Late Pleistocene dispersal corridors across the Iranian Plateau: A case study from Mirak, a Middle Paleolithic site on the northern edge of the Iranian Central desert (Dasht-e Kavir)

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Abstract

This paper has two objectives. Mirak is a major Middle Paleolithic open-air site on the northern edge of the Iranian Central Desert. Flake-based blank production, an abundance of prepared and chapeau de gendarme platforms, a significantly high value for the Levallois index, the presence of tools typical of Mousterian technology, and the near-total absence of Upper Paleolithic diagnostics all indicate that Mirak dates to the Middle Paleolithic (ca. 250–47 ka BP in the Levant). Although clearly a palimpsest, a case is made for high compositional integrity at Mirak, and a relative lack of disturbance. Second, this paper proposes three major migratory corridors used by foragers during the Upper Pleistocene and early Holocene. Identification of those corridors is based on survey data acquired since the mid-1990s, the distribution of other known Paleolithic sites on the Iranian plateau, and sparse data from geography, geology, and geomorphology. Route A follows the north coast of the Persian Gulf and the Sea of Oman in southern Iran, Route B skirts the southern shore of the Caspian Sea in northern Iran, and Route C runs between the southern foothills of the Alborz Mountains and northern edge of the Iranian Central Desert.

1. Introduction

Middle Paleolithic sites are among the most evocative in world prehistory. The most obvious reason for such an assertion is their correlation with archaic human populations, amongst which Neanderthals are the best known. Not all Middle Paleolithic sites are associated with Neanderthals. Some Levantine Mousterian sites (e.g., Qafzeh, Skhul) contain human fossils assigned to anatomically modern humans (Bar-Yosef, 1992, 1998; Shea, 2003a, 2003b), and the authorship of some European Mousterian industries has also been called into question (e.g., Vindija (Karavanic, 1995), El Castillo (Bernaldo and Mailló, 2009), Riparo Mezzena (Longo et al., 2012)). The near-absence of any hominin remains from Middle Paleolithic sites in Iran (Bisitun (Trinkaus and Biglari, 2006)) is an exception that has made correlation between the Mousterian and any specific group of hominins more complicated. Because of regional political instability, logistical factors (Paleolithic sites are often in remote areas), and a strong emphasis on Iran’s spectacular protohistory, limited attention has been given to the Middle Paleolithic in general and the Iranian Plateau in specific. Although the most important Middle Paleolithic site in the region is Shanidar Cave, located across the border in Iraqi Kurdistan (Trinkaus, 1983; Soblecki, 1963), most Middle Paleolithic sites are in caves and rock shelters clustered in the eastern slopes of the Zagros Mountains and excavated from the late 1920s through the late 1960s by western ‘pioneers’ like Dorothy Garrod (Hazar Merd (Garrod, 1930)), Carleton Coon (Bisitun, Tamtama, Khunik (Coon, 1951, 1957; Smith, 1986)), Frank Hole and Kent Flannery (Kunji, Gar Arjeneh, Ghamari (Hole and Flannery, 1967; Speth, 1971; Baumber and Speth, 1993)), Bruce Howe (Warwasi, Gar Kobeh (Braidwood and Howe, 1960; Lindly, 2005)), Phillip Smith (Ghar-i Khar (Young and Smith, 1966; Smith, 1986)), Peder Mortensen (Hulailan sites (Mortensen, 1974, 1993)), and Charles McBurney (Ke-Aram I (McBurney, 1970; Bewley, 1984)). Because of the overthrow of the Shah (1979) and the Iran–Iraq War (1980–1988), most western involvement in Paleo- lithic archaeology ceased until the mid-1990s, when a new generation of Iranian scholars initiated survey projects in areas outside the Zagros. Many new Middle Paleolithic sites were discovered, most of them surface scatters of variable contextual integrity. They include Sepid-Dasht (Vahdati Nasab et al., 2009), Zavieh (Heydari-Guran et al., 2012), Moghanak and Otchunak (Chevrier et al., 2006; Berillon et al., 2007), Jarno-Riz (Dashtizadeh, 2009), the Ghaleh...
Gushe site complex (Conard et al., 2009), and the subject of this report, Mirak (Vahdati Nasab, 2009; Rezvani and Vahdati Nasab, 2010). Sometimes in collaboration with westerners (e.g., Otte, Jaubert, Conard), the only substantial report on the results of these surveys, most of which took place in the past 15 years, was published in 2009 (Otte et al., 2009).

The intention here is (1) to describe a newly discovered Middle Paleolithic surface site, Mirak, located on the northern edge of the Dasht-e Kavir; (2) to make a case for high contextual and compositional integrity for the site, despite the fact that it is an obvious palimpsest; (3) to put Mirak in a larger regional context in which surface sites are quite common; (4) to wring as much behavioral information out of the systematic surface collections as possible; and (5) to establish Mirak’s relationship to one of three dispersal corridors used throughout the Pleistocene (Fig. 1).

2. Geography and historical background

Bounded by the Alborz Mountains in the north and the Lut Desert (Dasht-e Lut) in the southeast, the Iranian Central Desert (Dasht-e Kavir) is a large (77,600 km²) salt desert situated in the middle of the Iranian Plateau at an average elevation of 900–1000 m (Fig. 2). One of the driest places on earth, the plateau is almost rainless today, with a very arid climate. Because of saline soils and sediments, only desert adapted halophytic species can grow there (e.g., Artemisia vulgaris). Although the northern margins of the Dasht-e Kavir might have supported ephemeral lakes and marshes at intervals during the Pleistocene, and have a few permanent water resources today, the Dasht-e Lut is a sand desert that cannot support any life at all. Even with modern technology, human settlement remains mostly confined to the edges of the plateau and to the oases. Although the hard rock geology of Iran has been fairly well investigated (e.g., Stöcklin, 1974, 1981), these studies lack the resolution required for geoarchaeological research. Despite its importance for human evolution, the Quaternary period remains poorly known.

Approximately 5 km south of the modern city of Semnan (220 km east of Tehran) on the northern edge of the Iranian Central Desert lie a series of small mounds, known to local residents as Mirak (Fig. 3). Mirak originally consisted of seven mounds 4–11 m in height, separated from each other by a few hundred meters, and extending in a line for about 2.5 km. Several seasonal and permanent water resources surround Mirak with the largest one, the Gey-No River, located less than a kilometer to the east (Fig. 3). A perennial stream containing water even during the hottest months of the year, the Gey-No originates in the foothills of the Alborz Mountains some 16 km north of the site, and disappears into the desert some 3 km to the southeast.

