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# EARLY EPIPALEOLITHIC SITES IN CENTRAL AND SOUTHERN JORDAN: SITE FUNCTION IMPLICATIONS

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## ABSTRACT

Research concentrated on the Early Epipaleolithic (Nebekian) in central and southern Jordan. Four archaeological field seasons occurred during the summers of 2009-2012. The excavated sites were on the Kerak Plateau (KPS 75), in the Wadi al Hasa (Yutil al-Hasa and Tor at-Tareeq), and at the Wadi Madamagh rockshelter in the Petra region. Excavations were carried out by the University of Jordan and the University of Pennsylvania. The main goal was to build a systemic view of Nebekian adaptations and to use these data to examine the range of behavioral variability in the Levantine Early Epipaleolithic. Lithic analysis provided data relevant to site function and how hunter-gatherer settlement and subsistence strategies were modified in the face of climatic and paleoenvironmental changes during this period.

**KEYWORDS:** Epipaleolithic, Nebakian, Kerak Plateau, Wadi al Hasa, Wadi Madamagh, Lithic

## 1. INTRODUCTION

During the summers of 2009-2012, four archaeological fieldseasons were conducted on the Kerak Plateau, in the Wadi al Hasa, and in the Petra region. The excavations were carried out by the University of Jordan and the University of Pennsylvania, with funding from the National Science Foundation and the University of Jordan. The excavations focused mostly on the Early Epipaleolithic (Nebekian) in parts of central and southern Jordan, although possible Qalkhan Early Epipaleolithic occupations, as well as a late Upper Paleolithic occupation also were recorded.

The goal of this project is to build a record of the habitats, settlement systems, site types, and subsistence strategies that characterized hunter-gatherer groups who lived during the Last Glacial Maximum (LGM) and its immediate aftermath. The ultimate aim is to build a systemic view of Nebekian adaptations and to use these data to examine the range of variability in the Levantine Early Epipaleolithic (that is, the steppic Western Highlands of the eastern Levant in contrast to existing data on the Mediterranean/coastal Kebaran in the western Levant). Four sites were chosen: the KPS-75 rockshelter on the Kerak Plateau, which is about a kilometer from lacustrine deposits of a Pleistocene seasonal lake in the open parkland (now Irano-Turanian steppe), the Wadi Madamagh rockshelter farther to the south in the Wadi Musa region, an area characterized prehistorically by Mediterranean woodlands, and the Yutil al-Hasa rockshelter and the open-air site of Tor at-Tareeq in the main Hasa drainage, which were characterized by paludal and lacustrine contexts in an otherwise Irano-Turanian setting (Fig. 1).

## 2. THE EXCAVATED SITES

### 2.1 *KPS-75*

KPS-75 is on the Kerak Plateau to the north of the Wadi al-Hasa. It was first discovered during a geological survey in 1997 (C. Bartlett, personal communication 2010) and then surface investigated more thoroughly during an archaeological survey in 1999 (Schurmans 2001). The site is a small rockshelter (*ca.* 3 m x 2 m) with a larger occupation area outside the rockshelter.

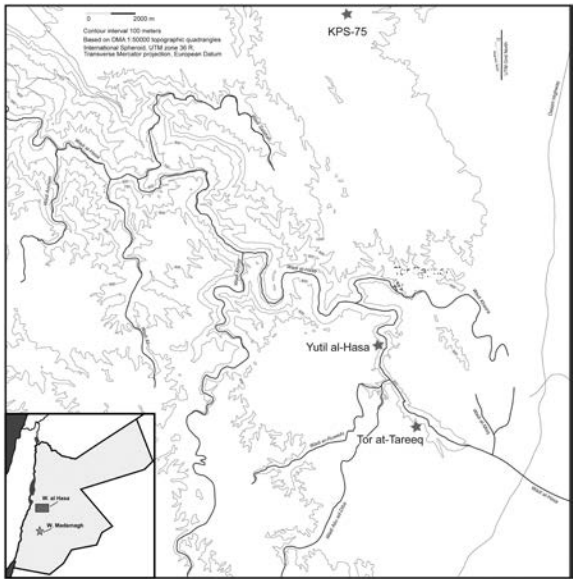


**Figure 1: The excavated Early Epipaleolithic sites (2009-2012)**

The 2009 fieldseason at KPS-75 yielded a large number of lithics—more than 27,000 attributed to nonmixed contexts. Within the tool component, there are numerous very narrow microliths indicating that these assemblages are temporally related to the Early rather than the Middle Epipaleolithic, as quite narrow microlith widths are a widely recognized hallmark feature of the Early Epipaleolithic (al Nahar et al. 2009; Olszewski et al. 2010). The lithic assemblage was divided into two major occupations. The lower set of levels contains relatively high abundance of narrow, attenuated curved (double arched) bladelets, typical for Nebekian assemblages. The upper set of levels contains similar microliths, increased number of geometric microliths and Ouchtata bladelets. It is not clear if this upper occupation is also Nebekian or Qalkhan, or is a phase leading into the Middle Epipaleolithic period.

