THE PALAEOLITHIC SEQUENCE OF WĀDĪ ṢABRĀ: A PRELIMINARY REPORT

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Introduction: History of Research

In 1983, several Upper and Epipalaeolithic sites were recorded during a Neolithic survey in Wādī Ṣabrā (Gebel 1984, 1988; Schyle and Uerpmann 1988).

During the establishment of the 'Our Way to Europe' Collaborative Research Centre (www.SFB806.de) in 2007, which aims to investigate the possible migration routes of modern man from Africa to Europe and the palaeoenvironmental conditions of this migration, these Palaeolithic sites were suggested for further investigation. The sites represent ideal locations for such research, as the finds occur embedded in thick *wadi* deposits, in close association with terrestrial palaeoclimate archives of specific local relevance.

Field seasons were spent in Wādī Ṣabrā in summer / autumn 2009, autumn 2010 and autumn 2011 by a joint team from the Universities of Aachen (geosciences) and Cologne (prehistory). Preliminary geoscientific results have been published by Bertrams *et al*. (2012).

The Archaeological Sites

The sites recorded so far belong to the time span between the Lower Palaeolithic and Neolithic. The focus of fieldwork was Wādī Ṣabrā, which is divided by a dry 'waterfall' into a lower part around al-Anṣab and an upper part immediately south of the spring of Ṣabrā. An additional site was tested near the village of aṭ-Ṭaybah (**Fig. 1**).

Lower Wādī Ṣabrā

adh-Dhāhir

The oldest finds discovered so far in Wādī Ṣabrā were found in 2010 on an old limestone surface close to the edge of the lower Wādī Ṣabrā, about 500m south of al-Anṣab.

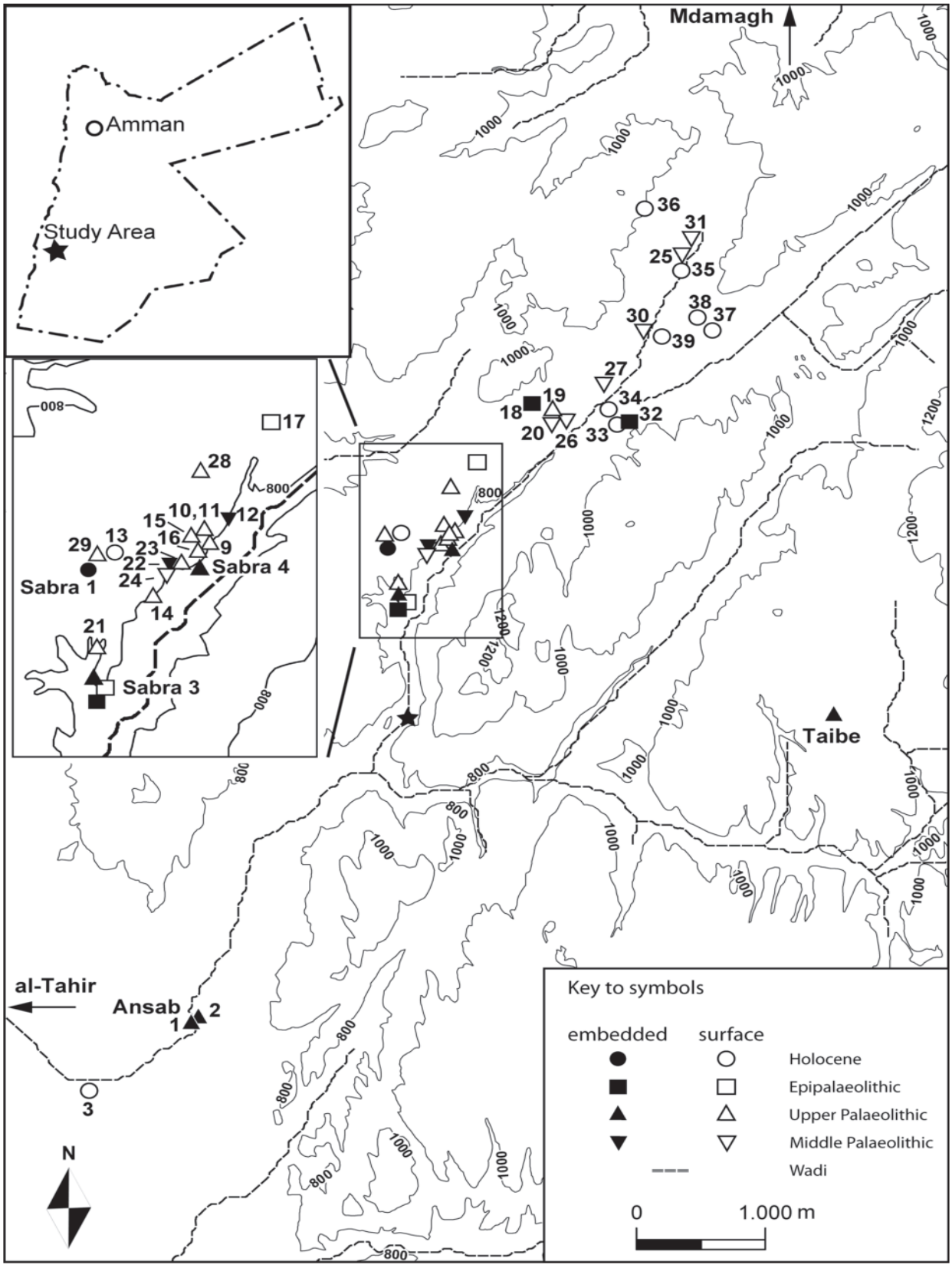
The site is located along a track leading out of the *wadi* to the east, finally ending at the road from Rājil to Wādī 'Arabah. On the north side of the track, large chunks of flint are scattered over an area of roughly 200x500m (**Fig. 2**). Several handaxe preforms were discovered amongst these chunks. Subsequent survey of the site yielded a mixed assemblage of handaxe preforms and Levallois points and cores, as well as some substantial blades with large, plain platforms. Characteristic artefacts were collected and their co-ordinates recorded by GPS. Clearly, this natural flint occurrence was exploited from the Lower Palaeolithic onwards, perhaps even until Chalcolithic times.

Site of al-Anṣab

al-Anṣab 2

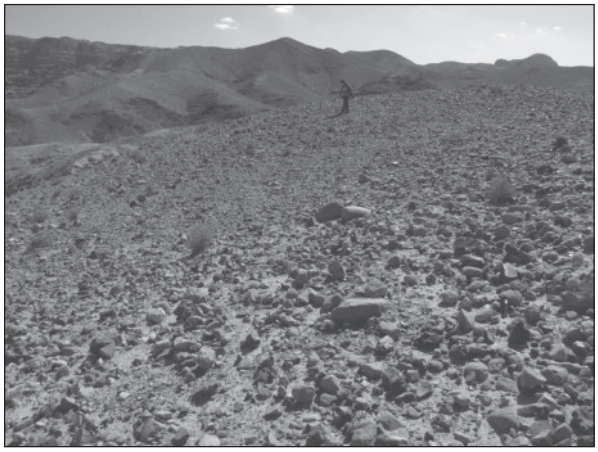
Discovered in 1983 (Schyle and Uerpmann 1988), the site is located close to tilted limestone formations which include numerous flint seams and block the outlet of Wādī al-Anṣab, an eastern tributary of Wādī Ṣabrā, some 1,000m upstream from adh-Dhāhir (**Fig. 3**). Thick deposits in the tributary *wadi* are held back by the limestone ridge and have thus been protected from erosion.

The fieldwork in 2009 was dedicated to the previously known Early Ahmarian occurrence at al-Anṣab 1. Although we spent almost three weeks at the site, carrying out 3D mapping (**Fig. 4**), local surveys, the excavation of several geoscientific and two archaeological sections, this work did not result in the discovery of any finds other than the previously known Early Upper Palaeolithic material.



1. Distribution of sites in Wādī Ṣabrā; star indicates location of 'waterfall'.

As a result, in 2010 we decided to limit our work at al-Anṣab to small-scale geoscientific sampling. However, in spring 2010, unusually heavy rains exposed additional find spots close to our 2009 excavation area. Unfortunately, these were only discovered towards the very end of the 2010 field season and only one day was available in which to assess the surface scatters. Two of them turned out to be superficial. However, at the third, densely packed artefacts were found outcropping from a steep slope of *wadi* deposits. A sounding revealed a small secondary deposit of well-preserved artefacts without organic remains. This occurrence was designated al-Anṣab 2.



2. adh-Dhāhir from the west; note large chunks of flint in foreground to right.

At first sight, the artefacts reveal a very similar technology to that of the Initial Upper Palaeolithic assemblage excavated from layer B of Ṭawr Ṣadaf in Wādī al-Ḥasā (Fox 2003), *viz*. laminar, convergent blanks with large plain platforms occurring together with predominantly flat single or opposed platform cores. Despite being relatively large, the recovered assemblage includes only a single tool: a burin (**Fig. 5**).

The positioning of this secondary deposit of apparently Initial Upper Palaeolithic artefacts slightly *above* the Early Upper Palaeolithic Ahmarian layer is for the moment far from being understood. It might indicate a general sloping and increased erosion of the deposits downwards to the *wadi* bottom, or perhaps two phases of sediment accumulation, separated by a major erosional event.

