DMP VI: Preliminary results from 2009 fieldwork on the human prehistory of the Libyan Sahara

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Abstract
This paper reports on the work carried out during the 2009 field season of the prehistory sub-theme of the Desert Migrations Project. The work consisted of detailed survey and small-scale excavations in two wadis that drain the Messak Settafet, near the town of Jarma. Both wadis were found to contain evidence of Palaeolithic and Neolithic occupation, as well as of having been used as migratory routes between the Ubani and Murzuq sand seas. One of the wadis (WJAR-E-O1) was surveyed intensely along a few kilometers of its tributary margins. This revealed archaeological material ranging from Oldowan (Mode 1) to historic. The distribution of the various industries and structures had a distinct spatial patterning; the Palaeolithic scatters were spatially discrete, but Holocene remains were often found superimposed on earlier industries. Among the finds were a spatially discrete Oldowan assemblage, an extensive Acheulean industry which included the exploitation of fossil wood as raw material, the identification of at least five major outcrops of fossil trees, and a number of more recent structures dating from Neolithic to Islamic times and consisting of graves, cairns, rock engravings, and stone features. Middle Stone Age lithics, so predominant over the surface of the Messak plateau, were absent. The second wadi (WJAR-W-02) was geomorphologically different, being comparatively narrow and deeply incised, and containing a number of terraces on the wadi bed resulting from cut and infill processes in the past. The surface of these terraces contained an extensive Aterian lithic industry, while evidence of late Holocene use of the area was also recorded in the form of Tifinagh inscriptions, rock engravings, cairns and graves. Besides mapping the archaeological distributions, a number of trenches were dug at the edge of the river terraces. These revealed an in situ stratigraphic sequence, within which Aterian lithics were found at a depth of >1 m. Samples for OSL dating were taken. Overall, the work of the 2009 field season was extremely successful in that, besides the fascinating range of archaeological material recorded and studied, it provided important insights into the role of the north-south wadis that cross the Messak, the southern boundary of the area being explored by the DMP, and their differential use in prehistory.

Introduction
The Desert Migrations Project (DMP) began field investigations in 2007. The aims of the overall project are to explore the archaeology, prehistory and palaeoenvironments of the Fazzan region of southern Libya. The context for this is evaluating the extent to which the population history of this region reflects a pattern of human migrations and dispersals that link northern and sub-Saharan Africa. The project has three sub-themes, which carry out related fieldwork. The first theme is focused on the history of the Garamantes, in terms of their origins, economic and social development and how their settlement patterns relate to changes in environment and climate (see Mattingly et al. 2007, 2008 and 2009 for details). The second theme is concerned with the deeper prehistory of the Fezzan; over the course of the Pleistocene and Holocene hominins, both archaic and modern, dispersed into and occupied the region, and played a critical role in the overall patterns of African human evolution (see Mattingly et al. 2007, Mirazón Lahr et al. 2008). The third theme is concerned with the palaeoenvironemntal history of the region, and in particular the changes in lakes and rivers across the glacial cycles (see Armitage et al. 2007; Mattingly et al. 2007; Mirazón Lahr et al. 2008). These changes in water availability and distribution form the essential environmental background for both archaeological projects.
This paper reports on the third field season of the early prehistory sub-project. In the 2007 and 2008 seasons, field survey was carried out along the northern edges of the Ubari sand sea, and to a lesser extent across some of the interdunal corridors. The fieldwork included both archaeological and palaeoenvironmental investigations. The preliminary results indicated periods of considerably greater wetness and extensive lakes, and hominin occupation across much of the Pleistocene. Mode 1 (Oldowan), Mode 2 (Acheulean) and Mode 3 (Middle Stone Age) lithics were found extensively. Preliminary results suggest that hominin colonization of the central Sahara may have been early (on the basis of technological evidence), but that the occupation was either sparse or temporary (or most probably both) until the Middle Pleistocene. There also appear to have been differences in the record in the interdunal depressions and the sand sea margins, with the former being predominantly occupied during more recent periods (Mattingly et al. 2007; Mirazón Lahr et al. 2008).