### 2.2 *Yutil al-Hasa (WHS 784)*

Yutil al-Hasa is in the main Wadi al-Hasa drainage, where it narrows and topography steepens. The site is on a southeast facing slope and contained at least one rockshelter. Currently, large boulders representing rockshelter collapse characterize much of the area in which the prehistoric occupations were situated.

Previous work in 1984, 1993, and 1998 revealed three different phases of occupation—Late Upper Paleolithic (Late Ahmarian), Early Epipaleolithic (Nebekian), and Late Epipaleolithic (Early Natufian). During previous excavations, the Early Epipaleolithic was encountered in Areas C and E (Coinman et al. 1999; Olszewski et al. 1990; 1994; 1998), while the 2010 excavations also found Early Epipaleolithic in Area F (Olszewski and al-Nahar 2011a). The lithics from the 2010 season reported here total 4,736 artifacts.

### 2.3 *Wadi Madamagh*

Wadi Madamagh was originally excavated in 1956 (Kirkbride 1958), when two trenches were opened that ran roughly East-West and which were oriented perpendicular to the backwall of the rockshelter. No chronological distinctions between lithic assemblages were made by Kirkbride, as she considered the various stratigraphic levels in the two trenches to all belong to the same occupation. She described the lithics at Wadi Madamagh as Epipaleolithic, basing her description on the presence of narrow, double arched backed bladelets which she noted were similar to the Kebaran then known from sites in Palestine (Kirkbride 1958).

In 1983, Wadi Madamagh was reinvestigated by Schyle (Schyle and Uerpmann 1988: 47-52). The lithic collection from Schyle's test unit is small, but includes materials from two distinct occupations. The upper materials are Early Epipaleolithic (Nebekian), with a few microburins and backed bladelets. Lithics from the lower levels include inversely retouched microliths. One radiocarbon date on bone (ca. 17,350 cal BP) was obtained for the upper deposits, but it is clearly chronologically too late given other Nebekian sites in Jordan, which date between 25,000 to 20,000 cal BP (e.g., Byrd 1994; Olszewski 2003).

The 2011 excavation confirmed that Wadi Madamagh has materials from the Nebekian Early Epipaleolithic and an earlier occupation characterized by inversely retouched microliths (probable Upper Paleolithic (Olszewski and al-Nahar 2011b), with subsequent continued excavation later in 2011 by Daniel Schyle). The chipped stone lithics from the Nebekian occupation of Wadi Madamagh total 4747 pieces, while those of the late Upper Paleolithic total 8,324 artifacts.

### 2.4 *Tor at-Tareeq (WHS 1065)*

Tor at-Tareeq was located during survey of the south bank of the Wadi al-Hasa (MacDonald et al. 1983) and was previously excavated during seasons in 1984 and 1992 (Clark et al. 1988; 1992) and in 2000 (Olszewski et al. 2000; 2001). The site consists of several Epipaleolithic occupations, the earliest of which date to the Nebekian Early Epipaleolithic, and the latter of which is likely to be Middle Epipaleolithic. Hearths in Steps A, B, and C yielded dates ranging from 21,800 to 18,300 calibrated BP (Clark et al. 1988: 265; calibrated using IntCal13, OxCal v4.2.4).

In the 1984, 1992, and 2000 seasons, lithic and faunal assemblages were recovered. The 1992 charcoal date is from a hearth in the Early Epipaleolithic deposits and is 20,800 to 19,500 cal BP (Neeley et al 2000: 247; calibrated using IntCal13, OxCal v4.2.4). Area A was excavated only in 1984 and thus is the least known part of the site. Therefore, in the 2012 season it was chosen for more investigation and 11 m² were opened.

All of the levels in all of the units during the 2012 season yielded cultural materials. Lithics were the most abundant. The analyzed materials total 28,731 lithic artifacts from the 2012 excavation. Preliminary data suggest at least two main divisions within the Nebekian at the site, an observation first proposed by Neeley et al. (2000).

## 3. FAUNAL ASSEMBLAGES

All four sites yielded different amounts of fauna, some of which are still understudy, as are pollen, phytolith, and geoarchaeological samples

### 3.1 *KPS 75*

Analysis of a sample of the fauna from the lower levels at the site indicates that hunters here focused on high-ranked resources including aurochs and wild ass, and exploited smaller game such as gazelle, as well as slow-moving, easy to capture, tortoise (Munro et al. n.d.).

### 3.2 *Yutil al Hasa*

Faunal preservation at this site was not exceptional, however, some levels did preserve identifiable elements, which includes gazelle, aurochs, equids, and wild goat (Munro et al. n.d.). Land tortoise also is present. Interestingly, as in the 1993 and 1998 excavations into the Early Epipaleolithic occupation, examples of fossil shark teeth were found in the new units in Areas C, E, and F; possibly these were collected and brought to the site by its inhabitants.

