Shanidar Cave and the Baradostian, a Zagros Aurignacian industry

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Abstract

Whilst there has been significant interest in the origins and spread of the Aurignacian industry, usually linked with the physical dispersal of anatomically modern humans into Europe, comparatively little attention has been paid to possible origins or movements further east. Recent work at Shanidar Cave, a site better known for the Neanderthal evidence discovered by Ralph Solecki in his 1951-1960 excavations, has recovered new information on the 'Baradostian' Upper Palaeolithic in Iraq. This paper reviews the regional evidence for the Baradostian as an example of the Zagros Aurignacian and discusses its place in debates about Neanderthal/Modern Human relations.

Key words: Shanidar Cave, Baradostian, Aurignacian, Neanderthal, Zagros

Introduction

The Aurignacian was the most widespread and often the earliest Upper Palaeolithic industry or technocomplex associated with modern humans across much of western Eurasia (Bar-Yosef & Zilhao 2006). In some regions the Aurignacian is separated from the Middle Palaeolithic Mousterian by technocomplexes with Upper Palaeolithic affinities including the Chatelperronian, proto-Aurignacian and Lincombian-Ranisian-Jerzmanowician. These have less certain affinities with modern humans or may be associated with Neanderthals (e.g Flas 2011; Hublin 2014; Hublin *et al*. 2012). First defined at Aurignac, France, by Breuil (1913), the Aurignacian is characterised by a diverse lithic toolkit based on flakes, blades and bladelets, the latter produced from a variety of core types that were themselves initially described as tools such as carinated and nosed endscrapers (Bourlon *et al.* 1912). There a characteristic burin form where bladelet removal was ended by the production of a notch, creating the so-called busked burin (Bar-Yosef 2006). A diagnostic retouched bladelet form was the lamelle Dufour with inverse edge retouching. The larger retouched blades could carry heavy, invasive retouching that was described as 'Aurignacian retouch' and some blades were so heavily retouched on both edges as to produce a 'waisted' or 'strangulated'

appearance. A major contrast with the preceding Mousterian was the associated bone artefact inventory, the Aurignacian having split-based bone points and double bevel-ended points along with bone, tooth and ivory pendants. The organic component was frequently absent in the Middle Eastern versions, however, and frequencies of particular tool types also varied. Early emphasis on the core-scrapers derived from the coarse recovery methods used on excavations in earlier phases of Palaeolithic research, whereas contemporary studies place far greater emphasis on the bladelet component that has been revealed by the systematic use of sediment sieving (Bar-Yosef & Zilhao 2006 and papers therein; Shidrang 2009, 2018).

The dating of key early Aurignacian sites is often still disputed, but many authors would agree that the Aurignacian technocomplex was established across western Eurasia by around 38,000 cal. BP (calibrated years before the present) (e.g. Discamps *et al*. 2015; Jacobs *et al*. 2015; Zilhao & D'Errico 2003; but see, for instance, Higham *et al*. 2012). The dating is important because, if the Aurignacian is the first technocomplex to be associated with modern humans, the pattern of dates for Aurignacian sites in western Eurasia would be expected to show earlier occupations further east reflecting the spread of modern humans westwards. The origin of the Aurignacian, therefore, is a key question to understanding modern human dispersals into and across Eurasia.

In the Levant, the picture is slightly different, not least because it is possible that several different groups of anatomically modern humans, some with Middle Palaeolithic and some with Upper Palaeolithic technology, may have been present between 55,000 and 35,000 years ago (e.g. Alex *et al.* 2017; Douka *et al.* 2013; Hershkovitz *et al*. 2015). The earliest Upper Palaeolithic may be the Emiran (although see a recent review: Barzilai & Gubenko 2018) and the Ahmarian, the latter appearing possibly as early as 48,000 cal. BP (Alex *et al.* 2017; Kadowaki *et al.* 2015). The first widely established Upper Palaeolithic technocomplex is the Levantine Aurignacian, perhaps from around 38,000 BP (Alex *et al*. 2017; Zilhao & D'Errico 2003). The latter is believed to be the product of modern human groups that, once established in the Levant, spread out into Europe (Bar-Yosef & Zilhao 2006 (and papers therein); Hublin 2014). There appears to be a time lag between the appearance of modern humans in the Levant and their subsequent spread into Europe (Bosch *et al.* 2015a, 2015b; Douka 2013; Douka *et al*. 2013, 2015; Hershkovitz et al. 2015; Hublin 2014; Zilhao & D'Errico 2003) and this may be one of the times when Neanderthals and modern humans interbred.

