Desert Migrations: people, environment and culture in the Libyan Sahara


Abstract
The Desert Migrations Project is a new interdisciplinary and multi-dimensional collaborative project between the Society for Libyan Studies and the Department of Antiquities. The geographical focus of the study is the Fazzan region of southwest Libya and in thematic terms we aim to address the theme of migration in the broadest sense, encompassing the movement of people, ideas/knowledge and material culture into and out of Fazzan, along with evidence of shifting climatic and ecological boundaries over time. The report describes the principal sub-strands of the project's first season in January 2007, with some account of research questions, methods employed and some preliminary results. Three main sub-projects are reported on. The first concerns the improved understanding of long-term climatic and environmental changes derived from a detailed palaeoenvironmental study of palaeolake sediments. This geo-science work runs alongside and feeds directly into both archaeological sub-projects, the first relating to prehistoric activity and mobility around and between a series of palaeolakes during wetter climatic cycles; the second to the excavation of burials in the Wadi al-Ajal, exploring the changing relationship between material culture, identity and ethnicity across time, from prehistory to the early Islamic period (the span of the main cemetery zones). In addition, some rock art research and a survey of historic period sites was undertaken in the Wadi ash-Shati and Ubari sand sea.

Introduction
By David Mattingly, Nick Drake, Marta Lahr and Kevin White

The Desert Migrations Project (DMP), under the overall direction of David Mattingly, has been initiated as a core strategic project by the Society for Libyan Studies as a follow up to the Fazzan Project (FP). The FP (1997–2002) created a framework for the interdisciplinary study of Libya's vast desert hinterland, and suggested a number of themes and questions for more profound research. The results of the FP (two volumes published and two more in advanced...
state of preparation: Mattingly et al. 2003; 2007; forthcoming a and b) have provided a solid foundation for future study, but have also highlighted urgent research priorities in an area where the pace of modern development gives particular urgency for raising the profile of the archaeological heritage (Mattingly et al. 2006). The archaeological heritage of Fazzan, exceptionally preserved by its remote desert setting, is under sustained assault by the combined impacts of oil exploration, massively increased tourism and accelerated modern development in the form of housing and road building and a locational shift in oasis agriculture (the focus of which has moved 1–2 km across the landscape in the last decade).

The oases of Fazzan, Libya’s southwest province, sit at one of the greatest cross-roads of the desert routeways that have been critical to the human story: from the ‘Out of Africa’ theory of human evolution, to the time of the Garamantian kingdom, to the nineteenth-century overland slave trade, or the competing forces of World War II. The new project is focused on the theme of migration in the broadest sense, encompassing the movement of people, ideas/knowledge and material culture into and out of Fazzan, along with evidence of shifting climatic and ecological boundaries over time.

The DMP involves archaeological field teams working closely with geographers and climatologists to construct knowledge of the dating and impacts of the sequence of human and environmental changes that have occurred in the Fazzan over the last few million years. The project has been conceived as a broad umbrella to cover a series of targeted investigations of specific issues that link to the migration theme and that have been selected as susceptible to greater resolution in terms of chronology and social impacts. These themes can be summarised as follows:

- human migration, from early hominins and anatomically modern humans, to the complexities of Garamantian and post-Garamantian oasis farming communities;
- climatic and environmental migrations, tracing change in climate and environment and dating it using an array of scientific measures;
- technological change, focused on issues such as hydraulic technology of irrigation, metallurgy and crop and animal husbandry;
- botanical and faunal transfers into the region, notably those relating to changing environmental conditions and to the transition to farming;
- material culture and trans-Saharan contacts across a broad timeframe;
- disease migration – notably seeking evidence for the earliest evidence of malaria in the region.

The methods being used to address these topics focus on:

- exploration of early activity sites on the main routeways across the Sahara;
- excavation of burials in the Wadi al-Ajal near Jarma and full osteological analysis accompanied by examination of DNA and Isotopic samples taken from the skeletons;
DESERT MIGRATIONS

- wider survey focused on other regions of Fazzan (for example Wadi ash-Shati) or self-contained communities such as the Dawada or the Tubu to provide comparative data to set against the picture derived from the Wadi al-Ajal;

- geographical examination of dried up lake formations of varying date (Miocene to Holocene), with an emphasis on reconstructing the contemporary environment and on obtaining the most accurate dates possible;

- further examination of evidence of the use of high technology in Garamantian society – in particular linked to attempts to date the adoption and abandonment of foggara irrigation and the first introduction of metallurgy;

- renewed study of the rock art complex of Fazzan, with a particular emphasis on themes relevant to the migration theme – especially studies relating to the appearance and disappearance of particular species of wild beasts and of domesticated animals.

In the first year of work, we have focused on two main archaeological sub-projects: the first concerns prehistoric activity and mobility around and between a series of palaeolakes during wetter climatic cycles; in the second strand, burials are the focus of excavation in the Wadi al-Ajal, as we seek to learn more of the changing relationship between material culture, identity and ethnicity across time, from prehistory to the early Islamic period (the span of the main cemetery zones). These transitions will be set against the improved understanding of long-term climatic and environmental changes derived from a detailed palaeoenvironmental study of palaeolake sediments. This palaeoenvironmental work forms a third sub-project which runs alongside and feeds directly into both archaeological sub-projects. We shall start this report with an overview of the palaeoenvironmental research. The Fazzan has one of the best records of climate change in the Sahara with a record of palaeolake sedimentation spanning the period from about 4,000 years ago to at least 750,000 years ago, but there are many deposits that are as yet unstudied and there is an urgent need to evaluate them in order to expand and enhance this picture. These lake sediments will be dated using palaeomagnetic, optically stimulated luminescence (OSL) and radiocarbon methods, analysed for pollen and phytoliths in order to determine vegetation composition of the surrounding palaeoenvironment and linked to the archaeological record in order to evaluate the role that climate change played in migration. Some additional smaller-scale work has also been carried out in 2007 on rock art sites in proximity to the cemeteries explored and on two comparative surveys – of the historical archaeology of the western and central Wadi ash-Shati and of the Dawada villages at lakes Mandara and Truna in the Ubari sand sea.

The central Saharan route out of sub-Saharan Africa: importance of the palaeoclimate of the central Sahara as revealed by Palaeolake MegaFazzan

By Nick Drake, Kevin White, Simon Armitage, Vassil Karlkouvski and Mustapha Salem

The Palaeoclimate research component of the DMP is directed by Dr Nick Drake, Dr Kevin White and Dr Mustapha Salem. It runs alongside both the archaeological sub-projects and will provide critical input to both. Fazzan forms a large closed basin (Fig. 1) containing numerous
outcrops of palaeolake sediments that provide evidence for at least five humid/arid, interglacial/glacial cycles in the middle Pleistocene from about 750 to 420 ka (Armitage et al. 2007; Drake et al. 2006; White and Mattingly 2006). During the humid interglacials the Fazzan Basin contained a giant lake (~135,000 km²), roughly the size of England, indicating a surprisingly wet environment in what is now a hyper-arid desert (Armitage et al. 2007; Drake et al. 2006). There is also a detailed palaeolake record from 100 ka when smaller lakes existed in Fazzan, with evidence for humidity at about 100, 74, 47, 30, 14 to 13 and 10 to 3.5 ka (Armitage et al. 2007; Brooks et al. 2003; Drake et al. 2006).

These results show that Fazzan contains the most extensive lacustrine record in the central Sahara Desert. However, important gaps remain in our understanding, primarily because, thus far, we have only studied a small proportion of the palaeolake sediment outcrops in the region. Therefore, a detailed palaeoenvironmental survey was carried out as part of the 2007 season of the DMP. Because of the wide range of palaeoenvironmental analyses required, a multidisciplinary team of geologists and environmental scientists was assembled (see Acknowledgements).

Samples were collected from two types of geological setting, firstly those of the Al Maharuqah Formation, which represent a Middle Pleistocene lacustrine/aeolian sedimentary sequence resulting from arid/humid climate transitions; secondly, those representing more recent phases of lacustrine sedimentation during the Late Pleistocene and Holocene. Exposures of the Al Maharuqah Formation, identified from geological maps, were visited in order to log the sequence stratigraphy, evaluate the fossil content and collect samples for palaeomagnetic analysis, OSL dating and thin-section analysis. Holocene lake basins were identified from satellite imagery. Where exposures were extant, sequence stratigraphy was logged, fossil content was evaluated, and samples were collected for OSL dating. Where such exposures were not available, 4 m sediment cores were extracted using a percussion corer. The cores were transported to laboratories in the UK for dating using OSL, and for palaeoenvironmental analysis (mineral, magnetic, pollen, diatom and phytolith analysis).

Collection of samples for palaeoenvironmental analysis took place along a transect across the Dahan Ubari to the northwest of Jarma (sites 1–5 on Fig. 1). Two sites were located close to the Al Wafa gas field (Fig. 2). The first (site 1 on Fig. 1) was shown on published geological maps as being of Miocene age. It contains sediments from Lake MegaFazzan, and the sequence provides evidence of one humid/arid transition, represented by a basal limestone overlain by a coarsening-upwards conglomerate. The sequence was exposed in a wadi section, with paired alluvial terraces with significant surface lithic scatters (see below, The central Saharan route out of sub-Saharan Africa: Palaeolithic and palaeoanthropological research). Samples of limestone and conglomerate were collected for thin-section analysis.

Another important site (site 2 on Fig. 1) was identified nearby with the aid of satellite imagery. The stratigraphy contained evidence for five arid/humid climate transitions. The basal unit consisted of a limestone, overlain by sandstone containing concretions and what appear to be fossil bones from as-yet unidentified animals. This was overlain by indurated sandstones containing root-casts, concretions and fossils, separated by layers of less cemented sands. This
A further site was located on the Hamada Saghair, in the centre of the Dahan Ubari (Fig. 3), about 250 km north of al-‘Uwaynat. Though the geological map suggests that the entire area is overlain by continental sediments of Pliocene age, interpreted by previous workers as palaeolake sediments (Theidig et al. 2000), we found that only the western edge contains palaeolake sediments; the majority of the area consists of Carboniferous rocks. However, we identified a number of outcrops of Holocene lake sediments in the same vicinity, preserved underneath phreatophytic mounds, which contained a continuous 14 m-thick sequence of lacustrine and aeolian sediments that were sampled for OSL dating.

