Assessing Patterning in the Upper Paleolithic and Epipaleolithic at Warwasi, Iran

Deborah I. Olszewski
University of Pennsylvania, USA

Received: March 10, 2016 Accepted: November 4, 2016

Abstract: The Warwasi (Iran) sequence contains Early Zagros Aurignacian, Late Zagros Aurignacian, and Zarzian lithic assemblages. By examining attributes of the lithic assemblages from each of the 10 cm arbitrary levels, several patterns characteristic of each of chronological block of deposits emerge. These document aspects of how the Warwasi rockshelter was used at certain points in time, but are not necessarily statements about base versus task camps or duration of site visits. This is because each level and each chronological block represents time-averaged activities (tasks, discard, and artifact transport) that form cumulative palimpsests. While the patterning at Warwasi provides a view of change over time for this site, this sequence cannot automatically be widely or broadly applied to other sites in the Zagros Mountains region. Comparisons to the Upper Paleolithic cumulative palimpsest deposits at Yafteh Cave and Ghār-e Boof suggest why such comparisons must be carefully considered.

Keywords: Zagros Aurignacian, Zarzian, Chipped Stone Industry, Warwasi, Ghār-e Boof

Introduction

The rockshelter site of Warwasi in the foothills of the Zagros Mountains of Iran contains a long sequence of deposits with lithic assemblages ranging from the Middle Paleolithic to the Upper Paleolithic to the Epipaleolithic (Braidwood *et al*. 1961; Dibble and Holdaway 1993; Olszewski 1993a, 1993b). The repeated visits to this locale created cumulative palimpsests (e.g., Bailey 2007) that represent a record that can be examined for long-term patterning (or lack of patterning). The focus here will be on the Upper Paleolithic (Levels LL-P) and Epipaleolithic (Levels O-A) deposits, constituting approximately 3.7 m in depth (from a roughly 8 m by 1 m trench excavated along the rockshelter wall) (Olszewski 1993a, 1993b). The beginning of the Upper Paleolithic deposits is at Level LL and its highest occurrence is Level P; similarly, the lowest Epipaleolithic occurrence is Level O and the highest is Level A. Although there are no radiometric dates from Warwasi, broad comparability to other Zagros lithic assemblages suggests that the Upper Paleolithic may be 35,000 – 40,000 cal BP (Conard and Ghasidian 2011: 45; Ghasidian 2014: 62; Otte *et al*. 2011: 342), while the end of the Epipaleolithic is prior to 10,000 cal BP, with some sites such as Palegawra possibly used during the Younger Dryas interval (Zeder 2006: 194-195).

Warwasi today is situated in the Kurdo-Zagrosian oak-steppe forest belt (Fig. 1). This setting includes deciduous oaks, juniper, almond, pistachio, maple, Syrian pear, and hawthorne (Litt *et al*. 2014: 31). During the late Pleistocene (33,000 - 10,000 cal BP: late MIS 3 and MIS 2), however, paleoenvironmental conditions in the Zagros region are likely to have been considerably drier and colder on average (Çağatay *et al*. 2014: 113-114). For instance, during this period, levels in Lakes Van, Urmia, and Zeribar were lower than modern levels, although there were rises in Lake Van levels that correspond to interstadials at 26-24.5 and 21-20 cal BP (Çağatay *et al*. 2014: 111-112). The Younger Dryas, ca. 12,800 to 11,500 cal BP also was particularly dry and cool. Thus, while there were warmer intervals during which Upper Paleolithic and Epipaleolithic hunter-gatherer-foragers could have used Warwasi (especially before 33,000 cal BP), most of the Upper Paleolithic and Epipaleolithic periods would have witnessed relatively harsh conditions.

The Warwasi Lithic Assemblages

The Upper Paleolithic and Epipaleolithic from Warwasi can be divided into an Early Upper Paleolithic (Levels LL-AA), a Late Upper Paleolithic (Levels Z-P; Level R is not included), and the Epipaleolithic (Levels O-A)

Deborah I. Olszewski
Department of Anthropology, University of Pennsylvania, Philadelphia, USA.
deboraho@sas.upenn.edu

Fig. 1. Map showing location of sites discussed.

(Olszewski 1993a, 1993b, 1999, 2001, 2009). Elsewhere, the Warwasi Upper Paleolithic component has been described as the Zagros Aurignacian, a facies similar to some entities found in the Levant and in Europe (e.g., Olszewski 2009; Olszewski and Dibble 1994, 2006), rather than the Baradostian (a label that obscures the Aurignacian characteristics of the lithic assemblages). The Epipaleolithic at Warwasi is attributed to the Zarzian (Olszewski 1993b, 2012).

The excavations by the Braidwood team at Warwasi in 1960 used 10 cm thick arbitrary levels within a fill that had few overt distinctions throughout the 3.7 m Upper and Epipaleolithic sequence. While this means that there may be some potential for "mixing" because level boundaries may have cross-cut distinct accumulations, overall, a taphonomic study using lithic refits indicated that inter-level mixing was not significant (Tsanova 2013: 49). Thus, long-term trends in lithic typology and technology from the Early Upper Paleolithic through the Epipaleolithic can be examined by comparing the lithic assemblages from each level with some confidence. Lithic densities, debitage, cores, and tools through the Warwasi sequence form the basis for the observations and interpretations discussed below.

Assemblage Densities

The densities of the lithics in each level were standardized to one cubic meter of sediment. Tools, cores, and debitage were used in these calculations, including debitage less than 2.5 cm in size. Because debitage is the most frequent category in assemblages, these density patterns are partly driven by the amounts of debitage discarded at Warwasi. As can be seen in Fig. 2, there are several general observations that can be made. First, overall density regardless of level or chronological time period is relatively modest (<2500 artifacts per m^3), and densities below 2000 artifacts/m^3 most likely signal relatively light use of the rockshelter at Warwasi. Second, both the beginning of this sequence (Levels LL-CC in the Early