The position is different again to the east of the Levant, since another Upper Palaeolithic industry with clear Aurignacian affinities, the Baradostian, has been recognised

in the Zagros Mountains of Iraq and Iran, and material culture attributed to the Aurignacian has been recognised as far east as Afghanistan. The spread of modern humans into the Zagros region is poorly known and dated, but it has been suggested that the Baradostian/Aurignacian may have evolved *in situ* in this region (Ghasidian *et al*. 2007; Olszewski 2007a, 2007b; Otte 2014; Tsanova 2013; Tsanova *et al*. 2012). If this is correct, the interpretations placed upon the industrial succession in the Levant will require re-assessment, but it is not the purpose of this paper to do so. Instead, we review here the evidence for the Baradostian as an example of the Zagros Aurignacian and attempt to place the findings from the new work at Shanidar Cave into that context.

Shanidar Cave and transitional Upper Palaeolithic industries east of the Levant

The site of Shanidar Cave, in the mountains of Iraqi Kurdistan (36º50' N, 44º13' E), was excavated by Ralph Solecki between 1951 and 1960 (Solecki, 1952a, 1952b, 1953a, 1953b, 1955, 1957, 1958a, 1958b, 1960, 1963; Fig. 1). In his 14 m-deep trench he discovered a succession of stone tool industries: (from base to top) a Middle Palaeolithic flake-based industry classified as 'Mousterian' (Layer D); an Upper Palaeolithic blade-based industry termed 'Baradostian' (Layer C); an Epipalaeolithic or Mesolithic 'Zarzian' industry characterized by backed blades (Layer B2) and similar material associated with a group of burials (Layer B1); and Holocene Neolithic industries (Layer A). Radiocarbon dating of charcoal indicated that Layer D ended *c*.45,000 BP and from rates of sediment accumulation Solecki estimated a start date as perhaps *c*.100,000 BP. There appeared to be a hiatus of *c.*10,000 years between the Mousterian in Layer D and the Baradostian in Layer C (Solecki 1971: 256) as the radiocarbon dates for the latter was *c*.35,000-29,000 BP. Layer B was dated to *c.*12,000-10,500 BP and Layer A from *c.*7000 BP to recent (Solecki 1971). Most of Solecki's publications centred on the spectacular finds of the skeletal remains of a number of Neanderthals and the associated behavioural evidence for burial, care of the elderly and possible burials with flowers (Leroi-Gourhan 1975; Solecki 1975). The more recent industries were dealt with in a publication on the Proto-Neolithic cemetery (Solecki *et al.* 2005). In contrast, the Upper Palaeolithic material was rather neglected, despite Solecki writing his PhD on the Baradostian material (Solecki 1958b).

[Figure 1 about here]

