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Investigations at Tor al-Tareeq: An Epipaleolithic Site in the Wadi el-Hasa, Jordan

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The Epipaleolithic site of Tor al-Tareeq (WHS 1065) was discovered in 1982 by Burton MacDonald’s Wadi Hasa Survey in west central Jordan, surface collected and tested in 1984, and partially excavated in 1992. The earliest and best represented occupation is an early Epipaleolithic industry, overlain in places by an ephemeral geometric industry identified by a higher incidence of geometric microliths. Six radiocarbon determinations span the period between 16,900 and 15,600 b.p. and confirm an early Epipaleolithic date but the subsequent geometric phase has not been dated. The site consists of a series of camps, near a collapsed rockshelter and a spring, and strung out along the shore of a mildly-alkaline, late Pleistocene lake. The permanent water and varied resource zones surely made the locale attractive in an otherwise arid landscape. Faunal remains and pollen from the site indicate diverse resources in conditions substantially different from those of today. This report examines a wide range of archaeological and paleoenvironmental data in order to understand aspects of the regional system of settlement and subsistence of which Tor al-Tareeq was a part. Continuing research in the eastern Hasa drainage seems likely to provoke a reassessment of current models of hunter-gatherer adaptation during the Epipaleolithic in the southern Levant.

Introduction

Archaeological excavation and survey in the Levantine Epipaleolithic have discovered hundreds of sites over the past 65 years. Spanning the interval from 20,000 to 10,000 b.p., the Epipaleolithic has generated much interest as the predecessor to domestication economies. A large body of research has focused on the latter portion of the Epipaleolithic, in particular the Natufian (12,500–10,500 b.p.) (Bar-Yosef and Valla 1991). Immediately preceding Neolithic domestication economies, Natufian settlement and subsistence strategies have been characterized as being markedly different from those of the earlier Epipaleolithic. Over the last 25 years, however, the early and middle Epipaleolithic (20,000–12,500 b.p.) have undergone increased research emphases. Despite the growing richness of the early and middle Epipaleolithic database, consensus as to how these
industries are defined has not been reached. Indicative of
the state of Levantine Epipaleolithic research is the prolif-
eration of names used to classify assemblages from different
regions of the Levant (Byrd 1994). The primary basis for
these divisions lies in the analysis of techno-typological
traits among assemblages (Bar-Yosef 1970, 1975, 1981;
to these classification schemes are the retouched
tools, especially the microliths. It is primarily the frequency
and type of geometric and non-geometric microliths that
form the bases for these temporal and regional distinctions.
These complexes were first defined in the coastal regions of
the western Levant, but as research has expanded inland,
many researchers have questioned the utility of these labels
and proposed revised terminologies for regions east of
Olszewski et al. 1994).

Although the classification of these assemblages allows us
to place them in time and space, Levantine researchers are
also interested in what these assemblages might tell us
about forager adaptive strategies. In particular, how did
these Epipaleolithic foragers organize themselves over the
landscape? Several models of Epipaleolithic settlement have
been proposed, relying upon seasonal forager trans-
movement and/or long-term responses to climatic changes
(Henry 1987, 1994, 1995; Marks and Freidel 1977; Gor-
ing-Morris 1987; Bar-Yosef 1981). These models provide
reasonable explanations of Epipaleolithic forager strategies
within the regions for which they were developed, but the
applicability of these settlement models outside these re-
gions is questionable. The possibility exists, for example,
that different settlement strategies might have been adopted
by foragers in the Hasa region.

The aims of this paper are twofold. First, the results of an
excavation of a multi-component Epipaleolithic site are
presented, with the goal of placing it within the current
systematic framework. Second, we examine evidence from
the site and region in order to better understand the settle-
mament strategies utilized in the Hasa relative to the models
derived from other regions.

Overview of the Early and Middle
Epipaleolithic

The Kebaran, dating from 19,000 to 14,500 b.p., is
perhaps the earliest Epipaleolithic complex, and is defined
by a high frequency of backed non-geometric microliths
and the absence of the microburin technique for truncating
bladelets (Bar-Yosef 1975, 1981; Bar-Yosef and Vogel
1987) (table 1). Typological variation among Kebaran as-
semblages has been attributed to regional and temporal
differences (Bar-Yosef 1975, 1981). Kebaran sites are gener-
ally small in size and represent a strategy of frequent resi-
dential mobility, although a few larger sites (e.g., Ohalo II)
indicate a higher degree of sedentism (Nadel and Herskovitz

In southern Jordan, the Early Hamran has been iden-
tified as a regional variant of the Kebaran on the basis of
minor techno-typological differences (Henry 1982, 1983,
1988, 1995). Roughly contemporaneous with both the
Kebaran and the Early Hamran is the supposedly unrelated
Qalkhan complex, argued to represent an adaptation to arid
environments (Henry 1986, 1995). Unlike the Kebaran,
the Qalkhan is characterized by variable microburin fre-
234) sees similarities between the Qalkhan and the un-
named early Epipaleolithic industries of the Azraq Basin in
eastern Jordan. Byrd (1994: 210–211), however, is reluc-
tant to label the assemblages east of the Rift Valley, prefer-
ing to use the more generalizable term of non-Natufian
microlithic.

The middle Epipaleolithic, from 14,500 to 12,500 b.p.,
includes the Geometric Kebaran and the Mushabian. The
Geometric Kebaran is distinguished typologically by the
presence of large numbers of geometric microliths (Bar-
Yosef 1975, 1981). Within this complex, regional industries
have been identified based on variations in the general
Geometric Kebaran techno-typological theme (Bar-Yosef
1981; Henry 1989). Geometric Kebaran sites are found in
a wider range of environmental settings than those of the
Kebaran, and some settlement strategies are based on the
seasonal movement of foragers between elevationally differ-
etiated resource zones (Bar-Yosef 1987; Goring-Morris

Regional Geometric Kebaran variants include the Mid-
dle, Late, and Final Hamran in southern Jordan (Henry
microliths, Hamran sites show an increase through time in
lunate and microburin frequencies relative to Geometric
Kebaran sites in the core region of Israel. Contemporane-
ous with the Geometric Kebaran and Middle Hamran is an
unnamed non-microlithic industry identified at a few sites
in the Azraq Basin. The presence of a non-microlithic indus-
try during the middle Epipaleolithic suggests differences in
the sequence of lithic industries and regional adaptations
between the eastern and western Levant.