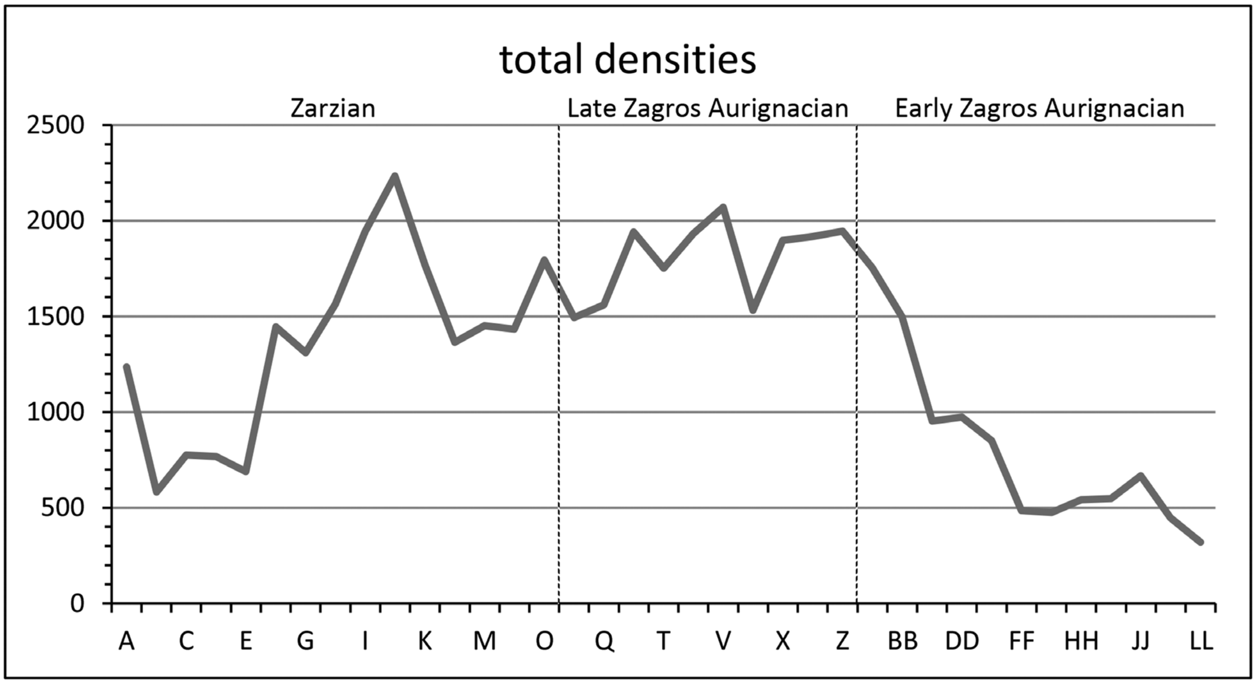

Fig. 2. Lithic artifact densities at Warwasi.

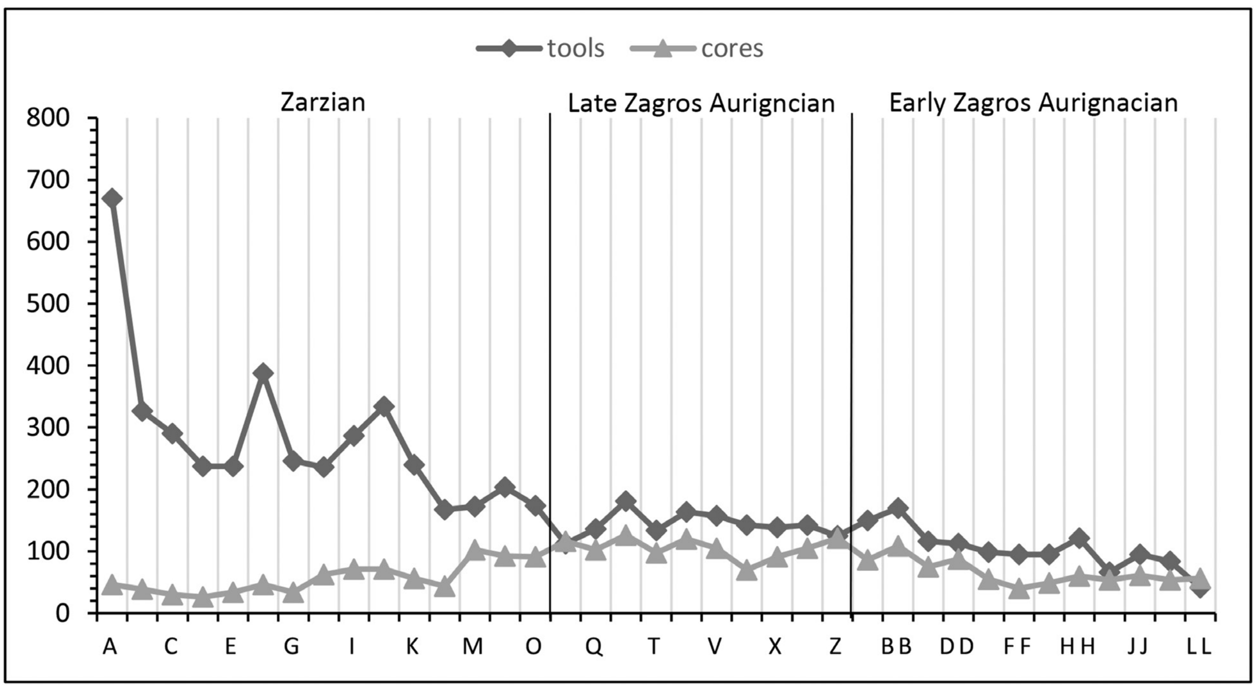

Fig. 3. Tool and core densities at Warwasi.

Zagros Aurignacian) and its end (Levels E-B, but not Level A) contain quite low densities (<800 artifacts/m^3). Whether this pattern reflects particularly harsh climatic intervals during the late Pleistocene when hunter-gatherer-foragers may have not used the mountain foothills either extensively or intensively is difficult to determine in the absence of absolute dates. Third, Zarzian Levels E-A have low amounts of debitage, which contributes to the low overall density of artifacts. Finally, the most intensive use of the rockshelter, in terms of deposition of lithics, occurs during all of the Late Zagros Aurignacian, as well as the early part of the Zarzian sequence.

One of the most intriguing patterns present in the artifact densities can be seen in Fig. 3. During the Early

