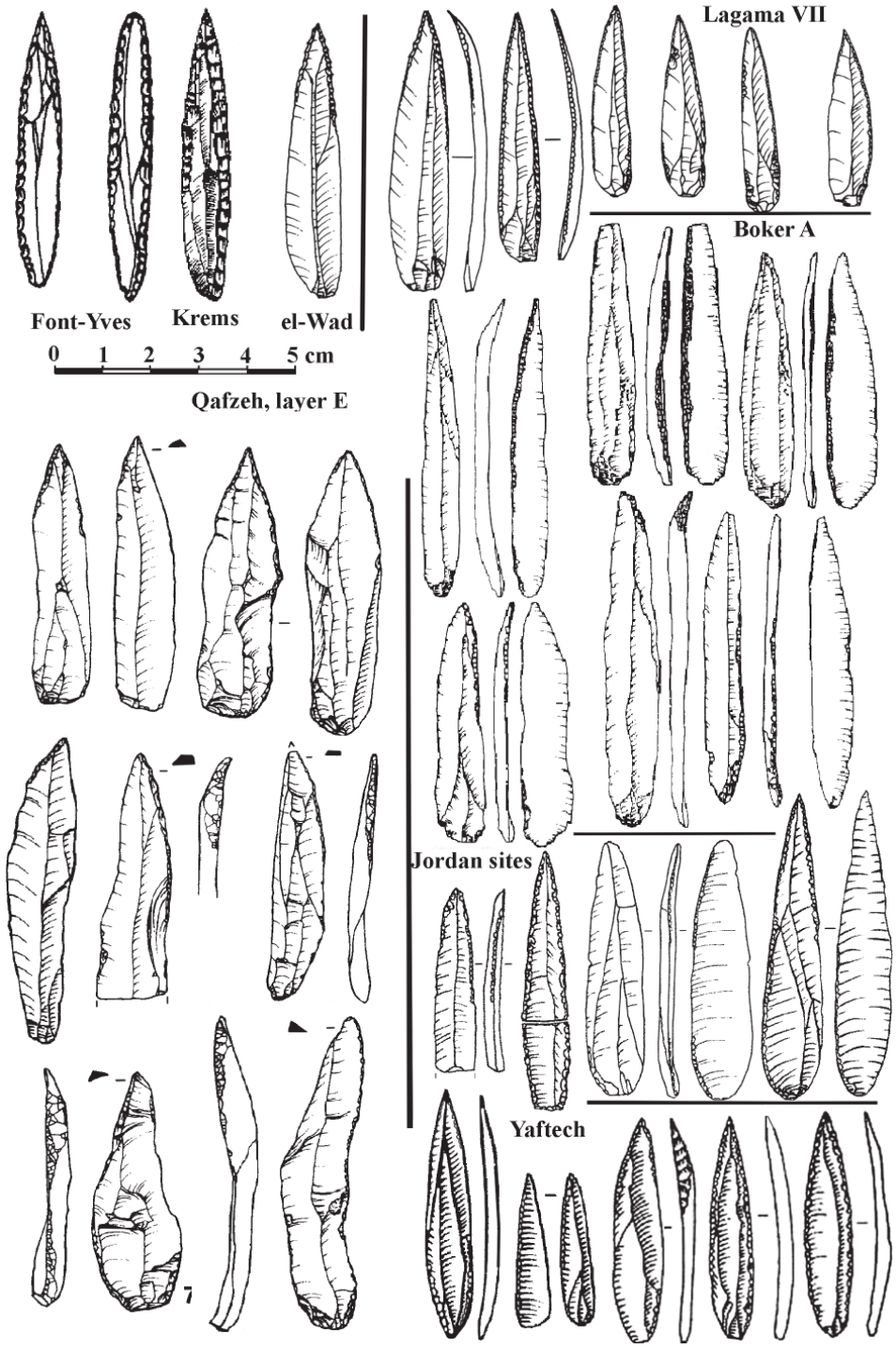


Figure 10 – Points from the EUP sites in the Near East. 'Classic' Font-Yves and Krems points (Brézillon 1971), and 'classic' el-Wad point (Bar-Yosef & Belfer 1977); variable points from Lagama VII (Bar-Yosef & Belfer 1977); Boker A (Monigal 2003); Jordan sites (Coinman 2003); Qafzeh, layer E (Bar-Yosef & Belfer-Cohen 2004); Yafteh (Otte *et al.* 2007, 2011).

