EGYPT

New Research on the prehistory of the escarpment in Kharga Oasis, Egypt

Alicia L. Hawkins
Department of Anthropology
University of Toronto
100 St. George Street
Toronto, Ontario, Canada, M5S 3G3

Jennifer R. Smith and Robert Giegengack
Department of Earth and Environmental Science
University of Pennsylvania
Philadelphia, Pennsylvania, USA, 19104-6316

Mary M. A. McDonald
Department of Archaeology
University of Calgary
Calgary, Alberta, Canada, T2N 1N4

Maxine R. Kleindienst
Department of Anthropology
University of Toronto at Mississauga
Mississauga, Ontario, Canada, L5L 1C6

Henry P. Schwarcz
School of Geography and Geology
McMaster University
Hamilton, Ontario, Canada, L8S 4M1

Charles S. Churcher
Department of Zoology
University of Toronto
Toronto, Ontario, Canada, M5S 3G5

Marcia F. Wiseman
Department of Anthropology
University of Toronto at Scarborough
Scarborough, Ontario, Canada, M1C 1A4

Kathleen Nicoll
Chevron Overseas Petroleum, Inc.
6001 Bollinger Canyon Rd.
B/2352 San Ramon, California, USA, 94583

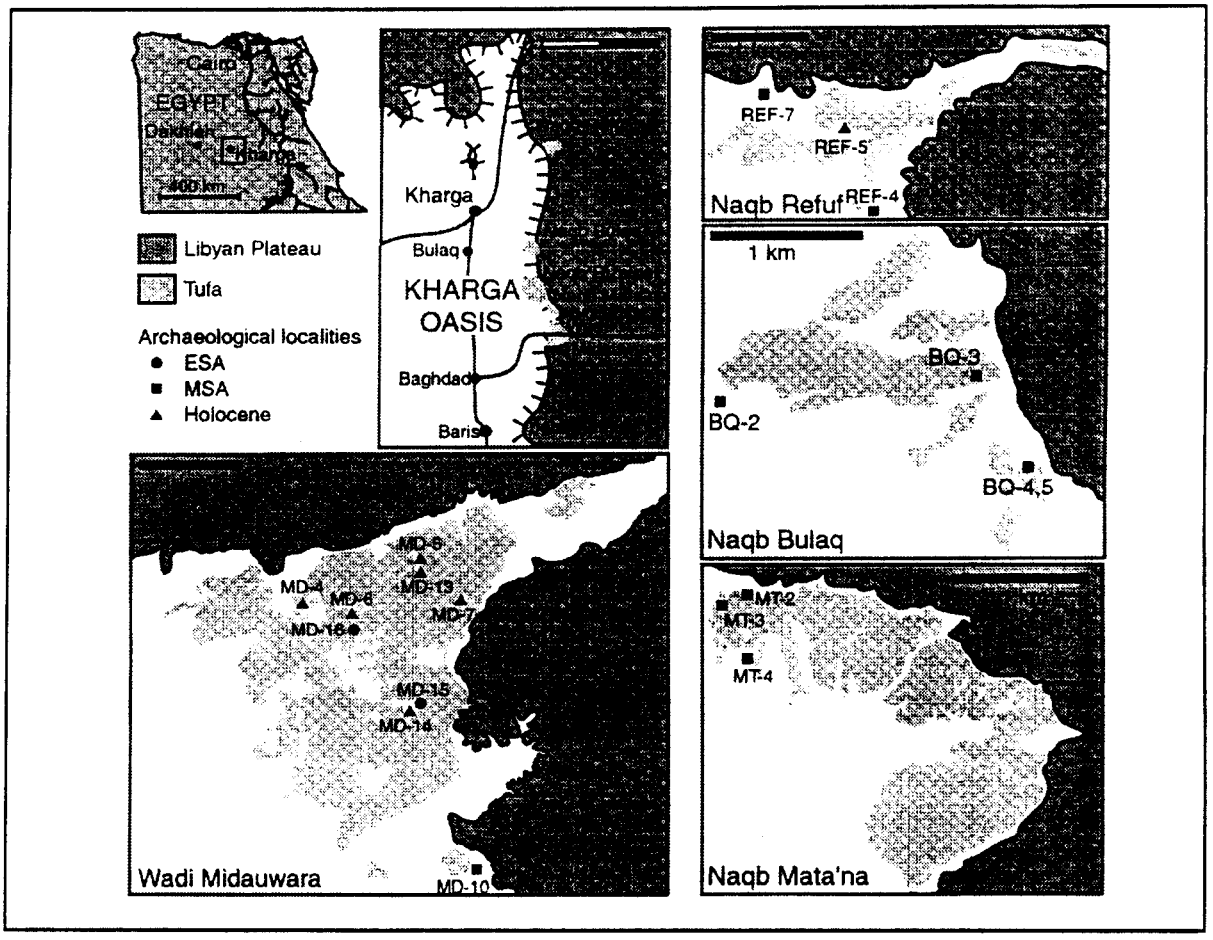
Introduction

Members of the Kharga Oasis Prehistory Project ran a short field season in March 2001 during which we revisited and sampled archaeological localities discovered by Caton-Thompson and Gardner (Caton-Thompson 1952), and by Giegengack, Nicoll (Nicoll, et al. 1999), and J. Smith (in preparation) between 1995 and 2000. We focused our work between Naqb Refuf and Wadi Midauwara on the escarpment that bounds the western edge of the Libyan Plateau (Figure 1). Here artifacts are found in association with fossil-spring deposits, or tufas, a calcium carbonate rock ($CaCO_3$). Dating of tufas is underway by J. Smith and Schwarcz. Smith (in preparation) is mapping the escarpment in detail and examining stable isotopic composition of tufas and associated gastropods in order to extract a paleoclimate signal. Artifact analyses are preliminary and identifications are based on Caton-Thompson's (1952) work and our research at Dakhleh Oasis (Hawkins 2001; Kleindienst 1999; McDonald 1991, 1999; Wiseman 1999).

Background

