

Ferran Borrell; Juan José Ibáñez; Miquel Molist (editors)

Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East

7th Conference on PPN Chipped
and Ground Stone Industries
of the Fertile Crescent



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Assessing typo-technological variability in Epipalaeolithic assemblages: Preliminary results from two case studies from the Southern Levant

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Abstract

In this paper we discuss the lithic assemblages from two Epipalaeolithic sites in the southern Levant and their contributions to understanding the different uses of each site. Uyun al-Hammam is a small classically-Geometric Kebaran campsite and cemetery in the northern Highlands of Jordan, whose lithic assemblage is dominated by trapezes-rectangles microliths. Kharaneh IV, on the other hand, is an exceptionally large Epipalaeolithic site in eastern Jordan that served as an aggregation area for Early and Middle Epipalaeolithic groups. The microlith assemblage from Middle Epipalaeolithic levels at Kharaneh IV is notably different from those at contemporary sites in the region, leading to uncertainty about how the occupations here relate to those elsewhere in the Southern Levant. Here we explore the possible reasons for such differences in the assemblages from two roughly contemporaneous sites and examine how this relates to site function. Differences are explored by comparing the lithic technologies at these Middle Epipalaeolithic sites, highlighting reduction strategies, raw material selection, and the morphology of finished tools through the conceptual framework of chaîne opératoire. Building on recent work in the region, the data collected from a techno-typological examination of the microlith assemblages from these sites provides interesting insights into the uses of these tools and, we suggest, the nature of occupation at these sites.

Keywords: Epipalaeolithic, Southern Levant, lithic technology, microliths, Kharaneh IV, Uyun al-Hammam.

1. Introduction

Here we present preliminary results from the analysis of lithic assemblages from two Epipalaeolithic sites in the southern Levant (fig. 1) and discuss their contributions to understanding the different uses of each site. Uyun al-Hammam is a small, classic Geometric Kebaran campsite and cemetery site (c. 16,000 cal BP) in the northern highlands of Jordan, whose lithic assemblage is dominated by trapeze-rectangle microliths (Maher 2007; Maher *et al.* 2011b). Kharaneh IV, on

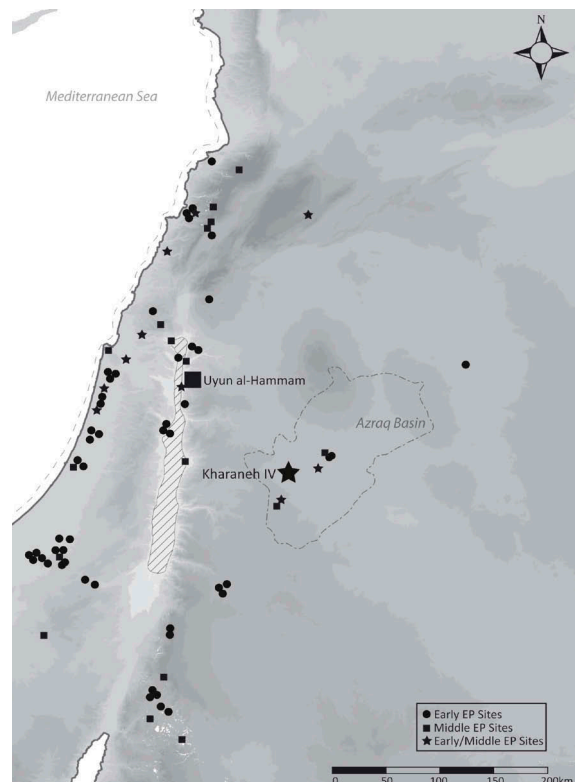


Figure 1: Map of the southern Levant showing the locations of Kharaneh IV and Uyun al-Hammam within the context of other Epipalaeolithic sites in the region.

the other hand, is an exceptionally large site in eastern Jordan that may have been occupied by several Early and Middle Epipalaeolithic groups (c. 20,000-18,000 cal BP) simultaneously (Maher *et al.* 2011a, 2012, in press). The microlith assemblage from Middle Epipalaeolithic levels at Kharaneh IV has been described as notably different from those at contemporary sites in the region (e.g., Muheisen 1988b; Muheisen, Wada 1995; Olszewski 2001, 2007), leading to uncertainty about how the occupations here relate to those elsewhere in the Southern Levant. Here we explore assemblage variability between these two sites and the possible reasons for the differences from two roughly contemporaneous sites. We argue that an in-depth examination of lithic production at both sites, and their microlith assemblages in particular, provides interesting insights into the nature of occupation at each site. In this paper we explore assemblage variability in two dimensions: examining change over time in lithic production from the Early to Middle Epipalaeolithic at Kharaneh IV and regional differences in microlith types between the Middle Epipalaeolithic assemblages at Kharaneh IV and Uyun al-Hammam. This highlights chronological changes in site use at Kharaneh IV, while exploring regional differences in site function through the comparison of Uyun al-Hammam with the Middle Epipalaeolithic deposits at Kharaneh IV. This chronological and regional comparison of Epipalaeolithic assemblages contributes to our understanding variable site and landscape use prior to the origins of agriculture.

It is important to note that although a large number of artifacts have been analyzed from Kharaneh IV our work at the site is still preliminary. The material presented here was analysed during a study season in 2011 and represents only a small sample of the lithics from selected *in situ* contexts including occupational surfaces, hearths, and midden deposits. In contrast, the en-

tire lithic assemblage from Uyun al-Hammam has been analysed over the last decade and the material discussed here represents artifacts from all contexts of the site, including middens, pit features, and burials.