In 1990, an archaeological survey under the aegis of the Iranian Cultural Heritage Organization (ICHO) led to the discovery of two vast lithic scatters in this area, separated from each other by about 3 km (Rezvani, 1990). The northern one, known as Delazian, has undergone repeated systematic surveys and its lithic assemblages have been extensively studied. Although a palimpsest produced mainly by deflation, it consists of relatively homogeneous Upper Paleolithic industries, with little material indicative of earlier or later occupation (Vahdati Nasab, 2009; Vahdati Nasab et al., 2010; Vahdati Nasab et al., in press). The southern one, Mirak, was first reported by Rezvani (1990), and in 2009 was selected for intensive pedestrian survey and systematic sampling (Vahdati Nasab, 2009). The preliminary analyses of cores, debris, and retouched pieces all indicate a Middle Paleolithic age for this site (Rezvani and Vahdati Nasab, 2010).

3. Site formation processes

To determine whether buried deposits might be present, eight small (0.5 × 0.5 m) trenches were excavated to a depth of 70 cm
below the modern surface in the flat areas adjacent to the mounds. No subsurface deposits were uncovered, initially indicating that the artifacts are restricted to surface contexts. In July, 2012, Mirak was revisited by one of the authors (HVN) and Abbas Einali, a geomorphologist affiliated with the Iranian Geological Survey. Although a preliminary geomorphological assessment was made in 2009, it focused on the artifact scatters, rather than the mounds themselves. The second visit helped clarify the formation processes at the site and led to a better understanding of the relationship between the artifact scatters and the mounds.

The only vegetation in the area occurred on top of the mounds. The artifact concentrations themselves were devoid of vegetation, as were the surrounding flatlands. The vegetation appears to have absorbed whatever water was available during mesic intervals, and concentrated the dominantly alkaline minerals dissolved in it around their roots, thus rendering the mound tops relatively resistant to wind erosion compared to the adjacent flat areas where the artifacts are concentrated. The long-term dominant geomorphological process in the region, aeolian deposition, concentrated sands and silts around these clumps of vegetation, forming what became the mound cores. Accelerated during wet periods, the process took place repeatedly over the Pleistocene and those mounds not destroyed by wind erosion grew larger incrementally, preserving artifacts and fauna in the mound cores. As was the case at Delazian, a deflated palimpsest comprising the remains of numerous campsites is indicated, with vertical concentration of artifacts but with only relatively minor horizontal displacement. It is these remnant concentrations of what once were living surfaces that provided the source of the dense artifact accumulations that are the subject of this report.

A scenario that could account for Mirak would be one in which a series of short-term, ephemeral campsites are clustered in the vicinity of relatively reliable water in an extremely arid region where humans were essentially ‘tethered’ to water sources, at least during dry intervals (Olszewski and Coinman, 1998; Coinman, 2007, 2009; Hauck, 2011). Paleotemperatures played a role in changing atmospheric moisture and, as a rule, cold intervals were usually dry, warm intervals relatively wet (e.g., Cordova, 2007: 124). Although doubtless beset by numerous so-far undetected fluctuations in temperature and moisture, the Dasht-e Kavir was almost certainly uninhabited during dry/cold intervals (MIS 6, 4) and only its northern margins could have been exploited, albeit sporadically, by small bands of foragers during wet/warm phases (MIS 5, 3).

4. Materials and methods

Mirak covers a surface area of approximately 1.6 km². Considering the size of the site and the enormous number of artifacts, eight loci (A–H) consisting of 4 x 10 m transects were randomly selected, and all lithics within these loci were collected (Table 1). To make sure the dispersion of the artifacts is roughly homogenous throughout the site, all eight loci were compared to each other.
using conventional techno-typological systems (a Bordesian system analogous to that used in Europe and the Levant). The results indicated that no statistically significant differences are observable among the loci; therefore, the entire collection (7744 pieces) is aggregated for the rest of the analysis. The pieces themselves are in pristine condition, with little evidence of rolling, trampling, or other forms of mechanical abrasion.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Mirak – lithic counts from loci A to H.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locus</td>
<td>Number</td>
</tr>
<tr>
<td>A</td>
<td>968</td>
</tr>
<tr>
<td>B</td>
<td>989</td>
</tr>
<tr>
<td>C</td>
<td>1021</td>
</tr>
<tr>
<td>D</td>
<td>856</td>
</tr>
<tr>
<td>E</td>
<td>1213</td>
</tr>
<tr>
<td>F</td>
<td>974</td>
</tr>
<tr>
<td>G</td>
<td>711</td>
</tr>
<tr>
<td>H</td>
<td>1012</td>
</tr>
<tr>
<td>Total</td>
<td>7744</td>
</tr>
</tbody>
</table>

All collected lithics were classified into (1) debris, (2) tools, (3) debirs, (4) cores and (5) core fragments (Table 2). Débitage refers to morphological flakes and blades (i.e., those that exhibit striking platforms, erailleure scars, bulbs of percussion, etc. — the normal criteria by which flakes and blades are defined). Débitage refers to the by-products of lithic reduction — small, sharp angular pieces of tool-stone that lack the above characteristics but that are clearly due to flint knapping (sometimes called ‘shatter’). The appearance of shatter indicates a certain amount of lithic reduction on site and, since shatter tends to be small, relatively little transport off-site. A tool is defined as a flake or blade that exhibits at least some clear-cut marginal retouch. Although there are lots of tools, relatively few of them are formal tools like side-scrapers. Most of them are continuously retouched pieces (CRPs) — otherwise unmodified flakes with some continuous marginal retouch.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Mirak – major lithic categories.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Number</td>
</tr>
<tr>
<td>Débitage</td>
<td>2416</td>
</tr>
<tr>
<td>Tools</td>
<td>3816</td>
</tr>
<tr>
<td>Debirs</td>
<td>1184</td>
</tr>
<tr>
<td>Core &amp; core fragments</td>
<td>328</td>
</tr>
<tr>
<td>Total</td>
<td>7744</td>
</tr>
</tbody>
</table>

Following the preliminary categorization presented in Table 2, artifacts were classified by (1) blank type, (2) platform configuration, (3) amount of cortex, (4) the extent to which they were utilized (with low-power magnification, ×50), (5) retouch intensity, (6) raw material type, and (7) tool typology. The intent was to try to establish unequivocally that, despite its open-air context, Mirak is a credible Middle Paleolithic site (or, more accurately, series of sites). It was also hoped to gain some insight into aspects of reduction, raw material transfers, and the extent to which retouched pieces figured in the overall collection (Miller and Barton, 2006).

