PRELIMINARY REPORT ON THE 2006 SEASON AT EPIPALAEOLITHIC 'AYN QAṢIYYA, AZRAQ ASH-SHĪSHĀN

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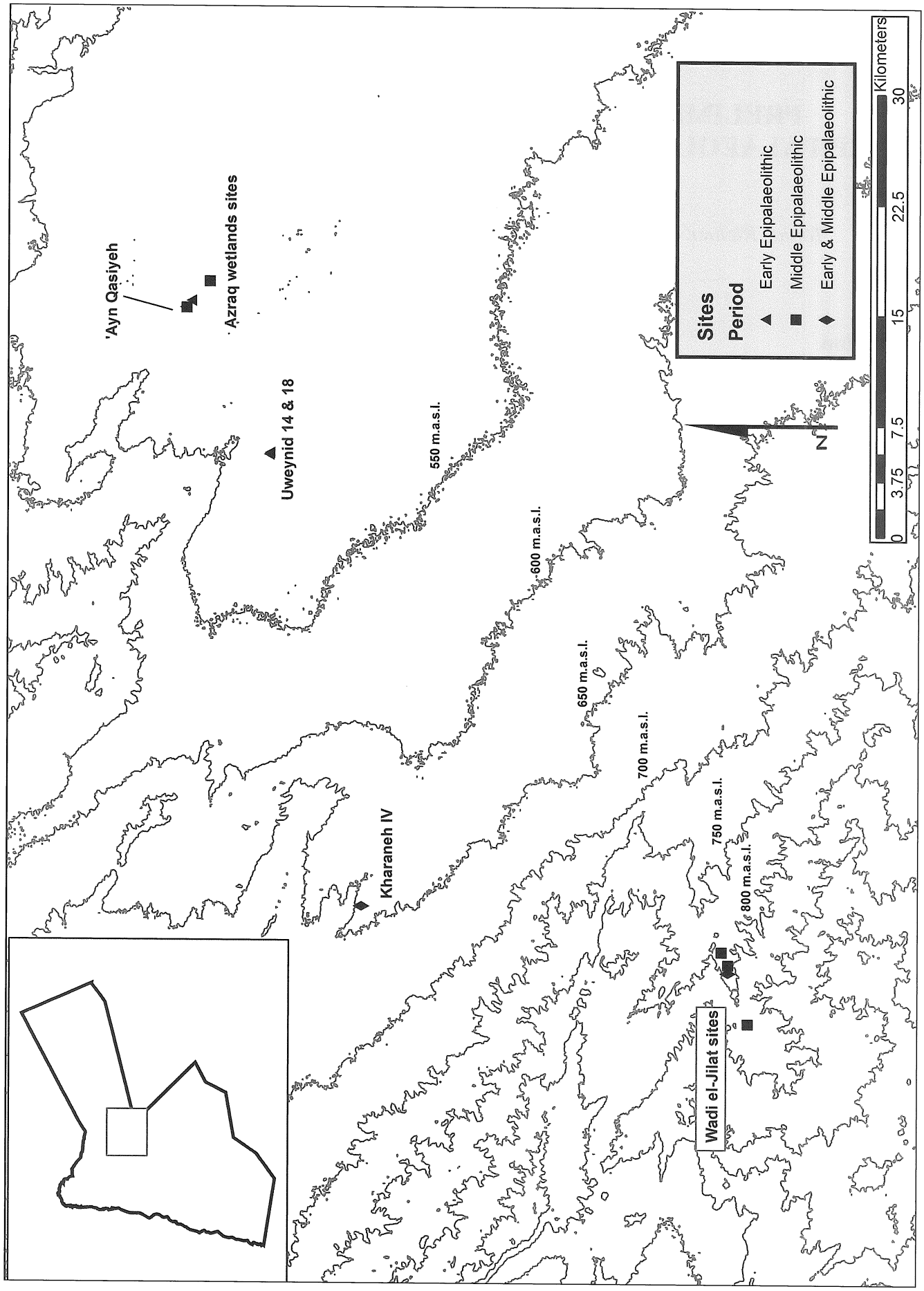
Introduction

Al-Azraq Oasis of eastern Jordan has attracted the interest of prehistorians for a number of decades, beginning with the work of John Waechter (Waechter *et al.* 1938), Zeuner (Zeuner *et al.* 1957) and Henry Field (Field 1960). During the 1980s excavations and intensive survey at several locations throughout al-Azraq Basin demonstrated the richness and abundance of Epipalaeolithic and Neolithic sites in the region (Betts 1988, 1991, 1998; Byrd 1988; Byrd and Garrard 1989; Garrard 1984, 1991, 1998; Garrard *et al.* 1985, 1987, 1988, 1994a, 1994b, 1996; Muheisen 1988a, 1988b), providing a unique dataset for studying semi-arid zone human adaptations (**Fig. 1**). The presence of two Epipalaeolithic 'mega-sites', consisting of lithic artefact scatters around 20,000m^2 in size in the Wādī al-Kharrāna and Wādī Jīlāt, demonstrated that this currently semi-arid to arid region was intensely settled in the final Pleistocene. Al-Azraq oasis, situated at the lowest point of the basin, was a crucial focal point in the region, since the permanent availability of water ensured the availability of abundant and diverse resources. Although surveys and excavations have been conducted in the oasis itself, which documented evidence for late Epipalaeolithic (Natufian) and Pre-Pottery Neolithic B sites, only one early and one middle Epipalaeolithic site have been investigated in this area to date (Garrard 1991; Garrard *et al.* 1988, 1994b; Rollefson *et al.* 1997, 1999). A survey of al-Azraq Wetlands Reserve, commissioned by the Royal Society for the Conservation of Nature (RSCN) in 2000 located a series of previously undocumented Epipalaeolithic sites in Azraq ash-Shīshān area (Rollefson *et al.* 2001), including 'Ayn Qaṣiyya.

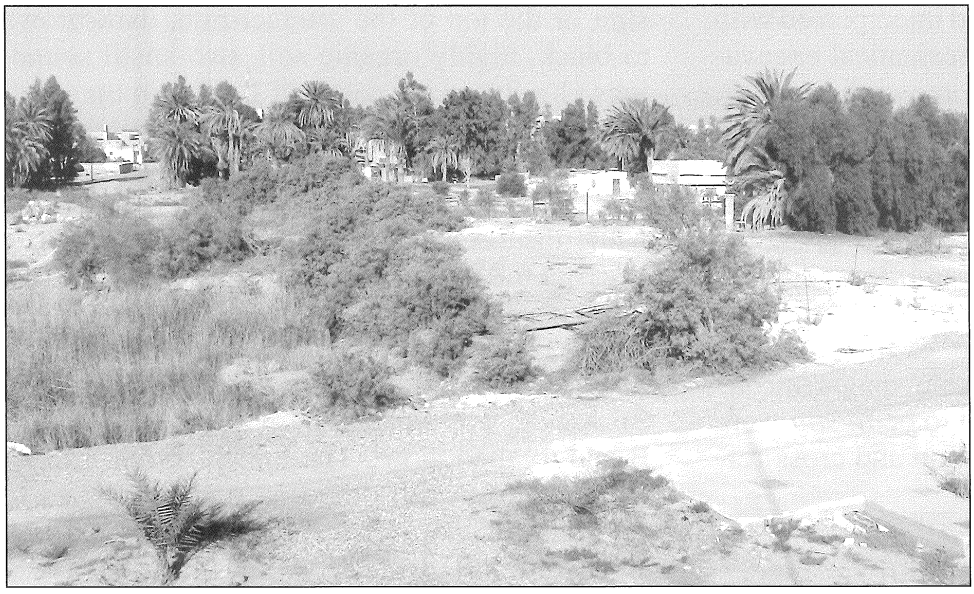
Rescue excavations at 'Ayn Qaṣiyya were initiated, due to concerns that the ongoing drying out of the oasis would lead to an increase in erosion and thus damage the preservation of the site. Following an initial, exploratory season of fieldwork in 2005 (Richter and Röhl 2006), a four-week excavation season was conducted at 'Ayn Qaṣiyya in the summer of 2006, which is the subject of the present report. Building on the initial exploration of the exposed sections of the site visible with in the northern banks of the 'Ayn Qaṣiyya pool, the aim of the 2006 season was to excavate larger areas of the site to locate potential habitation areas, sample for botanical and faunal remains and to obtain suitable radiocarbon samples to place the site within its regional chronological framework. In addition, we aimed to reconstruct terminal Pleistocene food procurement patterns in the southern al-Azraq marshlands, seasonality of occupation, the scope of human activities carried out here and to gain a better understanding of the palaeoenvironmental conditions in the oasis around the Last Glacial Maximum (LGM).