Two 4 m-depth sediment cores were extracted from Lake Mandara and Sabkha Beni Atayi, near Jarma (site 5 in Fig. 1), to study recent environmental change in the sand sea. The base of both cores consisted of green sands; similar sediments were found in earlier studies to underlie
all the exposures of palaeolake sediments in the area. The stratigraphy of another sequence of palaeolake sediments above the town of Al-Ghrayf was logged, fossil content evaluated and samples collected for OSL dating. This was conducted in association with an archaeological investigation of lithics contained within these sediments in order to link archaeology and palaeoclimate in the region. A similar exercise was conducted at a palaeolake margin site in Wadi ash-Shati. The lithic content was evaluated by excavation of a 2 m × 1 m test trench to a depth of 1 m, and two samples were collected for dating to constrain the age of an artefact bearing bioclastic beach deposit comprising shells of *Corbicula africanus*, *Melanoides tuberculata* and *Cerastoderma glaucum* (see below, The central Saharan route out of sub-Saharan Africa: Palaeolithic and palaeoanthropological research).

Numerous exposures of palaeolake sediments were visited in Wadi ash-Shati (site 4 in Fig. 1) to test the hypothesis that lake sediments in the region get progressively younger towards the lowest point in the basin, as humid climate phases become less wet over time (Fig. 4). The oldest sequences, previously described as the Bir al Zallaf member of the Al Maharuqah Formation by Theidig *et al.* (2000), provide the most complete sequence of humid/arid climate transitions found so far in the region. Five arid/humid cycles are preserved over a large area; these are probably contemporary with those studied in the vicinity of Al Wafa (see above). Fossils of *Melanoides tuberculata* were found in a calcareous sandstone bed rich in ostracods in
the middle of the sequence. Samples of all five layers were collected for palaeomagnetic dating and thin-section analysis.

At lower elevations in Wadi ash-Shati are found isolated deposits of cemented fossil molluscs that have been dated by Armitage et al. (2007) to the previous interglacial (~100 ka). At even lower altitudes we discovered a diatomite deposit that we have sampled for OSL dating while at the lowest point in the Wadi ash-Shati there is a Holocene playa that we cored and successfully obtained a 4 m core that consists of lacustrine clays overlain by a thin layer of gypsum capped by halite. Analysis of this diverse array of sediments should provide a long-term palaeoclimate record.

The central Saharan route out of sub-Saharan Africa: Palaeolithic and palaeoanthropological research

By Marta Lahr, Huw Barton, Federica Crivellaro, Robert Foley, Lisa Maher and Jay Stock

In the last decade it has become clear that while sub-Saharan Africa appears to be at the centre of many events in human evolution, the issue of dispersal out of this region is equally critical. In this respect, the question of the role of dispersals across the Sahara has become a focus of intensive research. This element of the research is directed by Dr Marta Mirazon Lahr, with support from Professor Rob Foley and Dr Huw Barton.
Classically, it was assumed that the Nile was the primary route for hominins (and other species) to expand beyond sub-Saharan Africa. A number of factors have changed this perspective, notably growing interest in the ‘southern route’ (i.e. across the Red Sea into the Arabian Peninsula, opening up expansion across the Indian Ocean Rim) and recognition that at various times the Sahara was inundated with lakes and river systems (allowing multiple routes into Northern Africa).

The DMP arises from this paradigm shift. It has been known for several decades that lakes like Lake Chad have drastically fluctuated in water levels through time (Drake and Bristow 2006). These fluctuations have been linked to periods of greater precipitation across the Sahel and Sahara that appear to have taken place at particular points during glacial/interglacial cycles. Drake et al. (2006) have used satellite imaging and extensive fieldwork to identify and date known palaeolake shorelines and to reconstruct the former extent of the lakes. In addition to Palaeolake MegaFazzan, detailed above, other, similar patterns of expanded lakes, river systems, swamps and wetter areas, occurred elsewhere in the Sahara. Three of the largest lakes – Fazzan, Chad and the Tunisian/Algerian Chotts – would have formed adjacent catchment areas, and a potential corridor for dispersal (Drake and Bristow 2006). Research questions associated with the dispersals of hominins and humans across the Sahara (and the converse, issues relating to the presence of barriers to dispersals) must be asked in the context of this emerging palaeogeography.

The aims of this element of the DMP are to map the landscape archaeology across a segment of the Sahara in order to determine the relationship between the prehistory of the region and the palaeogeography and palaeoecology of palaeolake and palaeoriver systems. The underlying hypothesis is that the pattern of the archaeological record will be strongly associated with periods
of high lake stands, and that the distribution will follow the topography of drainage systems.

The initial research programme consisted of a transect across the region, from the northern edge of the Sahara to Jarma. Across this transect we used the base maps of the geomorphological team to locate areas with exposed lacustrine and fluvial stratigraphy and surfaces that span a wide range of ages from Late Miocene to late Holocene. These were sampled using off-site techniques to determine the density, distribution and technological character of any archaeological material. Where possible, samples were taken for OSL and palaeomagnetic dating, and where not, stratigraphic associations with the geomorphology were used. Fossil bone was also recorded where available. In addition, in order to measure the taphonomic effects on archaeological visibility, we carried out surface surveys of control areas, and where appropriate shovel pit testing. The aim of this approach is to be able to have a quantifiable measure of archaeological landscape distribution across the region. In future seasons it is hoped to be able to use this as a base for further transects, and thus a comparative measure of hominin dispersal and settlement patterns across the Fazzan Basin.

In terms of expectations, previous work has shown that lithic scatters are extensively distributed across the region. It was our expectation that Mode 2 (Acheulean), Mode 3 (Levallois, Middle Stone Age, Aterian) and Mode 4 (later material) would be found. There was also the possibility of Mode 1 (Oldowan), although these have proved to be relatively rare in Northern Africa. The known dates of the mega lakes, generally associated with interglacial stages, are from 750 ka to the early Holocene (10 to 3 ka), which covers, in human evolutionary terms, the expansions of *Homo heidelbergensis*, *Homo helmei*, and *Homo sapiens*. *Homo ergaster* has yet to be found this far north, but the broader distribution of this taxon and its allies would suggest that this is possible. The occurrence of Miocene-Pliocene deposits in the area (Berendeyev 1985; Protic 1984), along with the recording of hominins from these periods in Chad (*Sahelanthropus tchadensis*, *Australopithecus bahrelghazali*) opens up the possibility of even earlier material.

The archaeological methods were what have been referred to as off-site archaeology. At each selected locality, transects were sampled in a star fashion away from a stratigraphically determined base point. All artefacts were recorded using GPS and other surveying systems, and an attribute analysis performed on them in the field. Sedimentary context was measured. The scale of transects, and their number, was determined on the basis of pilot studies in the field.

Survey collections consisted of pairs or solitary personnel walking an arbitrary transect across a particular geographic location. The length of transects varied and was generally terminated as a result of time constraints and did not follow any prescribed length. Artefacts of interest, or clusters of artefacts, were identified spatially by an alpha-numeric location number and GPS coordinates, and numbered accordingly for later analysis. Where particularly rich sites were located more intensive collection was undertaken, either by grid square or by more intensive survey of a given area. Where necessary, details of the recording strategy will be noted in relation to each recording location below.

The work was structured into three phases: (a) geoarchaeological surveys across a north–south c. 300 km transect between the towns of Darj and al-Awaynat, crossing the Ubari sand sea; (b) geoarchaeological surveys in the Wadi ash-Shati, northern Fazzan; and (c) focal studies around the town of Jarma.
Justification of this approach, rather than a more intensive excavation of major localities, lies in the fact that previous work in the region shows that surface scatters constitute the major portion of the archaeological record, and that, although some level of chronological resolution may be lost through this approach, the higher level of spatial resolution will provide a fuller set of data for answering broad, inter-regional questions related to dispersals and corridors.

The Human Prehistory mission of the DMP thus aims at establishing the presence of hominins in the central Saharan desert, working together with a team of geologists to establish the timing and extent of high lake-levels in the area. The initial fieldwork consisted mainly of geoarchaeological survey, surface collections of lithic material and geological sampling for dating purposes.

Prehistoric research in North Africa has clearly established the presence of hominins in the area since the early Lower Pleistocene, although Mode 1 (or Oldowan) sites are very rare, as are early Mode 2 (or Acheulean) ones, suggesting a sporadic and low-density occupation of the region until the Middle Pleistocene (Table 1). With a few exceptions (such as Tihoidane, Algeria), the majority of the known North African Lower and Middle Pleistocene sites are concentrated in the Mediterranean coastal areas, while Aterian assemblages, dated in the Maghreb to the first half of the Upper Pleistocene, are more widely spread inland.

(a) Geoarchaeological survey across the Ubari sand sea

The geoarchaeological survey between the towns of Darj and al-Awaynat was carried out from the 3 to 14 January 2007 (Table 2). Although small scale surveys of both geological deposits and archaeological materials were undertaken throughout the trip, the study targeted two particular areas at the edge between escarpments and sand sea, in which previous remote sensing analyses by Drake and White showed the presence of palaeolake sediments and exposed escarpment faces. The location of these areas in relation to the western Ubari sand sea is shown in Fig. 5.

In travelling south from Darj across the Hamada al-Hamra (HAH), four small areas were surveyed for archaeological material, of which the most significant were:

HAH 1.1: rocky, deflated surface, with small scattered bushes and plants. Small collection of artefacts in a 50 m × 50 m area.


HAH 1.4: quick survey around Camp 2, with small collection of artefacts.

Subsequently, the team visited the Gargaf Escarpment (GES). The area has a Miocene escarpment eroded by a wadi, which has created flat alluvial terraces on either side. The wadi has a gentle east-facing slope. The geological team concentrated on the high exposed Miocene deposits,
from which a number of samples were taken for palaeomagnetic analysis. The archaeological team covered a transect of the wadi, from the top of the escarpment on either side to the alluvial plain. Four survey areas forming a cross-section of the wadi were named GES 1 (A to D). Artefacts were found on all four areas, and a sample collected for study. The area was very rich in artefacts, some of which were very eroded, others fresh. Four further locations in the Gargaf area were examined through archaeological survey (named GES 1.2 to 5). Small collections of artefacts were made in GES 1.2, 3 and 4, while GES 1.5 had no archaeological materials.

The third main zone of archaeological survey was located around Camp 3, named NUS 1 (North Ubari sand sea). Six areas were surveyed for archaeological materials, while another three were studied for geological context.

