Abstract
This paper reports on the results of the work of the Palaeo team of the DMP in January 2010. The fieldwork was focused on two different areas – the Wadi ash-Shati and the southwestern margin of the Ubari Sand Sea. Work in the Wadi ash-Shati confirmed the existence of Oldowan sites in Fazzan (locality SHT11 and environs), which although undated, represent a major addition to the extent of prehistoric occupation of the area. Further work near the site originally studied by Petit-Maire in the 1980s confirmed the association of a shell layer dated to the last interglacial with archaeological artefacts in situ. These artefacts are of MSA affinity, thus placing Fazzan in the context of other northern African sites of that time. The work in the southwestern margin of the basin represented the first formal archaeological survey of that area. This revealed extensive Holocene and MSA occupations, and in a group of sites at the southern edge of the Hamada Zaqher, also Oldowan lithics. Little if any Acheulean remains were observed, while the latter predominate in the interdunes just north of the Wadi al-Ajal. Overall, the spatial and technological analyses of the sites and remains suggest that there were different resource constraints on hominins in the Middle and later Quaternary, shaping the distribution of industries and raw materials. Furthermore, the relative widespread distribution of Oldowan sites – Wadi ash-Shati, southern Messak, and Hamada Zaqher, shows that the Central Sahara played an important role in the evolutionary geography of Lower Pleistocene hominins in Africa.

Introduction
The aims of the early prehistory sub-project of the Desert Migrations Project (DMP) are to investigate the Pleistocene and Holocene record of hominin, archaic and modern occupation of Fazzan (see Mattingly et al. 2007; Mirazón Lahr et al. 2008). 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. 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), Mode 3 (Middle Stone Age) lithics were found, as well as extensive evidence of human presence during the Holocene, corroborating that found elsewhere. In the 2009 season, work focused on two wadis that drain the Messak Settafet escarpment near the town of Jarma, to explore the role of such wadis as routes between the two large basins in Fazzan – Ubari and Murzuq (Mirazón Lahr et al. 2009). The fourth field season had four aims – first, to re-visit two archaeological localities in the Wadi ash-Shati surveyed in 2007; second, to continue to map the spatial and temporal extent of hominin occupation of the Fazzan during the Pleistocene and Holocene focusing on the southwestern margin of the Ubari Sand Sea; third, to carry out a focused survey of the main quarry identified at the MES1 locality in 2008; and fourth, to continue the analysis of the lithic material collected during previous seasons, as well as beginning analysis of the collections made this season. As during previous years, the fieldwork included a large portion of off-site archaeological surveys (Foley 1981) implemented through the recording of archaeological remains on the surface of particular geomorphological formations using both hand-held GPS and total stations. Some collection of diagnostic lithic material, as well as of geological samples for dating purposes and raw material analyses, were made. A small transect excavation was also carried out at a site in the Wadi ash-Shati. All material collected was deposited at the Museum of Jarma.

(I) Archaeological Survey along the Wadi ash-Shati
A short survey of four localities in the Wadi ash-Shati was carried out in 2007 (Mattingly et al. 2007). That work confirmed the presence of stone tools in the...
vicinity of shell horizons previously dated to the last interglacial (Petit-Maire et al. 1980), as well as identifying what appeared to be the first recorded Oldowan site in Libya. Furthermore, a number of geological formations and palaeolake exposures have been dated in the area (Geyh and Thiedig 2008), confirming the chronology of major wet phases in Fazzan during the late Middle and Upper Pleistocene. Thus, this season’s field work in the Wadi ash-Shati had four specific aims: 1. to attempt to link, stratigraphically, the shell exposures that have been dated to the last interglacial and the surrounding archaeology; 2. to confirm the Oldowan character of the assemblages identified in 2007 through a more extensive and comprehensive survey; 3. to verify the presence or absence of archaeological remains in the vicinity of pre-Holocene palaeolake exposures in the main Shati basin; 4. to carry out the first archaeological survey at the westernmost edge of the wadi, near the area where it discharges into the Ubari Basin. The survey thus involved re-visiting some of the localities identified in 2007, as well as new ones (Fig. 1). All but one of the sites visited were either at the bottom or at the edge of the main palaeolake sediments from the Wadi ash-Shati; the exception was the site of al-Mahruqah, the geological type locality for one of the main exposures of palaeolake sediments (Geyh and Thiedig 2008), which represents an inselberg near the edge of the wadi and thus with more attributes of the hamada that extends to the north.

ZALI This area was visited in 2007 (SHT 15 and SHT16), but a more detailed survey was carried out this year. The locality is characterised by a major exposure of palaeolake sediments protruding up to 25–30 m above the sandy plain, which itself consists of sand overlaying greenish palaeolake sediments. This area corresponds to the type locality of the Bir Zallaf formation (Geyh and Thiedig, 2008). The altitude at the very top of the exposed lake sediments varies between 378 and 385 m above sea level (asl), while that of the surrounding plain oscillates between 358 and 365 m asl. The 2010 survey focused on the plain to the southeast of the exposures, where the ground sloped gently towards the main basin, forming two main terraces – one at c. 365 m asl, the other at c. 360–358 m asl (Fig. 2). The surface of the plain consists of loose sand and gravel overlaying further lake sediments. The latter are pale green in colour and hardened into an almost solid surface. Along the edge of the main exposure and over the surface of the first terrace, a small number of worn artefacts, some of Middle Stone Age (MSA) character, were found. Over the surface of the second terrace, small scatters of fresh lithics of Late Stone Age (LSA) character were seen, increasing in density towards the SE edge of the terrace where areas of concentrations of hearths, broken grinding stones and ostrich eggshell fragments were observed. Overall, this locality has evidence of ephemeral occupation during at least two periods after the main palaeolake had dried and the surrounding landscape had deflated to its present level.

Figure 1. Distribution of archaeological localities in the Wadi ash-Shati identified and surveyed in 2010 (black), as well as those visited in 2007 (white).
This is another major exposure of palaeolake sediments at the bottom of the Shati basin c. 14 km southwest of ZAL1. The sediments at locality ZAL2 protrude c. 20 m above the sandy-muddy plain, and are partially covered by a dune (Fig. 3a). The site consists of an accumulation of eight hearths (Fig. 3b) located against the lake sediments/dune to the east-south-east over a gravelly/sandy surface surrounding the sediments. The basin stands at c. 350 m asl, extending to the west and southwest.