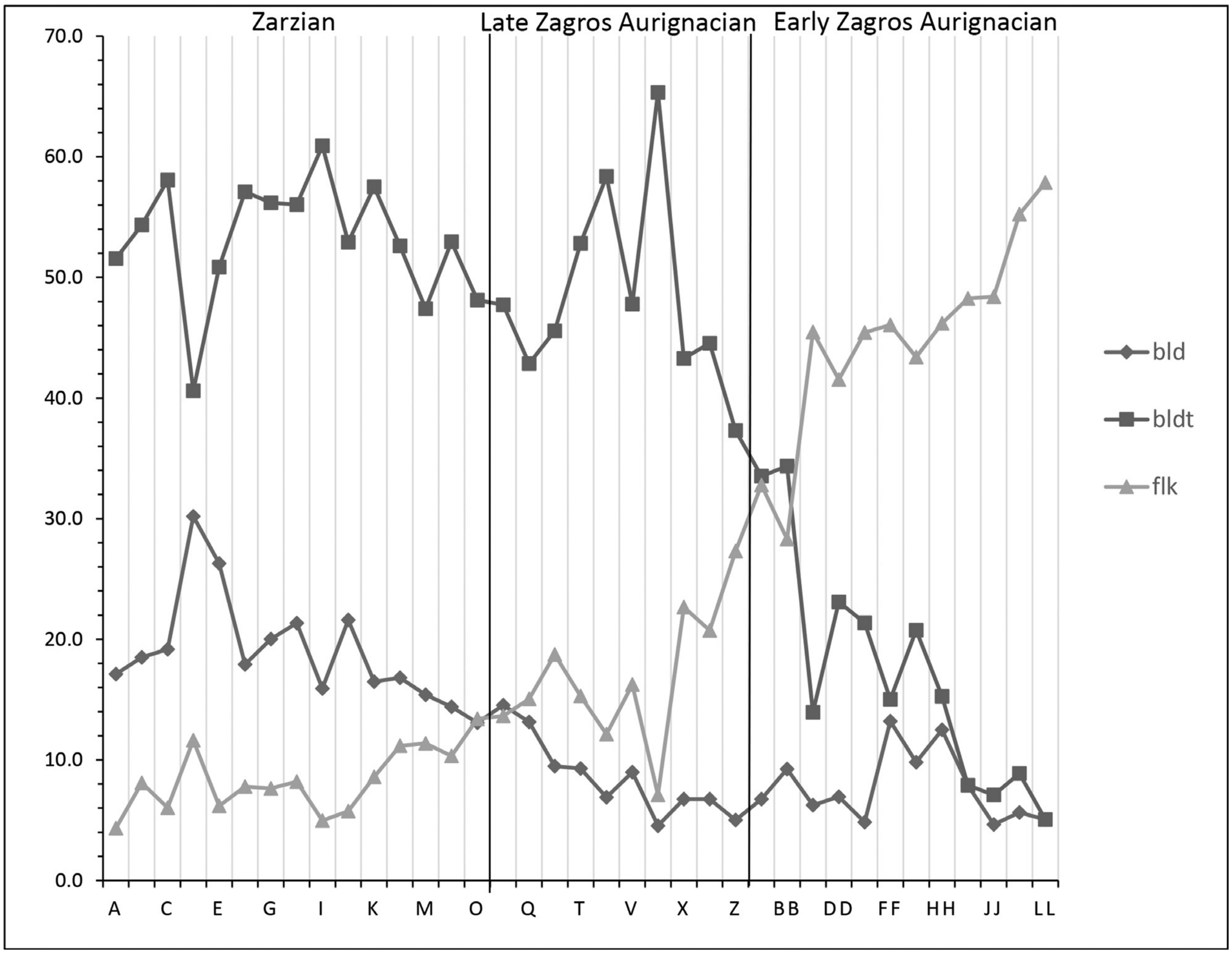

Fig. 4. Frequencies within the debitage of flakes (flk), blades (bld), and bladelets (bldt) at Warwasi.

and Late Zagros Aurignacian, tool and core densities are relatively similar, with tools usually slightly more abundant than cores. However, at the start of the Zarzian portion of the sequence (Level O), this pattern shifts abruptly. Now, tools are much more abundant than cores; in fact, cores decline while tools increase dramatically, particularly at the end of the sequence (Levels C-A). As noted above, debitage amounts also drop precipitously in these levels. The patterning seen in tools and cores has several possible interpretations. Among these are how the rockshelter may have been used and the degree to which certain artifacts may have been transported in/out or manufactured/discarded on site. For example, similar tool and core densities in the Early and Late Zagros Aurignacian suggest a similar use of the rockshelter throughout the Upper Paleolithic. In this case, with the number of tools per core comparable throughout these deposits, this may indicate that the range of activities during site visits remained relatively constant and/or that artifacts were transported into and out of the rockshelter in analogous ways. On the other hand, the Zarzian pattern of many tools and few cores might suggest that cores were intensively reduced (with many tools made on site) or that cores were transported from Warwasi to other locales or that tools were brought into and discarded at high rates at Warwasi (perhaps due to an activity such as retooling of hunting implements). These possibilities are further treated in the Discussion section below.

Debitage

As reported elsewhere, the Early Zagros Aurignacian has a flake dominated debitage (except for Levels BB and AA), while the Late Zagros Aurignacian and the Zarzian are blade/bladelet industries (Olszewski 1993a, b, 2001: 82; Tsanova 2013: 42). This is seen also in Fig. 4, where the shift from abundant flakes (cortical, partially cortical, and noncortical combined) to bladelets (and some blades) begins to occur in Levels BB and AA near the transition into the Late Zagros Aurignacian. Interestingly, despite the new emphasis on blade/bladelet technology, rejuvenation flakes

do not decline (not shown here) until Level Y in the early part of the Late Zagros Aurignacian, when rejuvenation bladelets and rejuvenation blades become more abundant. These frequency distributions by level undoubtedly reflect in part the "mixing" effect of the arbitrary 10 cm levels in which Warwasi was excavated. Finally, while it is perhaps unsurprising that the Late Zagros Aurignacian and Zarzian are dominated by bladelet debitage, it is intriguing that the Zarzian shows a greater abundance of blade debitage than the Upper Paleolithic sequence, as Epipaleolithic assemblages in the greater Middle East (particularly the Levant) often contain very few blades (e.g., Garrard and Byrd 2013; al-Nahar and Olszewski 2016: Table 2). The frequencies of rejuvenation bladelets, rejuvenation blades, and rejuvenation flakes combined (3.1% to 7.5%) is lower during Zarzian Levels L-A (except for Level B, which has 10.4%) than in the early portion of the Zarzian and the Upper Paleolithic levels. This may suggest that the idea that cores were intensively reduced during the Zarzian (see above) is not the most viable explanation for their low density.

Cores

As shown in Fig. 5, the Early Zagros Aurignacian is dominated by cores for the production of flakes, not unexpected given the flake-dominated debitage discussed above. Although cores with final removals as blades are rare, they are slightly more common in the Zarzian levels, matching the observation that blade debitage is more frequent in this part of the Warwasi sequence. Core types (not shown graphically here) include single, opposed, 90°, discoidal, and multiple platforms (Olszewski 1993a, b). In the Early Zagros Aurignacian, these types are relatively evenly distributed in frequency within the cores, although discoidal, and single and multiple platform cores, tend to be the most abundant. In the levels of the Late Zagros Aurignacian, core types are mainly single (excluding carinated burins which most likely also are cores: see tools below), followed by opposed platforms. The frequency distribution of core types in the earliest part of the Zarzian is similar to that of the Late Zagros Aurignacian. However, beginning with Level J, there is a more even distribution of single and opposed platform cores, with Levels K-C also yielding numerous 90° platform cores.

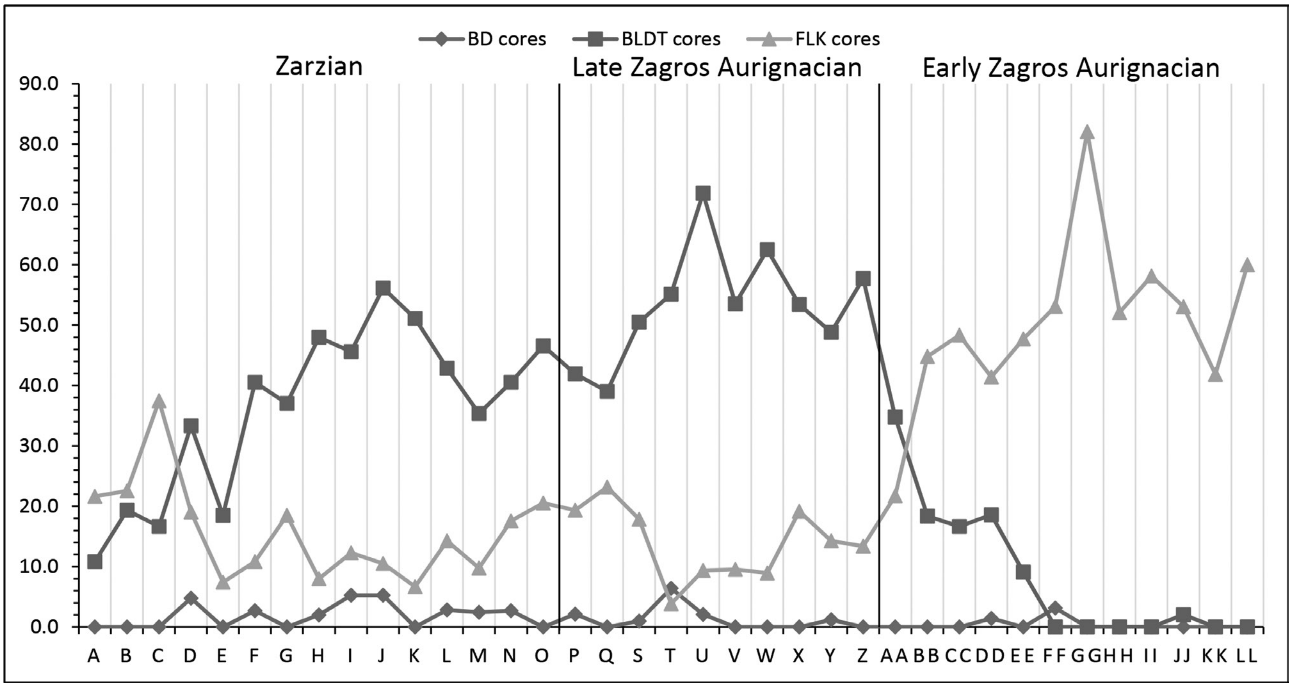

Fig. 5. Frequencies within the cores of those with final removals reflecting flakes, blades, or bladelets (not shown are mixed blank cores).