Site Location and Geography

'Ayn Qaṣiyya and 'Ayn as-Sawda are the two major springs that feed the southern part of al-Azraq marshlands, which once represented the largest wetland area in the oasis. The unique character of this landscape has been discussed in detail by others (Garrard 1998; Macumber 2001; Nelson 1973) and does not have to be reiterated here. 'Ayn Qaṣiyya is the most northern of the two Azraq ash-Shīshān springs and is composed of a deep spring head and a fairly extensive pool, with a southeastern outlet that once fed into the wetlands (**Fig. 2**). The pool was dug



1. Map of al-Azraq basin with main Epipalaeolithic sites.



2. Overlooking the site facing northwest.

out in recent times for water extraction by the local community. Until the early 1990s this area was inundated with freshwater from the copious springs, as witnessed by the persistence of dried out vegetation in the area. The archaeological material at 'Ayn Qaṣiyya is contained within a dark, highly organic buried soil indicative of a former marsh and wetland reedbed (see below). Today the site is situated within the Azraq Wetlands Reserve owned and administered by the RSCN, whose rejuvenation efforts have recreated parts of the marsh to the east and southeast of the site. The Acheulean and middle Epipalaeolithic sites at 'Ayn as-Sawda is situated ca. 210m and 130m to the south of 'Ayn Qaṣiyya (Rollefson 1983; Rollefson *et al.* 1997).

Previous research in and around al-Azraq oasis has shown that at the time of occupation around the Last Glacial Maximum (ca. 20,000BP) water tables were probably higher, which indicates that wetter conditions than today prevailed (Garrard 1998; Garrard *et al.* 1988, 1994b; Macumber 2001). Although extensive lake settings have been recognised as widespread phenomena during the final Pleistocene in Jordan, with their margins representing attractive settlement locations (Olszewski 2004), the extent of al-Azraq Pleistocene lake is not yet fully understood (Garrard *et al.* 1988). Based on the presence of clays in the basal levels at 'Uwaynid 14 and other sites in the region it seems clear, however, that substantially higher water tables existed during the Last Glacial Maximum in the region. Other recent data indicates that general climatic conditions in the southern Levant around the LGM were characterised by cold and dry conditions (Robinson *et al.* 2006), the exact timing of the Lake al-Azraq highstand may therefore be in question. Thus, al-Azraq Lake, fed by several copious springs, as well as seasonal surface water runoff, would have represented a crucial, permanent resource for human groups within this semi-arid region, providing a stable location in the area that was relatively resilient in the face of climatic change (Macumber 2001). The diversity of available plant species in the oasis, as well as the abundant wildlife, would have been further attractive features. Indeed, the 62 Epipalaeolithic locations recorded as part of al-Azraq Wetlands Survey (Rollefson *et al.* 2001) and the excavations at Bawwāb al-Ghazāl, al-Azraq 17 and al-Azraq 18 (Garrard 1991, 1998; Garrard *et al.* 1988, 1994a; Rollefson *et al.* 1997, 1999) demonstrate intensive habitation of the area in the Epipalaeolithic. The nature of late Epipalaeolithic (Natufian) occupation is well documented from the excavations at al-Azraq 18 (Garrard 1991). However, data from early or middle Epipalaeolithic sites remains scarce (Byrd 1988; Garrard 1998; Garrard *et al.* 1988; Rollefson *et al.* 1997, 2001).

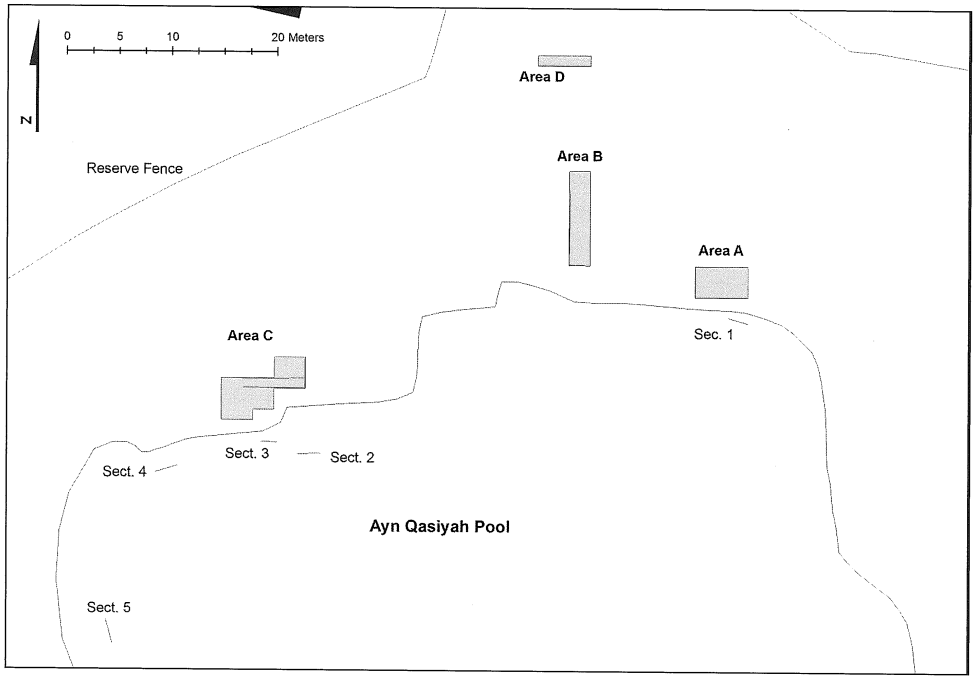
Excavation Methods and Strategy

To establish firm control over artefact location and recovery the site was subdivided using a north-aligned 1x1m grid system with an arbitrarily defined datum point of 1000E/1000N. Due to the firm and highly compact nature of the

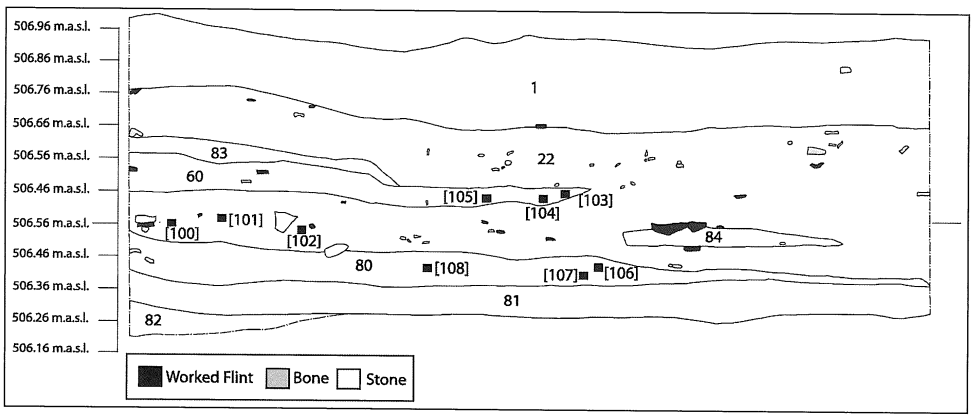
topsoil — a matrix of silty sand interspersed with carbonate concretions — a mechanical excavator was used to loosen and remove the top 40-60cm. Following this, excavations were carried out by hand in grid meter squares. Soil samples for flotation were taken from viable deposits and all other excavated material was dry-sieved using a combination of 50mm and 2mm screens and then wet-sieved using a 2mm screen. This ensured a high recovery rate of even small artefact fragments. Where applicable, diagnostic artefacts or artefacts considered to be *in situ* were piece-plotted using a total station and cross-referenced with the site plan.