| EUP Industry | Chronology/ context | Flaking technology: blade or bladelet oriented | Tool blanks: blades or bladelets | Sources |
|---|---|---|---|---|
| **WESTERN EUROPE** | | | | |
| **Typical Aurignacian** early phase= 'Aurignac. I' in Perigord, France | oldest date for the early Typical Aurignacian in Castanet is 35 ka $^{14}$C BP; most of dates are between 34–32 ka $^{14}$C BP | two separate technologies:<br><br>1) 'Aurignacian' blades are produced from unipolar prismatic cores with minimal pre-forming, crests are uncommon; core tablets; facetted or spur butts predominate on blades;<br>2) bladelets are straight or curved, come from carinated pieces with wide front | most tools are made on 'Aurignacian' (large, wide, thick, curbed) blades; tools made on bladelets are rare | Bon 2002;<br>Bordes 2006;<br>Fernandez 2006 |
| **Swabian Aurignacian** (early phase) in Swabia, German | oldest dates >40 ka $^{14}$C BP; most of dates are 35.5–33 ka $^{14}$C B*P*; strong similarities with the early Aurignacian in Perigord | two separate technologies:<br><br>1) blades come from unipolar prismatic cores;<br>2) bladelets mostly come from carinated pieces | most tools are made on 'Aurignacian' blades; tools made on bladelets are absent | Teyssandier, *et al.*2006;<br>Conard & Bolus 2006 |
| **Mediterran Aurignacian** 'Archaic' or 'Proto-Aurignacian', Mediterranean Europe, incl. Le Piage, K in Perigord and 'Krems' Aurignacian in Austria | oldest dates in Fumane, L'Arbreda, and others fall between 42–36 ka $^{14}$C BP; within robust series most earlier dates fall between 36.5–34.5 ka $^{14}$C BP as in layer C4d at Isturitz and layer 8 at Cueva Morín; recent ABOx–SC dates of level A2 at Fumane are 35.9–34.2 ka $^{14}$C BP; chronology of 'Krems' Aurignacian is worse | continuous production of slender blades (significantly thinner than 'Aurignacian' blades) and long (3.5-4 cm), narrow (width 0.5-1 cm), straight or slightly curved bladelets from unipolar prismatic cores; simple pre-forming; débordant blades or crests are uncommon; core tablets; bladelets also come from large carinated pieces | most tools are made on blades/bladelets; diversity of tools on blades and flakes; bladelets are used mostly for production of Dufour bladelets | Bordes 2006;<br>Fernandez 2006;<br>Conard & Bolus 2006;<br>Teyssandier, *et al.*2006;<br>Kozlowski 2006;<br>Higham *et al.* 2009 |
| **WESTERN ASIA** | | | | |
| **Levantine Aurignacian** (early phase) in the Levant | Levantine Aurignacian lays atop Early Ahmarian in Ksar Akil and Kebara; most complete sequence in Ksar Akil shows three phases 'A' (lev. XIII-IX), 'B' (levels VIII-VII) and 'C' (levels VI-IV); dates are 33.5–29.5 ka $^{14}$C BP at Ksar Akil and Umm-el-Tlel, and 35–33 ka $^{14}$C BP in units I-II at Kebara | flaking technology oriented to the continuous production of slender and long, straight or slightly curved blades and bladelets from mostly unipolar prismatic cores; predominance of blades & bladelets (59% in levels XIII-IX at Ksar Akil);<br>bladelets are also produced from carinated pieces with wide front | most tools are made on flakes, and slender blades and bladelets; blades are used mostly for production tools with lateral retouch, burins, and end-scrapers | Bar-Yosef & Belfer-Cohen 1996;<br>Belfer-Cohen & Bar-Yosef 1999;<br>Soriano & Ploux 2003;<br>Gorring-Morris & Belfer-Cohen 2006;<br>Lengyel *et al.* 2006 |
| **Zagros Aurignacian** 'Baradostian' (early phase) in Iran | Zagros Aurignacian lays atop IUP industry from lev. AA-LL at Warwasi;<br>dates are 35.5–29 ka $^{14}$C BP in Shanidar lev. C, and ca 33.5 ka $^{14}$C BP in lower lev. at Yafteh;<br>early Zagros Aurignacian (lev. P-Z in Warwasi) is similar to early Levant. Aurign. - lev. XIII-IX at Ksar Akil | continuous production of slender and long, straight or slightly curved blades and bladelets (60% , mostly bladelets) from unipolar (53%) or opposed platforms (18%) prismatic cores; thick 'Aurignacian' blades are rare; bladelets also come from carinated pieces; small discoidal cores for flakes | most tools are made on blades or bladelets (60% in levels P-Z at Warwasi); in Yafteh most tools are made on bladelets, while blades are used mostly for production pieces with lateral retouch, burins, and end-scrapers | Olszewski & Dibble 2006 ;<br>Bordes & Shidrang 2009;<br>Otte *et al.* 2007, 2011 |
| **Ahmarian** (early phase) in the Levant | the earliest fully-fledged UP industry in the Levant;<br>oldest dates are 43–38 ka $^{14}$C BP in Kebara (IV–III), most 30-35 ka $^{14}$C BP | continuum of blade and bladelet production from mostly unipolar narrow-fronted and prismatic cores | most tools are made on bladelets / blades;<br>CTE used for production burins, and end-scrapers | Bar-Yosef & Belfer, 1977;<br>Belfer-Cohen & Gorring-Morris 2007;<br>Rebollo *et al.* 2011 |

