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FROM INITIAL UPPER PALEOLITHIC TO AHMARIAN AT ÜÇAĞIZLI CAVE, TURKEY

ABSTRACT: Early Upper Paleolithic industries in central Eurasia characterized by Upper Paleolithic retouched tool forms and blades produced by variants of the Levallois method are known variously as Emiran, Bohunician, "lepto-Levalloisian", or Initial Upper Paleolithic (IUP). These assemblages are often described as being transitional between Middle and Upper Paleolithic. This paper describes changes over time in early Upper Paleolithic technology and tool forms at Üçağızlı cave, Hatay, Turkey. Initial Upper Paleolithic assemblages are found at the bottom the Üçağızlı sequence, whereas the uppermost layers yield Ahmarian industries characterized by blade manufacture by soft-hammer or indirect percussion techniques. Taken as a whole the sequence seems to document a complex, in situ transition between IUP and Ahmarian between roughly 41,000 and 30,000 radiocarbon years BP. Different aspects of the assemblages changed at different rates. Frequencies of different blank and retouched tool forms appear to have shifted quite gradually, whereas the shift from hard hammer to soft hammer or indirect percussion was relatively abrupt. Changes in dorsal scar patterns on blades and core forms are also abrupt but non-synchronous. The evidence for an in situ transition from IUP to Ahmarian at Üçağızlı cave supports conclusions drawn earlier from the site of Ksar 'Akil. These results suggest that if there is a major break in the Levantine Upper Pleistocene sequence corresponding with the appearance and spread of modern Homo sapiens, it must have been between the Mousterian and the Initial Upper Paleolithic, or perhaps earlier.

KEY WORDS: Upper Paleolithic – Lithic technology – Turkey – Blades

THE SIGNIFICANCE OF THE INITIAL UPPER PALEOLITHIC

For almost a century, the Aurignacian was virtually synonymous with the early Upper Paleolithic, and many researchers assume that industry to be the archaeological signature for the earliest anatomically modern humans to inhabit Eurasia. However, it has become increasingly clear that the Aurignacian is neither the oldest nor the most widespread form of early Upper Paleolithic. From central Europe to Siberia there is remarkable diversity in early Upper Paleolithic assemblages, and the Aurignacian *sensu stricto* occupies a relatively minor part of the spectrum of variability. Throughout most of this huge area, the earliest assemblages, whether by stratigraphic position or direct radiometric age assessment, fall into the general category of Initial Upper Paleolithic (IUP), also known by the more descriptive but less convenient term "lepto-Levalloisian".

The label IUP or lepto-Levalloisian refers to assemblages characterized by essentially Upper Paleolithic inventories of retouched tools combined with blank production systems based on variants of the Levallois method. IUP assemblages are typified by flat blades and elongated points with broad, faceted platforms, products which would normally be classified as derived from a Levallois production system. Many, though not all IUP technological systems are further characterized by bidirectional preparation and exploitation of cores (Demidenko, Usik 1993, Škrdla 1996, 2003). Whether or not these early Upper Paleolithic methods of core exploitation are truly Levallois depends on the breadth or narrowness of the definition of Levallois technology used. In most cases retouched tool forms consist mainly

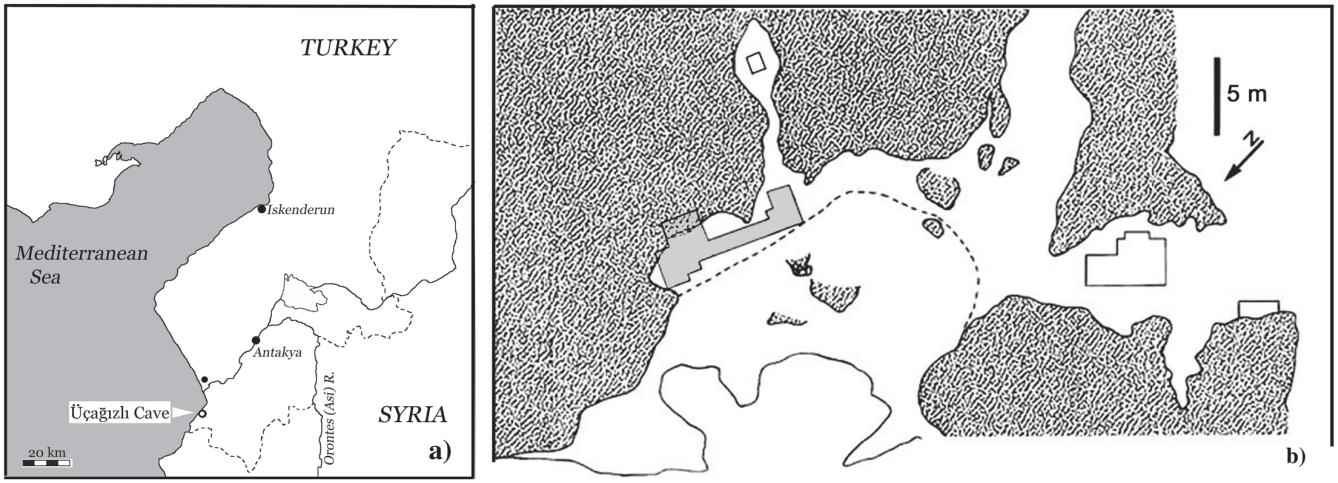

FIGURE 1. Area and site map, Üçağızlı cave.

of Upper Paleolithic forms (burins, endscrapers, and retouched blades), sometimes with a significant number of generic Middle Paleolithic types (such as sidescrapers and broad points). Temporally distinctive tool forms tend to be confined to relatively small areas: the presence of *chanfreins* and Emireh points in the Levantine IUP (Bar-Yosef 2000, Gilead 1991, Schyle 1992) constitutes about the only examples of "type fossils" in the IUP, and these artifacts have a very restricted geographic distribution. Although the IUP is best known for its lithic technology, other kinds of typical Upper Paleolithic elements, including bone tools and ornaments, are also present in some but not all sites and assemblages.

