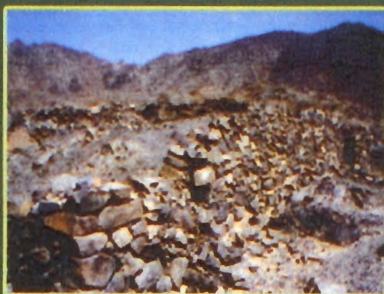
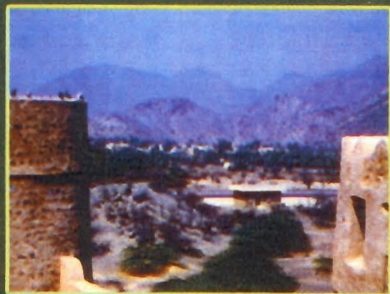




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Peter Hellyer and Dr. Michele Ziolkowski

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New Neolithic sites in the Rub al-Khali: survey and excavations at Umm az-Zamul - the 2004 season

Heiko Kallweit, Mark Beech and Walid Yasin Al-Tikriti

Abstract

Recent research by the Abu Dhabi Islands Archaeological Survey in cooperation with the Department of Antiquities and Tourism in Al Ain, now part of the Abu Dhabi Authority for Culture and Heritage (ADACH), has revealed new Neolithic sites in the Umm az-Zamul region, located in the south-eastern desert of Abu Dhabi in the United Arab Emirates. The sites comprise of extensive lithic scatters spreading more than 3 kilometres alongside the south-eastern slopes of barchan dunes (crescent-shaped dunes whose arms point down-wind). The lithics scatters belong to the so-called Arabian Bifacial Tradition (ABT). Detailed recording of single flints as well as controlled total collection from defined contexts was applied. This was carried out to determine the character of the assemblage composition and to discuss the possible origins of site formation. These new sites allow us to re-examine the nature of settlement activities within the desert interior of south-eastern Arabia.

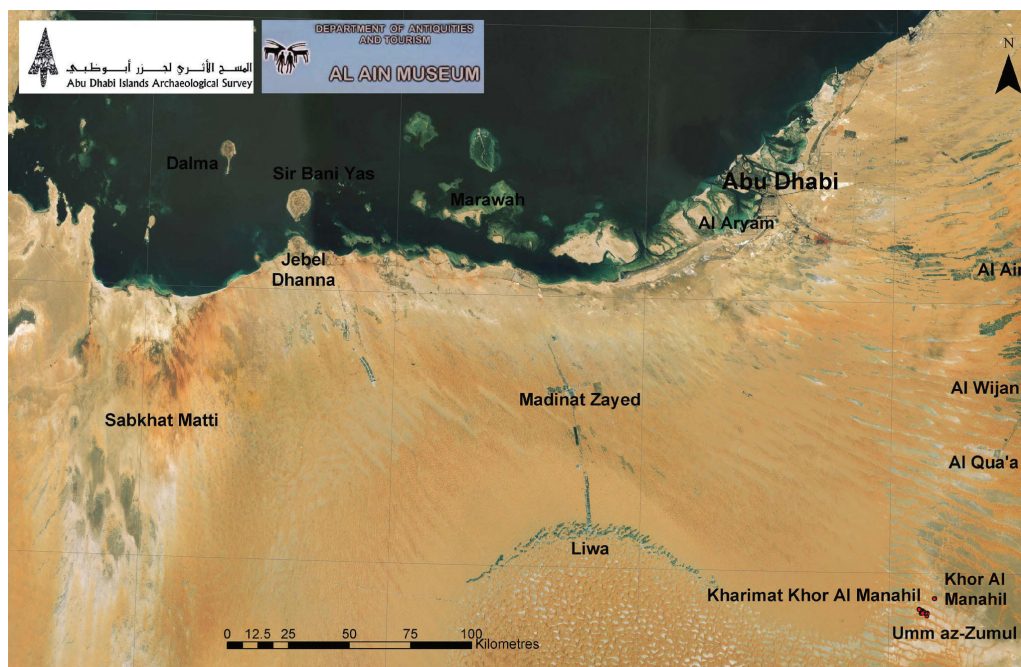


Figure 1. Location Map of Kharimat Khor Al Manahil and Khor Al Manahil in Abu Dhabi emirate, UAE.

Introduction

This paper presents important new evidence for human occupation recently discovered in the Umm az-Zamul region, an area located in the south-eastern desert of Abu Dhabi in the United Arab Emirates. It is near to this point that the UAE meets the borders of both the Sultanate of Oman and Saudi Arabia. Historically, Umm az-Zamul has long been an important area because of the presence of a sweet-water well. The area is sparsely populated and human activities at the present day are largely confined to camel farming and related occupations, although development of an oilfield to the north, is now under way.

Situated at the north-eastern edge of the Empty Quarter or Rub al-Khali, the region today is characterised by flat plains interspersed with linear mega-dunes and local patches of sabkha, some of which cover several square kilometres. These plains and sabkhas act as interdunal corridors and they are generally oriented NW-SE. Some of these interdune areas have a thin covering of smaller aeolian dunes which are locally covered with scrub vegetation. These generally cross the interdune areas obliquely and are the result of recent erosion of the older mega-dunes.

Discovery of the sites

In October 2003, during the course of research on habitats in the south-eastern desert of Abu Dhabi, a team lead by Chris Drew, at that time employed in the Terrestrial Environmental Research Centre (TERC), part of the Environment Agency - Abu Dhabi, reported a number of archaeological finds to the Abu Dhabi Islands Archaeological Survey (ADIAS). Subsequently, the potential and character of the sites was evaluated by Dr Mark Beech during a short visit in November 2003. During this visit to the area known locally as Kharimat Khor Al Manahil (abbreviated site code: KHM), numerous surface scatters of flint were observed. Consequently, an initial field season was planned and organised for January 2004 in cooperation with the former Department of Antiquities and Tourism in Al Ain. This work was subsequently carried out by the present authors between the 24th January and the 6th February 2004. A report on this first field season was presented at the Seminar for Arabian Studies held at the British Museum in July 2004 which was subsequently published in the Proceedings of the Seminar for Arabian Studies (Kallweit *et al.* 2005).

Priorities of the first field season were:

(1) To record and explore the extension and precise location of each single surface scatter. In the course of this work, a number of important single finds were collected as well as total find complexes.

(2) To investigate neighbouring areas in order to explore the extent of the total area with archaeological finds.

To date, a linear area about seven kilometres long and one kilometre wide of almost continuous flint scatters has been investigated. The borders of the archaeological area still remain uncertain.

Discovery of the sites

The site complex is located close to the border with Oman and Saudi Arabia, in the south-eastern corner of the Emirate of Abu Dhabi (*Fig.1, and see note 1*).