The aim of the third season of the Human Prehistory mission of the Desert Migrations Project was to continue mapping the spatial and temporal extent of hominin occupation of the Fazzan during the Pleistocene and Holocene. Attention shifted to the Messak, a very pronounced feature in the region consisting of an uplifted Mesozoic formation of sedimentary rocks that separates the Ubari and Murzuq sand seas. The sedimentary history of the wadis that cut through it, draining towards the south, has been a focus of both settlement and communication over very long periods of time, while the Messak itself is the primary lithic raw material source for the region. In addition, it was hoped that the wadis, with both funerary monuments and sedimentary sequences, would offer the opportunity to recover organic material and also dating samples, and in particular to focus on developing a better understanding of the chronology.

To achieve these aims, the following work was carried out:

1. A detailed survey and selective excavations in a part of the Wadi WJAR-E-01.

2. Surface collection, excavation and preliminary geomorphological mapping of a small portion of Wadi WJAR-W-02
The areas were selected on the basis of previous investigations, and because they offered contrasting environments and geographical contexts. However, in contrast to previous seasons, all work occurred within a relatively small area, close to the Wadi al Ajal, around the town of Jarma. All material collected was deposited in the Museum of Jarma.

As for the 2007 and 2008 seasons, the fieldwork included a large portion of off-site archaeological surveys (Foley, 1981), surface collections of 2 m by 2 m samples of lithic assemblages, as well as of general surface diagnostic lithic material and geological sampling for dating purposes. However, differently from previous field seasons, the work also included four small excavations – three of Holocene cairns along the WJAR-E-01, and one of a river terrace in a more protected branch of Wadi WJAR-W-02, to the west of the Jarma-Barjuj road. The work was structured into three phases: (a) detailed archaeological survey of a portion of the broad WJAR-E-01 wadi channel just east of the Jarma-Barjuj road, including excavation of two Holocene cairns and one structure; (b) archaeological survey of a small area of a branch of Wadi WJAR-E-01 to the west of the Jarma-Barjuj road, including excavation of a small area of a river terrace; and (c) lithic analysis at the Museum of Jarma.

**Major wadis of the Messak Sattafat near Jarma**

The Messak massif is cut by a number of wadis that slope towards the south. In the area south of Jarma, where the Messak is relatively narrow, the gullies and channels that feed the larger dip-slope wadis cut through more than half the north-south extent of the escarpment, and would have been important in prehistory as (1) access routes to the plateau (and eventually to the Wadi al Ajal itself), (2) access to exposures of raw material for stone artefacts, and (3) potential areas for hunting near water. The wadis form the major geomorphological and topographical features of the Messak, and their watersheds provide a basis for any sub-division that is possible in an otherwise featureless landscape.
Although some of the wadi systems have local names, these are variable in usage, and are not universally known. For the purposes of this project we have devised a system of nomenclature for the wadi systems in the vicinity of Jarma, on the Messak. Although arbitrary in nature, it provides a systematic means of description, and also will form the basis for further regional analysis.

The Jarma-Barjuj road provides an easily definable point on the landscape, running north to south. The wadi systems have been named in relation to this. Those to the east have been labeled WJAR-E-, in numerical sequence, and those to the west, WJAR-W- in sequence. The drainage systems and stream sequences of these have been mapped using ArcGIS. Figure 1 shows the wadis close to the Jarma-Barjuj road, and the location of those surveyed this year.

**Prehistory of Messak Sattafat Wadi WJAR-E-01**

The 2009 DMP-Palaeoanthropology group focused part of its fieldwork on exploring a portion of the wadi that lies immediately to the east of the Jarma-Barju road (WJAR-E-01). This channel runs north-north-west to south-south-east, approximately parallel to the road that links Jarma to the Wadi Barjuj agricultural project. Its source lies only ~800 m from the northern margin of the escarpment, cutting through the Messak for ~21 km and into the flattish slopes north of Barjuj (Fig. 2). The wadi as a whole is distinctive in having a long and wide channel over an extensive distance, so that it is easily traversable. It is flanked by a number of side wadis or tributaries. There is a major bifurcation or confluence, with two large source streams, thus

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**Figure 3.** Detail of survey area of WJAR-E-01, showing the location of the archaeological localities described in the text (MES50 to MES60) (background image: Google Earth).

**Figure 4.** Locality MES-50. The dark area is the inselberg, and the archaeological material primarily distributed to the south (background image: Google Earth).
enhancing the open and relatively flat nature of the discharge into the Wadi Barjuj. The area selected for survey represents the interface between the more open discharge floodplains and the southern Messak scarps and gullies. The work concentrated within an area of 527,643 m² of interfluves and gullies (Fig. 3).