The second major middle Epipaleolithic complex is the
Mushabian. First identified in the Sinai, the Mushabian is
distinguished by the use of the microburin technique to
manufacture non-geometric microliths (table 1). Found in
some arid regions of the Levant, Mushabian sites overlap
spatially and temporally with the Geometric Kebaran. Most
sites are small but a few larger ones suggest a strategy of

<table>
<thead>
<tr>
<th>Period</th>
<th>Industrial phase</th>
<th>Range of site</th>
<th>Industrial characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Epipaleolithic</td>
<td>Kebaran</td>
<td>Mediterranean regions of Israel, Jordan Valley</td>
<td>Micropoints, arched backed bladelets, backed and obtusely truncated bladelets (50–90% of retouched pieces), no use of the microburin technique</td>
</tr>
<tr>
<td>19,000–14,500 B.P.</td>
<td>Early Hamran</td>
<td>Southern Jordan</td>
<td>Straight backed and obtusely truncated bladelets (13–64% of retouched pieces), microburin technique is generally absent</td>
</tr>
<tr>
<td></td>
<td>Qalqeh</td>
<td>Southern Jordan</td>
<td>Use of the microburin technique, variety of non-geometric microliths, rectangular Qalqeh point-diagnostic (4–58% of retouched pieces)</td>
</tr>
<tr>
<td></td>
<td>Qalqeh</td>
<td>Eastern Jordan</td>
<td>Various non-geometric microliths (73–94% of retouched pieces), use of the microburin technique</td>
</tr>
<tr>
<td>Middle Epipaleolithic</td>
<td>Geometric Kebaran</td>
<td>Mediterranean and desert regions of the western Levant</td>
<td>Geometric microliths (trapezes, rectangles) make up &gt; 50% of retouched pieces, microburin technique is generally absent</td>
</tr>
<tr>
<td>14,500–12,500 B.P.</td>
<td>Middle Hamran</td>
<td>Southern Jordan</td>
<td>Geometries comprise 0–19% of the retouched pieces, non-geometries 58–73%, straight backed and truncated bladelets, microburins absent</td>
</tr>
<tr>
<td></td>
<td>Late/Early Hamran</td>
<td>Southern Jordan</td>
<td>Geometries comprise 10–20% of the retouched pieces, an increase in the number of lunates, non-geometries 55–76%, straight backed and truncated bladelets, microburins are rare</td>
</tr>
<tr>
<td></td>
<td>Mushabian</td>
<td>Arid regions of Negev and Sinai</td>
<td>Use of microburin technique, arched backed bladelets, La Mouillah points, backed and obtusely truncated bladelets, some geometrics</td>
</tr>
<tr>
<td></td>
<td>Madamaghan</td>
<td>Southern and western Jordan</td>
<td>Few geometrics, arched backed, straight backed bladelets, La Mouillah points, use of microburin technique</td>
</tr>
</tbody>
</table>

small-scale seasonal aggregation. Variation in site size and structure has been attributed to a land-use pattern of seasonal upland and lowland mobility (Goring-Morris 1987; Henry 1989).

In the areas west of the Rift Valley, the Mushabian label has been applied variably to assemblages exhibiting some degree of typological similarity (Goring-Morris 1987; Henry 1989). Acceptance of these various labels by Levantine prehistorians has been slow (Byrd 1994: 209). East of the Rift, Henry (1989, 1995) has labelled the local variant of the Mushabian the Madamaghan. He suggests that the Madamaghan developed out of the early Epipaleolithic Qalqeh complex, creating a parallel development to the Kebaran-Geometric Kebaran sequence (Henry 1995: 339). Excavations elsewhere in Jordan have produced Madamaghan-like assemblages yielding dates contemporaneous with the Kebaran (Byrd 1988; Olszewski et al. 1994).

The regional terminology used to classify early and middle Epipaleolithic assemblages in the Levant clearly indicates a lack of terminological consensus. Byrd (1994) has suggested that the areas east and west of the Rift Valley should be considered separately but even within these regions there exists considerable variability and confusion regarding the terminology. For these reasons the traditional culture-stratigraphic units of the Levantine Epipaleolithic (e.g., Kebaran, Geometric Kebaran, Mushabian, Nacufian) should be used with caution. For many workers, these terms are taken to correspond to the material residues of ethnic or social groups that existed in the past, which can be identified through the classification and comparison of retouched stone artifacts (e.g., Bar-Yosef 1991; Kaufman 1995). We question these interpretations, however, and argue that they are ill-suited for the identification of ethnicity (Neeley and Barton 1994). It is our opinion that a better understanding of the meaning of lithic variation is to be found in the examination of a range of situational variables (e.g., raw material “package size” and availability, forager mobility, local group size, site function) that affect all mobile foragers (Barnforth 1986, 1991; Kuhn 1991, 1994).

We do not pretend to resolve these conceptual issues here, but in order to reduce confusion and to avoid being misunderstood, we rely on very general terms (early and middle Epipaleolithic) based on general similarities with the temporal trends outlined above.

**Levantine Models of Settlement**

Forager land-use models that have received the most attention in the Levant are those proposed by Marks and Freidel (1977) and Henry (1987, 1989). The Marks and Freidel model is based on archaeological data from the Negev Highlands, whereas Henry’s model is derived from survey and excavation in southern Jordan.

Marks and Freidel argue that changes in settlement strategies should be closely associated with long-term climatic changes. These climatic changes affect resource availability, which in turn necessitates a change in the land use strategies. The model is dichotomized conceptually into radiating and circulating strategies (Marks and Freidel
1977: 150; see also Mortensen 1972). For the early and middle Epipaleolithic, the model suggests foragers practiced a circulating strategy of land use. With a circulating strategy, extractive/special activity sites are apt to be small, perhaps archaeologically invisible loci, while base camps, which vary in the length of occupation, are not expected to be formally structured in terms of their use of space (i.e., anticipated duration of occupation is likely to be short [Kent 1992]). As a result, we should see less intrusive patterning with regard to the use of space, and “blurring” of patterning as a result of repeated, non-continuous occupation over time. With a radiating strategy, base camps are organized logistically and may be highly visible due to extended occupations and the accumulation of midden deposits. They may contain greater intrusive patterning with regard to structures, features, and disposal areas. Extractive sites are expected to be more numerous, although still potentially invisible archaeologically, because of the limited range of activities occurring there.

Henry’s (1987, 1989, 1994) model of forager land-use is based upon the seasonal movement of foragers between upland and lowland settings. This model is used to characterize land-use strategies over much of the later Pleistocene and Holocene but is especially relevant to the Epipaleolithic, where it is linked to a large body of archaeological data. Henry suggests that larger winter camps will be found in lowland settings whereas the smaller summer camps are situated in upland regions. The model incorporates aspects of the radiating/circulating model in that a radiating pattern of settlement would be expected for the large winter, lowland sites and a circulating pattern of settlement for the upland sites. Variations on the upland/lowland pattern of settlement have also been applied to areas of the western Levant (Bar-Yosef 1987; Goring-Morris 1987).