NUS 1.1: area on top and at the very edge of the escarpment, delimiting the beginning of the sand sea. A small collection of artefacts manufactured on black ironstones and red sandstone was made. An area of approximately 20 m × 20 m was surveyed.

NUS 1.2: survey of the first palaeolake, at the rocky foot of the escarpment. The area represented a flat, alluvial plain, slightly dissected by small wadis and presently heavily deflated. The archaeological team carried out three transects from the middle of the basin towards the foot of the escarpment. Archaeological materials were sparse, and concentrated on particular spots. Small collections were made.

It was decided to concentrate the archaeological survey on a nearby wadi, a few km from the escarpment, and which the remote sensing analysis suggested contained at least three palaeolakes along its course, distributed less than 10 km apart. Four areas were surveyed along this wadi, at the very mouth of the wadi, and in three palaeolake deposits along its course. These localities were called NUS 1.3, NUS 1.4, NUS 1.8 and NUS 1.9 respectively.

NUS 1.3: quick survey at the mouth of the wadi, in a plain area of residual Triassic lake sediments, cutting through an escarpment of Miocene/Pliocene limestone. The area was sandy and deflated, and contained sparse and scattered artefacts. A few stone accumulations, interpreted as deflated hearths, were observed.

NUS 1.4: small lake basin, bordered on either side by sandstone and limestone eroded escarpments. The deposits had chert (chalcedony-like material) nodules eroding from the surface, and being washed down the plain into the lake through small wadis. The archaeological team carried out three transects (A to C), covering the higher terraced margins along the northern margin of the lake (C), the actual lake margin in the plain...
Artefacts were found and collected along all three transects, although the latter had very different densities of material. Along the higher lake margins/terraces, only crude and sparse flakes were found (C); the lower lake margins (B) contained two main areas of lithic density, at the beginning and end of transect, consisting of both Epipalaeolithic and Middle Stone Age artefacts; the transect across the middle of the basin contained relatively high density of Epipalaeolithic tools and cores.

NUS 1.8: larger lake basin, with more complex margins, consisting of a series of stepped, terrace-like plateaus of eroded lakeside sandstones and palaeolake sediments. Three major such terraces were visible, with small wadis and erosional wadis cutting through and into the palaeolake plain. The geological team carried out small excavations of the terraced deposits, and collected a number of samples for both palaeomagnetic analysis and optical dating. The archaeological team carried out three transects (A to C), cross-sectionally to the basin, starting on the surface of the higher terrace and down into the plain. The area proved to be archaeologically extremely rich, with artefacts spanning the Old Stone Age to Neolithic, including Acheulean, Middle Stone Age, possibly Late Stone Age, Epipalaeolithic and Neolithic materials deflated into the different surfaces of the palaeolake sediments. Artefacts were found not only scattered through the surface, but also concentrated in places with extremely high densities of tools. Samples from all three transects were collected, while at one of the high-density sites, a 100% surface collection of a 2 m × 2 m area was also made. Artefact quality ranged from very eroded to very fresh surfaces, and from debitage flakes and bladelets to retouched tools.

NUS 1.9: third lake basin along the same wadi, in which a single transect and another 100% surface collection of artefacts in a 2 m × 2 m area were carried out. Very rich in archaeological remains of Late Stone Age, Epipalaeolithic and Neolithic character, similar to those found in NUS 1.8.

Al Wafa: during one of the transects carried out in NUS 1.8, a possible fossiliferous bed was identified. The material was very eroded, and undiagnostic. In discussion with the geologists, the potential fossiliferous bed was followed around the escarpment, leading to a small, enclosed basin in which the said strata formed the floor. Eroding out of the surface of this small plain, named Al Wafa by the team, a number of animal fossils of large size were visible. A small excavation was carried out to expose one of these for the purpose of photographing for palaeontological identification. A transect across the basin showed the presence of Acheulean and Middle Stone Age artefacts, as well as a number of hearths on the deflated surface. A soil sample for palaeomagnetic analysis was also collected.

Moving further south into the Ubari sand sea, nine areas were surveyed for archaeological evidence. These consisted of palaeolake surfaces within inter-dunal depressions, named USS 1.1 to 1.9 (Ubari sand sea). These areas differed markedly in archaeological content and density, ranging from no artefacts, to relatively dense scatters. In three of these areas, (USS 1.4, USS 1.7, and USS 1.9), transects across the inter-dune plains were carried out. Samples of lithics were
Table 2. List of locations in Ubari sand sea.

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<th>Lat. N (deg/min)</th>
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<td>USS 1.4</td>
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<td>27° 37.876'</td>
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<tr>
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<td>27° 36.861'</td>
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<td>27° 39.051'</td>
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</tr>
<tr>
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<td>27° 39.056'</td>
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<td>No</td>
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<tr>
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<td>27° 20.761'</td>
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<td>27° 19.801'</td>
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</tr>
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<td>CUS 1.3</td>
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<td>27° 19.406'</td>
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<td>Yes</td>
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<td>27° 23.255'</td>
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<tr>
<td>CUS 1.6</td>
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<td>27° 22.093'</td>
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<tr>
<td>CUS 1.7</td>
<td>No</td>
<td>0</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0</td>
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<td></td>
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<td>AWN 1.1</td>
<td>11° 21.593'</td>
<td>25° 57.550'</td>
<td>No</td>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2. List of locations in Ubari sand sea.
collected in all but one (USS 1.7), and some soil samples for optical luminescence dating were also collected. The archaeological industries present ranged from Old Stone Age (Acheulean) to Neolithic.

The next zone of geoarchaeological surveys was around Camp 6 (target Area B), named CUS (Central Ubari sand sea). The area consists of exposed rocky surfaces, sometimes forming escarpments, surrounded by the Ubari sand sea to the north, east and south. The work focused on six spots, named CUS 1.1 to CUS 1.6.

CUS 1.1: At the top of the escarpment; the geological team studied and sampled the deposits to verify if they were indeed of Miocene age, while the archaeological team carried out three transects. The area was archaeologically sterile, and only a couple of flakes were found within a very large surface.

CUS 1.2: the archaeological team moved into the mouth of a wadi that cut through the escarpment into a large alluvial-lake basin. The wadi was relatively deep and narrow, with steep escarpments on either side. Three transects were carried out, cross-sectionally. Very few archaeological artefacts were found, with the exception of the alluvial plain before the wadi, in which beautiful arrowheads were found.

CUS 1.3: another three transects across the wadi, from escarpment to plain to escarpment, were carried out some 2 km into it. Again, archaeological materials were very sparse.

The archaeological team then concentrated on two palaeolake basins some 20 km away.

CUS 1.5: large lake basin, surrounded by dunes on the north and south sides. A number of transects across the palaeolake margins were carried out, as well as across the area that separated this palaeolake from a smaller one some 2 km away. The area did not have much archaeological evidence, although a few concentrations of hearths, Epipalaeolithic and Middle Stone Age artefacts were found and samples collected. The geological team excavated two of a number of small hills made from the surviving and eroded roots of tamarisk trees, and took soil samples for dating.

CUS 1.6: small lake basin, of similar context as CUS 1.5, and at a distance of approximately 2 km from the latter. One transect was carried out, in which a number of Middle Stone Age and Epipalaeolithic artefacts were collected.

During the course of travelling from Camp 6 to Jarma, three small archaeological surveys were carried out and materials collected. The first two of these, close to Camp 6, were named CUS 1.7 and 1.8, while the last was named AWN 1.1, for its proximity to al-Awaynat.

(b) Geoarchaeological survey in the Wadi ash-Shati
Part of the geoarchaeological team spent four days (17–20 January 2007) in Wadi ash-Shati. The aim of this work was to establish the extent of Pleistocene archaeological materials, and to work with the geological team on establishing its context. Previous work in the region by Petit-Maire (Petit-Maire et al. 1980) had indicated Middle Stone Age materials, and proposed some geological and chronological context (last interglacial, c. 100,000 years ago).
Three areas were investigated. The first was in the locality of Petit-Maire’s report of *in situ* levallois flakes in relation to coquina deposits. We carried out transects in the region of her locality 3, and recorded extensive Middle Palaeolithic-style artefacts on the surface (SHT 1.1 and SHT 1.2 – see Table 3 for long. / lat. references). In order to establish the stratigraphic context, two excavations were carried out – one (SHT 1.1/T1), a section across an existing ‘ditch’, and the other a more controlled 2 m × 1 m trench (SHT 1.1/T2).

Both excavations yielded the same stratigraphy – a superficial disturbed surface, a thick layer of sand which has been calcified to some extent and has coquina fragments, underlain by a layer of larger pebbles and cobbles. One artefact (flake) was recovered from this layer. Below this was a layer of patchy, coarser grained sand. This stratigraphy broadly matched that of Petit-Maire. It is our conclusion that the levallois artefacts associated with her section in the top unit actually belong to the superficial disturbed level, making an interpretation hazardous. However, the artefact we recovered definitely shows the presence of humans prior to the coquina level, thus likely to be during or before the last interglacial. Two samples for OSL dating were taken. Further work is required in this area, both to find more extensive samples of the stratified artefacts, and also to establish the source of the extensive Middle Stone Age surface material.

The second area examined was the Wadi ash-Shati alluvial fan. This is a large area (c. 8 km × 3 km), where alluvium has built up from the wadi edge to the low-lying Holocene lake playa. Coquina has also been reported from this area, and there are a series of terraces that one can hypothesise represent different later Pleistocene lake levels. The purpose of our transects was to establish the archaeological evidence relating to these sediments.

Three transects were walked in each of four areas (SHT 1.11, SHT 1.12, SHT 1.13, SHT 1.14). These produced archaeological material of several ages. However, the most striking finds were extensive and widespread material of highly wind-abraded, Mode 1 artefacts made with a fine-grained phonolite. Many of the stones found were too abraded to still be identifiable as artefacts, but a sufficient number clearly had diagnostic features. Cores, flakes and choppers were recovered for later analysis. Two pieces could be refitted, indicating that the sample had not been derived from far away. Interestingly, these two pieces showed different patterns of wear, despite being clearly associated.

These remains could potentially be of great importance, if their age reflects their morphology/typology. Such potentially early technologies are rare in North Africa, especially in well-documented stratigraphic contexts. Further work is required to establish both the source of the phonolite and the depositional history of the artefacts.