### 3.3 Wadi Madamagh

Kirkbride (1958) observed that faunal materials greatly outnumbered lithics and Perkins (1966: 66-67) briefly described the Wadi Madamagh fauna (primarily *Capra*, but also *Bos*, *Gazella*, and *Equus*). In the 2011 excavation, both phases yielded an abundant faunal assemblage, which continues to show an abundance of *Capra* (N. Munro, personal communication).

### 3.4 Tor Tareeq

Faunal analysis from the 2000 and 2012 seasons yielded gazelle, equids, aurochs, and tortoise, along with a few birds and hare (*Lepus* sp.) (Munro et al. n.d.; Neeley et al. 1997, 1998, 2000). During the 2012 season, faunal remains were recovered from nearly all contexts at the site. However, these tend most often to be highly fragmented due to poor preservation conditions. The faunal signature at the site, including light use of small, fast game such as hares, along with the relatively large size of the tortoises exploited, suggests an interpretation of low intensity use (Munro et al. n.d.). In addition to lithic and faunal assemblages, the 1992 and 2012 excavations yielded marine shell (*Mitra*, *Strombus*, *Conus*, *Arcularia*, *Nerita*, *Columbella*, and *Dentalium*) (Neeley et al. 1998; 2000; Olszewski and al-Nahar 2014).

## 4. LITHIC ANALYSIS RESULTS:

### 4.1 Debitage and Cores

At KPS 75, blade/bladelet cores are dominant in the lower occupation and slightly more numerous compared to flake cores in the upper occupation. Among the debitage, however, blade/bladelet frequencies are similar to those of flakes, perhaps reflecting the effects of selection of bladelets for tool manufacture. Microburin technique, while present, is less common in the later compared to the earlier phase. About 16% of the microburins analyzed are quite large, being in the size range of blades, which is not surprising given that Qalkhan points (found in both lower and upper occupations) are made using microburin technique to snap blades. (Table 1).

At Yutil al-Hasa, the assemblage is about evenly distributed between blade/bladelets and flakes. Single platform cores are the most frequent type with blade/bladelet cores somewhat more frequent than flake cores. Microburin technique is much more prominent compared to the two occupations at KPS 75.

The debitage and cores recovered during the 2011 excavations were separated into Nebekian and pre-Nebekan contexts at Wadi Madamagh, as noted above. The Nebekian includes cores that are predominantly for blade/bladelets. Most of these are single platform, typical of Epipaleolithic occupations. The Nebekian debitage has a somewhat higher frequency of blade/bladelets than flakes. Microburin technique is used, but is not as prominent as at Yutil al-Hasa. Cores from the pre-Nebekian occupation are flake-oriented (about half the cores), which is mirrored in the flake-dominated debitage. There are a small number of microburins in the Pre-Nebekian, but it is likely that these are intrusive from the (formerly) overlying Nebekian deposit.

The debitage at Tor at-Tareeq is dominated by very small pieces (shatter) in most layers due in part to the high incidence of pieces broken by heat exposure, either from burning events in hearths or more generally from exposure to the sun while these pieces were on the site surface. Blade/bladelet debitage is slightly more common in the lower set of occupations. The data from the 2012 fieldseason units adjacent to the step trench that stand out in particular are the somewhat greater frequencies of microburins in the lower layers compared to the upper layers. The distinction in microburin frequency between the two occupations appears to offer support for either different chronological periods or sets of activities.

The upper occupation has a greater frequency of cores compared to the lower occupation at Tor at-Tareeq. This supports an attribution of the upper layer to the later set of Nebekian occupations that coincide with a warmer and wetter climatic interval, as suggested by Neeley et al. (2000), or possibly to a Qalkhan phase (see tools below) somewhat similar to the lower occupation at KPS 75. The lower layer cores are somewhat unusual in being relatively evenly divided between single and opposed platform types, as well as having a modest representation of multiple platform cores. Most of the cores at the site in both the upper and lower occupations are blade/bladelet single and opposed platforms cores.

### 4.2 Tools

#### 4.2.1 *Macrolithic tools (Table 2) and Microliths (Table 3)*

The Early Epipaleolithic at KPS 75 was divided into two sets of occupations (as noted above): upper and lower. The lower layers are characterized by much higher percentages of nongeometric attenuated curved bladelets than the upper layers, as well as more frequent Qalkhan points. Other nongeometric microliths in the lower occupation consist of moderate frequencies of Ouchtata and backed and truncated bladelets. It is interesting that the upper layers included a much higher frequency of Ouchtata bladelets than the lower layers. The greater presence of Ouchtata bladelets in this later phase suggests that this microlith type is not particularly chronologically sensitive as pointed out by al-Nahar (2000) in her extensive treatment of the Epipaleolithic of the inland Levant. Larger tools tend to be either endscrapers or retouched pieces.

