

LIFE AT THE EDGE: SEPULCHRAL, HYDRAULIC AND PASTORAL LAND USE IN WADIS AS-SAHAB AL-ABYAḌ AND AL-ASMAR, SOUTH-EASTERN JORDAN: PRELIMINARY REPORT ON THE FOURTH SEASON OF THE EASTERN JAFR JOINT ARCHAEOLOGICAL PROJECT, 2010

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The Project

The fourth season of the Eastern Jafr Joint Archaeological Project (Eastern Jafr JAP) was carried out over 11 field days in June 2011 in Wādī as-Sahab al-Abyaḍ and Wādī as-Sahab al-Asmar, under the joint directorship of Dr Hans Georg K. Gebel and Prof. Dr Hamzeh Mahasneh, with the close co-operation with the Department of Antiquities of Jordan. The project runs under the auspices of Ex Oriente at the Free University of Berlin and Mu'tah University, and receives additional support from Research Cluster 2 of the German Archaeological Institute at Berlin. Previous seasons were carried out in 2001, 2006 and 2008 (Mahasneh and Gebel 2001, 2009; Gebel and Mahasneh 2006, 2008, 2009, 2010, in press; Gebel 2010; Pokrandt, in prep.; see also Kirkbride and Harding 1944).

The project's principal survey areas are the drainage systems of Wadis as-Sahab al-Abyaḍ (SA) and al-Asmar (AR) (**Fig. 1**), located in Jordanian territory north of Jabal at-Ṭubayq (Rhothert 1938), 30 - 35 km from the Saudi border and 120 - 130 km east-south-east of al-Jafr (for the project's general survey area see Mahasneh and Gebel 2009: Fig. 1). Both wadi systems constitute sepulchral and hydraulic landscapes of the aceramic Late Chalcolithic / Early Bronze Age periods, with Wādī as-Sahab al-Asmar hosting a large number of campsites and settlements at *inselberg* locations (**Table 1**, **Fig. 2**). Excavations have focused on the main site of the area, Qulbān Bani Murra.

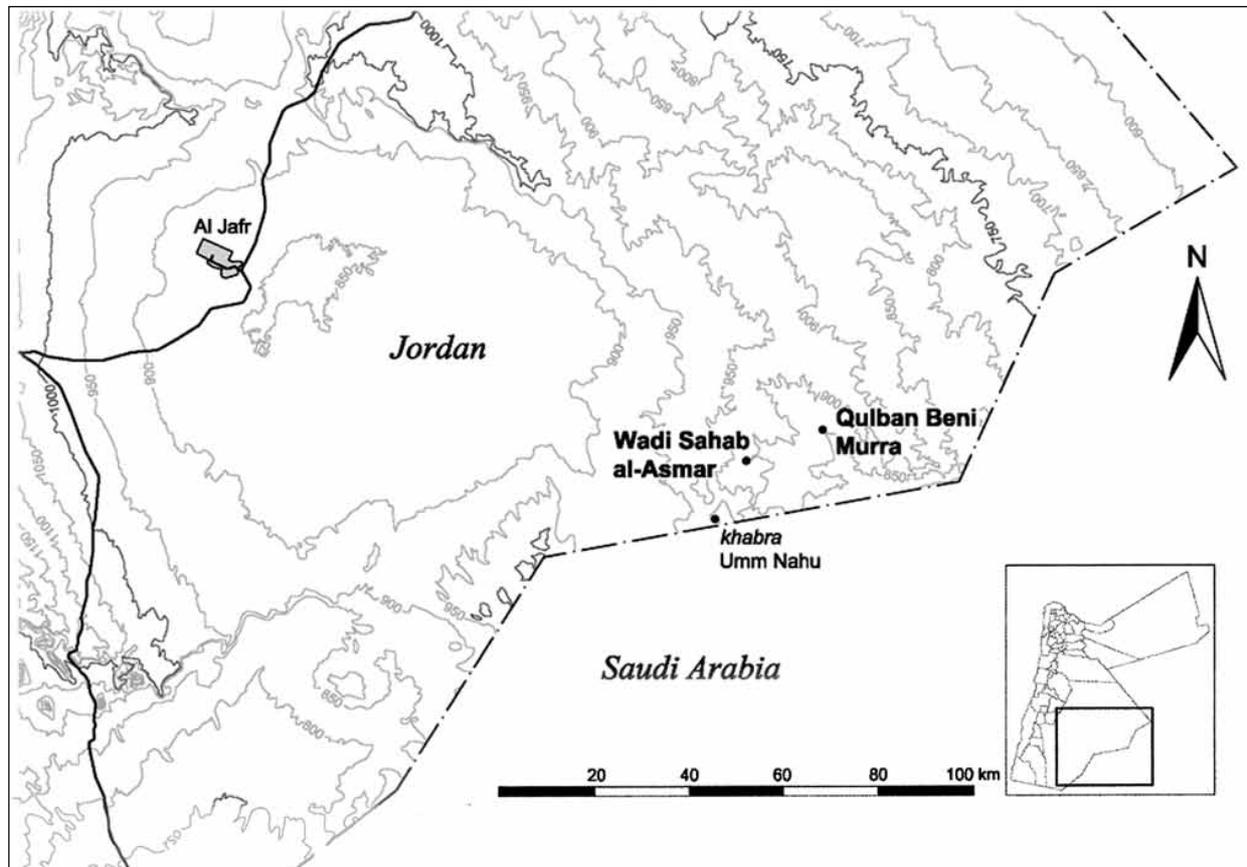
This remote area is challenging in terms of working conditions and requires careful logistical planning. During summer, work can be only carried out in the mornings and late afternoons. It is even more challenging to find preserved,

datable climatic data, such as mid-Holocene sedimentary sequences and organic material.

The field work of 2010 ended Phase I of the Eastern Jafr JAP, which concentrated on general survey, preliminary excavations at Qulbān Bani Murra and hydrological studies. It prepared the ground for Phase II, which will focus on excavation of collective burials, camp sites, hydraulic features and structures, geophysical and (palaeo-) hydrological studies related to water management, physical anthropology and isotope analysis, palaeoethnobotany and zooarchaeology, and environmental / climatic sedimentology.

In 2010, water and a large herd of camels were brought in from al-Jafr to exploit the extensive areas of *Stipagrostis plumosa* grazing (Reinder Neef, pers. comm.) (see **Fig. 20**) that emerged after a wet spring (see J. Baumgarten below). During the 2006 and 2008 seasons no *bedouin* camped in the immediate vicinity, while in 2001 we shared the area with just one *bedouin* tent.

The archaeological landscape of Wadis as-Sahab al-Abyaḍ and al-Asmar is suffering from increased looting of its burial mounds by local *bedouin*. In light of recent illicit digging, our previous reluctance to touch preserved burials before gaining an understanding of their nature and date now seems inappropriate. News of our discovery in 2010 of a statue in one of the graves (Luck 2010) immediately caused a rush to the research area, leaving more cairns looted. It should however be mentioned that the burial mounds have been subjected to looting throughout the millennia since 4000 BC, but more recently the rate of damage has accelerated as a result of increasing *bedouin* motorization in the area. Our project has therefore begun to explore ways and means of increasing heritage aware-



1. Locations of *Qulbān Banī Murra* in *Wādī as-Sahab al-Abyaḍ* and *Wādī as-Sahab al-Asmar* in the south-eastern deserts of Jordan (drawing Keilholz).

ness amongst local *bedouin*, in an attempt to reduce the ongoing destruction of Jordan's remote sepulchral landscapes.

Objectives of the 2010 Season

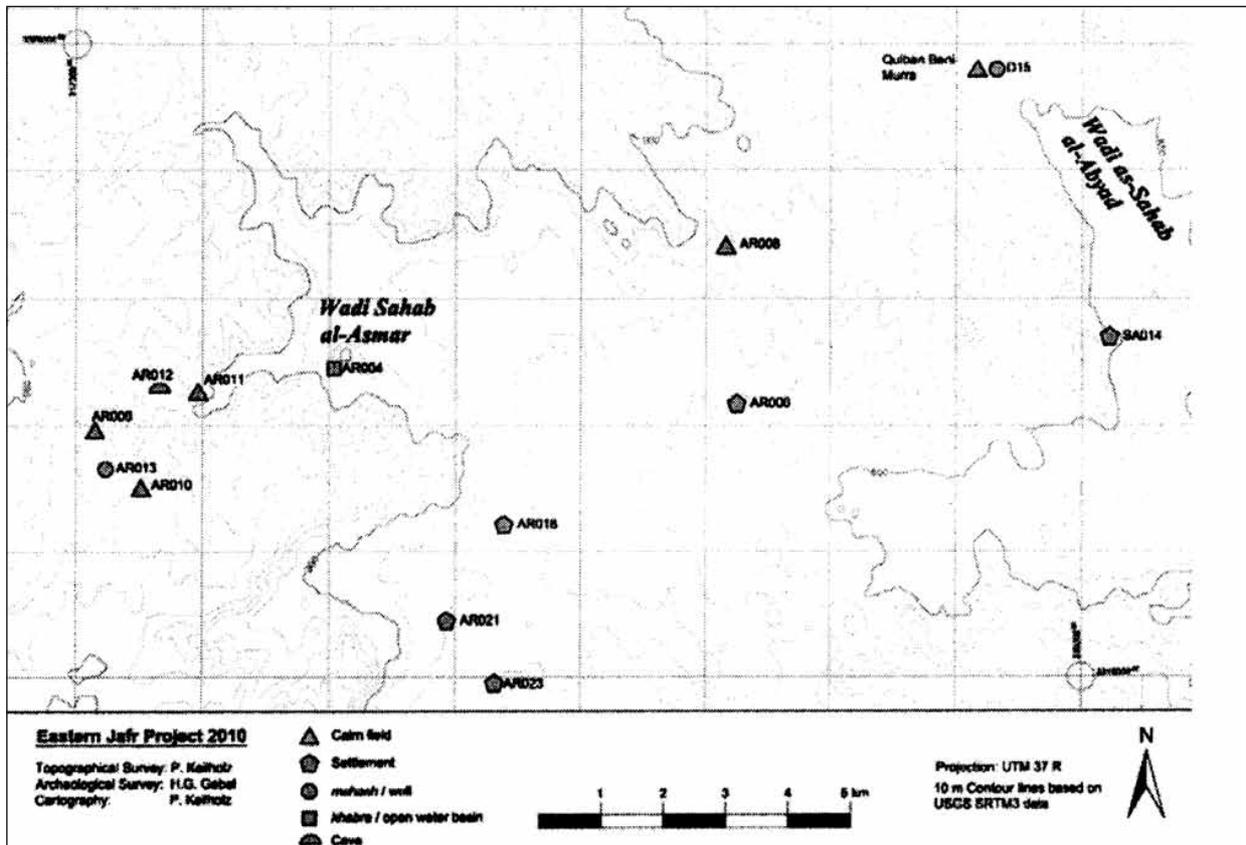
The fourth season, with its extraordinary discoveries, concentrated on (1) a sounding in the previously excavated well complex (Space 12 of Structure D15, excavated in 2008) at the Late Chalcolithic / Early Bronze Age site of *Qulbān Banī Murra* (Gebel and Mahasneh 2008), (2) surveying the neighbouring *Wādī as-Sahab al-Asmar* and upper *Wādī as-Sahab al-Abyaḍ* (Table 1, Fig. 2) and (3) on mapping the camp and burial site of *Wādī as-Sahab al-Asmar* 14 (SA014). Major objectives were to obtain datable samples from the well complex and to assess Late Chalcolithic / EB water management and sites in the area, in addition to the general objective of the survey, namely the location of sites from all periods in archaeologically unknown areas of Jordan. The Late Chalcolithic

/ EB objectives aim to provide a framework of research hypotheses to assess whether or not the area witnessed a local transition from pastoral 'well cultures' to sedentary oasis cultures based on well irrigation. Such a process may have occurred as a consequence of drier conditions after mid-Holocene climatic optima, and would demonstrate the association of the Jordanian arid zones with one of the most important socio-economic and cultural achievements of the Arabian peninsula, *viz.* the oasis economies by which means sedentism was eventually established throughout Arabia after 4000 BC.