Assemblages corresponding to the general definition of IUP/lepto-Levalloisian are distributed over a vast area extending from the Siberian Altai (Derevianko 2001, Derevianko *et al.* 2000a, Otte, Kozłowski 2001) through the Levant (Azoury 1986, Bar Yosef 2000, Bergman, Ohnuma 1987, Boëda, Muhesen 1993, Coinman, Fox 2000, Kuhn *et al.* 1999, Marks, Volkman 1983) and into eastern and central Europe, where they are best exemplified by the Bohunician (Cohen, Stepanchuk 1999, Demidenko, Usik 1993, 1995, Ginter *et al.* 1996, Gladilin 1989, Kozłowski 1988, 2000, Svoboda 1988, Svoboda *et al.* 1996. Svoboda, Škrdla 1995). Similar kinds of assemblages are found as far east as Mongolia (Derevianko *et al.* 2000b, 2001). Currently, the lepto-Levalloisian does not seem to be present west of the Balkans, although it is possible that something like it extended into the Rhone Valley (L. Slimak, pers. comm. 2003). Even though it is widespread, the IUP is not ubiquitous throughout this range. Most notably, it seems to be absent from areas such as the Crimea and the Caucasus where the Middle Paleolithic lasted until well after 40,000 years ago and where the Upper Paleolithic came relatively late (Adler 2002, Chabai, Monnigal 1999, Golovanova *et al.* 1999, Meshveliani *et al.* 2004, Pettit 1998, Tushabramishvil *et al.* 1999). Where long sequences are preserved, IUP layers tend to be positioned stratigraphically between the latest Mousterian and other Upper Paleolithic complexes. In central Eurasia radiometric dates for the IUP/lepto-Levalloisian tend to fall between around 35,000 BP and the practical limits of radiocarbon dating (Bar-Yosef 2000, Derevianko 2001, Dolukanov *et al.* 2001, Goebel *et al.* 1993, Kozłowski 2000, Otte, Kozłowski 2001, Svoboda, Bar-Yosef 2003). The Mongolian sites are significantly younger, less than 30,000 years old (Derevianko *et al.* 2000b, 2001), and may represent a separate phenomenon.

Three general questions about the IUP/Lepto-Levalloisian remain outstanding. First, does this phenomenon represent a single, widely diffused cultural complex or is it more of a generalized developmental stage between Middle and Upper Paleolithic? The eventual answer will hinge on the level of technological coherence among the various early Upper Paleolithic assemblages with Levallois-like blade technology. As with the Aurignacian, the term Initial Upper Paleolithic may disguise a great deal of variability. The second question concerns the origins of the IUP. Although the presence of Levallois elements in the methods of blank production has prompted many researchers to refer to the IUP as "transitional" between Middle and Upper Paleolithic, Levallois technology was very widespread in the Middle Paleolithic so that the traits in question need not have been derived from the *local* Mousterian industries everywhere they occur. Technological discontinuities between the IUP and the most recent Mousterian have led investigators to argue that the complex is actually intrusive to areas such as Moravia and the Russian plain (Svoboda *et al.* 1996, Tostevin 2000). The third question concerns the relationships between the IUP and subsequent Upper Paleolithic industries. The simple fact that it seems to represent the first recognizable type of Upper Paleolithic in many places does not necessarily mean that the IUP was ancestral to later complexes: it might well have disappeared "without issue" over all or part of its range.

Recent excavations at Üçağızlı cave in south-central Turkey have produced a large body of information pertinent to addressing two of the questions posed above. Üçağızlı

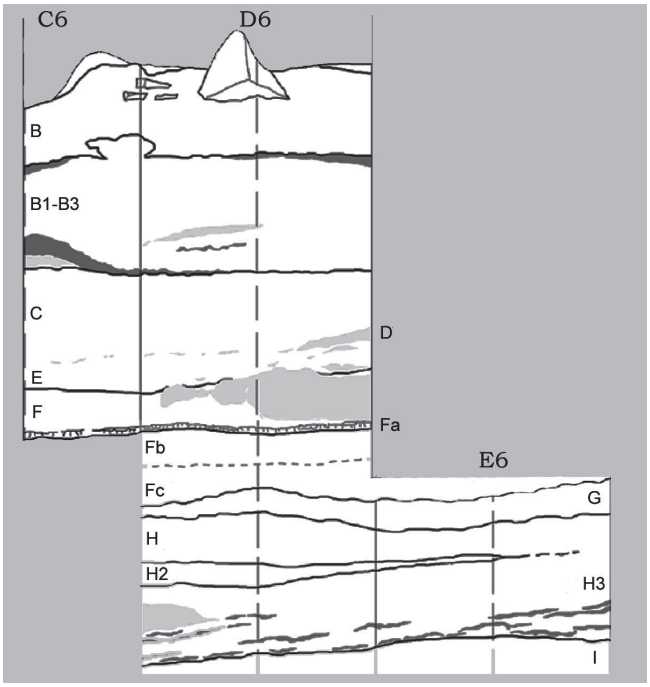

FIGURE 2. Stratigraphy of northern trench.

cave lacks a substantial late Middle Paleolithic component so that it cannot be used to assess the relationship between the IUP and the local Mousterian. On the other hand, the large IUP assemblages from the site can contribute to better characterization of technological variation within the complex. More importantly for the purposes of this paper, the stratigraphic sequence at the site is well suited for assessing the relationship between the IUP and later Upper Paleolithic industries. Results from the site suggest that there is a high degree of technological continuity within the Upper Paleolithic sequence at the site, but that different elements of technology changed somewhat independently of one another.

SITE LOCATION, DESCRIPTION, AND HISTORY OF RESEARCH

Üçağızlı ("three mouths") cave is located on the Mediterranean coast of the Hatay region of southern Turkey, about 15 km south of the mouth of the Asi (Orontes) river (*Figure 1a*), in the extreme northeast corner of the Mediterranean basin. Although it lies within the borders of the Turkish Republic, topographically and ecologically it resembles the coastal Levant much more closely than it does Anatolia. The area around Üçağızlı cave is characterized by dramatic relief. To the north and east of the site rugged cliffs of Cretaceous limestone and much older underlying metamorphic rocks rise several hundred meters to an interior plateau, while immediately to the south of the site the slopes of Kel Dağ rise directly from the sea to an elevation of >1,500 m. Drainages in the area of Üçağızlı cave are short, narrow, steep, and choked with rockfall. Two dry valleys located immediately north of the site end in vertical "box canyons" a kilometre or two from the sea.

Like many other caves situated along this particular stretch of Mediterranean shoreline, Üçağızlı cave collapsed at some time in the past. Intact Pleistocene-aged sediments are preserved in two parts of the site (*Figure 1b*). At the south end of the site a narrow, tubular chamber open at both ends preserves at least a meter of Upper Paleolithic sediments. A small remnant Epipaleolithic deposit was also located in this southern chamber. A deeper stratigraphic sequence is preserved at the north end of the site along what was formerly the back wall of the cave, where Paleolithic deposits extend into a narrow "niche" that actually widens out considerably with depth. The northern and southern areas are separated by a steep slope composed of colluvial material originating in the large hole in the cave's roof. This colluvium truncates archaeological deposits laterally so that it is impossible to connect the sequences in the northern and southern areas directly.

Üçağızlı cave was identified and first excavated in the mid 1980s by A. Minzoni-Déroche (Minzoni-Déroche 1992). The current project began in 1997 and continues to the present (2003). The research is a collaboration between the University of Arizona and Ankara University: the Turkish team is headed by Prof. E. Güleç (Kuhn *et al.* 1999, Güleç *et al.* 2002, 2003). Minzoni-Déroche excavated mainly in the tubular cave at the south end of the site (*Figure 1b*). Our work has concentrated on the northern area, although we also opened small excavation areas in the southern area in order to excavate the remnant Epipaleolithic deposits and to obtain comparative material and dating samples from Minzoni-Déroche's earlier trench.