There is no archaeology directly associated with the hearths, which are scattered over an area of c. 30 x 20 m. A very
small lithic scatter was found in the area, with a handful of largely undiagnostic pieces. A couple of artefacts were identified on the surface of a major terrace near the top of the sediment exposures; these were also largely undiagnostic, and partly water-worn. A transect of some 100 m southwest along the surface of the recent Holocene lake identified no archaeology, with only two isolated LSA pieces found some 20 m from the hearth concentration.

ZAL3 This site is located on the plain to the north of ZAL2, the site itself approximately 2.4 km northeast of ZAL2. The area is flat, covered in thick gravel, with numerous deflated hearths. The site was not actually surveyed, just superficially investigated and recorded to mark the main features. Two artefacts, extremely water-worn, were found in between hearths, a core (undiagnostic) and a retouched blade of MSA character.

ALM1 An inselberg on the northern margin of the Wadi ash-Shati, named after the neighbouring village of al-Mahruqah. The inselberg has at the top very large exposures of palaeolake sediments, dated by Thiedig and Geyh (2008) as Middle Pleistocene (their type locality for the ‘Brak Member’ of the sequence of lake sediments in Fazzan). According to these authors, these sediments (and similarly dated ones in the Ubari Sand Sea) represent the largest/deepest lake that formed in Fazzan since the early Middle Pleistocene. The lake sediments at the top of the inselberg are today being mined, and a large modern quarry is located at the foot and top of the formation. The purpose of the visit was to examine the surface of the inselberg itself, but this has been completely removed and disturbed by bulldozers.

SHT17 This locality marks a small scatter of lithics on a small slightly raised surface at the bottom of the Wadi ash-Shati itself. The lithics are of Mode 1/Oldowan character, water-worn, and extremely eroded. They are similar to those from SHT11 (Mattingly et al. 2007), although more water-worn, consistent with their location at the bottom of the main Middle/Upper Pleistocene and Holocene Shati lake.

SHT18 A locality along the palaeolake surface of Wadi ash-Shati, with a moderately dense lithic scatter partly exposed by recent farming activity. The lithic industry is broadly similar to SHT11 (Mattingly et al. 2007), namely that it is a simple Mode 1 assemblage, today highly eroded. A small collection was carried out in an area of c. 20 x 20 m, including some very simple cores with one or two flakes removed, as well as a disc core (Fig. 4). A number of knapped pieces of fossil wood were present, including some retouched into scraper-like artefacts.

SHT11 and neighbouring localities One of the main objectives of this season’s fieldwork in the Wadi ash-Shati was to extend the survey of locality SHT11, originally carried out in 2007. The lithic industry found at this locality has a distinctive Oldowan character, although extremely abraded and eroded by aeolian action. Therefore, the aim was to make a larger representative collection of artefacts for analysis, as well as to explore the extent of the site. Four new localities were marked in a radius of 6 km from SHT11/12, two of which were archaeological (SHT19 and SHT20) and two were not (SHT21 and SHT22).

SHT19 and SHT20 Along the wadi that joins the tarmac road (that runs from Brak to Idri) and the

Figure 4. Examples of the lithic industry from SHT18 of Mode 1 character, showing simple cores with a few flakes removed, and a disc core. All artefacts are rolled and water-worn.
main SHT11 Oldowan site, two significant lithic scatters were identified. The artefacts were generally similar to those of SHT11, and probably represent an extension of the same period/type of early occupation. The location of the sites was recorded, but they were not surveyed.

SHT21 and SHT22 A brief survey of the area to the southwest of the main locality SHT11 was carried out through two main transects – 5 km in a southwest direction, and 1.3 km to the south. The first of these transects crossed a long stretch of recent lake beds, with a surface of cracked mud and soft evaporates. The second transect went from an area of bushes and tamarisk mounds towards the south, covering some natural slate exposures amongst further palaeolake surfaces. No archaeological material was observed throughout the survey.

SHT11 This locality, which also encompasses that named SHT12 in 2007, consists of a series of low hills at the edge of a major wadi (c. 400 m across) that runs northeast to southeast from the hamada towards the Wadi ash-Shati itself (Fig. 5). These hills are approximately 10 m above the wadi surface (at between 305–310 m asl), which is itself approximately 10 m above the low lake surface to the southwest. The terrace on which locality SHT20 is located has the same elevation as the Oldowan hills of SHT11, at c. 311 m asl. These hills/terraces probably represent the deflated ancient early Pleistocene surface, cut through by the present wadi, which slopes down from the hamada towards the Wadi ash-Shati lake.

The survey at SHT11 focused on examining the lithic assemblage on the surface of a number of the higher terraces/hills, and collecting a representative sample for detailed analysis. Seven small hills were surveyed, four of which in detail. The lithic scatters were very similar in both character and density, and although the industry itself is variable, the assemblage as a whole represents a distinctive Oldowan industry. The Oldowan features of the assemblage may be summarised as including a range of simple flakes, crude pebble/cobble cores, amorphous irregular cores, as well as a few slightly more structured cores, ‘choppers’ or cores which have relatively small flake removals, quite significant heavy usage damage on larger pieces, smaller pieces some...
of which appear to have a simple retouch, and some artefacts with steep retouch presumably to be used as scrapers. The assemblage also includes a small number of pieces that are surprising in this context, namely some trimming flakes and some cores of more discoid form. However, the vast majority of the artefacts examined are fully consistent with a relatively crude Oldowan industry.

In order to contrast the density of artefacts in relation to background stones, a 1 x 1 m square was examined on the surface of one of the hills. Of the 23 stones on that 1 m², seven were clearly artefactual, six in a greenish black stone, and one in brown quartzite. Another six stones may have been artefacts, as some facets were visible, but the degree of erosion did not allow further diagnosis, while some ten pieces in brown to light brown sandstone were natural. Therefore, it could be said that up to half of the stones on the surface of these hills may have been hominin-made artefacts. The SHT11 artefacts were made on a small range of raw materials, which are difficult to identify due to the degree of patination. Four main types of raw material were observed (ranging in colour from black to grey to pale green), mostly fine-grained, sometimes with inclusions or colour patterning. Sectioning of a few pieces suggests that they may all be sandstone variants, or possibly quartzite, but this has to be confirmed by the petrological analysis. The main problem with the lithic material from the site is the degree of aeolian erosion. Most of the artefacts are extremely wind-blown, to the point of smoothing flaking scars and core edges, and thus losing facets and surface information.