The area surveyed included a number of different geomorphological formations and landscapes – from the wadi bed, to inselbergs on the wadi floor, to fluvial terraces formed by meandering channels, to gently sloping terraces, to the steep scarps that formed the wadi edges, to the flat surface of the Hamada. With the varying volume of water and position of channels through time, these geomorphological landscapes would have been optimal for hominin occupation and use at different times.

The surveys carried out found evidence of hominin presence from all periods in prehistory – Oldowan, Acheulean, Middle Stone Age, Pastoral-Neolithic, Garamantian and historical. In other words, the wadi margins were probably used for over a million years as a north-south route across the Messak and as temporary hunting and gathering grounds.

Although contiguous, the survey area was divided into a number of localities (all prefixed with the overall locality label MES). These were defined in terms of their dominant geomorphological characteristics, although there is a level of arbitrariness in this; ultimately this is a single landscape used by human populations. Table 1 summarises the localities, 11 in all (MES50 to MES60). Central GPS points for each of these localities are listed, as are the main archaeological attributes (see also Fig. 3).
The main results for each locality are summarised below:

**MES50**: this locality consists of an inselberg on the western margin of the main wadi channel and its immediate surrounding area (Fig. 4). The inselberg is relatively small (79 m long and 33 m wide, with a perimeter of 194 m, and an area of 2,220 m²), but forms a distinctive feature in the landscape. The slope is steep, becoming almost vertical towards the top. The upper walls contain a large number of rock engravings, displaying a range of animals, some with riders, and inscriptions (Fig. 5). Surrounding the inselberg, and extending as much as 50 m from it, there is a relatively flat terrace with evidence of human occupation at high density (Fig. 5). The surface archeology included cairns, stone circles (Fig. 6), lithic artefacts (mainly of Holocene hunter-gatherer and Pastoral age, but including a few older pieces), grinding tools and pottery. Among the latter, a nearly complete lid of a Garamantian pot shows continuity of occupation up to the recent past. The total record and substantial collection was made with 3D co-ordinates, allowing the reconstruction of activity areas around the inselberg.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Lat N (deg.omin)</th>
<th>Long E (deg.omin)</th>
<th>Altitude (m a.s.l.)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES50</td>
<td>26°27.097’N</td>
<td>13°07.000’E</td>
<td>565</td>
<td>Inselberg on wadi floor</td>
</tr>
<tr>
<td>MES51</td>
<td>26°27.109’N</td>
<td>13°07.119’E</td>
<td>560–574</td>
<td>Wadi margin and steep slopes to Hamada surface of Messak</td>
</tr>
<tr>
<td>MES52</td>
<td>26°27.130’N</td>
<td>13°06.778’E</td>
<td>560–580</td>
<td>Dissected channels and interfl uves on low-lying wadi margins</td>
</tr>
<tr>
<td>MES53</td>
<td>26°27.201’N</td>
<td>13°06.976’E</td>
<td>564</td>
<td>Wadi floor</td>
</tr>
<tr>
<td>MES54</td>
<td>26°27.269’N</td>
<td>13°07.113’E</td>
<td>570–603</td>
<td>Dissected channel running steeply off Messak into main wadi</td>
</tr>
<tr>
<td>MES55</td>
<td>26°27.334’N</td>
<td>13°06.783’E</td>
<td>570–606</td>
<td>Wadi margin and slopes to Hamada surface of Messak</td>
</tr>
<tr>
<td>MES56</td>
<td>26°27.374’N</td>
<td>13°07.103’E</td>
<td>581–597</td>
<td>Flat Hamada top of Messak, with boulder, cobble surface</td>
</tr>
<tr>
<td>MES57</td>
<td>26°27.424’N</td>
<td>13°06.913’E</td>
<td>560–586</td>
<td>Wadi margin and slopes to Hamada surface of Messak</td>
</tr>
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<td>MES58</td>
<td>26°27.585’N</td>
<td>13°07.088’E</td>
<td>570–581</td>
<td>Narrow source channel with dense boulder channels and interfl uves</td>
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<tr>
<td>MES59</td>
<td>26°27.284’N</td>
<td>13°06.921’E</td>
<td>586</td>
<td>Flat Hamada top of Messak, with boulder, cobble surface</td>
</tr>
<tr>
<td>MES60</td>
<td>26°27.505’N</td>
<td>13°06.978’E</td>
<td>572–587</td>
<td>Narrow gully feeding main channel</td>
</tr>
</tbody>
</table>