Major landscape features in that area are large intra-dunal plains, stretching roughly into a north-northwest to south-southeast direction. These plains are divided by dunes or dune chains, reaching an average elevation of about 30-60 metres. Where gaps or more precisely, lower dune ridges occur, the plain is divided again in a north-northeast to south-southwest direction by lower dune ridges. Clearly, these intruding low dunes are blown fairly recent into the plains. At least, they appear to be younger than the high dune chains (but for a cautionary note, see the discussion below concerning the dating of dunes). If one looks at aerial photographs or satellite images of these plains, known locally as Kharimat Khor Al Manahil, an irregular pattern of dune sands can be observed, dividing the plains into segmented patches. This impression is supported by the rather white colour of the plains in contrast to the sandy-beige colour of the dunes. The conspicuous white colour of the plains is partly a result of the aeolian erosion of the limestone bedrock, which outcrops in several locations in the plain (*Fig. 2a*).



Figure 2. (a) Limestone outcrops in Kharimat Khor Al Manahil.



(b) Palaeodune outcrops at Kharimat Khor Al Manahil.

Samples of the limestone including a gastropod fossil were collected to determine the age and composition of the limestone. The plain surface is covered by small limestone pellets, ranging up to a few millimetres in size. Another phenomenon of the surface morphology are small escarpments, running in a north-east direction. These steps are about two metres high, dividing the plain into sub-units of different elevations. At site KHM0002, a similar structure was observed partly covered by dune sand. Archaeological finds recorded were mainly concentrated on the higher terrace surface. Only a few small flakes were found on the lower levels. Along the north-western fringes of the plain, partly running underneath the foot of the dune slopes, there are several fossilized dunes exposed (*Fig.2b*). These structures are easy to identify by their visible layers and the fact that the sand is a different colour. The sand within these palaeodunes is not loose and has a relatively moderate degree of compaction. A series of large flint surface scatters were observed situated on similar such outcrops throughout the area.

Another conspicuous landscape feature are areas of sabkha. These are also present in some of the interdunal plains located to the west of the study area.

Kharimat Khor Al Manahil

The archaeological sites recorded at Kharimat Khor Al Manahil (abbreviated site code: KHM) vary in their composition and extent. They range from locations with single tools or groups of tools to large patches of debitage, as well as structures. It is remarkable, however, that the space between the single sites are also well covered with sporadic scatters of debitage or tools. This area of more or less continuous lithic scatters spreads along the northern fringe of the plain, close to the foot of the southern slopes of the large dunes. It is by far the most extensive spread of lithics recorded in the United Arab Emirates, stretching for more than three kilometres.

Two archaeological sites within this area will be discussed in more detail.

Lithic Scatter (KHM0035)

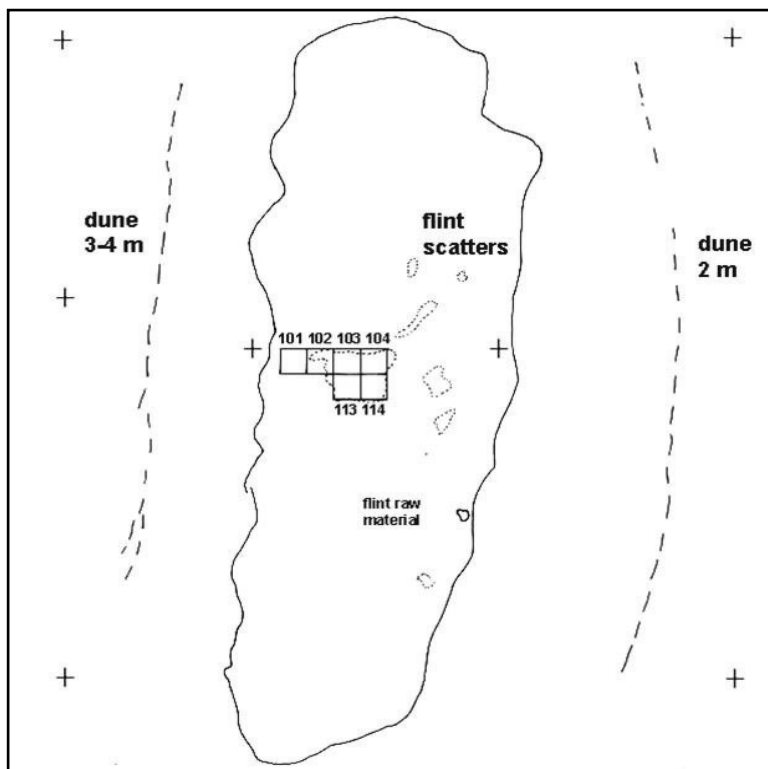
Site KHM0035 is situated in a small dune depression. Two flat dune ridges running roughly in north to south direction enclose the site on the east and the west (*Fig.3a*). The surface of KHM0035 is covered with flint debitage (*Fig.3b*), which extends over an area of about 15 x 8 metres. The highest concentration of flakes was observed in the centre, at the deepest point of the site. This may, of course, also be an effect of natural erosion. It is interesting to note that the surface of KHM0035 is uneven, with small ditches and ridges, in contrast with the dune depression which are purely covered by sand. Besides the flint flakes, white coloured limestone pellets form patches on the surface. To the west, where the dune depression opens its mouth into the plain, the typical rippled structures of palaeodunes are visible.



Figure 3. (a) Site KHM0035, view to the north with the east-west grid line established;

(b) The surface flint scatter at site KHM0035.





(c) Sketch map of site KHM0035 with the grid system of flint collection



(d) Detail of the composition of the deposits in square 103 at KHM0035.

The following methodology was adopted at the site. A metre grid square system was established after a ten metre long east-west baseline had been installed which bisected the edge of the major debitage concentration (*Fig.3c*). More than 1200 grams of flint flakes were subsequently collected and recorded. Each metre square was then divided into 25 sub-squares, each measuring 20 centimetres, using a standard wooden archaeological planning frame. Each of these sub-squares was then excavated to a depth of 10 centimetres, all the excavated sediment being dry sieved with a mesh size of approximately one millimetre. To analyse the composition of the deposits, samples of pure sand as well as the organic content were also taken. The debitage was concentrated just in the first few centimetres down from the modern ground surface (*Fig.3d*).

A huge quantity of tiny flint chips, less than one centimetre in length, were preserved. Many larger cortical pieces, knapped from different coloured and textured raw material, were also noted suggesting that it was a knapping site. All of the pieces could be classified as debitage, as they had no traces of further work to them. It seems like only the unusable pieces remaining from primary production were left at the site. The presence of so many cortical pieces, a limited number of different types of raw material and the preservation of even the tiniest pieces offers a rare opportunity to study details of dismantling techniques.