Tools recovered from Yutil al Hasa (YH) were primarily nongeometric forms of microliths, especially attenuated curved bladelets and curved bladelets. These are typical of the Nebekian. Other tools such as endscrapers, burins, truncations, and backed pieces are rare. The dominance of nongeometric microliths (see Table 3) suggests that activities at Yutil al-Hasa may have been limited to a small range of tasks.

The Wadi Madamagh (WM) tool component is dominated by nongeometric microliths for both phases of occupation. In the Nebekian, about one-third of the nongeometrics are attenuated curved backed bladelets. Other types include backed and truncated, pointed, Ouchtata, and Dufour. Among the geometrics are a small number of trapezes with distal and proximal ends marked by microburin scars (a type also found at KPS 75, Yutil al-Hasa, and Tor at-Tareeq). In contrast, the Pre-Nebekian nongeometric microliths are dominated by twisted Dufour bladelets and non-twisted inversely retouched bladelets and small flakes. A small number of Ouchtata bladelets are present, as are some pointed, truncated, and backed and truncated bladelets. There also are a few probable intrusive geometric microliths from the (formerly) overlying Nebekian. Notable features of the pre-Nebekian occupation are its slightly more frequent endscrapers, burins, and special tools compared to the Nebekian occupation at the site.

At Tor Tareeq (TT), the upper layers contain slightly more endscrapers and burins and fewer nongeometric microliths than the lower layers. This is one of the markers that Neeley et al. (2000) used to distinguish a later Nebekian occupation at the site. The upper layer is also different in yielding a somewhat higher frequency of rare Qalkhan points and of La Mouillah points. However, it also contains typical Nebekian extremely narrow attenuated curved backed bladelets. The geometric microliths in the upper layers are a small number of narrow rectangles, trapezes, and isosceles and scalene triangles.

The lower layers at the site are characterized by high frequencies of nongeometric microliths. They include attenuated curved backed bladelets and a majority of the microgravette points. There also are geometric microliths in the lower layers. These include narrow trapezes, rectangles, and scalene triangles.

## 5. SITE FUNCTION IMPLICATIONS

The cold and dry climatic conditions of the LGM likely influenced hunter-gatherer settlement systems to at least some degree because people were faced with choices concerning where to find adequate resources such as food, water, and raw materials, such as stone, in a relatively inhospitable landscape. In these conditions, it is often thought that such groups would exhibit high levels of mobility. The degree of mobility of site occupants might be assessed through artifact types and their manufacturing stages (e.g. Kuhn 1995). The composition of the lithic artifact assemblages at a site thus has potential to signal site function and help in understanding the range of activities performed (Shott 1986).

The analyses here help to gauge site function through comparing the proportions of flakes, blades, bladelets, macrolithic tools, microliths, and microburin proportions and ratios. The proportions of the large blanks (blades and flakes) and cores at the site are indicators of the degree of manufacturing of macrolithic tools at a site The proportions of the macrolithic tools enables assessment of whether processing activities were performed at or outside a site. These then are guides to site function and mobility strategy, at least in the sense of the most prevalent activities occurring during those palimpsest occupations.

Several comparisons were conducted for the four sites (Yutil al Hasa, KPS 75, Tor Tareeq and Wadi Madamagh). One of these is to examine the bladelet proportion (as potential blanks for making microlith types) with microlith and microburin proportions. This could assist in the recognition of the degree of emphasizing microlith manufacturing and hunting tasks as a main site function, such that some of these occupations might reflect hunting stations or camps located near hunting stations or residential bases, where hunters made microliths on an expedient basis as their stocks of replaceable elements ran low. On the other hand, sites that have high ratios of large blanks (flakes and blades) usually have a focus on macrolithic tools. These large blanks are used to make scrapers, notches/ denticulates, burins, etc., which can be repeatedly rejuvenated or resharpened. At these sites, Ouchtata bladelets are found among the microliths. The lithic composition indicates that the groups occupying the sites practiced hunting, tool maintenance and meat processing. These are probably locales where game animals were brought and butchered, and where meat was processed.

In a larger sense, mobility puts constrains on the kind and number of tools which could be carried throughout the landscape. Highly mobile groups tend to design portable, lighter, smaller, and multipurpose tools (Shott 1986; Torrence 1983; Keeley 1982). One aspect of portability of stone artifacts might be the miniaturization that is seen in the manufacture of microlith types. As small elements that often are used in combination with each other, microliths reflect two important aspects of portability—their small size makes them lightweight and as elements of composite tools, the breakage of one element is easily mitigated by replacing the element rather than having to replace the entire tool. Assemblages from the occupations at the four sites (KPS 75, Tor at-Tareeq, Wadi Madamagh, and Yutil al-Hasa) discussed here clearly show that microliths were an important component. While this is a generally true statement for any Epipaleolithic period site, it does not detract from the utility of thinking about microliths from the viewpoint of the advantages that accrue to portability and multipurpose uses (e.g., as barbs, as arrow tips, as reaping elements).

