AN EPIPALAEOLITHIC SEQUENCE FROM WĀDĪ ḤISBĀN IN THE EAST JORDAN VALLEY

by

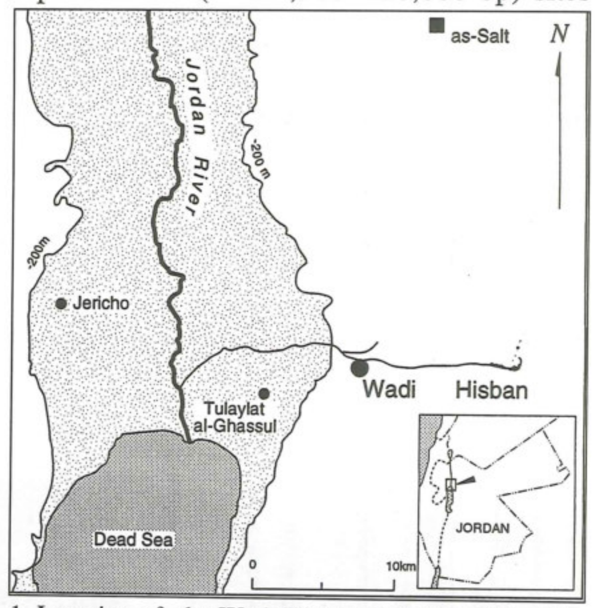
Phillip C. Edwards, M. John Head and Phillip G. Macumber

Introduction

This report describes excavations at a sequence of three new Epipalaeolithic sites in Wādī Ḥisbān (Fig. 1), located along a two-hundred metre stretch of the wadi's north bank in the east Jordan Valley (Fig. 2). The locale lies intermediate between the village of ar-Rawḍa to the north and Tall Iktanū to the south (Figs. 3-4). Although several sites are evident in the wadi terrace sections in this area, manifest as small bands or isolated cases of chert artefacts, our investigations concentrated on the sampling of three sites stratified in the top two metres of the terrace.[1] These three sites are *in situ*, rich in artefacts, horizontally bedded and superimposed. Additionally, the upper two revealed surface signs of stone constructions.

Before excavation, retouched artefacts eroding from the terrace indicated that the whole sequence dated from the middle to late Epipalaeolithic, concluding with the uppermost Natufian site. Excavation of the sites was inaugurated in order to provide data about several key issues:

- prior to this project, no *in situ* Late Epipalaeolithic (ca. 14,500 - 10,000 bp) sites

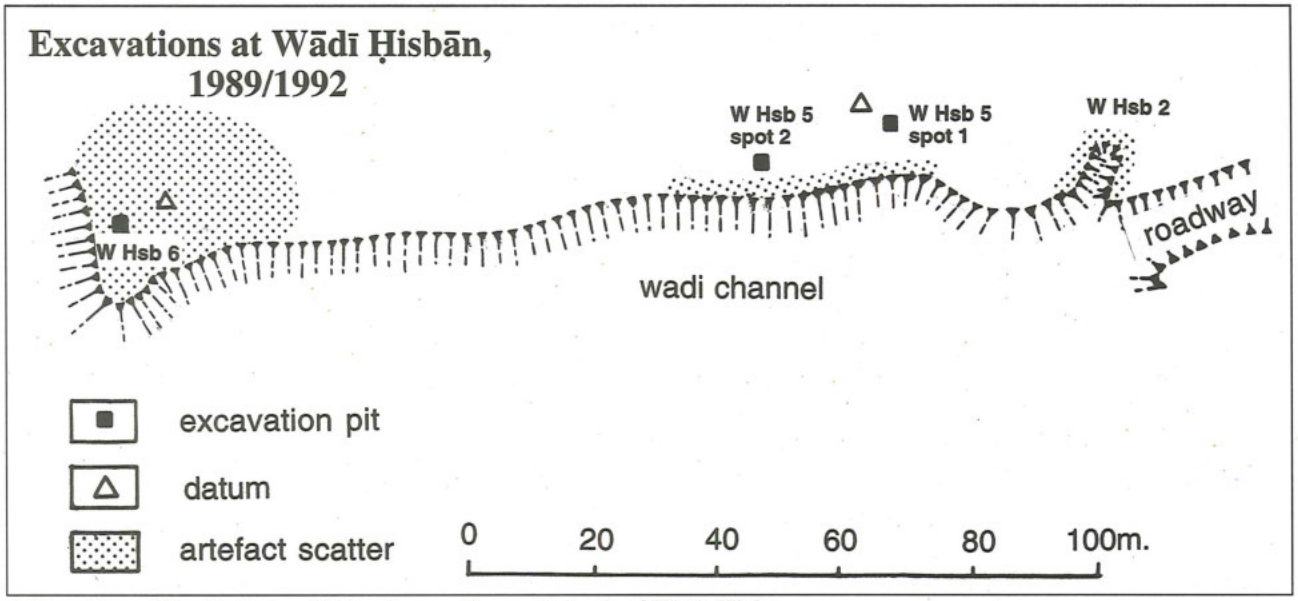


1. Location of the Wādī Ḥisbān Epipalaeolithic sites in the east Jordan Valley. The shaded area within the *zor*, or Jordan River flood plain, indicates land below the -200 m contour. This is close to the -180 m contour which marks the greatest extent of Pleistocene Lake al-Lisān.

1. Wādī Ḥisbān 2 was discovered by Phillip Macumber in the spring of 1989, and excavated by Phillip Edwards in December of that year. The work at Wādī Ḥisbān 2 was carried out by Edwards on behalf of the Department of Antiquities of Jordan, through the courtesy of the then Director-General of Antiquities Dr Ghazi Bisheh. The excavation team included Department of Antiquities representative Mr Ali Sa'idi, Abū Isa, Abū Sami, Sa'ad Yusuf Khashan, Musa'ad Yusuf Khashan, Abū Afif, and Abū Fawzi. The excavations were funded thorough an Australian Research Council (ARC) fellowship held by Edwards at the Department of Archaeology, University of Sydney.

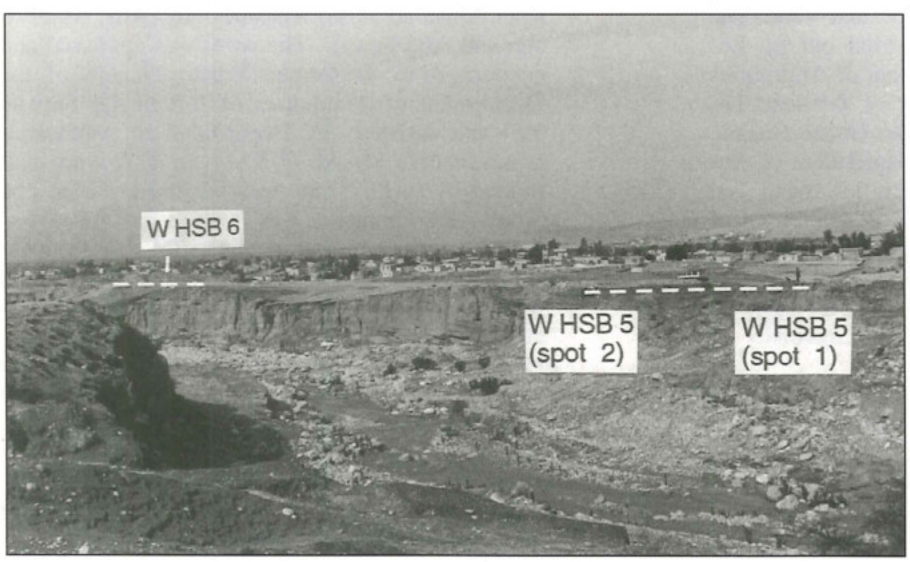
Further survey by Macumber and Edwards in December 1991 clarified the potential of the two overlying sites Wādī Ḥisbān 5 and Wādī Ḥisbān 6. These were excavated by a small La Trobe University excavation team directed by PCE and including Dr Susan Colledge and Dr Louise Martin, in December 1992. The excavation team also included Abū Isa, Abū Sami, Sa'ad Yusuf Khashan, Musa'ad Yusuf Khashan, Abū Afif, Abū Nasim and Abū Fawzi. The work was approved and encouraged by the former Director-General of the Department of Antiquities of Jordan, Dr Safwan Tell and assisted by Department of Antiquities representative Mr Ali al-Khayyat. This work was funded by a La Trobe Central Starter Grant and Small ARC Grants.