The Western Desert has undergone high-amplitude variation of local precipitation in the past (Crombie et al. 1997; Szabo et al. 1995; Wendorf et al. 1993). In dry times, conditions have been at least as arid as the present; in moister times local precipitation may have been as high as 300 mm/yr. Tufa-precipitating springs along the escarpment must have represented significant water resources throughout the Quaternary. These springs would flow from aquifer storage for some time after local rainfall ceased, and would be re-established quickly when modest rainfall returned. Because tufa deposits are more resistant to aeolian erosion than lacustrine and playa deposits, tufa accumulations adjacent to spring orifices below the crest of the escarpment represent the sediments most likely to preserve a near-continuous record of human occupation of the oasis depressions of the Western Desert. While these masses of tufa have been degraded by periods of erosion, it is still possible to discriminate between distinct stratigraphic units with each such unit representing a humid time in the history of the Western Desert. At Naqb Refuf, Bulaq and Mata'na Caton-Thompson and Gardner

Figure 1. Map of study area.



(1952) demonstrated several generations of accumulation of spring tufa. Smith (in preparation) has shown that multiple discrete phases of tufa deposition are represented at Bulaq, Mata'na and Wadi Midauwara (Nicoll et al.1999). Because uranium is frequently incorporated into tufas at the time of their deposition, while its daughter, thorium, is generally excluded, spring tufa deposits offer an opportunity to assign direct ages to periods of spring activity using U/Th disequilibrium. Work by members of the Dakhleh Oasis Project (Kleindienst et al. 1999, no date) has shown that U-series ages occur in clusters at around 100 and 200 ka, with several determinations of >350 ka also occurring.

Archaeological localities investigated

Below we describe the more important localities examined, the artifacts recovered, and associations with tufa deposits. We made no attempt to systematically record the numerous surface localities at Kharga.