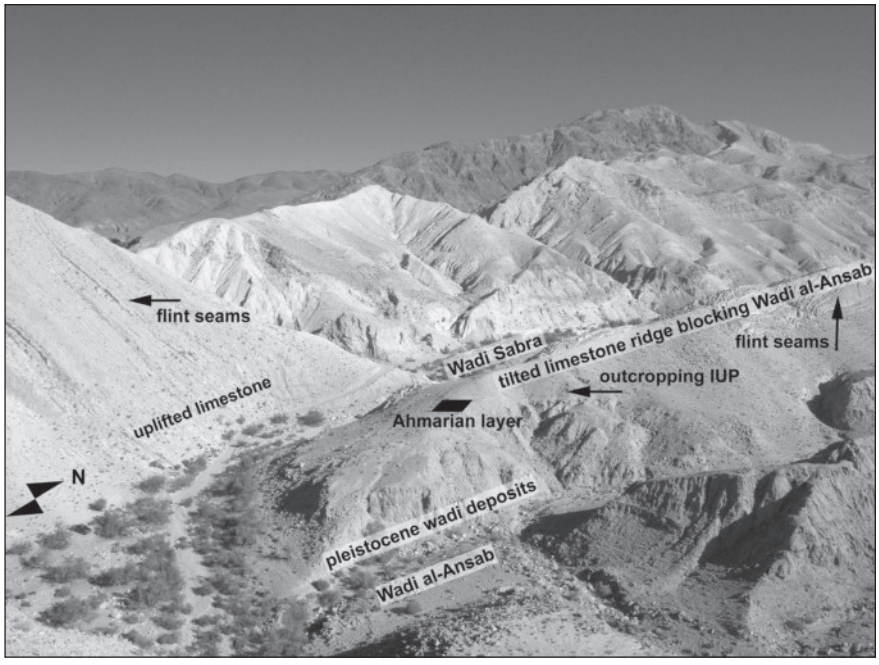
Upper Palaeolithic

al-Anṣab 1

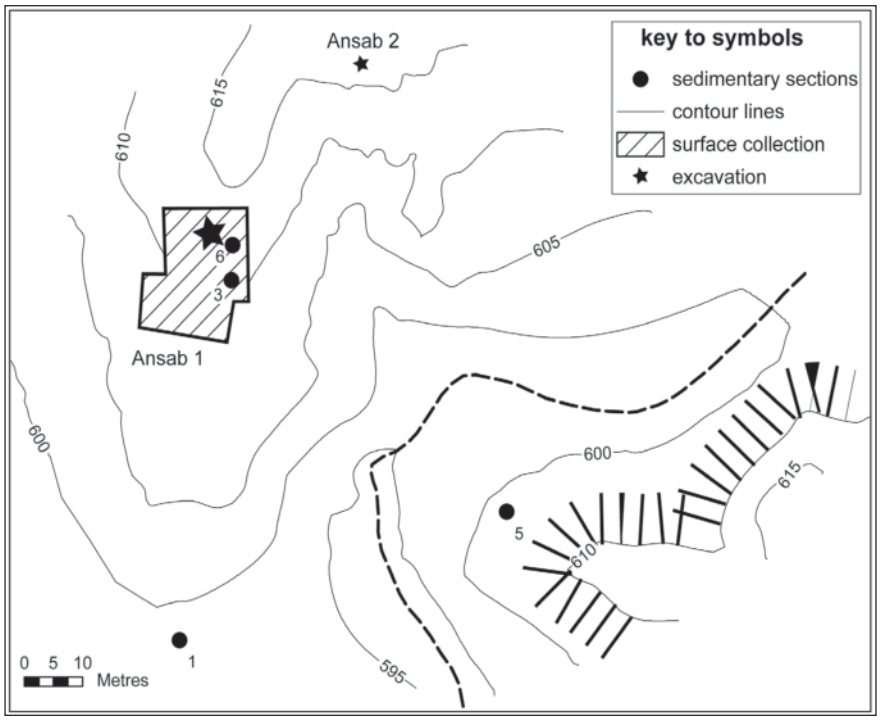
The true *in situ* record at al-Anṣab starts with the Early Upper Palaeolithic Ahmarian layer on the surface of the remnant.

In spring 2009, we noticed two natural sections with outcropping Upper Palaeolithic artefacts. In summer / autumn 2009, the site was gridded, surface collected and the two natural sections with adhering eroded artefacts – potential outcrops of *in situ* layers – were cleaned and excavated.

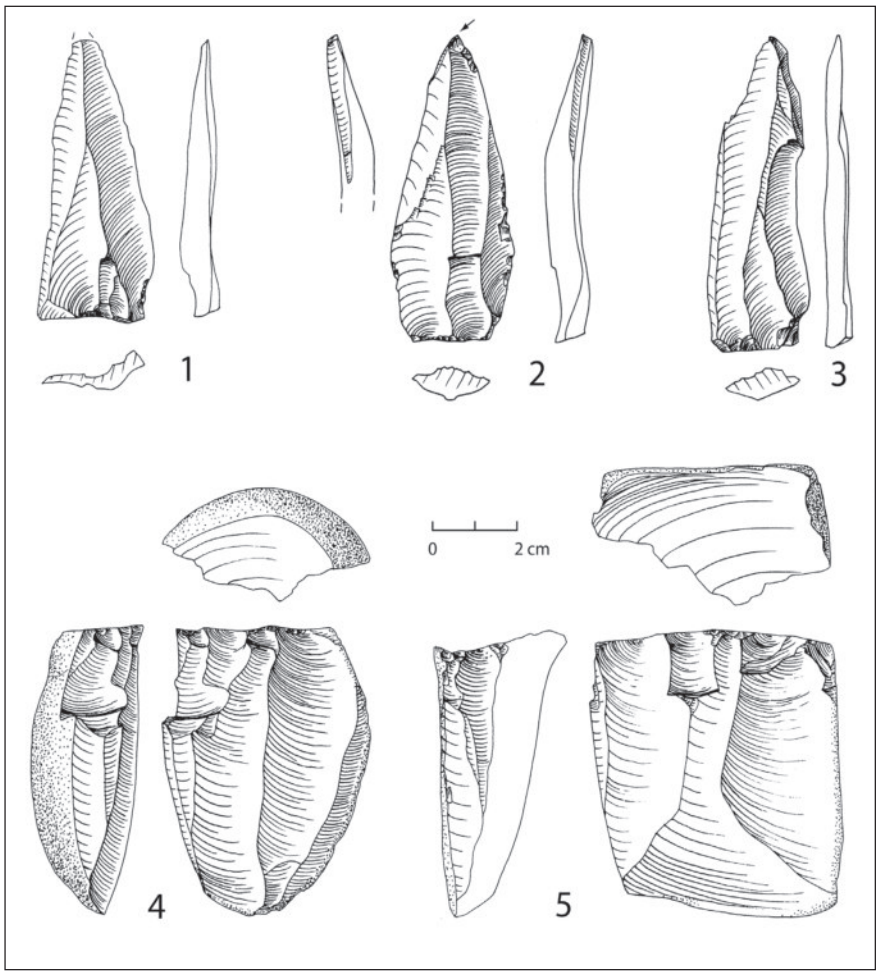
After excavation it turned out that only the



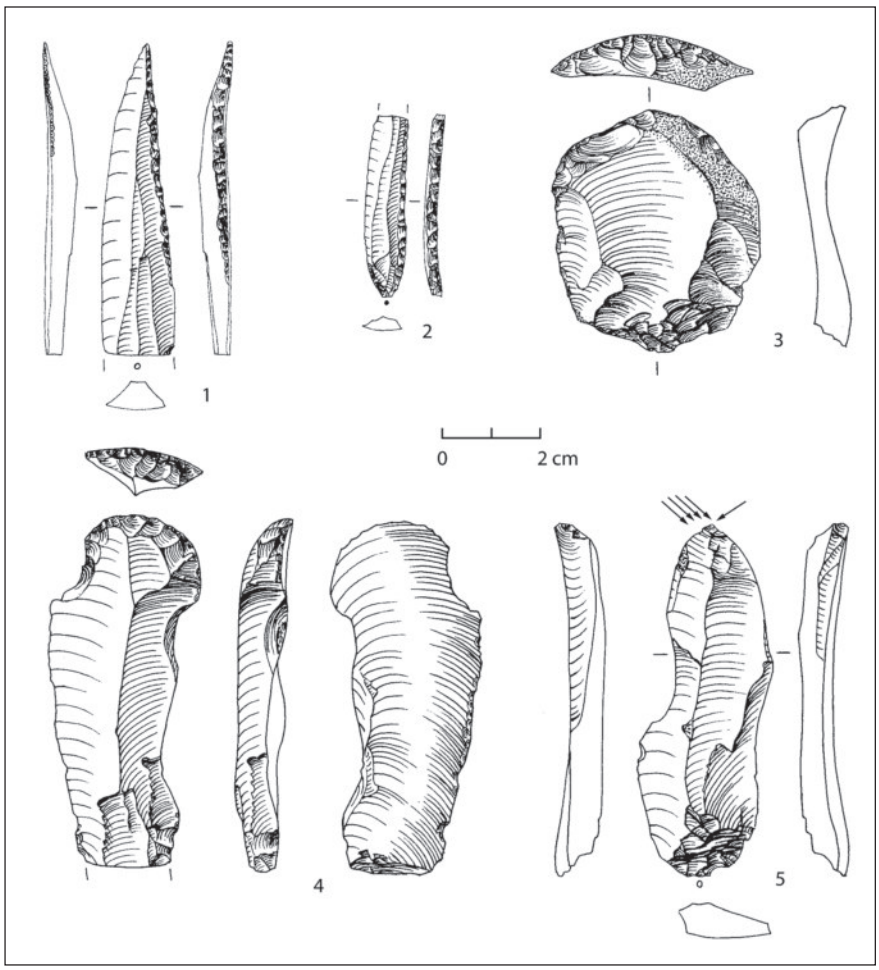
3. View of al-Anṣab to the northwest before excavation.