The authors are most grateful to Dr Kay Prag for her encouragement to work on these sites located within her study area in the environs of Tall Iktanū and for her ongoing assistance and provision of valuable information about the area. We would also like to thank Dr Jonathan Mabry for providing information about the area. Finally, thanks are due to Mr Wei Ming and Mr Rudy Frank of the La Trobe University School of Archaeology: Rudy for photographic work and Ming for the stone artefact drawings.



2. Location of the Epipalaeolithic sites on the north bank of Wādī Ḥisbān.

3. Relationship of Wādī Ḥisbān 2 to Wādī Ḥisbān 5 on the north bank of Wādī Ḥisbān.



4. Relationship of Wādī Ḥisbān 5 to Wādī Ḥisbān 6 on the north bank of Wādī Ḥisbān, with ar-Rawḍa village visible in the background.

had been excavated in this part of the East Jordan Valley. This sequence promised to fill an archaeological lacuna in the region for this crucial period in Levantine prehistory.

- these sites promised to extend the chronological coverage of the East Jordan Valley Epipalaeolithic sequence (ca. 19,500 - 14, 500 bp, Edwards *et al.* 1996) we had excavated further north in Wādī al-Ḥammeh during the 1980s.
- the lower altitude of the Jordan Valley at its southern end generates conditions of lower rainfall and greater aridity than obtained for Wādī al-Ḥammeh in the moister region to the north. Consequently the areas differ markedly with respect to climate, geology and flora, raising the prospect that human adaptations during the Late Pleistocene near the Dead Sea might have varied significantly from contemporaneous ones in Wādī al-Ḥammeh.
- archaeobotanical and faunal remains might be recovered, yielding subsistence data relatively rare for the pre-Natufian period.
- settlement data might be obtained, providing comparisons to terminal Pleistocene trends towards sedentism, for example, in nearby complex residential Natufian sites, such as Tall as-Sulṭān (Jericho) and Wādī al-Ḥammeh 27.
- radiometric dating of the top of the Wādī Ḥisbān terrace levels might bear on data already obtained by Macumber in Wādī al-Ḥammeh regarding the desiccation of Lake al-Lisān (Macumber and Head 1991). At the time of their occupation the cluster of sites would have overlooked the lake (see Fig. 1), the shore of which is estimated to have lain about two kilometres to the west at an altitude of 180 m bsl (Neev and Emery 1967).

Excavation Methodology

From lowest to uppermost, the three sites were designated Wādī Ḥisbān 2, Wādī Ḥisbān 5 and Wādī Ḥisbān 6 respectively [2] (see Figs. 2-4). Throughout the project, excavation proceeded by natural stratigraphy, complemented by smaller artificial units (usually five centimetres) to retain finer-scale vertical control. A natural stratigraphic deposit is here termed a 'Locus', and an artificial excavation unit a 'Unit', so that the term 'Locus 1.10' refers to the tenth artificial unit in the natural deposit 'Locus 1'. The locales of the various excavation pits are called 'Spots', so that for example the two excavation pits for Wādī Ḥisbān 5 are termed 'Spot 1' and 'Spot 2'.

All sediments were routinely wet-sieved in the adjacent wadi through 3 mm mesh. Additional nested-sieve samples were taken using five mesh sizes ranging from 0.5 to 25mm (all the tabulated data in this report derive from the 3 mm sieve residues). All sites were sampled for charred botanical fragments by bucket flotation in Wādī Ḥisbān.[3]

The shape and depth of the excavation pits varied with each site depending on conditions of access. The uppermost site Wādī Ḥisbān 6 was accessible through a straightforward pit, (initially 2 x 1 m and continuing deeper as a 1 square metre pit; Figs. 2 and 7). The middle site Wādī Ḥisbān 5 was approachable by sinking a 1 square metre pit into the deposit at 'Spot 1' (Fig. 5). The laterally extensive cultural horizon of this site was further investigated 20 m to the west by excavating a 1m broad pit ('Spot 2') through the outcrop (see Fig. 2). The lowermost site Wādī Ḥisbān 2 was only accessible by sampling the cultural stratum along an outcrop in the terrace wall (Fig. 6). Deep excavation back into the terrace face was impracticable

2. The site numbers 2, 5 and 6 were allocated to these sites in order to conform to the site survey numbering system developed by Dr Kay Prag for the area.
3. Flotation and charred plant identifications were carried out by Dr Susan Colledge. Disappointingly preservation was not good enough to yield any diagnostic botanical samples; however enough charred material was collected to enable these samples to be submitted for AMS carbon dating.

5. Excavation at Wādī Ḥisbān 5, Spot 1. Stone hearth (F. 1) is stratified in the rear wall of the pit, above the dense artefact layer visible as the darker band of sediment.

6. Artefact rich sediment at Wādī Ḥisbān 2.

here since the deposits were strongly cemented.

Wādī Ḥisbān 2

Site Characteristics and Stratigraphy

Wādī Ḥisbān 2 is the lowermost site in the sequence. Prior to its discovery in 1989 a deep gully gouged into the bank, probably associated with nearby roadworks (Fig. 2), had serendipitously exposed the site. A rich band of lithics and burnt animal bone some thirty centimetres thick extends in outcrop (Fig. 6) ten metres laterally from east to west along the wadi terrace.

The enclosing sediment is a dark yellowish-brown (10YR 4/4) silty clay. It contains fossil large benthonic foramenifera (*Nummulites sp.*) at low frequencies (ca.< 0.1% by weight of sediment), reflecting their alluvial transport from parent Late Cretaceous/ Eocene limestones that comprise the foothills of the Jordanian plateau immediately to the east. No structural features were encountered in the excavations, however they were unlikely to have been recovered even if present because the excavated sample was very small. The only possible remnant structural feature was a single burnt limestone cobble which may have constituted part of a hearth.

Sediments were dug from the exposed cutting in the 1989 season. Although a small volume was excavated due to the intractability of the deposits (Table 1), the site proved to be extraordinarily rich, containing 135,044 lithic fragments per cubic metre. The high mean artefact density may be ac-

Table 1. Characteristics of Wādī Ḥisbān Epipalaeolithic sites.