Table 6 – EUP Industries of Western Europe and Western Asia (chronology and technology).

| EUP Industry | Points | Backed pieces | Retouched bladelets | Retouched blades | End-scrapers | Burins | Organic artifacts | Sources |
|---|---|---|---|---|---|---|---|---|
| **WESTERN EUROPE** | | | | | | | | |
| **Typical Aurignacian** early phase= 'Aurignac. I' in Perigord, France | points on bladelets are absent | entirely absent | rare; retouch is marginal and mostly inverse; rare Dufour bladelets | are common (16% of the tool set), 4% blades w/'Aurign.' retouch | 52-56% of tools, are made on blades; 11-12% carinated or nosed | 8-11% of tools; made on blades | split-base points | Sonnev.- Bordes 1960; Bon 2002; Bordes 2006 |
| **Swabian Aurignacian** (early phase) in Swabia, German | points on bladelets are absent | entirely absent | retouched or Dufour bladelets are absent | are common | prevail in tools on blades; carinated pieces are common | made on blades | bone tools & other organic artifacts common; figurines; split-base points | Teyssandier *et al.* 2006; Conard & Bolus 2006 |
| **Mediterran Aurignacian** 'Archaic' or 'Proto-Aurignacian', Mediterranean Europe, incl. Le Piage, K in Perigord and 'Krems' Aurignacian in Austria | points on bladelets are absent | entirely absent | retouched bladelets are common (7-20%); Dufour bladelets are common | are rare; blades with 'Aurignac.' retouch are absent | are made on blades; carinated pieces are common | made on blades | some bone tools; split-base point | Bordes 2006; Fernandez 2006 |
| **WESTERN ASIA** | | | | | | | | |
| **Levantine Aurignacian** (early phase) in the Levant | El Wad points are common | are rare (1%) or absent | Dufour bladelets are common | are common | are made on blades; carinated pieces are common | made on blades | some bone artifacts; split-base points; perforated canines | Gorring-Morris & Belfer-Cohen 2006 |
| **Zagros Aurignacian** 'Baradostian' (early phase) in Iran | El-Wad points are rare (1%); Arjeneh points are common in Yafteh (19%) | are rare | Dufour bladelets are common (14% in Warwasi) or predominate (47% in Yafteh) | are common (12% in Yafteh) | common (7.5-8%), are made on blades; carinated pieces are common | burins (10-11%), mostly made on blades | some bone tools & personal ornament.<br><br>split-base points absent | Olszewski & Dibble 2006; Otte *et al.* 2007, 2011 |
| **Ahmarian** (early phase) in the Levant | el-Wad points are common | very rare | domined marginal dorsal retouch; Dufour bladelets are rare or absent; inversely retouched | the retouch is semi-abrupt or fine; alternately, inversely retouched | are made on blades, technical flakes, on flakes | made on blades, technic. flakes, on flakes | split-base points absent | Belfer-Cohen & Gorring-Morris 2007; Bar-Yosef & Belfer, 1977 |

Table 7 – EUP Industries of Western Europe and Western Asia (typology).