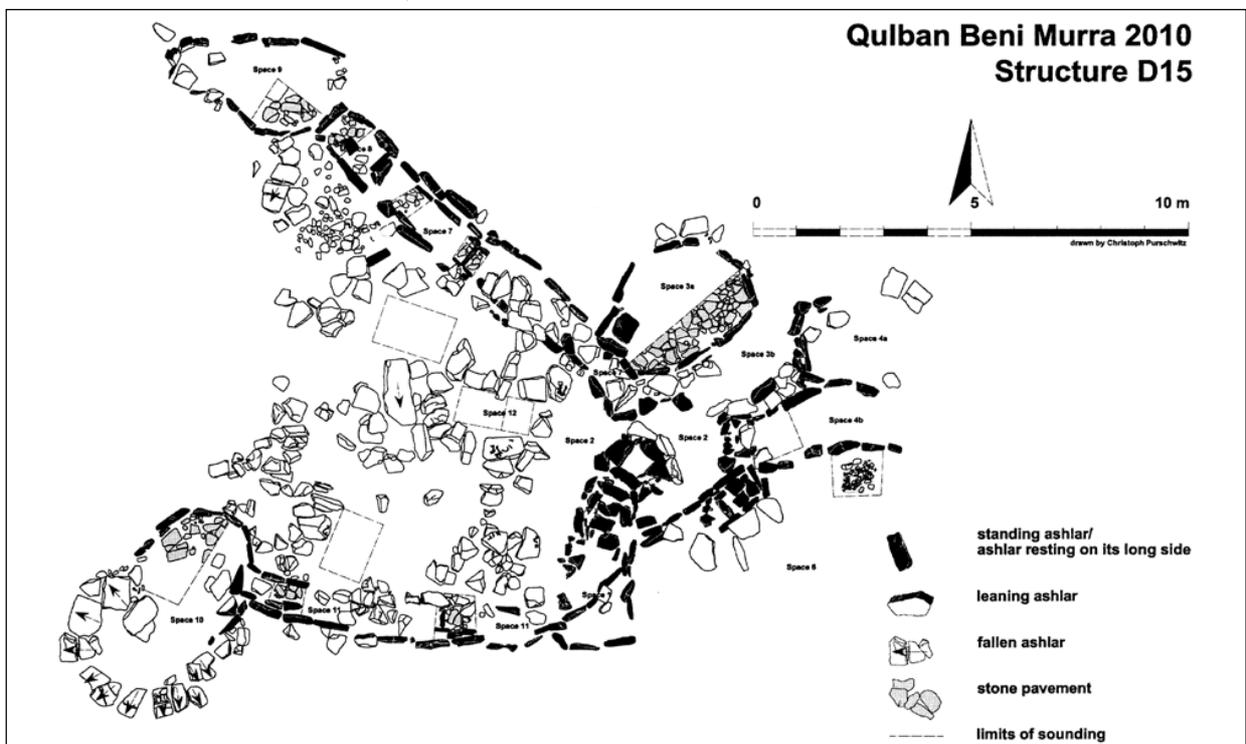
The main aim of our project is embedded in a broader research framework focused on the palaeoenvironments and occupational history of arid southern Jordan, and neighboring north-western and northern regions of Saudi Arabia, during the mid-Holocene / Late Chalcolithic and EB periods. The Eastern Jafr JAP benefits from established scientific collaborations; after the 2010 season one of the authors (HGKG) visited Ra-

Table 1: Major sites located during the 2010 season (SA = Wādi as-Sahab al-Abyaḍ; AR = Wādi as-Sahab al-Asmar).

AR005 (Khibrat Umm Naḥū)	29 55.906' 37° 03.551' 942 m	Khibrat Umm Naḥū: located near the Saudi border and visited by camel herds from the Ṭubayq area before the border was closed.
AR006	37 R 0327462 3323230 886 m	<i>Inselberg</i> campsite / settlement (Late Chalcolithic / EB): main occupation on south-west side with terraced animal pens partly dug into the slope; small habitation structures, hearths, silos, some fan scrapers etc. between the pens. At the base of slopes and on the north-east side of the <i>inselberg</i> , circular structures of boulders, ashlar structures, horseshoe-type structure, groups of boulders, cairns, <i>bedouin</i> graves, two long u-shaped structures (<i>ca</i> 6 m); high diversity of structures.
AR008	30° 03.005' N 37° 12.520' E 889 m	<i>Ca</i> 20 ashlar cairns / ashlar line cairns and other structures (Late Chalcolithic / EB); ashlar-line cairn 11 = "statue cairn".
AR009 - 11	approx. 30° 01.243' N 37° 06.115' E 944 m	Three cairn fields with more than 100 cairns of different types (late Chalcolithic - Iron Age), unknown structures, <i>bedouin</i> cemeteries and desert mosques.
AR012 (Lower Ṭur Sahab al-Asmar)	30° 01.786' N 37° 06.956' E 911 m	Rockshelter / cave in upper sandstone cliff; Thamudic inscription at cave entrance.
AR013 (<i>Mshāsh</i> Sahab al-Asmar)	30° 01.080' N 37° 06.458' E 921 m	5-6 wells and sub-recent pottery (?) kilns; source of red ochre, Late Chalcolithic / EB chipped stone, early oasis location (?).
AR014 (Upper Ṭur Sahab al-Asmar)	30° 01.150' N 37° 06.205' E 921 m	Rockshelter ("very deep cave"); no visible finds.
AR016 (Ibex Rock II)	30° 00.661' N 37° 10.368' E 883 m	<i>Inselberg</i> campsite / settlement (Late Chalcolithic / EB): petroglyphs including two ibexes and another horned animal, square with a cross inside, plan of stone structure / stone alignments, and an ibex and cheetah (?); also many flint and quartzite flakes, including fan scrapers, 15 round structures, partly constructed of ashlar (3-5m diameter; cf. QBM Area A); isolated hearths; 2 long, dam-like walls protecting terrace with round structures from wadi floods; wells anticipated on fringes of settlement; 'breakwater boulder fields' on sides of outcrop; 3 superimposed terraces on south-west side with large round ashlar structures (10 m diameter); more circular ashlar structures north of the <i>inselberg</i> on a raised wadi terrace (<i>ca.</i> 60 x 40 m).
AR021	29°59' 40.5" N 37°07'47.9" E 886 m	<i>Inselberg</i> campsite / settlement (Late Chalcolithic / EB): round / oval / curvilinear animal pens (pen wall on raised terrace to south also protects from wadi floods), circular habitation structures, silos, ashlar structures, double parallel row of ashlar with east-north-east - south-south-west orientation, pavements, flint and quartzite flake industry, bedrock bowl / mortar.
AR023	29°59'18" N 37°10'18" E 874 m	<i>Inselberg</i> camp site / settlement (Late Chalcolithic / EB).
SA052 (<i>Mshāsh</i> Ṣaliḥ)	30° 09.286'-307' N 37° 10.583-987' E 886 m	4-5 <i>Mshāsh</i> were still providing water in the 1970s in seasons of good rainfall; today the wells are buried by gravels.
SA053	30° 09.092' N 37° 09.666' E 890 m	Small dam located 10-60 m below several <i>Mshāsh</i> pools.
SA054-55 (al-Khabari al-Qubra' or Khabrat Qubūr al-Maṭālqah)	30° 10.641' N 37° 07.042' E 935 m	5 cement-renovated graves; one the grave of Diab al-'Audaṭ who died in 1890.



2. Wadis as-Sahab al-Asmar and al-Abyad: sites discovered in 2010.



3. Qulbān Bani Murra, watering complex / Well D15, Space 12 as investigated in 2010; dates to second half of the 5th millennium BC (field records Pokrandt, Keilholz and Suleiman; drawings Purschwitz).

jajil, a site similar to Qulbān Bani Murra located near al-Jawf in Saudi Arabia (see Zarins 1979).

This report includes sections on recent land use (by J. Baumgarten) and sub-recent water supplies and storage (by P. Keilholz) in order to document aspects of the rapidly vanishing traditional *bedouin* cultures with which our field projects are logistically associated, or even embedded. It represents an awareness of our responsibility as cultural researchers. While we have to concentrate on our archaeological research, we must not miss the chance to record the disappearing traditional cultures around us (Gebel and Baumgarten, in press). Therefore, our future archaeological preliminary reports will also contain summarized observations and insights into (sub-) recent socio-economic and cultural topics and related traditional local culture.

The Development of Project Objectives and Research Hypotheses

The results of the 2010 season allowed us to refine the project hypotheses by which we are tackling the question of a climate-induced transition from unknown mobile shepherd cultures of the second half of the fifth millennium BC to sedentary oasis life after 4000 BC. Parts of Jordan's south-eastern *Hamād* — including our research area — may have been one of the 'incubator' regions for this new way of life. Or, if our region was environmentally unsuitable for a successful transition, it may have witnessed such an attempt whilst in the event remaining pasture land to such extent as the climate permitted.

The Eastern Jafr JAP follows explicit project hypotheses which are steadily modified according to each season's results. This way, the development of testable interpretative frameworks remains transparent and checkable. The 2010 hypotheses are presented below.

Although 'announced' by the site of Wādī as-Sahab al-Abyaḍ 14, which was discovered in 2001, and other evidence, it was only during the 2010 season that we fully appreciated that the Late Chalcolithic / EB pastoral population must have lived in the area on a semi-sedentary basis (**Figs. 4, 5 and 6**). They not only left the vast,

partly megalithic burial grounds — making the area a sepulchral landscape hundreds of square kilometres in extent — but also stayed at specific locations in animal pen campsites / settlements. The latter were found in association with *inselbergs* in Wādī as-Sahab al-Asmar, a wadi system not thoroughly explored in previous seasons. It is possible that these sites date to a period when the climate deteriorated, forcing shepherds to settle seasonally in areas with water.