On the basis of our preliminary findings from Kharaneh IV and a comparison with the Uyun al-Hammam material, we suggest a hypothesis that in the Middle Epipalaeolithic levels of Kharaneh, the lithic assemblage –and especially when put together with other aspects of material culture– provide evidence for the use of Kharaneh IV as an aggregation site, where groups from throughout the southern Levant congregated at certain points in time. This assessment of the lithic assemblage is corroborated by several other lines of evidence, including shell beads, faunal remains, and site features (e.g., Maher *et al.* 2012; Martin *et al.* 2010; Richter *et al.* 2011, in press). Changes in the lithic technology through time illuminate the different strategies employed by the inhabitants of Kharaneh IV, and when paired with other aspects of material culture, highlight changes over time. This interpretation is further strengthened when compared with the more ‘classic’ Geometric Kebaran assemblage at Uyun al-Hammam, showcasing the differences in regional site use across the Levant during the Middle Epipalaeolithic.

2. The chipped stone analysis

This paper provides an overview of the results from our preliminary work on the chipped stone assemblages from Kharaneh IV and Uyun al-Hammam. Our work on this material explores the role material culture plays in creating, maintaining, and transforming prehistoric societies. Our approach to the chipped stone sees stone tool production within a wider social context and integrated with other technologies. For example, stone tools were often used in conjunction with other materials to produce composite technologies, such as the bow and arrow, or were used to manufacture other artifacts. Thus, although we present here only a brief report on our chipped stone analysis so far, the material is best understood together with other aspects of material culture and environmental data to reconstruct both the past landscape and the activities of each site’s inhabitants. Lithic analysis of the Uyun al-Hammam assemblage began a decade ago, initially focusing on the tool assemblage and preliminary typological debitage analysis. Detailed attribute analysis was conducted on a sample of the debitage assemblage to further explore the reduction strategy at the site (Macdonald 2007). The data presented here represents a summary of the entire excavated and analyzed lithic assemblage.

The goals of our preliminary work at Kharaneh IV were to conduct a detailed typological and technological analysis of a selection of the chipped stone material excavated in 2008–2010. Since our excavations yielded an enormous amount of lithic material (over 2 million to-date), emphasis was placed on the Middle Epipalaeolithic occupations and particular contexts were sampled to complement the other ongoing faunal, botanical, and environmental analyses, including from hearths, huts, middens, caches, and occupation surfaces. This work was conducted largely at the Council for British Research in the Levant in Amman in 2011.

Several researchers have argued that the microlith assemblage from Middle Epipalaeolithic levels at Kharaneh IV are unusual and emphasize the large size and high degree of variability in trapeze/rectangle forms (e.g., Muheisen, Wada 1995; Olszewski 2007). With this in mind, we examined the Kharaneh IV material with both a typological and technological approach to lend insights into the nature of site occupation and view it in its regional context. Rather than focus primarily on microlithic tools, we present a larger sample of the microliths within the context of their accompanying debitage and compare them with other contemporary sites. We explored assemblage variability in two dimensions, looking at change over time through all occupations at

the site, and change within individual occupation levels to detect the types of activities occurring in various parts of the site. Our observations from a detailed comparative study of the Middle Epipalaeolithic microliths from Uyun al-Hammam and Kharaneh IV is discussed below.

3. Kharaneh IV: an Epipalaeolithic aggregation site

Since 2008, the Epipalaeolithic Foragers in Azraq Project (EFAP) has conducted three excavation seasons at the Epipalaeolithic site of Kharaneh IV investigating the interrelated patterns of mobility, inter-regional exchange, social organization, technology, and palaeolandscape use. Kharaneh IV covers more than 21,000 m² and is one of the densest Epipalaeolithic site in the region. We suggest that the site served as an aggregation centre and that repeated occupation led to the formation of complicated, high-resolution stratigraphy containing hut structures, hearths, living surfaces, postholes and midden deposits, spanning the Early and Middle Epipalaeolithic (c. 19,800-18,600 cal BP). The site is extraordinarily rich in stone tools, worked bone objects, red ochre, marine shell beads, and archaeobotanical remains, particularly charcoal. And, uniquely for these early Epipalaeolithic periods, there is evidence for long-term occupation, potential food surpluses, and caching of utilitarian and symbolic objects.

Kharaneh IV is situated in one of the driest areas of modern Jordan. EFAP is particularly interested in understanding why people chose this location and repeatedly occupied the site for about a thousand years. Ongoing geomorphological work has demonstrated that the Late Pleistocene landscape was characterised by several small lakes and rivers, suggesting that the occupants of Kharaneh IV had ready access to fresh water within a well-vegetated landscape. Large amounts of charcoal from the archaeological deposits support this reconstruction, as do the faunal remains that indicate the use of a wide range of locally-available species, including gazelle, equid, wild cattle, boar, fox, hare, and migratory birds. However, chipped stone is, by far, the largest artefact category at Kharaneh IV and thus its analysis has proven time-consuming, yet critical, to interpreting on-site activities, landscape use (through raw material sourcing), social networks (intra-site variability and inter-site comparisons), and technological choices. In three seasons of excavation, our current estimates indicate that we have recovered well over 2 million lithics from an excavated 120 m² to-date.