Although these models are derived from regional databases, their applicability to other areas, especially the inland regions of northern and central Jordan, remains to be tested. In particular, we are interested in the inland regions characterized by lakes or oases. During the late Pleistocene, inland lakes were present in the Jafir Basin, the Azraq Basin, the northern Jordan Valley, and the eastern Wadi Hasa. These lake beds are presently located in arid, steppe desi...
both in situ deposits and radiocarbon-dated features in these areas (Clark et al. 1988). During 1992, 2 × 2 m units were opened up adjacent to trench segments B and C in the hope of identifying additional features, architecture, and intact cultural deposits (FIG. 2). To date, excavation at Tor al-Tareeq has resulted in the collection of more than 200,000 lithic artifacts along with fauna, shell, and ground stone.

**Stratigraphy**

**The 1984 Trench**

In 1984 a 44 m step trench (Steps A-I) was excavated along a N-S line following the slope of the land surface. Previous reports have discussed a limited part of the trench (Steps B, C) or dealt with the general geomorphological site processes (Clark et al. 1987, 1988; Schuldenrein and Clark 1994). The section drawing indicates that much of the site stratigraphy is represented by colluvial deposits overlying calcareous lacustrine marls (FIG. 3a–c). Occupation of the site appears to have been largely confined to the upslope areas of Steps A, B, and C as they contain consistently high densities of artifacts and features from top to bottom (Clark et al. 1988).

During the 1992 season, the upper steps of the 1984 step trench were cleared of backfill in order to utilize the old stratigraphic profile as a guide for further excavations. Both Steps B and C are documented in previously-published section drawings (Clark et al. 1988: 255) and we used these as guides for following the natural stratigraphic levels visible in the trench. When the correspondences between the 1984 and 1992 strata were unclear, excavation proceeded by arbitrary 10 cm levels.

Differences in the stratigraphy of Units B and C are evident. Unit B seems to have greater preservation of intact, distinct strata from the early Epipaleolithic occupation.
along the lake margin. The stratigraphy of Unit C, further downslope, is less distinctive, probably because of greater colluviation.

**Unit B**

Excavation Unit B (2 × 2 m) was located on the eastern edge of Step B (Fig. 1). This area was adjacent to the part of the step trench with exposed charcoal and ash (Feature 3) reported in the 1984 excavations (Clark et al. 1987, 1988). Excavation in Unit B revealed five distinct strata corresponding to those identified in the 1984 excavations (Clark et al. 1988).

**Unit C**

Excavation Unit C (2 × 2 m) was placed along the western edge of Step C. Because of recent erosion along the trench, which destroyed part of its western edge, a small balk was left in place between the trench and excavation Unit C (Fig. 2). Excavation identified four stratigraphic levels. The stratigraphy differs markedly from the complex stratigraphy reported for the eastern face of Step C in the 1984 excavations (Clark et al. 1987: 58). The western face of Step C, however, which is much less complex, is very similar to that identified in the 2 × 2 m unit. The lower levels are characterized by carbonate lenses, suggesting local
conditions wetter than at present due either to the proximity of the spring, lake, or overall more mesic climatic regimes. Changes in the frequency and kinds of lithic artifacts throughout the levels in Step C and those in Unit C are strikingly similar, however, suggesting a continuous horizontal distribution of occupational debris in this area of the site. It is only in the area of Step C and Unit C that there is compelling evidence for differentiating between an earlier (Level 5) and later (Levels 1 and 4) Epipaleolithic occupation (Stevens 1996).

Although we argue for the relative integrity of the two archaeological occupations, we acknowledge the possibility of mixing. Location on a slope has resulted in some displacement of material over time (Cohnman, Clark, and Donaldson 1989), which might produce a “watered down” assemblage signature as the earlier materials are combined with those of the later occupation. This is problematic when trying to place assemblages within the existing culture-stratigraphic units. Nonetheless, while recognizing these potential alternative sources of patterning, we feel that the arguments presented here warrant the separation of the material into an early and later geometric Epipaleolithic occupation.

Chronology

Eight radiocarbon samples have been processed from Tor al-Tareeq (Table 2; Schudlenkrein and Clark 1994: 34 contains a complete listing of radiometric dates from the eastern Hasa region). Six of the eight determinations cluster in the 16,000–15,000 B.P. interval—dates compatible with radiocarbon-dated early Epipaleolithic industries in the Levant (Bar-Yosef and Vogel 1987; Byrd 1994). Typologically, the paucity of geometric microliths and a high proportion of backed bladelets typical of the radiometrically-dated levels correspond to a generalized Kebaran pattern (Bar-Yosef 1975, 1981). While an internally consistent cluster of dates was obtained for the early Epipaleolithic occupation, the upper layers did not yield dateable remains of the subsequent occupation. Thus far, all of the radiocarbon dates on charcoal come from the lowest levels in Steps A, B, and C. The later material, containing higher proportions of geometric microliths, is confined to Step C and rests well above the dated levels. Two other dates were obtained from soil samples containing organic material in Unit B within a heavily calcified, consolidated layer. These dates are much younger than the others and are considered problematic with regard to the site chronology because of potential problems inherent in the bulk sample dating technique, and the possibility of contamination. They are not considered in the following site interpretations.

Analysis of Pollen

Pollen preservation was inconsistent with natural strata at Tor al-Tareeq, but productive samples indicate the strong predominance of non-arboreal taxa. Some of the variability among pollen spectra may be the result of the transport of pollen-bearing plant materials into the camp environments (e.g., Ambrosia-type pollen in Feature 2 and Typha/Sparganium pollen in Feature 3).

The pollen spectra indicate steppe-like conditions persisting throughout most of the site occupation (Fig. 4). There is some indication that the earliest occupations may have been associated with cooler and possibly drier conditions in the absence of riparian taxa. These climatic conditions are in general agreement with conditions across the region during the last glacial maximum (Bar-Yosef 1990: 60). The local environment appears to have changed fairly rapidly with the onset of warmer conditions, indicated by the rise in Navea-type pollen and the regular appearance of riparian taxa in the pollen samples. These changes, however, do not appear to have altered the environment in a drastic fashion. The results suggest that the lake/marsh environment of the Hasa basin, with its numerous active springs, provided a broad range of resources that differed markedly from the surrounding steppe. This diversity was a major factor in the prehistoric occupation of the Hasa basin during the early Epipaleolithic.

In comparison, the shift toward Navea-type pollen may parallel a similar change in pollen configurations from an early to late period during the Early Epipaleolithic occupations investigated by Donald Henry in southern Jordan (Emery-Barbier 1988). As in the pollen sequence at Tor al-Tareeq, Artemesia appears following this shift, although Ephedra spans the entire early Epipaleolithic interval in the southern samples. Like the Tor al-Tareeq sequence, later assemblages contain small amounts of the pollen of mesic trees. In southern Jordan, these include alder, Olive family, elm (Ulmus), and fig (Ficus).