Excavation Areas and Stratigraphy

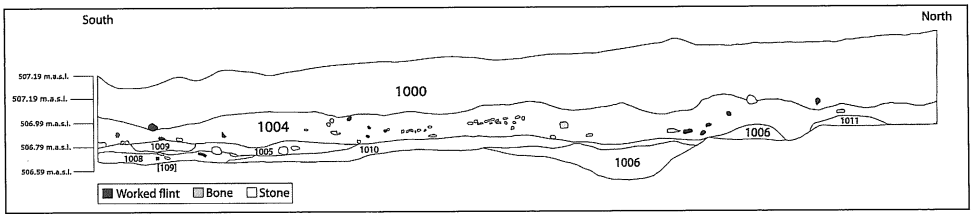
Four excavation areas were opened during the 2006 field season. Area A, begun in 2005, was extended to the west by 1m to measure a total of 3 x 5m (see **Fig. 3**). Following the exposure of the top of the artefact-rich, dark-brown to black, highly organic soil, two small soundings (1 x 3m in the east and 1 x 2m in the west) were excavated inside Area A to document the stratigraphic situation. The 1 x 3m sounding was excavated to a depth of 1.26m (see **Fig. 4**), while the 1 x 2m sounding reached sterile lake marls at 0.85m below the modern surface. Area B, situated 10 meters to the west of Area A was placed running upslope measuring a total of 9 x 2 meters with a maximum depth of 1.05m (**Fig. 5**). Area C was situated 34m to the east of Area B and totalled 27m^2. The trench had an irregular shape to avoid a modern revetment wall to the south of the trench. This area targeted rich archaeological deposits recognised previously in sections 2 and 3 (Richter and Röhl 2006). The area was excavated to a maximum depth of 1.98m (**Fig. 6**). Area D was placed 10m to the north of Area B and measured 5 x 1m. It was ex-



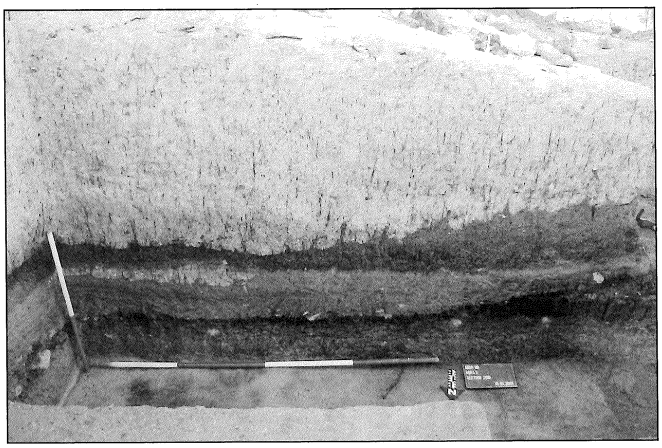
3. Plan of the 2006 excavation trenches and sections.



4. 'Ayn Qaṣiyya, Area A, section 7 facing west.



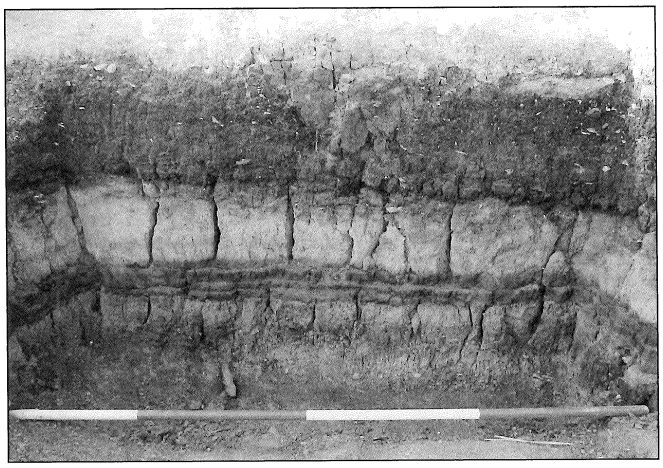
5. *'Ayn Qaṣiyya, Area B, section 9, facing east.*



6. *'Ayn Qaṣiyya, Area C, section 2001, facing north.*

cavated to a maximum depth of 1.83m. Excavations in these four trenches resulted in the observation of three principle stratigraphic situations. Generally speaking, the stratigraphic succession found in Areas A and B were found to be comparable, whereas Areas C and D showed a different depositional history.

The stratigraphy in Areas A and B revealed a succession of dark brown to black, highly organic deposits with abundant chipped stone artefacts and animal bone (**Fig. 7**). This deposit was stratigraphically below a cemented topsoil of aeolian silts with carbonate concretions and above a series of sterile, lake-deposited marls. However, these lake marls were not uniformly present, as a compactly formed carbonate concretion horizon was also encountered below the dark brown layer in the western part of Area A and the eastern part of Area B. At present it is assumed that this may represent a former raised area or small island within the former wetland.



7. *'Ayn Qaṣiyya pool, section 1, facing south.*

The Area C stratigraphy consists of a sequence of alternating thin and medium thick artefact-bearing layers situated between a fairly substantial colluvial overburden of aeolian silts with small carbonate concretions, as well as the sterile fill of a palaeochannel that appears to run below the excavation area (see also below). Two episodes of soil formation were recognised, representing periods of stabilisation of old land surfaces. Both the buried soils and other deposits consisting of clay-silt, low-energy erosional sediments, contained numerous Epipalaeolithic and Pre-Pottery Neolithic artefacts and animal bone. Artefacts recovered from these consist of both Epipalaeolithic artefacts as well as Pre-Pottery Neolithic diagnostic chipped stone tools.

The stratigraphy of Area D is as yet the least understood. A substantial colluvial overburden of varying compactness was excavated to a depth of more than 1m before archaeological layers were reached. However, unlike Areas A or B the deposits in this area did not consist of buried marsh deposits or palaeosols, but a much more degraded silty clay deposit with abundant carbonate concretions. Artefact concentrations were of much lower density in Area D and consisted mainly of Epipalaeolithic chipped stone artefacts.

Based on the observations made during excavation, as well as the geoarchaeological assessment of the 'Ayn Qaṣiyya sections, it is clear that erosion played a significant part in the formation of the archaeological horizons in Areas A, B and C. This is especially evident with regards to the archaeological deposits in Area C where lithic artefacts dating to the early and late Epipalaeolithic, as well as the Pre-Pottery Neolithic B and Pottery Neolithic, occur in the same layer. The lithic assemblages from Areas A and B are more

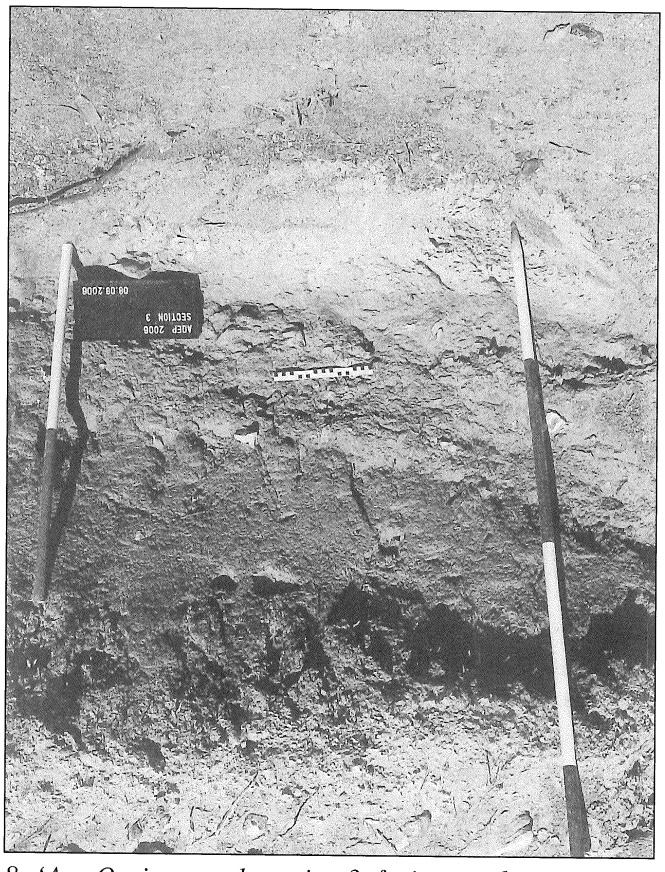
chronologically consistent since they contain only early Epipalaeolithic elements. Yet, there is no orientation of the archaeological finds in the deposits thus far excavated. No living floors or installations were found which would indicate the presence of a primary habitation area. The genesis of these deposits is discussed in more detail below, but the lithic artefacts indicate that erosion in the excavated areas was very likely a slow process with restricted lateral movement. The artefacts display fresh edges, damage is minimal, and most are not rolled. They can therefore not have been transported very far.