	Wādī Ḥisbān 2	**Wādī Ḥisbān 5 spot 1(Loc.1.9-1.13)**	**Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)**	**Wādī Ḥisbān 6 Loc.3.1-5.4**
Site altitude	- 149. 1 m.	- 146.9 m.	- 147. 9 m.	- 150.1 m.
Excavated volume	0.09 m^3	0.25 m^3	0.11 m^3	0.36 m^3
Estimated site area				
Constructed features	-	stone hearths	-	stone hearth
Flaked stone artefacts (Total no. of pieces)	12,154	4, 101	2, 450	2, 883
Flaked stone artefacts (Total weight)	5,068 g	1,766	798 g	1,349
Flaked stone artefacts (Density of pieces)	135,044 / m^3	16, 404 / m^3	22, 272 / m^3	8, 008 / m^3
Flaked stone artefacts (Density by weight)	56, 311 g / m^3	7, 062 g / m^3	7,255 g / m^3	3,747 g / m^3
Animal bone (Total no. of fragments)	8, 154	894	1,166	995
Animal bone (Total weight)	665 g	49 g	54 g	176 g
Animal bone (Density of fragments)	90, 600 / m^3	3, 576 / m^3	10,600 / m^3	2,750 / m^3
Animal bone (Density by weight)	56,310 g / m^3	196 g / m^3	491 g / m^3	489 g / m^3
Ochre (Total no. of fragments)	428	58	18	-
Ochre (Total weight)	37 g	6 g	9 g	-
Other artefact types	-	Grooved pebble	-	limestone bowl

counted for in part by the extremely good preservation of fine fragments such as micro-flakes and small chips. Nevertheless, the gross amount of chert artefacts and knapping refuse present far outstrips the quantities recovered from the other two sites according to the density of lithics by weight as well as the numbers of fragments (Table 1).

Two radiocarbon determinations were obtained for Wādī Ḥisbān 2 from different pre-treatments of a sample of burnt animal bone. The organic protein component of the bone yielded a determination of 9,490 ± 220 bp [4] (ANU-8469a). Stratigraphic and typological considerations, however, lead us to believe that a true age range for the site should be in the order of 16-15,000 bp and that the bone collagen was contaminated with later material. Another analysis of the sample (ANU-8469b) was then done on the inorganic bone apatite fraction which gave a somewhat older result of 11,560 ± 250 bp, still unfortunately indicating diagenesis of the bone apatite fraction.

Fauna

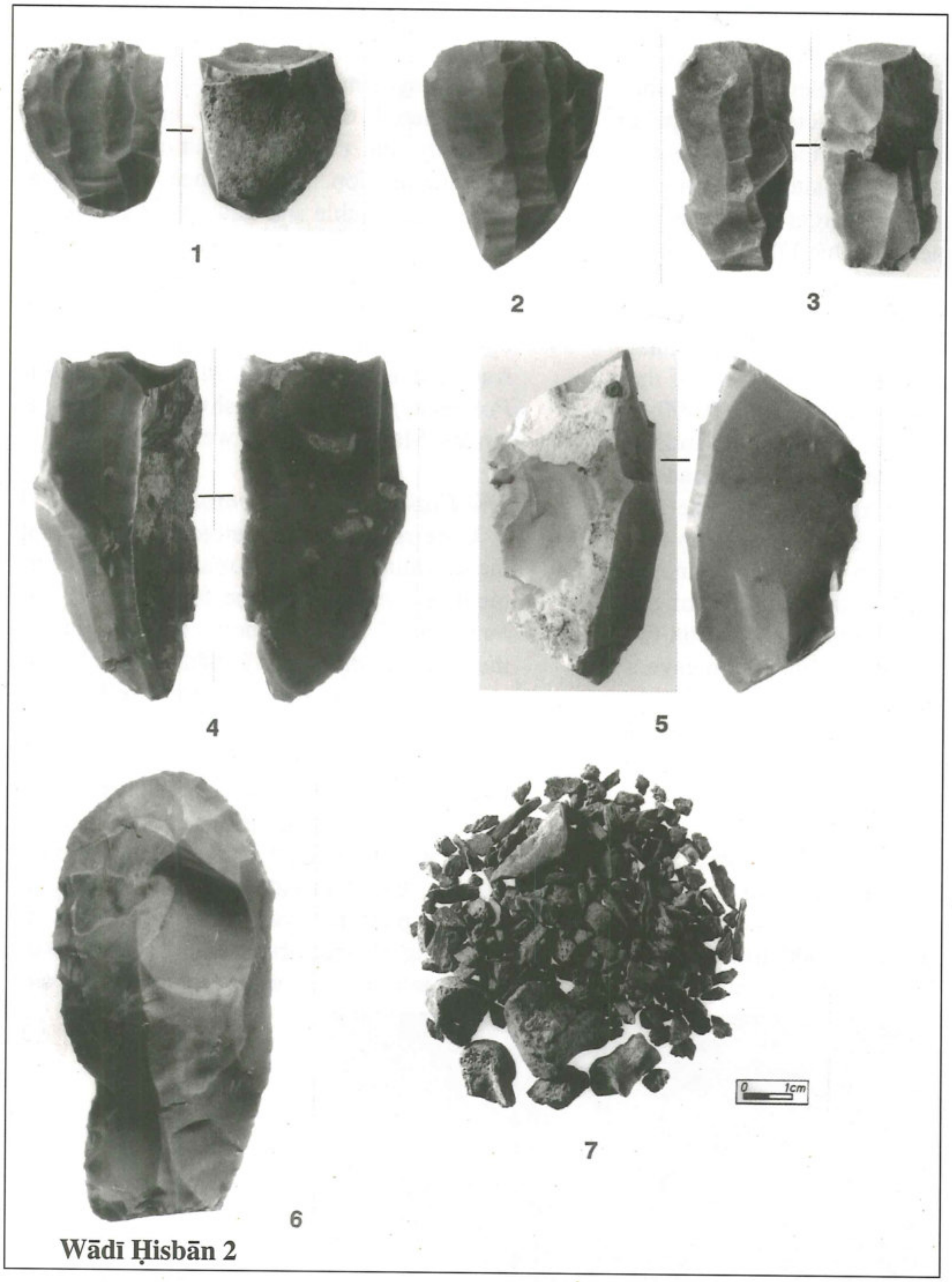
High quantities are even more pronounced for animal bone than for lithics. In Wādī Ḥisbān 2 faunal fragments occur at a density by weight 100 - 300 times higher than those of Wādī Ḥisbān 5 and Wādī Ḥisbān 6. Bone is notable for being present almost exclusively in the form of small, burnt fragments (Table 1 and Fig. 8:7). The comminuted nature of the burnt bone is probably due to post-depositional mechanical degradation. The absence of unburned bone is noticeable and raises the question as to whether unburned bone has been selectively attacked and degraded in the sediments post-depositionally. The few diagnostic faunal pieces comprise several fractured and burnt *Gazella* (gazelle) and *Potamon potamon* (freshwater crab) phalanges. Marine molluscs were absent.

The Flaked Stone Assemblage

Core reduction was effected by utilising the unlimited local raw material source immediately at hand, in the form of the large numbers of alluvial chert cobbles lying in the channel of Wādī Ḥisbān. The bladelet cores in the excavated sample reflect this situation in that most are single platform types (11 out of 18, Fig. 8:1-2), with only two out of eighteen opposed platform cores (Fig. 8:3) occurring. Blade detachment on cores was usually effected on one side only, leaving the other side cortical (Fig. 8:1). A striking platform was simply produced by removing a large transverse cortical flake. The small number of core rejuvenation ele-

7. Excavations at Wādī Ḥisbān 6. Clustered stones of a hearth (F. 1) are located in the near left hand corner of the Pit, another (F. 2) in the right foreground, and a scattered example (F. 3) in the background.

4. All radiocarbon dates reported here are expressed as uncalibrated determinations Before Present (bp).



8. Wādī Ḥisbān 2: (1-2) Single platform bladelet cores. (3) Opposed platform bladelet core. (4) Multiple burin (on straight truncation and on natural surface). (5) Burin on natural surface. (6) Endscraper. (7) Burnt and smashed animal bone fragments.

ments (0.2%, Table 2) such as core tablets and ridge-straightening blades reflect the lack of necessity for core rejuvenation.