Lithics Scatter and Stone 'Structures' (KHM0045-47)

During the 2004 season a series of possible 'structures', constructed from limestone, were noted. (*Fig.4*). Three 'structures' were located at the eastern edge of the investigated area, the three units being aligned close together in a north-northeast to south-southwest direction.

Subsequent excavations in January 2006 and 2007 revealed that the three 'structures' were in actual fact the result of seismic survey activities. Traces of metal and wire at adhering to limestone fragments were found deep in the centre of two of the depressions (KHM0045 and KHM0046), as well as a c. 15cm diameter, 4 metre deep borehole. This had clearly been drilled for the placement of an explosive charge, in order to carry out a seismic survey as part of oil exploration.

A Distinctive Artefact (KHM0005)

The lithics from Kharimat Khor Al Manahil are currently under study by Heiko Kallweit. One very interesting artefact was found during the November 2003 survey, just a few hundred metres to the west of the building structures (KHM0045-7). This was a curious shaped bifacial tool (*Fig 5*). Other authors have described similar tools as being "hoes". It is known that heavy flaked-stone implements mounted with bitumen were used in Mesopotamia in the 5th millennium BC. They sometimes occur together with flint-bladed sickles and grinding stones, these artifacts being taken to indicate the presence of farming settlements. Flint hoes were noted in Ubaid levels at Ur. One of the authors (HK) recently had the opportunity to study the stone implements stored in the British Museum which were recorded by the expeditions of Leonard Woolley between 1919-1924 (Kallweit *in prep.*). The examples from Ur are similar in shape, but the UAE specimen is made of a different type of stone. Whereas the Ur examples are made from limestone, our example is made of reddish flint.

Flint chert hoes have been also found in Ubaid 2 levels at Warka Sur 051 (OIM A34550), as well as Ubaid 4 levels at Warka Sur 137 (OIM A34555) and Warka Sur 411 (OIM A34551). These are on display in the Mesopotamia gallery at the Oriental Institute in Chicago. Flint "hoes" are also reported from the Ubaid site of Tell Maddhur in Iraq (Roaf 2002: 54).



Figure 4. View of Kharimat Khor Al Manahil looking to the north-east.

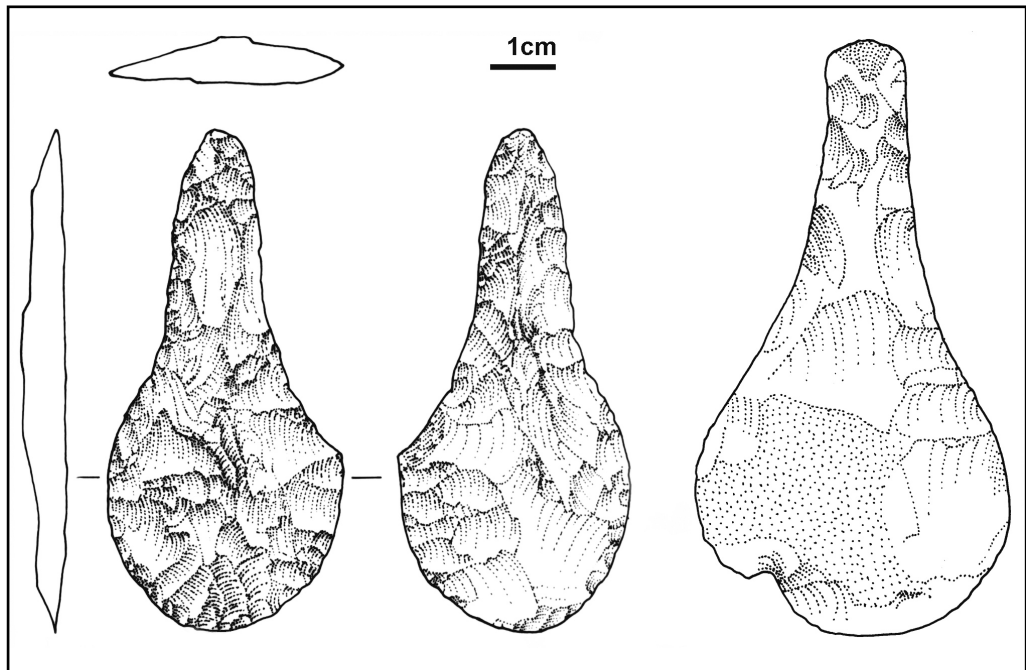


Figure 5. Left: Bifacial tool from Kharimat Khor Al Manahil KHM0005; Right: "hoe" from Ur.

Some authors have taken the presence of "hoes" to indicate evidence of desert-fringe agriculture. It was noted by Masry that fragments of hoes were recovered at Dosariyah on the Saudi Arabian Gulf coast, although he stated that ... "agriculture must have been practiced on a very small scale and only as a marginal subsistence resource" (Masry 1997: 114). We prefer, however, to err on the side of caution with such an interpretation. Such implements may have been used as more general multi-purpose digging tools.

Khor Al Manahil

About 7 kilometres to the north of the Kharimat Khor Al Manahil sites, another important archaeological site was reported to the ADIAS team by John Newby, formerly head of the Terrestrial Environmental Research Centre (TERC) at the Environment Agency - Abu Dhabi. This area is known locally as Khor Al Manahil (abbreviated site code: KAM). An initial reconnaissance visit by the authors, together with Mohammed Al Neyadi (Director of the Department of Historic Environment at the Abu Dhabi Authority for Culture and Heritage) revealed a large area covered with surface scatters of lithics.

The limited time available during the 2004 season precluded detailed mapping of the sites or the digging of sondages to examine the stratigraphy of the site. Both these activities are planned, however, for future seasons.

GPS coordinates were taken of the main find spots, the most important small finds being collected from the surface of the site. This was done primarily as there was a genuine fear that the site might succumb to the visits of amateur flint collectors, which would destroy valuable archaeological evidence.

Amongst the lithic assemblage retrieved were some very well preserved pieces of armature as well as a fragment of a large limestone vessel, KAM0008 (*Fig. 6*). The walls of the limestone vessel are about 3 centimetres thick and it is preserved to a height of about 17 centimetres. The fragment weighs nearly 900 grams. Subsequently, a second more complete limestone vessel was discovered by John Hoolihan (formerly of the Environment Agency - Abu Dhabi) less than 25 metres to the south of the first finding. These can be interpreted as being mortars, used for the crushing and processing of food remains. A similar vessel was discovered at the 'Ubaid-related settlement on Dalma island (UAEinteract 2004; Popescu and Beech, *in prep.*).