The preserved stratigraphic column at Üçağızlı cave reaches a depth of more than four meters at the north end of the site. Early Upper Paleolithic cultural materials are abundant in the uppermost three meters or so of the sequence but artifacts and bone are quite scarce below approximately 350 cm below datum. The sediments are considerably shallower and more extensively cemented in the southern chamber.

The early Upper Paleolithic stratigraphic sequence in the northern part of Üçağızlı cave (*Figure 2*) is fairly uniform lithologically. The main geogenic component consists of reddish clays or silty clays, the *terra rossa* typical of karstic terrain in the Mediterranean basin. The main stratigraphic distinctions are based not on changes in the basic geological matrix but on the relative abundance of anthropogenic sediment such as ash and charcoal, as well as artifacts and bone. Layers B, C, E, G, and I are composed predominantly of *terra rossa* clay with relatively minor amounts of ash. Layers B1–B4, D, F, Fa, Fb/Fc, H, and H2/H3 are characterized by a more evident anthropogenic component, ranging from massive deposits of ash to closely superimposed ash and charcoal lenses. Generally, the abundance of lithics, bone and mollusc shells correlates

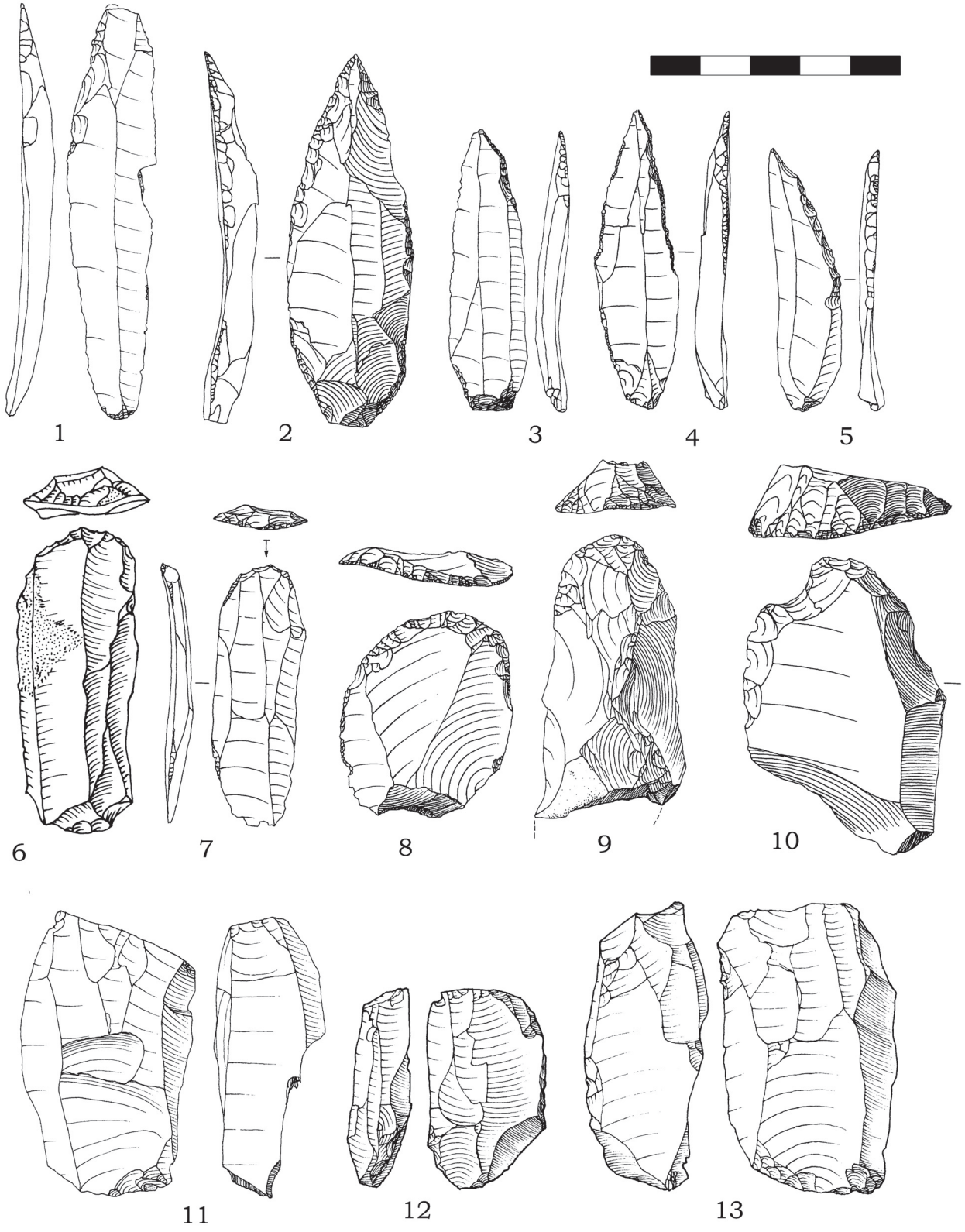

FIGURE 3. Ahmarian stone artifacts from layers B, B1–B4, and C at Üçağızlı cave. 1, retouched blade, 2–5, pointed blades, 6–9, endscrapers, 10, flat nosed endscraper, 11–13, cores.