This is a familiar mode of bladelet core reduction in the Levant where raw materials are bountiful. On the other hand, the most common retouched artefact type here is a tiny geometric microlith - a triangle (Figs. 9:1 and 10:5) - which in both its diminutive size and the painstaking care taken in its production presents a remarkable contrast to the expendable types of cores and the profligate use of raw material. Triangles were produced by the employment of a specific version of the microburin technique and the process is reconstructable due to the large numbers and full range of debitage products preserved in this assemblage. Blades produced from blade cores were initially selected for microburin production, sometimes with the first step being the production of concave-truncated bladelets (Fig.10:1). The extreme tips of these were then broken off by microburin technique, leaving in some cases long bladed microburins, and the resultant tiny trihedral piece.

Here one would be tempted to consider the microburin the effective implement, with the tiny trihedral piece representing the discarded waster, were it not for the fact that the great majority of triangular trihedral pieces have been subsequently retouched, an impressive feat of craftsmanship given that the average length of the triangles is just 8.7 mm (N = 100, SD =1.8). Occasionally the retouch of the trihedral piece was not added quite symmetrically and the result is a tiny lunate, or in rare cases, a trapeze (Figs. 9:1 and 10:6).

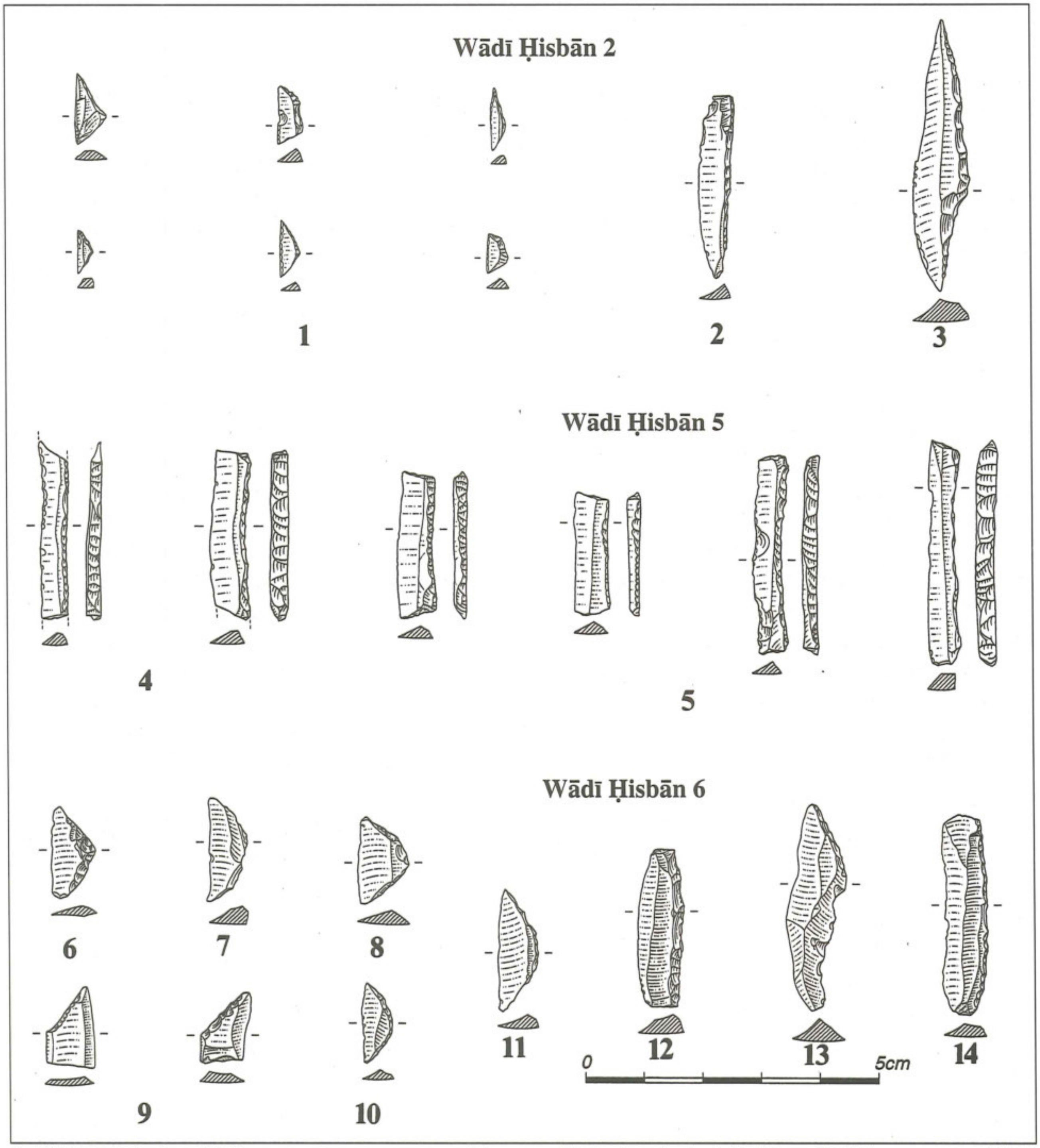
The small size of the triangles should render them easily lost or liable to removal through wind and water deflation which may explain the great preponderance of microburins. The restricted microburin index for the site (Henry 1974) is a colossal 74%, compared with 5 - 9% for the overlying site Wādī Ḥisbān 5 (Table 3). Wādī Ḥisbān 6 also has a very high restricted microburin index of 59.5 %, but in this case the sample size is very small.

During the microburin procedure blades were commonly snapped distally (Table 3), perhaps because the feathered distal terminations of the blades were easier to break than the thicker proximal ends. Microburins are also sometimes double (Fig.10:2), a practice unnecessary in the light of inexhaustible surplus local chert, but more efficient in terms of the production of triangles in that a double microburin once produced could be utilised to create two triangles compared to the one from a single microburin.

While the concave-truncated bladelets may be explained as part of the reduction sequence for production of the tiny triangles, a small proportion of backed blade-