5. Results

5.1. Technology

Table 3 summarizes major aspects of lithic technology for the Loci A–H collections. As presented in the table, flake production is clearly the major knapping technology at Mirak (88%), followed by the production of blades and (scarce) bladelets (12%). The dominance of flakes is interesting because flake-dominated assemblages tend to be more strongly correlated with relatively high mobility because flakes are more amenable to modification ‘in the field’ than are blades (Kuhn, 1995). It would also suggest that organic technologies associated with standardized hafts were not emphasized in flake-dominated assemblages as blades are better suited to insertion in weapon and tool armatures of standardized shape.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Mirak – blank types.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank type</td>
<td>Number</td>
</tr>
<tr>
<td>Flake</td>
<td>5504</td>
</tr>
<tr>
<td>Blade</td>
<td>304</td>
</tr>
<tr>
<td>Bladelet</td>
<td>424</td>
</tr>
<tr>
<td>Total</td>
<td>6232</td>
</tr>
</tbody>
</table>

Platform variability is widely recognized as an important monitor of modal blank production technologies (Odell, 2004: 126) and has been used by some workers as a proxy for flake dimensions (e.g., Dibble, 1995; Dibble and Pelcin, 1995). The sample of complete blanks was scored according to seven widely recognized platform types cross-classified by blank type (Table 4). Although there were examples of all platform types, plain and prepared platforms were dominant regardless of blank type.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Mirak – platform types.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>Number</td>
</tr>
<tr>
<td>Linear</td>
<td>624</td>
</tr>
<tr>
<td>Plain</td>
<td>1572</td>
</tr>
<tr>
<td>Cortical</td>
<td>108</td>
</tr>
<tr>
<td>Partly removed</td>
<td>150</td>
</tr>
<tr>
<td>Prepared</td>
<td>1230</td>
</tr>
<tr>
<td>Chapeau de gendarmerie</td>
<td>156</td>
</tr>
<tr>
<td>Stepped</td>
<td>138</td>
</tr>
<tr>
<td>Total</td>
<td>3978</td>
</tr>
</tbody>
</table>

5.1.1. Cortex

The amount of cortex (Fig. 4) and edge utilization (Fig. 5) on whole blanks were also measured. The average percentage of cortex preserved in a collection of flakes is an indication of the relative importance of stages in a reduction sequence. Collections with much cortex typically represent the earliest stages in a reduction sequence. Those with little cortex suggest later stages. Edge utilization sheds light on how intensively a collection of blanks was actually used, whether they were retouched or not. Current thinking suggests that the production of sharp-edged flakes was the primary objective of most flint knapping during the Paleolithic, and that it provides a better monitor of activity suites than do the frequently overemphasized retouched tools (e.g., Barton, 1991; Dibble, 1995). In the case of cortex, the blanks were classified into primary (>50% cortex), secondary (<50% cortex), and tertiary (no cortex) groups. Tertiary blanks were by far the dominant category (89%), suggesting that primary and secondary reduction took place off-site. Utilized and unutilized edges were about equally common (Fig. 5). To the extent that the assemblage is unaltered by post-depositional processes, this suggests far more intensive utilization of unretouched blanks than is commonly recognized. Tertiary blanks also suggest substantial mobility.

Fig. 4. Mirak – relative frequency of utilization (with low-power magnification ×50).
because mobile foragers would be unlikely to carry cores or partially decortified flakes around with them, especially if they were uncertain about the location of suitable raw material in the landscape.

5.1.2. Retouched pieces

In total 3816 retouched pieces were collected from Locals A to H, an unusually high incidence of retouch (61%). These pieces were classified into four groups based on the intensity of retouch observed on the edges of the blanks (Fig. 6). Most of the sample (78%) consists of semi-abrupt ‘light’ and ‘medium’ retouch extending along part of one or more edge(s) and defined by a series of continuous detachments (what are sometimes called ‘continuously-retouched pieces,’ or CRPs). Abrupt (or ‘backing’) retouch and flat invasive retouch are rare (12%, 10% respectively). As noted above, while flakes with marginal retouch are common, formal tool types are quite rare, and are dominated by different side-scraper types (single, double, convergent, etc.). Dibble has shown conclusively that side-scraper shape is mostly determined by blank size and shape (e.g., whether flakes are broad or narrow) and by the relative intensity of retouch, and not ‘mental templates’ that conform to arbitrary cultural norms (Dibble, 1984a, 1984b, 1987, 1995).

5.1.3. Raw material variability

In regard to raw material variability, it should be kept in mind that all rocks found in the vicinity of Mirak have been introduced by human and/or geological agencies. Given the terrain surrounding the site, which lies in a shallow basin filled with fine-grained silts and sands, and the absence of evidence for high-energy sediment transport (e.g., pebbles, cobbles, etc.), the former is more likely than the latter. The seven kinds of rock represented in the sample are chalcedony (20% by count), chert (40%), tuff (a compacted mix of volcanic glass and ash, 26%), jasper (7%), sandstone (4%), basalt (2%), and andesite (1%). The cryptocrystalline siliceous rocks (chert, chalcedony, jasper) and the igneous basalt, andesite and tuff are well-suited to knapping; the sandstone is not. The collection is dominated by chert, chalcedony and tuff, which together account for 86% of the sample (Fig. 7).

5.2. Typology

5.2.1. Retouch intensity

Although there are exceptions (e.g., the blade-dominated Levantine Tabun D-Type Mousterian (Bar-Yosef, 1998: 44–47)), Mousterian assemblages are defined historically as flake-based technologies with relatively high frequencies of retouched pieces, mostly different kinds of scrapers (Bordes, 1961, 1969; Binford, 1973; Mellars, 1996; Moncel et al., 2009; Picin et al., 2011). While Levallois technology is by no means universal (i.e., there are many Mousterian assemblages that lack it altogether), its deployment to produce flakes and points of standardized shape is also one of the major indicators of a Middle Paleolithic assemblage, especially in the Levant (Monnier, 2006). There is much evidence for Levallois technology at Mirak (IL = 46.0), but Levallois production and retouch in Mousterian assemblages have been shown to vary independently of one another both within and across sites (Marks, 1983). The various side scraper types, CRPs, notches and denticulates show no strong correlation with Levallois blanks; some of the scrapers are made on recurrent Levallois blanks (Bœda, 1988a, 1988b) (Figs. 8 and 9). As noted, most of the tools were made on flakes. Although pieces with some retouch account for almost half the collection (49.3%), retouch is not very intensive, sometimes taken as an indicator of short-term campsites rather than base camps occupied for longer periods of time (these typically have high indices of retouch intensity) (Marks and Freidel, 1977). Side scrapers consist of 36% of the assemblage; single (11%) and double-convergent (12%) forms are most common. Notches and denticulates are also present in significant numbers (11%) (Fig. 7).

To summarize the compositional make-up of the Mirak collection, it is (1) heavily flake-dominated, with a flake:blade ratio of 9:1; (2) Levallois technology is common (IL = 46.0), and the Levallois index is rivaled only by Bisitun (IL = 55.8), far exceeding those of Kunji and Warwasi (Table 5); (3) faceted and dihedral platform preparation are dominant, although a wide range of platform types occurs; (4) tertiary flakes lacking cortex comprise 89% of the assemblage, suggesting that primary and secondary decortication took place off-site; (5) about half the complete blanks were utilized (i.e., they show evidence of edge wear and damage), (6) raw material is dominated by chert and chalcedony, and there is no evidence for long-distance transport, and (7) there is a very high incidence of retouch, but most of it consists of short series of detachments along blank margins, rather than ‘shaped’ or ‘formal’ tools; consequently, (8) retouch intensity is low. How might these characteristics of the Mirak collection be interpreted in behavioral terms?