When the material from Layer C was found, Solecki showed it to a number of regional specialists of the time and it was Dorothy Garrod who suggested calling it the Baradostian after the Baradost mountains where Shanidar Cave is situated (Solecki 1971: 169). It was noted from the start that the industry resembled the European and Levantine Aurignacian Upper Palaeolithic stone industries but lacked the associated bone industry such as split-based bone points. In his descriptions of the Baradostian in Shanidar Cave, Solecki noted that there was an *in situ* transition from a lower Baradostian type which included relatively frequent Mousterian tools, especially sidescrapers, to a more typically Aurignacian type with carinated scrapers, endscrapers, burins and blade-based tools including a significant number of bladelets; classic Aurignacian blades and waisted blades were lacking (Solecki 1958b). Solecki described Layer C as 10-13 feet thick, its base marked by a large rockfall amongst which was sediment in which he found occasional Baradostian-type material that "appeared to blend texturally right into the soil of Layer D" (Solecki 1971: 127). He concluded that the Mousterian elements in Layer C were a genuine part of Baradostian technology rather than being derived by sediment movement from Layer D. The first Neanderthal skull (Shanidar 1) was discovered at the boundary between Layers C and D and was at first thought to have come from from Layer C (Solecki 1971: 127) but once it was identified as Neanderthal, it was assigned to Layer D. Hence, in keeping with the views of the time, it was assumed that the Mousterian was made by Neanderthals and that the Baradostian was the first industry made by anatomically modern humans.

Until new investigations at Shanidar Cave began in 2015, the main focus of study of the materials from the cave has been the Neanderthal skeletal remains (Trinkaus 1983) and associated sediments and artefacts. Elsewhere in the region, however, subsequent work has revealed Zagros-based derivatives of both Mousterian and Aurignacian industries (Conard *et al.* 2013; Heydari-Guran 2014; Olszewski 1999; Olszewski & Dibble 1994, 2006; Otte 2010; Otte & Biglari 2004; Otte & Kozlowski 2007; Otte *et al*. 2007; Piperno 1974; Rosenberg 1985). Work at a number of sites in Iran has recovered Middle and Upper Palaeolithic materials and, at a limited number of sites, associated human remains. There are Middle Palaeolithic Mousterian industries with relatively high frequencies of points, scrapers and burins that make much less use of Levallois technique than industries described from the circum-Mediterranean region such as the Levantine Mousterian (although there is significant temporal variation in these industries too).

The Zagros Aurignacian

There have been two main groups of study of the early Upper Palaeolithic of the Zagros: those by Olszewski (1993, 1999, 2007a & b) and with Dibble (1994, 2006); and those by Otte and co-workers (Otte 2010, 2014; Otte & Biglari 2004; Otte & Kozlowski 2007, 2011; Otte *et al*. 2007, 2011).

The former were developed from excavations in Warwasi rock shelter, Iran, where the early Upper Palaeolithic collections, classified as "Early Zagros Aurignacian", comprised a mixture of Middle Palaeolithic forms such as side scrapers and truncated facetted pieces, and Upper Palaeolithic forms such as carinated endscrapers, carinated burins, Font Yves points, and lamelles Dufour associated with a reduction involving both flakes and blades. The formal tools were predominantly made on flakes (66%), with 17% on blades and 11% on bladelets. Prismatic blade cores were used but blank production was not dominated by this technology (Olszewski & Dibble 2006). These materials were overlain by a "Late Zagros Aurignacian" that lacked Middle Palaeolithic elements and was more typically Upper Palaeolithic. The tool inventory included more carinated burins, carinated endscrapers, lamelles Dufour and some Font-Yves points. The use of blade blanks was also higher, with some 26% of tools being made on blades, 14% on bladelets and 38% on flakes. Bladelet debitage was dominant, followed by that of flakes and then of blades. The authors argued that the Late Zagros Aurignacian at Warwasi Cave resembles that found in Central Europe and the Levantine Aurignacian A, and that the Early Zagros Aurignacian could be a transitional industry: an Aurignacian lithic adaptation evolving out of a Middle Palaeolithic one.