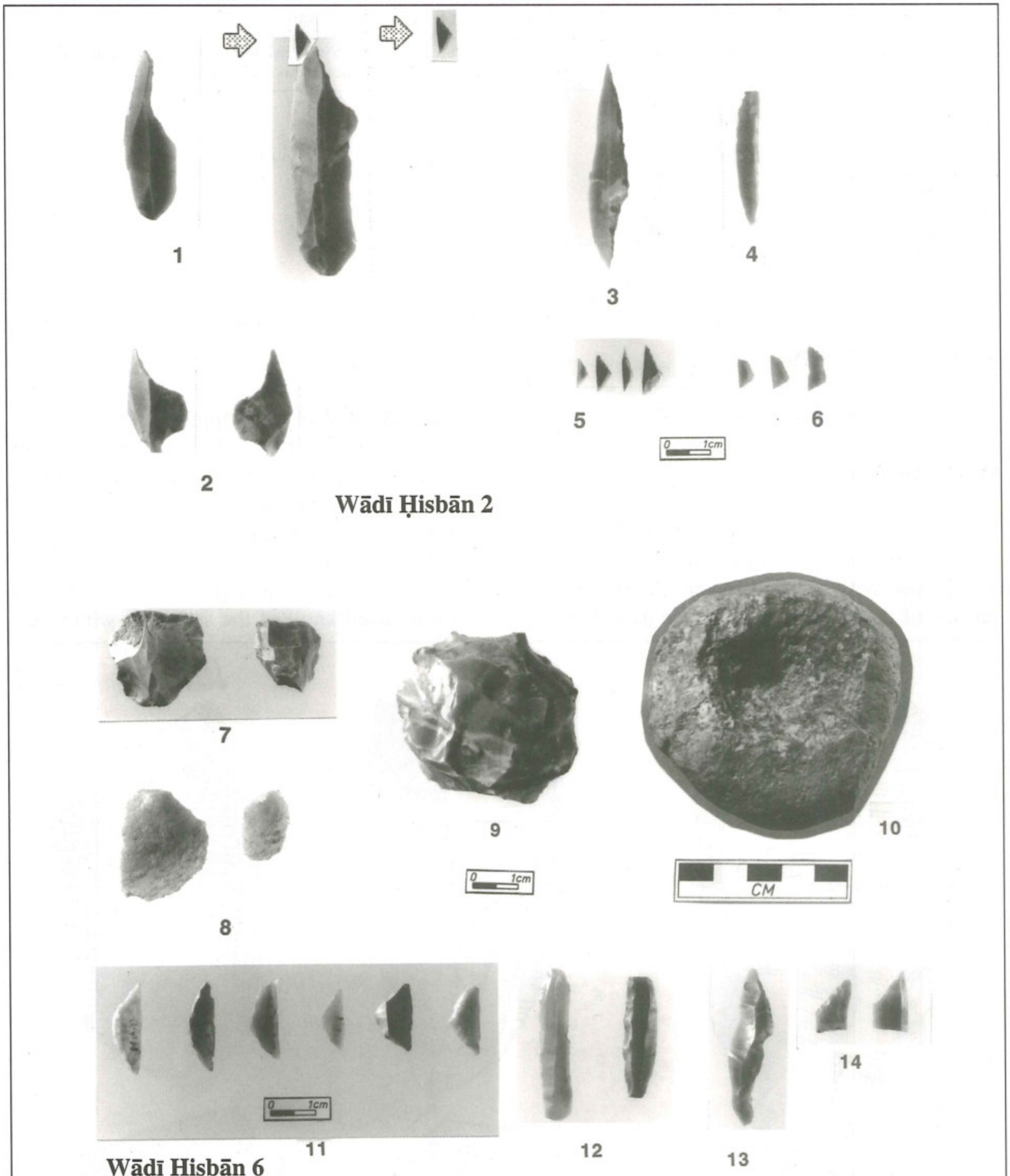
Table 2. Wādī Ḥisbān flaked stone assemblages.

Artefact type	Wādī Ḥisbān 2		Wādī Ḥisbān 5 spot 1 (Loc.1.9-1.13)		Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)		Wādī Ḥisbān 6 (Loc. 3.1-5.4)	
	N	%	N	%	N	%	N	%
Chunks	55	0.4	51	1.3	19	0.8	72	2.5
Chips	4,006	32.8	2,393	58.3	956	39.0	1,613	55.9
Sub-total	4,061	33.2	2,444	59.6	975	39.8	1,685	58.4
Flakes	5,570	45.6	700	17.0	771	31.4	878	30.4
Blades	1,273	10.4	708	17.2	521	21.3	271	9.3
Core trim.	22	0.2	3	0.1	7	0.3	5	0.2
Burin spalls	60	0.6	3	0.1	6	0.3	1	0.1
Microburins	847	6.9	12	0.3	15	0.5	16	0.6
Trihedral pieces	29	0.2	-	-	-	-	-	-
Cores	18	0.1	6	0.2	1	0.1	9	0.3
Sub-total	7,819	64.0	1,432	34.9	1,321	53.9	1,180	40.9
Scrapers	9	< 0.1	7	0.2	1	< 0.1	1	< 0.1
Burins	9	< 0.1	1	< 0.1	-	-	-	-
Multiple tools	-	-	1	< 0.1	-	-	-	-
Blades	6	< 0.1	1	< 0.1	-	-	-	-
Microliths	60	0.8	204	5.0	127	5.2	7	0.2
Geometric microliths	226	1.8	11	0.3	26	1.1	8	0.3
Notches & denticulates	20	0.1	-	-	-	-	2	0.1
Other	4	< 0.1	-	-	-	-	-	-
Sub-total	334	2.7	225	5.5	154	6.3	18	0.6
Total	12,214	100.0	4,101	100.0	2,450	100.0	2,883	100.0



9. Wādī Ḥisbān 2: (1) Tiny triangles, trapezes and lunates. (2) Broken backed bladelet. (3) Microgravette. Wādī Ḥisbān 5: (4) Broken backed bladelets, Spot 1, Loc. 1.13. (5) Trapezes, Spot 1, Loc. 1.11-12. Wādī Ḥisbān 6: (6) Inverse triangle, Loc. 4.1. (7,10,11) Abrupt lunates (8) Trapeze, Loc. 4.1. (9) Broken obliquely-truncated bladelets, Loc. 4.1. (12, 14) Straight bi-truncated backed bladelets. (13) Obliquely-truncated bladelet, Loc. 1.1.

lets were also made which cannot be. Most notable is a complete microgravette (Figs. 9:3 and 10:3), accompanied by several broken pointed and backed bladelets (Figs. 9:2 and 10:4). There were only a handful of larger retouched artefacts; ten in a sample numbering 12,214, which consisted of a few well-made, symmetrical endscrapers and a



10. Wādī Ḥisbān 2: (1) Reconstructed reduction sequence for triangles. (2) Microburin on truncated blade. (3) Microgravette. (4) Backed blade. (5) Triangles. (6) Trapezes.
Wādī Ḥisbān 6: (7) Multiple platform flake cores, Loc. 4.1A, Loc. 4.1B. (8) Quartzite flakes, Loc. 5.3A. (9) Rounded scraper, Loc. 5.3A. (10) Limestone bowl, Loc. 5.3A (at separate scale). (11) Abrupt lunates, (Left to right) Loc. 2.1, Loc.1.1, Loc. 4.3, Loc. 1.1; Trapeze, Loc. 4.1; Inverse triangle, Loc. 4.1. (12) Straight bi-truncated backed bladelets, (Left to right) Loc.3.1. (13) Obliquely- truncated bladelet, Loc.1.1B. (14) Broken obliquely-truncated bladelets, Loc. 4.1B.

Table 3. Characteristics of microburin technique for Wādī Ḥisbān Epipalaeolithic sites.