<table>
<thead>
<tr>
<th>Index</th>
<th>Kunji</th>
<th>Bisitun</th>
<th>Warwasi A</th>
<th>Warwasi B</th>
<th>Warwasi C</th>
<th>Warwasi D</th>
<th>Mirak</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL</td>
<td>10.1</td>
<td>55.8</td>
<td>13.1</td>
<td>7.4</td>
<td>7.5</td>
<td>11.2</td>
<td>46.0</td>
</tr>
<tr>
<td>IR</td>
<td>62.1</td>
<td>68.3</td>
<td>56.0</td>
<td>62.2</td>
<td>57.4</td>
<td>53.8</td>
<td>62.7</td>
</tr>
</tbody>
</table>

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6. Behavioral inferences – a shift in perspective

The ability to answer this question turns on interpretation of the technological and typological variables recognized in the conventional systematics used to describe Mirak, and what the overall approach suggests. To do this requires a shift in perspective from one emphasizing fine-grained descriptions of morphological variation in artifact form and frequency, and the tendency to equate patterns elicited from them to human groups, to one emphasizing situational variables with which all foragers had to contend (e.g., raw material procurement, blank production, tool production, maintenance, refitting, discard), particularly as influenced by mobility (more specifically, the duration of site occupation (e.g., Marks, 1988; Marks and Freidel, 1977; Binford, 1980; Kuhn, 1992, 1995)). It should be kept in mind that, with very rare exceptions (e.g., Shott et al., 2011), Paleolithic archaeological sites are time-averaged palimpsests that have nothing to do with day-to-day, year-to-year, or even generational behavior (e.g., Barton, 1990, 1991, 1997). They compress into an undifferentiated lump what surely was significant environmental variation and equally significant variation in human biocultural responses to environmental change (e.g., Barton and Riel-Salvatore, 2012). A particular type frequency in an archaeological collection thus bears no relationship to the frequency of that type in a collection of artifacts actually used by anyone at any time. What is probably being detected instead is a complex array of assemblage structures representing various combinations of two basic behavioral strategies determined by forager mobility in particular places and moments in time (Kuhn, 1991, 1992, 1995). One is to supply individuals with a flexible, portable toolkit, useful under conditions of uncertainty and in a variety of contexts. The other is to provision places in the landscape where technological activities are likely to be performed. Although foragers practice both provisioning strategies over the long term, which strategy is selected in a particular situation will depend largely upon perceptions of resource distributions in the local and regional context, and upon patterns of mobility and the duration of site occupation. If foragers are highly mobile, and if the location of target resources cannot be predicted (e.g., if prey were solitary or widely scattered; if meat were scavenged), they must depend on the limited array of things they can carry with them. This in turn puts constraints on the sizes and kinds of artifacts that are likely to end up in what, in functional terms, would have been small, ephemeral, short-term campsites. If foragers were more stable residually — if they moved less over the course of an annual round and if occupations tended to be of longer duration (e.g., if intercept hunting of gregarious species were emphasized) — there would be more predictable reuse of specific locations in the landscape, and tool makers could stockpile artifacts and raw materials at these places in anticipation of future needs. Mobility and duration of site occupation, linked ultimately to the distribution of food and water in the environment, should allow for prediction of the composition of artifact assemblages left behind at the two kinds of sites.

An acknowledged palimpsest located in a marginally habitable zone on the edge of a desert, how well does Mirak correspond — on average — to either of these two modal site types? The flake-dominated collections, the near-absence of primary and secondary decortication flakes and the relatively few cores would suggest that Mousterian occupations at Mirak were short-term ephemeral campsites where flake blanks could either be used ‘as is’ or reworked into other tools as circumstances required. Because of more stringent design specifications, blades are not so well suited for subsequent modification. The high incidence of retouch would seem to argue in favor of a higher proportion of residential bases until the casual, ad hoc nature of the retouch is taken into account. Most of the tools are continuously retouched pieces (CRPs) – otherwise unmodified flakes with light marginal retouch along part of one or both edges. They are not formal tools.

7. Comparisons with other sites

In default of anything that could be used to directly date Mirak (e.g., fauna, stratigraphy, organic sediments), lithic techno-typology was used to provide additional support for a Middle Paleolithic assignment for the site. Mirak lithics are mostly made on flakes with a low incidence of lamellar production (Table 3). Moreover, 35% of the platform types comprise various kinds of prepared platforms, including the distinctive dihedral and chapeau de gendarme variants. Both are characteristic of the Mousterian elsewhere (e.g., Bar-Yosef, 1996, 2000) (Figs. 9 and 10). Mirak was also...
compared with unequivocal Mousterian sites in Luristan (Kunji, Bisitun and Warwasi A–D) using the Levallois (IL) and the restricted scraper (IRe) indices (Table 5).

In Iran only a few Middle Paleolithic sites have been excavated, and fewer still have been studied, dated and published. Kunji, Bisitun and Warwasi are among them, all located in the central Zagros at elevations between 1300 and 1400 m. Kunji cave was first tested by Field (1939), and later dated to around 50 ka BP by Hole and Flannery (1967); its lithic assemblages were studied by Baumler and Speth (1993). A rock shelter, Bisitun was first excavated by Coon in 1949 (Coon, 1957); its collections have been analyzed and published by Dibble (1984a, 1984b). Warwasi rock

Fig. 8. Mirak — retouched pieces: 1 Mousterian point; 2–5, 7 convergent side scrapers; 6 convex scraper with faceted striking platform; 8 continuously retouched piece (2 edges); 9 circular scraper; 10 denticulate; 11 side scraper on a retouched blade.
shelter was excavated by Bruce Howe (Braidwood and Howe, 1960; Braidwood et al., 1961), and the lithics from its Mousterian levels (A–D) were analyzed by Dibble and Holdoway (1993). All three sites were re-examined by Lindly (2005) as part of his doctoral dissertation research.

So far as the scraper index (IRe) is concerned, the Mirak (62.7) collection closely resembles Kunji (62.1) and Warwasi B (62.2), less so the other sites. Warwasi D (53.8) diverges most strongly, but all the Zagros Mousterian sites display high scraper indices. Mirak’s Levallois index (46.0) is much higher than those of the other sites with the exception of Bisitun (55.8), but what this observation means in behavioral terms is contested. Levallois technology and the overall nature of pattern in the Mousterian are both controversial in Iran (Vahdati Nasab, 2010a). The presence or absence and frequency of Levallois technology and the overall affinities of the Iranian Mousterian with its Levantine and Caucasian counterparts have a long history, going back to Garrod’s 1928 excavations at Hazar Merd in Iraqi Kurdistan (Garrod, 1930). Garrod identified what she thought were similarities between the Mousterian in the Levant, notably at Tabun, and in the Zagros. However, McBurney (1964) believed he could identify marked techno-typological affinities between the Zagros and Middle Paleolithic sites in the