Other similar vessels have also been reported from a number of sites throughout the region including Khor F.B. in Qatar (Inizan 1988: 72, fig.30), Ibn Hammuda located near the Yemen border in Dhofar, Oman, as well as at Habarut and other sites in the Omani and Saudi Arabian Rub al-Khali (Zarins 2001: 45, Fig.17 and 48). At Naqdan, 110 km east of Jabrin, on the edge of playa lake deposits probably dating to the mid-Holocene, two limestone nodules were noted which had been flattened on one side (Edens 1988: 30).

Another example is known from the so-called "western Rub al-Khali Neolithic" identified by Edens (Edens 1982: 118 and plate 104, 10.) From the Yemen, more examples are reported from the western fringe of the Rub al-Khali (Di Mario 1989: 137 and figure 14, 5), and from the Central Highlands (Kallweit 2001: 126; Abb. 5,18 and Tafel 22-24). Stone vessels of different size and shape appear generally to be part of Neolithic assemblages throughout the Arabian Peninsula, but seem to have been missed in the records of the earlier collections made by amateurs. Among the armature, the discovery of a complete willow-leaf shaped point, more than 9 centimetres long, is quite remarkable (*Fig. 7*). The point weighs 17g and therefore seems rather too heavy to serve as an arrowhead. Both its faces have been carefully worked by parallel pressure retouch. It is manufactured of a reddish brown, fine grained flint, rather similar to natural sources known around Jebel Hafit near Al Ain .



Figure 6. A limestone vessel found at Khor Al Manahil.

In terms of their typology, the bifaces found at Khor Al Manahil (*Fig. 8, 1-5*) match well to the "broad foliate" type described earlier by Edens (Edens 1982: 111, Plate 102, 1-9; Edens 1988: 18, Fig. 1, 8-9) from sites in south-western Saudi Arabia. Similar types from the Buraimi Oases have been referred to as "foliates" (Copeland & Bergne 1976: 44-48; fig. 1, 1-3 and Fig. 2, 1-3, 8). In a more recent study by Margarethe Uerpmann, comparable objects from Oman are called "simple foliates" (Uerpmann 1992: 84-85). R.H. Spoor has analysed the geographical and chronological distribution of different types of armature in SE Arabia. He has discussed similar types from different sites inside the UAE which he identified as "Huwayyan slugs" or "Huwayyan foliates", and divides them into various sub-types (Spoor 1997: 146).

The total number of finds from the Khor Al Manahil and Kharimat Khor Al Manahil sites is still small, nevertheless it is interesting to see the range of types present. The arrowheads recorded at Khor Al Manahil are all either stemmed and barbed (*Fig. 8, 6-7*), or diamond shaped with a tendency towards a triangular cross-section (*Fig. 8, 8-9*). Stemmed bifacial points, especially the barbed variety, are extremely typical of the mid-Holocene bifacial industry throughout the Arabian peninsula (Edens 1982, 1988). Taking into account confidence intervals, radiocarbon dating places the Arabian Bifacial Tradition (ABT) between 6000/5800 and 3700/3500 BC (Edens & Wilkinson 1998: 63), although some local variants of the ABT in coastal southeast Arabia may have been of shorter duration (Uerpmann 1992).

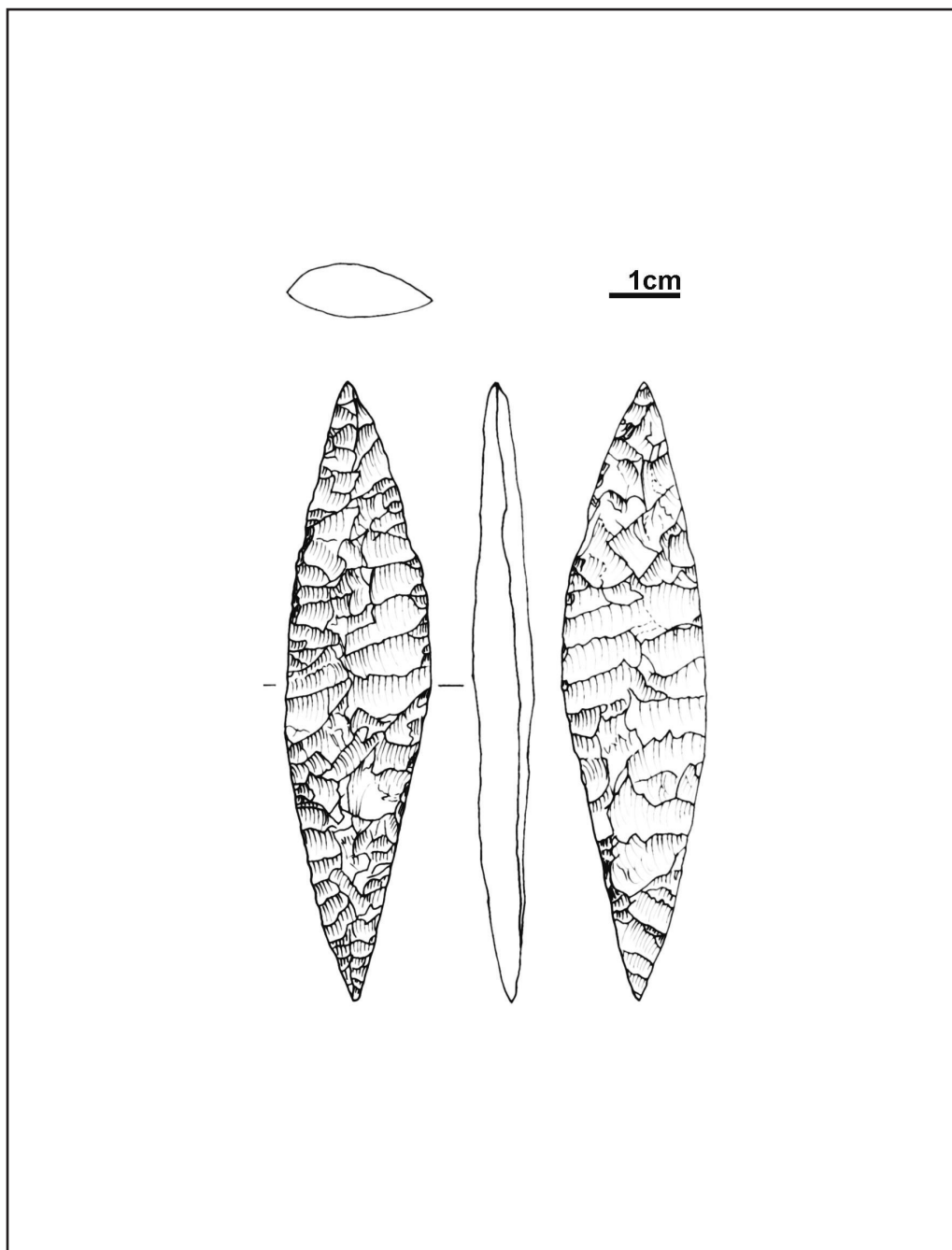


Figure 7. A complete nine centimetre long willow-leaf shaped projectile point found at Khor Al Manahil (KAM0009, no.16).