Typological Comparisons

Meter-deep cultural deposits in conjunction with radiocarbon dates indicate that the site was occupied over a span of several thousand years. Because of the continuity of cultural deposits and the likely disturbances associated with natural processes, the identification of discrete, occupational episodes (e.g., living floors) was not possible. Rather, it seems more productive to identify gross differences in the occupational episodes based on aspects of lithic typology and technology. The retouched tool component from Tor al-Tareeq indicates some variability over the occupational history of the site. Typological differences are noted in both
Figure 3. Stratigraphic profile of the east side of the 44 m trench. A) Steps A–C, comprising the main occupation area. B) Steps D–E, colluvial deposits overlying ancient muds. C) Steps G–I, marl and sand deposits from the Pleistocene lake.
Step G

1a. Loose, light tan, rocky silt
4e. Compact silt, carbonates
4f. Blocky gravels with slightly compact silts and sands
6a. Marl deposits, some carbonates
6b. Fine marls
6c. Fine, compacted marl silts
7. Compact marl silts with gravels and pebbles

The horizontal and vertical dimensions of the occupation that can be differentiated into two major culture-stratigraphic phases. The earliest occupational history is characterized by a non-geometric microlithic industry occurring in the basal levels and the upper slope of the site. The later phase, stratigraphically higher and further downslope, is characterized by broad, geometric microliths.

The Earliest Occupation

The levels in excavation Unit B are characterized by a high proportion of non-geometric microliths (Table 3). The incidence of non-geometric microliths in the five levels form 64–84% of the retouched tool totals. Within this tool group, straight backed bladelets and arched backed bladelets are most common (Figs. 5, 6). The arched backed bladelet category includes narrow micropoints and curved backed bladelets. Other forms represented in these levels include backed and truncated bladelets, truncated bladelets, and partially backed bladelets. Among the layers in Unit B, Level 5 differs from the others in its higher incidence of arched backed bladelets (21% vs. 6–10%). The presence of arched backed bladelets and narrow micropoints in quantity suggests a typological affinity with the early Kebaran, whereas late Kebaran assemblages are believed to be represented by a greater incidence of obliquely truncated backed bladelets (Bar-Yosef 1981; Bar-Yosef and Vogel 1987: 225).

Geometric microliths (trapeze/rectangles, triangles, lunates) comprise a very small part of the retouched tools in Unit B. The greatest frequency of these forms occur in Level 1 (3%) and they represent less than 1% of the retouched tool component in Levels 4 and 5. Ratios of non-geometric to geometric microliths are greater than 10:1, indicating that geometric forms comprised a very small proportion of the retouched pieces. These low frequencies indicate a predominantly non-geometric assemblage in these levels that is relatively homogeneous from bottom to top. Minor differences might represent differences attributable to temporal

<table>
<thead>
<tr>
<th>Laboratory no.</th>
<th>Level</th>
<th>Material</th>
<th>Age ka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-57898</td>
<td>B3</td>
<td>Soil/sediment</td>
<td>9,010 ± 100</td>
</tr>
<tr>
<td>Beta-57899</td>
<td>B3</td>
<td>Soil/sediment</td>
<td>11,280 ± 290</td>
</tr>
<tr>
<td>UA-4392</td>
<td>B4</td>
<td>Charcoal/hearth</td>
<td>15,580 ± 250</td>
</tr>
<tr>
<td>UA-4394</td>
<td>B4</td>
<td>Charcoal/hearth</td>
<td>15,860 ± 430</td>
</tr>
<tr>
<td>UA-4396</td>
<td>C5</td>
<td>Charcoal/hearth</td>
<td>16,570 ± 380</td>
</tr>
<tr>
<td>Beta-57900</td>
<td>B4</td>
<td>Charcoal/hearth</td>
<td>16,670 ± 270</td>
</tr>
<tr>
<td>UA-4393</td>
<td>C5</td>
<td>Charcoal</td>
<td>16,790 ± 340</td>
</tr>
<tr>
<td>UA-4391</td>
<td>A5</td>
<td>Charcoal</td>
<td>16,900 ± 500</td>
</tr>
</tbody>
</table>
variation within the early Epipaleolithic occupation and/or site functional differences.

Similar distributions of high proportions of non-geometric microliths (>50% of all tools) and low proportions of geometric microliths (<5% of all tools) occur in Steps A (A3, A5), B (B2–B5), C (C5), and Unit C (C5a, C5). These levels coincide with the earliest occupation of the site.

The Later Occupation

The most recent stratigraphic levels in Unit C are characterized by a consistent proportion of non-geometric microliths (62–63%) (Table 4). Among the non-geometric tools, backed bladelets are by far the most numerous type, although truncated bladelets are prevalent in these upper two levels of Unit C. Other forms represented include backed and truncated bladelets, partially backed bladelets, and arched backed bladelets.

Geometric microliths are more numerous here than the lower levels, ranging from 7–10% of the retouched tool total. Although these may not seem like significant differences, the ratio of non-geometric to geometric microliths for these levels is less than 10:1. Geometrics include atypical trapezes, double truncated bladelets, and backed and bi-truncated bladelets (Fig. 7). The geometric forms from these levels tend to be wide relative to their length and bear a morphological resemblance to geometrics found in the final Geometric Kebaran component at Kharian IV (Byrd 1994: 211).

A similar pattern of greater proportions of wide geometrics (>5% of all tools) occurs in Steps C (C1–C4b), B (B1), D (D1–D4c), and E (E1–E4c). The latter two steps, as well as Step E, contain greater densities of material in the upper levels, an absence of features, and are situated on a steeper slope suggesting that this material is derived from upslope (Clark et al. 1988; Coman, Clark, and Donaldson 1989). The absence of lithic deposits from the early occupation phase in these steps suggests that the earliest occupation was confined to the upper slope (A, B, C) and that this lower area may have been submerged by the lake during the earlier cultural phase. It is in these steps that marl-like deposits (heavily calcified carbonates) begin to appear in the profiles.

Technological Comparisons of the Chipped Stone Assemblage

For the purpose of comparison, samples were examined from Units B and C with regard to aspects of their technology. These samples represent three distinct strata: 1) Unit C, Level 4, corresponding to a level with a high incidence of geometric microliths; 2) Unit B, Level 3, a compact, calcified gray deposit; and 3) Unit B, Level 5, the basal deposit representing the earliest occupation level. Several indices were compiled from these three strata (Table 4). Differences are noted among these deposits and in some cases appear to be quite striking. The most notable disparity in reduction strategies occurs in Unit B3. This level is represented by the lowest ratios for all four indices (debitage to core, tool to core, cortical piece to core, and shatter to core). These low values suggest a non-intensive reduction strategy that might correspond to episodes when raw material is easily procured and residential mobility is low. Further evidence for lower mobility in this stratum is suggested by the midden-like deposits found here. Unlike levels B5 and C4, the tool to core ratio is very low, indicating that the reduction strategy was not directed toward maximizing the number of tools per core. Two general behaviors could be responsible for such a pattern. First, the production of potential tool blanks could occur on-site but then be carried off-site for use elsewhere. Alternatively, the production and use of tool blanks may focus on more informal tool forms that are not recognized in the typological classification of the material (i.e., utilized pieces). Such a strategy might be employed in a base camp setting when raw material is abundant and the activities of tool production and use are not spatially and temporally segregated.