Fig. 9. Mirak – Levallois pieces: 1, 2, 7, 8 Levallois points; 3, 4 Levallois flakes; 5, 6 pseudo Levallois points; 9 Levallois disk core.
Caucasus, a finding recently confirmed by Lindly (2005: 85–94). In the first regional synthesis of the Zagros Mousterian, based on work at Shanidar D, Bisitun, Hazar Merd C and Kunji, Skinner (1965) claimed that there was no evidence of Levallois technology, faceted platforms, discoidal cores, and bifaces in the Zagros Mousterian, but high frequencies of side-scrapers and retouched ('Mousterian') points. In the early 1980s, Dibble reanalyzed the Bisitun collections and, contra Skinner, uncovered substantial evidence for Levallois technology (Dibble, 1984a,b). Then, in the early 1990s, Baumler and Speth (1993) restudied the latter’s 1969 collections from Kunji (Speth, 1971) and concluded that Skinner was right – they conformed in most respects to Skinner’s definition. Recent work reports a high frequency of Levallois technology in the Zagros (Roustaei, 2010). Variation in raw material ‘package size’, coupled with the constraints imposed on mobile foragers in areas where suitable raw material is scarce, are suggested to be driving these patterns, but simple sampling error owed to the few surveys in the highlands is likely to be the main reason why it has been so difficult to get a clear picture of the Mousterian in this relatively well-investigated area. Whatever the case, with the addition of credible open-air Mousterian sites like Mirak in regions outside the Zagros, it is becoming clear that there is much more variability in the Iranian Middle Paleolithic than is commonly appreciated (see papers in Conard et al., 2009). This observation also applies to other regions, notably eastern Europe and the Soviet successor states (Clark, 2009).

Although Mirak is believed to be a relatively ‘pristine’ Mousterian palimpsest (series of campsites superimposed on top of one another), it is important to keep in mind that the conventional systematics used to describe the artifact collections here have been subjected to much criticism in recent years in respect of what pattern might mean (e.g., Dibble, 1995; Clark, 2002, 2009). Many workers also note a ‘disconnect’ between the normative reduction strategies and idealized tool forms that constitute the basic analytical units of the conventional systematics and the behaviors that supposedly produced them (Riel-Salvatore and Barton, 2004; Shea, 2011).

8. Discussion

8.1. Residential and logistical mobility

Whereas Mousterian lithics in the Zagros were probably carried into the mountains in the form of usable blanks and partly-reduced cores during seasonal (summer) forays by hominins living at lower elevations during the rest of the year (Lindly, 2005), Mirak — in a very different environment — appears to represent a case of local access to tool-stone. Fine-grained, homogeneous, volcanic tuff...
occurs in marker beds and drainages 16 km north of Mirak, chert and chalcedony in the form of cobbles in the Gey-No River channel, less than 1 km to the east. Raw material in close proximity, and light and medium retouch on most (78%) of the tools all tend to indicate local procurement. The only factor that doesn’t square with this scenario is the amount of cortex. It is usually assumed that, in sites with easy access to abundant raw material sources, primary and secondary decortication flakes should show up in relatively high frequencies. This is not the case for Mirak (Fig. 4). Cores and debris are also underrepresented (4%, 15% respectively). The high incidence of tertiary blanks associated with low frequencies of cores and debris suggest that the preliminary stages of lithic reduction (i.e., decortication) might have taken place off-site (or at least outside Units A–H), perhaps at the loci of procurement.

8.2. Forager mobility and the composition of lithic assemblages

Over the past 30 years, Marks and Freidel (1977), Binford (1982, 1983) and Kuhn (1995), among many others, have proposed models to describe and explain artifact diversity and function in hunter-gatherer sites. In one way or another, they all relate forager mobility to the kinds and quantities of artifacts found in campsites of different kinds and with different durations of occupation. Although neither the first nor, perhaps, the best of these models, the one proposed by Lewis Binford has received the widest attention, and has been applied in many Pleistocene archaeological contexts all over the world. Binford characterized forager mobility strategies in terms of an idealized continuum between residential mobility, where small numbers of foragers move as a group from one resource patch to another, producing sites that are essentially spatial and compositional replicates of one another, and logistical mobility, where small numbers of foragers move as a group from a central base on relatively short trips to procure particular kinds of resources (e.g., firewood, water, edible plants, game). Logistical mobility would thus produce at least two modal kinds of sites (i.e., larger, long-term residential bases with features, diverse artifact assemblages, and small, short-term limited activity stations with few or no features, restricted artifact assemblages), and probably more. The two mobility patterns were proposed as opposite ends of a continuum, and no forager group was exclusively residentially or logistically mobile, but rather emphasized one or the other strategy depending upon a complex combination of climate, temperature, precipitation, latitude (residential mobility tended to be higher at higher latitudes), seasonal variation in resource distributions (a function of latitude), size and composition of the local group, duration of occupation, and a number of other factors. Any given forager group would therefore exhibit a combination of both strategies over the course of an annual round. Longer term (decadal, generational, etc.) shifts in the balance of residential and logistical mobility were also recognized (Andřešky, 2005: 214) and palimpsests like Mirak would be expected to reflect a time-averaged modal ‘signature’ if, indeed, the sites were functional equivalents of one another.

8.3. Site function, artifact density and incidence of Retouch

Based on the Binford model, Chatters (1987) proposed the use of an evenness index to predict site function based on artifact diversity. He classified sites as winter base camps, winter hunting sites (both consistent with Binford’s logistic camps), and spring base camps (consistent with Binford’s residential camps). Chatters’ evenness index ranges between 0 (least diversity) and 1 (most diversity). Low values are taken to indicate transient campsites with a limited range of activities (hence a small number and a limited range of artifacts), typically occupied for very short periods of time; higher values indicate residential base camps where occupations were of longer duration and where a wider range of activities took place (hence more diverse artifact assemblages). The evenness index \( E \) for Mirak was calculated using the formula proposed by Andřešky (2005: 215):

\[
E = -\frac{\sum \left( \frac{n_i}{N} \right) \left( \log \frac{n_i}{N} \right)}{\log s}
\]

where \( n_i \) stands for the number of artifacts of a given type, \( N \) equals the total number of artifacts for all types, and \( s \) is the number of artifact types. For Mirak, \( E = 0.83 \), which falls toward the ‘base camp’ end of the range. Keeping in mind that the ‘site’ is a palimpsest (composite of many small sites), the collection is both abundant and diverse, suggesting that a wide range of activities took place there. This configuration would be consistent with long term use of single locale, perhaps a spring or a lake, or both. Work in a similarly xeric environment, Jordan’s Wadi al’Hasa, shows that permanent water sources acted as powerful attractors to both humans and animals (e.g., Coinman and Olszewski, 2003, 2007; Cordova, 2007), and that large quantities of artifacts accumulated over time in the vicinity of lakes, marshes, and springs. This was also the case during the long Mousterian sequence at Hummal, one of the artesian springs at El Kowm in the Syrian Desert (Hauck, 2011).