The third area to be examined was in the region of the Bir Zalaaf Pipeline Section (see Table 3 for locations), and a smaller area to the west of this. Three 1 km length transects were walked along the slopes on the southern side of the escarpment (SHT 1.15). Lithics were found all along the transects in low densities, and in the zone between 100 m to 300 m from the scarp were found to be very dense. The artefacts belonged to both Epipalaeolithic and Holocene forms, but there was also a relatively high proportion of more abraded lithics, larger in size, and with simple morphological forms. Some of these were reminiscent of the material from SHT 1.12, but others appeared more characteristic of Mode 3 industries. A further transect at SHT 1.16 produced a lower density of similar material.
This area has some potential for further work as it has a relatively high ratio of older material, but further work is necessary to establish potential source areas that could provide stratified contexts.

(c) Focal studies around Jarma
Three geoarchaeological studies were carried out near the town of Jarma, during which samples were collected.

Lithic study of large cores on the Massak
The surface of the Massak is known as archaeologically rich in both cores and finished artefacts of various prehistoric industries, ranging from Old Stone Age (Acheulean) to late Palaeolithic. A small number of very large cores and flakes obtained from these were identified on the surface of the escarpment just south of the town of Jarma. The flakes were refitted into the original cobbles, and three of these refits collected for the purpose of cosmogenic radionuclide analysis. As this dating method is still being tested and developed, only two of the refitted cobbles were taken to the UK for analysis.

Test excavation, al-Ghrayf
Near the village of al-Ghrayf a wadi, running southwest to northeast, has cut through palaeolake sediments and alluvium at the foot of the escarpment. This has exposed about 2 m of soil, stratified into a number of units, two of which consist of palaeolake sediments. The surface area of the plain (c. 200 m × 100 m) is extremely rich with archaeological artefacts which have either deflated on the surface or eroded from deposits higher up at the edge of the escarpment. The work concentrated on the stratified layers exposed by the cutting of the small wadi within the plain. The geological team focused on the study of the exposed stratified lake sediments, and collected a number of samples for OSL dating. The archaeological team excavated two trenches on the edge of the small wadi, each c. 1 m × 1 m, from the surface of the plain down

<table>
<thead>
<tr>
<th>Location</th>
<th>Long. E (deg/min)</th>
<th>Lat. N (deg/min)</th>
<th>Excavation</th>
<th>No. of transects completed</th>
<th>Samples</th>
</tr>
</thead>
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<td>14º 28.223’</td>
<td>27º 30.955’</td>
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<td>1</td>
<td>Yes</td>
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<tr>
<td>SHT 1.2</td>
<td>14º 29.728’</td>
<td>27º 30.637’</td>
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<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>SHT 1.11</td>
<td>13º 54.351’</td>
<td>27º 25.754’</td>
<td>No</td>
<td>3</td>
<td>Yes</td>
</tr>
<tr>
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<td>27º 26.032’</td>
<td>No</td>
<td>3</td>
<td>Yes</td>
</tr>
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<td>27º 26.605’</td>
<td>No</td>
<td>3</td>
<td>Yes</td>
</tr>
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<td>27º 26.326’</td>
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<td>3</td>
<td>Yes</td>
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<td>27º 25.995’</td>
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<td>27º 25.904’</td>
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</table>

Table 3. List of locations in Wadi ash-Shati.
DESERT MIGRATIONS

to the floor of the wadi. The total depth of the excavated trenches was c. 2 m. In the course of the excavation, 10 different sediment layers were identified, including the ‘contact zones’ between the alluvium and the palaeolake sediments. Very few archaeological artefacts were found, concentrated between palaeolake deposits, particularly on the ‘contact zones’.

Geoarchaeological survey of palaeolake deposits EDU 100–101 in the Dahan Ubari, near the oasis of Mandara
Palaeolake sediments with evidence of prehistoric occupation were identified during reconnaissance work by David Mattingly near the oasis of Mandara, in the Dahan Ubari. These were further investigated for both geological context and archaeological survey. A small excavation of one of a number of unusual circular depressions on the surface of the palaeolake sediments was carried out. The surface depression (of approximately 1.7 m diameter × 1.4 m depth) proved to have been man-made, and shaped as a funnel. It was filled by loose sand, and archaeologically sterile. A piece of charcoal was found at the bottom of the structure, and sampled for radiocarbon dating. A survey of archaeological artefacts deflated and eroded onto the surface was carried out, disclosing a wide range of stone-tools from Old Stone Age (Acheulean) to Epipalaeolithic and Neolithic. A sample of diagnostic artefacts was collected for further study. The site is important as a source of Pastoral phase fine-grained lithic tools made from small pebbles that had formed on the surface of the old palaeolake and been collected and worked by the Pastoral communities, whose extensive artefact assemblages spread across an area of more than 200 m around the deposits.

(d)Lithic analysis
All lithic artefacts collected by the geoarchaeological survey have been labelled and deposited at the Museum of Jarma. This report details the technological analysis of four main recording locations: GES 1.1; Al Wafa; SHT 1.11 to 1.13; and NUS 1.9. The collection strategy focused on the recovery of formal tools, retouched pieces and cores, though in some cases other flake types were included. As a result the material can be considered broadly representative of the ‘tools’ present and to a lesser extent ‘cores’, but not of the entire range of debitage and raw materials. Visibility at all sampling locations was high, primarily consisting of various combinations of gravel lag and sand on low grade slopes, flat plains, and lake basins.

GES 1.1
The material collected appears derived from the stony Hamada above the wadi, consisting of cobbles in various stages of reduction of other siliceous material (55%, n=22), chert (35%, n=14), and single pieces of quartzite, silicified sandstone, volcanic, and fossilised wood. The collection recovered primarily a selection of chunky retouched flakes (52.5%, n=21), some of which are made from levallois flakes, and two Aterian tanged points, a broken backed blade, and a range of informal cores (73%, n=8), two microblade cores made from chert (18%, n=2), and one levallois core (9%, n=1). Within the flakes and tools are several blade flakes made from either the corner of a cobble or block or possibly the central ridgeline of a thick flake. Apart from
the microblade cores, there are no true blade cores in the assemblage, and the blades described are probably more accurately elongate flakes. The assemblage also contained a single silicified sandstone muller that was later been recycled into a hammerstone.

The collection from GES 1.1 also contains a large number of scrapers made from levallois flakes and primary or secondary flakes from large cobbles cores (Table 4). Retouch locations are varied forming an assemblage of end scrapers and side and end scrapers, with retouch always from the ventral to dorsal surface. The levallois scrapers (n=4) all retain a strong central point on the dorsal surface giving them a slightly pyramidal form in cross section. Two retain some dorsal cortex and all appear to have been struck on simple flake platforms. The informal flake scrapers are also either primary or secondary flakes from cobbles.

Table 4. GES 1.1 tools and retouched flakes.

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. #</th>
<th>Material</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Thick. (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
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<td>9</td>
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<td>Chert</td>
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<td>63</td>
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<td>Chert</td>
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<td>27</td>
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Table 4. GES 1.1 tools and retouched flakes.
Al Wafa (NUS 1.8 = AW 7)

Forty-three artefacts were collected from this locality, including nine handaxes, from an intensive surface survey of approximately 200 m × 200 m. Associated material consisted of numerous stone fireplaces and quantities of chert from a large Epipalaeolithic occupation site, mostly oriented toward the nearby shoreline of the palaeolake. The dominant raw material at AW 7 was quartzite (81%, n=35) followed by silcrete (9%, n=4), chert (5%, n=2), limestone (2.5%, n=1), and other (2.5%, n=1). Artefact classes collected included debitage (41%, n=16), cores (30%, n=13), handaxes (22%, n=10), and bifaces (7%, n=3).

All material is covered with patina and appears abraded or water worn. Edges of flakes and tools are all excessively rounded and smooth. The quartzite is covered with a yellow patina similar to the material collected from SHT 1.11 to 1.13, and would originally have been white in colour. The handaxes in particular, must have been quite striking when freshly made. The surface alteration of the tools here is not the same as that from SHT 1 sites which was very rounded and smooth. Here the material has a rough exterior and is strongly pitted; perhaps indicating long periods of surface and sub-surface erosion?

Another notable feature of AW 7 was the number of handaxes, 10 handaxes being recovered during the survey (Table 5). These display a wide range of forms and are generally crudely manufactured and irregular in profile and cross-section. Several are quite large approaching 1 kg in weight. The majority (n=8) are made from quartzite or silcrete cobbles, are highly varied in size from a diminutive 158 g up to 956 g. The smallest, AW 7 (#42) and AW 7 (#15) have such sinusoidal profiles that it is hard to imagine the edge itself was functional for cutting or scraping and they have more the appearance of cores than tools, though they retain the characteristic handaxe symmetry on the long axis.

Table 5. Handaxes at locality AW 7.

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. #</th>
<th>Material</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Thick. (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
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<td>40</td>
<td>248</td>
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<td>81</td>
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<td>Chert</td>
<td>102</td>
<td>69</td>
<td>25</td>
<td>188</td>
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</tbody>
</table>

*Mean* 116.9 72.3 46.9 444.6

*SD* 28.8 13.0 10.6 297.3
Two of the sample are manufactured from chert (AW 7 (#10) and AW 7 (#45)), and are thinner, flatter with a more ovate profile. The first of these is very roughly made with only one surface entirely free of cortex, a roughly lenticular cross-section and would probably have only had one functional edge. The second is nicely finished, a slightly pointed ovate, with a clear lenticular cross-section. These two pieces seem out of place with the majority of the sample and may derive from a later period.

*SHT 1.11 to 1.13*

Fifty artefacts were collected from the transect survey at locations SHT 1.11, 1.12 and 1.13. Raw materials consisted of quartzite (52%, n=26), silicified sandstone (30%, n=15), and volcanics (18%, n=9). It is difficult to gauge the natural distribution of raw material without a comprehensive collection, but our impression is that the quartzite was being preferentially selected for flaking and was much less abundant than the volcanics at each location surveyed. Artefact classes represented were debitage (54%, n=27), cores (42%, n=21), and tools (4%, n=2). The tools consisted of an informal retouched flake (distal retouch) made from quartzite, and a rather dubious pebble biface. At least one of the cores may be considered a classic Mode 1 ‘chopper tool’ (SHT 1.12 (#B1–01)) rather than a core, and is discussed below.