Earlier Stone Age. Two ESA localities were investigated, both in Wadi Midauwara: MD-16 (Upper Acheulean or "KO10 Unit"): A large number of bifaces lie on tufa and silts on the surface in an enclosed basin. Of the small collected sample, two are probably made on nodules, at least one is made on a flake. Most pieces were trimmed around the laterals and butt, but in several cases cortex is present somewhere on the piece. One bears lateral cortex "guards". The length to thickness ratio falls in the range expected for the Upper Acheulean or the KO10 Unit. The raw material is predominantly chert, but limestone was also employed. Most of the bifaces collected are ovate to elongated ovate in shape, with one example of a lanceolate.

MD-15 (Terminal ESA, "Balat Unit"): Artifacts were recovered from sandy gravels at the

Table 1. Average chart dimensions of samples of bifaces collected from Wadi Midauwara.*

Locality	N	Length	Width	Thickness	Length/Thickness
MD-16 Upper Acheulean	6	154 ± 34	81 ± 18	38 ± 6	4.1 ± 0.7
MD-15 Terminal Acheulean	4	112 ± 10	75 ± 7	30 ± 5	3.8 ± 0.7

*The sample collected from MD-15 included all bifaces seen, whereas the sample from MD-16 was selected by Smith and Hawkins to reflect variation in size, raw material and finesse of retouch.

base of ca. 5 metres of lacustrine carbonate silts. These are capped by tufa, and an older tufa is exposed in a position suggesting it underlies the sandy gravels. The condition of the pieces suggests that they were either exposed to the surface before burial, were water worn, or both. Four bifaces and a single platform core were recovered. The bifaces are ovate to cordiform in shape. Those with untrimmed butts or laterals are similar to "backed knives" (i.e., Balat Unit bifaces) recovered from Dakhleh Oasis (Schild and Wendorf 1977). All of the collected pieces are of chert. The dimensions of these bifaces differ significantly from those from MD-16 and approximate those of the Balat Unit[1]. Schild and Wendorf (1977) first described the Dakhleh Terminal ESA based on an extensive collection recovered from artesian spring eyes at Dakhleh Oasis, but it has never been directly dated at Dakhleh. Kleindienst considers the Balat Unit to be cognate to Sangoan. Churcher et al. (1999) estimate that the Upper Acheulean *sensu.stricto* dates to >400 ka, while the Terminal ESA dates to >300 ka.

Middle Stone Age: Caton-Thompson and Gardner (1952) describe six Levallois-based units at Kharga, while other researchers only recognise two (Mandel and Simmons 2001, Wendorf and Schild 1980). Following Kleindienst (1999) we recognise four units: Older MSA, Younger MSA, Aterian, and Khargan[2].

REF-4: This is Caton-Thompson and Gardner's Locus IV (1952:103-105), where a cut for the now abandoned railway exposed silt and gravel underlying tufa. Caton-Thompson and Gardner describe two "Lower Levalloisian" sets of artifacts from this location: one from basal gravels, and one from a "chipping floor" in a sand lens above. We did not recover any artifacts from the basal gravels and artifacts are exposed in the sand at a variety of levels. The artifact sample includes pieces from the face of the cut and from the colluvium, predominantly from the area above the gravel level. The cores show remarkable cohesion, all being Levallois (recurrent and preferential) and most being large, flat cores with few removals on the striking platform face, and centripetal reduction with the entire core perimeter serving as a striking platform (i.e., equivalent to Bordes' disc cores). One core is a bidirectional core for recurrent flake removals. These pieces differ from the preferential cores illustrated by Caton Thompson (1952), but neither sample is large. A U-series determination of 220 ± 20 ka (Isochron) has been obtained on tufas overlying the silts and in a lens within the sediment (Churcher et al. 1999).