Although no fauna were recovered, the high overall lithic density and the diverse and numerous side scrapers could indicate that one of the major activities at Mirak was hunting and processing of meat and hides and that, on average, high density, high diversity artifact accumulations are more likely to represent the remains of residential bases than short-term ephemeral campsites (Kuhn, 1995; Miller and Barton, 2008; Hauck, 2011). This view is consistent with the apparent concentration of relatively permanent water sources in the immediate vicinity of the site (fossil lakes, springs, streams, the Gey-No River). Almost no paleoclimatic research has been undertaken in the Iranian Central Desert, however, and, except for a brief reconnaissance in 2009, none along its northern margin, so that reconstruction of ancient landscapes must await the full spectrum of geoscientific research (i.e., geomorphology, geoarchaeology, palynology, sedimentology, paleohydrography, paleoecology, etc.) upon which such reconstructions depend. A deflated depression immediately to the south of Mirak exposes sandy sediments that contrast with what might be lacustrine silts at the site itself. It should be noted that over the past century the desert appears to have expanded along its northern edge, as indicated by the remains of the historical city of Semnan, located about a kilometer south of its present location. While extremely rapid in geological time, it suggests that the fluctuating desert margin set fairly stringent limits on whether or not humans could live there at all, and this is particularly true of ‘technologically challenged’ foragers. Although there is, as yet, no basis for identifying these fluctuations in the archaeological record, it is possible to say something about when they occurred using dated evidence from the Levant and Arabia, and, based on site distribution maps, identify the most likely corridors of migration or dispersal (Fig. 10).

9. Migratory corridors on the Iranian Plateau

More than six decades of survey and excavation leave no doubt that the Iranian Plateau has been occupied, albeit sporadically in time and differentially in space, since the Lower Paleolithic (Vahdati Nasab, 2011). Because of the history of investigation, most known Paleolithic sites are concentrated in the Zagros Mountains, but that is changing rapidly due to recent surveys (e.g., Otte et al.,

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2009). Other geographical zones like the east coast of the Persian Gulf, the southern shore of the Caspian Sea, and the northern edge of the Central Desert are now attracting researchers for various reasons, among them the identification of the migratory pathways used for hominin range extensions (Fig. 10). The physical geography of Iran essentially confines movement to these corridors. While some natural barriers (e.g., mountains, seas, deserts) might present obstacles to human movement, archaeological evidence points to human movement through the intermountain valleys of the Zagros and Alborz since at least the Middle Paleolithic, and probably much earlier. Long term, long distance movements were not goal directed, of course, but were incremental and probably owed to range extensions, perhaps driven by pursuit of the gregarious ungulates upon which most Pleistocene foragers relied. Climate change almost certainly affected the volume of ‘traffic’ along these routes, but there were probably no substantial intervals in the Upper Paleostocene when they were not in use, essentially because there are no viable alternatives to skirt the Dasht-e Kavir and the Dasht-e Lut. It is therefore expected that there would be significant concentrations of Paleolithic sites along these routes. With more extensive survey data available since the mid–1990s, efforts were made to determine whether or not this was so during the Middle Paleolithic (Fig. 10, A1). How these ‘traffic’ along these routes changed over time is the subject of another paper but, given the marine isotope record of global paleoclimatic oscillations, it should also be possible to retrodict whether, to what extent, and even perhaps when, a particular route was most likely to have been emphasized.

The modern nation of Iran (surface area 1,648,000 km²) consists of a high plateau (average elevation 1000 m) located between two depressions, the Caspian Sea on the north and the Persian Gulf on the south. Most of the interior of the country is sparsely populated even today, and consists of deserts ringed by mountain chains. The massive NW/SE trending Zagros Chain (max. elev. 4548 m) forms the modern border between Iraq and Iran, and stretches south for over 1000 km from Lake Van in Turkey to the Persian Gulf. To the north of Tehran lie the Alborz Mountains (max. elev. 5671 m), a narrow, E/W trending range that parallels the southern shore of the Caspian Sea and separates it low, humid and fertile coastal plain from the central plateau. The Makrān Chain (max. elev. >4000 m) lies between the central plateau and the Gulf of Oman whereas the Khash Range (max. elev. 4042 m) hooks north from the Makrān to form the border between Pakistan and Afghanistan (Schweizer, 1975; Loveday, 1994).

9.1. Route A – Baluchistan through the Mākran along the north shore of the Persian Gulf

The three migratory routes or corridors (A–C) are shown in Fig. 10. Routes A and B are mainly coastal pathways. Route A extends from Iranian Baluchistan in the southeast, through the Makrān coast, and along the northeastern shore of the Persian Gulf. The Gulf was clearly much wider during cold intervals, when sea level regression created a broad, resource-rich river valley (e.g., Rose, 2010). The significance of this corridor has been recognized since the 1970s. In 1966–7 Hume initiated Paleolithic surveys in the terraces of the Šimish and Moshkid Rivers near the border with Pakistan with the intent to track possible early hominin range extensions from source populations in East Africa. He identified several Paleolithic sites, at least two of which appear to be Middle Paleolithic (Fig. 10, A1, A2) (Hume, 1976). Field surveys during the 1970s in the Makrān region along the Gulf of Oman coast also resulted in the discovery of a few Paleolithic sites, some of them assigned to a Levallois-type Mousterian (Fig. 10, A3) (Vita-Finzi and Copeland, 1980). During the same decade, archaeological surveys in northern Baluchistan revealed still more Paleolithic sites in this region (Marucheck, 1976) (Fig. 10, A4). More recently, surveys by the Tübingen–Iranian Stone Age Research Project (TISARP) of the Basht region in the southern Zagros foothills identified 15 Paleolithic caves and rock shelters, and some open sites (Chasidian et al., 2009) (Fig. 10, A5). Other post-1995 surveys have also led to the discovery of Paleolithic sites in the Khuzestan Plain on the river terraces of Karkheh River (Vahdati Nasab, personal observation) (Fig. 10, A6). Work in the Jam-o Riz valley revealed several Middle and Upper Paleolithic localities at regions very close to the north coast of the Persian Gulf (Dashitzadeh, 2009) (Fig. 10, A7). To the authors’ knowledge, the most recent work concerning the Iranian Paleolithic is on the north coast of the Persian Gulf, where Mortazavi et al. (2012) report the occurrence of Lower and Middle Paleolithic sites in the terraces along the Dez River (Fig. 10, A8).