Our previous hypothesis that hitherto unknown pastoral well cultures preceded and became the progenitors of early oasis development after the climate of the Arabian peninsula became drier and colder had to be elaborated and refined for our research area. The presence of settlement-like camps indicates that some sort of seasonal pastoral settlement was possible in the area. Since the locations of these camps appear to be in sheltered and hydraulically favourable settings, the *inselbergs* (and perhaps also wild date palm stands) may have been where sedentary oasis life subsequently developed when the surrounding steppe gradually degraded and aquifers were depleted. However, it does not necessarily follow that the climate of the region allowed for a successful local transition.

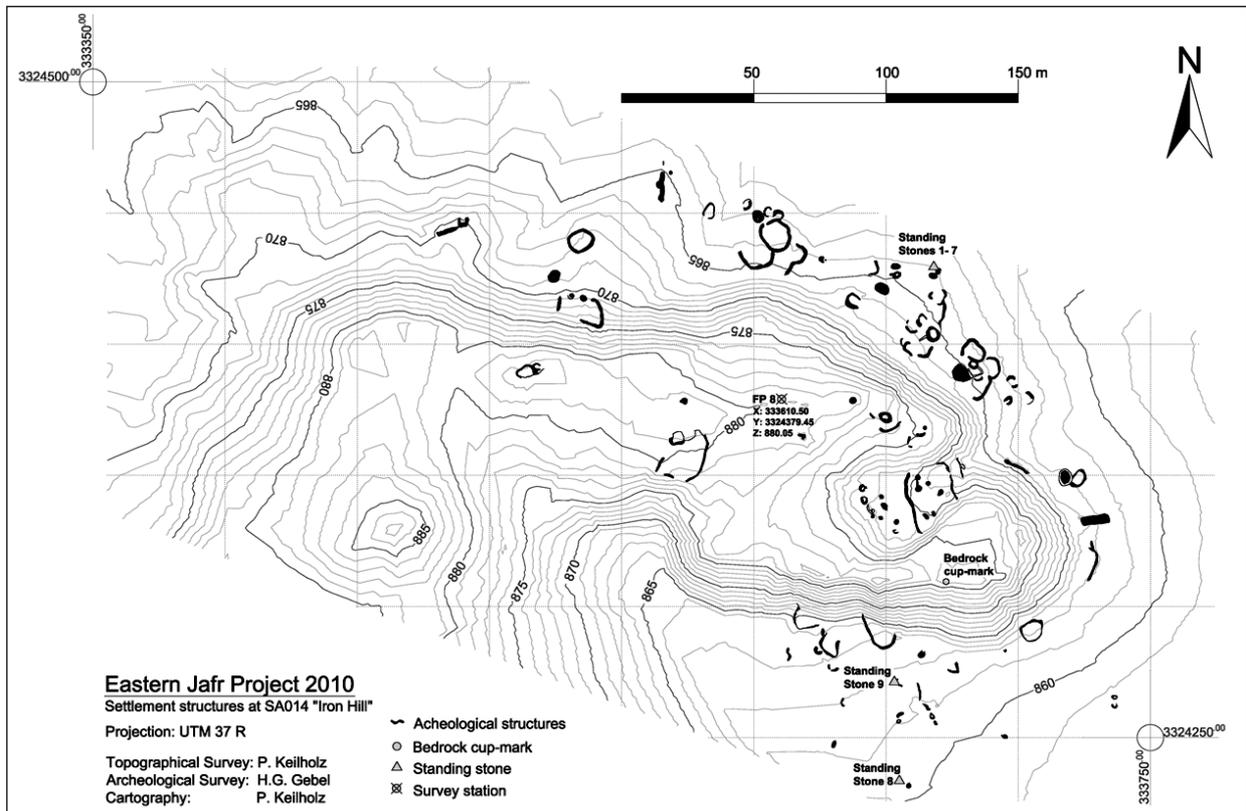
The refined project hypotheses for 2010 were¹:

Hypothesis 1

The extensive burial fields in the Wādī as-Sahab al-Abyaḍ and al-Asmar regions testify to the presence of Late Chalcolithic / EB pastoral societies before and after 4000 BC, whose subsistence and progressive population dynamics were favoured by the so-called mid-Holocene climatic optimum (possibly optima) of the Arabian peninsula, when the peninsula was characterized by extensive steppes, aquifers with high water tables and lakes. These conditions not only sustained progressively more productive domestic flocks, they also provided the pastoralists with substantial wild ungulate populations for hunting and possibly stands of wild dates, which would have been easy to store and transport over long distances.

1. These hypotheses are based on calibrated dates and other radiocarbon data (Pokrandt, in prep. and pers. comm.) from the well complex of Structure D15 at Qulbān Bani Murra (second half of the 5th millennium

BC) and one of the ashlar-line cairns (4th millennium BC), as well as on the presence of fan scrapers, a general chronological marker for the Late Chalcolithic / EB at these sites.



4. Wādī as-Sahab al-Abyaḍ 14 (inselberg setting): layout of Late Chalcolithic / EB campsite (records Gebel, Keilholz and Suleiman; drawings Keilholz).



5. Wādī as-Sahab al-Abyaḍ 14 (inselberg setting): terraced, inner part of the outcrop with Late Chalcolithic / EB cairns from north-east (photo Gebel).

Hypothesis 2

In this period, tribal modes of organisation were established as prevalent and sustainable social systems, along with the specific *bedouin* territoriality and environmental adaptations to

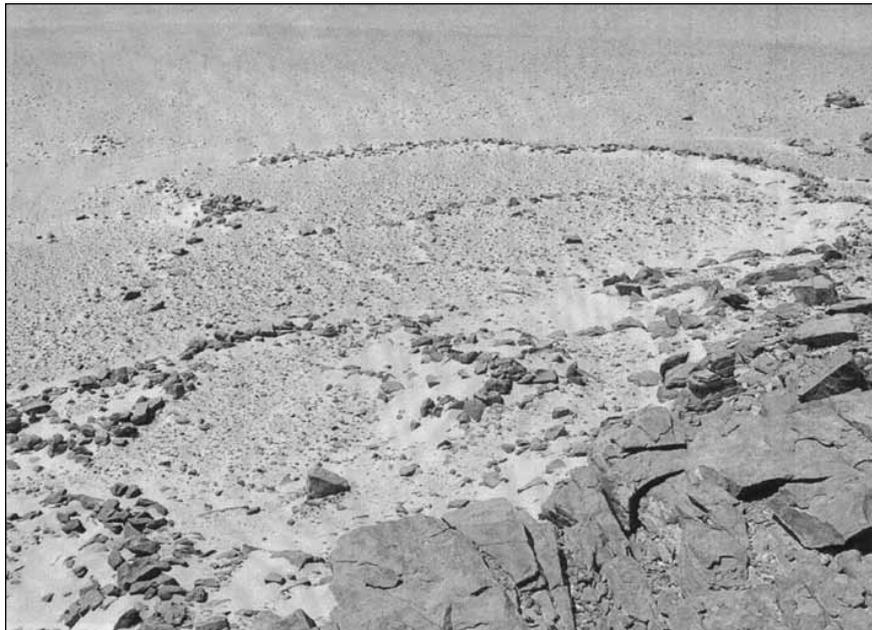
(semi-) arid conditions known to this day. During the optimal conditions of the second half of the fifth millennium BC, networks of these pastoral cultures extended from Sinai to the regions east of Riyadh and also Yemen, belonging to a



6. Wādī as-Sahab al-Abyad 14, southern side (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), platforms, burials with ashlars etc. (photos Gebel; editing Pokrandt).



7. Wādī as-Sahab al-Asmar 20 (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), terrace walls, flood-protection walls, platforms, burials with ashlars etc. (photo Gebel).



8. Wādī as-Sahab al-Asmar 21 (inselberg setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, up to 30 m diameter), terrace walls, flood-protection walls, platforms, burials with ashlars etc. (photo Gebel).

‘green desert belt’ stretching from the Sahara to Oman and Yemen. The pastoralists’ long-distance contacts created similar cultural and ideological milieus throughout this area.

Hypothesis 3

During these moist periods, in favoured locations — especially along major corridors

with access to ungulate migration routes, ibex habitats and water — locally restricted, horizontal transhumant patterns would already have emerged which showed tendencies for (seasonal) philopatry supported by locally available nutritional resources. Most probably such conditions existed in Wadis as-Sahab al-Abyad and al-Asmar. However, this does not rule out

that ‘islands’ of permanent settlement continued to exist from the PPNB onwards in the Arabian peninsula, remaining in post-Neolithic socio-economies.

Hypothesis 4

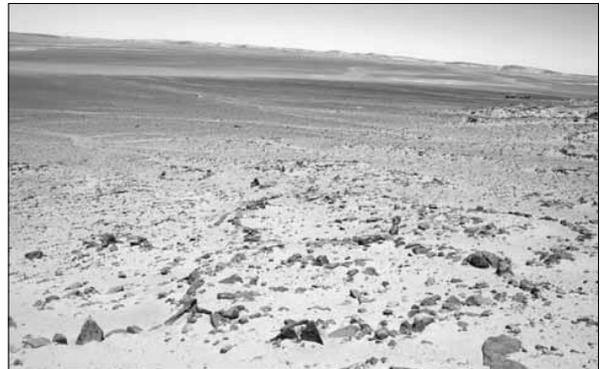
When conditions got drier and colder in the first half of the 4th millennium BC (Rapid Climate Change 6000-5000 BP, see Weninger *et al.* 2009) and steppe habitats disappeared in most regions, groups of hitherto mobile herders would have gathered at remaining well-watered locations. Regressive population dynamics were associated with this development. Mobile pastoralists became sedentary oasis horticulturalists, while maintaining their tribal organisation and identity. They used their experience in well-building and channel-type watering systems / troughs for the new oasis irrigation systems, while domesticating the wild date palms growing at these well-watered locations. Gardens were created, with the palm trees providing protection from the sun and creating ‘green house’ micro-climates. A new, innovative and sustainable economy developed out of this climatic change, which the majority of steppe populations in the peninsula must have experienced in the context of the destruction of their mobile way of life. Mshāsh Sahab al-Asmar (see below) may have been one such location for this transition.

Hypothesis 5

Animal pen campsites / settlements like Wādī as-Sahab al-Abyaḍ 14 and Wādī as-Sahab al-Asmar 6, 15, 20 and 21 might represent regional starting points — as per Hypothesis 3 above — for oasis economies. Depending on what water supplies remained in the locale during aridisation in the first half of the fourth millennium, Wādī as-Sahab al-Abyaḍ and al-Asmar may have

become (1) an ‘incubator’ area for new oasis economies, (2) an area supporting pastoralism of greatly reduced mobility, existing alongside early oases developing at more remote and / or more favoured locations, or (3) a region from which both mobile pastoral life and seasonal settled life disappeared altogether.