Geoarchaeological Studies

Four sections in the north wall of the 'Ayn Qaṣiyya pool and one section in the west wall (**Fig. 3**) were examined and described in order to understand the environmental background of the site. Figure 8 summarises the different geological units in the sections and the correlations between them.

Unit I

This basal unit is evident in sections 1, 3, 4 and 5. Silty clay, suggesting standing water conditions, contains flints between 1-5cm in size which suggests that moving water was nearby or the flints were transported by other means e.g. people. The matrix is coarser in section 3. At the top of this unit in sections 4 and 5 there is a concentrated layer of larger flints which are orientated NW to SE in section 4. This suggests a period of increased in-wash at these locations, possibly one flood event. The transition to Unit II is marked by a distinct surface suggesting a hiatus in deposition or an erosional surface. Middle Palaeolithic artefacts were found in the flint layer in section 4.



8. 'Ayn Qaṣiyya pool, section 3, facing south.

Unit II

The red and green silty clays of this unit represent a substantial period of time when there was calm standing water at the site. The differences in colour probably represent changes in oxidation states. This unit contains small fragments that may be shell, material but contains very few flint or bone clasts.

Unit III

Unit 3 comprises largely black organic deposits. In places, these sediments contain numerous bone and flint clasts. The unit represents a period of time when water levels at the site were considerably lower than during the previous unit and reed and root remains suggest a marshland environment. This deposit is associated with early Epipalaeolithic artefacts in section 1. In section 2 and 3 it is associated with early and late Epipalaeolithic, as well as PPNB artefacts.

Unit IV

The top unit of the succession is a pale, sandy, soil containing many carbonate concretions and is often well cemented. Additionally many snail shells are found throughout this unit which will help describe the initial environment of deposition. The exact environmental formation of this unit is unclear and will depend on laboratory analysis of the sediments.

Unit V

In this unit the average grain size in sections 2 and 3 is much coarser than that found to either side suggesting a higher energy environment. Some of the clasts in the lower facies of this unit

are very large and heavy. The unit represents a channel or inflow fan of flowing water entering the pool. The sandy upper facies has a clear channel shape in section 3. The top of this facies is 30cm lower in section 2 compared to section 3. The sandy upper part of this layer can be seen, albeit as a much thinner horizon, as sandy layers within unit II in sections 1 and 4.

The stratigraphic units describe changing water levels at the site and include periods of hiatus and possible erosion which could account for substantial amounts of time. It is unclear at the moment if these changes are simply due to shifting margins of a wetland or correlate to changes in water levels of a large palaeolake at al-Azraq. Further work within the wetland reserve should clarify this.

Botanical Studies

Systematic botanical sampling was carried out by stratigraphyic unit in each 1m grid square excavated from three separate trenches at 'Ayn Qaṣiyya. It was hoped that due to the prior submersion of deposits by the spring that botanical preservation might be good; however, the sampled deposits did not contain any waterlogged remains and thus submersion did not have any apparent effect on preservation conditions. Flotation samples were collected from units considered taphonomically 'intact', i.e. erosional horizons were not sampled, whereas palaeosols were always sampled. Initially ¼ of a grid square was the measure for a single sample; however, due to time constraints on processing, the target volume for each sample was reduced to a maximum of 10 litres. This resulted in a total of 198 litres of sediment sampled. Twenty-two samples (Area A: 9, Area B: 10, Area C: 3) were taken from an equal number of stratigraphic units within 10 separate contexts. As sampling was based on stratigraphic units rather than contexts, multiple samples have been taken from single contexts. The samples were recorded in the field with relation to their grid square and context.

Processing of the samples took place in the field. First the volumes were measured and recorded. They were then processed by manual (bucket) flotation and separated using sieves with mesh sizes of 1mm and 300μm. The residues were bagged and dried, then transported to the Institute of Archaeology, University College London where they were examined in the botanical laboratory[1]. Fifty percent of the residues from the 1mm fraction were scanned under a binocular microscope, noting the presence of wood charcoal and extracting any non-wood charred remains. As a test case, a single sample as sorted, separating wood charcoal from any non-wood charred remains.

The results of botanical sampling were inconclusive. The samples were largely comprised of modern roots and other vegetation. All of the samples contained wood charcoal in varying amounts. The wood charcoal was highly fragmented and less than 4mm in size. The occurrences of non-wood charred remains by trench are as follows.

In total, 11 of the 22 samples deriving from all three of the trenches contained 21 fragments of non-wood charred remains. Apart from a few examples of parenchyma, which were not identified to species, these charred remains could not be identified due to poor preservation, lack of both external and internal diagnostic morphological features of the plant fragments that would facilitate identification, and the small size of those plant fragments present. Several macroscopic samples of charred wood were collected during excavation and recovered directly from the deposits. Although few in numbers, these will provide some degree of insight into past palaeoenvironmental conditions once identified.

Material Culture

The Chipped Stone Assemblages

So far more than 16,000 chipped stone artefacts have been sorted and counted, which represents roughly the half of the total sample recovered during this field season. Diagnostic early Epipalaeolithic chipped stone artefacts were recovered from Areas A, B and D, while Area C also produced artefacts of late Epipalaeolithic and Neolithic affinity. The assemblages from Area A and B display very similar characteristics and it is very likely that they relate to the same general time frame of occupation. There is no evidence to suggest contamination of Areas A and B by later material, suggesting that the

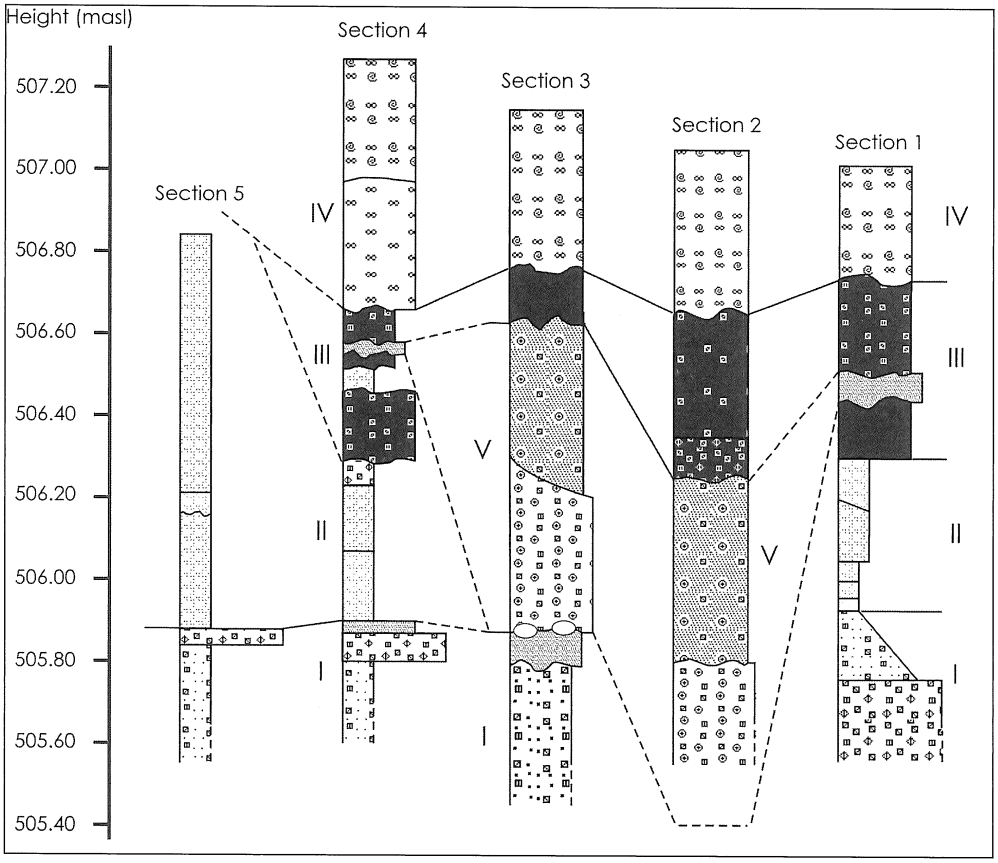
1. Flotation and analysis were carried out by Sarah Luddy under the supervision of Sue Colledge.