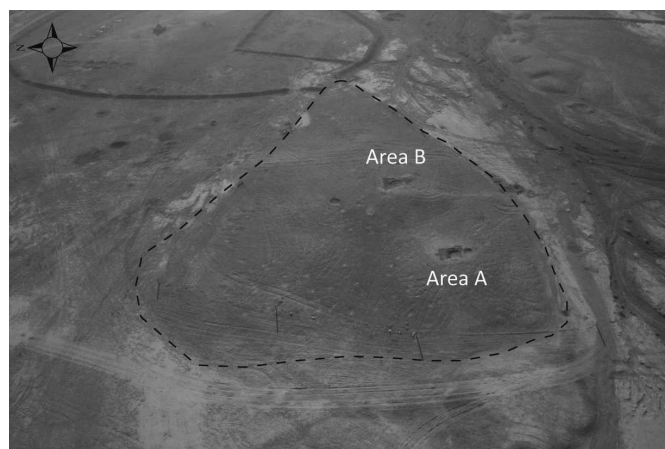


Figure 2: The approximate boundaries of the Epipalaeolithic site of Kharaneh IV, eastern Jordan, are shown by the dashed lines. The two main excavation areas, Area A (Middle Epipalaeolithic) and Area B (Early Epipalaeolithic) are labelled.

Kharaneh IV is a low mound on the desert landscape; the accumulation of cultural deposits has created a mound rising 2 meters above the surrounding terrace surface. This mound has two peaks, one on the west and one on the east side of the site. Our main excavation areas, Area A and Area B (fig. 2), are placed on top of each peak to trace features, including hearths, floors and burials originally identified by M. Muheisen in the 1980's (Maher *et al.* 2007, 2012; Muheisen 1988a). The Middle Epipalaeolithic area, Area A, is on the western portion of the mound and has stratified Early Epipalaeolithic material below the later deposits. Area B, the Early Epipalaeolithic area, is the highest point on the site and has no overlying Middle Epipalaeolithic artifacts. Each of these areas has multiple phases of occupation that may relate to more than one cultural entity; however, for the purposes of this analysis the assemblages were analyzed as either an Early Epipalaeolithic occupation or a Middle Epipalaeolithic occupation. From the preliminary analysis we suggest that the cultural material relates to the Kebaran and the Geometric Kebaran cultures, respectively. We have also placed a series of 1x1 meter test pits and a geological trench around the site to trace the extent of the stratified deposits, and the relationships between the Early and Middle levels across space. However, this material is still under study and will not be discussed within the context of this paper.

4. The Early Epipalaeolithic occupations at Kharaneh IV (Area B)

In the Early Epipalaeolithic area, our work focuses on a combination of horizontal and vertical excavations. Radiocarbon samples date the occupation sequence between 19,800 – 18,800 cal BP. The sequence of deposits offers a fine-grained record of site formation. Thin and compacted occupation surfaces alternate with thicker midden deposits characterized by very dense concentrations of lithic and faunal remains. Occupational deposits reach a depth of 1.35 m below the surface, below which is archaeologically sterile clay representing the deposits of an ancient lake.

Our excavations in the Early Epipalaeolithic area have revealed several pit features, compacted surfaces, hearths, middens, caches of lithics (fig. 3) and gazelle horn cores, and ash dumps. During the 2010 excavations we uncovered evidence for one, probably two, hut structures dated to 19,400 cal BP (Maher *et al.* 2012). The exposed structure is just over 2x3 meters in size and is covered by an organic-rich, black layer containing abundant charcoal fragments suggesting the huts were burned after abandonment. Situated beneath the burned layer, but on top of the hut



Figure 3: Close-up photograph of a small lithic cache adjacent to a hut feature (not shown) within the Early Epipalaeolithic (Area B) levels of Kharaneh IV.

floor, are groundstone fragments, red ochre, and articulated aurochs vertebrae. Near the center of the structure, on top of the burnt layer, are three distinct concentrations of pierced marine shells accompanied by large chunks of red ochre (pictured in the top right image) around a large flat rock. These concentrations contain over 1,500 shells from both the Mediterranean and Red Seas.

4.1. The Area B tool assemblage

To date, 1,479 tools have been analysed from the Early Epipalaeolithic component of the site (table 1). The tool assemblage is dominated by non-geometric microliths at 50% of the overall assemblage and these consist largely on gracile obliquely backed and truncated bladelets and micropoints (fig. 4). Fragmentary microliths are the second most common tool at 34% of the assemblage and are likely broken portions of non-geometric microliths. When the non-geometric and fragmentary non-geometric microliths are combined, 84% of the overall tool assemblage is composed of microlithic tools. These microliths are produced on narrow, thin bladelets and have minimal backing.

The next most common tools are retouched flakes at 3%, while backed blades and scrapers (endscrapers) both comprise 2% of the retouched assemblage. It is common for Epipalaeolithic tools assemblages to have a high proportion of microliths (Bar-Yosef 1970; Goring-Morris 1987), but this assemblage is on the higher end of this scale. The low frequency of retouched pieces and notches/denticulates is unusual and might speak to minimal post-depositional disturbance in the Kharaneh IV (and Uyun al-Hammam) deposits. Post-depositional damage can often mimic these classes, and the low frequency may suggest little movement such that these tools were not subjected to these destructive forces. Alternatively, activities on-site and in its vicinity may simply not have demanded a need for these tools.

Tool Type	KHIV Early EP		KHIV Middle EP		'Uyun al-Hammâm	
	Count	%	Count	%	Count	%
Scrapers	33	2.2	110	2.9	932	10.0
Multiple Tools	13	0.9	84	2.2	220	2.4
Burins	9	0.6	43	1.1	304	3.3
Retouched Burin Spalls	1	0.1	11	0.3	-	-
Retouched Pieces	50	3.4	194	5.1	-	-
Backed Blades	34	2.3	104	2.7	422*	4.5
Truncations	9	0.6	14	0.4	93	1.0
Points	0	0	1	0.0	2	0.1
Perforators	1	0	3	0.1	45	0.5
Notch and Denticulates	25	1.7	40	1.1	160	1.7
Heavy Duty Tools	0	0	3	0.1	41	0.4
Non-geometric microliths	738	49.9	554	14.6	927	9.9
Geometric microliths	1	0.1	763	20.1	4973	53.5
Fragmentary microliths	501	33.9	1544	40.6	1182	12.7
Utilized Pieces	64	4.3	330	8.7	-	-
Total	1 479	100.0	3 798	100.0	9 301	100.0

*All retouched blades and flakes were classed together.