SHT23 and SHT24

In 2007, localities SHT1 and SHT2 were preliminarily identified as broadly corresponding to the site dated by Petit-Maire and colleagues to MIS5 (c. 120,000 years ago) (Petit-Maire et al. 1980). The original geological site represents an ancient beach at the edge of the lake that existed in the Wadi ash-Shati during that interglacial, and is characterised by the presence of a layer of gastropod shells in stratigraphic position. The work carried out in 2007 included a small excavation trench (SHT2), in which a single, undiagnostic, flake was found in situ. In view of this, the area was revisited this year with the aim of characterising the surface industry of the area, as well as excavating a second trench on the western side of the beach exposures. The work focused on (a) surveying an area of c. 300 x 300 m at the edge of the recent Holocene lake, to the east of the existing patch of vegetation and west of the present-day farms, (b) a survey of the area to the northwest, towards the location of the SHT1 locality of 2007, and (c) a survey of the terrace opposite the site (SHT24), across the recent lower lake basin (Fig. 6).

SHT23 The locality is a terrace 8–10 m above a lake basin (elevation 345 m asl), extending in a northwest – southeast direction. Its western margin is bordered by a thicket of bushes and desert plants growing around a small puddle of water; its eastern margin is bordered by farmland. The northeastern end of this terrace corresponds to locality SHT1, while locality SHT2 is on the other side of the farms to the east (Mattingly et al. 2007). Although the area is moderately disturbed by recent farming activities (irrigation channels, etc.) and tyre-tracks, archaeological material, such as hearths and grinding stones, were clearly still in situ. The terrace is cut by a number of gullies that slope west-southwest towards the recent lake basin. The surface is mainly gravelly sand, below which a c. 5 cm thick layer of duricrust is observed. A trench at the edge of the terrace (albeit below the highest level) revealed compacted lake sediments, with some organic matter (root casts, etc.) and sand.

Figure 6. Satellite image of SHT23 and SHT24, showing the relative position of both sites, the margin of the ancient beach, the main scatters recorded and the transect surveyed.
Lithic artefacts of both MSA and LSA character are found throughout the locality, although some patterning to their respective distributions may be identified. MSA lithics, all of which are wind and water-worn, are found at the eastern and southern margins of the terrace, but concentrated on the latter, suggesting that as the MIS5 lake dried and contracted, people used the raised beaches, abandoning their artefacts there, which were then exposed by aeolian erosion of the sediments during the last glaciation and covered by water for a substantial period of time (presumably during the early Holocene). As the highest Holocene lake contracted, the terrace was again exposed and used by recent hunter-gatherers or Pastoralist communities, at the edge of the main basin lake. Two main areas of Holocene occupation were identified – the eastern margin of the terrace and an area of c. 50 m² a few metres down-slope from the main terrace. The latter is actually a small lower terrace above the smaller Holocene lake and below the old MIS5 beach, and almost all the archaeological material found was of LSA character. This latter area may have been a small Holocene encampment, as it contains hearths and a very large quantity of grinding tools. The lithics within are more worn than those found above the main terrace.

The MSA surface industry is very eroded and water-worn, and also very variable. The lithic scatters are concentrated in patches, which can differ substantially one from the other. The overall assemblage contains a few Levallois pieces, and includes a large number of retouched flakes, including notched and denticulated pieces, as well as a few pieces of Aterian affinity (Fig. 7). Some localised scatters near the edge of the terrace (M1, M2, M3 and M4) contain almost no cores, while others (for example M5) have a very high proportion of cores, mainly crude pieces with a single or a few flakes off. The LSA industry contains a high proportion of microliths, including geometric pieces. Associated with the LSA scatters are a large number of broken grinding tools of different sizes and shapes.

The presence of a drainage trench running approximately east to west, to a depth of between 1 m and 20 cm, provided the opportunity to explore the terrace’s sub-surface stratigraphy with the aim of locating the gastropod shell layer, finding in situ artefacts and obtaining further dates. These investigations matched those carried out at SHT2 in 2007. Nine one-metre slots were cut back to a distance of between 50 to 100 cm, and to depths ranging from 50 to 140 cm. Although depths varied, they all showed the same basic stratigraphy (Fig. 8).
At the top were superficial sandy deposits, with gravel wash. Underlying these was a shelly layer, which graded into calcrete deposits. In plan, these were clearly blocky lake sediments, and carried on to a depth of around 15 cm. Shells occurred throughout these deposits, with greater density at the bottom. Beneath this layer were finer sands and silts, with larger rounded gravel and pebble intrusions. From units 5–6 and 11–12 artefacts were recovered from the surface of the calcrete levels. OSL samples were taken from below the lake sediments at two points (Fig. 9). Dating and sediment analysis will be used to determine the relationship between these levels and those reported by Petit-Maire et al. (1980). The artefacts recovered were undiagnostic flakes, both fresh and worn specimens. The flakes were made primarily on chert, with some sandstone.

SHT24 Lies to the southeast of SHT23, on the other side of the recent lake basin (Fig. 6), southeast along a ridge that probably marks the continuation of the ancient MIS5 lake beach – although the ridge is 10 m higher in elevation (c. 355 m asl) than the SHT23 beach. On the 15 m wide terrace that forms the top of the ridge there was a very dense lithic scatter. This consisted almost entirely of MSA water-worn artefacts, similar to those observed on the main SHT23 terrace. A collection of c. 80 stone tools was made, of which 35 were unretouched flakes, 17 cores, 22 retouched pieces, and four were fragments of Holocene/LSA character. Retouched pieces form c. 40% of the total sample. The assemblage is very diagnostic, containing several Levallois cores (unipolar and bipolar), Levallois points, blades and flakes, and the use of faceted platforms. The pieces are small and dominated by small blade/flakes – i.e. small flakes (< 5 cm long) which tend to be longer than wider, with some technically blades. Although eroded, one tool is almost certainly a tanged Aterian point. The industry is made on a variety of raw materials, but nearly all are variations of sandstone, perhaps somewhat coarser than that used in the MSA industry of SHT23.

SHT25 Formed by the exposure of an ancient eroded geological landscape, 14 km east of SHT24, the locality consists of a high plateau (375–380 m asl) overlooking a major palaeolake to the north and is surrounded by a semi-circle of high hills (up to 400 m asl) to the west, south and east. The whole formation is very inhospitable and barren. Two very eroded artefacts were found on the surface.

SHT26 This is a small enclosed basin, surrounded to the east by a dune field, and to the north and west by a small range of hills. The terrain of the basin is relatively flat, and has superficial deposits consisting of sabkha, drifting sands, gravel wash, and dry lake sediments. In parts of the basin small hillocks occur, consisting of pediments or inselbergs of the underlying strata.