The latter suggestion is matched in the work of Otte, who has argued for a Central Asian origin of the Aurignacian (Otte 2014). Otte developed his views from new work at Yafteh Cave, Iran (Otte *et al.* 2007; Otte *et al.* 2011) and from surveys of the material from known sites in the Zagros and further east where earlier excavations had also yielded Aurignacian-like lithic collections: the Baradostian from Shanidar, collections from the Iranian sites Warwasi, Yafteh, Eshkaft-e Gavi, Pa-Sangar, Shekaft-I-Ghad-I-Barm-I-Shur and Sefid Ab (a surface collection), and Kara Kamar in Afghanistan (Otte & Biglari 2004; Otte & Kozlowski 2007; Otte *et al.* 2007). The study indicated an *in situ* transition between the Middle and Upper Palaeolithic at Warwasi, confirming the observations of Olzsewski & Dibble (2006). In the case of Eshkaft-e Gavi it was argued that there is some continuity between Middle and Upper Palaeolithic traditions, and at Yafteh that there is an internal development within the Zagros Aurignacian sequence that matches the Early/Late Zagros Aurignacian sequence observed in Warwasi (Otte *et al*. 2007).

Eshkaft-e Gavi is located in the southern Zagros mountains of Iran but Otte and Kozlowski (2007) propose the term Baradostian for its Upper Palaeolithic assemblage. The latter includes some Mousterian tools such as side-scrapers and points. The presence of Mousterian points is interesting if the recovered bladelets are meant to be armatures: had the Baradostian occupants of the site moved beyond a more generalised Middle Palaeolithic form of hunting to use different hunting technologies for different game? The rest of the Baradostian tool list at Eshkaft-e Gavi includes typical Aurignacian forms such as carinated burins and scrapers, retouched blades and Arjeneh points, the latter resembling the El Wad points found in the Levantine Aurignacian. Association of the lithic materials with human remains are few, but at Eshkaft-e Gavi there are fragmentary modern human bones that appear to have been burnt and bear cutmarks (Scott & Marean 2009). A bird bone pendant was also recovered. The main fauna hunted was gazelle, followed by caprids and cervids.

Pa-Sangar is a small cave that yielded a series of Arjeneh points and many other 'armatures'. It appears to have been a small seasonal hunting camp (Hole & Flannery 1967; Otte & Kozlowski 2007). Shekaft-I-Ghad-I-Barm-I-Shur had some Middle Palaeolithic tools in an Upper Palaeolithic context including thick blades with Aurignacian retouch, carinated burins, dihedral burins, prismatic blade cores, and some lamelles Dufour (Piperno 1974; Otte & Kozlowski 2007). The surface collection at Sefid Ab, a site on the edge of the central Iranian desert, included carinated burins, fine bladelets and some Mousterian tools, but whether the associations of Middle and Upper Palaeolithic forms are valid or simply a mixture of materials from different periods needs to be tested by excavation (Shidrang 2009).

Kara Kamar in Afghanistan is one of the easternmost expressions of the Aurignacian technocomplex. It was discovered by Coon (1957) and had two key layers. The material in the lower layer was Middle Palaeolithic with Levallois technology; that in the upper was Aurignacian but with Levallois elements in it. Bladelets were made on core and flake fragments. 'Sub-prismatic' and 'sub-conical' blade cores were recognised in the assemblage, but there is some debate as to whether there are any carinated scrapers and burins (Otte & Kozlowski 2007).

What becomes clear from the above work by Olzsewski, Dibble, Otte and others is that, when viewed from a regional perspective, the Upper Palaeolithic has a regional coherence: there is a clear Aurignacian element including carinated tools, various retouched bladelet forms and some Aurignacian blades. This designation derives from mostly small assemblages including several collected some decades ago with poor contextual information, and the admixture of earlier Mousterian materials from lower occupation layers (whether by

bioturbation or coarse excavation techniques) cannot be ruled out. Nevertheless, there does seem to be pattern of Mousterian artefacts occurring regularly with early Upper Palaeolithic materials.