The other two strata examined (B5 and C4) show much
Table 3. Percentages of major tool classes from all excavation units at Tor al-Dareeq.

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higher ratios ofdebitage to core and shatter to core, indicating a greater emphasis on on-site reduction strategies. The evidence of on-site core reduction is bolstered by the higher ratios of cortical pieces to cores, corresponding to the initial stages of core reduction. This suggests that cores were brought onto the site in a mostly complete form (i.e., they have not been shaped extensively off-site). The transport of mostly complete raw material nodules on-site might reflect the distance in which the materials were carried and suggest the utilization of nearby raw material sources. The tool to core ratios in B5 and C4 suggest either a greater emphasis on in situ tool manufacture, use, and discard or are representative of a “gearing up” stage of tool production for future tool use during which old, worn out tools are discarded in favor of newly manufactured ones. Both sorts of behaviors are compatible with base camp settlements.

Blank and Tool Metrics

In addition to debitage ratios, measurements were recorded for lithic samples from these three strata. Typologically, Units B3 and B5 are most similar and fall within the range of a generalized early Epipaleolithic industry. The third sample, Unit C4, bears a greater affinity to a geometric industry. Measures of length, width, and thickness were recorded for complete retouched and unretouched flakes and blades.
Figure 5. Retouched stone artifacts and cores from Unit B, Level S. 1–2: backed and obliquely truncated bladelets; 3–4: arched backed bladelets; 5–6: straight backed bladelets; 7: inversely retouched bladelet; 8: double backed bladelet; 9: straight backed bladelet with basal modification; 10: truncated blade segment; 11: circular scraper; 12–14: bladelet cores.
Figure 6. Retouched stone artifacts and cores from Unit B, Level 3. 1–2, 4: straight-backed bladelets; 3: straight-backed bladelet with a retouched tip; 5, 12: backed and obliquely truncated bladelets; 6, 11: arched backed bladelets; 7: multiple burins on a blade; 8: endscraper/burn on a straight truncation; 9: bladelet core; denticulate on a retouched blade.
Figure 7. Retouched stone artifacts and cores from Unit C, Level 4. 1-2, 4-6: Hasa lunates; 3, 8: double-truncated bladelets; 7: broken Hasa lunate; 5, 10-13: backed and truncated bladelets; 9: retangular; 14: endscrapers/burin on an oblique truncation; 15: flake/blade core.
Table 4. Technological indices pertaining to reduction strategies for three strata at Tor al-Tareeq.

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The results of these measurements indicate that B3 contains the longest average unretouched blade length (44.04 mm), followed by C4 (38.03 mm) and B5 (31.34 mm). The larger sized blanks from B3 support the notion of a non-intensive reduction strategy. The unretouched blades and flakes from Level B5 are the smallest in size for all three variables. Complete flake sizes are largest in C4.

Differences in the retouched blades are noted for all three levels. Those in C4 are smaller than the unretouched blade sample whereas retouched blades in B3 are larger and those in B5 are about the same size. The larger size of blade tools in B3 might be due to 1) better preservation (less breakage); 2) intrasite functional differences in which large blade tools were important (e.g., scrapers, burins, retouched blades); or 3) tool and blank production were less intensive (i.e., producing larger sized usable blanks). Although most of the tools in this level are microliths (non-geometrics account for 71%), some larger tools like scrapers and burins are relatively well represented (7% each).

**Technological Summary**

The aim of the technological comparison of these samples was to try to identify intra-assemblage differences. Differences have been noted for indices of reduction intensity as well as blank and tool morphology. Reduction strategies appear to be variable within typologically similar assemblages, whereas aspects of blank morphology among the early Epipaleolithic samples remain very similar. Having identified some aspects of variation is not, however, the same thing as explaining why they occur. Perhaps the most widely accepted explanation for differences in pattern in Epipaleolithic assemblages is that they reflect differences in cultural or ethnic identity (e.g., Bar-Yosef 1975, 1981, 1991; Bar-Yosef and Vogel 1987; Goring-Morris 1987; Henry 1989). These explanations depend upon the assumption that technological and typological differences are isomorphic with differences in learned behavior, which in turn reflect differences in ethnic identity. Some of these assumptions have been questioned recently and alternative explanations advanced that account for variability in terms of a smaller number of universal situational variables (e.g., raw material availability, mobility, site function) (Donaldson 1991; Kuhn 1994; Neeley and Barton 1994). Perhaps the greatest challenge of these alternative explanations lies in the difficulty of untangling these factors. Raw material availability/use and mobility can influence assemblage variation in a variety of ways, resulting in a somewhat incomplete separation of these distinct causal factors (see Kuhn 1995; Potter 1993).

**Ground Stone Assemblage**

During the 1984 and 1992 excavations at Tor al-Tareeq, 14 ground stone implements were recovered. In addition to the excavated sample, five bedrock grinding features were located in the rocky escarpment directly NE of the archaeological deposits. Morphologically the artifacts fall into a relatively narrow range of categories.

Ground stone artifacts were placed in one of four categories: 1) indeterminate fragments, 2) handstone/poleta fragment, 3) pestle, or 4) mortar. Two indeterminate fragments were defined by the presence of a ground surface or surfaces that were too small for any further typological distinction. The three items in the handstone/poleta category were complete enough to warrant a general functional inference (Fig. 8). Usewear typically occurs as battering of one or both ends, with striations or grinding around the circumference near the ends.

Four of the bedrock mortars were of the small “cupmark” variety (Wright 1991: 31). They are circular in plan, with slightly incurving sides. The remaining two mortars are of interest because they seem to have two composite, yet distinctive, use surfaces. They contain a large, elliptical depression surrounded a smaller, cup-shaped indentation similar to those described above.

Excluding the mortars formed in the Upper Cretaceous limestone bedrock, the ground stone raw material includes basalt, quartzite, and limestone. Several basalt outcrops are present within a 15 km radius of the site (Bender 1974: 112). Basalt sheet lavas are a prominent feature of the Jurfd Darawish area to the south, and basalt plugs occur to the west, along the Wadi al-Hasa drainage.

Whatever the specific occupational history of the site, it appears that ground stone technology was used throughout its duration as pestles and handstones are found in the upper and lower levels of Unit B. The ground stone assemblage from Tor al-Tareeq is distinctive on two counts: 1) the
lack of deep vessel/mortars and shaped pestles; and 2) the occurrence of multifunctional grinding and pounding mortars. The combination of expedient handstones and bedrock mortars seems especially efficient for mobile populations returning to a site as part of an annual cycle in which plant foods played a decisive role.

Features

The excavations at Tor al-Tareeq revealed five features in Steps A, B, and C; four are hearths while the other appears to be a minor architectural feature.