Several areas were surveyed within SHT2-26. SHT26-1 is an area at the east of the basin, focused on a small hillock (c. 380 m asl), and lying on the margins of the lake sediments and the sabkha. Across this area a number of lithics were recovered. These were typically large flakes made on sandstone, with relatively few derived or specific traits, and with a state of wear suggesting considerable antiquity. The most plausible interpretation is that this is a relict distribution of ESA or MSA artefacts. SHT26-2 is further to the northwest, and is at a slightly lower elevation than SHT26-1 (369 m asl). Again it is an area that comprises both sabkha and older lake sediments (calcretes). Transects around this point revealed a low artefact density throughout, except on the slopes leading up to the surrounding hill. The lithics comprised a set of flakes which were similar to those from SHT26-1, being large, highly eroded,
and simple in form. The cores were amorphous and unipolar. In addition, there were a number of micro-lithic cores, as well as a fine blade. These latter were less worn. SHT26-3 is a small terrace above the main basin (to the northwest). The terrace was gravelly, and consisted largely of a flat area of wash. Larger rocks tended to be highly wind-sculpted. A small collection of lithics was made from an area of 30 m radius. These were Mode 3, and included Levallois flakes and disc cores made on coarse-grained sandstone. In addition, one bifacially retouched flake was collected which was made on the harder, marbled, lake sediments.

SHT26-4 was a further terrace (380–385 m asl) above the main basin level, but which probably slopes gradually into it, rather than forming a clear escarpment. This terrace has a gravelly wash surface, with a high density of highly eroded large black rocks. Some of these may have been flaked, and it is possible that this area represents the remnants of quarrying activities. More diagnosable material was recovered from an area to the north (SHT26-4F). The industry here is made on sandstone, is moderately eroded, and includes small blades, of largely MSA affinities. In summary, SHT26 is a small lake basin with a low but significant density of lithics, largely derived from Pleistocene rather than Holocene periods. Some of this may be older (ESA), but some is clearly MSA.

SHT27 The locality consists of a narrow wadi (< 100 m wide) that runs south towards the edge of the Wadi ash-Shati, with some vegetation still present. The wadi meanders across the sloping landscape, forming high margins, islands and low beaches. Evidence of both Pleistocene and Holocene occupation was found on the surface of the latter, a few metres to the east of the main sandy wadi bed. The MSA lithic scatter consisted of a number of Levallois cores and a few flakes, with some knapping events preserved. The cores were made on black sandstone. Very few retouched tools were found, among which there was a carefully retouched scraper. The Holocene occupation was revealed mainly in the form of grinding and trapping stones. The grinding tools were unusual, representing large slabs of pinkish sandstone in which depressions formed as a result of their use as a grinding/pounding surfaces, with striations and pits visible on the depressed areas. The largest trapping stone was made on greyish sandstone, measuring c. 70 x 30 cm, with a very clear rope waist. An unusual finding was a square block of sandstone with evidence of having been drilled more than once – the purpose of this remains unclear. Very few LSA lithic artefacts were found in the whole site.

(II) Archaeological Survey of the Southwestern Ubari Sand Sea

The archaeological survey of the southwestern corner of the Ubari Sand Sea had three aims: (1) to explore the nature of the strip of land that connects the Hamada Zaqaer to the Wadi al-Ajal in a north to south direction and which is surrounded by dunes, (2) to survey the southern margin of the Hamada Zaqaer itself, including the areas that were dated by Geyh and Thiedig (2008) to the early Middle Pleistocene, as well as to verify the potential of the hamada’s rocky surface as a source of raw material for stone tools, and (3) to investigate the archaeology associated with thick palaeolake sediments near the Wadi al-Ajal which have been variously dated to different interglacial phases within the Middle and Upper Pleistocene, as well as the Holocene. The mission left the tarmac road east of al-Awaynat, and travelled north to the edge of the Hamada Zaqaer, eastward along its southern margin, then crossed the sand sea using this part of the Ghadamis-Ubari road to reach the interdune lake localities at the northern edge of the Wadi al-Ajal (Fig. 10).

Figure 9. Schematic representation of the stratigraphy 20 cm below the surface at SHT23.
The locality is characterised by a variety of lithic findings mostly of MSA typology, found together with scattered LSA artefacts and microliths on chert. The collection of artefacts aimed at recording only the most diagnostic material of different industries and chronologies. Among the collection, the older artefacts are large flakes of typical Levallois technology (Mode 3), made on sandstone and chert, and a few eroded pieces in fossil wood. The Neolithic industry is nicely represented by retouched tools, like scrapers, retouched blades and grinding stones (Fig. 11 a, b).

Located in a flat landscape on which several hearths were observed, but with little archaeology in their proximity. However, the survey of the surrounding area revealed two very eroded handaxes of sandstone, together with a simple chopper, bifacially knapped on one of the edges. Disc-cores and knapped chunks of fossil wood were also observed (Fig. 11c, d), as well as a few, undiagnostic cortical flakes. AAT2 probably represents part of an ancient deflated landscape with very eroded ESA artefacts, while the more recent hearths reveal an ephemeral Holocene use of the area. This landscape persisted for some distance to the north of the locality.

This represents the western end of a large and very low basin (c. 540 m asl), that slopes westwards. The basin has a number of rock-tilted geological exposures, giving it a rugged appearance. These may be the southern end of the ridge of tilted ancient sediments that run north to south at the eastern margin of Localities SWU1-3 (see below). The AAT4 basin contains a well that is still in use. There was very little archaeology throughout, except for a series of trapping stones.
located along the edge of a recent pond (the surface of which was covered by mud-cracks) at the western end of the interdunal basin (Fig. 12). A broken chunk of yellow chert, out of which a LSA flake had been knapped, was found near one of the trapping stones.

**SWU1** The locality consists of a moderately flat terrace that overlooks lower lake sediments to the east and northeast, cut by a number of gullies that have further eroded the surface. It incorporates a lithic scatter that continues over c. 600 m northwest to southeast by 400 m southwest to northeast. MSA lithics are found throughout the extent of the site, but with varying density, being most concentrated near the foot of the dune to the west. LSA artefacts (lithics and a few grinding tools) as well as a few hearths were found in the area away from the dune, near the palaeolake margins. Although most of the non-Holocene lithic material from this site is part of a MSA assemblage, a few Acheulean bifaces and very worn cores were also found. Black sandstone pebbles, with a polished appearance, were found throughout the site. These appeared to have been used as mullers/hammers, or even possibly grinding tools, although they are very different from the traditional Holocene grinding tool kit typically found in the area. They varied in length from c. 4–7 cm. SWU1 is approximately 500 m from the smaller SWU2, on the edge of a major dune that marks the southwestern margin of a larger enclosed basin.