Continuing work by Otte (Otte *et al*. 2007, 2011) has sought to refine our understanding of these issues and address the matter of the origin of the Aurignacian directly. The radiocarbon dates obtained from Yafteh Cave suggest that the two Baradostian phases found there date to about 42,000-36,000 cal. BP, but since these dates are on charcoal and did not use the ABOX pre-treatment method that has been demonstrated consistently to push back Late Pleistocene ^{14}C dates by several thousand years (Higham 2011; Higham *et al*. 2009), they can be regarded as at best minimum ages. The use of ABOX dating at Kobeh Cave, Kaldar Cave and Ghār-e Boof in Iran combined with Bayesian modelling dates the start of their Upper Palaeolithic levels to around 45,000-40,000 cal. BP (Becerra-Valdivia *et al*. 2017). The Yafteh Aurignacian is likely to be contemporary with or predate the Ahmarian in the Levant dated from *c*.46,000 cal. BP at Manot Cave (Alex *et al*. 2017), with only Kebara Layers IIIa, IIIb, and IVb and IV/V (Bar-Yosef *et al*. 1996), Qafzeh Level 9 (Bar-Yosef & Belfer-Cohen 2004) and Boker A (Monigal 2003) seeming to provide older results. The authors suggest that the Lower Baradostian at Yafteh is similar to the Early Ahmarian and the Upper Baradostian to the Levantine Aurignacian (whilst noting some typological differences), leading to their conclusion that the Aurignacian technocomplex had its origins in the region, more specifically on the Central Asian plateau, an area they regard as providing a "demographic reservoir" for modern humans prior to the spread of the Aurignacian across Europe (Otte *et al*. 2011).

A contrasting view is presented by Ghasidian *et al*. (2017) based on a techno-typological study of the lithics from the cave of Ghār-e Boof and comparisons with materials from Shanidar, Warwasi and Yafteh. They argue that, far from there being a coherent pattern of *in situ* development, the record shows multiple technological traditions instead of a single one. They suggest that a model that reflects a mosaic pattern for the evolution of the early Upper Palaeolithic in the Zagros Mountains would better fit with the increasing evidence for a chronologically deep and spatially complex process of the spread of modern human populations over Southwest Asia (Ghasidian *et al*. 2017: 47). In this paper they also introduce a new label for the early Upper Palaeolithic industry: the Rostamian.

Shidrang (2018), however, criticises this work, saying that they are comparing a Late Baradostian at Ghār-e Boof with early, flake-based, versions of the Baradostian elsewhere. She points to similarities between some of the core and reduction characteristics shared

between these assemblages. She does not accept a straightforward *in situ* evolution of the Aurignacian from the Mousterian, questioning how a switch from hard to soft hammer reduction would take place with both being present in the same layer. She argues that there are indications at Warwasi of a mixture between the layers containing the industries of two different periods. Most significantly she also says that "mixture could even be two different groups of people – Neanderthals and Modern Humans – using their own technologies at the site in closely timed stays" (Shidrang 2018: 151; see also Bordes & Shidrang 2009). In summarising the technological sequence of the Baradostian, she links the appearance of the Early Baradostian in the Zagros to the same agents as those involved in the appearance of the Early Ahmarian in the Levant and the Proto-Aurignacian in Europe (Shidrang 2018; Shidrang *et al.* 2016). Tsanova (2013) reaches a similar conclusion and suggests there may have been some acculturation of populations using Mousterian technologies with incoming groups of modern humans using Upper Palaeolithic technologies.

In short, the debates in the recent literature about the Zagros Baradostian indicate that matters are far from settled. There is a clear assemblage form that all authors recognise as linked to the Levantine and European Aurignacian comprising flake, blade and bladelet reduction strategies that produce retouched bladelet forms described as Arjeneh points and Lamelles Dufour, accompanied by carinated burins and scrapers, the latter probably also serving as cores for bladelets. The assemblages are usually relatively small and made on local materials, especially river pebbles. Where fauna has been recovered and is described, it is also local and in the few cases where comparison is possible, it shows little change in hunting strategies through time. This consistency also stretches back into the Middle Palaeolithic (Bazgir *et al*. 2017). Most sites are described as small hunting stations of short duration. There is certainly a predominance of artefacts associated with hunting such as flake- and blade-based points and microlithic armatures. Many of the retouched bladelet forms at Yafteh have impact fractures (Bordes & Shidrang 2009). Yafteh was also used for hide working and, on the evidence of colouring materials, bone artefacts, and perforated teeth and mollusc shells, for ornament making (Shidrang 2018). There is one view that sees the Baradostian as an *in situ* development from local Mousterian traditions that gave rise to the Aurignacian technocomplex, but the evidence for this, especially the chronological control, remains slight (Ghasidian *et al.* 2017; Shidrang *et al.* 2016).