Table 1. List of localities surveyed in the first wadi, with central GPS points, information as to the nature of the study, main chronological affinities of findings, and information about particular aspects of Holocene occupation (presence or absence of rock art, grinding tools, pottery, hearths, cairns, structures and Islamic burials).
This locality is the eastern margin and escarpment slope of a main branch of Wadi WJARE-01 (Fig. 7). It is an area extremely rich in archaeological finds, derived from a range of periods: there are a number of cairns of various periods, as well as Islamic tombs (Fig. 8 a, b and c). The Islamic tombs are found in the middle of the channel, whereas the older cairns are all located on the lower edge of the escarpment slope. Two rock art panels, one of which depicted a milking cow, were also found (Fig. 8 d). Scatters of lithic artefacts were found all along the slope terraces. These were predominantly from the Holocene occupation periods (microliths and grinding tools). However, there was also a patch of very weathered, large flaked cobbles, of Oldowan (Mode 1) affinities. This was particularly concentrated near a gully draining from the escarpment.

Table 1. List of localities surveyed in the first wadi, with central GPS points, information as to the nature of the study, main chronological affinities of findings, and information about particular aspects of Holocene occupation (presence or absence of rock art, grinding tools, pottery, hearths, cairns, structures and Islamic burials). (cont.)
Figure 8. Examples of features observed in Locality MES52: A) cairn; B) stone circle and structure, with visible tracks leading to it; C) set of Islamic tombs on wadi channel; and D) rock engraving picturing a suckling cow and calf.

Figure 9. Areas surveyed in Locality MES52, and main distribution of primary archaeological assemblages (background image: Google Earth).
to the east, and surveys of the escarpment top showed them to have deflated or been washed down from the Messak surface.

The cairn pictured in Figure 8a was excavated to investigate the existence of any surviving remains in spite of its apparent disturbance. A 2 m by 1 m trench was opened, and excavated following the natural stratigraphy of the landscape. The bottom levels were: SE 774 cm, SW 542 cm, NW 341 cm and NE 555 cm. Sediment colour did not vary significantly from bottom to top (5YR 6/6 Yellowish Red, 2.5YR 5/6 Red and 5YR 5/6 Reddish Yellow). Although all of the excavated sediment was screened (mesh size 4 mm and 2 mm), no remains (material or human) were found and there was no clear evidence of an underground chamber.

**MES52**: this is a complex locality, encompassing a number of geomorphological formations and archaeological assemblages (Fig. 9).

The most outstanding natural feature at this locality was the presence of two exposed large trunks of fossil wood (Fig. 10), which had been extensively used as a source of raw material in prehistory. The nature of the lithic material and spatial features (cairns, circles) indicate that the area was intensely used during the Acheulean and the Holocene. Accordingly, a very large number of finely made handaxes and other Early Stone Age tools, as well as microliths (rare), grinding tools, a trapping stone, stone circles and a cairn were found (Fig. 11). The areas of intense Acheulean scatters contained a large number of small logs of fossil wood (up to 1m in length) that had been broken off the fossil tree trunks, and transported to various points on the terraces, including at the very foot of the escarpment. Hundreds of artefacts made of fossil wood were found, both in association with the transported logs (including refitting pieces) and in isolation. Analysis of these showed that both Acheulean hominins and Holocene humans made such artefacts.

The cairn found was relatively small, approximately 3 m by 2.50 m, and was undisturbed. The 5 m by 3 m trench exposed a 1 m longitudinal section of stratified sediments that showed clearly that the cairn had been built on the surface of the wadi. The lack of any remains (material or human), in spite of screening all of the excavated sediment (mesh size 4 mm and 2 mm), and...
the presence of many laminar white sandstone slabs forming horizontal layers in the sediment dismissed the possibility of this structure having been constructed over a pit.

MES53: was defined as a small area at the confluence of two branches of the wadi, although is would be probably part of a larger area in future survey work. The key features in this area are two isolated Islamic tombs found in the main wadi channel. These were found side by side, aligned towards the north, and marked by standing head and foot stones (Fig. 12). The location of the tombs is consistent with the probability that more recent burials are more likely to be found in the wadi itself.