SWU2 Is a major Holocene occupation site, probably Pastoral Neolithic in age. The site has two main areas. One of these is on the dune slope, characterised by the presence of a number of dispersed hearths, a lithic scatter (which contained a few MSA artefacts as well), and a few grinding tools. The other area represents a relatively flat terrace above the lake basin, on the surface of which was an extremely dense scatter of LSA lithics, grinding stones, ostrich eggshell, ostrich eggshell beads, bone and hearths. The site extends for over 200 x 20 m in a main northwest by southeast direction.

The lithic artefacts from the site comprised cores, flakes, blades and a large number of retouched tools. A range of raw materials was used, from sandstone and chert to fossil wood. Fragments of ostrich eggshell were found throughout the terrace, including decorated pieces. The decoration on the ostrich eggshell varied, including single rows of dots, to multiple dot patterns, to criss-crossed hatches. Some of the ostrich eggshell was clearly burnt. A number of ostrich eggshell beads were also found, including pieces still in the process of production. A small concentration of small bone fragments was found near one of the hearths. The grinding tools comprised both lower and upper grinding stones, most of which were made on sandstone. Some of the grinding slabs also show evidence of pounding (Fig. 13). The handstones varied in shape, from oval to round pieces, and had both unifacial and bifacial
polishing facets. One almost complete pair of grinding tools was found near the northeastern edge of the scatter.

**SWU3** This locality was visited very briefly. It is located approximately 7 km to the northeast of SWU2, on the eastern margin of the basin, just below the rugged scarp ridge. The lake slopes up towards the ridge, and forms a terrace c. 10 m higher than the lake basin (at c. 540 m asl), which is relatively flat. On this surface, a number of hearths were visible, mostly dispersed accumulations of fist-sized cobbles, some of which showed evidence of having been burnt. The landscape becomes more rugged closer to the ridge, and slopes more steeply. Before the scarp, a large seemingly undisturbed cairn was found at an altitude of 561 m asl. The cairn was c. 5 m in diameter and nearly 2 m high, made of local grey stones and slabs. The base of the cairn was not visible, as it had been partially covered by loose sand. The stones used to make the cairn were quarried from a large exposure immediately to the west of the cairn, one of the many exposed tilted sediments that form the scarp ridge.

**CUS9** This locality is nearly 45 km to the north-northeast of the SWU1-3 basin, located on the western margin of the Hamada Zaqher and c. 25–35 km south-southwest of localities CUS1 to CUS5 surveyed in 2007 (Fig. 14). The area between the SWU1-3 basin and CUS9 is mainly hamada surface, at times covered by strips of dunes, and often forming small to large depressions. The surface of the latter can vary from cracked mud to thick duricrusts. Some of this landscape is today very barren, but the presence of trapping stones at the edge of the depressions almost along the entirety of the route indicates that, during an earlier phase in the Holocene, the area must have been a very attractive hunting ground for hunter-gatherer and Pastoral communities.

The site represents the remains of a Holocene camp located mainly at the northern edge of the duricrust. The lithic material from CUS9 consists of a very rich LSA industry, characterised by a large number of blades, flakes, a few cores (including microlithic cores), burins, and microliths, including backed pieces. A few small arrowheads were found. The microliths are mainly made on chert and chalcedony, but sandstone was also used. Intricate retouch is observed in some pieces. Ostrich egg-
shell fragments are found throughout the site, and a number of ostrich eggshell beads were also seen, including a bead made on a stromatolite, similar to those found in CUS5 (Mattingly et al. 2007). A few grinding stones, as well as two trapping stones were present.

Hamada Zaqher
The Hamada Zaqher (Hamada Sagirah, Hamada al-Socra) is a small meseta c. 55 km north-south by 35 km east-west, which extends westward through a major, downsloping, intricate web of wadis running 15–20 km east-west that link it to the rocky desert to the west. The hamada is relatively low, ranging from c. 540 to 580 m asl, and is covered by an almost featureless surface of broken small stones. No major rock outcrops were visible along the southern edge of the hamada, and very little archaeological material on the surface. It forms the northwest margin of the Ubari Sand Sea, with the dunes abutting against its edge or often overlying the rocky surfaces and sediments.

HAZ1 A site where the dunes meet an area of fragmenting calctretic lake sediments. In places, within the dunes, the lake sediments emerge through the sand; in others they are completely buried; and to the north, the sand gives way to full hamada: flat, rocky exposures. On the whole, the lake sediments were at a higher level than the hamada. The surveys carried out at HAZ1 attempted to explore the archaeological record as associated with the dunefields and the hamada lake sediments. A small trench excavated showed that the sands are indeed superimposed on the silty lake sediments. Transects were carried out from the dunes to the north, northeast, and northwest.

The finds collected along the transects were dominated by microliths, and all the evidence suggested a predominantly LSA assemblage. A low density scatter of lithics, pottery sherds and ostrich eggshell occurred along the margins of the dunes and across the lake sediments to a distance of approximately 200 m. Grinding stones were relatively abundant, and knapped fossil wood artefacts were also observed. Compared to other localities, there is a high proportion of chert artefacts, with less sandstone. The ostrich eggshell was undecorated, as was the pottery. The microliths show a higher proportion of blades and bladelets, compared to localities in the Wadi ash-Shati. Although there are some flakes which may be derived from MSA contexts, it is clear that this area is significant primarily for the evidence it provides for Holocene populations.