Tools

Retouched tool classes and types are one of the key components in distinguishing or defining particular chronological periods within the Upper Paleolithic and Epipaleolithic. As discussed in previous publications on the Zagros Paleolithic (e.g., Bordes and Shidrang 2009; Ghasidian 2014; Olszewski 1993a, b, 2009, 2012; Olszewski and Dibble 2006; Otte and Kozlowski 2007) and recent Ph.D. theses (e.g., Shidrang 2015), microlith forms have been particularly useful for chronological divisions. As seen in Fig. 6, during the Early Zagros Aurignacian, microliths are not as frequent as during later parts of the

Warwasi sequence, although they become more common in levels (BB-AA) that are near the boundary with the Late Zagros Aurignacian. Diagnostic nongeometrics during the Early Zagros Aurignacian are Gar Arjeneh points and Dufour bladelets, as noted for other Zagros sites as well (e.g., Yafteh: Shidrang 2015: 207-212). For the Late Zagros Aurignacian, the most diagnostic nongeometrics are Dufour bladelets, which are also the most frequent nongeometric type. It is with the Zarzian Epipaleolithic that geometric forms of microliths appear in increasing frequency, although these do not become prominent in the Warwasi sequence until Levels K-A. These geometrics are mainly scalene and elongated scalene triangles. The nongeometric microliths of the Zarzian are Dufour bladelets in the early part of the sequence (Levels P-L; thus sharing some similarity with the last part of the Late Zagros Aurignacian), while in Levels K-A, nongeometrics are pointed or truncated bladelets; higher frequencies of curved forms are typical of Levels G-A.

Among the macrotools, the most definitive patterning is seen in the distributions of endscrapers and burins (Fig. 7), although it is also true that the Early Zagros Aurignacian is characterized by numerous sidescrapers, while the Late Zagros Aurignacian and Zarzian have few of this macrotool type (Olszewski 2009: 40). For the most part, the sequence of levels in the Early Zagros Aurignacian shows that the frequencies of these two tool classes are similar. This pattern changes abruptly with the Late Zagros Aurignacian, where burins become much more common than endscrapers. This is due to the presence of numerous carinated burins within the burin class. These carinated burins have been described elsewhere as most likely to be cores for the production of twisted bladelets (as blanks for Dufour bladelets) rather than tools (Barton *et al*. 1996; Olszewski 2007). If carinated burins are not included in the burin class, then the frequencies of endscrapers and burins are more similar, analogous to the Early Zagros Aurignacian pattern. Finally, there is an interesting reversal of these two macrotools for much of the Zarzian sequence (except for Levels E-A), with endscrapers more frequent than burins. This pattern might be suggestive of a change in emphasis on activities that occurred in the rockshelter during the Epipaleolithic compared to earlier periods (see Discussion below).

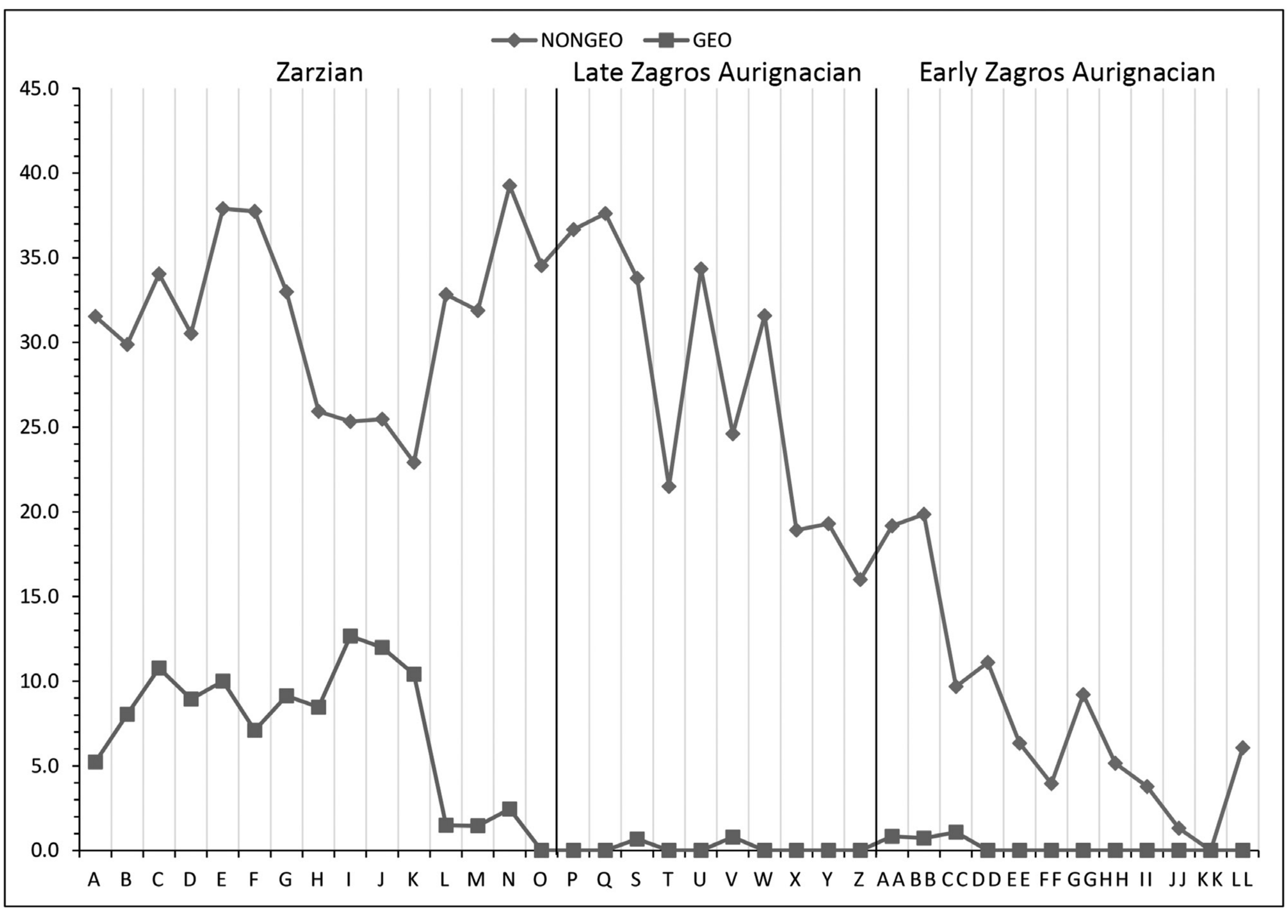

Fig. 6. Frequencies of nongeometric and geometric microliths (unidentifiable microliths not included) within the tools at Warwasi.