assemblage is chronologically consistent. The Area C assemblage is highly mixed with early and late Epipalaeolithic, as well as Pre-Pottery Neolithic and Pottery Neolithic artefacts. Since these materials all derive from one erosional deposit it is difficult to identify clear-cut distinctions between the different periods where debitage is concerned. A significant number of pieces from Areas A, B and C display a dark patina. This patina is the result of an immersion of unworked flint nodules in ground saturated with water. At the same time, differences in the colour pattern also indicate that some patination occurred after knapping. In other words, raw materials deriving from non-saturated and patinated deposits were also used, but their original color has been masked. This suggests on the one hand that raw materials were procured close to the site at sources associated with the wetlands, but also makes an assessment of the variety of used flint sources difficult. It appears that both tabular and nodular flint sources were used and that at least some proportion of the assemblage consists of material procured elsewhere.

The material preliminarily analysed to date (excluding Area D) suggests that cores, core preparation and trimming elements, as well as primary debitage is underrepresented. In all three areas less then %1 of the overall assemblage are cores. The vast majority of debitage are chips and chunks, as well as complete and incomplete flakelets (defined as flakes less then 20mm in overall size). The abundance of these categories reflects the intensive dry- and wet sieving of all excavated deposits. However, the low proportion of flakes, blades and bladelets, in conjunction with the relative absence of cores and core trimming elements, suggests that tool production was probably an insignificant activity at the site, both in the Epipalaeolithic as well as Neolithic. This is supported by a tool to core ratio of 7.5:1 for Area A, 11.6:1 for Area B, and 14.3:1 for Area C. However, the tool to core ratios from Areas A and B are generally comparable to those from other early Epipalaeolithic sites across the basin (Byrd 1988: 258). Although a detailed study of the cores and debitage is still pending, the technological characteristics of the retouched artefacts in the assemblage indicate the use of both single opposed platform removal strategies for bladelet blanks.

The retouched artefacts from Areas A and B, and the tools from Area C are discussed here as separate assemblages, since the material from the former two areas are distinctive early Epipalaeolithic types, whereas Area C consists of a mixture of Epipalaeolithic and Neolithic materials. Non-geometric microliths represent the most abundant artefact class within the Area A/B tool assemblage (see **Fig. 9**). Narrow (mean width 5.6cm), obliquely truncated and backed bladelets represent the bulk of microliths within this group, which were made exclusively on bladelets. The mode of backing differs between abruptly-direct, abruptly-bipolar and fine varieties. Other non-geometric microliths also occur, including a series of obliquely truncated bladelets without backing from Area B. Notable is the absence of any significant amounts of narrow arch-backed bladelets or double truncated and backed bladelets from the assemblage, as they have been documented at 'Uwaynid 14 upper phase and Wādī Jīlāt middle phase (Byrd 1988; Garrard and Byrd 1992; Garrard *et al.* 1988, 1994a). Generally, the microlithic assemblage from A/B appears to be more similar to layer B described from Kharrana IV (Muheisen 1988a, 1988b), where obliquely truncated and backed bladelets are more common and La Mouillah points are absent. Based on the predominant microlith forms and the relative absence of microburins from the present assemblage similarities can also be noted with Wadi al-Hamma 26 (Edwards 1987, 1989, 1988) and Ein Gev (Bar-Yosef 1970; Byrd 1994). The assemblage analysed to date also appears to differ from either the Qalkhan or Madamaghan assemblages identified by Henry (Henry 1988, 1990, 1995) and the Falitian or Nebekian levels from Jabrud (Rust 1950). On a number of obliquely truncated and backed bladelets the truncation is located proximal with reference to blank orientation. A similar idiosyncratic tendency has been noted by Rosen (Rosen 2000) with regards to late Epipalaeolithic application of the microburin technique in the Negev, but requires further investigation at 'Ayn Qaṣiyya.

Other types of non-geometric and geometric microliths occur in overall low proportions in the present assemblage. These include a few arch-backed bladelets, retouched bladelets, curved-pointed bladelets, pointed and backed bl-



9. The 5 described sections from the edge of 'Ayn Qaṣiyya. Descriptions of each of the sedimentary units (Roman numerals in figure) can be found in the text.

adelets, and isolated occurrences of lunates, parallelograms, and an isosceles triangle. Among the larger lithic component scrapers, retouched blades and retouched flakes dominate. Scrapers were commonly made on broad blades and more rarely bladelets or flakes. Few carinated types are present. The complete scrapers on blades/bladelets commonly have flat, cortical platforms usually associated with lips and rarely pronounced bulbs of percussion. This indicates the use of soft-hammer percussion to produce these tools. No backed blades are present in the assemblage and the retouch on blades is dominated by partial and fine retouch, while some blades exhibit traces of utilisation. The rariety of burins is also notable. Given the predominance of microliths, scrapers and various retouched elements in the 'Ayn Qaṣiyya assemblage from Areas A and B, and the relative absence of burins or perforators, it appears that the activities associated with these tools generally reflect food procurement and initial food processing, as well as perhaps some tool maintenance. The low numbers of burins and absence of awls/drills indicates that non-residential activities played a more significant role at the site, which in turn suggests that the site may have been occupied for brief episodes. Thus, the retouched tool assemblage appears to suggest a fairly short-term occupation or series of repeated occupations orientated around food procurement and processing, as well as minor tool maintenance.

As indicated earlier, the chipped stone assemblage from Area C represents a chronologically diverse collection, since both early and late Epipalaeolithic, as well as Neolithic diagnostic artefacts occur together. This poses significant problems with regards to identifying specific patterns of occupation, as well as teasing apart technological tendencies in stone tool production. Early Epipalaeolithic chipped stone artefacts are represented by fine, double-truncated and backed pieces, comparable to materials from Wadi al-Jilat 6 lower phase, 'Uwaynid 14 middle and 'Uwaynid 18 upper phase (Byrd 1988). So-called 'robust' La Mouillah points and Qalkhan points also occur, which more closely resemble the assemblages from Wadi Jilat 6 middle phase and 'Uwaynid 14 upper phase. However, they appear to differ from the assemblage recovered from al-Kharrana IV phase B documented by Muheisen (1988a, 1988b). The Area C assemblage also contains a significant number of lunates. These are largely abruptly

backed and short, which suggests a likely late Natufian affinity. Only one Helwan lunate was recovered. In addition, 21 Neolithic projectile points have been recovered from Area C (**Fig. 10**). The types represented are el-Khiam, Byblos (**Fig. 11**), Helwan and Jericho points. This appears to reflect a broad chronological spread across the early, middle and late PPNB, as indicated by others sites in al-Azraq Basin (Jilat 7, Jilat 26, Jilat 32 and al-Azraq 31). Other diagnostic elements are few in the Area C assemblage, although a number of naviform blades were documented. Various drills and perforators also exhibit typically Neolithic retouch with long, invasive pressure flaked scars. On the other hand, various types of end-scrapers made on blade and bladelets appear to relate more closely to the Epipalaeolithic. Apart from these more diagnostic elements it is difficult to securely separate other elements of the assemblage into discreet chronological horizons, be they simple retouched artefacts or unmodified debitage. Further studies of the lower deposits have yet to be undertaken and may allow a better distinction between various chronological horizons. Broadly speaking, the assemblage appears to reflect brief and task-specific visits to the site, which occurred over a long span of time. This is perhaps more true of the Epipalaeolithic materials, then of the PPNB materials, since here the presence of drills and perforators may indicate more residential activities. However, the absence of any substantial ground stone artefacts, such as handstones, pestles, mortars or grinding stones, as one might expect, appears to suggest short, rather than long-term visits.