The composition of lithic assemblages within the sites can be used to help predict site function and degree of mobility in the settlement-subsistence systems of which those sites were once a part (Shott 1986). Studying the composition of assemblages and their diversity at a site helps in the analysis and understanding of tool production, use, maintenance, and discard behavior that occurred there. The site function therefore could be indicated through the composition of the assemblages and the technological activities performed at a site. Comparative information from different sites provides a better understanding of site differences and similarities in terms of function and technology (Coinman 1997).

With these considerations in mind, two frameworks for assessing site function might be those of Jelinek (1976) and al-Nahar (2000) who recognized site types based on artifact composition. Jelinek (1976) identified three site types based on artifact composition: *(1) Manufacturing sites.* According to Jelinek, these types of sites include high proportions of exhausted, unusable, and partially worked cores, broken flakes, and large amounts of debris resulting from knapping processes; *(2) Use sites.* These sites mostly contain only the end-stage products of manufacturing (complete tools). They have little or no manufacturing debris, exhausted cores or broken tools; *(3) Use and manufacturing sites.* This type of site includes large numbers of complete and broken tools combined with high manufacturing debris and cores indicating a wide range of activities.

Al Nahar (2000) conducted Ward's method ofcluster analysis using artifact percentages and ratios on ten Late Upper and Early Epipaleolithic sites in Jordan. The cluster analysis of the artifact composition of the study sites indicated that there were four types of sites. The functions of the sites were divided according to their lithic assemblages into four classes that reflected the predominant activities conducted in each class. The four site classes were (1) *meat processing and butchering sites*, (2) *sites in which the manufacture of hunting gear was important*, (3) *sites in which microlith production was emphasized,* and (4) *multipurpose residential bases*.

Examination of the cluster solution results suggests that the grouping of these sites is based mostly on the blade/let and flake blank percentages of the sites. These grouping criteria are in addition to tools and the presence of microburin technique.

***Meat processing and butchering sites*** : These sites have equal production of Blade/let blanks and flakes. They have high numbers of cores and tools, including retouched bladelets (Ouchtata bladelets). The tool assemblage includes large numbers of scrapers, burins and retouched tools; ***Hunting and the manufacturing on hunting gear sites***: These sites have large numbers of microliths and microburins, and low numbers of other tool types.; ***Microlith manufacturing sites*** :These sites include very high ratios of bladelet blanks, backed microliths and microburins. All microlith types are represented in the assemblage including equal amounts of "finished" and "unfinished" microliths.; ***Multipurpose activity sites:*** These sites have equal proportions of bladelet and flake blanks, as well as a large range of other tool types, including side and endscrapers, backed microliths, points, and Ouchtata bladelets. This indicates that a variety of activities were performed at these sites. These might have included cutting, butchering, hunting, refitting, core preparation, tool manufacture, and scraping hide and wood.

### *5.1 KPS 75*

The composition of the lithic assemblage at this site in both occupations is similar, in that both were dominated by flake blanks. Also, they have very high proportions of cores, especially in the upper occupation. The very high proportions of cores suggest that the site is very close to flint sources. The macrolithic tool percentages are relatively high with moderate bladelet blank proportions (Fig.2). As for the macrolithic tools, they have very low proportions. Considering the flake blank dominance, the high percentages of blades, and the large and small fragment proportions in these occupations, it seems that the occupants manufactured large number of macrolithic tools. The low proportions of macrolithic tools at the site thus suggest that many of them were used away from the site. A high incidence of microliths, and the low frequency of other tool types, probably indicates that the site was a **manufacturing and hunting station** in both occupations, with hunting and the manufacture and maintenance of hunting gear as the main activities.

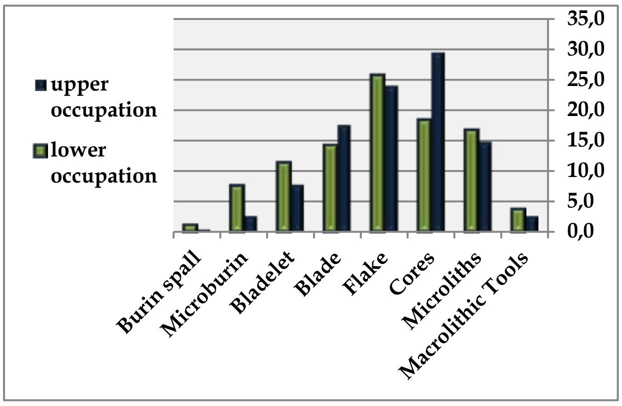


**Figure 2: Karak Plateau KPS 75 (upper and lower occupation)**

### *5.2 Yutil al-Hasa and Tor at-Tareeq*

The occupations at these sites yielded similar proportions of blanks and tools. Both sites are dominated by flake blanks and microliths (Figs 3, 4). The bladelets and blades at Tor Tareeq also have relatively high proportions. However, bladelets and macrolithic tools at Yutil al-Hasa and the microlithic tools in the Tor at-Tareeq occupations occur in moderate proportions. The blade percentage at Yutil al-Hasa is low (Fig.3).