All artefacts show signs of extensive weathering. All pieces, including flakes are entirely covered in patina, many of the cobble cores also display signs of having been extensively abraded and probably water rolled after initial flaking. A few pieces appear to have been flaked at a later period, as the flake scars appear less eroded and rounded; however, even these relatively fresher scars are also now completely covered in patina. The clearest examples of colour change due to patination are the quartzite artefacts. This raw material is now a deep yellow-brown colour, however flaking unworked cobbles shows that a freshly flaked surface ranges in colour from a brilliant white to white-grey.

The summary data from analysis of the cores is shown in Table 6. The reduction strategy at these sites is consistent in all surveyed locations comprising of relatively crudely flaked cobble cores, most of which were abandoned very early in the reduction sequence. Average core weights are 538 g, ranging from 154 g to 1161 g, with two cores weighing over 1 kg. Cores were mostly reduced flaking from a singe cortical platform (primary cores, 57%, n=12) utilising a single platform (unidirectional, 76%, n=16) with very little core rotation. A smaller number of cores (24%, n=5) have been flaked in an alternate pattern (bifacial reduction from a single platform). Recovered debitage also reflects the pattern shown in the cores with 41% consisting of relatively large primary flakes.

Overall the flaking strategy at Wadi ash-Shati appears to be one of relatively haphazard removals of large flakes from rounded to irregularly shaped cobbles. Knappers appear to have targeted very low platform angles, removed a few flakes and then discarded the cores. The high numbers of primary flakes suggests that these exterior flakes were unwanted debitage and that tertiary flakes, the majority of which will have primary platforms, were removed for use elsewhere – either before this material was deposited as alluvium or afterwards. Apart from the putative pebble biface, there is no attempt to produce bifacially worked platforms, or bifacial cores, that occur in much higher frequency in other recorded locations, particularly Al Wafa.
This flaked assemblage represents the most basic of all the flaking assemblages recorded in this season’s work. It is very unlikely that this assemblage represents the casual testing of cobbles in later time periods to find good quality raw material. This material appears to represent a relatively consistent pattern of cobble core reduction by knappers with the most rudimentary flaking skills.

**Oldowan-type chopper SHT 1.12 (B1-01)**

This artefact was recovered from a cobble lag deposit on a small rise within the alluvial fan (Table 7). It is manufactured from a black volcanic stone and has been extensively weathered. All surfaces, including the flake scars, are excessively smoothed and rounded, to the point that the piece maintains a shiny lustre. This piece has been roughly flaked from a single cortical platform,
with a series of directed flake removals and what could be considered as finer retouching near the platform margin. The tool body was probably a relatively ovate cobble with one flat surface that now forms the platform. Flaking appears initially to have started with a single large flake that removed one end of the cobble. Later flake removals were more controlled producing an irregular edge, obliquely angled with respect to the main axis of the piece. Given its probable antiquity and degree of weathering, it is now impossible to say reliably if the flaked edge has been used. It certainly lacks the heavy overlapping step flakes that may be produced from extensive wood or bone working.

Burials and identity in the Wadi al-Ajal

By David Mattingly, Muftah Ahmed, Franca Cole, Federica Crivellaro, John Dore, Mireya Gonzalez Rodriguez, Maria Guagnin, Sebastian Jones, Marta Laht, Victoria Leitch, Fares Moussa, Anita Radini, Ian Reeds, Martin Sterry and Jay Stock

The archaeology of the Wadi al-Ajal is dominated by funerary structures of varied date, with notable concentrations of cairns and other burial monuments along the foot of the escarpment that runs along the south side of the c. 150 km length of the depression. Charles Daniels who conducted research here in the 1960s–1970s estimated there were likely to be 120,000 visible tombs (Daniels 1989, 49). The earliest of these funerary structures appear to be of Pastoral (Neolithic) date, though in the absence of much detailed prior work in the al-Ajal it is uncertain how early in the Holocene these practices originated. A major component of the burial landscape concerns the vast Garamantian cemeteries, with distinctive burial forms, accompanying stelae and offering tables and other evidence of rituals (Mattingly 2007; Mattingly et al. 2003, 187–234). The Garamantes were the major regional power in the central Sahara from around the mid-first millennium BC to the mid-first millennium AD, with earlier origins and a later shadowy existence.

The FP has shed dramatic light on Garamantian civilisation – revealing an unexpected sophistication of oasis agriculture, water management, literacy, urbanisation and advanced technology (Mattingly 2006; Mattingly et al. 2003, 346–42). But many questions remain about where this people came from (or whether they were a purely local phenomenon), why they declined and what happened to them when they did. Detailed examination of a sample of burials

<table>
<thead>
<tr>
<th>Locality</th>
<th>Ref. #</th>
<th>Material</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Thick. (mm)</th>
<th>Weight (g)</th>
<th>Plat. #</th>
<th>Flaking pattern</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHT 1.12</td>
<td>B1-01</td>
<td>Volcanic</td>
<td>100</td>
<td>77</td>
<td>57</td>
<td>573</td>
<td>1</td>
<td>Uni.</td>
<td>Primary</td>
</tr>
</tbody>
</table>

Table 7. Chopper from SHT 1.12.

is the obvious way to tackle the complex issue of the identity/identities of the Garamantes and the peoples who preceded and succeeded them in this landscape. Although over 200 burials have been previously excavated, by Libyan, Italian, French and German archaeologists, in addition to some work by Daniels, none of these have yet been published to modern standards.
DESERT MIGRATIONS

The nearest close comparator study has been carried out some 400 km southwest – far from the Garamantian heartlands – and was more generally focused on the late Pastoral period (di Lernia and Manzi 2002; though see now the reports on Garamantian period burials in Castelli et al. 2005; Liverani 2006).

The new project is seeking to rectify this by systematic excavation of a broad sample of burials in the Jarma region, using the most up-to-date methods of field and laboratory recording and analysis. It is planned to sample burials believed to be of different dates between c. 6,000–1,000 BP and from different levels in the social hierarchy (as judged by structural and artefactual evidence). The project is also completing archive and post-excavation work on a number of burials excavated by Daniels, so that these can be published in definitive form (in The Archaeology of Fazzân. Volume 3, see Mattingly et al. forthcoming a) and be added to the overall corpus available for further analysis.

In this first year of the project we carried out additional survey work, followed by targeted excavation in a number of cemeteries in the Jarma embayment – between Zinkekra and Tuwash. There has been a considerable amount of recent disturbance and destruction of ancient cemeteries in this area and our work also served to draw attention locally to the importance of this aspect of the heritage. Altogether, we excavated more than 40 funerary or possibly funerary structures spread across nine sites. Further details about the various sites can be found in the site gazetteer of the FP (Mattingly et al. 2007)

(a) Zinkekra cemeteries

The work commenced with several sites on the north side of Zinkekra hill, where recent expansion of gardens and bulldozing for aggregates had caused visible damage to the cemeteries that succeeded the main phase of occupation at the Garamantian proto-urban hillfort there (Fig. 6). The recent erection of a fence by the Libyan Department of Antiquities is an important move to safeguarding the site, but our excavations were intended to demonstrate the scale and extent of the illegal disturbance of the archaeological remains here. In addition to excavating within cemeteries, we carried out additional work recording the rock art around the base of the hill in an attempt to see to what extent it might link to the location of cemeteries.

ZIN 220

ZIN 220 was a nucleated cemetery of Classic Garamantian date (first to fourth centuries AD broadly), perched on the north flank of Zinkekra hill and overlying earlier occupation levels that built up on the south side of a prominent terrace wall. The predominant form of burial here was the shaft burial (type 2a/2b). Eight tombs were excavated in a 10 m × 12 m area that was planned in detail. These varied hugely in constructional detail (from well-made cists and lined shafts to unlined shallow scoops) and in depth. In one case, T3 had clearly cut through the top part of an earlier shallow burial (T19), which comprised a woman buried with her new born child. Many of the burials had been robbed (only T3, T18 and T19 had surviving articulated bone, the last two fairly complete). The lack of surface indication of the robbing in the form of visible spoil heaps suggests that the disturbance happened a considerable time ago. Disarticulated material and traces of grave goods were recovered from the robbed burials.
T18 was difficult to discern at the surface – partly because T7 appeared to have impinged on it and pushed over one side of the cist lining, which was probably the reason it had escaped the attention of tomb robbers. Organic preservation was good, with many burials producing evidence of textiles, wood, date stones and some leather, twine and matting. Beads were also recovered from many of the tombs, though the small numbers suggest that this was a prime target of the robbing activity.

ZIN 217–219 were the site numbers assigned by Charles Daniels to a series of exposures of Garamantian walls and occupation horizons in the side of the gully defining the east side of cemetery ZIN 220. As part of the DMP work on ZIN 220, we recleaned and recorded the sections, revealing the presence of an intact young adult burial (ZIN 218.T1). This well-preserved burial, though sadly lacking the skull, produced an array of interesting finds including a jug wrapped in textile and a wooden headrest. The body here was wrapped in a straw mat (Fig. 7). The burial was cut down into the underlying occupation deposits from the early and proto-urban Garamantian phases and the opportunity was taken to sample key horizons down to bedrock for botanical analysis and dating. There appears to have been a significant period of abandonment of the site between the occupation phase and the cemetery use, with the former activity terminated (in one part of the section) by a catastrophic incident(s) of landslide.
ZIN 350
ZIN 350 constituted a large nucleated Garamantian cemetery, but the site has been severely truncated by the encroachment of a modern farm to the south of the old Jarma–Ubari road. About 100 m of the cemetery has been systematically destroyed – we found many fragments of human bone, pottery and funerary furniture such as offering tables and stelae on the piled up earth mounds at the southern margin of the recently established fields. A sample of the cemetery was recorded in plan and three burials selected for excavation. All three had been robbed in the past, but provided interesting information about the original burials and the construction of the monuments. ZIN 350.T16 was a large tomb, with a well-built wall around its central burial cist. The robbing activity had destroyed some evidence of the original form of the superstructure, but it seems likely that the broken offering table and stelae fragments found displaced on its east side had originally been set against that face. The few contents recovered from the tomb included a piece of pyro-engraved gourd. ZIN 350.T24 was a small robbed cairn adjacent to T16, from which little survived of the original contents of the tomb. ZIN 350.T25 was a small cairn preserved in half section in the edge of the bulldozed area. It had also been robbed, but provided a useful section through a corbelled cairn.
Figure 8. Location of Watwat cemetery groups (drawing: M. Sterry).
ZIN 700
ZIN 700 was the site number allocated to a variety of dispersed features on the low angle slope below site ZIN 220. Two cairns adjacent to the modern bulldozed cuts that had encroached south of the line of the old Jarma to Ubari road were selected for excavation. ZIN 700.T2 was a c. 5 m diameter low cairn, with no discernible outer kerb. The central burial had been robbed, though some fragments of disarticulated bone were recovered from the fill. ZIN 700.T3 was a more enigmatic structure, though from the surface appearance identical to T2. Again, the centre of the low cairn had been dug through by robbers in search of a burial, though there was little evidence from the material recovered to confirm whether or not there had been a burial present. Removal of the eastern half of the cairn revealed numerous discrete piles of ash and burnt dates and other organic material. These appeared to have been built up over a period of time, with successive events separated by layers of stone, laid in place while the fires were still hot. It is possible that this structure had some ritual function in relation to funerary activity in this area of extensive cemeteries – at any rate baskets of dates and other fruit appear to have been brought here from the zone of oasis cultivation 1–2 km away to the north for a particular form of structured deposition. The process is as yet unparalleled.