MT-2: Artifacts from Caton-Thompson and Gardner's "Upper Levalloisian" Mata'na G (1952: 141-144) lie in cemented silts between tufa deposits. Charcoal and possibly burnt flint are exposed in the section. We collected artifacts from the exposed profile and from two of Caton-Thompson's discard piles. Only one of the pieces from the discard piles bears the distinctive desert varnish of surface artifacts. Although this sample is not representative, there are differences between this material and that from REF-4. Most cores are centripetally prepared Levallois cores with some cortex on the striking platform face, including both recurrent and preferential cores. The difference lies in the preparation of the striking platform, which is restricted to the proximal end of the core. A bidirectional blade core was also recovered. We sampled tufa from above and below the cemented silts for dating. A U-series date of 125 ± 1.6 ka has been obtained on tufa overlying silts bearing artifacts at REF-2, another site that Caton Thompson designated "Upper Levalloisan" (Churcher et al. 1999, Kleindienst 1999).

BQ-2: Although Caton-Thompson and Gardner left the question of the chronological order

of the Aterian and Khargan open, Bulaq A is the best evidence they present for the "Kharga Aterian Industry" post-dating the "Khargan Industry" (Caton-Thompson 1952:116-123). At BQ-2 (Bulaq A) we examined the exposed sections of six open trenches. According to Caton-Thompson and Gardner (1952:117), Aterian material was found in the top 20 cm of silt and "Levalloiso-Khargan" material was found in silts between 20 and 40 cm b. s. and in a pebbly sand at 40 cm b. s. We are not confident, based on examination of the sections, that this material is not redeposited and therefore question the usefulness of this location for determining the relative chronological relationship between the Khargan and Aterian (cf. Kleindienst 1999).

REF-7 includes two loci where artifacts were found within tufa deposits. In one case, the deposit was a debris flow and other similarly sized non-artifactual pieces were also encased in tufa. At a nearby location, artifacts of different sizes were the only objects in the tufa, and it is unlikely that the artifacts moved far from their original location of deposition before tufa formed around them. Most pieces are undiagnostic flakes, but we recovered two cores: a centripetally prepared Levallois core for preferential flaking, similar to those from MT-2 and a probable bidirectional Levallois core, collected out of the debris flow area.

Other MSA sites are surface localities or are designated as "Undifferentiated MSA". MT-4 is a small Aterian surface cluster at Mata'na, BQ-3 is a Khargan surface aggregate on pan sediments in Naqb Bulaq and BQ-5 and MD-10 are MSA workshops in surface context.

Holocene Sites: Caton-Thompson (1952), like later workers (Simmons and Mandel 1986, Wendorf and Schild 1980), recognised two major prehistoric Holocene units in Kharga: an early Holocene "Terminal Palaeolithic" or "Epipalaeolithic" and a later "Neolithic"[3]. Sites recorded by these surveys are located either on the oasis floor or atop the Plateau. Caton-Thompson (1952:32) remarks that she found virtually nothing for this period "...on the scarp undercliffs, and the silty solution basins in the tufas...". However, the eight Holocene prehistoric localities recorded by the KOPP are all in the tufa areas on the escarpment, all but one of them in Wadi Midauwara, which neither Caton-Thompson nor Gardner visited. Of the eight, four are Epipalaeolithic (MD-4, MD-5, MD-7 and, tentatively, REF-5), three are probably Neolithic (MD-3, MD-13 and MD-14), while one (MD-6) has both Epipalaeolithic and Neolithic material. Only two of these localities, MD-5 and MD-6, have received much attention so far.

MD-5: This site consists of scatters of chipped stone and ostrich eggshell around playa silts on the floor of a tufa basin. Features include several low hearth mounds and at least one circle of limestone blocks, a possible hut foundation. The lithic industry, mostly on local chert, is blade oriented, with many single platform cores. Among the blades, point form platforms slightly outnumber single facet or lisse platforms. A grab sample of tools includes a dozen Harif points, microliths including triangles and one elongated triangle, various piercers, and an end scraper.

MD-6: Located in a nearby depression where there are also scatters of Neolithic and later material. The Epipalaeolithic here seems to differ technologically and typologically from that of MD-5. All the arrowheads are Ounan points, and there are many drills and some notched blades and blades with backing. Blade blanks are occasionally skewed to one side, and in one sample, 70% of blade platforms were single faceted. Also noted were cobble-covered possible hearth mounds, one or two probable hut circles, and a grinding slab fragment with a slightly upturned rim. Ostrich eggshell was scattered on the site; a single bead and a decorated eggshell fragment were noted. Eggshell was collected at both MD-5 and MD-6 for dating.