4. General map of the al-Anṣab site.



5. al-Anṣab 2: (1, 3) blades with large plain platforms; (2) burin on blade; (4 - 5) cores.



6. al-Anṣab 1: (1 - 2) fragments of El Wad points; (3 - 4) endscrapers; (5) burin.

upper natural section represented a true *in situ* layer, which was marked by a band of black sediments and high artefact densities. The preliminary results of the lithic analysis indicate Early Ahmarian technology and typology: a single soft hammer reduction strategy for straight, elongated, thin, curved blades and bladelets from single platform cores with an acute platform angle. Blades are much more numerous than flakes. The tool types include numerous El Wad points (**Fig. 6**), some of them with steep lateral retouch or backing (and in very variable sizes), and simple endscrapers on blades. Core trimming elements have frequently been used as blanks for the production of endscrapers and burins. Carinated pieces are present but rare.

The high proportion of cores and core trimming elements, and the low proportion of tools indicate that a main activity at this site was the knapping of flint from nearby outcrops. However, the dark grey cultural layer, complete range of tools and presence of (a very few small) bone fragments[1] represent other activities as well.

One OSL sample from above and six samples from below the cultural layer were dated to ~33 ± 6 ka (Klasen forthcoming). Specific methodological problems related to the low radionuclide contents of the sediments surrounding the samples resulting in rather imprecise dates. Being statistically of the same age, regardless of their stratigraphic position, the dates seem to indicate a rapid accumulation of the remnant's sediments. The overall date is broadly compatible with the archaeological assessment of the occupation layer.

Upper Wādī Ṣabrā

A larger number of sites are known from

1. The only taxon identified so far is gazelle (H. Berke [Institute of Prehistoric Archaeology, University of Cologne] pers. comm.).

the upper part of Wādī Ṣabrā, about two hours' walk south of the Nabataean settlement of Ṣabrā. During the 2009 field season, we identified several new Upper and Epipalaeolithic occurrences. Surface collections and small-scale excavations were carried out at Ṣabrā 4 - Palm View 1 and 3 (Upper Palaeolithic) and at Ṣabrā 3 (Late Upper and Early Epipalaeolithic). In 2010 we made the first Middle Palaeolithic finds at Ṣabra 2010 / 4, completed the excavation at Ṣabrā 4 - Palm View 3 and surveyed the Pleistocene remnants of the upper Wādī Ṣabrā from its source in the north to its constriction in front of the 'waterfall' (**Fig. 1**).

Middle Palaeolithic

In 2009, a few Middle Palaeolithic artefacts were found as more or less isolated single finds on the surface or within secondary deposits, e.g. *wadi* terraces. As a result, a main objective of the 2010 field season was to search for Middle Palaeolithic (MP) artefacts associated with sediments of the same time period. We succeeded in identifying a few locations within the upper Wādī Ṣabrā where MP artefacts were collected from the surface of *wadi* deposits, suggesting a MP or earlier date for at least some of the lowest parts of those deposits. At two locations, there is the potential for preservation of MP finds within *in situ* deposits.

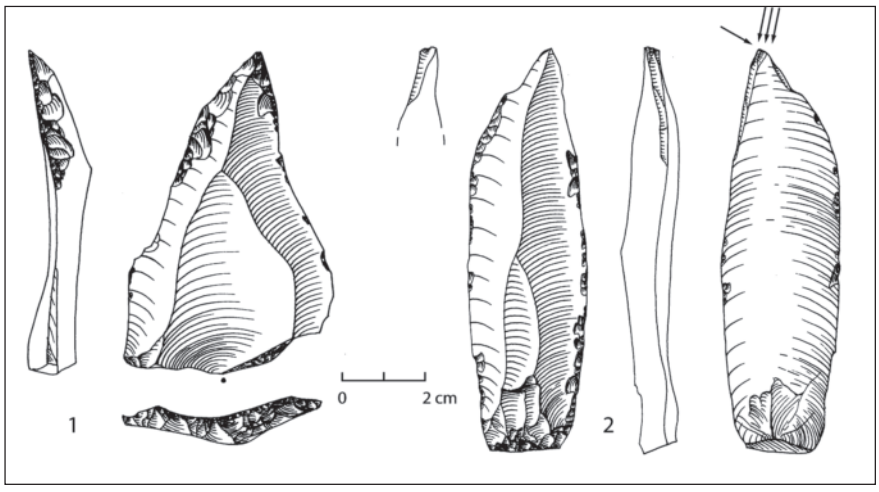
Ṣabrā 2010 / 4

This was the first discovery of fresh Middle Palaeolithic artefacts in 2010. Some were found in an erosional channel, but one artefact – a well-preserved typical Levallois point – was picked up from the top of the *wadi* sediment remnants, being the first evidence for the presence of Middle Palaeolithic deposits at the base of the sequence of Pleistocene sediments in Wādī Ṣabrā. In most parts of the adjacent erosional channel, the Middle Palaeolithic pieces were mixed with artefacts of apparently Upper Palaeolithic technology. Apart from the Levallois point (**Fig. 7.1**), they include a large Levallois blade with facetted butt in 'chapeau de gendarme' shape and a small Levallois core. There are some other blades with large, plain platforms, struck using a hard hammer technique, which may also belong to the Middle Palaeolithic component of the finds (**Fig. 7.2**). However, the presence of several blades with punctiform butts indicates an Upper Palaeolithic component amongst the finds from the erosional channel.

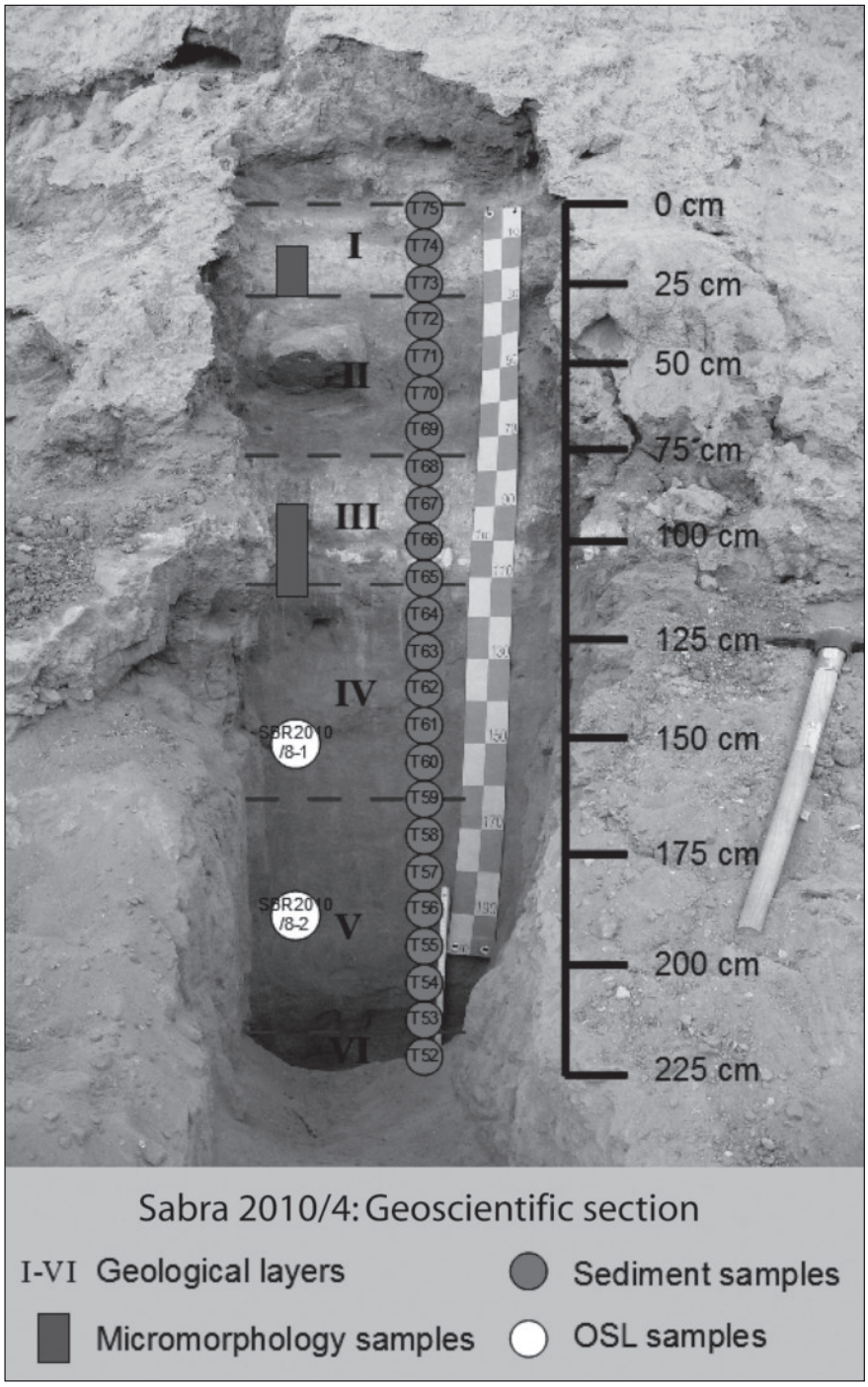
Subsequently, we cleaned the section of deposits above the location of the Levallois point. This revealed two concreted calcareous horizons, of which the upper (**Fig. 8.I**) contained two (undiagnostic) artefacts and might thus represent the layer from which the Levallois point originated. An additional geoscientific section (**Fig. 8**) was dug a few meters away from the location of the archaeological finds. The dating of two OSL samples taken from below the lower calcareous layer (III) is in progress.