One final comment that can be made about tools in the Warwasi sequence is that, while few in number, there are several hammerstones in the Early Zagros Aurignacian levels. In the deposits of Levels AA-A, however, only one hammerstone occurs (in Level G in the Zarzian). While cores occasionally have traces of hammerstone use, the pattern of nodules used as hammerstones in the Early Zagros Aurignacian stands out as distinctive.

Discussion

While the characteristics of the lithic assemblages from individual arbitrary levels in the Warwasi sequence can vary (as seen in Figs. 2-7), generally speaking, there are discernible trends, as well as similarities and contrasts between the major chronological sets of deposits. Excavation in arbitrary levels can increase the possibility of inadvertent mixing of assemblages, however, while this is somewhat apparent in the one or two levels that are on either side of where the chronological blocks have been delineated in the sequence, this effect appears to be minimal, an observation supported by the taphonomic study of Tsanova (2013). The patterning seen in the Warwasi sequence thus reflects the usefulness of time-averaged assemblages which form cumulative palimpsests (in the sense of Bailey 2007), where individual events (e.g., individual site visits) cannot be separated one from another, but information about use of place can be captured and then interpreted.

In this section, the Warwasi sequence is summarized and some comparisons to the Yafteh Cave Zagros Aurignacian sequence are made. Unfortunately, publications on Zarzian assemblages from sites other than Warwasi are not detailed enough to provide information on which to base a similar comparison of the Warwasi Zarzian.

The Sequence at Warwasi

Table 1 shows the major features of each cumulative palimpsest (Early Zagros Aurignacian, Late Zagros Aurignacian, and Zarzian). These create a signature for each chronological block, reflecting activities at the site as well as discard and transport of lithics in and out of the rockshelter. During the Early Zagros Aurignacian, the generally low densities of debitage, cores, and tools is indicative of either quite ephemeral uses of the rockshelter or of infrequent visits to this locale, so that few artifacts were discarded there. Despite having few cores and relatively few debitage pieces (until Level BB-AA), this cumulative palimpsest contains many reflaked artifacts, indicating a highly reduced assemblage, perhaps due to original nodules being small (Tsanova 2013: 49).

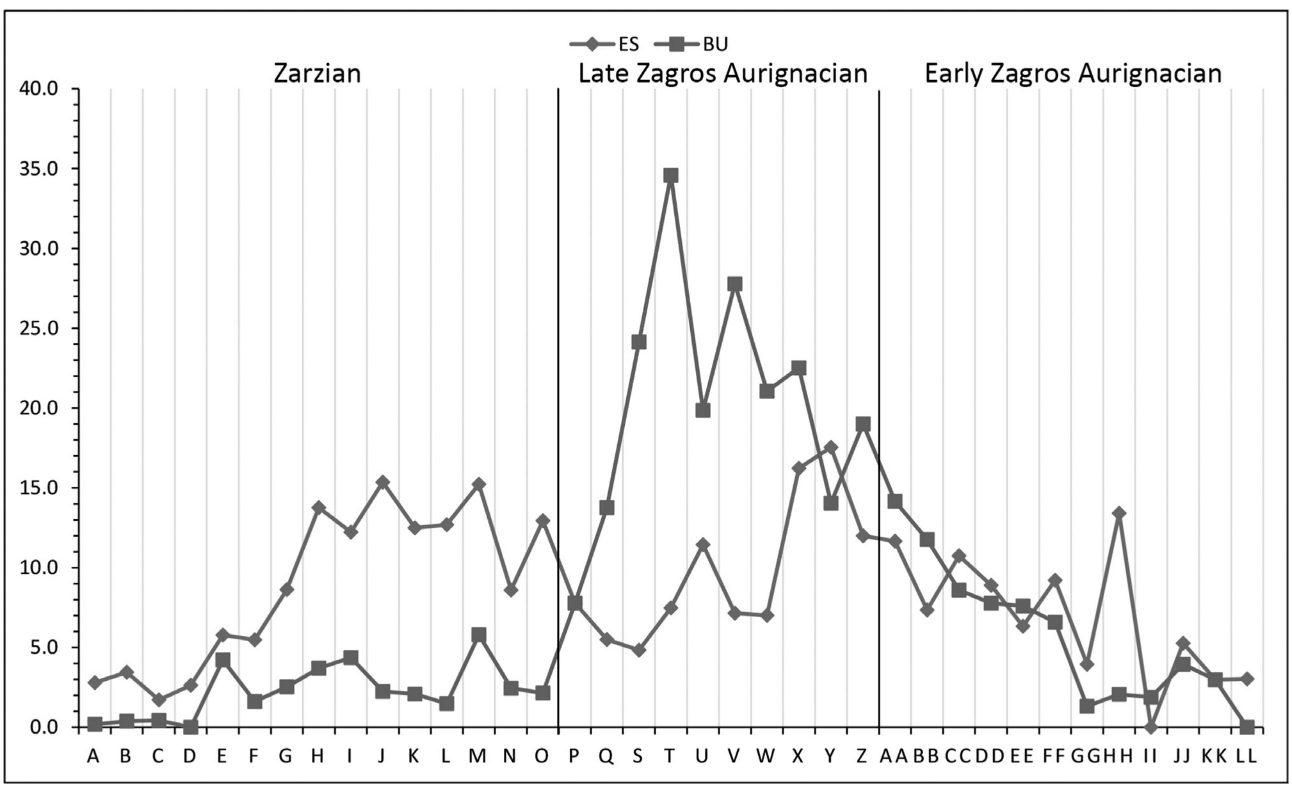

Fig. 7. Frequencies of endscrapers (ES) and burins (BU) within the tools in the Warwasi sequence.

Reduction of cores on site also is reflected by the presence of hammerstones. Taken together, if lithics during the Early Zagros Aurignacian are heavily reduced, but the products of these reductions (either simple debitage or tools) are not particularly frequent in the deposits, it suggests that these level assemblages reflect considerable transport of lithics. That is, pieces (including cores) that have been initially reduced elsewhere are brought into Warwasi where they are further reduced and some of them are discarded. At the same time, it is likely that at least some of the blanks (especially flakes) that are manufactured at Warwasi were then transported elsewhere, a process that is likely to be true for tools as well. Unfortunately, it is not possible to use indices such as blank-to-core or noncortical-to-cortical flakes (e.g., Ditchfield 2016) to assess artifact transport because broken debitage was not separated into proximal versus medial and distal fragments. The discard of similar numbers of endscrapers and burins during the Early Zagros Aurignacian perhaps indicates that if these tools were used (rather than simply discarded) at the site, the activities they represent were engaged in similarly. The modest number of nongeometric microliths were most likely parts of hunting armatures, and their discard at the site probably reflects a certain amount of retooling of these weapons. The fact that bladelet cores are extremely rare in the earliest part of the Early Zagros Aurignacian (Levels LL-FF), but both bladelet debitage and nongeometrics do occur, suggests that these lithic elements may have been transported into the site rather than manufactured there.