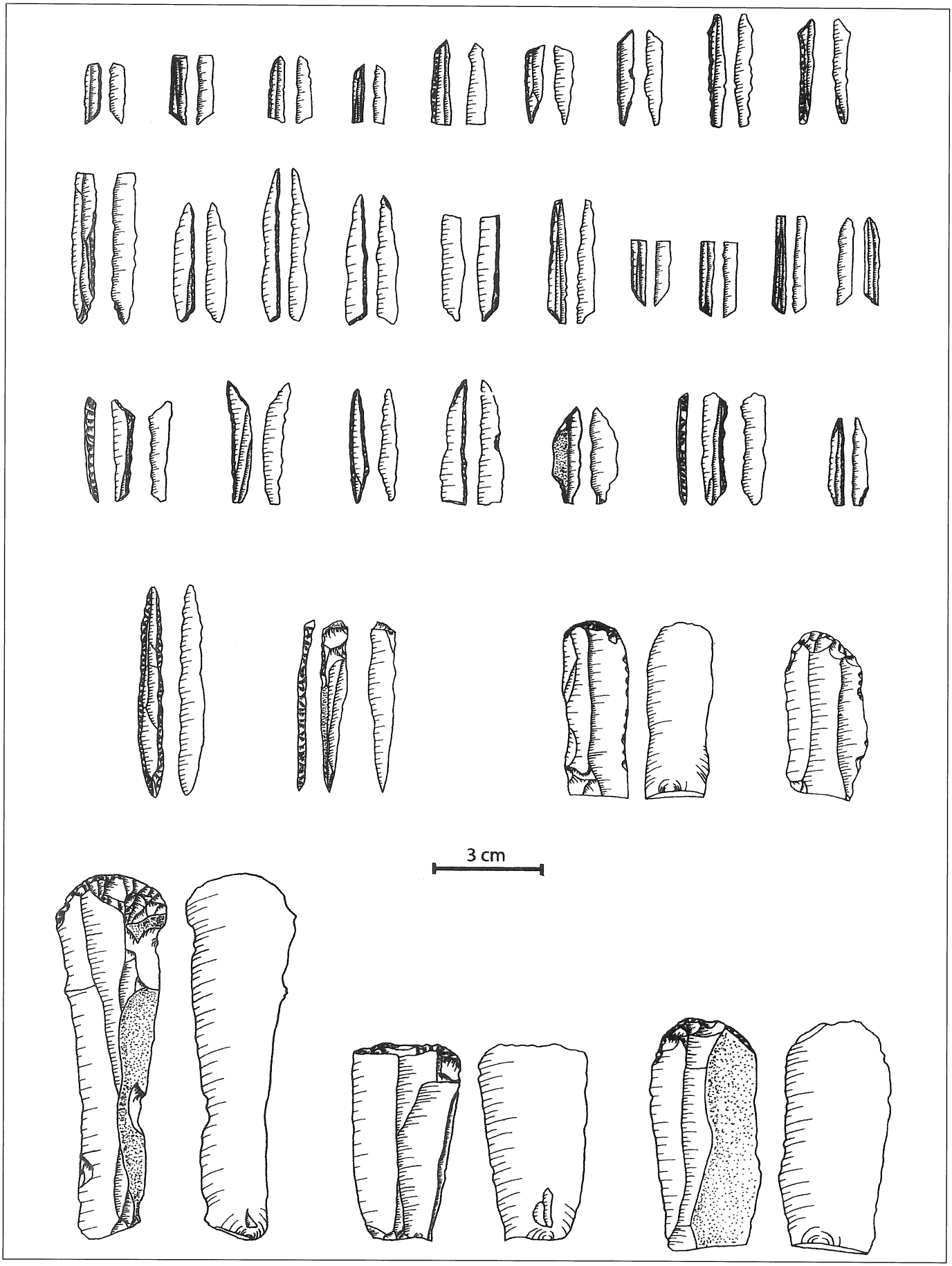
Stone Beads

Several beads were recovered from Area C (**Fig. 12**). These green beads are a common occurrence of the Pre-Pottery Neolithic B period in al-Azraq Basin and have been described in detail by Wright and Garrard (Wright and Garrard 2003). Based on their bead typology from other sites in al-Azraq Basin, the 'Ayn Qaṣiyya examples can be best described as examples of type 1a (Wright and Garrard 2003: 272). Workshops for these beads have been identified at Jilat 7 and Jilat 13, situated ca. 65km south-west of the Azraq ash-Shīshān area, while raw material sources exist 10-20km west of Wādī Jīlāt (Wright and Garrard 2003: 270). However, Rollefson (Rollefson *et al.* 1999) have also identified outcrops of similar greenstone and production debitage at late Epipalaeolithic and PPNB Bawwāb al-Ghazāl, which is situated only 2.5km east of 'Ayn Qaṣiyya. At present, it cannot be verified whether the 'Ayn Qaṣiyya stone beads are more closely related to those made at Bawwāb al-Ghazāl or to Jīlāt beads. Further work at the site should, however, indicate whether it is possible to relate them to either one or both of these workshop sites.

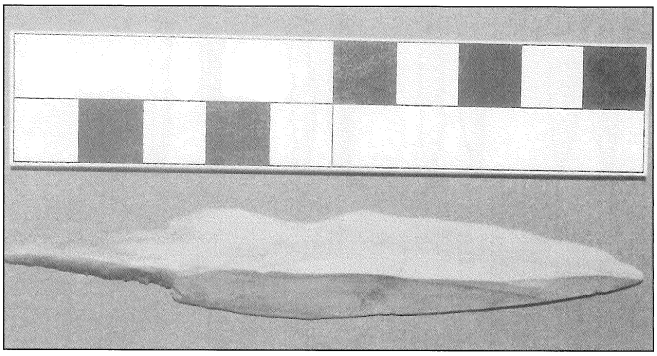
Human Remains

Semi-articulated human remains were found within the dark-brown and black marsh palaeosol of Area B and preliminarily exposed, but not fully excavated (**Fig. 13**). Although an attempt to obtain an Accelerator Mass Spectrometry radiocarbon date on a sample of skull fragments was made, poor collagen preservation in the sample suggested that a dating attempt was unlikely to produce any meaningful results (Tom Higham, Oxford Radiocarbon Accelerator Unit, by email). However, the remains are embedded within a deposit associated exclusively with diagnostic early Epipalaeolithic chipped stone artefacts and no disturbance into this deposit by a burial pit or grave cut was discernable. While dating of these remains must await their full excavation, based on its stratigraphic context we suggest an early Epipalaeolithic date.

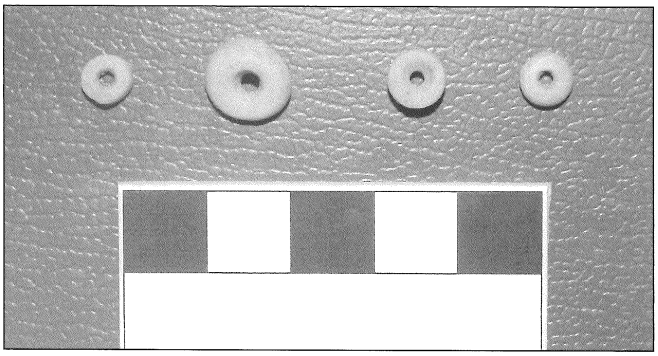
The preservation of the remains can be described as exceptionally good, although lateral displacement associated with the genesis of the dark-brown marsh palaeosol appears to have affected the position of the bones. The preliminary exposure of the remains revealed the presence of the cranium, upper and lower mandible, several ribs, one clavicle, scapula, possibly an ulna or radius, as well as a femur, tibia and fibula. The remains probably represent a fairly complete adult human skeleton, although only further excavations can clarify this. The position of the bones indicates that erosion has affected their position. Some of the lower long bones are positioned above or beside the cranium and upper body, but some post-cranial bones still appear to be in close association to one another (ribs situated right below the cranium and lower mandible, ulna/radius positioned across the rips,



10. Early Epipalaeolithic microliths and scrapers from Area A and B.



11. Byblos point from Area C.



12. Neolithic Dabba marble greenstone beads from Area C.

13. Human remains in Area B.

whereas femur, tibia and fibula were positioned together). This may suggest that the body was perhaps only semi-decomposed at the time of lateral movement, with tendons still keeping parts of the body together. If the burial environment was a marsh, this process could have taken place potentially long after the initial deposition of the body. The scarcity of Upper Palaeolithic and early Epipalaeolithic burials from Southwest Asia is well-documented. Nadel (1994, 1995) suggested that this lack may reflect the practice of particular burial customs leading to the obliteration of burials in the earlier Epipalaeolithic record. Many Upper Palaeolithic and early Epipalaeolithic human remains appear to have been placed in shallow graves (the recently excavated Ohalo II burial of an adult male being only one example). If this tendency was also true in the case of 'Ayn Qaṣiyya, the lateral displacement of the body here may be partially explained by the burial in a similarly shallow pit (now truncated?). Alternatively, it is also possible that the limited excavations do not yield the entire story to date and that the differences in the positions of the bones may reflect the presence of more than one individual. Only further excavation in the forthcoming field season will be able to address this issue.