Ṣabrā 2010 / 15

Another assemblage of about 20 artefacts of laminar Middle Palaeolithic technology was collected in 2010 in several erosional channels on a remnant a few hundred metres downstream from 2010 / 4. In contrast to the artefacts from al-Anṣab 2, most of the blanks (including two



7. 2010 / 4: Middle Palaeolithic artefacts collected from the surface of the Pleistocene sediments.



8. Stratigraphic section at Ṣabrā 2010 / 4; layer VI rests on bedrock.

Levallois points and a burin) have facetted butts. In spite of an intensive search, we were not able to locate an *in situ* layer from which these artefacts might have been eroded.

Upper Palaeolithic

Sabrā 4

A large, dense surface scatter of Upper Palaeolithic artefacts in a fresh state of preservation on a terrace in an intermediate position within the *wadi* deposits had already been noted in 1983 and was then designated Ṣabrā 4 (Schyle and Uerpmann 1988).

Having relocated the site in spring 2009, we searched for *in situ* deposits. During this activity we located two other separate occurrences

9. Ṣabrā 4 - PV1 as relocated in spring 2009, seen from the east. The large surface scatter of artefacts is to the left of the person. The stratigraphic section was dug later (summer 2009) towards the centre of the remnant.

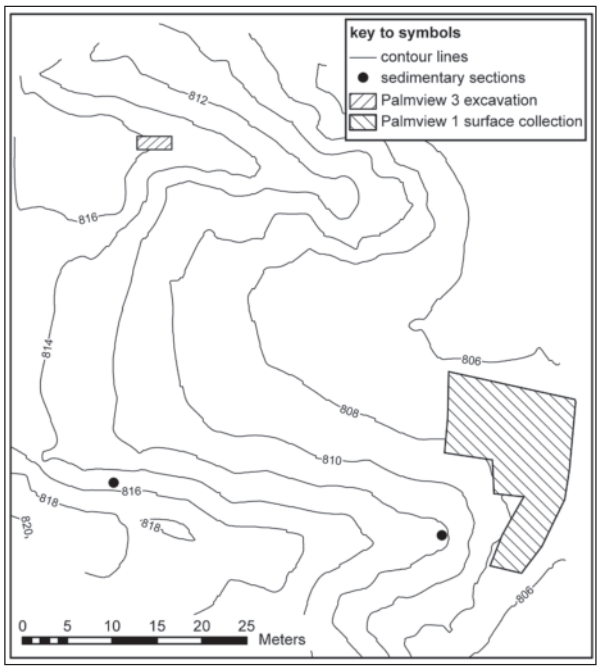
of Upper Palaeolithic artefacts eroding out of the *wadi* deposits nearby. The sites were named Ṣabrā 4 – Palm View 1-3; Palm View 1 designated the extensive surface scatter. In summer / autumn 2009 we carried out a detailed 3D recording of the site complex topography, collected about half the large surface scatter of Palm View 1 and started an excavation at Palm View 3, located on a very small remnant spur within the *wadi* deposits. This yielded a lithic assemblage from an *in situ* cultural layer, which also contained bone fragments[2]. Additionally, several geoscientific sections were dug nearby.

In 2010, the remaining parts of Palm View 3 were finally excavated, as was the location at Palm View 1 where artefacts were found eroding from the base of the stratigraphic section dug in 2009. Furthermore, the vicinity of Ṣabrā 4 was intensively resurveyed, which led to the discovery of several additional occurrences of Upper Palaeolithic artefacts.

Ṣabrā 4 - Palm View 1

This is the large surface scatter that led to the discovery of the site complex in 1983. Artefacts are spread on a terrace within the *wadi* deposits over an area of approximately 30x10m. The terrace is overlooked by a remnant with an almost vertical west-facing natural section (**Fig.9**).

In summer 2009, about half of the surface scatter was completely collected and a stratigraphic section dug into the natural section of

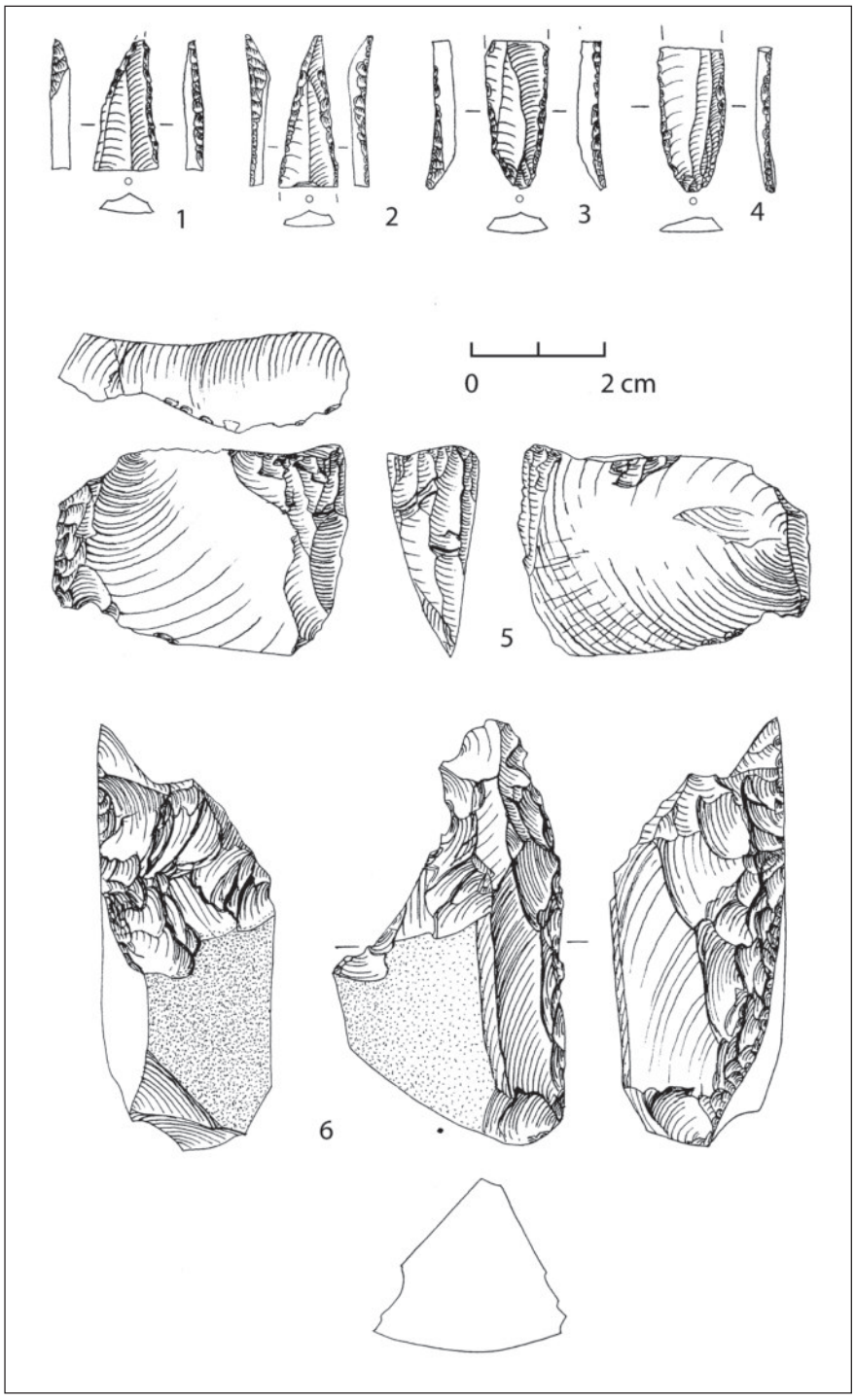


10. Contour plan of Ṣabrā 4 - PV 1 and 3, showing areas of excavation (PV 3) and surface collection (PV1), as well as stratigraphic sections.

the remnant, from its top to the top of the terrace (**Fig. 10**). During this activity, no artefact-bearing layer could be identified within the section. In 2010, the section was extended further down into the extremely cemented material of the terrace. A few artefacts and a piece of charcoal were recovered from this cemented layer, so it might be assumed that the origin of the artefact spread on the surface is within the upper part of the terrace. However, owing to the lack of bone and low density of artefacts from the section, the artefacts remaining within the sediment might not be preserved *in situ*.

The Palm View (PV) 1 assemblage (**Fig. 11**) is significantly different from the finds recovered at al-Anṣab. Amongst the debitage and tools, flakes are almost twice as numerous as blade/lets. Carinated pieces, including nosed, shouldered and carinated scrapers, as well as carinated burins (18% of tools), are much more numerous than at al-Anṣab. A particular characteristic is the occurrence of numerous 'combined' tools, which in most cases are 'recycled' pieces, e.g. a scraper transformed into a burin after exhaustion.