HAZ2, 3, 4 and 5
These localities comprise a related group in close vicinity of each other, and with a linked geological context. Geyh and Thiedig (2008) located and dated some lake sediments which formed the basal member of the al-Mahruqah Formation (Antalkhata Member). A date as old as 490 Kyr has been proposed for this member, making it the oldest dated level of the Ubari Basin. The area was visited and surveyed to attempt to provide some information about the archaeology that might be associated with the Antalkhata Member. Longitude and latitude provided in Geyh and Thiedig were approximate only, and so several localities were visited. In general terms, they followed an escarpment of the hamada, and these yielded intermittent...
outcrops of lake sediments. These are not extensive, and Geyh and Thiedig describe them as only about 1 m thick, overlying sandstones, and occurring sporadically. In view of the improbability of linking archaeological material directly with these levels, several localities were visited to obtain an idea of the regional pattern of archaeology. Overall, the HAZ2 – 5 surveys did not connect definitively any archaeological material with the lowest member of the al-Mahruqah Formation, but it is nonetheless suggestive that the archaeological record most common in the area with the oldest dated lake deposits of the Fazzan is predominantly Mode 1. Obviously Mode 1 or ESA industries can cover a considerable time range, and a future research effort will be devoted to trying to narrow this down to determine whether these Mode 1 populations were late surviving ones, or part of the earlier dispersals out of sub-Saharan Africa.

HAZ2 A locality comprising an area of the flat plateau top, the escarpment and the lower sediments. The section at HAZ2 is capped by lacustrine sediments that appear to be of Pleistocene origin, although they are somewhat thicker and more perturbed than those described by Geyh and Thiedig (2008). Very few lithics were recovered from the survey of the area. The most striking of these are two cores of Mode 1 affinity; one is a large multidirectional block core, with at least six flakes removed. It is made on fine grey calcere/limestone, and is abraded. The other one is very much like a classic Oldowan chopper or core, made on a sandstone which has either become very accreted with coarse sand, or has weathered in this way. However, the flake scars remain visible. In addition to these Mode 1 tools, there were two flakes that were probably MSA, and a number of microlithic cores and flakes, presumably of LSA origin.

HAZ3 An outlying promontory to the east of HAZ2, with sediments outcropping which are clearly laterally equivalent. No lithics were found in situ in the associated sediments, but a small number of artefacts were found on the upper terrace. As such, it provides only limited evidence for hominin activity. The key artefact was HAZ3-J1-1, which is a fine example of a Mode 1 chopper or simple core, made on very coarse sandstone. The artefact was recovered from the hamada top, above the escarpment. All the other lithics recovered were also likely to be of Mode 1 origin, but were too eroded to be diagnostic. However, as was the case with HAZ2, this is provocative evidence for an early, Mode 1 presence in the region. In addition to the Mode 1 lithics, a possible MSA flake and two microlithic cores were found isolated. Together with HAZ2, these show, unsurprisingly, that the place was used by Holocene populations, but not extensively.

HAZ4 Archaeological work at HAZ4 consisted of a survey from the hamada top along a side wadi onto the lower surface with aim of exploring the lower contour levels, which are thought to have been associated with particular lake level exposures. Some 20 archaeological events were recorded, which altogether yielded about fifty lithics, pieces of fossil wood, and possible lithics. The main component of these is Mode 1 – highly eroded large flakes made on sandstone, as well as a number of cores. In some cases, either the flaking was too limited for certain inference, and in others the degree of erosion was considerable, but there can be little doubt that there is, as at HAZ2 and HAZ3, evidence for a Mode 1-based activity. In particular, HAZ4-M3-1 was clearly a chopper or simple unidirectional core made on a black fine-grained sandstone similar to that found in other Mode 1 assemblages in the Ubari Basin. Additionally, a small number of MSA flakes were recorded, but LSA appears to have been entirely absent; this may relate to the distribution of early Holocene lakes in the area.

HAZ5 Only a limited amount of survey was carried out, which confirmed the presence of MSA in the area; no Mode 1 artefacts were observed at this locality.

HAZ6 The dunes which bound the Hamada Zaqher are high and well-established. Within these, satellite imagery shows very clearly a large number of interdunal depressions, many with probable lacustrine deposits. These inter-dunal systems are of interest for several reasons: a) such interdunal lakes are likely to be among the last surviving permanent water sources in the Ubari Sand Sea, especially as these are at a relatively high latitude; and b) Geyh and Thiedig implied that the al-Mahruqah formation deposits could be found among these. HAZ6 is one such interdunal depression, lying at the edge of a relatively flat corridor which runs from north to south into the sand sea. The survey carried out at HAZ6 revealed a number of new elements (Fig. 15a–c):

1. The exposed (and visible by satellite image) sediments are actually very variable, and are probably derived from both recent (Quaternary) and much more ancient sediments. In one case, it was possible to observe quaternary lake sediments superimposed on pre-tertiary ones.
2. Even within the Quaternary lacustrine elements, a number of different levels could be observed. In some cases these are likely to be parts of the same phase, but represent different depths, but in other cases there may have been different phases. Overall, these sediments suggest a complex hydraulic history to the interdunal system in this part of the Ubari Basin.

3. In some cases, it could be demonstrated that the dunes have developed since the lacustrine systems were formed, as they covered elements which could be matched laterally.

4. Excavations of the dunal margins revealed that the sand is superimposed in places along the lake margins on top of dark, organically rich sediments. It is likely that these represent (Holocene) lake margin environments such as are seen in current Fazzan lakes.

The archaeology recovered from the region suggested that the primary occupation visible was Holocene. Although a few flakes which may have been of MSA origin were found, microliths dominated. Compared to LSA assemblages found elsewhere, such as in the ash-Shati, these were more finely made, with backed elements and formal tool types. These included double-backed-blades, scrapers and end scrapers; pressure retouching was relatively common. A number of arrowheads were found on the edge of one of the lake sediment exposures. For the most part the artefacts were sparsely scattered across the landscape generally, but in one area along the western edge of the interdunal depression there was a rich density of (Pastoral?) artefacts, suggesting an encampment on the lower slopes of the dunes. In summary, HAZ6 shows that high altitude inter-dunal depressions were exploited by Holocene populations. Further research will attempt to date these events, and to source raw materials to determine whether the populations have links to the hamada to the north, or the regions to the south and west.

**Ubari Sand Sea – Interdune Localities**

Four interdune localities were surveyed between the Hamada Zaqher and the edge of the Wadi al-Ajal. Of these, USS30 and USS31 were only briefly studied. The other two, USS32 and USS33, represent major archaeological sites associated with very extensive lake sediments that had been previously dated to different high-water phases during the Pleistocene and Holocene. Both these localities, specially USS33, are threatened by the current growth of oil exploration in the area, the formation of major roads across the sands, the establishment of a large network of electricity pylons along the dunes, and the use of palaeolake duricrusts for the foundations in these constructions. Whole palaeolake exposures are currently being...
bulldozed, without their associated archaeological remains having been recorded in any way (Fig. 16).