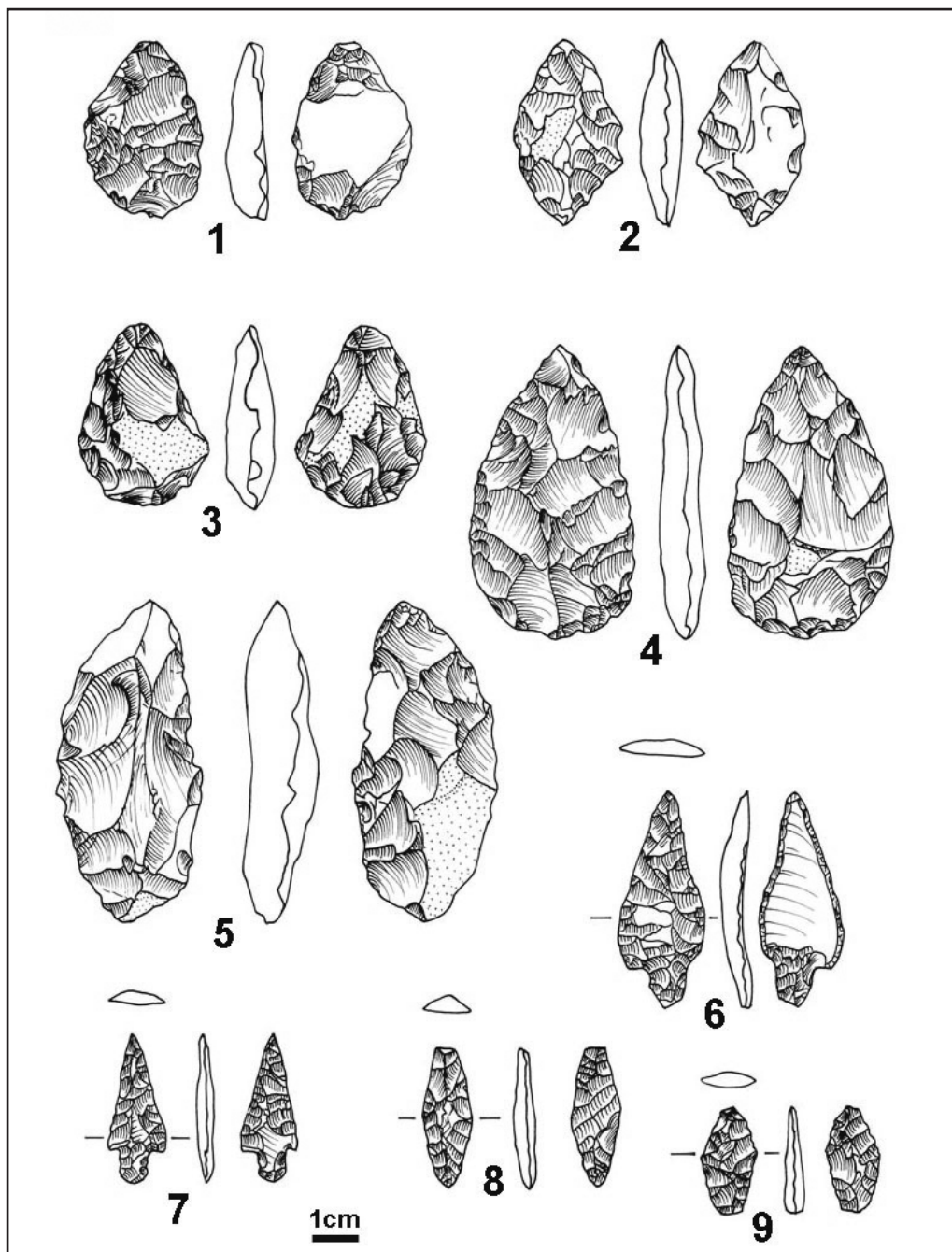


Figure 8. Lithics found at Khor Al Manahil sites. Number 1-5: bifaces. Number 6-9: arrowheads.

Neolithic sites in the Arabian Peninsula

The presence of lithic scatters in the Rub al-Khali has been well known for at least fifty years (Field 1955, 1960a,b; Zeuner 1954). Up until now, however, Neolithic sites in the Emirates are better known from island sites in the United Arab Emirates. On Dalma Island, a settlement area was identified with preserved layers and traces of housing (Flavin & Shepherd 1994; Beech & Elders 1999; Beech *et al.* 2000; Popescu & Beech, *in prep.*). On Marawah Island, some quite remarkable stone buildings have recently been discovered which date back to the mid 6th millennium BC (Beech *et al.* 2005). An important Neolithic site located in the interior has been discovered, however, at Jebel Buhais in the emirate of Sharjah in the United Arab Emirates. The site of Buhais 18 was the first major Neolithic site within the interior of the UAE to have been identified with well preserved organic matter. The skeletal remains of almost 500 individuals have been retrieved from the site, to date, as well as an important assemblage of animal bones. Apart from numerous fire pits, some of which were lined with stones, no evidence of building structures were observed, and the site does not seem to have been a permanent settlement (Uerpmann & Uerpmann 2000: 40; Uerpmann *et al.* 2000: 229).

Our new discoveries at Kharimat Khor Al Manahil and Khor Al Manahil are remarkable in that this is the first time that substantial Neolithic stone tool assemblages have been found within the desert interior of the UAE. No pottery has been found associated with the lithics. The presence of the characteristic lithics described above, together with other finds such as the limestone vessel fragments, tends to suggest that a range of probably seasonal settlement activities may have taken place in the vicinity. This provides a marked contrast with previous findings in the desert interior of Abu Dhabi which generally consist of isolated surface scatters of mainly weaponry and debitage. Examples of such sites include Yaw Sahhab at the eastern end of the Liwa oasis (Harris 1998: 24-27), Bida Al Mitawaa in western Abu Dhabi (Crombé 2000: 9-14) and Rumaitha, located close to the coast south of Abu Dhabi (Kallweit & Hellyer 2003: 1-7).

In order to fully understand the dating and context of these sites one has to consider the role played by the geomorphological history of the dunes in this region.

Dating of the dunes

Comparatively little work has been undertaken on firmly dating the aeolian activity of the dunes of Eastern Arabia. This is despite the fact that the large dunes of the Emirates often appear to be underlain by undated cemented carbonate dune sands. Although an episode of dune formation has been dated to between 42,000 and 34,000 years ago in Sharjah (Sanlaville 1992), most available data suggests that widespread dune formation took place between the time span 22,000 - 11,000 years ago (Glennie 1996).