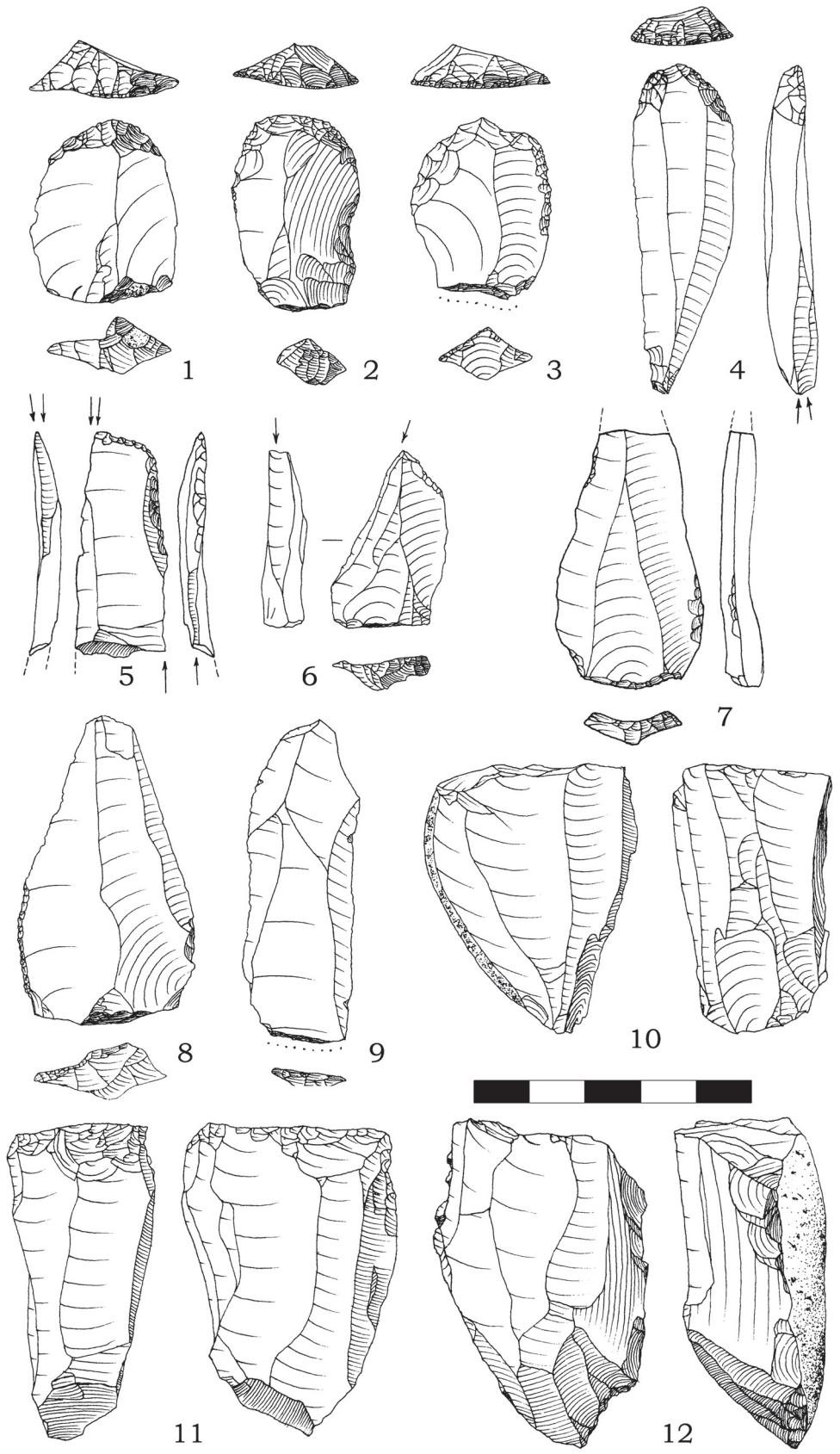

FIGURE 4. Initial Upper Paleolithic artifacts from layers H, H2 and H3 at Üçağızlı cave. 1–3, short endscrapers, 4, endscraper/burin, 5–6, burins on truncation, 7–9, Levallois products, 10–12, cores.

directly with the amount of ash in the sediment. Although there are no major changes in lithology of sediments in Üçağızlı cave, the stratigraphic sequence may not be entirely continuous. At least two layer boundaries, between layers I and H3 and C and B1–B4 respectively, are marked by very flat, sharp transitions that may indicate erosional discontinuities.

Most of the layers rich in ash were further subdivided into smaller stratigraphic units, such as B1, B2, H3, *etc.* These finer stratigraphic distinctions are based almost exclusively on variation in the anthropogenic components of the sediments. As a consequence the units tend to be thin and localized. Because they do not extend across the entire excavated areas, and because they yielded relatively small samples, many of these fine units have been combined for the purposes of this presentation: the discussion therefore refers to layers B1–B4, Fa/Fb, H2/H3 as single units.

Overall, the stratigraphic sequence at Üçağızlı cave seems to be dominated by the rhythms of human frequentation of the cave. *Terra rossa* clays are a constant component of the sediments. During intervals of time represented by layers B, C, E and I clay was the dominant sediment deposited and humans contributed comparatively little. Over other intervals, such as those represented by layers B1–B4, D, F, H, *etc.*, the human use of the cave was seemingly more intense, and anthropogenic sediments are a much more important component. It is possible that the amount of clay entering the cave from outside varied over time as well but we have no absolute scale from which to judge. What is most important from an archaeological perspective is that the intensity of human use of Üçağızlı cave, the duration and/or number of occupations, varied over time.

The nature of the anthropogenic deposits suggests that the rhythms of human occupation varied even among the layers rich in anthropogenic sediment and artifacts. In layers F, H, H2–3, and the upper part of layer I, ash, charcoal, artifacts and bones are concentrated in relatively thin, discrete lenses, separated by thin bands of clay. This finely-divided structure suggests that human occupation consisted of a (large) series of relatively brief events, separated by intervals of temporary abandonment. In contrast, at the north end of the excavation trench layer B1–B4 is dominated by a massive, midden-like accumulation of ash, lithics and bone that suggests a more intense or prolonged occupation

The lithic assemblages from Üçağızlı cave can be divided into three groups. Initial Upper Paleolithic assemblages come from layers F through I. Materials from layers B, B1–B4, and C fit within the definition of the "Ahmarian", a later Upper Paleolithic complex found throughout the Levant. Assemblages from layers D and E are somewhat transitional between these two main components though they resemble the Ahmarian more closely than the IUP.

The Ahmarian assemblages of layers B, B1–B4 and C (*Figure 3*) are characterized by a heavy predominance of narrow, regular blade blanks produced from bi-directional prismatic cores. Platforms on blades are small, sometimes invisible, and often show evidence of extensive preparation by grinding and chipping down of the core face. The morphologies of both cores and blades suggest that indirect percussion was used at least in the final stages of blank production. The bidirectional exploitation of cores often led to the manufacture of narrow blades with pointed distal ends. Endscrapers are the dominant tool forms in the Ahmarian: elongated simple endscrapers on blades are especially common although a variety of other forms are present. Other relatively common tool forms include retouched blades and pointed blades (Ksar 'Akil or el Wad points). Burins as well as typical Aurignacian forms, such as Dufour bladelets and carenated pieces, are very rare.

The IUP assemblages from Üçağızlı cave are marked by high frequencies of wide, flat blades with broad facetted platforms (*Figure 4*). The number of pieces that would fit a strict definition for Levallois blanks is relatively small, but the general configuration of both blanks and cores is highly reminiscent of Levallois method, especially in layers G, H and I. Dorsal scar patterns on blanks reflect predominantly unidirectional parallel or convergent orientation of detachments, although some cores show some evidence for exploitation of a second, opposed and offset striking platform. The large platforms and pronounced bulbs of percussion suggest that hard-hammer percussion was the dominant technique. As is true in the Ahmarian layers, endscrapers are the predominant retouched tool forms: in the earlier assemblages short endscrapers with faceted butts are especially common (*Figure 4, 1–3*). Burins are also more abundant than in the upper layers, while pointed blades are rare. *Chanfreins*, an artifact type characteristic of the IUP in Lebanon (Azoury 1986, Bergman, Ohnuma 1987), are clearly present only in layer I.