**USS30 & USS31** These localities are two among a sequence of interdunes which preserve palaeolake sediments and associated archaeological remains along the part of the route from Ghadamis to Ubari that crosses the southwestern part of the Ubari Sand Sea. USS30 was comparatively small, c. 3 x 2 km, of which the briefest of surveys was carried out in a small 20 x 20 m area immediately adjacent to the ‘road’. This revealed a number of hearths and a Holocene LSA lithic scatter on the surface of the broken palaeolake duricrust. Presumably, the distribution of the archaeological site extends across the rest of the interdune. Locality USS31 is more extensive and structured, having preserved a number of terraces formed by successive lake episodes. An area of 60 x 100 m was surveyed, showing that the site had been occupied both by MSA and LSA groups. A number of MSA flakes and cores was found on the higher terrace to the north of the interdune, while a not very dense LSA scatter was observed amongst a relatively large number of hearths. Fragments of grinding stones were also seen.

**USS32** Along the southern margins of the Ubari Sand Sea, where the dunes give way to the sabkha of the Wadi al-Ajal, there are a number of major dunes, within which occur inter-dunal depressions and lacustrine deposits. USS32 is one such locality. Within a depression flanked by a steep 80 m dune to the south west, there occurs a series of palaeolake sediments, with considerable topographical variation. The uppermost of these is a thick bed of limestone, lying unconformably on the underlying Palaeozoic deposits. This outcrop, which extends laterally for about 100 m, has been dated by Geyh and Thiedig (2008) to OIS13 (c. 500 Kya). No previous archaeological work has been carried out there.

Topographically, it was possible to divide USS32 into four units. Basal wind-blown sands (a); lower lying calcretes that probably reflect recurring late Middle and Upper Pleistocene lake levels, as well as Holocene episodes (b); the upper lacustrine units dated to approximately half a million years (the Antalikhata Member of the al-Mahruqah Formation) (c); and a further, limited set of higher deposits (d). Find spots were allocated within each of these, and extensive collections were made and mapped.

*Figure 16. View of interdunes near the northern margin of the Wadi al-Ajal in which major buildings, roads and electricity pylons have been constructed. These mostly use the exposed duricrusts of palaeolakes for their foundations, which are bulldozed for the purpose without any recording of the rich archaeological landscape prior to its destruction.*
The locality is extremely rich in lithic artefacts, derived from a wide range of technological modes and ages. Full results are pending the statistical analysis of the metrical and character data collected, but the following are the broad preliminary conclusions:

1. There is relatively little spatial variation in the assemblages within the three units. The inter-lacustrine deposits can probably be treated as a single archaeological unit spatially.

2. Unit B was the richest and most diverse. A very large number of bifaces was found (Fig. 17), although it remains unclear whether these are Mode 2 (Acheulean) or Mode 3 bifacial points and bifaces. Mode 3 is probably the most extensive scatter, with a large number of MSA flakes, blades and cores occurring. In at least one case, it was clear that a complete reduction sequence was present in a limited area, allowing for the refitting of at least one core. USS32 has the potential for providing considerable information on the modes of production and diversity of the MSA in the Fazzan.

3. Unit C had a lower density of artefacts, but still yielded lithics of MSA and a few of LSA affinity. No artefacts were found in situ or directly associated with the OIS13 deposits.

4. Unit C included the exposed surface of the upper lacustrine sediments, and the surface of much of this was covered with small fragments of a light greenish stone, most likely chalcedony. These were highly eroded, but may have been flaked, and it is possible that these lake sediments were a source of chalcedony for Holocene populations using a microlithic technology.

The lack of much differentiation between surfaces archaeologically suggests that the inter-dunal depression has been relatively stable for at least half a million years, and that during wet periods, while there may have been expanses of water, these did not cover the entire dune, and were not part of a larger lacustrine network. Effectively, hominin populations have been living on essentially the same landscape for a considerable period of time, and local hydraulic variation may have been critical. Detailed analysis of lithic diversity will provide insights into the extent to which this area was subject to multiple phases of occupation.

USS33 lies in an interdunal depression in the southern part of the Ubari Sand Sea. It is large, being c. 4.5 km northwest – southeast by c. 2 km southwest – northeast, and probably the largest to have been extensively surveyed as part of the DMP. The lake sediments exposed are extremely extensive laterally, stretching along the dune at different altitudes and forming independent terraces and patches of carbonates. The altitudinal range between these is of at least 10 metres. Some of these exposures have been dated to the last interglacial (MIS5) as well as the Holocene (Armitage et al. 2007). The highest of these is the MIS5 level. These sediments are not very extensive, and are largely confined to the northern margin of the interdune depression in patches, specially towards the western end. The higher lake sediments can have relatively consolidated structures forming thick duricrusts, and in some cases there is evidence that they may have formed the edges of younger lakes – thus the detailed topography of the lakes within the depression may have changed sequentially through the later Quaternary.

Archaeologically, USS33 was particularly rich (Fig. 18), and a very extensive survey was carried out. There was evidence that the surface had been disturbed recently by oil prospecting and development (about 50 hand-axes and other lithics had been placed concentrically on a single spot), and so the detailed spatial pattern will have been affected by recent disturbance. However, it is unlikely that it will have altered in a major way the overall archaeological structure of the locality. Further research is necessary to determine the detailed technological variation and its spatial context. However, preliminary conclusions are:
1. There is no Oldowan or Mode 1 technology present;
2. There is a small ESA component represented by Acheulean bifaces found lying on the sand above the main interdune;
3. There is a major presence of MSA, including bifaces, but perhaps less dominating an element compared to other parts of the Ubari basin;
4. Specific areas of the interdune are dominated by LSA lithic scatters, including microliths and retouched pieces. These can be very variable, and include formal tool types, backed pieces, as well as a large proportion of more informal forms.
5. In addition to the lithics, the landscape has a patchy distribution of hearth structures, which can be associated with dense lithics, grindstones and pottery. In particular, an area of very dense occupation, with more than 50 deflated hearths and extremely dense lithic scatters, was recorded at the northern margin of the interdune. Among the scatter, ostrich eggshell beads were found, as well as a couple of pottery sherds.
6. Elsewhere in the locality, greater quantities of pottery were found, both decorated and undecorated, thus providing the potential for a more specific chronological assignment. In several places there may be cairns, made from fragments of lake sediment.

In summary, USS33 is a very large inter-dune depression, with a complex lacustrine history, and a demographic history which includes major Pleistocene and Holocene phases of occupation.