Some optical dating has been carried out on linear dunes in Ra's Al Khaimah in the United Arab Emirates (Goudie *et al.* 2000). This work revealed that a 17m high dune at Awafi accumulated rapidly at a rate of about 3.3m ka⁻¹ about 10,000 years ago, whilst a 40m high dune at Idhn had accumulated over the past 1000 years with 20m of sediment accumulating in a time period of about 270 years. It was suggested that the older dune may have accumulated in response to the transgression of the Arabian Gulf by rising sea levels during the late Pleistocene and Holocene period, and that the younger dune may have formed more rapidly due to intensive human activities, a short-lived climatic event or because of reactivation by erosion from fluvial action at its base (Goudie *et al.* 2000: 1011).

From Ain al-Faidah, a spring located close to Al Ain, palaeoenvironmental data were obtained from sections at different construction sites. They indicate the presence of more favourable

conditions during the period 9,000-6,000 BP (uncalibrated). Periods of higher fluvial erosion activities along the western slopes of Jebel Hafit were identified and dated in some cases by sub-fossilized organic matter such as wood or shells (Gebel *et al.* 1989: 13-22).

More recently some important work has been undertaken in the Liwa region of Abu Dhabi emirate (Bray & Stokes 2004). Radiocarbon dating of lacustrine, travertine and palaeogroundwater deposits has suggested that the climate was more humid between 35-25,000 and 10-6,000 years ago. An optical dating study was implemented here in an attempt to establish ages for the intervening arid phases. A deep drill core provided an interesting insight into the style of barchan dune accretion in the Liwa region. The large dune accreted rapidly during the mid-late Holocene. The results suggest that the transitions from humid to arid conditions and resulting accumulation of aeolian sediment in the form of large bedforms occurred abruptly around 6,000 years ago. Further aeolian sedimentation has not been constant since that time, with initial gradual dune growth followed by rapid vertical accretion, and possible termination of accumulation around 2,000 years ago.

The two latter studies demonstrate an important point, namely, that dunes cannot be aged purely on the basis of their size. Bigger does not always necessarily mean older. In terms of clarifying the dating and geomorphological development of the sites at Kharimat Khor Al Manahil and Khor Al Manahil, it would be worthwhile in the future undertaking optical dating of the dunes directly associated with the archaeological occupation layers. Future archaeological excavation of the building structures, as well as further survey in the vicinity, may hopefully uncover traces of hearths or suitable organic material which might permit the use of radiocarbon dating.

Work which has already been done on the radiocarbon dating of lake molluscs and marls in the Rub al-Khali indicates that rainfall, probably of a monsoon nature, filled the lakes during two intervals of around 32,000-20,000 and 10-6,000 years ago. It is reported that the lakes lasted from a few years to hundreds of years and ranged in depth from about two to ten metres (McClure 1971, 1976, 1978, 1984 and 1988: 9). Further survey work in the area of Kharimat Khor Al Manahil and Khor Al Manahil may reveal the presence of lake depressions and freshwater molluscs. Certainly some of the lithics observed seem to be resting on the edge of terrace-like features (e.g. KHM0002). Only by undertaking further surveys as well as geomorphological work will it be possible to confirm if these terraces are in actual fact the edges of ancient lakes.

Conclusion

The extensive lithic scatters at Kharimat Khor Al Manahil and Khor Al Manahil are clearly situated on the ridges of ancient palaeodunes. This is similar to the situation reported elsewhere in Abu Dhabi emirate from Bida al-Mutawah (Crombé 2000: 9) and the Al Ghazal golf club at Abu Dhabi International Airport (Beech *et al.* 2004). Such sites may have been initially settled during the Climatic Optimum, between about 10,000 and 6,000 years ago. This was a time of greater humidity in Eastern Arabia when winds are believed to have been weaker than now and rainfall higher. Sand dunes would have been largely stabilised by vegetation (Glennie 1996: 20). In the Rub al-Khali, seasonal or permanent lakes were formed in some interdunal areas (McClure 1978). Whereas today we see arid desert in large parts of Abu Dhabi, it is important to remember that this is a comparatively recent phenomenon.

Are the newly-discovered sites in the south-eastern desert of Abu Dhabi also located in an area with seasonal or permanent lakes? At Umm az-Zumul there is a traditional sweet-water well which was used until the pre-oil era. This area is at the lower end of the hydrological system emanating from the Wadi Dank, located in the Hajar mountains to the east in the Sultanate of

Oman (Dr Mike Brook, *pers.comm.*). It may have thus been an attractive region for nomadic pastoralists in the past with it being a well vegetated area with a reliable sweet-water supply. Neolithic communities would have required pasture grounds for their domestic animals and may well have moved around SE Arabia between the coast, mountains and the interior (Kallweit 2001; Uerpmann et al. 2000). The animal bone assemblage from Buhais included the bones of domesticated cattle as well as sheep and goat (Uerpmann & Uerpmann 2000: 40). Bovids were quite common in the Rub al-Khali Holocene lake deposits (McClure 1978: 262) and domesticated cattle bones have been found at a number of 'Ubaid sites in the Eastern Province of Saudi Arabia (Masry 1997: 155-159). In south-western Arabia it has been suggested that cattle herders practiced transhumance with summers in the Rub al-Khali and winters in the highlands to the west. In the case of Dhofar, the cattle herders would go to the Rub al-Khali in the summertime and return to the Nejd in the winter (Zarins 2001: 50).

Are the lithic scatters identified at Kharimat Khor Al Manahil and Khor Al Manahil perhaps traces of the seasonal camps of the nomadic pastoralists inhabiting the interior of southeastern Arabia? They may form part of what Zarins has referred to as the "Southwest Asian Pastoral Technocomplex". It has been noted elsewhere in a study of nomads in the Dhofar region that due to their high mobility their houses are not very substantial (Janzen 1986: 133), and that smaller flimsier encampments may well be the summer camps of prehistoric nomadic pastoralists (Bar-Yosef 1984: 157). The seasonal mobility of the population from the al-Buhais site in the Emirates has been deduced from the slaughtering ages of the small ruminants found at the site, where very few young animals were killed (Uerpmann & Uerpmann 2000, 2003; Uerpmann et al. 2000).

"Al Buhais 18 is interpreted as a central place of a group of nomadic herders, who gathered there during the time of year when their animals had lambs, kids and calves. Other parts of the year, presumably the winter, they spent at the coast, where a number of site of this period have been found. Their summer and autumn sites are not yet known. We believe that they were in the higher parts of the Hajar mountains. In any case the evidence available at al-Buhais 18 is sufficient enough to indicate large scale mobility of the herders of the 5th millennium BC in SE-Arabia". (Uerpmann & Uerpmann 2003: 256-7).