Conditions for preservation of bone and shell are excellent at Üçağızlı cave, and as a consequence the site has yielded evidence for aspects of material culture other than chipped stone. Bone tools are found throughout the sequence but, as is true of other Levantine Upper Paleolithic sites, they are relatively rare. The largest numbers of bone artifacts come from layers B and B1–B4: these consist mainly of small, thin, pointed forms such as needles, awls or points. Isolated specimens of cylindrical points or large pins were recovered from both layer F and layer H. Ornaments, almost exclusively beads and pendants made from marine shells, are common throughout the sequence. The natures of the ornament assemblages do change considerably over time. In the earliest IUP layers (H though I) more than 90% of the beads are manufactured using a single species, *Nassarius gibbosula.* Over time the shell ornament assemblages become much more diverse, encompassing both a larger number of mollusc species and a broader range of sizes and shapes (Kuhn *et al.* 2001).

A large number of AMS radiocarbon dates have been obtained from the Üçağızlı sequence (*Table 1*). The great majority of the dates are for charcoal samples, although a few of the determinations from the top of the sequence were

TABLE 1a. Proportions of major blank forms, unretouched specimens. Indeterminate (fragmentary) specimens are not included in tabulations.

	AHMARIAN						IUP	
Layer	**B**	**B1–B4**	**C**	**C/D**	**D**	**E**	**F**	**Fa**
>75% cortical pieces	3.2	2.9	7.2	6.0	1.2	6.7	7.1	3.5
Plain flakes	23.2	22.5	26.8	30.0	28.4	25.7	25.4	25.9
Plain blades	64.6	65.5	49.4	45.9	54.3	50.1	46.5	53.1
Levallois flk/pt	0.1	0.0	0.5	0.0	1.2	0.0	0.3	2.8
Levallois blade	0.0	0.0	0.5	0.0	0.0	0.9	1.5	2.1
Crete	2.3	3.3	3.9	3.0	7.4	7.6	5.2	9.1
Core tablet	1.2	1.3	1.1	6.0	0.0	1.7	0.6	0.0

	IUP				
Layer	**Fb/Fc**	**G**	**H**	**H2/H3**	**I**
>75% cortical pieces	9.7	8.7	7.7	12.2	11.1
Plain flakes	25.0	23.0	26.2	30.0	42.3
Plain blades	43.2	42.6	44.3	38.3	19.3
Levallois flk/pt	0.7	1.5	0.8	0.5	1.6
Levallois blade	2.1	7.5	5.2	1.6	3.3
Crete	6.1	3.4	2.3	3.1	1.6
Core tablet	0.9	0.4	0.6	0.4	0.3

TABLE 1b. Proportions of major blank forms, retouched and/or typed specimens. Indeterminate (fragmentary) specimens are not included in tabulations.

	AHMARIAN						IUP	
Layer	**B**	**B1–B4**	**C**	**C/D**	**D**	**E**	**F**	**Fa**
>75% cortical pieces	4.5	2.8	4.9	10.5	–	6.6	2.0	2.0
Plain flakes	17.3	15.8	14.7	18.4	–	16.9	20.2	20.2
Plain blades	74.4	75.0	59.4	60.5	–	62.5	47.8	47.8
Levallois flk/pt	0.0	0.1	4.2	0.0	–	1.5	5.3	5.3
Levallois blade	0.3	0.0	0.7	0.0	–	1.5	15.8	14.6
Crete	1.3	1.5	1.4	0.0	–	5.9	2.9	2.8
Core tablet	0.3	1.8	2.1	0.0	–	1.5	0.0	0.0

	IUP				
Layer	**Fb/Fc**	**G**	**H**	**H2/H3**	**I**
>75% cortical pieces	4.8	4.9	2.4	5.5	0.0
Plain flakes	16.9	7.3	20.5	16.1	17.2
Plain blades	45.2	68.3	42.2	32.5	15.5
Levallois flk/pt	6.3	9.8	10.8	10.6	29.3
Levallois blade	16.5	7.3	13.3	25.8	27.6
Crete	3.8	2.5	2.4	2.5	1.7
Core tablet	0.0	0.0	0.0	0.3	0.0

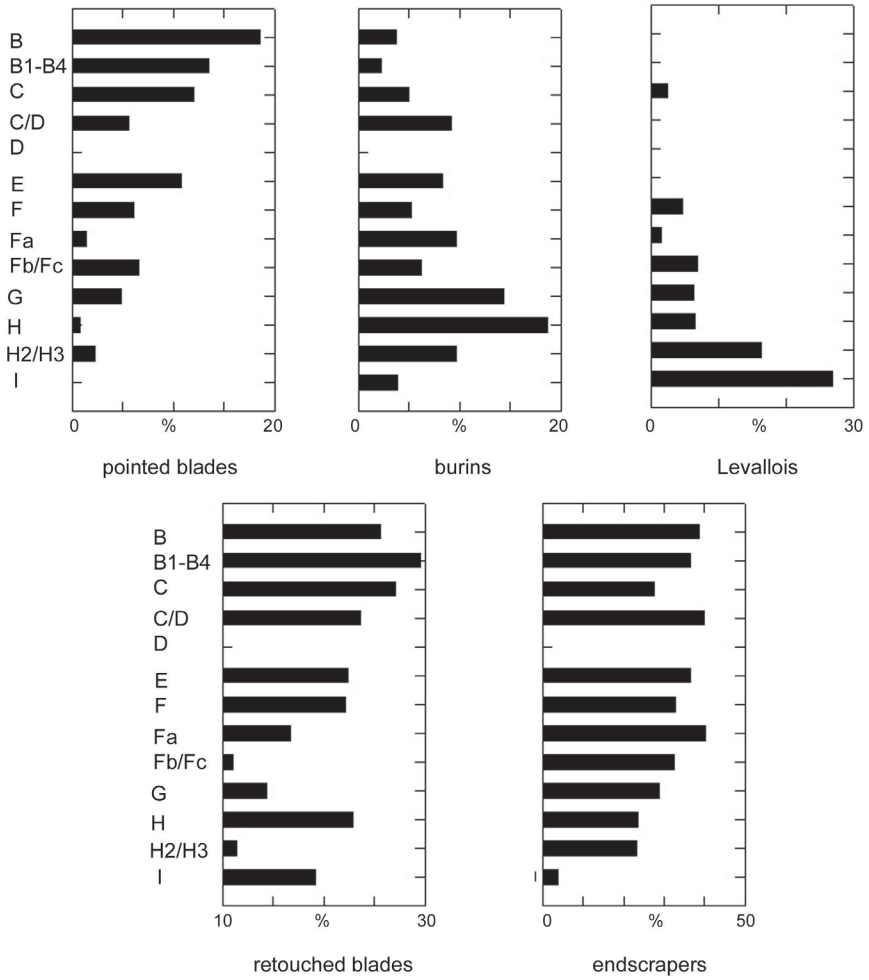

FIGURE 5. Trends in proportions of major tool classes.

made on marine shell. Basically, the dates show that the sequence spans an interval from roughly 29,000 BP to at least 41,000 radiocarbon years. Two factors make it difficult to provide a more precise assessment of the age of the earliest (IUP) layers. First is the presence of an "excursion" of as-yet unknown magnitude in atmospheric radiocarbon concentrations for the period between approximately 36,000 and 42,000 radiocarbon years ago, so that radiocarbon ages for the period in question may underestimate true ages by several thousand years and possibly as much as 6,000 years (Beck *et al.* 2001, Kitagawa, Van der Plicht 1998). Second, a number of samples yielding anomalous ages in the range of 34,000–36,000 have been dated from layers H, H2/3 and I. These unexpectedly recent ages could be due to contamination of samples, or they may reflect downward movement of small pieces of organic material within the stratigraphic column. Because it is easier for contamination with recent carbon to cause a very old sample to produce a radiocarbon age younger than its true age than for it to produce an age greater than the true date, the oldest dates for each layer are probably closest to the true ages. However, due to general problems of contamination in very old samples and uncertainties about the magnitude of the ^{14}C excursion even these dates should be treated as minimum ages.