Table 3: Retouched tool types by levels at Area B.

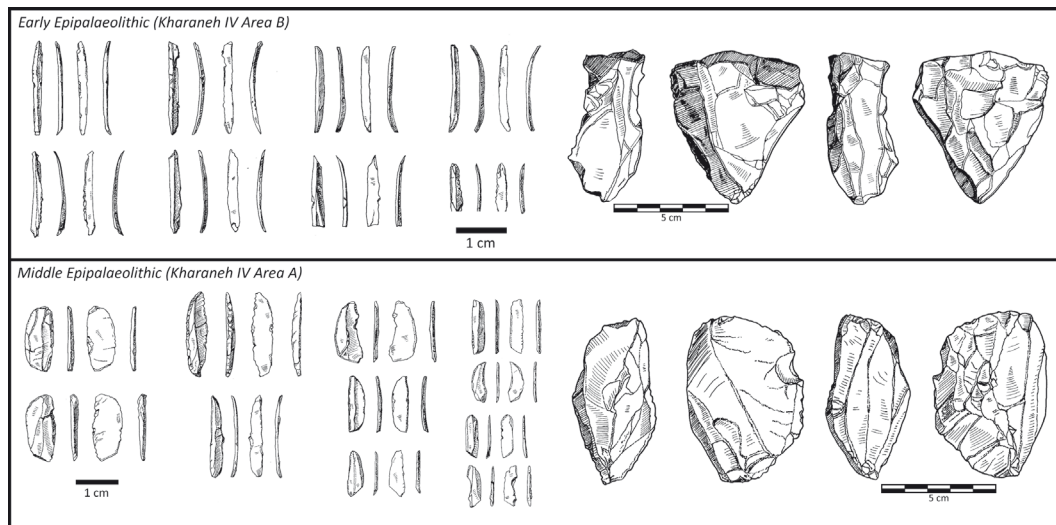


Figure 4: Microliths and cores from the Early and Middle Epipalaeolithic occupations at Kharaneh IV (drawn by C. Hebron): microliths from Area B (top images) are, from upper left, completely-backed bladelet, bladelet retouch on both edges, obliquely-truncated and backed bladelets (x2), and completely-backed bladelets (x4). Microliths from Area A (lower images) are classified as trapeze/rectangles on the basis of backing along one edge and/or one or both ends in separate planes, excepting the piece second down in the right column. The exception has discontinuous parallel backing on both edges giving it a semi-circular shape and notched appearance. It could be considered an atypical lunate.

4.2. The Area B debitage assemblage

Over 48,000 non-retouched lithics have been analysed from the Early Epipalaeolithic area (table 2). The raw material selection from this area seems focused on naturally thin, small nodules of dark brownish-grey chert found within the immediate vicinity of the site. Although it has not yet been quantified, our observations and an extensive raw material survey in the area suggest that the majority of the material from the Early Epipalaeolithic was manufactured on this local chert. The narrow shape of these nodules allowed for the production of small microliths from narrow-faced microlith cores, overall the most prevalent core shape at 52% (fig. 4). These cores were prepared with the removal of either a primary blade or a faceting platform spall to prepare a core platform. A crested blade was prepared along the face of the core for the initial blade removal. The sides of the core were thinned and shaped with lateral core trimming pieces (36%) removing cortex from the sides of the core. Core maintenance was also executed to correct mistakes and reshape the core for further bladelet removal during the course of reduction. Currently only three microburins have been recovered from the Early Epipalaeolithic levels, suggesting this technique was not systematically used for microlith manufacturing.

The flake to blade ratio is 1:3, which is on the low end of the standard ratio for Epipalaeolithic sites indicating a blade-rich assemblage. This confirms that blades and bladelets were the targeted product throughout the reduction process. These would then be retouched into microliths, scrapers, and backed blades.

In summary, the lithic reduction strategy in the Early Epipalaeolithic component of Kharaneh IV focused on choosing narrow chert nodules for the production of gracile blanks to be retouched into microliths. There was a relatively heavy investment in core shaping in order to maintain the core face for bladelet removals (fig. 5: A).

Debitage Type	KHIV Early EP		KHIV Middle EP		Uyun al-Hammâm	
	Count	%	Count	%	Count	%
Blades/Bladelets	8 160	17.0	26 227	24.9	30 687	21.4
Flakes	11 303	23.6	39 979	37.9	66 041	46.1
Chips (under 1 cm)	22 467	47.0	31 699	30.1	17 771	12.4
Shatter (chunks)	269	0.6	894	0.8	19 029	13.3
Burnt Shatter	4 479	9.4	3 874	3.7	8 952	6.3
Core Trimming Pieces	1 161	2.4	2 584	2.5	677	0.5
Total	47 839	100.0	105 257	100.0	143 157	100.0

Table 2: Thedebitage assemblages from Kharaneh IV Early and Middle Epipalaeolithic occupations and Uyun al-Hammam.