The dominance of microliths at both sites s indicates that these ***sites were mainly emphasizing manufacturing and maintaining of hunting tools.*** The flake blank dominance at these sites combined with the moderate proportions of macrolithic tools, small flakes, small bladelets, and fragments (large and small) confirm the emphasis on production and use of macrolithic tools. The manufacturing elements and the high percentages of retouched pieces and notches/denticulates suggest that activities other than hunting were performed at these sites, such as butchering and processing meat and scraping hides. In general, these sites were probably **multipurpose sites with an emphasis on hunting activities.**

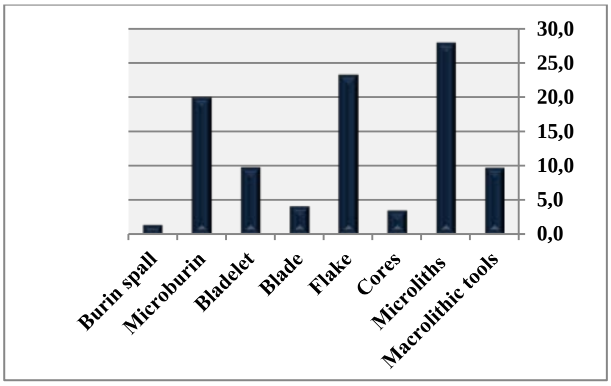


**Figure 3: Yutil al Hasa occupation.**

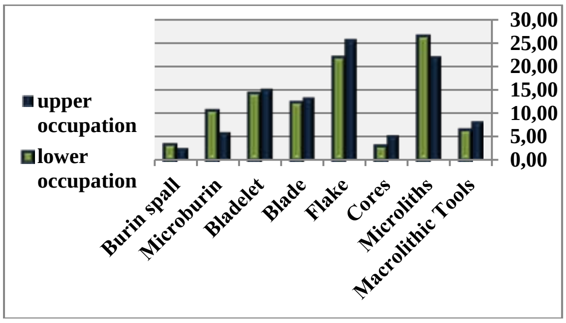


**Figure 4: Tor Tareeq (upper and lower occupations).**

### 5.3 *Wadi Madamagh*

The lower occupation at Wadi Madamagh is dominated by flake blanks. Microliths, macrolithic tools, blades, and bladelets have relatively low proportions. The composition of the lithic assemblage in the lower occupation suggests that the site was used mainly for **manufacturing microliths and macrolithic tools**.

The very high percentage of flakes and the low proportion of bladelets suggest that the occupants concentrated more on manufacturing macrolithic tools compared to microliths. The low proportions of both microliths and macrolithic tools in this occupation, however, suggest that the produced tools were mostly transported away from the site. Inversely retouched bladelets and Dufour bladelets are the main non geometric types in this occupation. The most common macrolithic tools are notch/denticulates and scrapers. These macrolithic tools and microlith types most likely indicate butchering, meat processing, and scraping types of activities at and away from the site.

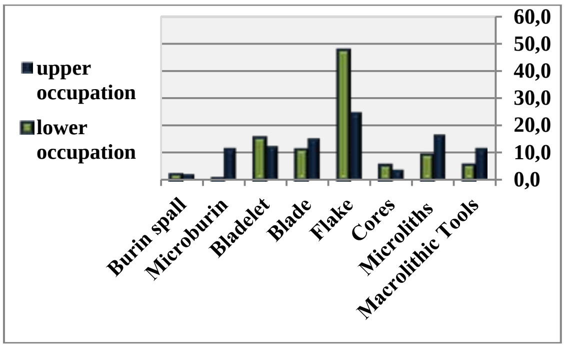


**Figure 5: Wadi Madamagh (upper and lower occupations)**

The composition of the upper occupation at Wadi Madamagh indicates a different site function compared to the lower occupation. The proportions of the blanks and tools (macrolithic tools and microliths) in the upper occupation are similar to each other. Even though the occupation is dominated by flake blanks, their proportion is much less than in the lower occupation. The proportions of microliths, macrolithic tools, blades and bladelets are moderate. These similar proportions indicate that the occupants manufactured both macrolithic tools and microliths with no concentration on either large or small tools. There is a high percentage of attenuated curved nongeometric microliths, Scrapers, and notch/denticulates indicate that wide ranges of activities were performed *on site* during this occupation. These activities perhaps include manufacturing tools, meat processing, hide scraping, and wood cutting, shaving, scraping, etc. The site during this occupation was primarily a ***manufacturing and processing camp***.