MES54: this locality consists of a gully cut from the escarpment (Messak Hamada) top, falling steeply to the fluvial terrace, fed by a number of tributaries and gullies, and discharging into the main wadi. In effect it forms a small enclosed side valley (Fig. 13). At the edge of the escarpment to the west of the gully, another trunk of fossil wood outcrops from just beneath the uppermost sandstone layers (Fig. 14). As in MES52, this was used as raw material in prehistory, and fossil wood logs and artefacts are found downslope for some 20 m. An extensive assemblage of Mode 1 Oldowan artefacts was identified in a restricted area at the end of the side valley – this consisted of large flaked cobbles, cores and flakes (Fig. 14), similar to those found at the top of the adjacent escarpment (locality MES56) and downslope of MES51 at the opposite side. The artefacts were extremely worn and eroded.
MES55: this area was briefly surveyed, mainly for the purpose of investigating whether the exposed fossil wood trunk (visible from across the wadi) had also been used as a source of raw material. This was indeed the case, with further evidence of the use of fossil wood fragments for the production of artefacts during Acheulean times by the finding of a number of bifacially flaked pieces. Given the extent of use of fossil wood as raw material, the number of outcrops of fossil tree trunks (Figs 15 and 16) must have made this area of the wadi extremely attractive during parts of the Pleistocene. In the area surrounding the fossil wood there were numerous lithics, including handaxes, while
Figure 15. Distribution of natural ‘outcrops’ of fossil wood trunks in the area surveyed (background image: Google Earth).

Figure 16. Fossil tree trunk at Locality MES55 (A) and bifacially flaked artefact made of fossil wood (B).

Figure 17. Stone structure and cairns at Locality MES55.

Figure 18. View of Locality MES56, with extensive Oldowan lithic scatter.
the outcrops on the escarpment edge had been quarried extensively. A number of stone features were also present, from cairns, to stone circles and an oblong structure defined by neatly placed stones (Fig. 17).

**MES56:** as part of the investigations into the potential Oldowan (Mode 1) presence in the region, further work was carried out on the Messak plateau between localities MES51 and MES54, where the material had been found. The work had two aims: to identify any potential raw material sources in the vicinity, and to see whether the Messak top was the source for the material on the lower slopes.

An area of 80 m by 100 m was intensively surveyed using a transect method (4 m by 100 m transects with 4 m by 4 m sampling every 10 m). Data for the construction of a density map of the lithics of the areas was collected. Preliminary observations suggest both that the Oldowan-style material extends to the top of the Messak, and that it occurs in high densities (Fig. 18) and probably in association with some raw material. The very high level of aeolian abrasion on both the artefacts and the outcrops means that it is often difficult to quantify their extent with the highest order of confidence, but progress was made towards separating natural from material of hominin origin.

**MES57:** this locality represents the western side of the channel of which MES51 is the eastern. As in the case of the MES51, MES57 was surveyed along the terraces that slope from the escarpment edge towards the wadi. Lithic scatters were comparatively rare, but the area was rich in Holocene structures. Two of these were investigated further – a group of two cairns and rock overhangs in the embayment formed by a small gully towards the northern end of the area surveyed, and a complex cairn at the edge of the present-day channel.

The first of these consists of a small area (Fig. 19) in which a number of structures are present – at least two cairns, one of which is relatively large, one large circular structure (~5m diameter) with a wall of stones, and stone circles near the very edge of the channel. The larger of the cairns was built against a very large isolated boulder sitting on the terrace slope, and shows signs of having been disturbed. Nevertheless, a few fragments of basketry and rope were still visible inside from the opening at the top, suggesting a recent date for its use (and probably construction). The area also contains a number of small overhangs (formed by the wind erosion of exposed sandstone sediments) along the edge of a low scarp. These were used as rock shelters in the past, as shown by small lithic scatters on the sandy surface inside and rock art. The rock art is not extensive, but decorates the edge of the largest of the rock shelters; engravings were also found on large rocks near the edge of the escarpment. Decorated pottery sherds were scattered near one of the cairns (Fig. 20).
The second feature from area MES57 investigated in greater detail was the complex structure at the southern end of the area (Fig. 21a and b). This was a relatively small pile of stones, placed within a low square wall built of a single layer of rocks (160 cm in length). This was surrounded by a neatly constructed outer ring of stones made of three concentric stone circles (diameter of the external ring, 5 m). The entire area was cleaned, and the outer ring shown to be only one stone-layer deep. A small excavation was carried out at one corner of the inner square to investigate the depth of the central structure. A 60 cm by 50 cm by 50 cm trench was opened (all of the excavated sediment was screened with mesh size 4 mm and 2 mm), but no underground chamber was found.
This surface structure was also shown to be only one stone deep, and sitting on the terrace bed (Figs 21c and d). Thus the structure does not appear to be funerary.