The 2010 results led to the development of a fieldwork programme for 2011 which included (1) archaeological — anthropological excavation of the so-called statue burial at Wādī as-Sahab al-Asmar 8 (**Fig. 2**) and / or other contemporary ashlar cairn burials in the Wādī as-Sahab al-Abyaḍ and / or al-Asmar burial grounds, (2) excavation and mapping of deflated buildings, hydraulic installations and other features of the Late Chalcolithic / EB camp sites of Wādī as-Sahab al-Asmar 6 and 15 (**Table 1, Figs. 9, 10 and 11**), (3) geophysical surveys at the Late Chalcolithic / EB camp sites of Wādī as-Sahab al-Asmar 6 and 15, (4) continuation of general surveys within the Wādī as-Sahab al-Abyaḍ and al-Asmar drainage systems, the area east of Qulbān Banī Murra and of Jabal al-Adhriyyāt, (5) continued documentation of recent *bedouin* land



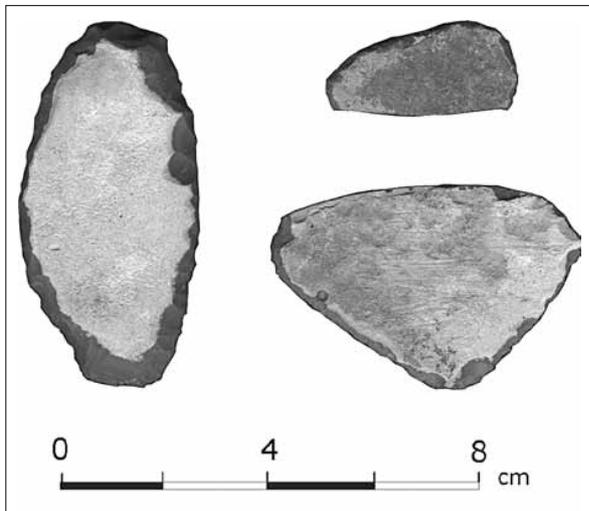
10. Wādī as-Sahab al-Asmar 6 (*inselberg* setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), terrace walls, platforms, hearth, ashlar graves, isolated ash-lars etc. (photo Mahasneh and Gebel).



9. Wādī as-Sahab al-Asmar 15 (*inselberg* setting): Late Chalcolithic / EB campsite with circular / curvilinear structures (pens and huts, 4-20 m diameter), platforms, hearths, burials with ash-lars etc. (photos Gebel; editing Pokrandt).



11. *Wādī as-Sahab al-Asmar 6: Late Chalcolithic / EB circular structure (hut / silo (?); ca 2.5 m internal diameter) with well-constructed double-faced wall (photo Mahasneh).*



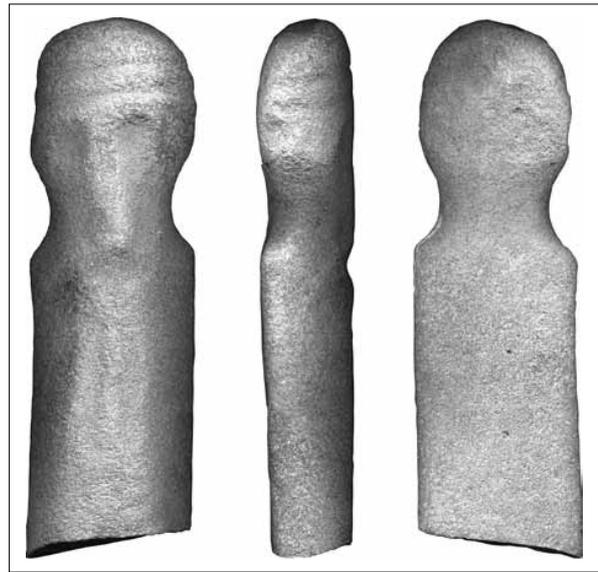
12. *Wādī as-Sahab al-Asmar 9: Late Chalcolithic / EB fan scrapers associated with pastoralists in this area; used for shearing, butchering, processing animal skins etc. (photo Gebel).*

use and (6) informal negotiations about opportunities for *bedouin* heritage education / awareness-building in an attempt to reduce illicit digging in the area.

Significant Results of 2010

New Burial Grounds and the Statue Fragments (Table 1, Figs. 13 and 14)

Four major aceramic Late Chalcolithic / EB cairn fields were discovered during the 2010 season, namely AR008, AR009, AR010 and AR011. AR008 is located on one of the ridges between Wadis as-Sahab al-Abyaḍ and al-Asmar. AR009 / 011 and AR010 are respectively located on the ridges and hillocks of the upper right and left banks of Wādī as-Sahab al-



13. *Wādī as-Sahab al-Asmar 8: statue known as “Dalish” from the stone capping of Late Chalcolithic / EB burial Mound 11; note features of Arab male clothing (columnar basalt; height = 35 cm) (photo Gebel).*



14. *Wādī as-Sahab al-Asmar 8: head of statue from the stone capping of Late Chalcolithic / EB burial Mound 11 (female (?) face; calcareous sandstone; height: 15.5 cm) (photo Gebel).*

Asmar in the Mshāsh al-Asmar area. While AR008 is represented by 20 limestone cairns and other structures, the burial fields of AR009 and AR010 each comprise some 40 cairns and some recent and sub-recent *bedouin* cemeteries, as well as desert mosques (cf. **Fig. 22**). The two latter fields are much more complex in terms of their grave structures, which include flattish Late Chalcolithic / EB ashlar-line cairns (some of which are quite prominent) and higher circular boulder cairns, which might be of aceramic Iron Age origin. Small boulders with Thamudic inscriptions are associated with Late Chalcolithic

/ EB ashlar-line cairns, indicating that these may have been re-used after a gap of thousands of years. AR011 consists of 18 huge, circular (Iron Age?) cairns, on average 2 m high and 10 m in diameter, overlooking the wadis from a narrow spur.

Burial Cairn 11 of the less prominent (probably because nearby bedrock was unsuitable for large ashlars) burial field AR008 was the location of an extraordinary chance find. A team member (Amer al-Suleiman, Hashemite University) found a columnar basalt statue fragment² (Fig. 13; the statue became known as “Dalish”) and a statue head of calcareous sandstone (Fig. 14) embedded in the stone capping of this multi-chamber Late Chalcolithic / EB ashlar-line cairn, which is orientated to the east and overlooks Wādī as-Sahab al-Abyaḍ. Fully preserved from the head to the abdomen, the basalt statue’s length is 35 cm. It probably represents a male with thick lips or a beard, a long nose, ear depressions and expressive eye depressions. The most intriguing features are two grooves around the front and sides of the head, and the neckline-like feature of a shirt or robe on the chest which may date the ‘*aqāl / dishdāsha*’ mode of dress as far back as *ca* 4000-3500 BC. In a way, the find literally gave a face to the hitherto unknown shepherd culture.

The statue³ was made of a piece of columnar basalt, with a natural sub-triangular section which facilitated production of the statue’s final shape. Nevertheless, considerable pecking would have been required to create the sculpture’s rounded triangular / plano-convex basic form and, especially, to shape the grooves of the chest, the ‘beard’, the relief of the mouth, nose and eyes, the grooves of the “ ‘*aqāl* ” and the round shapes of the front and upper part of the

head. The flat and more irregular reverse was less carefully shaped, has no sculpted details and might even partially consist of the natural surface of the basalt. The piece must have rested in its position for a long time, as exposed parts were smoother from wind and sand abrasion than those parts which were covered by soil, *viz.* the head and right shoulder.

A reduction of the cross-section below what was to become the head created the distinctly elaborated shoulders, from which no arms lead off. Owing to the nature of the raw material, the body / chest is parallel-sided and of the same width as the head. The head is designed in rather an abstract way, with large eye depressions between which a long and parallel-sided nose starts to run vertically downwards, limited by a larger groove not connected with the neck’s incision. Below this groove, a bulge-like area was sculpted which either represents a beard or lips. It is striking that the ‘beard’ — especially its left part — has a highly smoothed area (perhaps the result of handling); a similar smoothed surface can also be observed right of the right-hand chest groove. Other details of the face (e.g. cheeks, eyebrows) were not elaborated. The front of the head is high and the proportions of the eyes and nose remarkable. Similar proportions are known from the famous green amulet head of LPPNB Basta, which has been interpreted as having phallic symbolism. It should be noted that certain iconographic features may have survived from earlier periods, or were indeed shared between cultures; it is also possible that our statue was ‘culturally recycled’ and is of Neolithic origin. The front of the head has two parallel, slightly oblique, flat grooves (3-5 mm in depth) which end at the head’s sides and continue, though less pronounced, on its flat re-

2. The discovery was made on the morning of 25 June 2010; despite an intensive search in 2010 and 2011, the lower part of the fragment was not found. It probably was removed a long time ago for its raw material. The statue fragment was taken to the Department of Antiquities, Amman by departmental representative Sate al-Masadeh. Circumstances in the field did not permit closer inspection for traces of paint or other applications to the artifact; it did not receive any treatment other than gentle removal of adhering sand with a soft brush. The statue fragment is being considered for display in the new National Museum at Amman.
3. Measurements of the artifact are: preserved maximum length 350 mm, maximum width near break (abdomen

/ belly area) 110 mm, circumference near break (abdomen / belly area) 290 mm, circumference in area of neck across nose 237 mm, circumference of head near eyes / ears 296 mm, circumference in area of “ ‘*aqāl* ” area 284 mm; dimensions of the nose: length *ca* 86 mm, width of upper, flat part of nose *ca* 12 mm; dimensions of the ears: *ca* 18 mm height x *ca* 15 mm width, depths of depressions *ca* 3 mm; dimensions of eyes: *ca* 26 mm height x *ca* 22 mm width, depths of depressions *ca* 6 - 7 mm; dimensions of chest grooves (interpreted as neckline of *dishdāsha*): length *ca* 90 mm, width *ca* 7 - 10 mm, depth *ca* 2 mm; cross-sections: rounded-triangular near break, high plano-convex at head.

verse. The ears are particularly striking; like the eyes, they were worked as depressions, both sets of which could have held additional decorative elements (also suggested by the features of the other fragment; **Fig. 14**, see below). The head's end is nicely rounded. The chest has two parallel grooves running vertically down towards the abdomen (interpreted as the neck-line of a *dishdāsha*⁴).

The second sculpture (**Fig. 14**) to be found, a head fragment of soft calcareous sandstone⁵, was also found in the stone capping of Cairn 11. It undoubtedly represents a head similar to that of the basalt statue, insofar as the left ear is indicated by a depression similar to that of the basalt statue (the right ear was not executed; perhaps the statue remained incomplete or, alternatively, significance may have been attached to the missing ear). Other similarities include the long nose and a 'bulge', which in this instance might represent lips. A striking and unusual feature is the way in which the eyes are represented. On both sides of the upper nose, two pairs of pointed drillings were made as if representing four eyes. These 'eyes' do not give the impression of even abstract anatomy, as do those of the basalt statue, so it may be that this feature had a specific purpose (perhaps to retain decorative elements which marked the eyes). Although the facial area is again quite smooth, it would appear that the back of the head back did not receive much in the way of shaping and smoothing. The fracture above the neck, directly in the groove below the 'lips', probably represents the weakest part of the piece.

The style of the two sculpture fragments does not match that of the Rizqeh statues, once thought to be Chalcolithic (Kirkbride 1969; but see also Underbjerg 2003); these are now thought to be more reminiscent of the south Arabian Late Iron Age (Gebel 2010).