5. The Middle Epipalaeolithic occupations at Kharaneh IV (Area A)

Muheisen's original excavations in the Middle Epipalaeolithic component of the site unearthed a variety of archaeological features including what he identified as occupation surfaces, hearths, and post holes. Our goals were expand the excavations horizontally to trace the evidence of these features and excavate this area to a greater depth. The stratigraphy in this area is less complex than in the Early Epipalaeolithic area, with a series of horizontally deposited stratum, all of which are artifact rich. Radiocarbon dates place the occupation between 18,800-18,600 cal BP, providing some of the oldest dates for this period, however the lithic assemblage is distinctly Middle Epipalaeolithic based on the presence of trapeze-rectangle microliths.

The Middle Epipalaeolithic deposits contain a series of compact occupation surfaces distinctive from the overlying loose silts. These surfaces are identifiable based on the flat-lying artifacts and articulated animal remains deposited on top of compact sediment. Cut into these surfaces are a number of hearths, including two stratigraphically overlapping hearths. Surrounding these hearths are a number of small post-holes cut into the compact occupation surfaces. These post-hole features are concentrated around the hearths and are very small in diameter, suggesting that they would not support a large structure. Although analysis is still preliminary, these may show evidence of ephemeral structures placed near fireplaces, perhaps as cooking structures or as meat drying racks.

5.1. The Area A tool assemblage

To date, 3,798 retouched artifacts have been analyzed from the Middle Epipalaeolithic deposits (table 1). Microliths dominate the assemblage at 75% of the retouched tools. Twenty percent of the assemblage is geometric microliths and 40% are fragmentary microliths, many of which are most likely broken geometrics. These geometric microliths are primarily trapeze-rectangles, but they exhibit a wider range of forms than is usual for other contemporary Middle Epipalaeolithic sites (fig. 4). Some of these are very gracile, un-backed trapezes, while others are very wide with rounded corners, details of which are discussed below.

Retouched flakes make up 5% of the assemblage while scrapers are 3%. Both multiple tools and backed blades represent 2% of the retouch assemblage. The remainder of the assemblage includes truncations, perforators, notches, and burins, all in low percentages.

5.2. The Area A debitage assemblage

Over 105,700 pieces of Middle Epipalaeolithic debitage have been analyzed (table 2). The raw material selection is less constrained than the raw materials used from the Early Epipalaeolithic. There is a greater diversity in the choice of chert, both in the colour and the shape of the nodules. Rounded nodules are introduced as knapping materials along with the narrow tabular nodules preferred in the Early Epipalaeolithic. Preliminary raw material survey suggests that the majority of the raw materials were still collected from the local landscape, within 5-20 km from the site. Thus, it seems that the same raw materials were available to occupants of both Area A and Area B phases. The cores include both narrow and broad faced cores, probably reflecting the addition of rounded raw materials into the knapping repertoire (fig. 4). In total, 26 microburins have been recovered from the analyzed assemblage. This indicates that the use of the microburin technique was slightly more common during the Middle Epipalaeolithic occupations at the site, but was not a wide spread practice.

The initial reduction strategy is similar to the Early Epipalaeolithic assemblage. An initial spall is removed across the core to prepare a striking platform, followed by cortex removal and the removal of a crested blade from the core face. However, there is minimal core shaping after this removal. The majority of the core trimming elements are related to maintenance, removed during the knapping sequence to fix problems, instead of changing the shape of the core (fig. 5b). This suggests that the Middle Epipalaeolithic reduction strategy was more heavily focused on corrective removals rather than on preparation.