## 6. CONCLUSION

During the Last Glacial Maximum, the Wadi al-Hasa region was characterized by fresh-water springs, marshes, and seasonal ponds/playas. Only about 14 Epipaleolithic sites (survey/excavation) were recorded for this region, despite extensive surveys. All are aerially small sites. Activities, as reflected by site lithics and fauna, do not vary much. Interestingly, it is not the near-marsh location at Tor at-Tareeq that contains the greatest intensity of occupation, but the open parkland KPS-75 rockshelter area. Tor at-Tareeq actually has the lowest overall weight of lithic materials compared to KPS 75 and Yutil al-Hasa. The Wadi al-Hasa region might reflect the "norm" for the Early Epipaleolithic, even in the context of more optimal habitats, making the aggregation sites such as the near-marsh Kharaneh IV in the Azraq Basin (Maher et al. 2012) even more unusual.

Wadi Madamagh in the Petra region of the western highlands of Jordan is also an aerially small site. It contains both late Upper Paleolithic and Early Epipaleolithic occupations that in many ways are analogous to those of the Hasa region in reflecting relatively highly mobile settlement even within a favorable habitat (Mediterranean forest).

More than 50% of the tool classes in the occupations at all four sites is nongeometric microliths. The attenuated curved bladelets are the most common type in occupations in lower KPS 75, Yutil al Hasa and Tor Tareeq, as well as the upper occupation at Wadi Madamagh. The Ouchtata bladelet is the most common nongeometric in upper KPS 75. Inversely retouched and Dufour bladelets are the most common nongeometric in lower Wadi Madamagh. (see Table 3.)

These occupations also have moderate numbers of retouched pieces, notch/denticulates and scrapers. Other macrotools in these occupations are much less common. Even though the lower Wadi Madamagh occupation has fewer macrotools than the upper occupation, it has a relatively high percentage of scrapers, notch/denticulate, and burins. Other macrotools are few or absent (see Table 2.)

The high percentages of microliths (including geometrics, nongeometrics, microlith fragments) at the four sites under study suggest that these sites emphasize microlith manufacture. The high percentages of blade blanks, bladelet blanks, microliths, and the presence of microburins at the four sites indicate that the range of activities conducted at these sites was likely to have emphasized both tool manufacture and the aftermath of hunting activities.

According to the composition of the assemblage of the sites, all sites and their occupational divisions match the third type of Jelinek (1976) *manufacturing and use site type*. However, the degree of activities performed at each site and occupation vary from one site to another (al Nahar 2000). All sites show the manufacture of different types of tools (microliths and macrolithic tools)with some sites such as Wadi Madamagh (lower and upper occupations) showing the production of both microliths and macrolithic tools in an equal manner. Other sites are focused more on manufacturing hunting tools and gear, such as KPS 75, Yutil al-Hasa, and Tor at-Tareeq. Still other sites concentrated more on manufacturing macrolithic tools, such as Wadi Madamagh (upper occupation). The complete tools are not the only elements that help assess site function. The flake, blade, and bladelet blanks also aid in anticipating the degree of tool type production. This is because, in many cases, hunters transported and used their tools away from the site. The manufacturing process concentrations on certain tool types thus could be translated into different types of activities at a site. The proportions of the tools also enables an understanding of the degree of their use and therefore of the site function.

Finally, it is important to also take into consideration the potential degree of mobility of the hunter-gatherer groups who used these sites, as this allows one to refine the assessment of site function. The degree of mobility, which is generally considered to be relatively high based on site sizes and considerations of LGM landscape conditions, means that use of tools produced at a site must include not only where these were made, but also where they were transported to and used (that is, at particular sites or away from manufacturing locales to other sites in the landscape).

This paper focused on understanding site function during the Early Epipaleolithic in central and southern Jordan using the attributes of lithic assemblages and consideration of mobility. On-going analyses will add to these data to build a record of the habitats, settlement systems and subsistence strategies that characterized these hunter-gatherer groups who lived during the Last Glacial Maximum in the central and southern Levant.