In addition to the two sculpture fragments, the stone capping of Cairn 11 yielded two sandstone plate fragments, a fragment of another

sandstone plate, a plate fragment weight (?) with a biconical perforation, and a fan scraper.

Charcoal Samples and Radiometric Dates from Well Complex D15 at Qulbān Banī Murra

This season's sounding in Space 12 of well-watering complex D15 provided sufficient charcoal to date the structure's reddish deposits, interpreted as the eroded lining of the troughs. It is the first time that tiny charcoal remains have been recovered by the project from prehistoric deposits in the area.

Figure 3 shows the watering complex with well-room Space 2, the north-western and southern trough lines / channels (along Spaces 9 - 8 - 7 and 10 - 11 - 1), and the central part of the complex (not yet understood) around Space 12. Both trough lines are sub-divided by compartments, each having slightly lower floors dropping down towards their circular 'end troughs'. All floors of the structure's troughs have stone pavements.

The watering complex mounds of Qulbān Banī Murra consist of the structural remains and their eroded, reddish lining material. They must once have rested on the surface of the Late Chalcolithic / EB wadi, probably some 30-50 cm deeper than the present-day wadi bed.

This season's sounding in Space 12 was located close to the room containing the mouth of the well (Space 2). Its stratigraphy demonstrates that the reddish deposits have a depth of more than 80 cm in the centre of the structure and contain flint artifacts with 'fresh' edges, as well as bone fragments. Boulder and ashlar fragments from the sounding have no desert varnish.

Date KIA43373, obtained from Space 12, came in at cal BC 4459 - 4346 (two sigma range). The humic acid fractions of this sample and KIA43374 are considered too early at cal BC 5217-5018 and 5056-4894 (two sigma ranges), but hint that Sample KIA43374 might also be from the second half of the fifth millennium BC (Dr A. Dreves, Leibniz Labor für Alters-

4. Zeidan Kafafi has interpreted this as another anatomical detail of a phallus (pers. comm.).

5. Measurements of the piece are: preserved maximum length 155 mm, maximum width near break (below 'lips') 109 mm, maximum width near 'eyes' 130 mm, circumference of head near eyes / ears 354 mm, distance nose - back of head 78 mm; dimensions of nose:

length *ca.* 78 mm, width of upper, flat part of nose 10 - 14 mm; dimensions of ear: *ca.* 28 mm height x *ca.* 33 mm width, depth of depression 3 - 6 mm; dimensions of 'eyes': 5 - 7 mm width, depths 6 - 7 mm; cross-section: roundish / irregular high plano-convex at head. Preservation of the piece may be affected by algae; intervention is required to halt the growth of existing damage.

bestimmung und Isotopenforschung, Kiel University and J. Pokrandt, Kiel University pers. comm.) (Table 1).

Animal Pen Campsites (Table 1, Figs. 4-11)

For the first time, *inselberg* / rocky outcrop locations were surveyed along the wide flood plains of Wādī as-Sahab al-Asmar. It seems that the *inselberg*-foothill zones were the specific settings for aceramic Late Chalcolithic / EB campsites (SA014, AR006, AR014, AR015, AR020 and AR021). These are characterized by large (20-30 m) and small (3-5 m) circular and sub-circular enclosures / structures (sometimes in terraced succession, and interpreted as pens, silos or habitation structures), terrace walls, various features of unknown function (possibly some had ritual functions), hearths, platforms, cairns with and without ashlar / ashlar-lines, other grave types, isolated and grouped ashlar, occasional ibex and other rock art etc. Dam-like terrace walls sometimes occur along the side of the campsite facing the wadi (AR021; Fig. 8). At one site (AR016; Table 1), a field of large boulders appears to be a 'breakwater' structure. Where bedrock allows, structures can be megalithic. Indeed, the structural diversity and horizontal stratigraphy of these sites is a challenge to understand. The size of the camps is 200-300 m in length and 50 - 100 m in width. The *inselbergs* must have functioned both as windbreaks and as barriers / diversions for aquifers and surface run-off.

The campsites apparently did not use pottery, but are instead characterized by chert and quartzite flake industries with fan and other scrapers; very few grinding tools are present. Wells, watering complexes and possibly gardens are thought to have been buried by post-occupational wadi gravels, as it is also the case with some of the campsite structures. Future geophysical surveys may help to locate these. Some of the deflated campsites display horizontal stratigraphy (including Wādī as-Sahab al-Abyaḍ 14; Figs. 4-6), representing at least two occupations with domestic / animal pen and funerary functions. It might also be the case that campsites were also present in locations other

than *inselberg* / outcrop areas, but that for geomorphological reasons only those associated with these latter areas have been discovered.

Although we call these sites 'camps', their functional diversity, extent and seasonality may justify the term 'settlement'.

Sub-Recent Water Supplies and Water Storage (P.K.)

General

Water supplies in arid areas can be based on precipitation, aquifers and surface run-off; other important sources of moisture, such as dew supporting an area's water balance, are ignored here. Built structures assist man in arid environments with securing access (wells, *Mshāsh*, springs), storage (cisterns, open water basins or *Khabrat*) or direction of water (channels, diversion dams etc.) in order to guarantee perennial or seasonal water availability. According to Gebel (2010), all water management supported by structures can be understood as productive water management, whereas water harvesting without structures can be understood more in terms of water 'foraging'. The different types of water provision each have advantages and disadvantages (Table 2). Here, the features of two types of productive water management found in our survey area in 2010, namely *Mshāsh* and *Khabrat*⁶, are described. By analyzing current and sub-recent water harvesting structures, the potential for (pre-) historic water management can be evaluated and conclusions drawn on the lifestyles of vanished cultures insofar as they relate to water. In the region east of al-Jafr, three main methods of water harvesting and management were encountered, which are to some extent still practiced by *bedouin* utilizing the area today.

Mshāsh Sahab al-Asmar (AR013)

Mshāsh Sahab al-Asmar is an example of one type of seasonal water harvesting system used in the region, namely *Mshāsh*. These are known from several water-rich environments in the area, e.g. in our drainage system at *Mshāsh* Saliḥ (SA052) and at SA053. 70 km further north, large *Mshāsh* systems were used until recently at

6. A combination of both types might be represented at site SA053, where water was contained by dams to feed

Mshāsh located in a *khabra*-like setting.

Table 2: Sub-recent and recent methods of water acquisition in the Wādī as-Sahab al-Abyaḍ and al Asmar regions.

	Wells (<i>biyār</i>, <i>Qulbān</i>)	Seasonal pools (<i>Mshāsh</i>)	Open water basins (<i>Khabrat</i>)	Springs (not found in research area)	Closed basins / cisterns (not found in research area)
Construction effort	High	Medium	Natural / low	Low / medium	High
Evaporation losses	Low	Medium	High	Low	Low
Water availability	Annual, but no storage capacity	Seasonal	Seasonal, temporary storage capacity	Annual / seasonal	Seasonal / annual
Water quality	High	High - medium	Low	High	High
Utilization	Drinking water, watering animals	Drinking water, watering animals	Agriculture, watering animals	Drinking water, agriculture, watering animals	Drinking water, agriculture, watering animals

Mshāsh Ḥudruj and *Mshāsh* Umm Zaḡwh.

Mshāsh are shallow (1-3 m), artificial water pools or holes, with diameters ranging from 3-10 m, which are often found in the upper courses of wadis. They collect seasonally available water and their edges or sides are generally not strengthened with stones. As opposed to genuine wells, *Mshāsh* (or *Mshāsh* pools) are fed not by perennial aquifers, but by seasonal surface or sub-surface water, e.g. seasonal slope springs, as can be assumed in the case of *Mshāsh* Sahab al-Asmar.

Huge piles of very recent backdirt can be seen at *Mshāsh* Sahab al-Asmar, presumably the result of excavating the large pool which once existed here. Today, only a sand-filled depression is recognizable; reinforcement or similar of its edges could not be detected. The volume of backdirt attests to the one-time presence of larger structure. Its volume was calculated by means of a high-resolution topographic survey (Fig. 15).

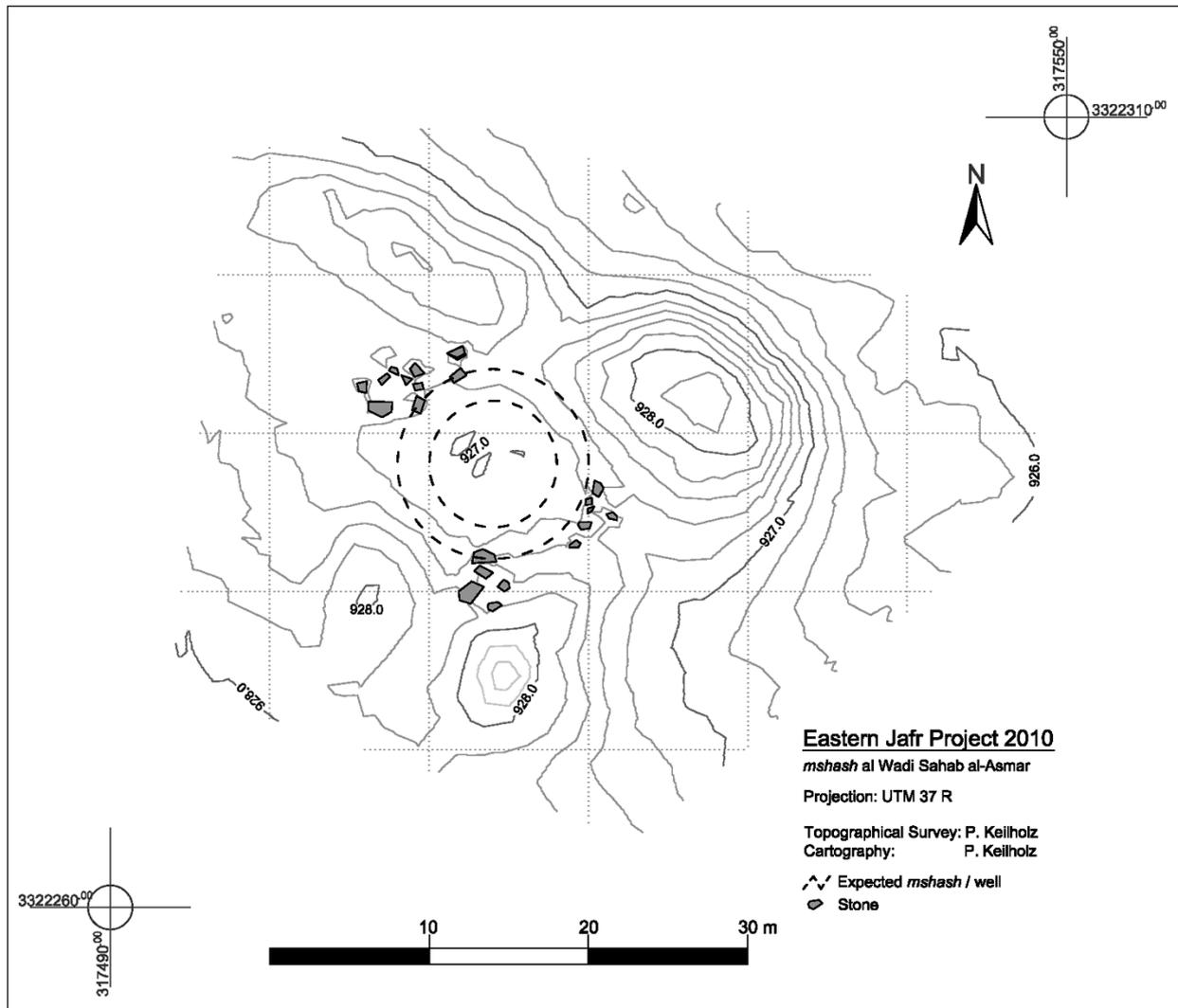
These data give a total volume of ca. 215 m³. The location of the pool can be reconstructed through terrain modeling. Its depth is probably ca. 4.3-2.7 m, with an interior diameter of 8-10 m. This is extremely large for a traditional *Mshāsh* pool and, furthermore, the backdirt appears to have been deposited in modern times. Nevertheless, traditional structures of this size are known from al-Jafr, Tayma and other areas.