2. The list of taxa from Palm View 3 identified so far by H. Berke is somewhat longer than at al-Anṣab and includes an unidentified equid, gazelle, wild sheep, fallow deer and wild cattle.



11. Selected tools from PV 1: (1 - 4) El Wad point fragments; (5) burin de vachons; (6) carinated scraper.

The technology and typology of this assemblage clearly warrant further discussion within the context of the Levantine Aurignacian, even after the recent redefinition of the latter (Belfer-Cohen and Goring-Morris 2003; Goring-Morris and Belfer-Cohen 2006; Williams 2006).

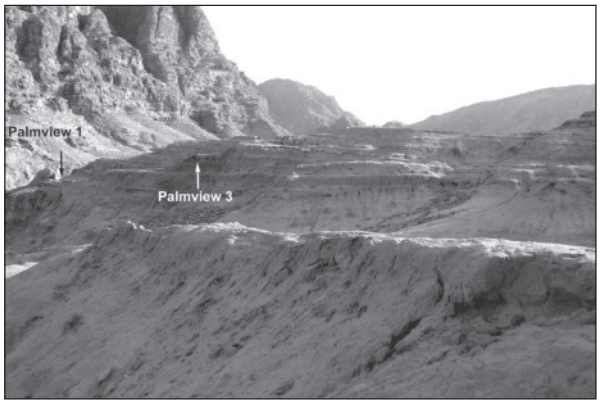
Sabrā 4 - Palm View 3

The occurrence of PV 3 was first noticed in spring 2009 as a thin band of dark sediment containing lithics, bones and charcoal, lying within a small spur of *wadi* sediments less than 5 m in length and 1m in width, which protruded out to-

wards the east. The stratigraphic position of PV 3 is above the level containing artefacts at PV 1 (**Figs. 10, 12**). The spur was completely excavated during the summer 2009 and autumn 2010 field seasons.

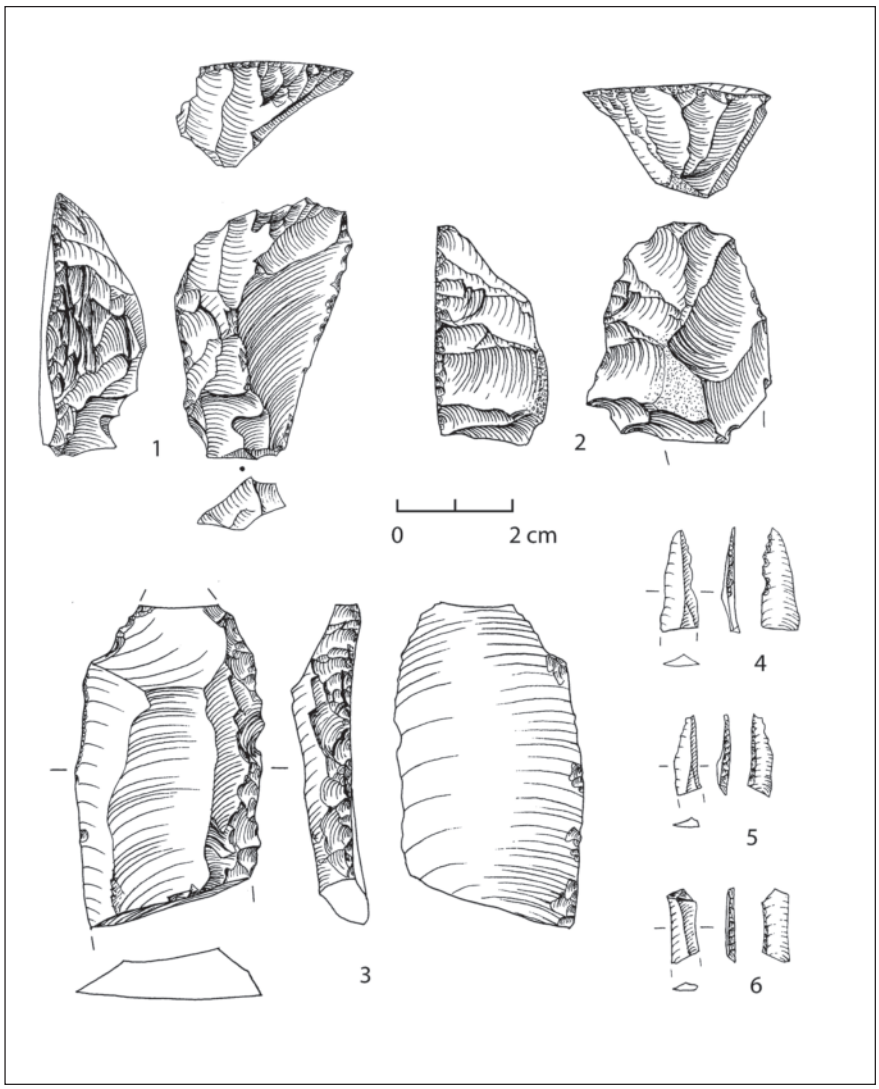
The lithic assemblage recovered is rather small (*ca.* 450 artefacts only, excluding chips) and shows similarities, as well as differences, with the assemblage from PV 1 (**Fig. 13**).

The flake/blade ratio amongst the debitage is almost identical to PV 1 but, amongst the tools, blade/lets slightly predominate at PV 3. Carinated pieces are present, but are less common at PV 3 compared to PV 1. Whereas small El Wad points are numerous at PV 1, they are completely absent at PV 3. In contrast, small comma-shaped, inversely retouched bladelets ('Dufour bladelets') are numerous at PV 3, but



12. The sites of PV 1 and PV 3 as seen from the north.

do not occur at PV 1. Their absence at PV 1 might simply be the result of their very small size, i.e. they've been washed away from the PV 1 surface; indeed, the carinated pieces suggest



13. Selected tools from PV 3: (1 - 2) carinated scrapers; (3) blade fragment with Aurignacian retouch; (4 - 6) inversely retouched bladelets.

that they should have been present before erosion. However, the absence of El Wad points at PV 3 cannot be explained by preservation issues. Finally, the high percentage of 'combined' tools at PV 1 is not repeated at PV 3.

The high flake/blade ratio and the moderate to high frequencies of carinated pieces and inversely retouched bladelets respectively associate the PV 3 assemblage with the Levantine Aurignacian. However, its 'aurignacoid' traits are not as pronounced as at PV 1. OSL and radiocarbon samples from the site are under analysis.

'Dufour bladelets' constitute an important part of the tool assemblage from the lower levels of Mdamagh rockshelter near Petra, which was excavated in 1983 (Schyle and Uerpmann 1988).

Other Upper Palaeolithic Occurrences

Upper Palaeolithic artefacts can be found on the surface at many locations, most of them around the site complex of Ṣabrā 4 (**Fig. 1**). The 2010 survey of the upper Wādī Ṣabrā located several additional Upper Palaeolithic occurrences, but without the discovery of another *in situ* site. In most cases, artefacts were found spread over the surface of Pleistocene deposits. At some locations, they were embedded within the deposits but without associated organic material and with artefacts frequently being in an upright and therefore secondary position.

The larger collections (**Fig. 1.7, 1.9, 1.14-16**) all have more or less 'aurignacoid' characteristics. They include typical carinated and nosed scrapers, carinated burins and small El Wad points, and are thus similar to the assemblage from PV 1.

The largest assemblage was collected at 2010 / 6 (**Fig. 1.14**), a site which was noted in 1983 and designated Ṣabrā 8 or 9. Many artefacts are spread within an active minor – but rather steep– erosional channel on the eastern slope of the *wadi* deposits towards the recent *wadi* bottom. The channel has isolated a huge sandstone outcrop, which originally may have provided some shelter almost in the centre of the *wadi* basin. Unfortunately, any *in situ* sediments that may originally have been adjacent to the eastern face of this rock outcrop have been removed by this channel. However, towards the recent *wadi* bottom, a narrow spur of *wadi* sediments, separated by the channel from the sandstone outcrop, is still preserved. Within this spur, two horizons of embedded artefacts could be identified. These are not associated with any organic material and the low density of finds suggests that they are not *in situ*. However, they might represent the periphery of destroyed *in situ* layers originally deposited close to the now denuded sandstone outcrop. The upper horizon seems to have been almost completely destroyed, with only a few artefacts still remaining embedded. A single Qalkhan point picked up on the surface of the sediments at this location hints at an Early Epipalaeolithic affiliation for the upper horizon.

The lower horizon displayed a higher density of artefacts, most of them spread on the surface of the remaining body of sediment, as well as some which were still in place within it. However, some of the latter were found upright, indicating secondary deposition. We systematically collected all the artefacts from the surface of the sediments around the outcrops of this lower horizon and cleaned a small section of the remnant; the finds within the erosional channel were not collected.

Analysis of the artefacts is still in progress, but the collection shows unmistakable 'aurignacoid' characteristics very similar to the assemblage from PV 1. The few single pieces picked up here in 1983 were tentatively classified as Ahmarian; this must now be rejected in light of the much more numerous recent finds.

It is worth noting that we have so far not found any unequivocal evidence for the presence of an (Early) Ahmarian site within the upper Wādī Ṣabrā. Whether this is the result of a sedimentation hiatus, or is caused by the present state of erosion – leaving Earlier Upper Palaeolithic sediments inaccessible in this area – will be clarified through investigation of the geoscientific sections cut at different locations in the upper Wādī Ṣabrā.