It is possible so, to think even of parts of a total social group, moving during a specific time in the year to preferred grazing grounds in the interior of the Arabian peninsula (Kallweit 2003: 62). Perhaps the Kharimat Khor Al Manahil and Khor Al Manahil sites represent seasonally-occupied sites during these summer or autumn periods? They may have been regularly-visited locations forming part of their annual cycle of movements around south-eastern Arabia, due to the presence of good grazing and sweet water in the vicinity.

Archaeological excavations subsequently carried out at Kharimat Khor Al Manahil in January 2006 revealed that the KHM0045-47 structures may in actual fact represent subterranean tombs.

Clearly research on Neolithic sites located in the interior of eastern Arabia still has some way to go. To date, most efforts have concentrated on the study of surface collections of artefacts. Unfortunately many of these studies have had to rely on rather biased samples of unprovenanced flint artefacts collected by amateur collectors (Gramly 1971). In this respect, the new sites discovered in the south eastern corner of Abu Dhabi offer for the first time a unique opportunity to learn more about the Neolithic in the interior of the United Arab Emirates.

Future fieldwork is planned for January 2007, to be carried out by the Abu Dhabi Authority for Culture and Heritage (ADACH).

Notes

(1) The exact locations of single finds or surface scatters and sites were recorded using a Garmin 12-channel GPS. As such flint sites are becoming more and more disturbed by visitors and amateur collectors, we do not give the GPS coordinates here, since we wish to keep the archaeological sites protected, at least whilst we are still in the midst of ongoing research on this important area.

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Author's addresses:

Dr. Heiko Kallweit

Astrid Lindgren 10,
79100 Freiburg, Germany
Email: heiko_kallweit@yahoo.de

Dr. Mark Beech

Head of Division - Cultural Landscapes
Abu Dhabi Authority for Culture and Heritage, ADACH
P.O. Box 2380, Abu Dhabi, UAE
Email: mark.beech@cultural.org.ae

Dr. Walid Yasin al-Tikriti

Head of Division - Archaeology
Abu Dhabi Authority for Culture and Heritage, ADACH
P.O. Box 15715, Al Ain, UAE
Email: wyasin11@yahoo.com

Bibliography

Bar-Yosef, O. 1984. Seasonality among Neolithic Hunter-Gatherers in Southern Sinai. Pages 45-160 in J. Clutton-Brock & C. Grigson (eds.), *Animals and Archaeology: Early Herders and Their Flocks*. Oxford: BAR International Series 163 (iii).

Beech, M., Cuttler, R., Moscrop D., Kallweit, H. & Martin, J. 2005. New evidence for the Neolithic settlement of Marawah island, Abu Dhabi, United Arab Emirates. *Proceedings of the Seminar for Arabian Studies* 35: 37-56.

Beech, M. & Elders, J. 1999. An 'Ubaid-related settlement on Dalma Island, United Arab Emirates. *Bulletin of the Society for Arabian Studies* 4: 17-21.

Beech, M., Elders, J. & Shepherd, E. 2000. Reconsidering the 'Ubaid of the Southern Gulf: new results from excavations on Dalma Island, U.A.E. *Proceedings of the Seminar for Arabian Studies* 30: 41-47.

Beech, M., Kallweit, H. & Hellyer, P. 2004. New archaeological investigations at Abu Dhabi Airport, United Arab Emirates. *Proceedings of the Seminar for Arabian Studies* 34: 1-15.

Biagi P., Maggi, R. & Nisbet, R. 1989. Excavations at the aceramic coastal settlement of RH5 (Muscat, Sultanate of Oman) 1983-5. Pages 1-8 in K. Frifelt and P. Sorensen (eds.), *South Asian Archaeology 1985*. London.

Bray, H.E. & Stokes, S. 2004. Temporal patterns of arid-humid transitions in the south-eastern Arabian Peninsula based on optical dating. *Geomorphology* 59 (1-4): 271-280.

Copeland, L. & Bergne, P. 1976. Flint Artefacts from the Buraimi area, Eastern Arabia and their relations with the Near Eastern Post-Palaeolithic. *Proceedings of the Seminar for Arabian Studies* 6: 40-60.

Crombé, P. 2000. A Neolithic site at Bida al Mitawaa in Western Abu Dhabi (U.A.E.). *Arabian Archaeology and Epigraphy* 11: 9-14.

Crombé, P., De Dapper, M. & Haerinck, E. 2001. An archaeological survey of Hawar Island (Bahrain). *Arabian Archaeology and Epigraphy* 12: 143-155.

De Cardi, B. (ed.). 1978. *Qatar Archaeological Report Excavations 1973*. Oxford: Oxford University Press.

Di Mario, F. 1989. The western ar-Rub'al-Khali "Neolithic": New Data from the Ramlat Sab'atayn (Yemen Arab Republic). *Annali Istituto Orientale Napoli* 49 (2): 109-148.

Edens, C. 1982. Towards a Definition of the Western ar-Rub'al-Khali "Neolithic". *Atlat* 6 (part III): 109-124.

Edens, C. 1988. The Rub al-Khali 'Neolithic' Revisited: the View from Nadqan. Pages 15-43 in D.T. Potts (ed.), *Araby The Blest*. Copenhagen: Tusculanum Press.

Edens, C. & Wilkinson, T.J. 1998. Southwest Arabia During the Holocene: Recent Archaeological Developments. *Journal of World Prehistory* 12(1): 55-119.

Field, H. 1955. New stone age sites in the Arabian Peninsula. *Man* 145: 137-8.

Field, H. 1960a. Stone implements from the Rubh'al-Khali. *Man* 30: 25.

Field, H. 1960b. Carbon-14 date for a "Neolithic" site in the Rubh'al-Khali. *Man* 214: 172.

Flavin, K. & Shepherd, E. 1994. Fishing in the Gulf: Preliminary investigations at an Ubaid site, Dalma (U.A.E.). *Proceedings of the Seminar for Arabian Studies* 24: 115-134.

Gebel, H.G, Hanns, C., Liebau A. & Raehle, W. 1989. The Late Quaternary Environments of 'Ain al-Faidha/ Al-'Ain, Abu Dhabi Emirate. *Archaeology in the United Arab Emirates* 5: 9-48.

Glennie, K.W. 1996. Geology of Abu Dhabi. Pages 16-35 in P.E. Osbourne (ed.), *Desert Ecology of Abu Dhabi - a review and recent studies*. Newbury, UK: Pisces Publications.

Goudie, A.S., Colls, A., Stokes, S., Parker, A., White, K. & Al-Farraj, A. 2000. Latest Pleistocene and Holocene dune construction at the north-eastern edge of the Rub Al Khali, United Arab Emirates. *Sedimentology* 47 (5): 1011-1021.

Gramly, R.M. 1971. Neolithic Flint Implement Assemblages From Saudi Arabia. *Journal of Near Eastern Studies* 30: 177-185.