Khabrat are natural depressions or basins in locations which allow run-off water to col-

lect. In addition, their water storage capacity is sometimes enhanced with the addition of minor constructions. *Khabrat* are only used between late winter and late spring / early summer, directly after the rains. *Bedouin* use alaun (*shebba*) to purify water from these *Khabrat* (Gebel and Baumgarten, in press).

Khabrat Miḥfār Sahab al-Asmar (AR004)

Visible from far away, the isolated mountain (AR038) at the edge of the south-eastern floodplain of Wādī as-Sahab al-Asmar ‘hosts’ *Khabrat* Miḥfār Sahab al-Asmar. Near the foot of the mountain on its southern side is a small natural depression with a shallow dam, used to this day by *bedouin* to collect water. The depression is situated in a closed basin; its catchment consists of two small wadis flowing in from the south-east, the mountain flanks to the north-east (with round structures AR039) and south-west (Fig. 16), and a small ridge immediately north-west of the *khabra*. To the south-east, another wadi passes by but is not connected with *Khabrat* Miḥfār. The small ridge to the north-west serves as a natural rampart, now open in two places giving the impression of a broken dam. In its upper part, stones had been piled up to raise the capacity of the reservoir the bedrock of the ridge. This all indicates that an already naturally favorable location (water-fed depression surrounded by elevated terrain) was enhanced by simple structures to increase its seasonal water harvest.



15. *Mshāsh as-Sahab al-Asmar*: potential location of the *Mshāsh* (drawing Keilholz).

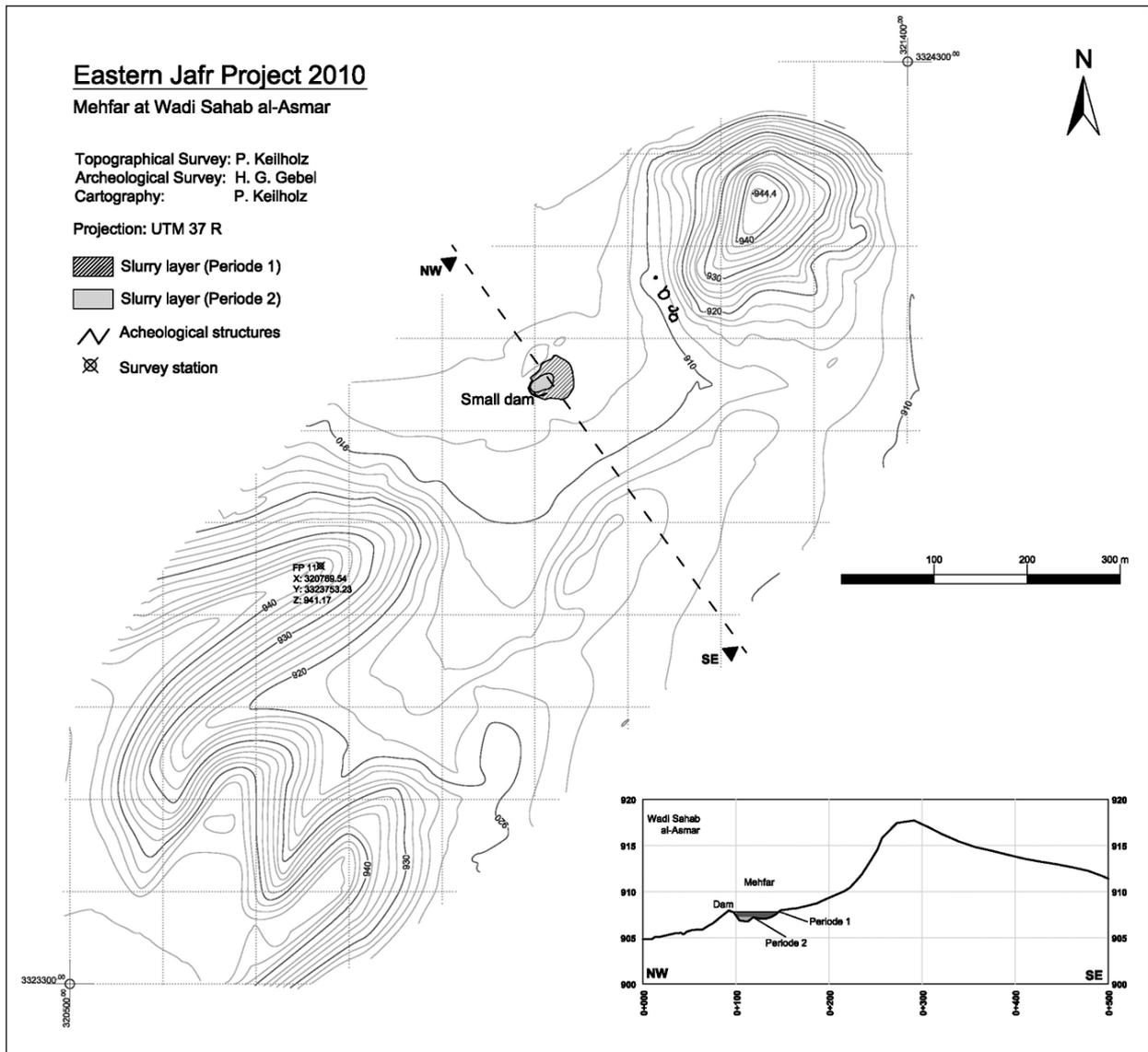
The complex appears to have two phases of use. In sub-recent Phase 1, the reservoir was much larger and may have retained water up to the level of the (partly) artificially raised natural ridge immediately to the north-west. The capacity of the reservoir later shrunk, creating its present-day Phase 2 shape and capacity, most likely as a result of one or more flash floods in the wadi which destroyed the raised dam on the reservoir's eastern and western sides, leaving only the central part intact. The Phase 1 water supply came from three sources: (1) water flowing in from the two southern wadis (0.18 km²), (2) run-off from the western mountain flanks and south-eastern slope (0.05 km²) and (3) water flowing in from the eastern wadi.

Phase 1 Water Supply

The present-day surface catchments are quite small for the task of filling a depression / reservoir of Phase 1 size. The extensive water-laid sediments in the depression (> 1640 m²) testify to a reservoir in use for a long period, suggesting that hydrological conditions were much more favorable at that time. A detailed analysis of run-off processes should allow for a calculation of the precipitation required for optimal management of the reservoir. This should give some indication of hydrological conditions during Phase 1.

Phase 2 Water Supply

Following the destruction of the raised dam,



16. *Khabrat Miḥfār Sahab al-Asmar: topography with drainage system, prominent hillocks with cairns on their summits (AR38) and round structures (possibly pens) at the base of their south-western slopes (AR39) (drawing Keilholz).*

water from the two southern wadis and mountain slopes drained unhindered into Wādī as-Sahab al-Asmar. As the dam seems not to have been repaired, it would appear that at least some of the surface run-off water potentially available in the area was subsequently allowed to go to waste. Today, the small *khabra* is fed only by the small catchment of the south-east slope and possibly the south-eastern wadi. *Bedouin* collect surface water in shallow, stone-lined runnels leading from the foot of the slopes to the reservoir. These well-preserved lines of stone are easily traced and often cross older erosion

rills. Today, *Khabrat Miḥfār* has a significantly smaller dam and an area of only *ca.* 350 m². The thick, water-laid deposits within it are stone-free (**Fig. 17**).

Khabrat Umm Naḥū (SA005)

Like *Khabrat Sahab (SA056)*, *Khabrat Umm Naḥū* is located close to the Saudi border (**Fig. 1**). It lies in an area of geological faulting caused by the intersection at an acute angle of the *Karak al-Fayḥa* and ‘*Arfa* fault systems / lines (Moumani 2008). This has caused the geology of the mountain to fold, resulting in the natural, up-



17. *Khabrat Mihfār Sahab al-Asmar: Phase 2 with its small dam (right) and the ridge immediately to north-west (from south) (photo Keilholz).*

right sandstone ‘walls’ characteristic of Umm Naḥū which block the flow of surface and sub-surface water (**Fig. 18**). Horizontal water flow is guided by these faults and may result in locally restricted availability of ground water.

Another potentially important factor in the supply of water to Khabrat Umm Naḥū might be the possibility that the vertical layers of the sandstone bed allow the groundwater to rise. If the aquifer carries confined groundwater, water can rise up to the surface or even beyond. Confined groundwater is the result of mountains being connected to the aquifer and related elevation differences. The water of these confined aquifers escapes at permeable spots / layers caused by geological anomalies. Higher moun-

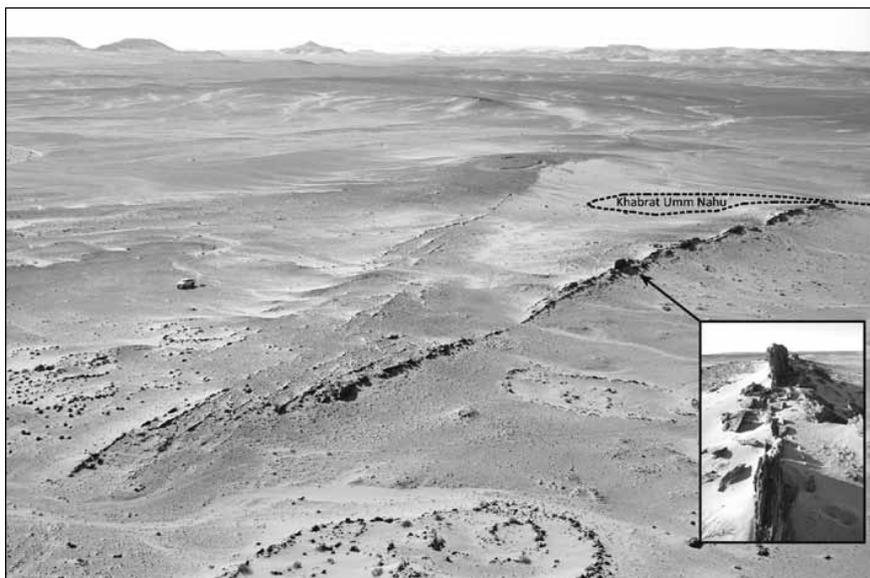
tains are present in the western part of Khabrat Umm Naḥū, making the existence of confined groundwater likely for this area.