**Table 1 : Lithic assemblage frequencies in the four excavated sites**

| | KPS | | WM | | TT | | YH |
|---|---|---|---|---|---|---|---|
| Classes | upper | lower | upper | lower | upper | lower | |
| macrolithic tools | 0.7 | 1.0 | 2.0 | 1.1 | 1.0 | 1.1 | 3.2 |
| microlith | 4.0 | 4.3 | 2.9 | 1.8 | 2.6 | 4.3 | 9.3 |
| cores | 7.9 | 4.7 | 0.7 | 1.1 | 0.6 | 0.5 | 1.2 |
| flakes | 6.4 | 6.6 | 4.3 | 8.9 | 3.0 | 3.6 | 7.7 |
| blades | 4.7 | 3.6 | 2.7 | 2.1 | 1.6 | 2.0 | 1.4 |
| bladelets | 2.1 | 2.9 | 2.2 | 2.9 | 1.8 | 2.3 | 3.3 |
| large debitage fragments | 5.9 | 4.2 | 12.7 | 9.1 | 6.3 | 9.2 | 30.7 |
| microburins | 0.7 | 2.0 | 2.0 | 0.2 | 0.7 | 1.7 | 6.6 |
| burin spalls | 0.1 | 0.3 | 0.4 | 0.4 | 0.3 | 0.6 | 0.5 |
| small bladelets (<10mm in length) | 9.8 | 6.4 | 4.3 | 5.6 | 2.4 | 3.4 | 6.8 |
| small flakes (<25mm) | 20.6 | 22.1 | 31.5 | 35.1 | 26.2 | 26.4 | 15.7 |
| small debitage fragments | 31.6 | 33.0 | 31.8 | 29.3 | 14.3 | 19.0 | 1.7 |
| shatter | 5.4 | 8.8 | 2.6 | 2.4 | 39.3 | 25.9 | 12.0 |
| | 100 | 100 | 100 | 100 | 100.0 | 100.0 | 100.0 |
| Total N. | (13970) | (13713) | (4747) | (8324) | (11760) | (16971) | (4736) |

**Table 2: Tool class frequencies in the four excavated sites**

| Tool Classes | YH | TT Upper | TT Lower | KPS Upper | KPS Lower | WM Upper | WM Lower |
|---|---|---|---|---|---|---|---|
| Scraper | 3.1 | 3.8 | 3.5 | 4.6 | 2.8 | 3.7 | 10.4 |
| Burin | 2.2 | 2.6 | 1.5 | 0.3 | 2.1 | 2.7 | 5.6 |
| Backed piece | 1.0 | 1.7 | 0.8 | 0.8 | 0.6 | 1.6 | - |
| Perforator | 0.3 | 0.7 | 0.1 | 0.2 | 0.4 | 0.5 | - |
| Truncation | 1. 9 | 1.9 | 2.2 | 0.6 | 2.1 | 1.1 | - |
| Geometric Microlith | 4.6 | 9.8 | 7.0 | 11.7 | 6.6 | 5.3 | 1.3 |
| Nongeometric Microlith | 60.5 | 42.6 | 51.2 | 49.2 | 61.4 | 55.3 | 55.4 |
| Microlith Fragment | 10.3 | 20.1 | 21.8 | 23.6 | 12.9 | 18.6 | 2.2 |
| Special tool | 0.2 | 0.2 | 0.1 | 0.6 | 1.0 | 1.6 | 3.0 |
| Notch/denticulate | 8.22 | 5.5 | 3.5 | 2.1 | 3.7 | 2.7 | 13.4 |
| Retouched piece | 7.0 | 10.3 | 7.6 | 6.2 | 6.1 | 6.9 | 6.9 |
| Multiple Tool | 0.2 | 0.2 | 0.2 | - | 0.1 | - | 1.3 |
| Varia | 0.3 | 0.5 | 0.3 | 0.2 | 0.3 | - | 0.4 |
| | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Total N | (584) | (418) | (908) | (657) | (726) | (188) | (231) |

**Table 3: The nongeometric microlith types frequencies in the four excavated sites.**

| Non-Geometric Microlith Types | YH | TT Upper | TT Lower | KPS Upper | KPS Lower | WM Upper | WM Lower |
|---|---|---|---|---|---|---|---|
| Dufour | 1.1 | 1.7 | 0.2 | 0.3 | 0.1 | 2.2 | 24.1 |
| Inverse | 2.8 | 1.1 | 0.6 | 0.4 | 0.4 | 4.3 | 51.9 |
| Ouchtata | 10.5 | 14.0 | 11.0 | 27.5 | 13.2 | 5.0 | 7.5 |
| Qalkhan point | 2.0 | 3.4 | 1.7 | 2.1 | 5.1 | 0.7 | - |
| Attenuated Curved | 39.9 | 28.7 | 37.8 | 12.8 | 31.4 | 26.6 | 1.5 |
| Curved | 16.8 | 3.9 | 9.2 | 11.1 | 12.6 | 11.5 | - |
| Pointed/Spike | 7.4 | 17.4 | 17.4 | 8.8 | 9.2 | 7.9 | 5.3 |
| La Mouillah | 2.8 | 4.5 | 1.3 | 2.1 | 2.8 | 1.4 | - |
| Backed & Truncated | 6.6 | 4.5 | 7.3 | 12.9 | 10.4 | 5.8 | 2.3 |
| Truncated | 4.6 | 11.8 | 6.9 | 3.6 | 3.8 | 3.6 | 1.5 |
| Double-Backed ("rod") | 0.9 | 2.2 | 1.5 | 12.9 | 1.6 | 1.4 | - |
| Other Types | 4.6 | 6.7 | 4.9 | 5.4 | 9.3 | 29.5 | 6.0 |
| | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Total N | (351) | (178) | (465) | (719) | (824) | (139) | (133) |

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