Harris, A. 1998. A Late Stone Age site south of the Liwa Oasis. *Tribulus - Journal of the Emirates Natural History Group* 8 (2): 24-27.

Inizan, M-L. 1988. *Préhistoire À Qatar. Mission Archéologique française*. Vol 2. Paris: Editions Recherche sur les Civilisations.

Janzen, J. 1980. Die Nomaden Dhofars/Sultanat Oman. *Traditionelle Lebensformen im Wandel*. Bamberg: Geographische Schriften, Heft 3.

- Janzen, J. 1986. *Nomads in the Sultanate of Oman*. Boulder: Westview Press.
- Kallweit, H. 2001. *Neolithische und Bronzezeitliche Besiedlung im Wadi Dhahr, Republik Jemen*. PhD thesis, University of Freiburg, Germany.
URL: <http://www.freidok.uni-freiburg.de/volltexte/270/> (pdf file - 15.4 MB).
- Kallweit, H. 2003. Remarks on the Late Stone Age in the U.A.E. Pages 55-64 in D.T. Potts, H. Naboodah & P. Hellyer (eds.), *Archaeology of the United Arab Emirates: Proceedings of the First International Conference on the Archaeology of the UAE*. London: Trident Press.
- Kallweit, H. *in prep.* Remarks on flints excavated by Sir Leonard Woolley stored in the British Museum.
- Kallweit, H., Beech M. & Al-Tikriti W.Y. 2005. Kharimat Khor al-Manahil and Khor Al Manahil - New Neolithic sites in the south-eastern desert of the UAE. *Proceedings of the Seminar for Arabian Studies* 35: 97-113.
- Kallweit, H. & Hellyer, P. 2003. A flint "dagger" from Rumaitha, Emirate of Abu Dhabi, UAE. *Arabian Archaeology and Epigraphy* 14: 1-7.
- Masry, A.H. 1997. *Prehistory in Northeastern Arabia - The Problem of Interregional Interaction*. London: Kegan Paul International.
- McClure, H.A. 1971. *The Arabian Peninsula and Prehistoric Populations*. Coconut Grove, Miami: Field Research Projects.
- McClure, H.A. 1976. Radiocarbon chronology of late Quaternary lakes in the Arabian Desert. *Nature* 263: 755-756.
- McClure, H.A. 1978. Ar Rub' al-Khali. Pages 252-262 in S. al-Sayari & J. Zoetl (eds.), *Quaternary Period in Saudi Arabia*. New York: Springer Verlag.
- McClure, H.A. 1984. *Late Quaternary palaeoenvironments of the Rub'al Khali*. Unpublished PhD thesis, Institute of Archaeology, University of London.
- McClure, H.A. 1988. Late Quaternary Palaeogeography and Landscape Evolution of the Rub al-Khali. Pages 9-13 in D.T. Potts (ed.), *Araby The Blest*. Copenhagen: Tusculanum Press.
- Popescu, E. & Beech, M. (eds.). *in prep. Excavations at an Ubaid-related site on Dalma Island, Abu Dhabi, United Arab Emirates*. British Archaeological Reports International Series. Abu Dhabi Islands Archaeological Survey Monograph Series (No. 2). Oxford: ArchaeoPress.
- Roaf, M. 2002. *Cultural Atlas of Mesopotamia and the Near East*. New York: Facts on File.
- Roshier, D.A., Böer, B.B. & Osbourne, P.E. 1996. Vegetation of Abu Dhabi and a preliminary classification of its plant associations. Pages 50-65 in P.E. Osbourne (ed.), *Desert Ecology of Abu Dhabi - a review and recent studies*. Newbury, UK: Pisces Publications.
- Sanlaville, P. 1992. Changements climatiques dans la peninsule arabique durant le Pleistocene superieur et l'Holocene. *Paleorient* 18(1): 5-26.

Spoor, R.H. 1997. Human population groups and the distribution of lithic arrowheads in the Arabian Gulf. *Arabian Archaeology and Epigraphy* 8: 143-160.

UAEinteract.com. 2004. UAE History - Ancient artifacts - Ceramic & stoneware - A limestone mortar from the UAE's oldest village, on Dalma. Around 5000BC. UAEinteract.com, official website of the Ministry of Information and Culture of the UAE.

URL: http://uaeinteract.com/history/e_muse/cer_stn/cerst_06.asp

Uerpmann, M. 1992. Structuring the Late Stone Age of Southeastern Arabia. *Arabian Archaeology and Epigraphy* 3: 65-109.

Uerpmann, M. & Uerpmann, H-P. 1996. 'Ubaid pottery in the eastern Gulf - new evidence from Umm al-Qaiwain. *Arabian Archaeology and Epigraphy* 7: 125-139.

Uerpmann, M. & Uerpmann, H-P. 2000. Faunal Remains of Al-Buhais 18, An Aceramic Neolithic Site in the Emirate of Sharjah (SE Arabia) - Excavations 1995-1998. Pages 40-49 in M. Mashkour, A.M. Choyke, H. Buitenhuis & F. Poplin (eds.), *Archaeozoology of the Near East IV: Volume B - Proceedings of the fourth international symposium on the archaeozoology of southwestern Asia and adjacent areas*. Groningen, Netherlands: ARC Publicatie 32.

Uerpmann, M., Uerpmann, H-P. & Jasim, S. 2000. Stone Age nomadism in SE-Arabia-palaeo-economic considerations on the Neolithic site of Al-Buhais 18 in the Emirate of Sharjah, U.A.E. *Proceedings of the Seminar for Arabian Studies* 30: 229-234.

Uerpmann, M. & Uerpmann, H-P. 2003. *Stone Age Sites and their Natural Environment - The Capital Area of Northern Oman Part III*. Beiheft zum Tübinger Atlas des Vorderen Orients. Reihe A (Naturwissenschaften) Nr. 31/3. Wiesbaden: Dr Ludwig Reichert.

Zarins, J. 1992. Pastoral Nomadism in Arabia: Ethnoarchaeology and the Archaeological Record - A Case Study. Pages 219-240 in O. Bar Yosef & A. Khazanov (eds.), *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*, Monographs in World Archaeology. Madison, Wisconsin: Prehistory Press.

Zarins, J. 2001. *The Land of Incense. Archaeological Work in the Governate of Dhofar, Sultanate of Oman 1990-1995*. The Project of the National Committee for the supervision of Archaeological survey in the Sultanate, Ministry of Information. Sultan Qaboos University Publications, Archaeology & Cultural Heritage Series Vol.1. Sultanate of Oman: Al Nahda.

Zeuner, F.E. 1954. Neolithic sites from the Rub' Al-Khali, Southern Arabia. *Man* 54: 1-4.