TECHNOLOGICAL AND TYPOLOGICAL VARIATION OVER TIME

Virtually every scholar that has attempted to synthesize the Upper Paleolithic record in the eastern Mediterranean agrees that Ahmarian technologies developed directly out of the Levantine IUP/lepto-Levalloisian (Bar-Yosef 2000, Gilead 1991, Marks 1992, Marks, Ferring 1988, Schyle 1992). If true, this would have profound implications for both long-term cultural evolutionary trajectories and hominid evolution in the region. Many scholars also believe that the IUP developed *in situ* out of some form of late Middle Paleolithic in the Levant (Gilead 1991, Marks 1992, Schyle 1992, but see Tostevin 2000 for a different view). If the IUP in turn developed into the Ahmarian, this would imply a high level of cultural continuity over the very period in which anatomically modern humans are thought to have colonized Eurasia from Africa.

The universality of this view is somewhat surprising in light of the fact that IUP and Ahmarian assemblage seldom occur together in the same stratigraphic sequence. In fact, the only site in which the "transition" can be examined in any detail is Ksar 'Akil, in Lebanon (Azoury 1986, Ohnuma, Bergman 1990). Although the Ksar 'Akil sequence does in fact suggest a gradual transition between the two industries,

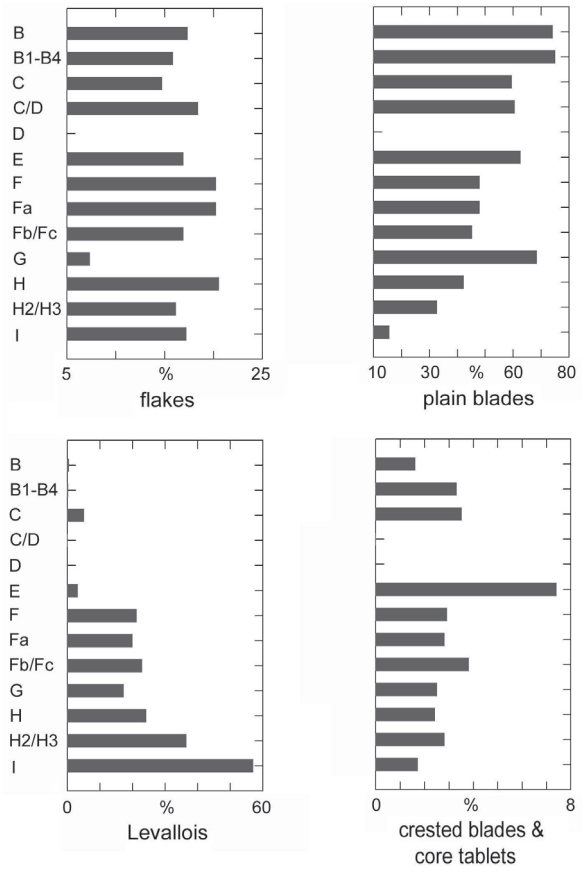

FIGURE 6. Trends in proportions of major blank classes (retouched or "typed" specimens only).

TABLE 2. AMS radiocarbon determinations for Üçağızlı cave.

LAYER	^{14}C age	sigma
B	29,130	380
B1–B4	31,900	450
	32,670	760
	34,580	620
C	29,060	330
E	36,560	790
	37,870	920
F	34,000	690
	35,029	740
G	39,100	1500
H, H2/H3	35,500	1200
	35,670	730
	38,900	1100
	39,400	1200
	41,400	1100
I	35,100	1400
	39,200	1300
	39,700	1600
	40,200	1300

the reliability of this conclusion is limited by the fact that the excavation was done more than 50 years ago, using rather course stratigraphic distinctions and large (4 m^2) horizontal provenience units. If the "layers" at Ksar'Akil crosscut the bedding of the archaeological deposits to some degree, the resulting mixing would tend to promote the appearance of gradual change over time regardless of the actual situation. The Üçağızlı sequence should provide an independent test of the hypothesis of continuity between the two complexes.

Below, I examine trends in several technological and typological indices over the entire Upper Paleolithic sequence at Üçağızlı cave. The samples discussed come from the north end of our excavation trench, squares B4 through F6. These particular squares were selected because the stratigraphic sequence is most complete in this part of the site: the south end of the trench essentially lacks layers B, B1–B4, and C. Moreover, it is apparent that assemblage composition and structure vary to a certain extent over even the small area covered by our excavation trenches: by focusing on one small area we can eliminate many effects of spatial differentiation in activities.

Figure 5 shows proportions of the five most important retouched tool classes within 13 stratigraphic units in the Üçağızlı cave sequence. There appear to be a few directional trends in the relative frequencies of each of these classes, although because they are proportions of the same whole there is a certain level of autocorrelation between the proportions. Generally speaking, the frequencies of Levallois and burins decline over time, while the abundances of pointed blades and endscrapers increase. For the most part these trends appear relatively smooth. The exception is unretouched Levallois pieces, which are significantly more abundant in layers H2/H3 and I, dropping off sharply at layer H and then disappearing almost completely in layer E.

Looking at trends in the proportions of different blank forms (*Figure 6, Table 2*) we see a similar pattern. Blades are the largest single class of blank, especially among retouched tools, in all layers except layer I, which is unique in that plain flakes are the most common tool blanks. However, the proportion of plain blades rises gradually throughout the sequence and reaches a distinct peak in layers B and B1–B4. Again, Levallois specimens are most common in layers H2/H3 and I, declining gradually within the IUP layers and essentially disappearing at the transition to layer E. Flakes and core trimming elements show no discernable long-term trends. Note that the commonness of Levallois pieces among the tools and their rarity in the unretouched/untyped category reflects the use of