Significance and further research

Our work shows that there are clear correlations between tufa deposits and earlier MSA units. ESA aggregates are found in gravels and in lag deposits, indicating both that an arid period succeeded deposition, and that this is turn was succeeded by pluvial conditions. Caton-Thompson's MSA localities, REF-4, MT-2, and REF-3 show excellent potential for future research because artifacts are still present in the sections and the small samples suggest these aggregates reflect short-term use. The technological differences between the

cores found at REF-4 and MT-2 lend support to Caton-Thompson's (1952) and Kleindienst's (1999) MSA classifications, in that there appear to be differences within the MSA that predates the Aterian. Dating of the tufas is underway and future analysis of artifacts will help to clarify whether these differences reflect change through time, as our available U-series determinations suggest (Kleindienst et al. n.d.), or production of different blanks in different locations.

Neither we nor Caton-Thompson and Gardner found any evidence for Aterian, Khargan or Holocene aggregates in direct association with tufa. Although this negative evidence may be disproven, we have conducted reconnaissance missions to Kharga since 1987 and Caton-Thompson and Gardner spent three seasons conducting detailed survey and mapping. We are therefore confident that if such materials do occur in association with tufa, such deposits are not extensive. This may have significance for our understanding of the adaptations of "Khargan" and "Aterian" peoples because it could indicate that in the Western Desert these units are not associated with a fully "wet" period. This has implications for the availability of resources and possibly restrictions on movement of prehistoric peoples.

Work on the Holocene portion of the sequence is still in its early stages. Perhaps the most interesting point to emerge thus far is the variation detected within the Epipalaeolithic flaked stone industry of this small geographical area. This mirrors to some extent the differences detected within the Epipalaeolithic of Dakhleh Oasis between the lithic assemblages of Masara C and Masara A respectively (McDonald 1991, in press). It might further be noted that Harif points and Ounan points, while morphologically similar, show different distribution patterns within Northeastern Africa and beyond (McDonald 2000). Further work on the Kharga Escarpment may help determine if this apparent dichotomy within the Epipalaeolithic reflects temporal variation, differences in adaptation or ethnicity, site function, or just sampling error.

Footnotes

1. Difference of means test.
2. Older MSA is equivalent to Caton-Thompson's Lower Levalloisian and Kleindienst's Dakhlah Large-sized MSA and the Younger MSA is equivalent to Caton-Thompson's Upper Levalloisian and Kleindienst's Medium-sized MSA.
3. Caton-Thompson's earlier unit, the "Bedouin Microlithic", is actually a mixture of Terminal Palaeolithic and early Neolithic material.

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References

Caton-Thompson, G.

1952 *The Kharga Oasis in Prehistory.* London: Athlone Press.

Churcher, C. S., M. R. Kleindienst and H. P. Schwarcz

1999 Faunal remains from a Middle Pleistocene lacustrine marl in Dakhleh Oasis, Egypt: palaeoenvironmental reconstructions. *Palaeogeography, Palaeoclimatology, Palaeoecology* 154(4): 301-312.

Crombie, M. K., R. E. Arvidson, N. C. Sturchio, Z. E. Alfy and K. A. Zeid

1997 Age and isotopic constraints on Pleistocene pluvial episodes in the Western Desert, Egypt. *Palaeogeography, Palaeoclimatology, Palaeoecology* 130:337-355.

Hawkins, A.

2001 Getting a Handle on Tangs: Defining the Dakhleh Unit of the Aterian Technocomplex - A study in surface archaeology from the Western Desert of Egypt. PhD dissertation, University of Toronto.

Kleindienst, M. R.

1999 Pleistocene Archaeology and Geoarchaeology of the Dakhleh Oasis: A Status Report. In C. S. Churcher and A. J. Mills, editors, *Reports from the survey of Dakhleh Oasis, Western Desert of Egypt, 1977-1987.* Oxford: Oxbow Books, pp. 83-107.