Regardless, the human remains from 'Ayn Qaṣiyya hold a high potential for informing and enhancing our current understanding of early Epipalaeolithic burial customs, population dynamics, health and diet in the region. The dataset of human remains from this time frame in Jordan is sparse to say the least. Only two early Epipalaeolithic human burials were found in Muheisen's excavation at al-Kharrana IV (Muheisen 1988a, 1988b; Rolston 1982), of which only one was fully excavated. The record is not any better in other areas with a minimum number of 22 individuals from 12 sites dating to the Upper Palaeolithic and early Epipalaeolithic (Nadel 1994, 1995), including 'Ksar Akil, Nahal Ain Gev I, Ein Gev I, al-Kharrana IV and Ohalo II.

Summary and Discussion

The 2006 excavations at 'Ayn Qaṣiyya documented early Epipalaeolithic, late Epipalaeolithic and Neolithic occupations. Based on the study of the archaeological deposits, the geological setting of the site and the available data from the chipped stone artefacts, it appears that 'Ayn Qaṣiyya was visited repeatedly for short

episodes throughout the early and late Epipalaeolithic, as well as the PPNB and PN. These visits appear largely to relate to hunting and other food procurement activities. The absence of significant numbers of burins and drills/awls from the Epipalaeolithic sediments in Areas A and B, the lack of sickle blades or ground stone equipment from the mixed Epipalaeolithic-Neolithic layers in Area C, the lack of any installations or architecture, as well as the available technological data of the chipped stone industries from all trenches suggest a task-specific campsite. If the early Epipalaeolithic La Mouillah-dominated component from Area C is not contemporary with the material recovered from Areas A and B, a shift in activity locales is plausible. At present, it cannot be ascertained whether the presence of these distinct collections represents the visit of different groups to the same place at the same time or reflects diachronic differences. It is possible that the area near Areas A and B was inaccessible and hence largely unused during earlier and later periods, as it may have represented a partially submerged marshland at the time. This shift in the use of these localities may relate to changing lake levels and the corresponding shifting of the marshland through time.

The archaeological sediments at the site suggest the excavated areas do not represent *in situ* occupation areas. The orientations of chipped stone artefacts and animal bones are not structured in section or in the excavated areas. No occupation surfaces or installations were found that would indicate primary habitation areas. At present, it is assumed that the dark-brown buried marsh soils at the site represent episodes of land stability or slow moving standing water conditions. This marshland or reedbed would very likely not have been the primary focus of prehistoric groups for settlement. Gradual lateral displacements of archaeological materials occurred by water flowing in the area. However, the presence of probable early Epipalaeolithic human remains nevertheless suggests that this area did have a degree of significance to early Epipalaeolithic groups. In Area C episodes of aeolian and fluvial activity infilled the now buried palaeochannel, which were interspersed with episodes of soil development as part of an advancing and receding marsh. It remains to be seen whether *in situ* occupation areas can still be found in the area north of 'Ayn Qaṣiyya or whether they have all been truncated and obliterated over time. Future fieldwork at the site will aim to tackle this problem.

The relationship between the occupation episodes at the site and changing environmental conditions in al-Azraq oasis throughout the final Pleistocene and early Holocene remain an important focus of future research. The geological sections documented as part of this field season indicate an interesting sequence of expanding and contracting lake levels and wetland shorelines. To correlate this sequence with the archaeological data our future research will aim to better understand the nature of occupation and use of the site. Of significance is the discovery of a buried palaeochannel below Area C. The course and age of this channel will have to be studied in greater detail in the future and indicates that the palaeolandscape of al-Azraq marshlands is as yet only partially understood, since this channel may suggest a somewhat different drainage pattern than at present. Reconstructing the 3-dimensional structure of these deposits will allow us to develop a more detailed picture of change in both time and space. It is also hoped that further palaeoenvironmental data can be gained from the pollen and sedimentary analyses at 'Ayn Qaṣiyya.

Interesting patterns regarding the correlation of 'Ayn Qaṣiyya with the regional settlement sequence have also begun to emerge, largely based on the chipped stone industry. The 'Ayn Qaṣiyya early Epipalaeolithic industry from Areas A and B appear more closely related to al-Kharrana IV phase B, but have no clear parallels at Wadi Jilat 6 or 'Uwaynid 14/18. The early Epipalaeolithic assemblages from Areas A, B and C also appear to post-date the industry from al-Azraq 17 (Byrd 1988; Byrd and Garrard 1989; Garrard and Byrd 1992; Garrard 1998; Garrard *et al.* 1988, 1994a). Tentatively, the early Epipalaeolithic assemblage studied to date suggests closer affinity to the early Epipalaeolithic industries from Wadi al-Hamma 26 (Edwards 1987, 1989) and Ein Gev I (Bar-Yosef 1970), rather than with the early Epipalaeolithic assemblages from southern Jordan (Henry 1988, 1994) or Syria (Rust 1950). The late Epipalaeolithic materials from Area C appear to indicate a late Natufian occupation, which may be closely related to both

al-Azraq 18 (Byrd 1988; Garrard 1991; Garrard and Byrd 1992; Garrard *et al.* 1988, 1994a) and Bawwāb al-Ghazāl (Rollefson *et al.* 1999). The Neolithic chipped stone indicates early to middle PPNB and PN short-term occupations at the site, which reflect the highly adaptive early Neolithic use of the Azraq landscape (Garrard *et al.* 1994b). The predominance of projectile points, the lack of cores and the absence of material culture other than chipped stone and stone beads, also suggest short term seasonal visits to the area, probably for the purpose of hunting, spanning hundreds of years. As far as the early Epipalaeolithic is concerned, it is interesting to note the emerging differences in settlement pattern between the oasis and the wadi tributaries. Massive open-air sites have been documented in the Wādī Jīlāt (Byrd 1989; Garrard 1998; Garrard *et al.* 1988, 1994a; Garrard and Byrd 1992) and in the Wādī al-Kharrāna (Muheisen 1988a, 1988b). Although the oasis would have provided ample opportunities for groups to procure a rich array of game and variable plant species, as well as water and other resources, no massive, large sites have thus far been found in the oasis. The settlement pattern reflects instead a highly flexible, shifting use of the landscape, with short-term, ephemeral occupations predominating at 'Ayn Qaṣiyya and al-Azraq 17. The significance of this difference is not clear to date and will be the focus of our ongoing research in the region.

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Bibliography

Bar-Yosef, O.
1970 The Epipalaeolithic Culture of Palestine, Unpublished PhD Thesis. Jerusalem: Hebrew University.

Betts, A.V.G.
1988 The Black Desert Survey. Prehistoric Sites and Subsistence Strategies in Eastern Jordan. Pp. 369-391 in A.N. Garrard and H.G. Gebel (eds.), *The prehistory of Jordan. The state of research in 1986*. Oxford: British Archaeological Reports International Series 396.
1991 The late Epipalaeolithic in the Black Desert, Eastern Jordan. Pp. 217-234 in O. Bar-Yosef and F.R. Valla, (eds.), *The Natufian Culture in the Levant*. Ann Arbor: International Monographs in Prehistory
1998 *The Harra and the Hamad. Excavations and Surveys in Eastern Jordan*. Volume 1, Sheffield: Sheffield Academic Press.