During the Late Zagros Aurignacian, some of the patterning is similar to the Early Zagros Aurignacian (see Table 1). That is, tool and core densities continue to be low, however, the amount of debitage is quite high, indicating a change towards more on-site manufacture of blanks and greater discard of them. This is supported by the fact that carinated burins represent nearly half of the burin category (Olszewski 1993a: 196), and because carinates are widely regarded as cores for bladelets (e.g., Almeida 2001; Barton *et al*. 1996; Hayes and Lucas 2000; Olszewski 2007), their presence helps explain the higher amounts of bladelet debitage. Additionally, because bladelets are smaller pieces than flakes, it is possible that their size and breakage may partially explain the higher densities of debitage during the Late Zagros Aurignacian cumulative palimpsest. The presence of carinated burins also contributes to the high frequency of burins compared to endscrapers during these sets of occupations. In fact, as noted above, if carinated burins are removed from the burin class, then the frequency of burins and endscrapers is similar, mirroring the frequencies during the Early Zagros Aurignacian. Placing carinated burins into cores would mean that the density of cores during the Late Zagros Aurignacian was more elevated than during the Early Zagros Aurignacian. Finally, there also is a pronounced emphasis on nongeometric microliths in the Late Zagros Aurignacian compared to earlier in the sequence (Levels LL-AA). Higher frequencies of these probable hunting armatures (whether as points or barbs) appears to suggest greater on-site production and discard of them (retooling episodes perhaps) during this cumulative palimpsest.

If there are a number of similarities between the Early and Late Zagros Aurignacian, the same cannot be said of comparisons of these periods to the Zarzian (see Table 1). While the early part of the Zarzian sequence (especially Levels O-L) can sometimes be similar to the Late Zagros Aurignacian, e.g., in the main type of nongeometric microlith (Dufour bladelets) and the frequency of nongeometrics to geometrics, most other measures indicate that the Zarzian cumulative palimpsest is considerably different from those of the Upper Paleolithic at Warwasi. In particular, there are four attributes that are striking. One is the moderate frequency of tools. Even though many of these are microliths, which because of their small size may inflate the tool class, this cannot be the explanation as the Late Zagros Aurignacian tools also are mainly microliths. The abundant tools of the Zarzian thus appear to reflect a considerably different pattern of site use. The second observation is the very low density of cores, which seems

Table 1. Main lithic characteristics of the Warwasi temporal periods.

	Early Zagros Aurignacian	**Late Zagros Aurignacian**	**Zarzian**
debitage density	starts low, then becomes high	high	starts high, then becomes low
core density	low	low	very low
tool density	low	low	moderate
endscraper frequency (ES)	similar to BU	low	high
burin frequency (BU)	similar to ES	high	low
nongeometric microliths	moderate	high	high
geometric microliths	negligible	negligible	moderate
technology	flake	bladelet	bladelet and blade

somewhat surprising given the moderate densities of tools and initially high densities of debitage (especially Levels O-H). Carinated burins are not a feature of the Zarzian, so the disappearance of these elements (which likely are cores) also adds to the picture of very low core density. This pattern suggests that either the cores were very heavily reduced on-site or they were transported away from the site but as noted above, intensive reduction of cores on-site is not as likely an explanation. Microliths and bladelet debitage may have been brought into the site and discarded there. A third aspect is that the Zarzian is characterized not only by bladelets but also by blades (both in debitage and cores). As blades are larger than bladelets, the cores that produce blades should be larger nodules (at least initially); because cores for blade production are present in the Zarzian, it would seem (again) that intensive reduction of cores was not the prime reason for low core densities. On the other hand, if transporting bladelets and microliths into Warwasi was typical of the Zarzian, then this could also be how many of the blades entered the site deposits. Finally, endscrapers are more frequent than burins in the Zarzian, likely indicating that if they were used for on-site activities, then endscraper associated tasks were more common than those related to burins.

Typo-Technological Comparison to the Yafteh Cave Upper Paleolithic Sequence

Detailed studies of the lithic assemblages at Yafteh Cave, from both the original excavations in 1965 (Hole and Flannery 1967) and the more recent excavations in 2005 and 2008 (Otte *et al*. 2007, 2011) have provided a valuable set of observations (Bordes and Shidrang 2009, 2012; Hole 2012; Shidrang 2015) which can be used in comparisons with Warwasi. For the most part, these are typo-technological comparisons because densities of materials at Yafteh Cave are not available from published information.

While one must always use caution because the activities and discard patterns in the cumulative palimpsests from different sites will record a variety of differences that impact the composition of lithic assemblages, it would seem that most of the earlier part of the Early Zagros Aurignacian sequence at Warwasi (Levels LL-BB) is similar to the early part of the sequence at Yafteh in having relatively low numbers of artifacts (see Shidrang 2015: Table 15). However, the emphasis at Warwasi is on the production of flakes (see above), while at Yafteh, the focus is on the manufacture of bladelets (Shidrang 2015: 189-190). Another difference is that Yafteh Cave has frequent Dufour bladelets in its lower sequence, whereas Warwasi does not (except for Levels BB-AA, which might reflect some mixing from the Late Zagros Aurignacian levels above). Shidrang (2015: 212) notes that the lower (and central) sequence Yafteh Cave Dufour bladelets are mainly straight or slightly curved in profile (that is, not twisted), which she calls Dufour subtype of Dufour, pointing out that these are similar to those found in the European Proto-Aurignacian. These differences between Warwasi and Yafteh Cave (along with Warwasi's abundant sidescrapers) possibly suggest that the Early Zagros Aurignacian at Warwasi is chronologically older than the deposits reached near the base of the Yafteh Cave excavations (a suggestion also made by Tsanova 2013: 62), but this is not the only possible interpretation (see Conclusions below).

The central phase at Yafteh Cave (the middle part of the sequence) appears to be missing from the Warwasi sequence. This is because this central phase at Yafteh Cave contains numerous Arjeneh points and core types that do not include carinated burins except in the uppermost levels in this phase, as well as yielding "rods" (bladelets with both laterals retouched) (Shidrang 2015: 192-193, 207, 209, 214). Such a combination is not present at Warwasi. As noted above, the bladelets in this phase at Yafteh are not twisted and the nongeometrics are the Dufour subtype of Dufour (except for the deposits near the boundary with the overlying upper phase). Interestingly, although sidescrapers are not mentioned for the 2005-2008 excavations (Shidrang 2015: 207), they are recorded in deposits of depths equivalent to the central (and upper) phase for the 1965 excavations (Hole 2012: 17). The several radiocarbon dates (ranging from about 36,700 to 40,500 cal BP) from the 2005-2008 excavations show no separation between the early and central phases at Yafteh Cave (Otte *et al*. 2011: 342).

The uppermost part of Yafteh Cave's sequence appears to correspond well with the Late Zagros Aurignacian (Levels Z-P) at Warwasi. Both contain abundant carinated elements (especially carinated burins), twisted bladelets, and Dufour bladelets (Hole 2010: 17; Shidrang 2015: 197, 202; 212; also see above). At Yafteh Cave, the Dufour bladelets are described as the "Roc de Combe" subtype of Dufour (which have twisted profiles) (Bordes and Shidrang 2012: 33; Shidrang 2015: 212). Hole's (2012: 17) description of upper level deposits in the 1965 excavations include sidescrapers; a few sidescrapers also are found in Levels Z-P at Warwasi. The upper phase at Yafteh has one date (ca 29,250 cal BP), which is considerably younger than those from the early and central phases (Otte *et al*. 2011: 342).