Late Upper and Epipalaeolithic Sites

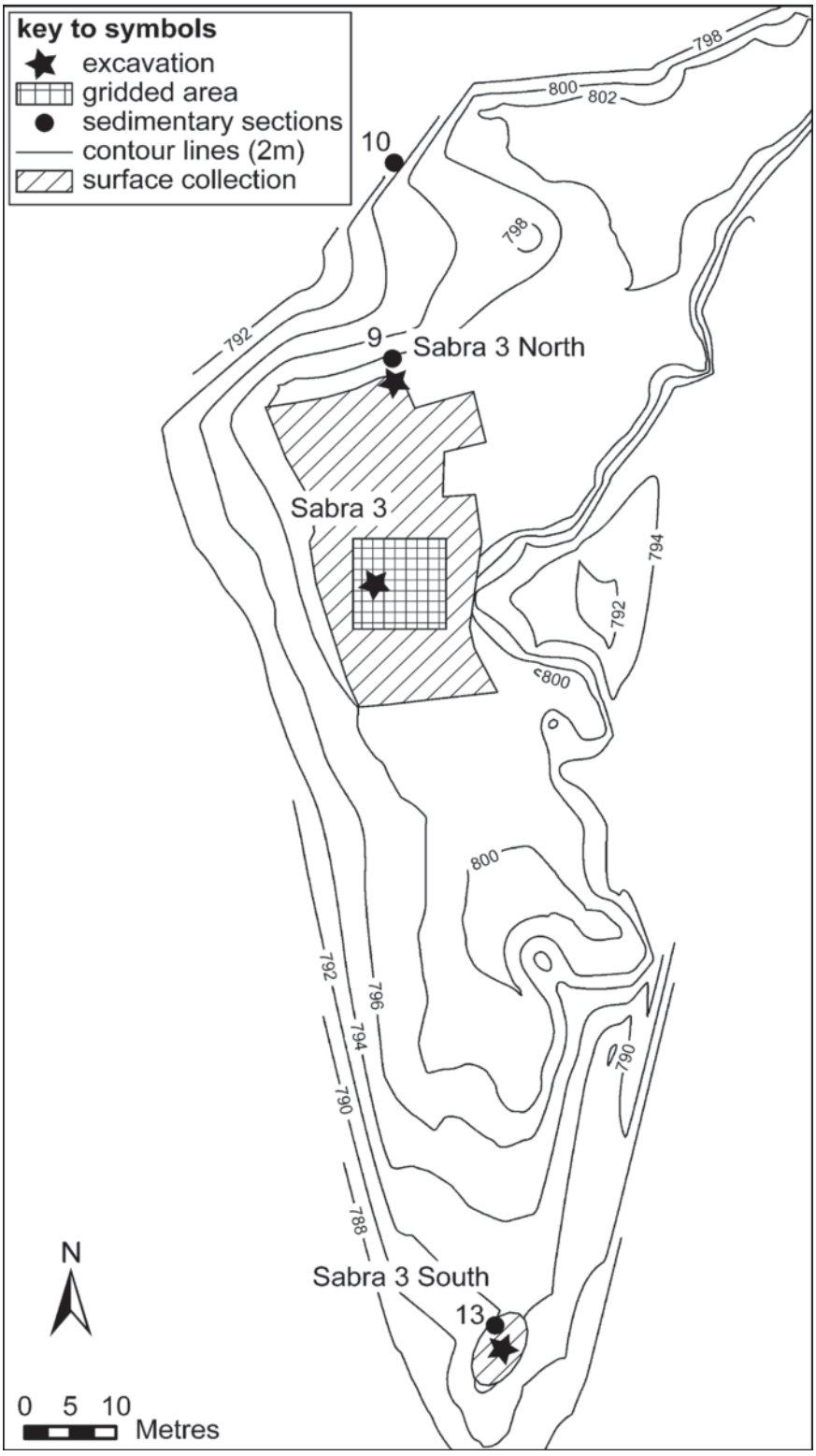
Ṣabrā 3

Further downstream, about 500m south of Ṣabrā 4, another site complex was recorded at a locality designated Ṣabrā 3 in 1983 (**Fig. 14**).

On top of the *wadi* deposits in this location, a small Epipalaeolithic assemblage was surface collected in 1983 and designated Ṣabrā 3 (Schyle and Uerpmann 1988; now designated Ṣabrā 3

Centre). Further artefacts had been brought to the surface by erosion since that time, which were noticed in 2008 and systematically collected in summer / autumn 2009. Additionally, a small trench was opened across the surface scatter to look for any remains left *in situ*.

In spring 2008 we also noticed lithic artefacts apparently eroding from a black layer



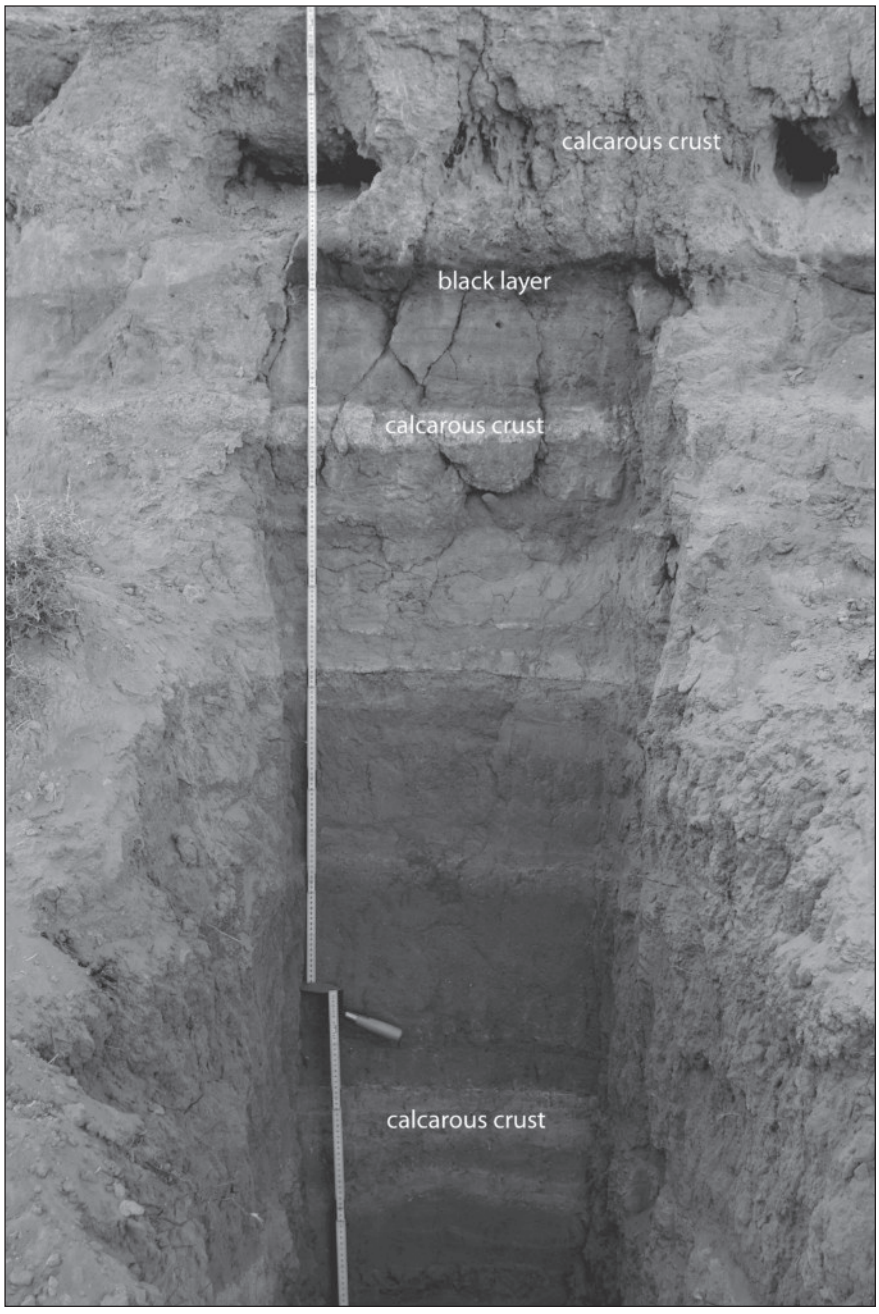
14. General map of the Ṣabrā 3 site complex.

about 0.5m below the surface of the *wadi* deposits (**Fig. 15**). This occurrence was designated Ṣabrā 3 North. From a cursory inspection of the finds scattered over the steep slope below the natural section (we did not collect any artefacts in 2008), it was clear that these artefacts were of Upper or Epipalaeolithic technology, although no diagnostic types could be found.

An Early Epipalaeolithic assemblage was excavated from a small remnant of *wadi* deposits located 50m further downstream of the southern end of the main body of contiguous *wadi* deposits. This occurrence was also discovered in spring 2008 and designated Ṣabrā 3 South.

Ṣabrā 3 North

The black layer noticed in 2008 (**Fig. 15**) is covered by a heavily cemented deposit (the calcareous crust from which the Ṣabrā 3 finds are eroding), which in 2009 we found ourselves unable to excavate without mechanical assistance. In 2010 we tried again, but had to give up



15. Geoscientific section at Ṣabrā 3 North.

again after the excavation of ½ m², the cemented layer being too hard and too thick to remove on a larger scale. Instead, we collected a sample of artefacts from the adjacent western slope of the *wadi* deposits. Extensive geoscientific sections were excavated at this location in 2009, covering the whole sequence of sedimentation down to bedrock.