Kleindienst, M. R., C. S. Churcher, M. M. A. McDonald and H. P. Schwarcz

1999 Geology, Geography, Geochronology and Geoarchaeology of the Dakhleh Oasis Region: Interim Report. In C. S. Churcher and A. J. Mills, editors, *Reports from the survey of Dakhleh Oasis, Western Desert of Egypt, 1977-1987.* Oxford: Oxbow Books, pp. 1-53.

Kleindienst, M. R., H. P. Schwarcz, K. Nicoll, C. S. Churcher, J. Frizano, R. Giegengack and M. F. Wiseman

No date Water in the Desert: First report on Uranium-series dating of Caton-Thompson's and Gardner's "classic" Pleistocene sequence at Refuf Pass, Kharga Oasis. In M. F. Wiseman, editor, *Oasis Papers II: Proceedings of the Second Dakhleh Oasis Project Research Seminar*, Royal Ontario Museum and University of Toronto, June 1997. Oxbow Books, Oxford.

Mandel, R. D. and A. H. Simmons

2001 Prehistoric Occupation of Late Quaternary Landscapes near Kharga Oasis, Western Desert of Egypt. *Geoarchaeology* 16(1):95-117.

McDonald, M. M. A.

1991 Technological organization and sedentism in the Epipalaeolithic of Dakhleh Oasis, Egypt. *The African Archaeological Review* 9:81-109.

1999 Neolithic cultural units and adaptations in the Dakhleh Oasis. In C. S. Churcher and A. J. Mills, editors, *Reports from the Survey of Dakhleh Oasis, Western Desert of Egypt, 1977-1987.* Oxford: Oxbow Books, pp. 117-132.

2000 The Early Holocene Masara cultural unit: puzzles and prospects. Paper presented at the Dakhleh Oasis Project Third International Symposium, Melbourne.

In press Holocene Prehistory: interim report on the 1997 and 1998 seasons - the Masara sites. In G. E. Bowen, C. A. Hope and B. Parr, editors, *Dakhleh Oasis Project: preliminary reports on the 1995-1999 field seasons*. Oxford: Oxbow.

Nicoll, K., R. Giegengack and M. R. Kleindienst

1999 Petrogenesis of Artifact-Bearing Fossil-Spring Tufa Deposits from Kharga Oasis, Egypt. *Geoarchaeology* 14(8):849-863.

Schild, R. and F. Wendorf

1977 *The Prehistory of Dakhla Oasis and Adjacent Desert.* Wroclaw: Polska Akademia Nauk.

Simmons, A. H. and R. D. Mandel, editors

1986 *Prehistoric Occupation of a Marginal Environment: An Archaeological Survey near Kharga Oasis in the Western Desert of Egypt.* Oxford: British Archaeological Reports.

Smith, J. R.

in preparation Geoarchaeology, stable-isotope geochronology, and geochronology of fossil-spring tufas, Western Desert, Egypt. PhD dissertation, University of Pennsylvania.

Szabo, B. J., C. V. Haynes and T. A. Maxwell

1995 Ages of Quaternary pluvial episodes determined by uranium-series and radiocarbon dating of lacustrine deposits of Eastern Sahara. *Palaeogeography, Palaeoclimatology, Palaeoecology* 113:227-242.

Wendorf, F. and R. Schild

1980 *Prehistory of the Eastern Sahara.* New York: Academic Press.

Wendorf, F., R. Schild, A. Close and Associates

1993 *Egypt During the Last Interglacial: The Middle Palaeolithic of Bir Tarfawi and Bir Sahara East.* New York: Plenum Press.

Wiseman, M. F.

1999 Late Pleistocene prehistory in Dakhleh Oasis. In C. S. Churcher and A. J. Mills, editors, *Reports from the survey of Dakhleh Oasis, Western Desert of Egypt, 1977-1987.* Oxford: Oxbow Books, pp. 109-115.