(b) The Watwat cemeteries
The second major area of cemetery study this year was the Watwat embayment, located south of the well-known mausoleum known as Qast Watwat (UAT 001). There was a very complex and rich funerary landscape here in Garamantian times (Fig. 8), comprising a large cemetery around the mausoleum (UAT 002), an isolated large tomb with forecourt for offerings (UAT 003), a linear arrangement of low cairns, some evidently with multiple burials (UAT 004) and two very large and dense burial grounds deep in the embayment (UAT 008–009).

UAT 004
UAT 004 comprises a line of 26 low cairns, leading south from the mausoleum cemetery towards the escarpment. These exhibit signs of having been robbed in the past, some with several sand-filled depressions in them, suggesting satellite burials around a central one. An example was suggested for excavation (UAT 004.11), being the eleventh in line going south from the mausoleum (Fig. 9). The central burial had indeed been robbed, but substantial amounts of bone had been redeposited in the cut, along with some of the original grave goods (including a carnelian bead and a fragment of amazonite). The cairn was completely excavated to check for underlying burials around the central one, but the secondary robber cuts proved to have been speculative ones, with no evidence of shafts penetrating the subsoil. However, on the south side of the central burial, some larger blocks set into the ancient land surface marked the presence of an earlier structure. Whereas the dating evidence from the main cairn included imported amphora sherds, this underlying structure had an associated deposit of potentially earlier Garamantian pottery (Zinkekra ware). The precise form and function of the earlier structure was difficult to discern, being simply a sub-rectangular foundation (c. 2 m × 1.7 m) of blocks associated with a possible hearth/ashy deposit. It is at least possible that the cairn was deliberately laid out to cover the traces of an earlier structure in the landscape.
UAT 008

UAT 008 is the largest of the cemeteries in the embayment with an estimated 517 shaft or cairn tombs crammed on to a narrow promontory between two gullies running down from the escarpment face. Surface sherds collected at the site by Daniels and earlier excavations by the Caputo mission in the 1930s had indicated a date centred on the early centuries AD (Mattingly et al. 2007, 109–10; Pace et al. 1951, 321–51). About 40 m south of UAT 008 lies another similar cemetery (UAT 009), where there are approximately 256 burials. This cemetery was also subject to some excavations by the Italian expedition. It was also probably of first to second
century date. Excavations in 2007 focused on a 23 m × 10 m area in the centre of UAT 008, running east–west across the width of the cemetery (Fig. 10). This small area contained over 50 shaft burials, arranged in honeycomb pattern. Of these, 24 were excavated, along with several possible burials that proved to be simply infill between shafts. On excavation, many shafts proved to have been robbed in the past – with indications that this must have occurred some hundreds of years ago, when the preservation of textile and leather shrouds around bodies was no doubt better. This would explain why some disarticulated bone in the backfill of the robbing activity retained a degree of relationship between adjacent skeletal elements. Few of the shafts in this area of the cemetery appear to have been properly lined, though the larger burials excavated by the Caputo mission generally had well-constructed orthostatically lined shafts or chambers. In most of the burials we excavated there was little more than a series of horizontally bedded stones defining the upper ring of the shaft and perhaps supporting cover slabs – a number of large flat slabs were found redeposited by the robbers inside the shafts and these were perhaps originally used to close some shafts. The tomb robbing here appears to have been quite methodical and violent, with possible shaft lining slabs also displaced and with much of the bone and stone redeposited once the tomb was clear, so as to allow space at the surface to open neighbouring graves. The average size of shafts was between 1 m and 1.5 m in diameter, with most around 1 m deep. A few exceptional shafts (for example UAT 008.T84 and T86) were wider and deeper, going down to c. 1.6 m.
Several burials yielded some articulated bone in the base of the shaft, allowing the original orientation of the body in the grave to be established. Many of the tombs, including those that were robbed, yielded important finds relating to the furnishing of the grave and associated rituals. Most bodies at this cemetery were interred in the crouched position wrapped in either textile, or leather shrouds, and also often lain on straw matting that lined the base of the tomb. Some of the textile and leather fragments may indicate colourful garments (see below). Of particular importance is the intact burial UAT 008.T32, which yielded dozens of ostrich eggshell and ebony beads, a ceramic dish, as well as coloured textile and leather and a fragment of pyro-engraved gourd (Fig. 11). Burial UAT 008.T22 had a partially intact burial, with a wide range of associated grave goods: textile garments on the body, a leather shroud, a pair of iron tweezers, glass fragments, wooden vessel fragments, human hair, cordage, a gourd fragment, and lots of beads including carnelian, cobalt blue glass and ostrich eggshell. Burial UAT 008.T38 was almost certainly a double inhumation, with a displaced adult in the base of the shaft and an intact child skeleton (missed by the robber cut) at one side of the upper fill of the shaft. Numerous fragments of Roman pottery, especially early African Red Slip forms and amphora suggest that many burials included at least one imported pot, but the excavated shafts were rarely big enough to have accommodated much more than that alongside the crouched burials.

(c) The Jarma escarpment quarry site
The recent resumption of quarrying at an old aggregates quarry site south of Jarma has had a dramatic impact on the archaeology within two minor wadis that are cut into the face of the Jarma escarpment – allowing relatively easy access in past times to the Massak plateau. The new quarry workings have involved the digging out of a deep trench in the floor of both wadis, with bulldozers cutting back to the steeper scarps at the very edges of the valleys. We were alerted to the new work by the dense dust cloud that rises from the quarry each day.

Some of the tombs previously recorded as GSC 042, 046 and 048 (see Mattingly et al. 2007, 130, 144) have been destroyed or damaged by the bulldozers, but a small number survive right on the edge of the bulldozed area and it is apparent that they might not exist for much longer given the current nature of exploitation of the quarry. In view of this situation, it was decided to excavate one tomb at site GSC 042, just beyond the present extent of bulldozing. GSC 042.
T1 proved to be a substantial Garamantian tomb with a central corbelled chamber, which, though robbed in antiquity, proved of high interest. The external appearance of the tomb was that of a sub-rectangular cairn with built outer walls of rough coursed blocks and a flat top made up of small stone chippings. Beneath this, the central cist structure was covered over by a series of large stone slabs. The tomb appears to have had a double burial within the large central corbelled cist structure, which was c. 1.6 m deep. Among the fragments of disarticulated bone recovered from the chamber were elements of at least two skeletons. The sparse finds suggested a date in the early centuries AD.

(d) A new Garamantian ‘mausoleum’ at Fugar?
The existence of a Garamantian mausoleum near Ibrayk, close to the village of Fugar, has long been recognised (Mattingly et al. 2007, 163–64). This site (FUG 001) lies at the heart of an Islamic burial ground, itself of some antiquity and linked to a local family. About 100 m to the west of the mausoleum stands the marabout tomb of Sidi Ali with its own associated area of Islamic burials. Recent bulldozing about 50 m west of the marabout has turned up about 15 ashlar blocks cut from a fine yellow sandstone and exhibiting an exceptional quality of tooling (average dimensions of the blocks were 90 cm × 45 cm × 40 cm). These have not been exposed to weathering, and thus probably were the foundations for an ashlar masonry structure – almost certainly another mausoleum – that must have stood in close proximity to where they now lie (as the blocks have not suffered much damage in being moved by the bulldozer). A brief trial excavation was made within the area affected by the bulldozing to see if it was possible to identify the footprint where this structure stood or whether any further blocks remained in the ground. Unfortunately, it appears that the bulldozing had reached into the natural subsoil and there was no trace of the footings. As with other identified mausolea in Fazzan, there appears to be no evidence here of a subterranean burial chamber (Mattingly et al. 2003, 189–92).

(e) Rock art around Zinkekra
Alongside the excavation of cemeteries in the Zinkekra and Watwat areas, a careful search was made for related rock art, in order to test whether there was a strong spatial association between funerary features and rock art loci. A small cluster of rock art was noted around the northwestern end of the Zinkekra promontory, on the upper cliff between the two cemetery areas ZIN 351 and ZIN 352. The panels (ZIN 522–ZIN 527) are situated at the tip of a small outcrop. The engravings generally face in a western direction and include two humans on horses, several stick-people and camels as well as a number of Libyan inscriptions. All panels appear to date to Garamantian times or possibly later.

Within the area of cemetery ZIN 351 a sparse but even spread of rock art was recorded. The panels were mostly Libyan inscriptions. There are also several depictions of animals, often unidentifiable; the heavily patinated engraving of an elephant (ZIN 504) appears to be of considerable age.

The number of panels increases towards the eastern end of cemetery ZIN 351. A larger concentration of panels was found in a gully just east of ZIN 351, only about 30 m west of cemetery ZIN 350. Here also the chronological depth of the panels appears to increase, with
some panels showing superimpositions. The majority of the engravings again featured Libyan inscriptions, ostriches, stick-people, oryx, and camels or sandals, which probably indicates a Garamantian or later date for these panels. However, there is also a large boulder with a depiction of a rhino (ZIN 511B), which most likely dates to an earlier period. Where rock art was located within a cemetery area, panels were often found in close proximity to tombs. In some cases cairns were built against boulders with rock art (ZIN 505).

Unlike other areas along the escarpment, the area around Zinkekra is characterised by numerous rocks with cup marks. One was found in ZIN 351, three in ZIN 700, two above ZIN 117, and a further 11 along the southern side of Zinkekra (the boulders with the most cup marks were found along the sides of ZIN 280). This is very unusual, and coincides with numerous cup marks along the fringes of the very top of the outcrop. Apart from the cup marks, not many panels were found in association with tombs around the southern side of Zinkekra. One remarkable exception being two pecked humans (ZIN 279) above a group of tombs in ZIN 280 (illustrated in Mattingly et al. 2003, 343).