If the Khabrat Umm Naḥū water supply is indeed fed by confined groundwater, this complex could be one of the rare perennial *Khabrat* in the region. This supposition is supported by information from local *bedouin* (Dalish Salim Dmaniyyah al-Huwaitat of al-Jafr), who recall that *bedouin* and camels used to travel long distances to drink water from the *khabra*. The water supply of the present-day depression derives from the western wadi, whose floods are partly channeled into the *khabra*. The water enters the depression through a disruption in the fault line; a small dam prevents it from draining to the south-east in times of higher retention.

*Khabrat al-Qara‘a (SA055)*⁷

The plateau of the upper catchment of *Qul-bān* Banī Murra is characterized by flat topography with depressions (*Khabrat*) in which the seasonal water accumulates. The depressions are stone-free and have mud layers (**Fig. 19**) which help to prevent the water from simply draining into the ground.

On parts of the plateau the bedrock is exposed, which helps a large proportion of rainfall to accumulate in the depressions by surface drainage. The resulting small, seasonal lakes can become quite extensive but are shallow. Under



18. *Khabrat Umm Naḥū: geological fault lines with Late Chalcolithic / EB circular structures in the foreground (from north-west) (photo Keilholz).*

7. Also known as Khabāri al-Qura‘ or Khabrat Qubūr al-Maṭālqah.



19. *Khabrat Qura'*, situated on a plateau in the upper catchment area of *Qulbān Banī Murra* (from south) (photo Keilholz).

present-day climatic conditions, water would evaporate from a 50 cm deep depression within six weeks of the last rainfall at the beginning of May. Therefore, these depressions can only be used for a limited period of time after rainfall, assuming of course that rains come at all that year. Six depressions have been documented at *Khabrat al-Qara'a*, but more can be expected to collect water on the plateau in wet years; under such conditions, abundant water sources may be available here, albeit for relatively short periods of time.

Conclusions

To judge from sub-recent and recent evidence for water management in the area, it seems likely that similar artificial and natural water supply systems were utilized during more arid phases of the Late Chalcolithic / EB (or in drier parts of the study area), *viz.* seasonal *Khabrat* with water retained by various natural and artificial dams, *Mshāsh* or combinations of the two. In addition, wells with watering complexes (cf. **Fig. 3**) were utilized in more humid periods (*ca.* 4400 BC). Although these would have yielded a relatively small amount of permanently available water, the labour required to fill the troughs would have been considerable. *Khabrat* may have been supplementary, seasonal watering places for animals and could possibly even have made agriculture possible in certain locations. Permanent humid-period lakes have not yet been encountered in the study area. While the shepherds

of *Qulbān Banī Murra* may represent a pastoral well culture with horizontal transhumance, it is possible that a *Khabrat / Mshāsh* based semi-sedentary way of life was associated with the seemingly later settlements / campsites at *inselberg* locations (**Figs. 2, 4-11**; cf. above).

Recent Land Use (J.B.)

The area east of al-Jafr, extending as far as the mountain range of *Jabal at-Ṭubayq*, is today used or even sometimes inhabited by sections of the *Huwaitat* tribe. It has been occupied by man since prehistoric times through various land-use practices, depending on prevailing climatic and hydrological conditions.

Traditionally, land-use in the *bādiya* consists of seasonal pastoralism in years of winter rainfall sufficient to allow pasture to grow. In June 2010, the *ca.* 40km long *Wadis as-Sahab al-Abyaḍ* and *al-Asmar* and their tributaries were still extensively covered with a grass known in Arabic as *naṣī* (**Fig. 20**). In the gullies a variety of shrubs and other plants were still green, with some in full bloom. The Latin name of *naṣī* is *Stipagrostis plumosa* (Reinder Neef, German Archaeological Institute, pers. comm.); according to our al-DmaniyyahHuwaitat guide, *naṣī* grass had not grown in the area for many years.

In 2010, the vegetation cover of *Wadis as-Sahab al-Abyaḍ* and *Asmar* fed a herd of more than fifty camels belonging to a family of the *Nawasreh Huwaitat*, a branch of the *Ibn Jāzī* (cf. Oppenheim 1943: 300). The *Nawasreh*, along



20. *Wādī as-Sahāb al-Abyaḍ*: *naṣi* grass (*Stipagrostis plumosa*) covering extensive parts of the wadi in June 2010 (photo Keilholz).

with other sections of the Huwaitat, were settled by means of government projects starting in the 1970s, with the construction of the new village of al-Jafr where the Nawasreh, Dmaniyyah and other major sub-tribes received houses from the government (Bocco 1996: 226-41). In 2010, the camels were herded by two adolescents who had not set up a tent, but instead sheltered under the water truck by which they had arrived from al-Jafr. The rich pasture that year could have fed many more animals. The fact that only one camel-breeding family saw fit to utilize the vast areas of grazing that resulted from a winter of above-average rainfall indicates the extent of the social changes that the previously nomadic Huwaitat have undergone.

The sedentarisation process, primary and higher education, a multi-resource economy (including income from smuggling, looting antiquities and falcon trapping), plus the fact that camels are no longer used as a means of transportation, have all diminished the importance of and restricted the time available for mobile herding. Heads of families and young adults have jobs in the public sector, army and police, work as truck-drivers, shop-owners and guards, or are employed at the port of ‘Aqaba, phosphate mines and other industrial zones. Local people recall that in the 1970s, well-watered locations in the *bādiya* were “crowded” with men

and herds — not only camels, but also goats and even sheep. Numerous recent stone structures, such as the remains of the campsites, prayer areas (Fig. 22) and graves that are densely scattered over the landscape, lend credence to this narrative. The *bedouin* pastured in the vicinity of natural water-collecting basins (*Khabrat*), some improved with small dams, and around the wells (*bi’r*, *qalib*, pl. *Qulbān*, *Mshāsh*) dug by tribesmen over long periods of time, which were used and re-used by the successive generations.

This way of life is now coming to an end. Owing to their integration within the modern national economy, year-round dwelling in settlements (offering electricity, running water, shops and medical facilities) and as a reaction to drier climatic conditions and lower water tables, the Huwaitat, like other *bedouin* tribes of southern Jordan, use the *bādiya* less frequently and with fewer people than before. It seems that herding is continued only by those members of a family who have “time” and are not engaged in business, either because they do not attend school, do not have a job⁸ in the monetarised economy or are too old for a job. The extent to which the values of an urban industrial market society, i.e. of waged labour and money, have entered *bedouin* mindsets is illustrated by the answer we often received when asking about the current occupation of a person: “Now he has no job, he

8. This does not ignore the fact that to this day some families live more or less permanently with their flocks

(camels, goats and even sheep), e.g. in the area north of Wādī Ḥudruj (Wādī al-Ḥasā).



21. Restored bedouin grave of Muhammad Diab al-'Audat (1890), near Khabrat al-Qara'a ("the bald pools") in upper Wādī as-Sahab al-Abyad (photo Gebel).



22. Qulbān Banī Murra, Area G: a desert mosque typical of the bādiya east of al-Jafr (photo Gebel).

is with the goats.” For the minority of *bedouin* families who still move their herds with ‘dispensable’ family members, herding is but an additional source of household income.

The decline in the number of people using the *bādiya* for herding is one reason for the many unused wells now filled with sand. The only well that has recently been dug to a depth of more than four meters (at Mshāsh Sahab al-Asmar) was not completed as groundwater was not reached (cf. Keilholz above). The main reason for the abandonment of wells, however, is that their maintenance is no longer a prereq-

uisite for the survival of men and animals in the *bādiya*, since water is brought in by water trucks. This was true in the case of the Nawasreh family mentioned above; whenever they needed to refill the water-tank of their truck, the boys went back to al-Jafr, a ride of about three hours, whereas in the past it had taken days — we were told — to move the herd from al-Jafr to Wādī as-Sahab al-Abyad, a distance of more than 120 kilometers.

This kind of motorized nomadism can exploit pasture without being dependent on natural water resources, whether surface runoff stand-

ing for weeks in *Khabrat* and other depressions after rainfall, or ground water close to the surface and easily accessible by *Mshāsh* or wells (cf. Obeidat 2009: 100-103; Lancaster and Lancaster 1999: 131-41). The well-known problem associated with motorized nomadism, *viz.* overgrazing caused by longer stays by large flocks transported into a fragile environment, does not seem to apply to the area east of al-Jafr which we found almost empty of men and herds.

Political borders have contributed to the decline of pastoral nomadism. In pre-state times, sections of the Huwaitat tribe used to camp at Jabal at-Ṭubayq during the winter season (e.g. Glubb 1948), visiting natural accumulations of water in depressions like *Khabrat Umm Naḥū* (cf. Keilholz above) to water their herds. The closure of the Jordanian-Sa‘udi border in the 1980s brought free migration in the region to an end. Traditional patterns of movement were halted, with tribes on both sides restricted to territories on their own side of the border. There are no official border-crossing points along the enormous distance between al-Umari and Mudawwara, and the impermeable ditch and berm system patrolled by Sa‘udi border police has suffocated the traditional life-style and migration of the *bedouin* of the region.

Nevertheless, the *bedouin* way of life is still appreciated by elderly tribe members, and the landscape they furnished and shaped with wells, pens, dams, graves and prayer areas is still a point of reference and part of local identity, not only for the older generation. *Bedouin* graveyards, as well as groups of graves, dot the area. We found some of the graves to be in poor condition, whereas others seemed well-maintained, even to the extent of having been restored with cement. Near one of the six or seven depressions called *Khabrat al-Qara‘a* (“the bald pools”), the restored grave of a Matalqa Huwaitat (Wādi as-Sahab al-Abyaḍ 54) has a recent Arabic inscription reading “Muhammad Diab al-‘Audaṭ 1890”, using the Christian calendar to give the date of death of the buried person (Fig. 21). The al-‘Audaṭ were a sub-section of the al-Matalqa (Oppenheim 1943: 300).

Ancient cairns may display *wusūm* or recent inscriptions pecked into one or two of their larger stones. For example, the cairn of Wādi as-Sahab al-Asmar 9:38 bears the inscription

“Muhammad Suleiman al-Hajaya 20/2/1997”, thus referring to a second *bedouin* tribe of the south, the Hajaya, who traditionally utilized the *bādiya* east of al-Jafr (Oppenheim 1943: 283-4; Ghazi bin Muhammad 1999: 10-11). Today, the Hajaya have settled around al-Qaṭrāna and al-Ḥasā. Likewise, the entrance to the Wādi as-Sahab al-Asmar 14 rock-shelter (upper Ṭūr Sahab al-Asmar) has a *wasm* of the ad-Dmaniyyah Huwaitat. A *wasm* is a tribal motif used for branding animals and marking locations (e.g. wells, graves, larger stones in prominent positions etc.). The practice of leaving a *wasm* may simply mean that a person wished to record his presence and thus express his self-esteem. However, the marking can also be an expression of tribal claims to territory and / or grazing grounds, denoting that it has been their territory for generations. A *wasm* underscores the right to access and use of a *dīra* or well by a certain tribe, or section of a tribe, and communicates ‘ownership’ of the area to members of other tribes.