**MES58**: in order to investigate whether a different pattern of occupation was to be observed away from the main wadi channel, one of the feeding branches of the wadi system was followed upstream (the branch to the northeast of Localities MES51 and 57. The wadi narrows considerably at this point, measuring between 30 and 40 m across. Several recent channels cut through terraces (or ancient slopes), exposing non-patinated artefacts in great concentration. The surface of the terraces is covered by a very dense scatter of artefacts, largely of Middle Stone Age affinity (Fig. 22). This is extremely interesting, as almost no Middle Stone Age artefacts were found elsewhere in the area, except for a restricted area at the edge of MES56, suggesting that Middle Stone Age hominins preferred to use the higher streams and gullies, and the top of the Messak plateau, instead of the wider lower wadi margins (or perhaps these areas were not available at the time). A 1m² trench was excavated on a small terrace at the intersection of two smaller branches, but no artefacts were found in situ.
MES59: only a small area of the escarpment top to the west of MES57 was surveyed, from the road cutting to the end of the escarpment to the south. Unlike MES56, lithics were rare but include artefacts made of fossil wood. However, the rocky outcrops at the very edge of the scarp were quarried in prehistory (Fig. 23), and the immediate area has scatters of primary debitage. The steep slope from the tip of the plateau to the south (just north of MES53) has a small number of rock-art panels, as well as two overhangs used as rock shelters and at least one circular structure.

MES60: this is a small gully with steep rocky slopes at the northern end of the channel of localities MES51 and 57 (Fig. 24a). A number of sandstone outcrops high up on the slopes have been eroded to form overhangs, similar to those observed in MES57. These contain evidence of use as rock shelters in the form of walls and a small amount of lithic debitage on their surface (Fig. 24b). One of these was clearly used as a burial, the entrance of which was probably covered by large tabular pieces of rock, forming a cairn-like structure against the wall (Fig. 24c). This burial was disturbed, and most of the rocks that covered it are now scattered. Inside, a clear sandy pit is visible. Examination of the latter produced two small fragments of human long bone at the very end of the pit, the only remaining bits of the skeleton.

The work carried out in WJAR-E-01 shows that the archaeological record preserved in the Mesak wadis is potentially enormous. WJAR-E-01 has an extent from source to discharge into the Wadi Barjuj of about 16 km; it is unusual among the Messak wadis in the Jarma region in having a relatively small network of tributaries in the Messak, but a broad wide channel. Given that the wadi system as a whole covers some 800 km², this year’s survey accounted for around 6% of it. Despite this, it yielded a sizeable number of recent stone structures, as well as very extensive lithic scatters. All of this indicates that WJAR-E-01 was, on many occasions in the past, an important focus of activity.

The evidence accumulated this year highlights the following major conclusions:

1. The lower slopes of the wadi channel and the channel surfaces themselves indicate that throughout the Holocene, including into the recent past, the area was used by human populations not just for economic and subsistence activities, but also as locations for ceremonial, ritual and symbolic activities – for example, rock engravings, funerary monuments and stone structures. It is a reasonable hypothesis, to be tested in the future, that the wadi’s location and topography as a major communication system led to its development as a landscape on which many markers of activity were deliberately left.

2. In addition to the stone structures, the work carried out at MES50 (the inselberg), where there is a high density of lithics, pottery and grinding stones, suggests that where the shelter or topography was suitable, encampments of both hunter-gatherers and pastoralists occurred. The MES50 is a very noticeable and distinctive element of the wadi geography.

3. Compared to other parts of the Messak, there is relatively little activity from the Middle Stone Age, and indeed from later Pleistocene periods more generally.