10). However, it is difficult to evaluate a degree of affinity among various types of EUP bladelet points basing on available publications, before a special comparative study of the entire assortment of the West Asian EUP points is done.

Split-base projectile points, which are the most characteristic bone tools of all Aurignacian industries in Europe and the Levantine Aurignacian, are absent in the Zagros Aurignacian and the Levantine Ahmarian. The Levantine Aurignacian, which is dated to the same time interval of about 35–29.5 ka $^{14}$C BP as the Zagros Aurignacian (table 6, 7), represents an even more mosaic cultural entity.

In comparing the EUP in the Caucasus with the EUP in nearby regions, one can note (table 1) that the earliest dates for the Caucasian EUP fall between 38 ka $^{14}$C BP (Layer 4d in Ortvale Klde) and 36 ka $^{14}$C BP (Layer 1C in Mezmaiskaya). Also, most researchers agree that in general the Caucasian EUP is more similar to the Early Ahmarian than to either the Zagros Aurignacian or Levantine Aurignacian. Our data discussed above suggest that the Caucasian EUP shows particular similarity to some Ahmarian industries from the southern Levant, such as Abu-Noshra I, II in Sinai and Boker A in Negev. All these observations may point out to a quite early northward migration of some EUP groups from the Levant to the Caucasus.

This hypothesis is supported by new data that demonstrate the abrupt appearance of the EUP in the Caucasus after 40 ka cal BP as a fully developed technological tradition (Adler *et al.* 2008; Bar-Yosef *et al.* 2006, 2011; Golovanova *et al.* 2006, 2010a). Also, the northward movements of EUP human groups are supported by preliminary results of obsidian transport studies. These studies suggest that some artifacts from the EUP levels of Mezmaiskaya Cave in the northwestern Caucasus are produced from obsidian procured from the Kojun Dag (Paravan) source located in the southwestern Caucasus. In Bondi Cave and Ortvale Klde, western Georgia, some artifacts are produced from obsidian procured from the same Chikiani-Paravani source area in southern Geor-

gia, located about 170 km southward of the sites, as well as from more distant southern sources in eastern Anatolia, Armenia and Azerbaijan.

We conclude that the time period between 40 and 30 ka cal BP was significant for the dispersal of essentially new EUP micro-laminar (bladelet) industries distinguished by developed blade and bladelet technologies, together with numerous and variable bladelet tools across a broad region including Mediterranean Europe, Zagros, Levant and Caucasus (Golovanova *et al.* 2007, 2010a). Further development of these industries could result in regionally unique features in each of these regions. The data considered above confirm this idea of geographical divergence of EUP modern human groups in Western Eurasia. The Caucasian records show a specific pathway of EUP development, as is shown by regional differences of the Caucasian EUP. Typical Gravette points with straight backs made by blunted retouch are the most common point type in the EUP levels at Mezmaiskaya Cave. Various backed bladelets are found in the EUP of Mezmaiskaya, Korotkaya, Dzudzuana, and Ortvale Klde. The Caucasian EUP demonstrates a wide assortment of bone tools, and some personal ornaments. These organic artifacts include points with rounded cross-sections, bone awls and needles, pendants made from caprid teeth, cockleshell or marine gastropod beads. Bone implements with geometric ornamentation are absent in the oldest EUP industries but appear in the later EUP levels in Mezmaiskaya, Dzudzuana, and Ortvale Klde (Golovanova *et al.* 2010b).

These recent findings significantly contribute to our understanding of EUP origin and development in the Caucasus. New and more detailed data from ongoing research will provide in the future better knowledge of the EUP in the Caucasus and its relationship to EUP entities in the extensive surrounding Paleolithic landscape of West Eurasia.

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