Conclusions

Examination of the Upper Paleolithic and Epipaleolithic sequence at Warwasi shows long-term trends, as well as differences. How these are ultimately interpreted, however, partly is influenced by how lithic artifacts are classified (e.g., if carinated burins are grouped with tools, one type

of pattern is produced, whereas if they are grouped with cores, a different pattern is evident; additionally they may be classified not as polyhedral (carinated) cores but as cores-on-flakes, e.g., Ghasidian 2014: 116-118, which also would alter the pattern). Beyond this, how a site was used, the activities that occurred there, and the degree to which mobility of the groups who occupied the site can be determined are not as simple as describing the features of a particular lithic assemblage. This is because such assemblages represent time-averaged episodes of use rather than discrete events (e.g., Barton and Riel-Salvatore 2014). As accumulations (or cumulative palimpsests: Bailey 2007), they can combine: 1) long and short term visits to a place, 2) differing sets of activities, and 3) variable pulses in how much and which artifacts were transported into and out of a place. Conversely, a cumulative palimpsest could be combining discrete events that were similar in duration, activity, and artifact transport. The point is that, except for rare instances, we cannot know which type of combination is present in the lithic assemblage we analyze because we do not know the exact composition of the lithic subsets that constitute each discrete event that occurred at the site.

The averages of the cumulative palimpsests that we deal with, however, are useful for examining diachronic changes, as well as synchronic differences, in lithic assemblage signatures. Thus, in the sequence at Warwasi, there are several major differences in cumulative palimpsest signatures between the Early Zagros Aurignacian, the Late Zagros Aurignacian, and the Zarzian (see above). Low densities versus higher densities of artifacts may inform us about how frequently Warwasi was used, just as higher (or lower) incidences of tools compared to cores may aid in understanding activities, discard, or artifact transport occurring during a block of time. This is not to say, however, that we should necessarily argue that Warwasi was a base camp during one chronological period and a task camp during another.

The synchronic value of cumulative palimpsests potentially can be seen in the comparisons between Warwasi and Yafteh Cave. Both sites have examples of cumulative palimpsest signatures that differ (the Warwasi Levels LL-CC signature is not found at Yafteh Cave; the Yafteh Cave lower and central phases signatures are not found at Warwasi) and others which are similar (Warwasi Levels Z-P and Yafteh Cave upper phase). Because there are no dates from Warwasi, the exact synchronicity of the Warwasi and Yafteh Cave palimpsests is not known.

In terms of absolute synchronicity, however, one can examine the lithic assemblages from the Upper Paleolithic site of Ghār-e Boof in the southern Zagros and compare these to Yafteh Cave. At Ghār-e Boof, radiocarbon dates place the Levels III, IIIb, and IV deposits in the 35,100 to 41,350 cal BP range (Conard and Ghasidian 2011: 45; Ghasidian 2014: 62), thus similar to the dates from the Yafteh Cave lower and central phases. The signature of the cumulative palimpsest from Ghār-e Boof has abundant twisted bladelets, including what descriptively appear to be the Roc de Combe subtype of Dufour (Ghasidian 2014: 135, 193-194). These were produced both from prismatic cores but also from cores-on-flakes (the drawings of which suggest they potentially could be called carinated elements by some researchers). Thus, compared to Yafteh Cave, there are typo-technological similarities to its upper phase, but the dates from Ghār-e Boof make this cumulative palimpsest archaeologically contemporary with Yafteh Cave's cumulative palimpsests featuring non-twisted bladelets, Dufour subtype of Dufour bladelets, and Arjeneh points. The Ghār-e Boof lithic assemblage also is defined by the presence of so-called Rostam bladelets, although it is difficult to completely determine their morphology based on the description given (Ghasidian 2014: 137); Rostam bladelets are shown in Conard and Ghasidian (2011: Fig. 9) but their highly variable morphology does not seem to warrant their placement into a distinctive tool type.

The patterning that is present in the cumulative palimpsests from sites in the Zagros Mountains region of the Middle East continues to present interpretive challenges. By considering their lithic assemblages as signatures of many accumulated activities and occupations at sites, rather than as base camps or task camps, or even longer versus shorter term visits, we can begin to unravel the histories of use of each locale. Thus, while an individual site's sequence may show a particular set of changes in patterns over time at that site (e.g., the Early Zagros to Late Zagros Aurignacian to Zarzian distinctions at Warwasi), these pattern shifts are not necessarily a chronological sequence that can be applied to other sites (for example, the shifts in patterning in the Zagros Aurignacian at Yafteh Cave are different from those of Warwasi). Moreover, at Yafteh Cave there is a dated chronological shift from non-twisted to twisted bladelets (and types of Dufour bladelets, as well as carinated elements), but the period (41,000 to 35,000 cal BP) during which the non-twisted bladelets appear at Yafteh Cave is the same dated chronological block at Ghār-e Boof in which twisted bladelets are common. Some might interpret this as meaning that the origins of twisted bladelet technologies are earlier at Ghār-e Boof, but such patterning differences equally might be interpreted as a reflection of the sets of activities at that locale (as suggested by Otte *et al*. 2011: 344). In other words, the technologies (and typologies) we define as used at a site are much more closely linked to specific tasks, discard, and transport history at that locale than they are to chronology or "culture." This should not be surprising given that modern human hunter-gatherer-foragers display great dynamism in the flexibility with which they choose strategies from within a wide array of possible options (Lombard 2012). Variability within and between sites of

the Zagros Upper Paleolithic and Epipaleolithic is one example of this flexibility.

References

Almeida, F.,
2001 Cores, Tools, or Both? Methodological Consideration for the Study of Carinated Lithic Elements: The Portuguese Case. In: Hays, M. & Thacker, P. (Eds.), *Questioning the Answers: Resolving Fundamental Problems of the Early Upper Paleolithic*, British Archaeological Reports International Series1005, Oxford, pp. 91-98.

Bailey, G.,
2007 Time Perspectives, Palimpsests and the Archaeology of Time. *Journal of Anthropological Archaeology* 26, 198-223.

Barton, C. M., D. I. Olszewski and N. R. Coinman,
1996 Beyond the Graver: Reconsidering Burin Function. *Journal of Field Archaeology* 23/1, 111-125.

Barton, C. M. and J. Riel-Salvatore,
2014 The Formation of Lithic Assemblages. *Journal of Archaeological Science* 46, 334-352.

Bordes, J.-G. and S. Shidrang,
2009 La sequence Baradostienne de Yafteh (Khorramabad, Lorestan, Iran). In: Otte, M., Biglari, F. & Jaubert, J. (Eds.), *Iran Paleolithic*, Proceedings of the XVth World Congress of the UISPP, Lisbon, Portugal, 4–9 September 2006. British Archaeological Reports International Series 1968. Archaeopress, Oxford, pp. 85-100.

2012 The Baradostian Sequence of Yafteh Cave. A Typo-Technological Lithic Analysis Based on the Hole & Flannery Collection. In: Otte, M., Shidrang, S. & Flas, E. (Eds.), *The Aurignacian of Yafteh Cave and its Context*, ERAUL 132. Université de Liège, Liège, pp. 27-39.