9.2. Route B – from Turkmenistan to the Ukraine via the Caspian coastal plain

Route B extends from northwest Afghanistan (a mountainous region) and southwest Turkmenistan (mostly dry steppe with little arboreal vegetation), skirting the southern shore of the Caspian Sea (a low-lying, densely vegetated coastal plain), and extending north into the Ukraine (Fig. 10). The coastal plain is bounded on the south by the steep, virtually impassable Alborz Mountains, rising to an elevation of nearly 6000 m within a few kilometers of the sea. The unusual bioenvironmental potentials of Route B (e.g., moderate temperature, abundance of plants and animals, lots of fresh water, coastal and marine resources) in a generally xeric region, coupled with the presence of caves and rock shelters, has attracted researchers to the south shore of the Caspian since the early 1950s. Coon was the first to explore the region (January, 1949), leading to the discovery and excavation of two well-known caves, Belt (Kamarband) and Hotu, both with Mesolithic and Neolithic occupations, but nothing earlier (Coon, 1957) (Fig. 10, B1, B2). In 1963, McBurney excavated a Middle Paleolithic sequence in Ke-Aram I cave (Goleston Province) at the eastern end of the Alborz chain, reporting a non-Levallois Mousterian dominated by points and scrapers that resembles Skinner’s Zagros Group A (esp. Shanidar) but contrasts sharply with evidence for Levallois technology in other Zagros sites (esp. Bisitun) (cf. McBurney, 1964, 1970 with Dibble and Holdoway, 1993) (Fig. 10, B3). Based on 1990s re-studies of collections from some of the classic Zagros Mousterian sites stored in museums (e.g., Bisitun, Kunji, Kohab, Warwasi, Houmian), it has become apparent that there is a great deal more variability in the Iranian Mousterian than has commonly been appreciated (see Dibble and Holdoway, 1993; Lindly, 2005 for discussion of sources of variation). McBurney also excavated Al-Teppe (Ali-Teppe, Ali-Tappeh), a cave located a few hundred meters from Belt and Hotu on the Caspian coastal plain and, like them, containing only Mesolithic occupations (McBurney, 1968: 395–6) (Fig. 10, B4). In 1972, a Franco-Iranian team headed by Keraudren and Thibault did some preliminary reconnaissance in the valleys leading down from the Alborz Mountains to the Caspian Sea and identified Pleistocene alluvial deposits with Paleolithic artifacts (Keraudren and Thibault, 1973) (Fig. 10, B5). This work stimulated renewed interest in the region, led to more intensive Franco-Iranian surveys in the 1990s and early 2000s (notably in the Amol region) and eventually ended in the discovery and excavation of the Upper Paleolithic site of Garm Rud 2 (Berillon et al., 2007, 2009) (Fig. 10). By the 1990s, it was becoming apparent that the southern shore of the Caspian Sea, best known previously for Belt and Hotu, also had a rich Paleolithic archaeological record hitherto ignored even by Iranian scholars, and underscoring the significance of Route B as a migratory corridor for different groups of hominins.
throughout prehistory. In the summer of 1999, Khal-Vasht rock shelter in Gilan Province on the southwestern side of Caspian Sea was identified and, based on its lithic typology, was assigned to the Upper and Epipaleolithic periods (Biglari and Abdi, 1999) (Fig. 10, B7). Two years later, an Iranian-Japanese expedition to the northwestern Alborz Mountains discovered the Lower Paleolithic open site of Ganj Par, located on the terraces of the Sepidrود River (Biglari et al., 2004) (Fig. 10, B8). In 2006, another Lower Paleolithic site, the cave of Darband A, was discovered in the same region (Biglari and Shidrang, 2006) (Fig. 10, B9). In the same year, a joint Iranian-Russian team initiated a series of surveys in the southwestern corner of the Caspian Sea near the city of Rasht, where the coastal plain opens out to the west. The work led to the discovery of at least 42 Paleolithic sites but, because of problems with identifying sites and recording site locations, and the possible mixing of collections after recovery, it is not possible to pinpoint all the reported localities on the map (Beshkani, 2008). In 2008, the second season of the Iranian-Korean Paleolithic Project (IKPP) reported two new Paleolithic sites in the Gilân highlands, Yar-Shalman and Malehan (Vahdati Nasab, 2010b) (Fig. 10, B10, B11). The most recent field mission in this region (Gilân, Mazâdanerân Provinces) took place in the spring of 2009 and involved preliminary soundings at the Mesolithic cave site of Komishan, located 12 km west of Hotu and Kamarband (Vahdati Nasab et al., 2011) (Fig. 10, B12).

9.3. Route C – from Afghanistan via the north edge of the Central Desert to Azerbaijan

In contrast to Routes A and B, Route C is an inland corridor connecting Afghanistan’s Herat Province with Azerbaijan by way of a pass between the southern piedmont of the Alborz Range and the northern edge of the Central Desert (Fig. 10). Part of the Silk Road, its eastern terminus is the region around Lake Urmia, a large lake (ca. 5600 km²) ringed by salt marshes that lies at the bottom of a large closed depression surrounded by mountains to the west and north, by plateaux to the south, and by plateaux and volcanic cones to the east. Notable for its extreme salinity (second only to the Dead Sea) and unique flora and fauna, it was designated a wetland protected region by the Iranian government in 1967. The pass varies in width from 20 to 80 km, and contains many important archaeological sites from all periods, thus testifying to its significance as a conduit or corridor for trade and human and animal movement in general. Several perennial and seasonal rivers originating at high elevations in the mountains deposit their rich alluvial sediments in the pass providing a favorable environment for humans both in the past and in the present.

Paleolithic research along Route C is in a very preliminary stage compared to work in the Zagros and the northern slopes of the Alborz Range. Near its western end lies the open site of Khaleseh, assigned to the Lower Paleolithic based on assessments of its lithic technological and typological affinities. Lacking bifaces, it is considered a ‘chopper-chopping tool’ site (Alikhei and Khosravi, 2009) (Fig. 10, C1). To the best of the authors’ knowledge, no cave or rock shelter in Iran has so far yielded stratified Lower Paleolithic industries, and the Acheulean is known mostly from isolated surface finds. In the west, handaxes and bifaces occur in the Hulailan Valley in north Luristan (e.g., Sar Kam, Tepe Gakia) and there is a relatively credible Acheulean surface scatter at Fal Barik (Mortensen, 1974, 1993). None of these sites are on Route C. A few isolated bifaces were recovered east of Lake Urmia in Azerbaijan (Singer and Wymar, 1976). In the extreme southeast, there are two alleged LP site clusters in Baluchistan near the Pakistani border, separated from each other by about 300 km. Both are referred to the ‘Ladizian,’ an industry that also lacks bifaces. Like Khaleseh, they were assigned to a ‘chopper-chopping tool’ industry although questions have arisen both with regard to the human authorship of some of the lithics and because they were dated by terrace sequences then thought to be linked to the European glacial sequence in the north German lowland plain (Hume, 1976; Maruchek, 1976). Credible Acheulean open sites also occur on the eastern slopes of the Zagros in Iraqi Kurdistan (e.g., and esp., Barda Balka). Reported by Braidwood and Howe (1960), they were collected but never intensively investigated. Barda Balka is perhaps the most promising of these, as the artifacts occur in Upper Pleistocene river gravels between two silt layers near a spring. There is an associated fauna (elephant, rhinoceros, deer, ovicaprines, onager), which augurs well for relatively undisturbed contextual integrity (Wright and Howe, 1951; Smith, 1986: 15, 16).