Numerous hearths have been described from Mushabian and Geometric Kebaran contexts in the northern Sinai (Bar-Yosef 1977; Bar-Yosef and Goring-Morris 1977; Phillips and Mintz 1977). These are often deflated, diffuse, scattered features which, like those at Tor al-Tareeq, are believed to have been made by mobile foragers. The hearths from the Sinai and Tor al-Tareeq are both informally made, often associated with burned stones in or around the hearth, and with depths generally about 10–15 cm. The Tor al-Tareeq hearths tend to be smaller (ca. average D. 65 cm, compared to 1 m for the Sinai sample). Nearly all of the Tor al-Tareeq hearths are incomplete, however, as they were found along the edges of the excavated units. Also, the deflation evident in the Sinai hearths may have increased the size of these features. In any case, they are both fairly clearly functional equivalents. The overall pattern at Tor al-Tareeq suggests short-term occupation, given that the hearths are informal affairs, relatively small, and constructed with a minimal labor investment.

Marine Gastropods

The excavations at Tor al-Tareeq yielded a modest amount of marine shell. The presence of marine shell from both the Mediterranean and Red seas suggests that the late Pleistocene foragers in the Hasa were not isolated groups, but likely participated in a larger, regional network characterized by interaction and limited exchange. Seven species of gastropod were identified, dominated by Mitra, Dentalium, Nerita, and Conus. These shells appear to have been used for decorative purposes, as most of them were perforated or otherwise intentionally altered (fig. 8). The sources for these marine gastropods are the Mediterranean Sea to the west and the Red Sea to the south. Shells of Mediterranean origin include Arca lucinensis and Columella, while Conus is found in both the Mediterranean and Red seas (Clark et al. 1988). The remaining shells are from the Red Sea. The Mediterranean shell appears to occur more frequently in the earlier levels, but the samples are too small to make any generalizable statements. Most of the marine shell can be sourced to the Red Sea, which is slightly further in distance than the Mediterranean Sea (ca. 155 vs. 135 km). Although closer in actual distance, access to the Mediterranean involves the topographic barriers of the Rift Valley and the Lisan Lake. The presence of shell from both coastal areas suggests that early Epipaleolithic foragers participated in some sort of informal exchange network, extending beyond the ranges normally traversed by these foragers in the course of an annual round. Implicated by this non-local material is a series of social relations (probably kin-based) with groups both to the west and to the south.

Comparison with Other Regional Industries

Placing the site in a broader, regional context employs published data from the western Negev and Sinai (Gilead and Marder 1989; Bar-Yosef and Goring-Morris 1977), northern and eastern Jordan (Byrd 1988; Edwards 1990; Muheisen 1988), west-central Jordan (Olszewski et al. 1994; Byrd and Collinge 1991), and southern Jordan (Henry 1995; Jones 1983; Byrd 1991). These comparisons are simple and very generalized in nature, but provide an initial assessment of the regional context of the site.

The occupational episodes at Tor al-Tareeq are differentiated by changes in microlith forms associated with distinct stratigraphic levels at the site. Although we disagree with some of the ethnic group ramifications of microlith morphology, we acknowledge that morphological variability can be used to identify spatial and temporal differences (Neeley and Barton 1994; cf. Bar-Yosef and Vogel 1987; Henry 1989).

For this comparison, materials from the uphill portion of the site were utilized, representing six levels from the early Epipaleolithic occupation and two from the later occupation. The geometric samples are distinct from the rest by virtue of higher proportions of geometric microliths (10–12%). When these collections are compared with Levantine assemblages ranging in time from the Kebaran through the Natufian, some salient patterns emerge (Table 8). Geometric Kebaran assemblages from the western Negev and Sinai are least similar to the geometric industry at Tor al-Tareeq in terms of the proportional frequency of geometric forms present. The Tor al-Tareeq collections contain far fewer geometric forms, proportionally. Those assemblages most similar to Tor al-Tareeq in terms of the proportional frequency of geometric forms are the Middle and Late Hamran industries (6–19%) from southern Jordan which are considered to be a regional variant of the Geometric Kebaran (Henry 1988: 251). The most common geometric form in the Tor al-Tareeq assemblage is the broad, atypical trapeze, a form similar to that found at Khazaneh IV in eastern Jordan (Muheisen 1985, 1988; Byrd 1994). Although this occupation remains undated at Tor al-Tareeq, recent dates from
Figure 8. Ground stone, shell and lithic artifacts from Tor al-Threeq. 1: basalt hand stone; 2-4: bladelet cores (2: Unit C, Level 4; 3-4: Unit B, Level 5); 5: drilled stone bead; 6-8: drilled and perforated shell beads.
Table 5. Comparison of 8 levels from Tor al-Tareeq with other regional Epipaleolithic industries.

<table>
<thead>
<tr>
<th>Site</th>
<th>Ensemblé</th>
<th>Burin</th>
<th>Perforator</th>
<th>Multiple</th>
<th>Notch-</th>
<th>Diamond</th>
<th>Transverse</th>
<th>Retouched</th>
<th>Non-geometric</th>
<th>Geometric</th>
<th>Vein</th>
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<tbody>
<tr>
<td>Tor al-Tareeq assemblage</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Step 5</td>
<td>2.7</td>
<td>2.4</td>
<td>1.2</td>
<td>0</td>
<td>3.7</td>
<td>3.7</td>
<td>18.7</td>
<td>58.0</td>
<td>0</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Unit B3</td>
<td>1.3</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
<td>2.2</td>
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<td>1.3</td>
<td>0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Unit B5</td>
<td>1.1</td>
<td>1.2</td>
<td>0.5</td>
<td>0.5</td>
<td>11.9</td>
<td>9.9</td>
<td>9.7</td>
<td>58.3</td>
<td>3.3</td>
<td>2.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Step 38</td>
<td>1.3</td>
<td>1.4</td>
<td>0.5</td>
<td>1.4</td>
<td>10.9</td>
<td>11.9</td>
<td>9.9</td>
<td>58.3</td>
<td>3.3</td>
<td>2.7</td>
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</tr>
<tr>
<td>Unit C6</td>
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<td>1.2</td>
<td>0.5</td>
<td>0.5</td>
<td>11.9</td>
<td>9.9</td>
<td>9.7</td>
<td>58.3</td>
<td>3.3</td>
<td>2.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Step 35</td>
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<td>1.4</td>
<td>0.5</td>
<td>1.4</td>
<td>10.9</td>
<td>11.9</td>
<td>9.9</td>
<td>58.3</td>
<td>3.3</td>
<td>2.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Unit C4</td>
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<td>9.9</td>
<td>9.7</td>
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<tr>
<td>Step C4b</td>
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<td>1.4</td>
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<td>9.9</td>
<td>9.7</td>
<td>58.3</td>
<td>3.3</td>
<td>2.7</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Early Epipaleolithic industries