Braidwood, R. J., B. Howe, and C. A. Reed,
1961 The Iranian Prehistoric Project. *Science* 133, 2008-2010.

Çağatay, M. N., N. Öğretman, E. Damcı, M. Stockhecke, Ü. Sancar, K.K. Eriş, and S. Özeren,
2014 Lake Level and Climate Records of the Last 90 ka from the Northern Basin of Lake Van, Eastern Turkey. *Quaternary Science Reviews* 104, 97-116.

Conard, N. J. and E. Ghasdian,
2011 The Rostamian Cultural Group and the Taxonomy of the Iranian Upper Paleolithic. In: Conard, N.J., Drechsler, P., and Morales, A. (Eds.), *Between Sand and Sea: The Archaeology and Human Ecology of Southwestern Asia. Festschrift in Honor of Hans-Peter Uerpmann*, Kerns Verlag, Tübingen, pp. 33-52.

Dibble, H. L. and S. Holdaway,
1993 The Middle Paleolithic of Warwasi Rockshelter. In: Olszewski, D. I. & Dibble, H. L. (Eds.), *The Paleolithic Prehistory of the Zagros-Taurus*, University Museum Symposium Series, University of Pennsylvania, Philadelphia, pp. 75-99.

Ditchfield, K.,
2016 An Experimental Approach to Distinguishing Different Stone Artifact Transport Patterns from Debitage Assemblages. *Journal of Archaeological Science* 65, 44-56.

Garrard, A. N. and B. F. Byrd,
2013 *Beyond the Fertile Crescent. Late Palaeolithic and Neolithic Communities of the Jordanian Steppe*. The Azraq Basin Project, Volume 1. Oxbow Books, Oakville, CT.

Ghasidian, E.,
2014 *The Early Upper Paleolithic Occupation at Ghār-e Boof Cave. A Reconstruction of Cultural Tradition in the Southern Zagros Mountains of Iran*. Kerns Verlag, Tübingen.

Hays, M. A. and G. Lucas,
2000 A Technological and Functional Analysis of Carinates from Le Flageolet I, Dordogne, France. *Journal of Field Archaeology* 27/4, 455-465.

Hole, F.,
2012 The 1960s Excavations at Yafteh Cave. In: Otte, M., Shidrang, S. & Flas, E. (Eds.), *The Aurignacian of Yafteh Cave and its Context*, ERAUL 132. Université de Liège, Liège, pp: 11-25.

Hole, F. and K. Flannery,
1967 The Prehistory of Southwestern Iran: A Preliminary Report. *Proceedings of the Prehistoric Society* 33, 146-206.

Litt, T., N. Pickarski, G. Heumann, M. Stockhecke, and P. C. Tzedakis,
2014 A 600,000 Year Long Continental Pollen Record from Lake Van, Eastern Anatolia (Turkey). *Quaternary Science Reviews* 104, 30-41.

Lombard, M.,
2012 Thinking through the Middle Stone Age of sub-Saharan Africa. *Quaternary International* 270, 140-155.

Olszewski, D. I.,
1993a The Late Baradostian Occupation at Warwasi Rockshelter, Iran. In: Olszewski, D. I. & Dibble, H. L. (Eds.), *The Paleolithic Prehistory of the Zagros-Taurus*, University Museum Symposium Series, University of Pennsylvania, Philadelphia, pp. 187-205.

1993b The Zarzian Occupation at Warwasi Rockshelter, Iran. In: Olszewski, D. I. & Dibble, H. L. (Eds.), *The Paleolithic Prehistory of the Zagros-Taurus*, University Museum Symposium Series, University of Pennsylvania, Philadelphia, pp. 206-236.

1999 The Early Upper Paleolithic in the Zagros Mountains. In: Davies, W. & Charles, R. (Eds.), *Dorothy Garrod and the Progress of the Palaeolithic. Studies in the Prehistoric Archaeology of the Near East and Europe*, Oxbow Books, Oxford, pp. 167-180.

2001 Ruminations on the Early Upper Paleolithic and a Consideration of the Zagros Aurignacian. In: Hays, M. A. & Thacker, P. T. (Eds.), *Questioning the Answers: Re-solving Fundamental Problems of the Early Upper Paleolithic*, British Archaeological Reports International Series 1005, Oxford, pp. 79-89.

2007 Carinated Tools, Cores, and Mobility: The Zagros Aurignacian Example. In: McPherron, S. P. (Ed.), *Tools Versus Cores. Alternative Approaches to Stone Tool Analysis*, Cambridge Scholars Press, Newcastle, pp. 91-106.

2009 Whither the Aurignacian in the Middle East? Assessing the Zagros Upper Paleolithic. In: Otte, M., Biglari, F. & Jaubert, J. (Eds.), *Iran Paleolithic*, Proceedings of the XVth World Congress of the UISPP, Lisbon, Portugal, 4–9 September 2006. British Archaeological Reports International Series 1968. Archaeopress, Oxford, pp. 39-45.

2012 The Zarzian in the Context of the Epipaleolithic Middle East. *International Journal of Humanities* 19/3, 1-20.

Olszewski, D. I. and H. L. Dibble,
1994 The Zagros Aurignacian. *Current Anthropology* 35/1, 68-75.

2006 To Be or Not To Be Aurignacian: The Zagros Upper Paleolithic. In: Bar-Yosef, O. & Zilhão, J. (Eds.), *Towards a Definition of the Aurignacian*, Trabalhos de Arqueologia 45. American School of Prehistoric Research/Instituto Português de Arqueologia, Lisbon, pp: 355-373.

al-Nahar, M, and D. I. Olszewski,
2016 Early Epipaleolithic Lithics, Time Averaging, and Site Interpretations: Wadi al-Hasa Region, Western Highlands of Jordan. *Quaternary International* 396, 40-51.

Otte M., F. Biglari, D. Flas, S. Shidrang, N. Zwyns, M. Mashkour, R. Naderi, A. Mohaseb, N. Hashemi, J. Darvish, and V. Radu,
2007 The Aurignacian in the Zagros region: New Research at Yafteh Cave, Lorestan, Iran. *Antiquity* 81, 82-96.

Otte, M. and J. Kozłowski,
2007 *L'Aurignacien du Zagros*. ERAUL 118, Université de Liège, Liège.

Otte, M., S. Shidrang, N. Zwyns, and D. Flas,
2011 New Radiocarbon Dates for the Zagros Aurignacian from Yafteh Cave, Iran. *Journal of Human Evolution* 61, 340-346.

Shridrang, S.,
2015 *The Early Upper Paleolithic of Zagros: Techno-Typological Assessment of Three Baradostian Lithic Assemblages from Ghare Khar, Yafteh and Pa-Sangar in the Central Zagros, Iran*. Ph.D. thesis. University of Bordeaux I, Bordeaux.

Tsanova, T.,
2013 The Beginning of the Upper Paleolithic in the Iranian Zagros. A Taphonomic Approach and Techno-Economic Comparison of Early Baradostian Assemblages from Warwasi and Yafteh (Iran). *Journal of Human Evolution* 65, 39-64.

Zeder, M. A.
2006 A Critical Assessment of Markers of Initial Domestication in Goats (Capra hircus). In: Zeder, M. A., Bradley, D. G., Emshwiller, E. & Smith, B. D. (Eds.), *Documenting Domestication: New Genetic and Archaeological Paradigms*, University of California Press, Los Angeles, pp. 181-208.