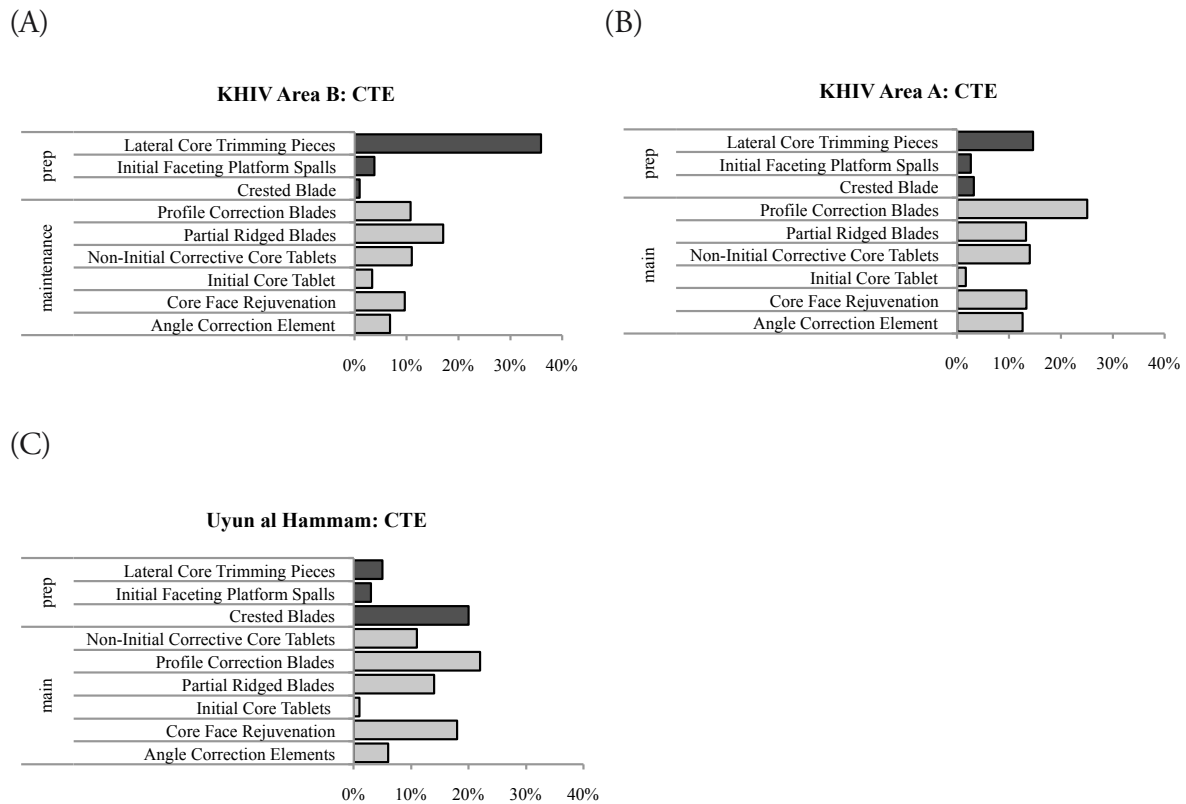


Figure 5: Core trimming elements from Kharaneh IV (A-B) and Uyun al-Hammam (C), showing the breakdown of core trimming preparation pieces versus core maintenance pieces for each site.

6. Changes in reduction strategies

There are a number of changes in the lithic reduction strategies between the Early and the Middle Epipalaeolithic assemblages at Kharaneh IV. In the Early Epipalaeolithic the raw material choice is more constrained, with a preference towards narrow nodules of dark brownish-grey flint. In contrast, there is a wider selection of chert sources in the Middle Epipalaeolithic, where the inhabitants of the site are less restrictive in their definition of appropriate knapping materials. This raw material selection is witnessed in the cores and their products, where there is an increase in broad faced cores and the variety of cherts used from the Early to Middle Epipalaeolithic.

More time and effort is invested into core shaping during the Early Epipalaeolithic in comparison to the Middle Epipalaeolithic. In the earlier occupations, 41% of the core trimming elements were removed for initial shaping and core preparation. Later, only 20% of the core trimming elements were used for core preparation, whereas 80% were removed for core maintenance during reduction. This suggests that earlier occupants at the site invested more energy into core shaping prior to removals, whereas the later occupations maintained the removal face through correction pieces instead of initial shaping.

The different investments in core preparation relates to the types of microliths being produced during the Early and Middle occupations. The non-geometric microliths are very minimally retouched and therefore required standard-sized blanks in order to fit into hafts. In contrast the geometric microliths used in the Middle Epipalaeolithic are heavily retouched suggesting the shape of the initial blank was less important. This shows a shift in emphasis from the preparation of cores to the modification of the tools themselves.

7. The Middle Epipalaeolithic site of Uyun al-Hammam

Uyun al-Hammam is a classic Geometric Kebaran site located in northern Jordan. It sits on an ancient alluvial terrace (fig. 6) in the eastern portion of Wadi Ziqlab adjacent to a large spring of the same name, and at its largest extent covered an area of about 1500 m². The Epipalaeolithic deposits are deeply buried within a distinct red-coloured Pleistocene palaeosol and sealed by poorly developed Holocene colluvium (Maher 2011).



Figure 6: The Middle Epipalaeolithic site of Uyun al-Hammam, showing the location of excavation areas stepped into the terrace edge.

The site was occupied repeatedly, although probably episodically, from approximately 17,000 to 14,600 cal BP (Maher 2007). In the occupational deposits are dense accumulations of lithic and faunal material, and some site features, including middens full of burnt fauna and fire-cracked rock, and other stone features, such as stone-lined pits. The site was also used as a burial ground concurrently with occupation of the site and likely continuing afterwards. To date, eight distinct burials have been excavated at the site, exhibiting a range of burial practices (Maher *et al.* 2011). These include primary and secondary interments, evidence for the re-use of graves for multiple individuals, and individuals interred with grave goods, including lithics, articulated animal skeletons, namely fox, and bone implements.

7.1. The Uyun al-Hammam Tool Assemblage

To-date, 9301 retouched tools have been analyzed from Uyun al-Hammam (table 1). The tool assemblage is overwhelmingly dominated by microliths, forming just over 75% of the tool assemblage, and the majority of the tools are trapeze-rectangles (fig. 7). These are manufactured in a standardized fashion, with almost 70% of the trapeze-rectangles backed with invasive unidirectional retouch. In addition, the fragmentary microliths consist almost exclusively of backed bladelet fragments that very likely are trapeze-rectangles broken on both ends. The remainder of the assemblage is primarily composed of scrapers (10%), backed or retouched blades (4%), retouched flakes (4%) and burins (3%).

7.2. The Uyun al-Hammam debitage assemblage

Over 140,000 pieces of debitage have been analyzed from the site (table). The raw material selection is largely a local, tan-brown coloured flint that outcrops in the adjacent hill slopes in both nodular and tabular form, as well as a wider variety of higher-quality dark brown, pink/purple and caramel coloured flint from adjacent wadis.

The flake to blade ratio is notably higher than that for both areas of Kharaneh at 2.17. This could be the result of increased core reduction prior to the removal of blades/bladelets for microlith production. Alternately the occupants of the site may have been producing flakes to be retouched into larger tools such as notches, burins, and retouched flakes.