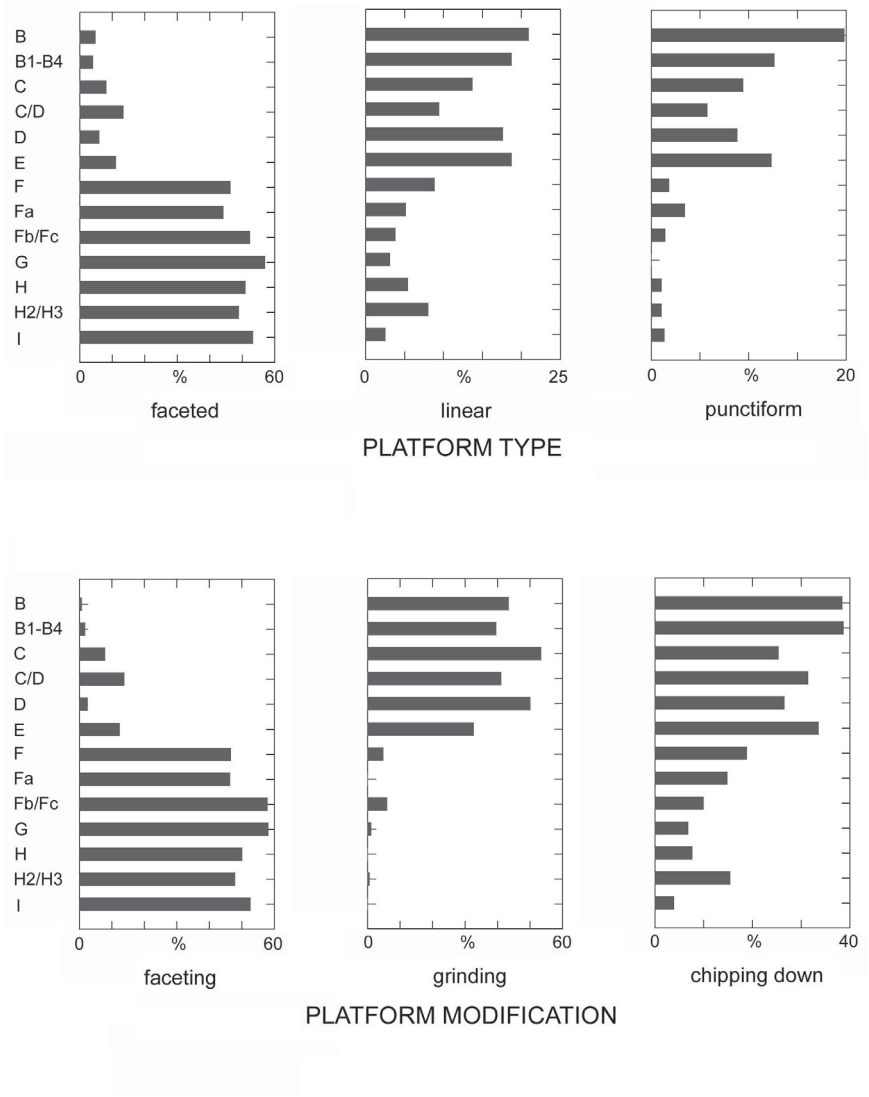

FIGURE 7. Trends in platform morphology and platform treatment.

the Hours (1974) Upper Paleolithic typology, which groups unretouched Levallois specimens with other tools.

A somewhat different set of trends develops when we examine technological indicators. *Figure 7* shows the proportions of different platform types and different techniques of platform modification. Only the most variable types of platforms (faceted, punctiform and linear) are shown: the frequencies of cortical, plain and dihedral platforms change relatively little over the course of the sequence. For both platform type and platform modification, trends through time demonstrate the replacement of Levallois-like blade production with blade production from prismatic cores using indirect or soft-hammer percussion. This is manifest in the declining frequencies of facetted butts and the corresponding increase in punctiform and linear butts, as well as in the increase over time in evidence for platform abrasion or grinding. However, in contrast to trends in blank and tool form, relatively abrupt shifts in platform treatment seem to have occurred with the transition from layer F to layer E, thus distinguishing the IUP levels from all those above them.

As discussed above, there is a general trend over time in the Üçağızlı sequence away from single platform, unidirectional cores and towards the use of cores with two opposed platforms. This trend is reflected in both the orientations of dorsal scars on blanks and in the forms of residual cores (*Figure 8*). As with platform attributes, dorsal scar patterns on blades show a relatively abrupt transition between layers F and E, such that a strong predominance of unidirectional (proximal) scar origins gives way to a more equal representation of unidirectional and bidirectional patterns of scar origin. Some mix of uni- and bidirectional scar patterns is expected even where most cores have two platforms: not all blades from opposed platform cores preserve scars originating at both ends. Interestingly, core forms show a somewhat different pattern of change over time from the dorsal scar patterns on blades. Among the layers yielding sufficiently large samples for reliable characterization, the real change seems to take place above layer C. Only in layers B and B1–B4 do cores with two opposed platforms outnumber those with a single platform.

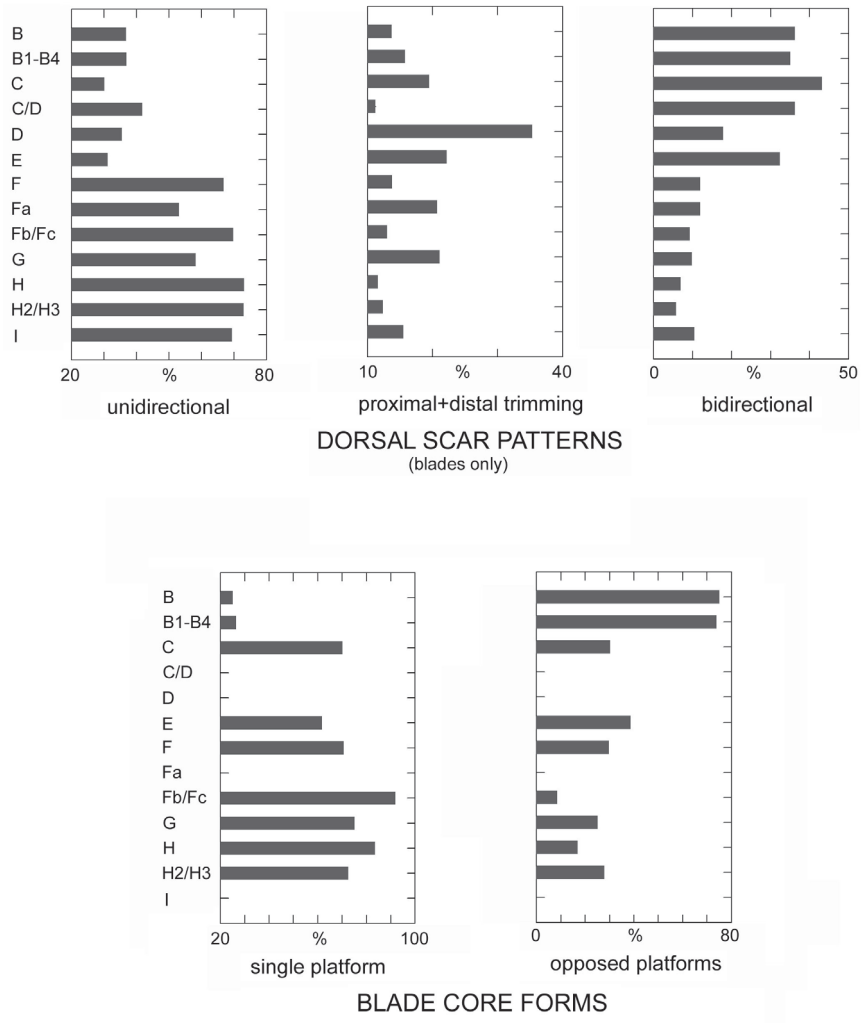

FIGURE 8. Trends in dorsal scar patterns on blades (retouched and unretouched) and in core morphology.