- W. Hammah 26*: 6.2, 5.7, 0, 0, 3.1, 0, 3.6, 78.9, 0.5, 2.1
- Yotul Hasa†: 1.8, 1.8, 0, 0, 6.1, 1.0, 6.1, 80.1, 2.8, 0.8
- Uwaynakh 18 T2: 1.7, 0.9, 0, 0, 2.8, 1.3, 3.8, 89.8, 0, 3.4
- Uwaynakh 14: 1.0, 0, 0, 0, 2.8, 1.3, 3.8, 89.8, 0, 3.4
- Jilat 6 Lower: 2.1, 0.7, 0, 0, 2.8, 1.3, 3.8, 89.8, 0, 3.4
- Jilat 6 Middle: 1.9, 0.7, 0, 0, 2.8, 1.3, 3.8, 89.8, 0, 3.4
- J504*: 12.8, 2.7, 3.3, 1.3, 12.8, 4.4, 32.3, 28.3, 0, 3.4
- J520*: 11.8, 3.6, 3.2, 0.3, 16.1, 2.8, 34.6, 26.1, 0, 0.7
- J1: 3.6, 1.8, 0, 0, 10.7, 3.6, 42.8, 19.6, 1.8, 8.9
- J2: 13.0, 8.7, 0, 0, 13.0, 0, 52.2, 13.0, 0, 0
- J201C: 5.2, 3.2, 3.2, 0, 3.2, 2.6, 16.2, 64.3, 0, 1.9

Middle Epipaleolithic industries

- Nahal Rut 48A**: 1.1, 0.2, 1.2, 0, 3.3, 0.3, 9.6, 64.4, 0, 3.3
- Nahal Rut 48B: 1.1, 0.2, 1.2, 0, 3.3, 0.3, 9.6, 64.4, 0, 3.3
- Nahal Rut 48C: 1.1, 0.2, 1.2, 0, 3.3, 0.3, 9.6, 64.4, 0, 3.3
- Nahal Rut 48D: 1.1, 0.2, 1.2, 0, 3.3, 0.3, 9.6, 64.4, 0, 3.3
- Lagama N. IV†: 9.6, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- Lagama N. VII†: 1.2, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- Mustaib XIV L2: 0, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- Mustaib XVII: 0, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- Mustaib XII: 0, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- Kharaneh IV*: 10.7, 3.2, 1.7, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- Kharaneh IVd: 7.7, 2.8, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- J201B§: 4.4, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- J201A: 3.9, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- J201 Middle: 3.9, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- J201 Upper: 3.9, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- J201 Lower: 3.9, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3
- J201 Upper: 3.9, 0, 0, 0, 3.3, 0, 3.3, 64.4, 0, 3.3

Natufian Industries

- W. Hammah 27*: 5.3, 2.5, 0, 0, 4.3, 0, 3.3, 16.2, 7.3
- Tabaqi§§: 9.6, 7.0, 1.6, 1.1, 17.6, 2.7, 15.5, 23.5, 7.6
- Beidha***: 11.6, 3.9, 1.1, 2.9, 30.4, 6.5, 9.7, 5.5, 13.1, 15.3

* Edwards 1990
† Oegema et al. 1994
‡ Byrd 1988
§ Henry 1995; Jones 1983
** Gilead and Marder 1989
*** Byrd 1991
†† Bar-Yosef and Goring-Morris 1977
‡‡ Mahassen 1985, 1988
§§ Byrd and Collod 1991

Kharaneh IV are consistent with the latter portion of the early Epipaleolithic (Byrd 1994).

For the early Epipaleolithic industry at Tor al-Tareeq, the assemblages most similar in terms of microlith frequencies seem to be the Madamaghan from the Wadi Hasa (Yotul al-Hasa), the early Epipaleolithic sites from the Asraq basin (Uwaynakh 18, Uwaynakh 14, Jilat 6), and the Kebaran from Wadi Hammah 26 in the northern part of the Jordan Rift. All of these contain high proportional frequencies of non-geometric microliths (>70%) and are associated with moderate to intensive use of the microburin technique for snapping bladelets. Low frequencies of geometrics also characterize the Early Hamran of southern Jordan, but the Early Hamran contains a high frequency of retouched pieces, fewer non-geometrics, and lacks evidence for consistent use of the microburin technique. The assignment of these levels to the early Epipaleolithic is also supported by the six radiocarbon dates from Tor al-Tareeq that fall squarely...
within the range of dated early Epipaleolithic occupations elsewhere (Byrd 1994).

Site Function

Previous reports have suggested that Tor al-Tareeq represented a base camp, or a series of superimposed base camps (Clark et al. 1987, 1988; Schuldenrein and Clark 1994). This interpretation seems to be based primarily on the large areal extent of the site (812 sq m), the potential for architectural remains, and the high density of bone and lithic debris. This interpretation should be re-evaluated in light of the 1992 data. The long temporal span of occupation (possibly representing repeated occurrences over several thousand years), the likelihood that natural processes (especially colluviation and erosion) have artificially inflated the size of the site, and the question of whether the portion of architecture exposed is associated with the main occupational sequence, make the "base camp" interpretation of Tor al-Tareeq less straightforward than it appeared to be in 1986.

Although Tor al-Tareeq does not appear to be a limited activity/extractive site, it remains to be determined whether it represents a semi-sedentary locality (e.g., like Ohalo II) or whether it is the result of numerous, short-term occupations over a span of several thousand years. Most of the evidence suggests that the site was not occupied for long, continuous spans of time (i.e., it was not a semi-sedentary logistically-organized settlement). This evidence includes the high density of artificial debris spanning several thousand years of occupation (based on the radiocarbon dates), as well as the different ages and placement of the hearths and the relatively informal nature of their construction. Long-term occupants would presumably invested greater time and effort in constructing site features (e.g., hearths, huts). The more architectural feature cannot be firmly associated with the early Epipaleolithic levels. Aside from this rock alignment, no evidence for long-term occupation such as living surfaces, houses, or burials were identified (cf. Bar-Yosef 1970; Muheisen 1985; Nadel and Hershkovitz 1991; Garrard, Baird, and Byrd 1994). Also, the heavily microlithic assemblage can be argued to be a response to the demands of mobility in which lightweight, portable, and easily manufactured, multifunctional tools would be desirable (see e.g., Short 1986; Kuhn 1994). The informal, expedient nature of many of the ground stone tools lends additional support to a higher degree of group mobility.

Some evidence that might support a longer-term occupation is the formation of the dark organic levels, probable midden-like deposits given the absence of any features. These areas are characterized by high densities of bone and lithic debris, but the rate at which this material accumulated is unknown and it is possible that they resulted from intensive short-term or seasonal occupations.