The question of association with a particular form of human has been explored. At Eshkaft-e Gavi cave ten hominin specimens were recovered: a mandibular molar, four cranial fragments, a clavicular diaphysis, the proximal half of a metacarpal, a fragment of os coxa,

the proximal diaphysis of a juvenile femur, and a patella (Scott & Marean 2009). The fact that some of this material shows cut marks and burning has been used to suggest cannibalism and ritual treatment of human remains, but this should be excluded from the repertoire of Baradostian behaviour pending better contextual and chronological data: the bulk of the material is probably Epipalaeolithic in date and has been conflated with the Baradostian. Trinkaus and Biglari (2006) reported a Neanderthal radius fragment from Bisitun and there is a modern human molar from Warwasi's lower Baradostian levels (Scott & Marean 2009; Tsanova 2013). Scott and Marean (2009) posited that the Zagros and its late surviving Neanderthal groups could have formed a barrier to incoming modern human populations from Africa.

New excavations in Shanidar Cave

New work began in 2015 at Shanidar Cave to explore the adaptations and extinction of Neanderthals at the site (Barker 2017; Pomeroy *et al.* 2017; Reynolds *et al.* 2015). In order to investigate the Mousterian sediments of Solecki's Layer D, new excavations have been made that have exposed the Baradostian Layer C (Fig. 2). The excavations are not large and little new lithic material has been recovered, but the latter confirm descriptions of the Baradostian found by the previous excavations at the site. The full description and analysis of the new material are in preparation, but the preliminary study shows that there is a series of carinated tools, both scrapers and burins, many of them made on flakes or flake fragments (Fig. 3). There is a high proportion of bladelets and knapping debris. Solecki (1971) reported that the Baradostian layer was the most impoverished in terms of the amount of lithic material recovered and the work thus far would support this, although the use of intensive recovery techniques using water flotation to collect all materials greater than 2 mm has resulted in an assemblage dominated by microdebris and microdebitage showing a background human presence. Of the *c.*1500 pieces recovered from excavation units that are the equivalent of Layer C, only 10% are larger than a maximum dimension of 100 mm. There was clearly a limited amount of retouching and reworking of lithic materials at the site. Raw materials are mostly local river pebbles but there is a small amount of both black and green obsidian that derives from sources in eastern Turkey around the Lake Van area. Preliminary ^{14}C dates from the Oxford Radiocarbon Laboratory place the main Baradostian levels that we have exposed at *c.*42,000-35,000 cal. BP.

[Figures 2 and 3 about here]

The levels investigated by the present project are at the base of Solecki's Layer C at its junction with Layer D. This is where (Solecki 1971: 256) thought there was a hiatus based upon the ^{14}C dates. We have not identified an obvious break in the sedimentary succession, although the zone of contact between Layers C and D has been heavily disturbed by rock fall. Some of the Neanderthal remains were presumed by Solecki to have been placed within the fallen stones and Shanidar Neanderthals 1 and 5 are close to or at the transition between Layers C and D. In the Layer C sediments that we have investigated are a number of small (under 30 cm diameter) scooped ash-filled hollows, some with charcoal and burnt bone in them, that probably represent the remains of hearths. Initial pollen and molluscan analysis suggests that the environment at the time of occupation was steppeland. Fauna hunted include ibex and tortoise. Fish scales indicate the capture of river fish presumably from the Greater Zab river (about 3 km below the site). Examination of the organic materials from the Baradostian sediments at the base of Layer C has identified a fragment of landsnail shell with incised lines on it (Hunt *et al.* 2017), complementing the evidence from Yafteh for Baradostian craftworking (Shidrang 2018).