Knowledge of the resources of the *bādiya*, especially usable plants and animals, still exists among the older generation of *bedouin* who have spent their lives, or parts of it, as pastoralists. Here we give some examples of the various ways of using plants: *azr* is the ‘mint of the desert’, collected for making tea; *hatāt*, if boiled in water and drunk cold, helps against snake and scorpion bites; the leaves of *ribla* can be chewed; *qsīs* plants indicate the presence of *kema*, the truffle of the *bādiya* known by some as the ‘potato of the desert’. There are two types, white and brown. White *kema* is cooked and eaten with yoghurt; brown, juicy *kema* is squeezed and provides a liquid used for soothing and healing eyes. *Silla*, *noqod* and *djreiba* are camel fodder plants; *naṣī* grass has been mentioned above.

Of the few animal species that survive in the *bādiya* (birds, reptiles, mammals), *ḍabb* is especially prized by local people. The large spiny-tailed *ḍabb* lizard (either Egyptian *Uromastyx aegyptia* or possibly *Uromastyx spinipes*) is found in Wadis as-Sahab al-Asmar and Abyaḍ and in Jabal at-Ṭubayq. It is hunted by *bedouin* for its delicious meat, considered to be both healthy and a cure for many sicknesses, as well as a means of “strengthening a man’s sexual power”. A large adult *ḍabb* can provide “as much

meat as a small goat”⁹. Other animals trapped in the Afra region east of al-Jafr are *shāhin* and *ṣaqr* falcons (Gebel and Baumgarten, in press). Apart from the prestige associated with owning falcons, the present-day trapping and sale of falcons to Saudi customers is an occasional but very lucrative activity: a *shāhin* can be sold for 100-300 JD, while a *ṣaqr* (not caught since 1999) may be sold for up to 56,000 JD. Falcon trapping is associated with the arrival of migratory birds passing through the ‘Afra region in October.

It is doubtful whether this knowledge will be passed on to future generations. Rather, the stories we have heard about camel herding in the *bādiya*, with flooded *qī‘ān* and *khabrāt* surrounded by tents and large herds, and tribespeople wading into pools filled knee-deep with water, seem to be stories of the past, of an era that is disappearing. Mobile, nomadic *bedouin* have become a tiny minority. In the Governorate of Ma‘ān less than 3 % of household incomes are based on agriculture or raising livestock (cf. Tarawneh et al. 2003: 8). Sinking water tables resulting from deep well pumping to provide water for urban-industrial centers have made life in the *bādiya* even more difficult and less rewarding. Development plans for the national economy are mostly brought into effect at the expense of arid area environments and to the detriment of pastoralism. Unfortunately, Donald Cole seems right with his statement: “Land degradation and desertification of the steppe is usually blamed on the Bedouin. However, the new uses, or abuses, are the work of non-Bedouin. Indeed, many Bedouin are themselves victims of the misuses of others” (Cole 2003: 262).

Conclusion

The clear, new evidence for the presence of aceramic Late Chalcolithic / Early Bronze Age *inselberg* campsites / settlements in Wādī as-Sahab al-Asmar (dated on the strength of the presence of fan scrapers, e.g. Fig. 12) requires consideration of slightly different occupational

scenarios for the region (cf. also Hypothesis 5): either the pastoral cultures of the vast burial grounds (e.g. Qulbān Banī Murra) in the area were less mobile than previously thought and were already associated with semi-sedentary land-use, becoming incubators for later oasis economies, or the deflated *inselberg* settlements already represent ‘proto-oases’. The complexity of funerary structures in the region might also be an indication that the area was occupied by both types of socio-economy over a longer time span, say from 4500 to 3500 BC, i.e. an earlier pastoral ‘well culture’ and a later early oasis culture, perhaps with a parallel, later pastoral culture unable to share — owing to environmental conditions — in the oasis economy. Future investigations will assess whether the *inselberg* location of the settlements was the result of aquifers being redirected and raised at such locations by sub-surface bedrock topography and / or the shelter that such locations afforded, as well as the extent to which the settlements were seasonal or permanent. The results of the 2010 season of the Eastern Jafr Project has allowed us refine the hypotheses (see above) by which we approach the question of how early oasis economies and their hydrographic contexts (Pokrandt, in prep.) might have developed in Jordan’s south-eastern *ḥamad* during the first half of the 4th millennium BC.

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9. The *ḍabb* is hunted by hand “because it does not move fast”. It is necessary to block the entrance of its burrow before trying to catch the animal, usually with two or three people. The *ḍabb* is killed with a knife, “saying *bismillah* when cutting its throat”. The usual way of cooking a *ḍabb* in this area is to prepare the white meat in the manner of *mansaf*: the pieces of meat are

fried with onions, boiled in *jamīd* (reconstituted dried sheep’s yoghurt) and then served on a mound of rice with a hot *jamīd* ‘soup’ poured over it. The meat of the *ḍabb* can also be roasted or grilled on a spit (information provided by Dalish Salim ad-Dmaniyyah of al-Jafr).

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Bibliography

- al-Ghazzi, A.
2004 (1424) Standing stones in Saudi-Arabia, A comparative Study. *Journal of the Historical Society* (Riyadh) 5 (9): 5-46.
- Bocco, R.
1996 *Etat et tribus bédouines en Jordanie, 1920-1990. Les Huwaytat: territoire, changement économique, identité politique*. Université de Lille III/Diss. Paris, Institut d'Etudes Politiques.
- Cole, D.P.
2003 Where have the Bedouin gone? *Anthropological Quarterly* 76(2): 235-267.
- Gebel, H.G.K and Baumgarten, J.
In Press Der Laden des Firās Na'im al-Ḥammari. Beobachtungen in Ma'an zum Wandel der beduinischen Kultur - und ein Plädoyer für eine andere kulturwissenschaftliche Verantwortung. *Zeitschrift des Deutschen Palästina-Vereins* 2012.
- Gebel, H.G.K.
2010 Untergegangen im Klimawandel. Die paläo-bedinische Kultur von Qulbān Banī Murra, Jordanien. *Antike Welt* 2010.6: 40-44.
- Gebel, H.G.K. and Mahasneh, H.
2006 Qulbān Banī Murra/ Wadi as-Sahab al-Abyad. *Munjazat* 2006: 89-90. Amman, Department of Antiquities.
2008 Qulbān Banī Murra. *Munjazat* 9: 119-121. Amman, Department of Antiquities.
2009 Petroglyphs and Sepulchral Contexts. Preliminary Note on Late Chalcolithic/ Early Bronze Age Findings at Qulbān Banī Murra, Wadi as-Sahab al-Abyad. *Journal of Epigraphy and Rock Drawing* 3: 1-9. Amman, Department of Antiquities.
2010 Qulban Bani Murra, and Its Late Chalcolithic/ EB Pastoral, Hydraulic and Sepulchral Environments. *Munjazat* 11. Amman, Department of Antiquities.
in press Qulbān Banī Murra. Unknown Mid-Holocene Sepulchral Green Desert Landscapes, Pastoral Well Cultures, and the Origins of Arabia's Oasis Economies. In R. Eichmann, F. Klimscha, C. Schuler and H. Fahlbusch (eds.), *Water. Innovation: Technical, Social. Work Results of Research Cluster 2*. Berlin, Deutsches Archäologisches Institut.
- Ghazi bin Muhammad
1999 *The Tribes of Jordan at the Beginning of the Twenty-First Century*. Amman
- Glubb, J.B.
1948 *The Story of the Arab Legion*. London: Hodder & Stoughton.
- Kirkbride, A.S. and Harding, G.L.
1944 The Seven Wells of the Beni Murra. *QDAP* 11: 37-46.

- Kirkbride, D.
1969 Ancient Arabian ancestor idols. Part I: The discovery of the sanctuary at Risqeh. *Archaeology* 22.2: 116-121, 188-195.
- Lancaster, W. and Lancaster, F.
1999 *People, land and water in the Arab Middle East: Environments and landscapes in the Bilād ash-Shām*. Amsterdam: Harwood Academic Publishers.
- Luck, T.
2010 New Find in the Badia illuminates ancient Bedouin life. *Jordan Times* 21/7/2010
- Mahasneh, H. and Gebel, H.G.K.
2001 Wadi as-Sahab al-Abyad. *Munjazat* 2001: 60. Amman, Department of Antiquities.
2009 The Eastern Jafr Joint Archaeological Project. The 2001 and 2006 Surveys in Wadi as-Sahab al-Abyad, Southeastern Jordan. *ADAJ* 53: 465-478.
- Moumani, K.A.
2008 *The Geology of al Jibal al Adfriyyar Area. Map Sheet No. 335*. The Hashemite Kingdom of Jordan. Natural Resources Authority, Geology Directorate. Bulletin 67.
- Obeidat, D.
2009 Water harvesting and storage techniques in the eastern parts of the northern Jordanian badiah. In: H.G.K. Gebel, Z. Kafafi and O. al-Ghul (eds.), *Modesty and Patience. Archaeological Studies and Memories in Honour of Nabil Qadi („Abu Salim“)*. Monographs of the Faculty of Archaeology and Anthropology: 98-107. Irbid, Yarmouk University/ Berlin, Ex Oriente.
- Oppenheim, M. von
1943 *Die Beduinen. Band II: Die Beduinenstämme in Palästina, Transjordanien, Sinai, Hedjāz. Unter Mitbearbeitung von Erich Bräunlich und Werner Caskel*. Leipzig: Otto Harrassowitz.
- Pokrandt, J.
in prep. *The Palaeoecology of Oasis Origin on the Arabian Peninsula (4th Mill. B.C.)*. Kiel University: planned PhD.
- Rhotert, H.
1938 *Transjordanien. Vorgeschichtliche Forschungen*. Vorgeschichtliche Forschungen in Kleinasien und Nordafrika 1. Stuttgart: Strecker und Schroeder.
- Tarawneh, M.
2003 Maan: An Open Crisis. Center for Strategic Studies, Jordan University.
- Underbjerg, H.
2003 *Rizqeh*. Copenhagen University, Carsten Niebuhr-Institute: unpub. MA-thesis.
- Weninger, B., Clare, L., Rohling, E.J., Bar-Yosef, O., Böhner, U., Budjar, M., Bunschuh, M., Feurdean, A., Gebel, H.G.K., Jöris, O., Linstädter, J., Mayewski, P., Mühlenbruch, T., Reingruber, A., Rollefson, G., Schyle, D., Thissen, L., Todorova, H. and Zielhofer, C.
2009 The Impact of Rapid Climate Change on Prehistoric Societies During the Holocene in the Eastern Mediterranean. *Documenta Praehistorica* 26: 1-53.
- Zarins, J.
1979 Rajajil – a unique Arabian site from the fourth millennium B.C. *Atlat* 3: 73-77.