Artefact density within the excavated portion of the site is quite high (*ca.* 350/ m²); there are many burnt flint fragments, a few pieces of charcoal and occasional bone fragments, suggesting good *in situ* preservation. However, diagnostic tools are still lacking; so far, tools consist exclusively of simple endscrapers, whether from the excavation or surface collection. The proportion of blades and flakes amongst the debitage is almost even. Two carinated cores were recovered; the remainder are relatively small, single platform bladelet cores. As a result, the exact cultural affiliation of the assemblage remains unclear, but a general final Upper Palaeolithic classification is likely.

Ṣabrā 3 South

In spring 2008, numerous small flints and bones[3] eroding out of the top of this small remnant were noticed. In summer / autumn 2009 we collected the surface around the remnant and excavated what remained of what must originally have been an *in situ* cultural layer. This deposit was preserved only at the very top of the remnant, along a narrow 'spur' of approximately 5x0.5m². It was completely excavated by sieving the sediment recovered from ¼ m² (**Fig. 14**). Additionally, a geoscientific section was cut into the mound to link its sequence of deposits with the main body of contiguous deposits further north. The small remnant of Ṣabrā 3 South lacks the heavily cemented calcareous crust present on top of the *wadi* deposits at Ṣabrā 3 and above the black layer discovered at Ṣabrā 3 North. It may be that the cultural layer at Ṣabrā 3 South was originally below – in stratigraphic terms – the assemblage found on top of the calcareous crust at Ṣabrā 3. However, this still needs to be confirmed by sedimentological analyses which are still in progress.

The small assemblage recovered (just 55 objects) can be attributed to the Early Epipalaeolithic Kebaran / Nebekian industry (**Fig. 16**). It is dominated by backed bladelets, with narrow, obliquely truncated variants being the most numerous type. A few of them display microburin scars below the truncation, but there are also a few true La Mouillah points. Finely ('Ouchtata') retouched bladelets also occur. The remainder consists of truncated as well as broken backed bladelets. The non-microlithic tools include a few massive denticulated scrapers, which might also be classified as small flake cores, and a few burins.

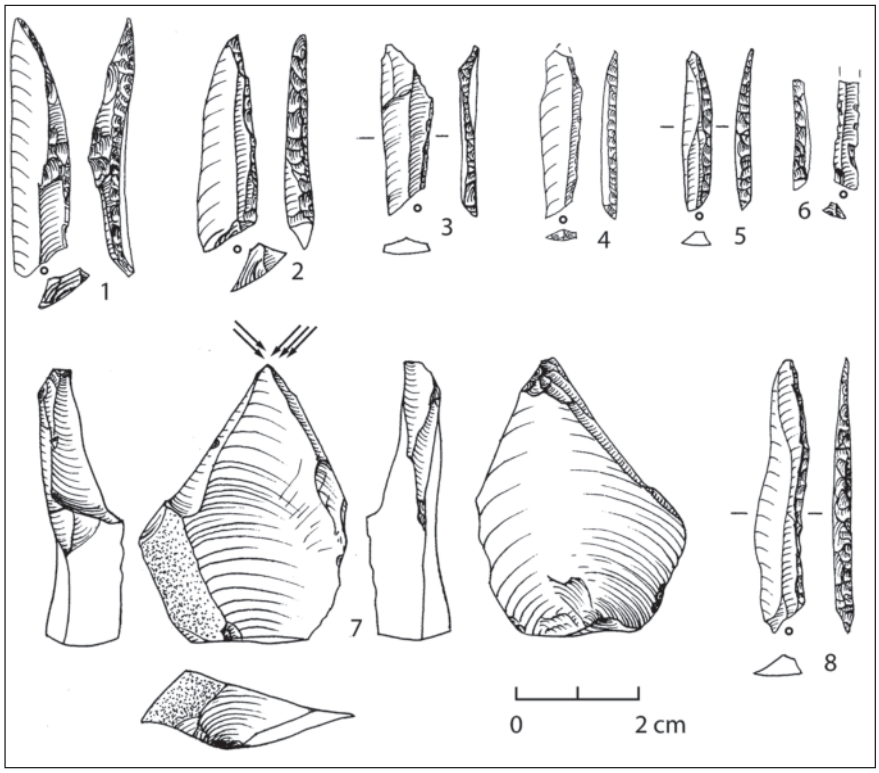
Sabrā 3 Centre

A thin scatter of artefacts was found scattered across the surface of the calcareous crust over an area of approximately 500 square metres, with an area of slightly higher artefact densities within a square of only 10x10m (**Fig. 18**).

Even initially, it was clear that the artefacts on the surface were distributed according to relief, with the highest artefact densities being found in shallow depressions or along shallow erosional channels. We established a grid of 10x10m within the area of highest artefact density, which we collected in 1x1m squares. Additionally, the surrounding area was collected using larger, arbitrarily sized collection areas of between 7 and 20 square metres. Overall surface artefact density was very low: the most productive 1x1m square yielded just 35 artefacts, and the richest collection area not more than an average of three artefacts per square metre. These richest areas corresponded to shallow basins, where artefacts had gathered as a result of erosion.

Seven square metres were excavated to a depth of up to 20cm to investigate whether or not *in situ* deposits might be preserved. Excavation of the hard calcareous crust proved to be very arduous and time-consuming, and was therefore called off on logistical grounds. Subsurface artefact densities within the excavated 1x1m squares were considerably higher than on the surface (up

3. Ṣabrā 3 South has a small but seemingly varied bone assemblage, which includes a medial fragment of a bone point. The taxa identified by H. Berke include an unspecified equid, wild cattle, gazelle, wild sheep, fallow deer, wild boar and bear.



16. Selected tools from Ṣabrā 3 South: (1 - 2, 6, 8) obliquely truncated backed bladelets; (3 - 4) trapezes; (5) arched backed and obliquely truncated bladelet; (7) burin.

to 170 artefacts per square metre), but the artefacts were distributed within the upper 10cm of sediment, without preservation of organic material or any evidence of anthropogenic features. As a result, it has so far not been possible to locate any *in situ* remains, although the possibility cannot be discounted that they may be preserved in some parts of the site.

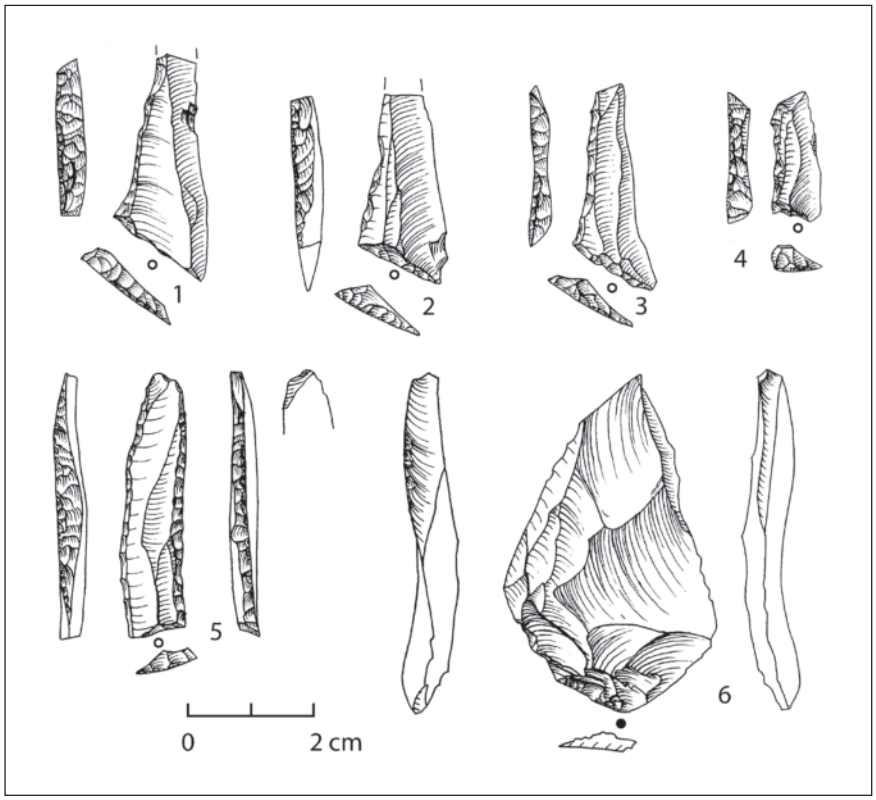
The assemblage recovered so far is very homogenous and corresponds with the finds made in 1983 (**Fig. 17**). Amongst the tools, largish 'microliths' predominate by far. Backed and truncated pieces, among them several Qalkhan points and asymmetric trapezes, are the most frequent types. The use of the microburin technique is attested by a single La Mouillah point, as well as several retouched 'piquant trièdres' still visible on the truncated ends of the microliths. Similar Qalkhan assemblages (Henry 1981) are known from Jordan (Garrard *et al*. 1986; Henry 1982) and Syria (Cauvin 1981). Individual Qalkhan points were also found on the surface during our survey of Wādī Ṣabrā at 2010 / 6 (**Fig. 1.14**) and 2010 / 9 (**Fig. 1.17**).