By contrast, the Watwat embayment was completely devoid of rock art, apart from the crude depiction of a cow (UAT 106) within cemetery UAT 006. Overall, there seems to have been an emphasis on rock art along the northern side of Zinkekra, quickly thinning out along its southern side and towards UAT, and this does not seem to be strongly correlated with the locations of cemeteries.

(f) Finds from the burials
Around 1,400 sherds of pottery were processed from the excavations conducted at Zinkekra, Watwat, and the Jarma Escarpment, and from material collected from the surface in the Ubari sand sea (EDU 100). Table 8 summarises the distribution.

<table>
<thead>
<tr>
<th>Type</th>
<th>EDU</th>
<th>GSC</th>
<th>UAT</th>
<th>ZIN</th>
<th>Total</th>
</tr>
</thead>
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<td>357</td>
<td>587</td>
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<td>201</td>
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<td>32</td>
<td>2</td>
<td>543</td>
<td>830</td>
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</tbody>
</table>

Table 8. Pottery analysed by site and type.

Fineware
Small quantities of Terra Sigillata, of Italian origin, dating to the first century AD, were recovered. Most notable were the fragments of a late first century AD dish *(Conspectus Formarum*, form 3.2), from UAT 008, Tomb 5 (context 329).

Among the examples of early African Red Slip ware recovered, Hayes forms 3b, 3c and 8 were well represented with Hayes forms 6, 7 and 9 also present (Hayes 1972; 1980). Examples of later forms were scarce but the following have been provisionally identified:

GSC 042 .T1. Wall sherds in a thin-walled, fine fabric possibly dating to the second/third century AD.

ZIN 350. Fragment from a flange in a thick, granular fabric with a thinnish slip; possibly a Hayes form 91, fourth to fifth century AD.
Only one example of Tripolitanian Red Slip ware was recovered: ZIN 350. Hayes form 5.

**Amphora**
The amphora assemblage was dominated, to the almost total exclusion of others, by two types. The first (Tripolitana I, FP Types 19, 20 and 21) is known to have been produced in Tripolitania. The second (FP Types 15 and 16) is a small, thick-walled, heavy vessel with a body of ellipsoidal sectional profile. There are indications that it may have been produced within the region.

Other types attested are: ZIN 220. Late Punic Type (FP Type 5). Possible Greco-Italic Type (FP Type 10).

**Lamps**
Few fragments were recovered. One stamped fragment was recovered from UAT 008 and about 50% of a lamp showing a gladiatorial scene came from UAT 008.T5 (Context 329).

**Coarseware**
Most of the coarseware types fall within the classificatory scheme of the FP Typeseries. Types recovered include: 108, 143, 179, 180, 204, 216, 217, 219 and 222. The dates of these fall within the bracket late first century BC to third century AD.

Of note is an almost complete example of a small jug with a single handle (FP Type 204) which was recovered from ZIN 218.T1. This type is known to be associated with funerary contexts.

**Handmade**
The following were represented:

Types common at Zinkekra: FP Types 301, 302, 303, 307, 321, 322, 323, 324 and 325 (first millennium BC).


**Metal artefacts**
A single pair of iron tweezers was recovered from UAT 008.22. Metal artefacts were probably a prime target of grave robbers.

**Beads**
Beads were predominantly disc-shaped, and manufactured from ostrich eggshell, turquoise faience, cobalt-blue glass and ebony. Ebony beads had not previously been recorded in the FP work. Three carnelian and two amazonite beads were found. The proportion of stone beads to those of other materials are very different to those noted at Old Jarma. In several instances we recorded beads alternating blue and white or black and white. In UAT 008.T22, the cobalt blue beads appear to have been associated with textile or leather covering down the legs. In burial UAT 008.T32, several clumps of beads from a necklace of all the above materials were noted in the area of the collar bone. There were also some ostrich eggshell beads down in the
hip area, perhaps from a belt or loincloth. One set of ebony beads from UAT 008.32 had been strung on a leather thong.

Textiles
No less than 14 burials contained textile fragments, varying between shreds and a near complete garment or shroud. About half of the latter, from ZIN 220.T19, has been conserved and opened out, comprising close to 1 m$^2$ of cloth. The garment was woven in rectangular segments, weft-faced, with braided selvedges. At least two separate panels were sewn together with a double thread along the selvedges.

Textile fragments from three burials included red-dyed threads, and preserved fragments show that coloured thread was incorporated both into the selvedges, and woven into the body of the textile itself. UAT 008.T86 included textile fragments with narrow bands of crimson and bright blue. Further fragments from the same burial included a wider band of red interspersed with small blue squares (c. 1 cm across) (Fig. 12).

The majority of textile represented was weft-faced and woven to a very high quality, with weft numbering more than 30 threads per cm. One fragment from ZIN 220.T4 included coarse over-sewn embroidery, apparently forming triangles on the surface. Occasional fragments of coarser tabby-woven cloth have also been recovered, but the fine cloth predominates.

This is to our knowledge the largest collection of Saharan textiles of classical antiquity outside Egypt. These fabrics show a great variation of technique and further study of these and any additional material collected in the course of the project will greatly add to our knowledge of textile production and use in this period.

Leather
Numerous burials contained fragments of tanned leather, some of which were undoubtedly leather shrouds in which the bodies were deposited in the grave. Leather from the shrouds showed evidence of red pigment (presumably ochre) applied to one surface. The shrouds were constructed from smaller panels sewn together with fine thread (c. 15 stitches per cm). One fragment from UAT 008.T38 was decorated with adhering zig-zags of unknown material (possibly resin). The leather comes from the softer flesh split with no visible hair or skin grain. Further conservation of the often brittle leather fragments will be required before full study.

Wood
A number of wooden vessel fragments was recovered from ZIN 220 and UAT 008.T33. Other burials contained fragments of worked wood, including pointed batons and a headrest (ZIN 218.T1).

Gourds
Five fragments of gourd were recovered from various burials, two of which had been pyro-engraved.
Matting and threads
Matting was noted in many tombs, but generally could not be lifted intact. *In situ* examination demonstrated that the reeds had been perforated and joined by two-ply vegetable fibre cord. These threads and other cordage recovered from a number of burials appear to be characteristic traces of perished matting.

Study of the amphorae in the Department of Antiquities store
The Libyan Department of Antiquities holds an important collection of whole or nearly whole Roman amphorae in its store at Jarma. These derive from a number of campaigns of excavations at a number of locations, with the majority thought to have come from the tombs at Saniat bin Huwaydi. While parts have been previously studied (most notably, Mattingly *et al.* 2007) as far as we are aware the whole assemblage has never been subjected to an integrated study. As part of the ceramic-related work conducted by the DMP this season a start has been made on just such a programme of detailed recording and study.

The overall aim of the study is to gain a clearer understanding of the types of amphora reaching...
the Fazzan, their provenance, their date and their possible contents. To this end a preliminary phase of documentation has been carried out this season. Accurate digital photographic records have been made, supplemented with written description of the form, fabric and surface detail (inscriptions, graffiti etc). All of this information is being entered into a database.

During the current season detailed recording of 71 whole or nearly whole vessels has been completed. Although the study is at an early stage it has already revealed the dominance of the assemblage by one particular amphora type, small, thick-walled and heavy, with a capacity of around 25 litres (FP Type 15).

(g) Skeletal remains

The following is a brief summary of the osteological cataloguing and analysis undertaken in association with the DMP 2007, at the museum in Jarma. Human skeletal remains already housed at the Jarma museum were conserved, reboxed, labelled and analysed for osteobiographic information and morphometrics where possible. These have been given a new general numbering system, starting with J1. Numbers for these skeletons range from J1 to J61.

Skeletal remains from the current excavations were given similar numbers, beginning with J62, and running through to J130. MNI (minimum number of individuals) has been calculated for each tomb or archaeological feature. As many of the remains were quite fragmentary, an overall MNI would be of little use. In total, the skeletal remains from 68 archaeological features were described.

Where possible, the skeletal remains were measured to estimate body size, diaphyses were moulded for biomechanical analyses, and growth and development of subadults were assessed in detail. Crania that were complete or could be reconstructed were digitised using a microscribe for future analysis of morphology. Pathologies were described and photographed. Notable pathologies include considerable frequencies of spinal arthritis, and evidence for periodontal disease, dental caries and abscessing, linear enamel hypoplasia, cribra orbitalia, porotic hyperostosis, and healed trauma, both post-cranial and cranial.

Survey of historic settlements in the Wadi ash-Shati and the Dawada lake villages

By Stefania Merlo

As part of the wider work of the DMP, two exploratory archaeological surveys, with a focus on the Garamantian and Islamic periods, were carried out by Stefania Merlo. The first of these targeted the archaeology of the Wadi ash-Shati, still a relative blank on the archaeological map and for which there is little published information. The Wadi ash-Shati is the northernmost of the three bands of east–west aligned oases of Fazzan. The FP had already highlighted this as an area of probably high importance in the Garamantian era (Mattingly et al. 2003, 372), just as its abundant springs have made it a key zone of settlement and agriculture in more recent periods (it was the most populous region of Fazzan when the Italians conducted a census in the 1930s, Scarin 1934).

The operations carried out in respect to general reconnaissance started with the GPS recording of archaeological settlements and features, followed by photographic and video documentation.
of sites and landscapes. Some selected locations (mainly settlements more recently abandoned by the informants such as Mandara and Triuna in the Ramla al-Dawada and Adwesa in the Wadi ash-Shati) were surveyed at a finer detail: the positions of domestic units, public buildings such as schools and mosques, wells, and field systems were mapped.

The survey started from Idri and extended east along the main axis of the Wadi ash-Shati as far as the village of Gotta (Table 9). The old villages of Idri, Timsan and Gotta were visited and found to contain a fortified *qasr* of probable Garamantian origins, as well as extensive later settlement complexes. Several additional *qsur* were recorded (Ain Omar, Bin Aghenneb, Abyad, Timtam, and Bin Maherik), together with abandoned settlements most probably of modern date (Winzrik, Qasr Shara, Gulla, Adwesa). A number of different building techniques were documented, including the extensive use of stone alongside mudbrick. The distinctive characteristics of stone and mudbrick arrangement and the clear change in techniques within different areas of the same settlement suggest that a dedicated study to establish typologies of construction in the Wadi as-Shati, in comparison with those in the Wadi al-Ajal and in the southern oases has the potential of clarifying the chronology and possibly the cultural differences of the settlements of the Fazzan.