Like in the Middle Epipalaeolithic levels at Kharaneh IV, there was a focus on core maintenance rather than initial shaping (fig. 5: C). Although the proportion of crested blades is rela-

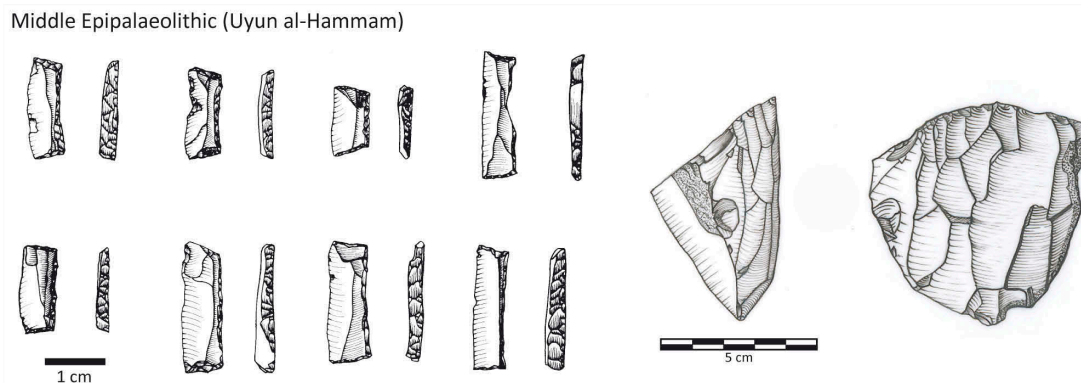


Figure 7: Illustrations of microliths (trapeze-rectangles) and a typical broad-faced core from the Middle Epipalaeolithic occupations at Uyun al-Hammam.

tively high, overall efforts were concentrated on core face corrections. There was less control over the overall core shape, so the size and shape of the resulting blades and bladelets was more variable. Like at the Middle Epipalaeolithic levels at Kharaneh, broad-faced (fig. 7) and sub-pyramidal cores far outnumber narrow-faced ones.

8. Discussion

8.1. So, what does this all mean?

If we look at the Early vs. Middle levels at Kharaneh IV, in addition to the changes seen in the lithic technology, there are a number of other changes witnessed here. A recent publication by Martin *et al.* (2010) showed an increase towards gazelle intensification during the Middle Epipalaeolithic at the site. Possible changes in hunting strategies towards communal gazelle hunting may have influenced the change in lithic technology. There is also evidence for increased trade and exchange in the Middle Epipalaeolithic as witnessed by the increased frequency and travelling distance of long distance items (i.e., marine shell) at the site. This places the people of the Middle Epipalaeolithic into more regular and active interaction networks with other Levantine communities. Interactions with communities and the potential aggregation of new peoples from outside of the Azraq Basin to the site may have influenced changes in lithic technology in Kharaneh IV.

Perhaps most importantly, changes in the lithic technology from the Early to the Middle Epipalaeolithic are not a reflection of resource or raw material availability, but of the different choices made by the inhabitants of the site. The narrow cobbles preferred by the Early Epipalaeolithic inhabitants are still readily available in the Middle Epipalaeolithic; yet these people brought their raw materials back to Kharaneh IV from further distances along with other non-local goods, such as marine shell.

8.2. Geometric variability in the Middle Epipalaeolithic

There are several similarities between the lithic assemblages from Uyun al-Hammam and the Middle Epipalaeolithic deposits at Kharaneh IV. Both sites are dominated by geometric microliths and have reduction sequences focused on core maintenance rather than core preparation. Where the two sites diverge is in the variability of geometric microlith types; Kharaneh IV has a highly diverse microlith assemblage with varying morphologies of backed and unbacked geometrics.

So, how do we explain the variability witnessed in the lithic assemblage at Kharaneh IV in comparison to the more homogenous assemblage at Uyun al-Hammam? Our hypothesis is that increasingly during the Middle Epipalaeolithic, Kharaneh IV served as an aggregation site where people from throughout the southern Levant congregated and interacted. The variability we see at Kharaneh IV appears greater than any other sites in the region, with the exception of Jilat 6, another potential aggregation site based on its size and density of occupation. In contrast, the site of Uyun al-Hammam exhibits less variability within the lithic assemblage, suggesting that the knappers of the site could be learning and performing tool manufacturing within the same community. We suggest that the variability within the Kharaneh IV lithic assemblage represents a conglomerate of knapping traditions from disparate groups, learning and knapping independent of each other, deposited at the site during times of aggregation. The people congregating at Kharaneh IV brought their own skills and knowledge of tool production with them to the site and utilized the resources in the local landscape to manufacture familiar tools. Thus, the variability we see in the Middle levels of KHIV might reflect a number of regional variations or lithic traditions 'blended' in the archaeological record. The idea of seeing many localised traditions at an

aggregation site fits well with the evidence at Kharaneh IV, but also at the only other site of this scale – Jilat 6, where the lithic assemblages have also been described as ‘unique’.

Although the microlith assemblage at Kharaneh IV is ‘unique’, it does not contain new types of microliths, rather it contains a wide range of known forms. The tool forms found at Kharaneh IV are known from other sites across the Levant, sometimes referred to as variants. Denticulated trapezes and wide forms are known from the Negev (Goring-Morris 1987), unbacked trapezes are known from several sites in the north (Cauvin, Coqueugnot 1988; Fujimoto 1979), and trapezes with one pointed end are found in low proportions at sites in the Jordan Valley and the Coastal Plain (Bar-Yosef 1970). None of the ‘variant’ microliths we see at Kharaneh IV warrant a new name in terms of typology, industry, cultural phase, or otherwise. What makes Kharaneh different is that we see a much wider range of known trapeze/rectangle forms, including so-called variants, and each is well-represented numerically. We make a distinction here between well-recognized types (e.g., trapeze) and variants (e.g., trapeze with one pointed end); with the latter being geometrics that are still recognizable as belonging to a type but also deviate in some way from this type. We, and others (e.g. see Olszewski 2011), believe that these variants simply represent a gradation of form that one finds constantly in microlith types and result from either individual preference or from small necessary variations in shaping for hafting that mean each piece need not fit a standard microlith ‘mold’, but instead fit into and function within a pre-existing composite tool. Although variants are found at other sites, they are usually only found in small frequencies. In fact, tallying them up is often difficult because, as they occur in such small numbers that they are often either lumped as trapezes, perhaps with passing mention, or lumped with other varia. However, at Kharaneh they occur with such frequency that from the earliest work here Muheisen identified more than 14 distinct variants of geometrics (Muheisen, Wada 1995). At Kharaneh, there are not just a few variant trapezes, there are thousands. But, given the immense amount of chipped stone material from the site, this is true of all lithic categories.