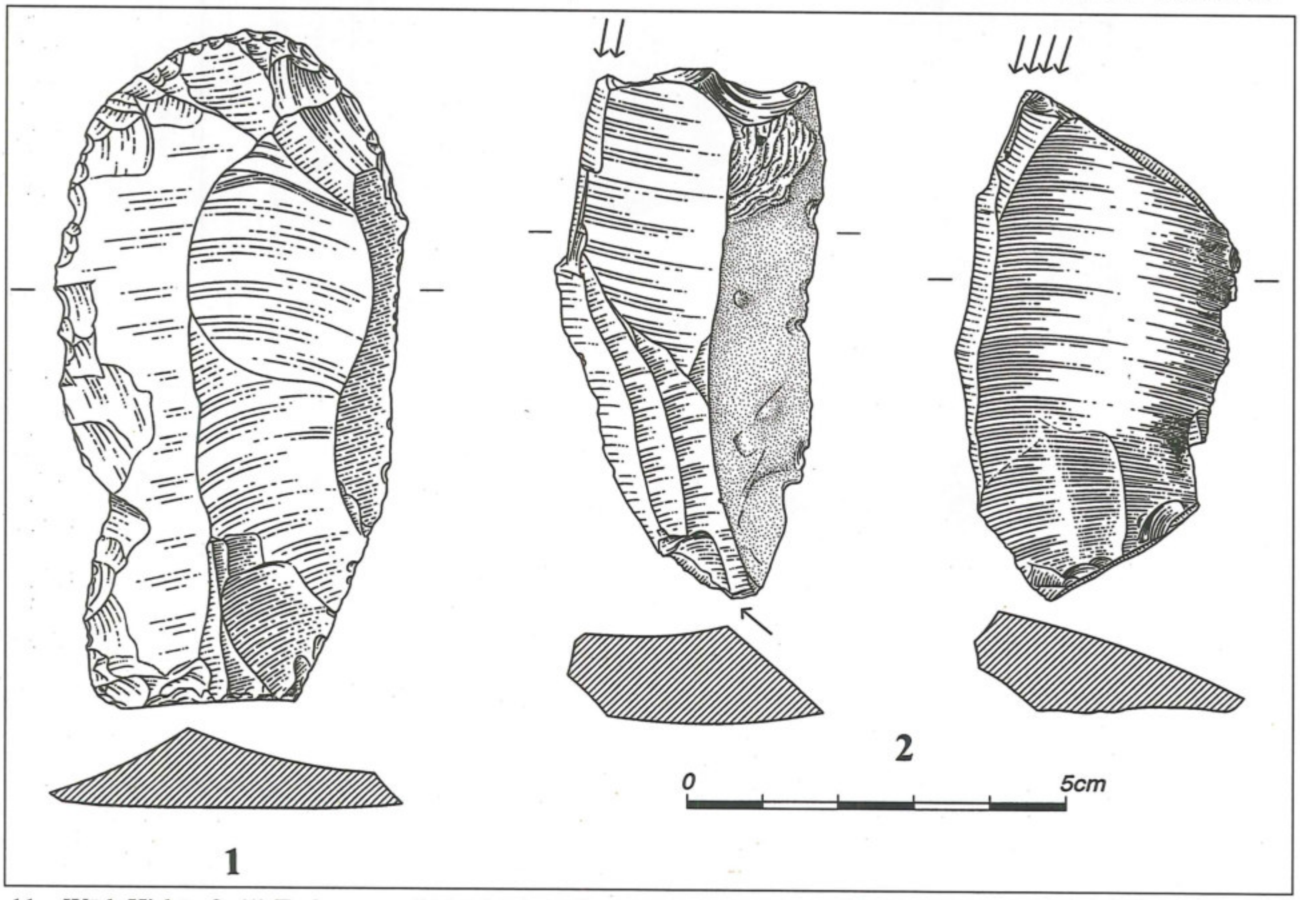
Microburin type	Wadi Ḥisbān 2		Wādī Ḥisbān 5, spot 1 (Loc. 1.9-1.13)		Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)		Wādī Ḥisbān 6 (Loc. 3.1-5.4)	
	N	%	N	%	N	%	N	%
Microburin, distal on blade	406	46.4	4	33.3	-	-	7	28.0
Microburin, proximal on blade	236	26.9	7	58.4	15	100.0	18	72.0
Microburin, orientation indeterminate	64	7.3	-	-	-	-	-	-
Double microburin (scars same side)	88	10.0	-	-	-	-	-	-
Double microburin (scars diagonal)	46	5.3	-	-	-	-	-	-
Microburin, other	7	0.8	1	8.3	-	-	-	-
Trihedral pieces	29	3.3	-	-	-	-	-	-
Total	876	100.0	12	100.0	15	100.0	25	100.0
Restricted microburin index = rIMbt	74.1 %		5.3 %		8.9%		59.5 %	

few burins (Figs. 8: 4-6 and 11:1-2).

Wādī Ḥisbān 5

Site Characteristics and Stratigraphy

Wādī Ḥisbān 5 overlies Wādī Ḥisbān 2, intercalated between that lower site and the surface of the terrace. It is visible as a thin, distinct band of outcropping archaeological material in the bank of the wadi extending over a distance of 45 m, about half a metre from the top of the terrace. Two excavation pits were positioned twenty metres apart in order to intercept this rich horizon (see Fig. 2). The easterly one (Spot 1) was positioned on a raised knoll of the sediment which af-



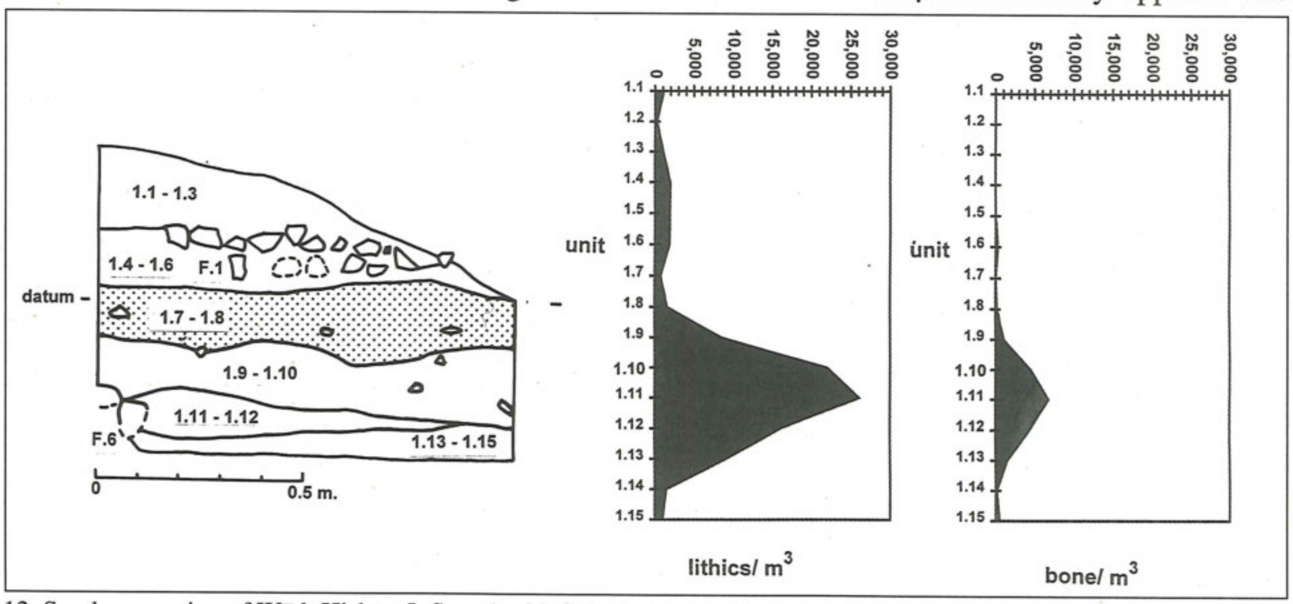
11. Wādī Ḥisbān 2: (1) Endscraper. (2) Multiple burin (on straight truncation and on natural surface).

forded the opportunity to excavate down through the deposit (see Fig. 5), and this was effected as a 1 square-metre pit. The westerly sondage (Spot 2) was a rectangular cutting excavated into the cliff face.