The dating of the Qalkhan is still far from satisfactory, but its stratigraphic position between a lower Early Kebaran / Nebekian and an upper Nizzanan assemblage (only the latter is adequately radiocarbon dated, to between 19 and 18 ka at Wādī Jīlāt 6 [Garrard *et al*. 1986; Byrd 1994a]) suggests an early Epipalaeolithic date immediately after the LGM. The remainder of the Stone Age archaeology in Wādī Ṣabrā is represented at the small but rich site of Ṣabrā 1, which was test excavated in 1983 (Schyle and Uerpmann 1988; Gebel 1988) and contained finds from the Middle and Late Epipalaeolithic (Geometric Kebaran; Natufian) to Early Neolithic (PPNA / EPPNB).

Additional Late Epipalaeolithic sites were found during the 2010 survey, namely an (Early?) Natufian surface lithic scatter on exposed bedrock about 1 km north of Ṣabrā 1 (**Fig. 1.17**) and (Late?) Natufian finds, including bones, still embedded in sediments forming a very steep slope adjacent to the sandstone cliffs of the eastern bank of Wādī Ṣabrā at 2010 / 25 (**Fig. 1.32**).

Additional Neolithic finds from 2010 are represented only by single isolated arrowheads. Two Early PPNB notched specimens were collected at 2010 / 26 (**Fig. 1.33**) and a single final PPNB or Late Neolithic type was found at 2010 / 5 (**Fig. 1.13**).

Sites Beyond Wādī Ṣabrā



17. Selected tools from Ṣabrā 3 Centre: (1 - 3) Qalkhan points; (4) trapeze; (5) obliquely truncated backed bladelet; (6) burin.

Additional sites in the surroundings of Wādī Ṣabrā were also visited in summer / autumn 2009. These include the site of Abū Shāhir, near the spring of 'Ayn adh-Dhawī, which also was discovered in 1983 and at that time looked set to yield an *in situ* Initial Upper Palaeolithic occurrence. Unfortunately we were not able to relocate the site until the very end of the summer / autumn 2009 season. The few artefacts recently collected indicate a likely Final Neolithic / Chalcolithic (rather than Initial Upper Palaeolithic) date for the site.

Finally, a rock shelter near aṭ-Ṭaybah (discovered and recommended to us by H-G. Gebel) was visited on the last day of our stay at Wādī Mūsā in 2009. In a similar topographic situation to Ṣabrā 1, *viz*. sediments leaning up against a steep sandstone cliff and protected by fallen blocks, we collected a few artefacts eroding out of the deposits, including backed bladelet fragments, a backed point and several *outils communs*. These indicated another Upper to Epipalaeolithic occurrence, which was tested during the 2010 season.

We carried out a detailed topographic survey, including 3D measurement of the surrounding ground surface, and established a grid prior to excavation of the westernmost of the three artefact concentrations observed, which was designated Ṭaybah 3. It consists of a remnant of sediments accumulated against the north-western 'wall' of a deep valley cut into the Ram sandstone. The sedimentary remnant is seriously endangered by erosion, mainly in the form of seasonal flash floods. Several archaeological layers have been widely exposed and abundant artefacts are scattered on the ground surface between the huge sandstone blocks covering and protecting the site.

The excavation area measured 4x1m, with a maximum depth of 2m. The trench was oriented to north-west. The excavation started at the steep, south-western slope of the sediment mound. 'Steps', each with an area of 0.5m^2, were excavated in order to expose a section through the stratigraphy. This consisted of 12 lithological horizons, designated layers A to M, which were represented by different grades of fine and intermediate sands of aeolian and fluvial origin. Enrichment of calcium carbonate eventually cemented four out of 12 sandy layers (L, J, F and C), indicating the existence of buried or eroded

surfaces. Layer L represents redeposition of reworked calcareous fragments, thereby suggesting a sedimentary hiatus of unknown duration.

Five archaeological horizons were identified (layers B, C, E, G and M), at least two of them (C and G) with a fair degree of bone preservation. On the basis of a preliminary assessment of the finds currently under analysis, the finds from the upper four layers are similar; the few artefacts from the lowest archaeological horizon (M) remain undiagnostic. Remnants of a fireplace were unearthed from the lower part of layer C (Square 5/23 b). Charcoal and burnt artefacts should permit radiometric dating of the structure.

In technological terms, the lithic industry is characterised by rather simple bladelet production adapted to the low quality of the utilised raw material, which is presumably of local origin. The bladelets were struck from single platform cores on small nodules or pebbles, or from clumsy burins on thick truncated flakes with a minimum of preparation. This is reflected in the varied shapes of the resulting bladelets. The tools consist mainly of small, short endcrapers, as well as a few endscrapers on larger flakes. The abovementioned large burins were most probably used as cores for bladelet production. Marginally obverse retouched bladelets are the most numerous type present. In this regard, the assemblage resembles the Late Ahmarian or Masraqan assemblages from Wādī al-Ḥasā (Coinman 2003) or Ohalo (Nadel 2003). However, the *chaîne opératoire* of the bladelet production seems to be somewhat more sophisticated and standardised at the latter sites.

Conclusions and Prospects

Archaeologically, the first two field seasons focused on the excavation of previously known sites. The second season continued work at some of these (Ṣabrā 3 and 4) and started new excavations at aṭ-Ṭaybah and Ṣabrā 3 North. Additionally, a systematic survey was carried out along the upper part of Wādī Ṣabrā.

These two seasons in Wādī Ṣabrā have provided us with a rich body of data which are currently under analysis. The preliminary archaeological results suggest that within Wādī Ṣabrā, archaeological finds associated with *wadi* deposits span the time from the Middle Palaeolithic to Early Neolithic. The area is thus ideal for diachronic analysis of human occupation and land use, in close association with terrestrial palaeoclimate archives, from MIS 3 until the beginning of the Holocene.

This does not mean that the whole period between *ca.* 50,000 and 10,000 years ago is continuously represented in the Wādī Ṣabrā area by sediments and finds. We have assemblages representing each archaeological stage of the sequence as a *pars pro toto*, but it is clear that the earlier part of the sequence in particular is much less well-represented by finds than the later part. This becomes particularly apparent when the assemblages are related to the temporal axes involved. There are only two assemblages representing the earliest (IUP and Ahmarian) part of the Upper Palaeolithic, which have to be 'stretched' over a time span of almost 20,000 years. A rather unexpected result, however, is the comparatively high density of sites dating to the period between 30,000 and 24,000 years ago, represented by the numerous 'aurignacoid' occurrences clustering in the upper Wādī Ṣabrā basin. Hitherto, the Levantine Aurignacian has been almost unknown in Jordan and is not well represented in other parts of the southern Levant. The similarly high frequency of sites dating to the LGM and its aftermath is comparable with other areas of the southern Levant, although the temporal peaks of site frequency within this time range seem to be distributed slightly differently from what we know west of the Jordan valley. In particular, the start of the post-LGM climatic amelioration, which is represented west of the Jordan valley by a marked increase in site numbers attributed to the Geometric Kebaran and Mushabian, seems to be represented in Jordan only by a few Middle Hamran sites in the Rās an-Naqab basin (Jones 1983) and isolated, single occurrences in Wādī Rum (Copeland and Hours 1970), the Azraq basin (Garrard 1998), Wādī al-Ḥammih (Edwards *et al*. 1988) and Wādī Ziqlāb (Maher 2011).

At present, it is difficult to interpret these shifting *foci* of site distribution. They might simply be caused by differences in site preservation or the state of research on either side of the Jordan valley. However, we do know of at least one other manifest shift of settlement from west to east at the end of the MPPNB, which was related to the emergence of LPPNB 'megasites' in

Jordan, so it might also be that similar phenomena occurred earlier as well.

Acknowledgements

Our work in Wādī Ṣabrā benefitted from the help and co-operation of many persons. The Department of Antiquities of Jordan provided exemplary administrative support. We thank the late Fawwaz al-Khraysheh and Ziad al-Sa'ad (Directors General of the DoA in 2009 and 2010) for their kind permits and interest in our work. Khalil Hamdan (DoA 'Ammān) ensured that the necessary administrative papers were received in time. In the field, particular thanks are due to Talal al-Ammareen (DoA Wādī Mūsā) who not only saved us from drowning in a heavy flash flood during our first visit in spring 2008, but also repeatedly helped us in later seasons to organise the thousand small things necessary for work and the acquisition of a degree of comfort in a remote area. The spartan conditions in Wādī Ṣabrā were shared by DoA inspectors Amer Bdour and Mohammed al-Marahleh in 2009 and by Adnan Rafaiah and Hussein Dahbour in 2010. We are very grateful for their patience with us and their compassion in the field. Thanks are also due to Zeidan Kafafi (Yarmuk University, Irbid) for his advice and help, and for introducing us to Maysoon al-Nahar (University of Jordan, 'Ammān) who gave us constant support during our work. We are also indebted to H-G. Gebel, who first identified the site of aṭ-Ṭaybah and suggested it to us for excavation.

Finally, we particularly acknowledge the assistance of Nadine Assmann, Anne Barusic, Hanne Decker, Hannah Parow, Thomas Wolter (University of Cologne), Christa Hunsalzer and Michael Lemke (RTWH, University Aachen) for the hard work of excavation, the competent support and survey photographs taken by Michael Baales (Ruhr University, Bochum), the compassion and geoscientific know-how of our colleagues Manuel Bertrams, Frank Lehmkuhl, René Löhrer and Jens Protze from RTWH, University Aachen and, last but not least, the vital job of our 'water man' and guard Haroun Ali Salem al-Faqeer (Umm Ṣayḥūn).

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