Settlement in the Wadi Hasa

How does the occupation at Tor al-Tareeq fit into the larger settlement models proposed elsewhere by Marks and Freidel (1977) and Henry (1987)? One of us (Clark 1992) has attempted to address this issue by comparing the coarse-grained Wadi Hasa survey data against the expectations of these models. For the period in question, neither the climatic model proposed by Marks and Freidel (1977) nor the elevation model of Henry (1987, 1994) was confirmed by the Wadi Hasa data (Clark 1992: 92–93). A particularly important factor for understanding the Epipaleolithic settlement in the Wadi Hasa is the large lake in the eastern end of the drainage. Clark (1992: 92) suggests that the presence of this lake and associated springs would have made settlement along its shoreline attractive, especially during more xeric climatic intervals. In addition to the lake-margin environment, fauna and pollen indicate the presence of steppe-adapted species along with some woodland and riparian forms. Resources available to foragers in the eastern Hasa would include aquatic fowl, amphibians, fish, and terrestrial species, all concentrated in the marshes and ponds found around the shores of the lake. Species identifications support this notion of a diverse natural environment as evidenced by the presence of *Testudo* sp. (tortoise), *Gazella* sp. (gazelle), *Bos* sp. (auroch), *Equus* sp. (horse, ass, zebra), *Ovis/Capra* sp. (probably ibex), and avifauna.

The presence of "site furniture" in the form of ground stone tools reinforces the notion that plant resources in the site vicinity might have played a significant role in repeated visits to the area. Fresh water from the spring also would have been a powerful attraction. In addition to its southward exposure, potentially important for winter occupations, the immediate site vicinity would have provided a vista for observing large areas of the eastern end of the lake, useful for tracking the movements of game animals.

Olczewski et al. (1994: 139) also take issue with the applicability of the current settlement models to these inland lake basin settings. They suggest that the ecological factors that constrain forager adaptations in the arid environments to the west and south are different from those of inland lake basins. Given the potential for higher resource returns in a lake environment, the high residential mobility characteristic of the other models might not apply for these regions. Instead, there may have been a kind of tethered mobility, with residential sites occupied for longer periods of time. Similar patterns of reduced residential mobility are found at Ohalo II and Ein Gev I along the Sea of Galilee. Using the lake basin as a central focus, with the steppe/
desert as a secondary resource area, these models combine aspects of both the circulating and radiating strategies proposed by Marks and Freidel (1977).

Preliminary indications point to a pattern of radiating settlement for the early Epipaleolithic, but absent are the long-term residential base camps implied by the Marks and Freidel (1977) model. In addition to the large site of Tor al-Tareeq, a smaller limited activity site with an early Epipaleolithic component has been investigated several kilometers to the north at Yutil al-Hasa (WHS 784) (Olszewski et al. 1994). The combined evidence suggests that a radiating strategy was characteristic of early Epipaleolithic settlement at least part of the time. Further research in the Hasa basin and the surrounding steppe-desert is necessary, however, as these patterns are suggestive of an adaptive system that is significantly different from that of grossly similar macro-environments in the Negev and Sinai. If these patterns hold up to future scrutiny, they would suggest that adaptive systems across the southern Levant comprised a mosaic of strategies strongly influenced by regional, microenvironmental conditions, rather than the more generalized adaptations suggested by current models. Consequently, the exploitation of these habitats (inland lake basins) might produce different spectra of artifact frequency distributions as local foragers responded to the constraints and opportunities available to them in these relatively unique environmental settings.

The faunal assemblage, while highly fragmented, contains a number of artiodactyl and herbivore teeth. A crucial component for testing these models is the duration of occupation and seasonality of the sites. One potential avenue for inferring the season(s) of occupation involves the incremental cementum analysis of teeth, a technique which has been successfully applied to a number of sites in the southern Levant (Lieberman 1993).

Conclusions

The excavations at Tor al-Tareeq provide another facet of our growing understanding of hunter-gatherer adaptations in west-central Jordan during the Epipaleolithic. Situated along the shores of a shrinking Pleistocene lake, early Epipaleolithic foragers could have potentially exploited a wider range of locally available resources than typically found in other xeric regions of the Levant (i.e., Sinai, the Negev) and, in the Hebron, and typological analyses indicate the presence of multiple occupations at the site corresponding to various phases of the early and middle Epipaleolithic.

On a regional level Tor al-Tareeq exhibits similarities with other assemblages from the Wadi el-Hasa and from eastern Jordan (Azaq basin) based on a limited comparison of typological and technological indices. Olszewski et al. (1994: 138–139) have recently suggested that these assemblages be placed in the Madamaghan, a technocomplex identified by Henry (1988, 1989; Henry and Garrard 1988) on the basis of work on the south edge of the Jordan Plateau. Although there are some similarities between the Tor al-Tareeq assemblage and these Madamaghan industries, we are reluctant to use the term because of the uncertain relationship of Madamaghan industries to the Mushabian (Henry 1989; cf. Olszewski et al. 1994). Henry (1989: 134) has suggested that the Madamaghan is a Jordanian variant of the Mushabian, found in the Negev and Sinai, and dated there between 14,000 and 12,500 b.p. The Madamaghan as defined by Olszewski et al. (1994), however, dates to a much earlier phase of the Epipaleolithic (ca. 20,000–18,000 b.p.) and appears to have little direct temporal continuity with the later Mushabian.

We suggest that Tor al-Tareeq belongs to the broad class of early Levantine Epipaleolithic industries based on its suite of radiocarbon dates ranging from 16,900–15,570 b.p. The geometric occupation is typologically similar to that found at Kharaneh IV (C and D) (Muheisen 1985, 1988), but contains low frequencies of geometrics like the Middle-Late Hamran assemblages of southern Jordan (Henry 1995). Many of the typological and technological characteristics link Tor al-Tareeq to industries found in eastern Jordan. The marine shell associated with these assemblages, however, is derived from sources to the west and south, suggesting interaction and social ties with foragers in other regions.

Although Tor al-Tareeq exhibits some similarity with lithic assemblages from other regions, it is important to try to understand the site within the settlement/subsistence patterns of the eastern Hasa basin. Throughout its existence, Tor al-Tareeq appears to be a residential camp that was occupied repeatedly during the early to middle part of the Epipaleolithic. Other sites in the Hasa drainage reflect different aspects of the regional adaptive system are only now being systematically investigated (see Byrd and Colledge 1991; Cooman 1993; Olszewski et al. 1994).

Epipaleolithic settlement/subsistence models developed elsewhere in the xeric regions of the Levant might not be appropriate for the Hasa. Whether we accept or reject them depends on the recovery of additional data and on comparisons between the Hasa, which is essentially a series of closed inland basins drained by a major watercourse, and the topographic settings in southern Jordan, the Sinai and the Negev highlands (Henry 1989, 1994; Marks and Freidel 1977; cf. Clarke 1992). As these data accumulate we hope to be better able to understand how prehistoric foragers survived and adapted to a succession of changing environments. Essential to this understanding is a regional per-
spective, for forager adaptations are always regional phenomena, and it is necessary to better control the range of situational variables (e.g., raw material package size and availability, local group size, resource distributions, logistical and residential mobility) that affected forager adaptations wherever they evolved and persisted.

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