Surface collections of pottery were made at selected sites in order to refine knowledge of the chronology from Garamantian to early modern times and to provide comparative collections to the larger assemblages from historic sites in the Wadi al-Ajal. Whilst, on the one hand, the similarity of the assemblages collected indicates a continuous occupation of the majority of the sites from the Garamantian period to their abandonment in the twentieth century, some patterns were noted that could be chronological and cultural indicators, in combination with the typo-chronology of building techniques.

In addition, numerous cemeteries of cairns were recorded on hill and ridge tops, especially between Timtam and Gotta. These are of comparable typology to those recorded elsewhere in Fazzan of late Pastoral and Garamantian date. Types noted include antenna tombs, ring tumuli.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Long. E (deg/min)</th>
<th>Lat. N (deg/min)</th>
<th>Altitude (m asl)</th>
<th>Pottery samples</th>
</tr>
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<tr>
<td>IDR 01</td>
<td>Qasr, Idri</td>
<td>13° 03.165'</td>
<td>27° 26.707'</td>
<td>405.8</td>
<td>Yes</td>
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<tr>
<td>TIM 01</td>
<td>Qasr Timsan</td>
<td>13° 07.030'</td>
<td>27° 28.849'</td>
<td>394.0</td>
<td>Yes</td>
</tr>
<tr>
<td>GOT 01</td>
<td>Qasr, Gotta</td>
<td>13° 47.206'</td>
<td>27° 29.102'</td>
<td>336.0</td>
<td>No</td>
</tr>
<tr>
<td>WIN 01</td>
<td>Qasr Ain Omar</td>
<td>13° 14.061'</td>
<td>27° 29.680'</td>
<td>373.1</td>
<td>Yes</td>
</tr>
<tr>
<td>WIN 02</td>
<td>Qasr Bin Aghenneb</td>
<td>13° 14.721'</td>
<td>27° 30.918'</td>
<td>390.4</td>
<td>Yes</td>
</tr>
<tr>
<td>TIT 01</td>
<td>Qasr Timtam</td>
<td>13° 37.684'</td>
<td>27° 32.738'</td>
<td>372.4</td>
<td>Yes</td>
</tr>
<tr>
<td>TIT 03</td>
<td>Qasr, unknown place</td>
<td>13° 38.590'</td>
<td>27° 33.922'</td>
<td>405.3</td>
<td>No</td>
</tr>
<tr>
<td>BIN 01</td>
<td>Qasr Bin Maherik</td>
<td>12° 35.455'</td>
<td>27° 44.489'</td>
<td>409.2</td>
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</tr>
<tr>
<td>AB 01</td>
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<td>13° 30.919'</td>
<td>27° 32.396'</td>
<td>383.2</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 9. List of *qsur* surveyed in the Wadi ash-Shati.
and aligned cairns. Some rock engravings were also recorded, primarily of the horse and camel phases, along with Libyan/Tifinagh inscriptions (and thus all pertaining to the Garamantian and Islamic periods).

This first survey of the Wadi ash-Shati’s historic buildings attests to a very conspicuous Garamantian presence and development of the landscape, with evident continuity into Islamic times. This data set further confirms the active engagement of the Garamantes on all the major trans-Saharan routes to the south (Edwards 2001; Mattingly et al. 2003), with an extensive network of internal connections within and between the oasis strips. It should also be stressed that, although confirming the spread of the Garamantian occupation and the extent of this network, the preliminary data from this survey seems also to emphasise differences between the Wadi ash-Shati sites and those encountered in the Wadi al-Ajal and in the southern oases. To give but one example, based on landscape management, the survey conducted in the Wadi ash-Shati did not identify any foggara systems, but a series of wells constructed with techniques that mixed stone and mudbrick. This aspect merits further investigation, in order to confirm the status of some mudbrick structures identified and establish dating of these wells.

The main routes that linked the Wadi ash-Shati and the Wadi al-Ajal across the Ubari sand sea pass by the relict lakes of the Dawada. This isolated people of the sand sea maintained permanent villages at three of the lakes until the 1970s, when they were resettled in the Wadi al-Ajal. Two of the abandoned villages were visited and subject to archaeological and oral recording. At Mandara, with the help of a local guide who was born and had lived by the lake, the settlement lifestyle was explored through interviews, planning of residential units and photographic recording. Pottery was collected in the area of wells dug in the 1980s, providing evidence of Garamantian occupation here, as well as a sequence of Islamic and early modern activity. At the core of the settlement a mud brick *qasr* was identified and recorded. It is interestingly linked to a series of local legends which testify to its antiquity. Pottery from surface collection in the area around it confirms the presence of material datable to the Garamantian period.

Several traditional misconceptions on the Dawada can already be rectified following this first study season. It had been reported, for example, that the Dawada did not produce pottery and cultivation was limited in the area (Wellard 1967). Contrary to this, not only is pottery very conspicuous at the site (in particular surrounding the residential units), but a clay source has also been identified to the northeast of the village. This consists of palaeolake deposits rich in lime-based clays. Moreover, field systems and wells are a testimony to the exploitation of the area around the lakes not solely for date cultivation.

By the lake at Truna, the survey concentrated on mapping residential units, wells and the mosques at the village by the natural natron lake, which was a key export commodity of the Dawada people. Moreover, everyday experiences, place names and significance of specific areas within and outside the main settlements were recorded during the informal interviews. With this preliminary information it is now possible to start addressing issues about the structure and localisation of people and settlements within the network of the Saharan trade.
Conclusions

By David Mattingly, Marta Lahr and Kevin White

The first season of the DMP has met its key objectives and has produced important results. Much analysis and scientific dating of the sampled deposits remains to be completed, but the project methodologies have demonstrated their worth. The close integration of the work of the diverse specialists within the project allows us to explore in a truly interdisciplinary way the unique relationships between people and their environment across long time scales. The extent to which landscape, climate and environment condition human lifeways and pathways of migration/contact, while at the same time influencing the emergence of distinctive social identities, are key themes of our work. It is clear already that migration and transfers of people, knowledge, technologies and material culture across the Sahara can be readily identified for many periods of time from the Palaeolithic to the present. At this stage in the project we have more questions than answers, but already some important patterns are starting to emerge in the data.

The palaeoenvironmental survey conducted as part of the 2007 season of the DMP has added considerably to our knowledge of the extent of the former Lake MegaFazzan, and the nature of the changing environment over the last 750,000 years. The regional pattern of multiple lake levels, representing at least four arid/humid transitions, provides an environmental framework against which to evaluate human migrations through the Sahara, and reinforces the importance of the record of environmental change preserved in the Lake MegaFazzan sediments. This report is only a preliminary summary of the results of field survey. A fuller report awaits the results of follow-up dating and palaeoenvironmental analysis of samples collected in the field, which will be undertaken in the UK, at laboratories in the Universities of London and Reading. The results of these analyses will enable a detailed reconstruction of the palaeoclimate of the region, which can be linked to the archaeological survey results undertaken during the 2007 field season, under the auspices of the DMP.

The Human Prehistory in the Libyan Sahara part of the DMP aimed at carrying out a preliminary survey of the potential association of evidence of prehistoric occupation and geological context suggestive of wet episodes. The work, carried out jointly by a team of geologists and palaeoanthropologists from both the UK and Libya, surveyed across a large area from Darj to the Wadi al-Ajal, testing deposits for evidence of palaeolake MegaFazzan and archaeological occurrences. The project was extremely successful in several respects. Firstly, the initial prediction, that the sediments of the MegaFazzan lake extend over a vast area, was confirmed. Furthermore, the terraces previously recorded and dated near the town of Jarma, were again identified in a much wider geographical scale, and samples collected for potential dating of the high lake level stands. The results thus obtained both confirm earlier preliminary work and demonstrate the enormous potential of further geological and palaeoenvironmental studies in establishing the extent and dating of the major wet episodes in this region.

In terms of prehistoric human migrations, the key question addressed by the project is whether the area of the Fazzan was part of a long migratory corridor of lakes and rivers that linked central Africa to the Mediterranean coast, and which was intermittently used by dispersing hominins.
The results obtained in the 2007 survey clearly demonstrate that indeed the Fazzan was densely occupied by hominins at particular times during the Pleistocene; whether the Fazzan was part of the trans-Saharan corridor, or with its megalake episodes, a migration destination itself, is still not clear. The artefacts found along the area surveys show discrete industries and the use of different raw materials, both suggestive of discrete episodes of occupation. However, all archaeological occurrences observed were surface scatters; one major aim for future years is to identify stratified sediments through which artefacts and palaeolake sediments can be correlated with precision. The potential of the Fazzan for increasing the knowledge of human prehistory in Africa, and the timing and pattern of human prehistoric migrations, is clearly demonstrated. Future seasons will aim at continuing the wide-area surveys, but coupled with focal excavations of promising sites like those visited this year just north of the Ubari sand sea.

The burial excavations this year have focused on a range of Garamantian cemeteries, generally dating to the early centuries AD. The range of organic finds preserved is opening a new window onto Garamantian material culture, because such finds did not survive in the lower levels of the FP excavations at Old Jarma, due to the elevated water table. Although Ayoub, Caputo and Daniels all noted the presence of textiles, matting and leather in Garamantian burials, the recorded details of these finds are poor and none of this material exists in the collections of Jarma museum. We are assembling the largest collection of ancient textiles and leather work from the central Sahara and its study will be a significant milestone as well as providing some very interesting material for display in Jarma museum. The differences in material culture between the urban assemblages previously collected at Jarma and the finds from the graves appear quite marked, though a larger sample is needed before the underlying patterns can be fully described. There is a suggestion at any rate that the specific artefacts in burials were carefully selected and perhaps deemed particularly appropriate to the funerary context. In addition to the presence of imported goods from the Roman empire, there is clearly a very strong Saharan tradition in the material culture represented. The preservation of organic materials in many of these burials will allow a much fuller picture to be built up of the complex social identities of the Garamantes and their Pastoral predecessors. Study of the skeletons will provide an interesting source of comparison between ethnic characteristics and particular behavioural or identity components.

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References

41
D. J. MATTINGLY ET AL.