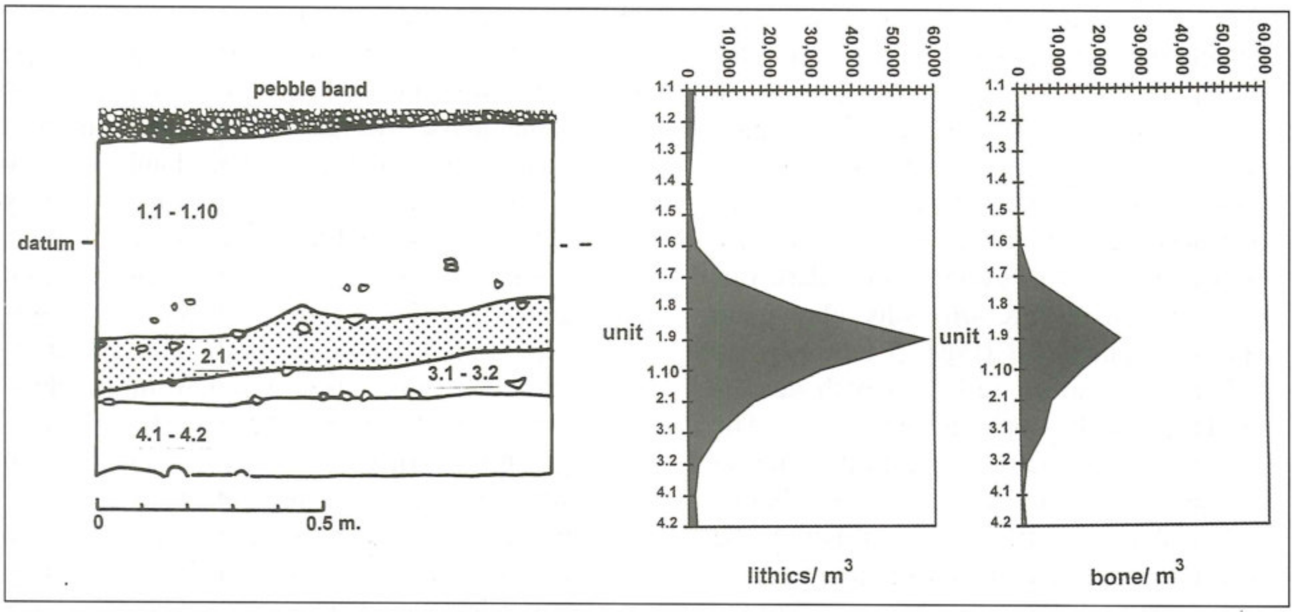
Both pits encountered the culturally rich band about a half metre below the terrace surface. In Spot 1 this comprised a dark yellowish-brown (10YR 4/6) silty clay loam deposit, Locus 1.7-8 (Figs. 5 and 12), including grey-stained sediment with numerous flecks of charcoal and burnt bone. The burnt inclusions bestowed a darker hue on this deposit than on those above and below (yellowish-brown 10YR 5/8), although the latter two consisted of a similar silty clay loam. In Spot 1 constructed features (in the form of hearths) were absent from the dense artefact band, however several rebuilt versions of a stone hearth (F. 1) were found both above it at a depth of 0.25 m, and another (F.6) below it at the bottom of the pit at a depth of 0.75 m (Fig. 12). Chert artefacts and burnt animal bone fragments reach a sharp peak of abundance in the dark-yellowish-brown stratum (Fig.12) and in the underlying sediments (Loci 1.8-12). Reduced quantities of the same types of artefacts and burned bone fragments occur both above and below the dense band throughout the excavated deposits.

Spot 2 was placed twenty metres to the west of Spot 1, designed to intercept the same dense artefact band which outcrops continuously along the wadi bank between them. Spot 2 like Spot 1 yielded a sharply defined band of lithic artefacts, burnt bone fragments and charcoal flecks encountered at 0.45 - 0.5 m below the wadi terrace surface (Fig. 13). The cultural stratum is stratified near the base of a half-metre thick fine-grained deposit (Loc. 1.1-10), comprising a dark yellowish-brown (10YR 4/6) silty clay loam. A few centimetres below the culturally rich band is a change to a coarser-grained deposit (Loc 2.1) containing numerous rounded pebbles. The silty layer (locus 1) is also capped on the surface of the terrace by a pebble band which evidently represents the course of a former wadi channel overlying the site. No structural features such as those discovered in Spot 1 were encountered in the excavation of Spot 2.

It is uncertain how far the artefact scatter registered in the excavations of spots 1 and 2 extended in the north-south direction. However it is suggestive that lithics and stone hearths can be found at a similar altitude below the surface along the south bank of Wādī Ḥisbān directly opposite this



12. Southern section of Wādī Ḥisbān 5, Spot 1 with flaked stone and faunal densities from the excavation.



13. Northern section of Wādī Ḥisbān 5, Spot 2 with flaked stone and faunal densities from the excavation.

site across the wadi, a distance of more than 100 m away, and it remains possible that these occurrences relate temporally to those investigated at site Wādī Ḥisbān 5.

A sample of burnt bone from Spot 1, Locus 1.11, was submitted for radiocarbon dating, yielding a determination of 9,200 ± 350 bp (ANU-9404) on the inorganic apatite fraction. Although this date is over two thousand years later than the bone apatite date (11,560 ± 250 bp, ANU-8469b) from the underlying Wādī Ḥisbān 2 site, it is still unreasonably too recent for an Epipalaeolithic site of this type and indicates later contamination of the bone. Further samples of charred plant material await testing.

Fauna

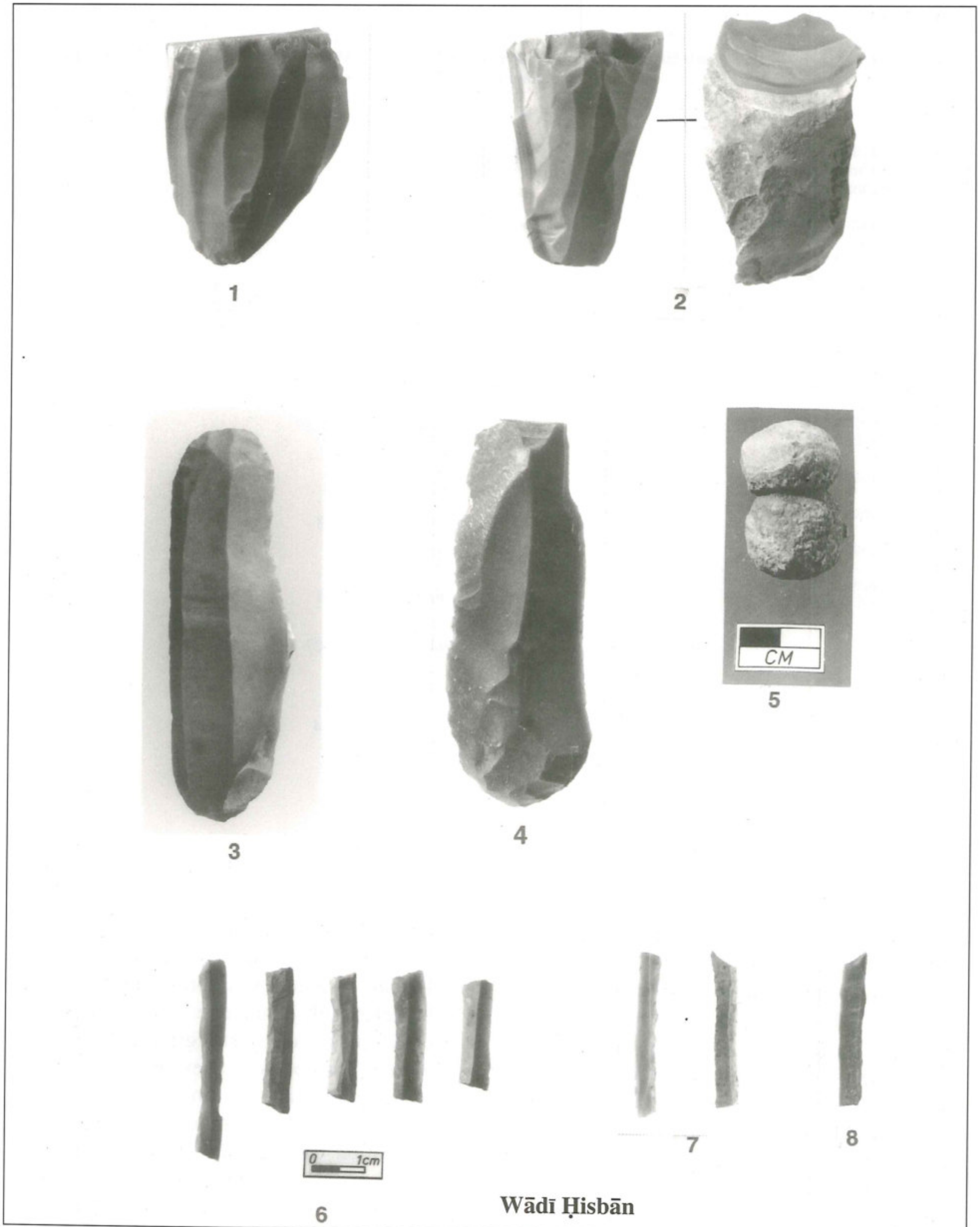
The composition of the bone assemblage is similar to the situation in Wādī Ḥisbān 2, where surviving bone occurs mainly as small and broken burnt fragments. Mean bone fragment density varies from 3,576 fragments per cubic metre in Spot 1 to 10,600 fragments per cubic metre in Spot 2 (see Table 1). These concentrations are much lower than for Wādī Ḥisbān 2, although peak densities in the rich cultural band of Wādī Ḥisbān 5 are higher at 6,720 per cubic metre for Spot 1 and 24, 267 per cubic metre for Spot 2 (Figs. 12-13). The faunal remains from all layers of this site were too fragmentary to identify any taxa.