The supposedly wide geometrics from the Middle Epipalaeolithic levels at Kharaneh IV are also somewhat misleading, as the production of ‘wide’ geometrics is inconsistent throughout these deposits – both narrow and wide ones, of the exact same ‘type’, are found in all contexts (fig. 4). Preliminary width measurements show that these are not bimodal but represent a continuum. Geometric Kebaran industries were once classified on the basis of having either narrow or wide geometrics, with wider forms (averaging 7–10 mm) more prevalent in southern sites and over time (e.g., Bar-Yosef 1981). Muheisen and Wada (1995: table 7) report the Kharaneh IV trapezes as ranging between 6 and 12 mm and, when further subdivided, the 8–10 mm category is only slightly larger than the 6–8 mm category. This places them well within the range of sites in the west, such as Kfar Vitkin III, Faza III, Ein Miri (Bar-Yosef 1970; Goring-Morris 1980; Shimelmitz *et al.* 2001) and even Uyun al-Hammam (avg. 7.1 mm), as well as sites to the south in the Negev and Sinai (Goring-Morris 1987). As a final point, it should be remembered that this discussion hinges on a difference in width of about 2 mm. This distinction is no longer widely used as new data show that both wide and narrow forms are found at sites throughout the region. However, it does serve to highlight the possibility that if differences in trapeze/rectangle widths are indicative of traditions, then the presence of such a wide range of geometrics at Kharaneh IV, from the very narrow to very wide, lends strength to the idea of aggregation and interaction of many groups here. Muheisen and Wada (1995) stressed the similarity of Kharaneh IV geometrics to other sites in the region, comparing them to examples in the north and south. Going beyond this, we assert here that these similarities represent far-reaching inter-group connections during the Middle Epipalaeolithic facilitated by aggregation, perhaps both seasonal and more permanent, at Kharaneh IV.

At Kharaneh IV, we interpret the variability we see in tool forms, reduction strategies, and raw material choice as a reflection of a multitude of traditions. In order to fully test this hypoth-

esis, future research will examine the variability in individual phases of each occupation, and look statistically at variability between Kharaneh IV and other contemporary sites. If Kharaneh IV was an aggregation site where many different groups congregated, what kinds of interactions and activities occurred at Kharaneh IV? Were lithic traditions and knowledge shared during these congregations –were there knapping workshops? Or, were the various traditions kept separate and can we see distinct knapping areas? Perhaps some of the caches of cores and their blade-lets will help shed light on these questions.

9. Conclusions

If we compare the chipped stone assemblages of the Early and Middle levels at Kharaneh IV there are a number of notable differences. While the Early and Middle Epipalaeolithic occupants were both focused on microlith production, they achieved this goal in different ways. Middle Epipalaeolithic knappers chose raw materials from a wider variety of local flint sources, suggesting they were less restrictive in their definition of appropriate knapping materials. More time and effort was invested by knappers in core shaping during the Early Epipalaeolithic in comparison to the Middle Epipalaeolithic and this is reflected in a greater range of core types over time. Knappers from the Early Epipalaeolithic invested more energy into core shaping prior to removals, whereas Middle Epipalaeolithic knappers maintained the removal face through correction pieces instead of initial shaping. The different investments in core preparation versus core maintenance relates to the types of microliths being produced during the Early and Middle occupations. The non-geometric microliths produced by Early Epipalaeolithic knappers are very minimally retouched and therefore required standard-sized blanks in order to fit into hafts. In contrast the geometric microliths produced by knappers and used in the Middle Epipalaeolithic are heavily retouched. Therefore, the shape of their initial blank is less important.

When comparing the lithic assemblages between Uyun al-Hammam and Kharaneh IV a number of important features are noted. Although these two sites fall roughly within in same named cultural group, ‘Geometric Kebaran’, they exhibit differences in the types of geometric microliths present in the assemblage. The assemblage at Uyun al-Hammam is dominated by classic trapeze-rectangles creating a homologous microlith assemblage. In contrast, the Middle Epipalaeolithic assemblage at Kharaneh IV has a wide range of different geometric forms including trapeze-rectangles, unbacked trapeze-rectangles, and triangles. Overall, this assemblage is highly variable in comparison to the assemblage at Uyun al-Hammam suggesting that it represents different compositions of flint knapping groups.

The reasons for the shift in microlith production at Kharaneh IV remain elusive, although it is certainly possible to speculate. Changes in hunting strategies and gazelle intensification may have influenced lithic technology or methods of hafting. Increased trade and exchange over time by groups from within and outside of the Azraq Basin may have encouraged interaction between communities and sharing of traditional knowledge. Perhaps most importantly, changes in the lithic technology from the Early to the Middle Epipalaeolithic are clearly not a reflection of resource or raw material availability, but of the different choices made by the inhabitants of the site.

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