(III) Survey at MES01 (Messak Settafet)

MES01 The site lies approximately 20 km south of Jarma on the Messak plateau, and represents an important Acheulean site recorded in 2008 (Lahr et al. 2008). What makes this site important is the possible presence of a small quarry of naturally occurring boulders at the edge of a mound from which flakes of particularly large size were removed and/or worked on. The purpose of revisiting the site was to investigate further the possible Acheulean quarry, and to map in more detail the spread of archaeological features over the eastern side and surrounding plain. The observations obtained formed the basis of Mr C. Halladay-Garrett’s undergraduate dissertation.

The survey, carried out by Cornelius Halladay-Garrett and Adam Purdon, mapped the overall structure of the site in greater detail, recording the position of the few cairns on top of the mound, the relative distribution of boulders and large flakes in the quarry site, and the distribution of lithics on the plain towards which material from the mound washes. Besides the known Acheulean presence at the site, the 2010 survey confirmed and mapped the distribution of MSA artefacts (a tanged point of Aterian affinities was found on top of the mound in 2008). Apart from the robbed small cairns, Holocene remains were extremely rare.

The area thought to be a quarry was investigated in more detail and mapped with a total station. The area was divided into three 10 x 10 m grids, and all archaeological material within these was recorded, with the view to understanding the spatial distribution of artefacts in relation to the raw material within the quarry. A total area of 300 m² was surveyed. The preliminary results suggest a high concentration of large flakes and material in the early stages of production in the areas where large boulders and slabs of sandstone occur naturally. Most interestingly, more giant flakes (> 15 cm long, some as long as 50 cm) with clear evidence of retouch were found, increasing the sample collected in 2008. Giant flakes are known in the Acheulean (Sharon 2009), but are extremely rare, and their function continues to be a matter of debate. It is expected that the findings at MES1 will

Figure 18. Examples of the rich and varied lithic artefacts from locality USS33.
contribute to our understanding of extractive behaviour during the Achuelean.

**Summary, Discussion and Future Prospects**

A total of 38 localities were investigated for archaeological and/or palaeoenvironmental evidence (Fig. 19). These were all recorded in detail using GPS recordings, field notes, and digital photography. All collected material was labelled and bagged separately, and after preliminary or detailed analysis, was stored in the Jarma Museum store. All in all, ten days were spent in the field and ten days on analysis at Jarma.

We refer to previous reports and publications of the DMP for broader conclusions and links to previous field seasons. Here we highlight the main findings derived from this year’s work.

1. We were able to confirm the existence of a Mode 1 (cf. Oldowan) technology in the Wadi ash-Shatī region. This was done firstly by extending and analysing the sample first collected in 2007 from the same locality, but also by finding further localities in the region which showed the same archaeological remains.

2. We were able to discover further Mode 1 industries in other parts of the Ubari Basin, especially in the region of the Hamada Zaţār. In combination with the ash-Shatī and Messak (see Lahr et al. 2009), we can now safely conclude that the Fazzan was inhabited by populations with Mode 1 technologies. These constitute the earliest forms of stone technology, and were those used by the first hominins to disperse out of Eastern Africa. Central to further research will be to attempt to narrow down the potential age range for these industries, and to explore more closely their affinities with other assemblages in Africa.

3. We focused fieldwork on determining the archaeological links with the upper member of the al-Mahruqah Formation in the Shati region, where a shell-rich layer had been dated previously. Extensive surface survey linked to limited excavations suggests that the MSA, possibly of Aterian affinity, was the predominant local facies at the time of the last interglacial.

4. Previous years’ research had explored the perimeter of the Ubari Basin and Sand Sea, with a view to linking prehistoric lake margins to...
archaeology. We had previously carried out only very limited research on the western margins of the basin. This year’s work corrected this omission. We were able to show, in addition to the Mode 1 industries, that there is a similarly rich MSA and LSA record in this part of Fazzan.

5. The more specific findings related to this area include:

a. That parts of the Hamada Zaqher have extensive Mode 1 industries, as well as Holocene occupation along the edge of the sand sea.

b. That the surface of the Hamada Zaqher has few rock outcrops of any form, and it probably was not a major source of lithic raw material in prehistory.

c. That the southwest Ubari region has a range of MSA and LSA localities, and that careful mapping can provide some separation of the archaeology in relation to palaeolake distributions.

d. That the CUS sites were similar to those visited in 2007, and demonstrated an extremely rich Holocene record, covering both hunter-gatherer and pastoralist phases.

e. Few if any Acheulean remains were found in this part of Fazzan.

Previous research both by ourselves and others has emphasised the importance of the inter-dune depressions within the sand sea, both as a part of the environmental history and the prehistoric record. This year’s work greatly extended this knowledge. We were able to record more inter-dune depressions and thus extend the geographical range; we began to accumulate evidence which would allow us to explore altitudinal effects; and we began to investigate inter-dune depressions which had more complex histories stretching over periods of up to half a million years. Insights derived from this work will be used to consider in more detail local lake development over the Pleistocene and its importance in the sequence of hominin dispersals and recurrent occupation of the Central Sahara in the Quaternary.

Overall, preliminary results of the palaeoanthropological work of the DMP 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). Lastly, the results from the combined DMP desert field surveys strongly indicate that three major sources of lithic raw material were used in the Pleistocene – the Hamada al-Hamra, the Hamada north of Wadi ash-Shati, and the Messak Settafet. Mapping of the distribution of lithics across the basin in relation to these should provide major insights about foraging and sourcing ranges in the past.

Acknowledgements

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Notes

1 For a key to all site codes, cf. Appendix 1.
**Appendix 1 – List of localities visited by the Palaeoanthropology Mission of the DMP, January 2010.**

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<th>First Visit</th>
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<th>Lon E</th>
<th>Elevation (highest)</th>
<th>Elevation</th>
<th>Excavation</th>
<th>Transsects</th>
<th>Samples</th>
<th>ESA</th>
<th>MSA</th>
<th>LSA</th>
<th>Grinding tools</th>
<th>Pottery</th>
<th>Ostrich eggshell</th>
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<th>Hearth</th>
<th>Trapping Stones</th>
<th>Cairns</th>
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ESA: Early Stone Age (Oldowan, Acheulean); MSA: Middle Stone Age (range of Mode 3 industries characterized by prepared-core technology, such as Mousterian, Levalloiso-Mousterian and the derived Aterian); LSA: Late Stone Age (range of industries, generally characterized by an important microlithic component, including those called Epipalaesolithic, Early and Late Acacus, Pastoral, and Neolithic).
References