Sepid-Dasht is a Middle Paleolithic site with Levantoid technology located on the Qazvin Plain south of the Alborz Mountains (Vahdati Nasab et al., 2009) (Fig. 10, C2). Nargeh is another Mousterian surface scatter northwest of the Central Desert (Biglari and Ghaflari, 2002) (Fig. 10, C3). The western edge of the Central Desert has been more extensively surveyed than the eastern part of Route C, and numerous Paleolithic sites have been reported by ICHO surveys in the region. However, only a few of these sites have reached publication: Zavieh (Heydari-Guran et al., 2012) (Fig. 10, C4); Kon (Conard et al., 2006) (Fig. 10, C5) and Sepid-Ab (Shidrang, 2009) (Fig. 10, C6) are the most important ones. Limited survey in the Masile Basin located in the southern outskirts of Tehran led to the discovery of a MP-dominated palimpsest but the small sample collected precludes more secure chronological placement (Malek Shahnirzadi, 1994; Fig. 10, C7). Moving east, test excavations at Ghaleh Askar in the foothills of the Damavand volcano in the central Alborz Range northeast of Tehran produced a blade and bladelet-dominated collection assigned to the Upper and Epipaleolithic on the basis of artifact typology (Amirlo, 1990; Fig. 10, C8). Surveys conducted by the Franco-Iranian Paleanthropological Programme (FIPP) in 2002 and 2003 in the same region led to the discovery of two Mousterian open sites, Moghanak and Ochtsunak, for which preliminary reports are available (Chevrier et al., 2006; Berillon et al., 2007) (Fig. 10, C9).

Mirak (Fig. 10, C10) was discussed earlier (see also Rezvan and Vahdati Nasab, 2010). This paper has made a fairly strong case that the site is a Mousterian palimpsest with relatively good contextual integrity, but given the near-total absence of radiometric dates for the sites discussed here (in fact, for the Iranian Paleolithic in general), that assessment rests solely upon the technotypological description of the artifacts themselves. Also located on Route C a few kilometers north of Mirak is the large open site of Delazian, or the Delazian Mounds (Fig. 10, C11). As the name implies, it consists of several mounds with dense artifact concentrations on top of marls and sands, in the vicinity of a fossil lake, and almost certainly owed to in situ deflation. In contrast to Mirak, Delazian represents a series of Upper (and possibly Epipaleolithic) campsites stacked on top of one another, and concentrated into a single artifact horizon by deflation. There are no Mousterian diagnostics in these extensive surface scatters (Vahdati Nasab, 2009; Vahdati Nasab et al., 2010; Vahdati Nasab et al., n.d.).

The northeast section of Route C is very poorly known and the only published material goes back to limited surveys and excavations conducted in the 1950s and 1970s. East of the city of Mashad near the border with Turkmenistan, a surface scatter was reported by a Franco-Iranian geoaarchaeological survey on one of the high terraces of the Khashfrud River. Called Khorasan, it is thought to date to the early Pleistocene. It lacks bifaces and, according to the convention of the time, was considered to pertain to a Lower Paleolithic ‘chopper-chopping tool’ industry (Ariai and Thibault, 1975) (Fig. 10, C12). If subsequent investigation confirms its association with the terrace, Khorasan could constitute the oldest
evidence of a hominin presence in the country. The easternmost site on Route C is Khunik, a Mousterian rock shelter near the eponymous village discovered and excavated by Coon in 1949 (Coon, 1957: 126, 127) (Fig. 10, C13). Khunik is said to have produced “fine flints like those of Bisitun,” but was determined to be extensively disturbed (Coon described it as an “upside down site” because potsherds, metal, and a modern human skeleton were recovered beneath the Mousterian levels (Coon, 1957: 126)). In light of the rudimentary knowledge of site formation processes in the 1940s, Khunik might repay further investigation. Since caves and rock shelters are common in the area, a survey might locate additional Paleolithic sites.

10. Conclusions

Coon (1957: 322) was the first to note that the peculiar geography of Iran severely constrained movement around its central deserts, and that a migration corridor originating in Iraqi Kurdistan (specifically, in the valley of the Greater Zab) and terminating on the southern coast of the Caspian Sea (part of Route B) might account for the migration of Upper Paleolithic peoples from the East to the West. In the era of ex oriente lux, tracking the peregrinations of “the blade makers” (cf. Bar-Yosef and Kuhn, 1999) was regarded as an important goal of archaeological research. Research identifies two other potential routes for hominin and animal range extension, Routes A and C, of which the former was almost certainly the more important. Exposure of up to 200,000 km² of continental shelf during glacial maxima would have facilitated movement along what is today the Persian Gulf in an environment that was a broad river valley teeming with game and plant resources, and fresh water, in a region that was dry over throughout most of the Pleistocene. Because of subidence and Holocene inundation beginning in the Tardiglacial, tracing the movements of early humans along this corridor is likely to be problematic, except insofar as vestiges of what is sometimes regarded as a refugium (Rose, 2010; Groucutt and Petraglia, 2012) during hyperarid intervals are preserved along its eastern shore. Advances in underwater archaeology might also contribute to a better sample of submerged Paleolithic sites, at least along the relatively shallow coastline (Bailey and Flemming, 2008; Bailey, 2009).

Finally, it is noteworthy that, except for caves and rock shelters in the Zagros Mountains, most of the sites reported here are open sites, located during recent surveys. The information potential of these sites cannot be overstated. While assessments of site contextual integrity are crucial to ascertain how much confidence can be placed in any patterns adduced from them, there is a common misconception that hominins spent most of their time in caves and rock shelters. The idea arose from (1) the questionable assumption that all or most open sites are ‘disturbed’ (whereas those in caves are largely intact), (2) the history and world-wide impact of the European research tradition, which focused almost exclusively on caves, and (3) the difficulty with distinguishing discrete artifact clusters from the background distributions of stone artifacts common in many desert environments (e.g., Clark et al., 2001).

Excitement in areas where late Pleistocene land surfaces are covered by a thick mantle of Holocene alluvium (e.g., western Europe), open sites are now known to be more common than those in caves and rock shelters. Although there are exceptions (e.g., Hummal, a deeply stratified artesian spring in the Syrian Desert (Hauck, 2011)), they are also more likely to be single component sites. Researchers must look for ways to better exploit the enormous potential of open sites for making behavioral inferences (e.g., Miller and Barton, 2008) in order to distance ourselves from the notion that caves and rock shelters are more reliable indicators of human behavior than open sites. Site formation processes are likely to be much more complex and difficult to untangle in caves and rock shelters because the concentrated human, animal, and geological activities in them were spatially confined over millennia. The impact of such factors is apparent in an understanding of the Paleolithic archaeology of Iran, which until recently has suffered from a lack of systematic surveys (Vahdati Nasab, 2011). Although new discoveries of Paleolithic sites look very promising, much remains to be done to get a picture of site distributions in time and space for the Iranian Plateau (indeed, for the nation as a whole) as a necessary prelude to the behavioral interpretation that should be the goal of a paleoanthropologically informed archaeology.

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