4. Older material (Early Stone Age) occurs in quite high densities, but is very patchily distributed. Perhaps the most significant element of the older record is the presence of a very worn, eroded but still diagnostic Mode 1 industry. This clearly occurs on the Messak top, and has deflated into the wadi as part of the process of gully formation. It is unlikely that this will be easily dated, but these discoveries represent an important addition to our knowledge of what might have been the original Mode 1 dispersals across the Sahara and into northern Africa. In contrast, although Acheulean is relatively common on the Messak itself, it was only found in two localities in WJAR-E-01 (MES52 and MES55).
5. The extensive evidence for the systematic exploitation of the fossil wood also represents an important discovery. Fossil wood is known widely across the Sahara, and has been reported as used for stone tools. However, there have been few detailed collections and studies. An extensive collection of material was taken from three fossil wood localities, and these form the basis of a technological study, involving refitting. Preliminary observations indicate that the fossil wood was exploited both in the recent past, and in deeper antiquity, perhaps even as part of the Acheulean technocomplex. Fossil wood has unique properties in being extremely hard and thus providing long-lasting edges, but also being difficult to work for the same reason. Future studies will hopefully throw light on the different technological procedures involved in fossil wood exploitation.

**Prehistory of Wadi WJAR-W-02**

A major focus of the palaeoanthropology component of the Desert Migrations Project is concerned with the movements of archaic and early modern humans in the later Middle Pleistocene and the early Upper Pleistocene (approximately 350–50 Ka). It is during this period that it is likely that the Sahara was used as both an extension of the range of sub-Saharan populations, and as a route to northern Africa and beyond. However, stratified and dated sites relating to this period are scarce.

Following preliminary investigations in 2008, we were aware of the presence of Aterian artefacts in one of the wadis to the west of the road connecting Jarma and Barjuj (Fig. 25). A major part of this year’s field programme was devoted to detailed work in this area.

The wadi system is WJAR-W-02, which is an extensive and complex one with a network of tributaries and feeding streams or wadis, draining off the Messak into the Wadi Barjuj. From source to outlet is almost 20 km. Approximately 11 km from the Barjuj the wadi diversifies into a complex network of streams. There are two major branches, and the research area designated MES11 is in the upper regions of the western arm. The wadi system emerges from narrow gorges in the Messak, and the upper reaches consist of deeply incised channels with extensive boulder fill (Fig. 26). This channel widens out over a distance of a kilometre or so, and there is a distinct cut and fill set of deposits, with a number of gravelly terraces (Fig. 27). All the channels, including the present one, showed signs of prehistoric activity in terms of lithics, often associated with knapping and primary procurement of raw materials from the river boulders. Among these scatters, on the higher terraces, are artefacts with Aterian affinities.

The area of investigation was designated MES11, and is the part of the wadi system where it is about 150 m wide and characterized by a number of raised fluvial terraces (Fig. 26). These were formed by a process of cut and fill as a response to changes in water flow and activity during the climatic fluctuations of the Pleistocene. The presence of Middle Stone Age (Mode 3) (Fig. 28) artefacts on some of these terraces prompted field investigations aimed at characterizing their nature and attempting to determine their stratigraphic context.

The work carried out included the following:

![Figure 25. Location of Wadi WJAR-W-02. The research area enlarged in Figure 26 is indicated (MES11) (background image: Google Earth).](image)
1. A geomorphological assessment of the wadi to determine the nature, height and extent of the terraces (with K. White and N. Drake). This work showed that there was a consistent pattern of elevated terraces that could be traced over a considerable extent of this section of Wadi WJAR-W-02. They are, however, complex features due to the interplay between fluvial processes and slope wash from the surrounding Messak escarpments. As the elevation differences between the various terraces were relatively small, detailed mapping of them is necessary to determine their stratigraphic relationships. Preliminary mapping of the terraces was carried out, and three transects were surveyed across the wadi, using a total station. Preliminary results suggest that there are three terraces at different elevations, possibly with different archaeological association, but these will have to be confirmed by further analysis. Both geomorphological and archaeological features were noted. These will be analysed using digital elevation and Landsat data.

2. Detailed mapping and collection of surface material from the terraces. Total surveys of selected terrace segments were carried out, along with selective sampling, as well as a number of 2 m by 2 m total collections. In addition, further transects were carried out on the wadi slopes, to gain an insight into the relationship between the archaeological record in the wadi and that both on and washing off the Messak top.