Byrd, B.
1988 Late Pleistocene Settlement Diversity in the Azraq Basin. *Paléorient* 14(2): 257-64.
1994 Late Quarternary hunter-gatherer complexes in the Levant between 20,000 and 10,000 B.P. Pp. 205-226 in O. Bar-Yosef and R.S. Kra (eds.), *Late Quaternary chronology and paleoclimates of the eastern Mediterranean*. Ann Arbor: Radiocarbon.

Byrd, B.F. and Garrard, A.N.
1989 The Last Glacial Maximum in the Jordanian Desert. Pp. 78-96 in O. Soffer and C. Gamble (eds.), *The world at 18,000 BP*. Unwin Hyman.

Edwards, P.C.
1987 Late Pleistocene Occupation in Wadi al-Hammah, Jordan Valley. Unpublished PhD Thesis, Sydney: University of Sydney.
1989 Kebaran occupation at the Last Glacial Maximum in Wadi al-Hammeh, Jordan Valley. Pp. 97-118 in O. Soffer and C. Gamble (eds.), *The world at 18,000 BP*. Unwin Hyman.

Edwards, P.C., Bourke, S.J., Colledge, S.M., Head, J. and Macumber, P.G.
1988 Late Pleistocene prehistory in the Wadi al-Hammeh, Jordan. Pp. 525-565 in A.N. Garrard and H.G. Gebel (eds.), *The prehistory of Jordan. The state of research in 1986*. Oxford: British Archaeological Report, Int. Series 396.

Field, H.
1960 *North Arabian Desert Archaeological Survey, 1925-1950*. Papers of the Peabody Museum, Harvard, Cambridge, Massachusetts, 45(2).

Garrard, A.N.
1984 Research Report: Azraq Survey 1982. *Levant* 16.
1991 Natufian settlement in the Azraq Basin, Eastern Jordan. Pp 235-44 in O. Bar-Yosef (ed.), *The Natufian culture in the Levant*.
1998 Environment and cultural adaptations in the Azraq Basin: 24,000 - 7,000 B.P. Pp. 139-148 in D.O. Henry (ed.), *The Prehistory of Jordan*. Oxford: British Archaeological Reports International Series 705.

Garrard, A.N., Betts, A., Byrd, B.F., Colledge, S. and Hunt, C.
1988 Summary of the palaeoenvironmental and prehistoric investigations in the Azraq Basin. Pp. 311-337 in A.N. Garrard and H.G. Gebel (eds.), *The Prehistory of Jordan. The State of Research in 1986*. Oxford: British Archaeological Reports, International Series 396.

Garrard, A.N., Betts, A., Byrd, B. and Hunt, C.
1987 Prehistoric Environment and Settlement in the Azraq Basin: an interim report on the 1985 Excavation Season. *Levant* 19: 5-25.

Garrard, A.N., Baird, D. and Byrd, B.F.
1994a The chronological basis and significance of the late Palaeolithic and Neolithic Sequence in the Azraq Basin, Jordan. Pp. 177-199 in O. Bar-Yosef and R.S. Kra (eds.), *Late Quaternary chronology and paleoclimates of the eastern Mediterranean*. Ann Arbor: Radiocarbon.

Garrard, A.N., Baird, D., Colledge, S., Martin, L. and Wright. K.
1994b Prehistoric Environment and Settlement in the Azraq Basin: an Interim Report on the 1987 and 1988 Excavation Season. *Levant* 26: 73-109.

Garrard, A.N., Harvey, P. and Hivernel, F.
1985 Prehistoric Environment and Settlement in the Azraq Basin. A report on the 1982 Survey Season. *Levant* 17: 1-28.

Garrard, A.N., Colledge, S. and Martin, L.
1996 The Emergence of Crop Cultivation and Caprine Herding in the 'Marginal Zone' of the Southern Levant. Pp. 204-226 in D. Harris (ed.), *The origins and spread of agriculture and pastoralism*

in Eurasia. London: University College London Press

Garrard, A.N. and Byrd, B.F.
1992 New Dimensions to the Epipalaeolithic of the Wadi el-Jilat in central Jordan. *Paléorient* 18(1): 47-62.

Henry, D.O.
1988 The Epipalaeolithic Sequence Within the Ras en-Naqb - el Quweira Area, Southern Jordan. *Paléorient* 14(2): 245-56.
1990 The Epipalaeolithic Sequence Within the Ras en Naqb-Quweira Area, Southern Jordan. Pp. 245-256 in O. Aurenche, M.C. Cauvin and P. Sanlaville (eds.), *Prehistoire du Levant: Processus des Changements Culturels*. Paris: CNRS.
1994 Prehistoric Cultural Ecology in southern Jordan. *Science* 265: 336-41.
1995 *Prehistoric cultural ecology and evolution. Insights from southern Jordan*. New York: Plenum Press.

Macumber, P.G.
2001 Evolving landscape and environment in Jordan. Pp. 1-30 in B. MacDonald, R. Adams and P. Bienkowski (eds.), *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press.

Muheisen, M.
1988a The Epipalaeolithic Phases of Kharaneh IV. Pp. 353-367 in A.N. Garrard and H.G. Gebel (eds.), *The Prehistory of Jordan. The State of Research in 1986*. Oxford: British Archaeological Reports, International Series 396.
1988b Le gisement de Kharaneh IV, note sommaire sur la phase D. *Paléorient* 14(2): 265-82.

Nadel, D.
1994 Levantine Upper Palaeolithic - Early Epipalaeolithic Burial customs: Ohalo II as a case study. *Paléorient* 20(1): 113-21.
1995 The visibility of prehistoric burials in the southern Levant. How rare are the upper Palaeolithic/early Epipalaeolithic graves? Pp. 1-8 in A. Campbell and A. Green (eds.), *The Archaeology of Death in the Ancient Near East*. Oxford: Oxbow.

Nelson, J.B.
1973 *Azraq: Desert Oasis*. London: Allen Lane the Penguin Press.

Olszewski, D.I.
2004 The Conundrum of the Levantine late Upper Palaeolithic and Early Epipalaeolithic: Perspectives from the Wadi al-Hasa, Jordan. Pp. 151-170 in A. Belfer-Cohen and A.N. Goring-Morris (eds.), *More than meets the eye: studies on upper Palaeolithic diversity in the Near East*. Oxford: Oxbow Books.

Richter, T. and Röhl, C.
2006 Rescue Excavations at Epipalaeolithic 'Ayn Qasiyah: Report on the 2005 season. *ADAJ* 50: 189-204.

Rollefson, G., Quintero, L. and Wilke, P.
2001 Azraq Wetlands Survey 2000. Preliminary Report. *ADAJ* 45: 71-82.
1999 Bawwab al-Ghazal: Preliminary Report on the Testing Season 1998. *Neo-Lithics* 1: 2-4.

Rollefson, G.O.
1983 Two seasons of excavation at Ain el-Assad, eastern Jordan, 1980-1981. *BASOR* 252: 25-34.

Rollefson, G.O., Schnurrenberger, D., Quintero, L., Watson, R.P. and Low, R.
1997 Ain Soda and 'Ayn Qasiya: New late Pleistocene and early Holocene sites in the Azraq Shishan area, eastern Jordan. Pp. 45-58 in H.G. Gebel, Z. Kafafi and G.O. Rollefson (eds.), *The prehistory of Jordan II. Perspectives from 1997*. Berlin: ex oriente.

Rolston, S.L.
1982. Two prehistoric burials from Qasr Kharaneh. *ADAJ* 26: 221-229.

Rosen, S.A.
2000. Dissecting the site: assays in decoding artifact distribution in a terminal Pleistocene campsite in the Negev. *Lithic Technology* 25(1): 7-29.

Rust, A.
1950 *Die Höhlenfunde von Jabrud*. Neumünster: Karl Wacholtz Verlag.

Waechter, J., Seton-Williams, V., Bate, D.M. and Picard, L.
1938 The excavations at Wadi Dhobai 1937-1938 and the Dhobaian industry. *Journal of the Palestine Oriental Society* 18: 172-86, 292-8.

Wright, K. and Garrard, A.N.
2003 Social Identities and the expansion of stone bead-making in Neolithic western Asia: new evidence from Jordan. *Antiquity* 77: 267-84.

Zeuner, F., Kirkbride, D. and Park, B.
1957 Stone Age exploitation in Jordan 1. *PEQ* 89: 17-44.