DISCUSSION

Overall, the cultural sequence at Üçağızlı cave is consistent with that from Ksar 'Akil, suggesting much continuity between IUP and Ahmarian. However, the nature of the transition depends on the kinds of features being examined. Different elements change at different rates – some shifts are gradual, some are more abrupt. And the points of apparently abrupt change differ among the technological attributes. This lack of synchrony between different elements provides a much richer perspective on the development of early Upper Paleolithic technology in the region. Changes through time in frequencies of different retouched tool forms are gradual and by and large of relatively small magnitude. Changes over time in blank form are similarly gradual and incremental, with the main trend through time being the decline and eventual near-disappearance of the Levallois-like blanks. The trends in blank forms are echoed in evidence for techniques of blade production, such as morphology and treatment of striking platforms. However, the shifts in manufacture technique appear to be abrupt rather than gradual, with a categorical change occurring at around the transition between layers F and E. Dorsal scar patterns on blades show a similarly abrupt change at the E/F boundary, reflecting a shift in emphasis towards opposed platform prismatic blade cores. However, this tendency does not manifest itself in the residual cores found at the site until higher in the sequence, in layers B1–B4 and B.

The continuity in tool and blank forms at Üçağızlı cave suggest similar activities and approaches to manufacture of composite tools prevailed throughout the entire period occupation. In light of the abundance of scrapers it seems likely that hide preparation was an important activity throughout the 12,000-year occupational span. Interestingly, the frequency of burins is actually inversely correlated with that of bone tools, in that burins are common only in the lowest layers where bone/antler artifacts are rare. Preliminary micro-wear results suggest that burins from the lower levels were indeed used to work materials other than bone or antler, most notably hides (K. Martinez, pers. comm. 2003).

Within the framework of this long-term continuity in the end products of lithic reduction, we see a major and relative shift in the techniques used in blank production, namely the replacement of hard hammer percussion with soft hammer or indirect percussion. This technological shift seems to occur fairly abruptly around the boundary between layers F and E. In some respects it looks like the introduction of a new set of techniques, although elements of it may have been present earlier. In fact, the shift may be equally well characterized in terms of the sudden disappearance of Levallois-like elements in technology. In any event this modification of manufacture techniques marks the end of the Initial Upper Paleolithic fairly clearly. The shift towards a greater emphasis on bi-directional, opposed-platform cores, as indicated by dorsal scar patterns on blades, also occurs at about this time.

The apparent lag between changes in dorsal scar patterns and shifts in core morphology is intriguing. On one hand this apparent asynchrony could be more apparent than real. In the lower, IUP layers, the platforms on bidirectional cores tend to be offset, such that one exploits the broad face of the core and one the adjacent narrow face: this same phenomenon has been noted in other "lepto-Levalloisian" industries (e.g., Svoboda, Škrdla 1995). A consequence of the offset platforms is that most flakes and blades preserve negatives of previous blows originating from only one of the platforms. By layer E and above cores are more classically prismatic in form, with opposed platforms being used to exploit the same face of detachment, a geometry which naturally produces more blanks with bidirectional dorsal scar patterns. The jump in residual cores with two platforms in layers B1–B4 and B may instead reflect changing strategies of raw material exploitation. B and B1–B4 are the only layers in which cores found at the site were mostly made using large flint nodules obtained from primary deposits situated some distance inland: in the rest of the sequence, most cores were made of smaller pebbles found not far from the site. The exploitation of larger packages of raw material in layers B, and B1–B4 would have made it easier to produce blades of usable length from opposed platform cores, whereas the use of smaller pebbles would have made it more difficult. Conversely, heavy reliance on raw materials from distant sources may have placed a premium on getting the most out of cores, including creation of a second striking platform.

It is noteworthy that the IUP at Üçağızlı cave is not homogeneous, and that many long term trends begin within the earliest layers and not above them. For example, we clearly see evidence for the production of fewer Levallois products and fewer burins over time, as well as an increase in pointed blades, within layers I through F. On the other hand, *technological* attributes (platform and scar patterns) are more consistent within the earliest levels. These data, along with the abrupt changes occurring at the E/F boundary, suggest that the basic method (or methods) of blade production within the Initial Upper Paleolithic was (were) quite coherent, and that modification of them took the form of a fundamental reorganization of manufacture techniques. In other words, there seem to be no intermediate stages between the two systems of blade manufacture, even though tool and blank forms changed gradually.

Finally, the continuity between IUP and Ahmarian at Üçağızlı cave and at Ksar 'Akil has implications for understanding the archaeological consequences of the dispersal of anatomically modern humans into Eurasia. According to Foley's survey of the genetic and anatomical evidence pertaining to modern human origins and dispersal, "The emerging consensus has been interpreted in evolutionary terms as evidence for a recent African origin (i.e. ca. 200,000 years ago) for modern humans, followed by dispersal from Africa with little or no interbreeding with other populations of hominids" (Foley 1998: 339, see also Klein 1999). The dating of this expansion event is uncertain but it almost certainly occurred during the Upper Pleistocene. If either "Out of Africa" scenario is valid we would expect to find a severe disruption in local archaeological sequences as a result of the immigration of new human populations. This discontinuity should be especially apparent in the Levant due to its proximity to Africa. Clearly, the gradual transition from IUP to Ahmarian discussed here provides no evidence for major disruption in local trajectories of cultural evolution during this interval. As we know that the late Levantine Middle Paleolithic is associated with Neandertals (as at Kebara, and Amud – Bar-Yosef 2000), the only remaining place to look is at the earliest Middle/Upper Paleolithic boundary, that is, the origins of the Initial Upper Paleolithic. Most researchers feel that the Levantine IUP developed locally. However, the only sequence which is likely to cover this "transition" is that of Boker Tachtit: at Ksar 'Akil there is a depositional hiatus between the Middle and Upper Paleolithic layers (Azoury 1986, Marks, Ferring 1988). The excavators of Boker Tachtit have clearly demonstrated a gradual pattern of technological evolution at the site (Marks 1983, Marks, Volkman 1983). Recently, though, several researchers have questioned whether the earliest layers at Boker Tachtit are in fact Middle Paleolithic based on both typology and technological attributes (Bar-Yosef 2000, Tostevin 2000), meaning that the sequence may not pertain to the MP/UP transition so much as changes within the early Upper Paleolithic. In sum, if we are to address and possibly even reconcile the discrepancies between the genetic and the archaeological evidence for the dispersal of modern humans, we need to re-examine the very beginnings of the Upper Paleolithic in the Levant, and especially the relationships between the late Mousterian and the Initial Upper Paleolithic.

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