3. A key element was to discover the stratigraphic origin of the artefacts, and to obtain radiometric dates for this context. Two trenches were excavated, one on the highest terrace and one on the intermediate one. The first of these yielded some stratified archaeological material, but the sedimentary matrix was too coarse to allow for OSL samples. The second excavation was more
successful. A step-trench in the side of one of the terraces exposed a 1.4 m section. A number of different sedimentary levels could be identified, and OSL samples were obtained from all the major units. These will be processed at Royal Holloway College by S. Armitage. Most significantly, the excavation yielded a large number of lithics throughout the section. Although the sediments are fluvial, it is clear that they were in situ in this matrix. All levels produce lithics of Middle Stone Age (Mode 3) character, suggesting a date in the early Upper Pleistocene. If this is correct and documented, then the Messak will provide one of the few securely dated MSA and Aterian sites in eastern North Africa.

4. A total in excess of 1000 lithics were recovered from both excavated and surface contexts. These were all fully analysed metrically in the Jarma Museum and will form an important dataset for characterizing the MSA in the region.

Overall, the work carried out at MES-11 showed that there is considerable potential in the area both to discover extensive Middle Stone Age material and to put it into an environmental and chronological context. What is particularly hopeful is that a better understanding of the fluvial processes and terrace formation in the region will both provide insights into climatic and environmental change, but also be a way of obtaining a more secure chronology in an area where it has proved difficult to find stratified contexts. We intend to continue this in future seasons.

Concluding remarks
In contrast to previous seasons (2007 and 2008) the 2009 one carried out more intensive and detailed work in a smaller area, rather than extensive survey. Also, where previous seasons focused on the Ubari sand sea and its northern margins, the current one took place exclusively on the Messak. This shift reflected a sharpening of the aims of the project, and in particular the need to obtain a better understanding of chronology and context.

The wadis of the Messak were particularly suitable for this more detailed approach, as they combined a high density of material, suggesting that they were important elements of the human landscape, with the potential for stratigraphically in situ material.

The January field season confirmed that the wadis of the Messak, on the basis of the two sampled (WJAR-E-01 and WJAR-W-02), have a deep antiquity. What was perhaps most striking in this context was the discovery of extensive potentially Lower Pleistocene Oldowan (Mode 1) assemblages. These have not been reported extensively in Libya, and are poorly understood in northern Africa generally, so their occurrence in the central Sahara may have significance for understanding the earliest dispersals of Homo. The discovery of the WJAR-E-01 material substantiates other such assemblages found by DMP in earlier seasons, particularly in the area of Wadi Ash Shati.

Although perhaps not reflecting such a high level of antiquity, the Wadi WJAR-E-01 yielded a small assemblage of Acheulean material. This is perhaps hardly surprising, given what is known of the region more generally, but of particular interest was the presence of what appears to be an Acheulean industry based on fossil wood. The work on the technology of fossil wood usage may prove to be an important insight into how a raw material that is difficult to use is still deployed, even in the presence of high quality alternatives.

Whereas the Messak top has an abundance of Middle Stone Age remains, the wadis themselves do not. Early MSA is completely absent on the basis of the sample assessed here. However, in one area of WJAR-W-02 at least an MSA with Aterian affinities was discovered. If other dated assemblages in North Africa can be used as a guide, then there is a possibility that dates of around 80-100 Kyr may be determined, and the extension of the Aterian to this portion of the Central Sahara will be a contribution to our understanding of the dispersal of the Middle Stone Age and modern humans.

In addition to the earlier Pleistocene remains, the wadis both have an extensive record of more recent material, indicating that in the last 10,000 years at least the wadis connecting the Messak to the Barjuj were important routes which were used to create a landscape with structures.
Clearly the wadis draining off the southern edge of the Messak are areas that will produce further important insights into the human prehistory of the Fezzan. At this stage it is not possible to determine the extent to which different wadis will show a diversity of evidence. Although the current field season shows quite a marked contrast between the two wadis studied, which may reflect different histories, it should also be remembered that one (WJAR-E001) was surveyed close to where it discharges into the Wadi Barjuj, and with a relatively open topography, while the other (WJAR-W-02) was surveyed in its upper reaches. A high priority for future seasons will be to extend this work to determine the nature of local variation.

References