Conclusion

The picture of the Baradostian phase developing from the new work at Shanidar Cave is of a sequence of small scale occupations by low numbers of people using the site as a base for hunting and for retooling hunting equipment, though the fragment of incised shell suggests that there was more to life in the cave than just the food quest. They used a recognisably Upper Palaeolithic lithic technology, but Mousterian elements were also present. The evidence fits well with the image from other Baradostian sites in the Zagros region of a population using small logistically organised groups to hunt (and in the case of Shanidar Cave, fish).

Given the likely sporadic and seasonal nature of the Baradostian occupations at Shanidar Cave, and the exiguous nature of the material culture transported to it, it is unlikely that the site will provide detailed direct evidence of the nature of the transition from the Middle Palaeolithic to the Upper Palaeolithic, and for the origins of the Aurignacian technocomplex. The possibility of a hiatus in occupation at the key point in time makes this equally unlikely. Perhaps the most likely scenario is of a demographic mosaic, with populations of both Neanderthals and modern humans coming to the cave within an

overlapping timeframe, but the lithic evidence at Shanidar Cave is unlikely to have sufficient resolution to determine contemporary activities. On a regional basis, the record is similarly limited: there are general patterns in lithic techno-typology that define a distinctive Baradostian/Zagros Aurignacian phase, but there are significant challenges to clarifying its origins, chronology, and hominin associations. The consistent use of ABOX or similar pre-treatment methods for AMS dating charcoal and of ultrafiltration techniques for bone is clearly one essential component of a robust regional chronology. However, the sedimentary complexities of deeply stratified human occupation sites such as Shanidar Cave typically result in a range of dates from each layer and it is a matter of judgement for investigators which might be recycled, intrusive, or genuinely date the age of the sediments and associated human occupation evidence; the youngest dates for a particular sedimentary unit are usually likely to be the most reliable. Establishing who are the makers of particular lithic assemblages at particular sites is an even greater challenge, with sedimentary aDNA offering significant potential (Slon *et al.* 2017) alongside future discoveries, no doubt rare, of further hominin fossils.

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Captions to the Figures

Figure 1. *The Zagros regions, showing the principal archaeological sites mentioned in the text, with the locations of the Levantine sites mentioned and Kara Kamar in Afghanistan indicated in the inset map: 1.Kebara, Manot Cave, Qafzeh; 2. Boker A; 3. Shanidar cave; 4. Bisitun, Kobeh Cave, Warwasi; 5. Kaldar cave, Pa Sangar, Yafteh Cave; 6. Sefid-Ab; 7. Ghār-e Boof; 8. Eshkaft-e Gavi; 9. Shekaft-I-Ghad-I-Barm-I-Shur; 10. Kara Kamar.*

Figure 2. *The new excavations in Shanidar Cave, showing the exposure of Solecki's Baradostian Layer C over the Mousterian Layer D. The two 2 m scales mark (left) the approximate location of the Shanidar 1 burial and (right) the location of the Shanidar 5 burial. These burials were in the interface zone between Layers C and D. One of the Baradostian hearths is visible just above the top of the left-hand scale. (Photograph: Graeme Barker.)*

Figure 3. *A series of formal tools retrieved from the new excavations in Shanidar Cave, from stratigraphic units equivalent to the base of Solecki's* Baradostian *Layer C: (top) multiple burin on a flake fragment; (middle row, left to right) two multiple burins on flake fragments; (bottom row, left to right) multiple burin on a plunged flake-blade, single burin on a flake and an endscraper on a distal blade fragment. (Illustrations: Tim Reynolds.)*