The Flaked stone Assemblage

For the purposes of this analysis two samples were taken from five successive excavation units in the dense artefact bands in Spots 1 and 2 and are presented here separately (Tables 2-4). For Spot 1 this includes the five units 'Locus 1.9 - 1.13' and for Spot 2 the six units 'Locus 1.7 to 3.1'.

In terms of the initial stages of core reduction, Wādī Ḥisbān 5 is similar to Wādī Ḥisbān 2. Bladelet cores are made from the same alluvial pebbles obtained from the nearby wadi, with a simple, single platform produced by flaking one end of the pebble (Fig. 14:1-2), and once again, considerable cortex is often left on the core (Fig. 14:2). The larger tools, few in number (Table 2), are also similar, and consist mainly of scrapers, including well-made endscrapers on blades (Fig. 14:3) and a burin/ scraper (Fig. 14:4).

The microlithic component of Wādī Ḥisbān 5 signals a major departure from the underlying site Wādī Ḥisbān 2 and its as-



14. Wādī Ḥisbān 5: (1 - 2) Bladelet cores, Spot 1, Loc.1.12. (3) Double endscraper, Spot 1, Loc. 1.12.(4) Burin / endscraper, Spot 1, Loc. 1.10. (5) Grooved pebble, spot 1, Loc. 1.12. (6) Trapezes. Spot 1, Loci 1.11 and 1.12. (7 and 8) Broken backed blade, Loc. 1.13.

Table 4. Wādī Ḥisbān microlithic types.

Artefact type	Wadi Ḥisbān 2		Wādī Ḥisbān 5 spot 1 (Loc. 1.9-1.13)		Wādī Ḥisbān 5 spot 2 (Loc. 1.7-3.1)		Wādī Ḥisbān 6 (Loc. 3.1-5.4)	
Microliths	N	%	N	%	N	%	N	%
Retouched bladelet	-	-	2	0.9	1	-	1	6.6
Curved retouched bladelet	-	-	-	-	-	-	1	6.6
Straight-truncated retouched bladelet	-	-	-	-	-	-	-	-
Obliquely-truncated retouched bladelet	-	-	8	3.7	-	-	1	6.6
Alternately retouched bladelet	-	-	1	0.5	-	-	-	-
Bladelet with alternating retouch	-	-	-	-	1	-	-	-
Broken retouched bladelet	-	-	1	0.5	-	-	-	-
Straight-truncated bladelet	1	0.3	-	-	-	-	-	-
Obliquely-truncated bladelet	1	0.3	3	1.4	14	9.2	-	-
Convex truncated bladelet	1	0.3	-	-	-	-	-	-
Concave-truncated bladelet	9	3.1	-	-	-	-	-	-
Backed bladelet	5	1.8	8	3.7	-	-	2	13.3
Curved backed bladelet	1	0.3	-	-	-	-	1	6.6
Pointed backed bladelet	12	4.2	-	-	2	-	-	-
Microgravette	1	0.3	-	-	-	-	-	-
Straight-truncated backed bladelet	-	-	36	16.7	4	-	-	-
Obliquely-truncated backed bladelet	-	-	58	27.0	63	41.0	-	-
Convex truncated backed bladelet	-	-	1	0.5	-	-	1	6.6
Concave-truncated bladelet	-	-	-	-	-	-	-	-
Broken backed bladelet	29	10.1	86	40.0	41	27.0	-	-
Other	-	-	-	-	1			
Sub-total	60	21.0	204	94.9	127	83.0	7	46.7
Geometric microliths								
Triangle	-	-	-	-	1	0.7	1	6.6
Trapeze	-	-	11	5.1	24	15.6	-	-
Parallelogram	-	-	-	-	1	0.7	-	-
Lunate	-	-	-	-	-	-	7	46.7
'Tiny triangle'	151	52.8	-	-	-	-	-	-
'Tiny trapeze'	5	1.8	-	-	-	-	-	-
'Tiny lunate'	22	7.6	-	-	-	-	-	-
Broken geometrics	48	16.8	-	-	-	-	-	-
Sub-total	226	79.0	11	5.1	26	17.0	8	53.3
Total	286	100.0	215	100.0	153	100.0	15	100.0

semblage of tiny triangles produced *via* the microburin technique. Whereas the restricted microburin index for Wādī Ḥisbān 2 is 74% (Table 3), microburins in Wādī Ḥisbān 5 are few and seemingly incidental, with a restricted microburin index (rIMbt) of only 5.3% for Spot 1 and rIMbt = 8.9 % in Spot 2. The type of 'tiny triangle' characteristic of Wādī Ḥisbān 2 is completely lacking here. There was a single triangle from Wādī Ḥisbān 5 (Spot 2, Locus 1.10), but at 10.8 mm long (even though it has one end snapped off) and 6.3 mm wide it is larger than the Wādī Ḥisbān 2 type and was not made by the microburin technique. Instead, the microlithic component of Wādī Ḥisbān 5 features a long, gracile backed bladelet with either one or both ends truncated, most usually straight or obliquely. In a small number of cases the bladelets are truncated but lack backing.

The retouch attributes of backing and truncation (usually straight or oblique) are thus variously combined to give, in a technical sense, a very similar series of products, but in a strict typological sense a great variety of microlith and geometric microlith types such as 'Obliquely-truncated backed bladelet', 'Straight-truncated backed bladelet', or in the cases where both ends are truncated - a long, gracile 'trapeze' (Table 4). The trapezes (Figs. 9:5 and 14:6) are much fewer in number than the singly truncated pieces. However, the caveat must be added that only eleven of these are entirely complete. The others were judged to have sufficient characteristics to be identified as various types of complete backed and truncated bladelets rather than the less informative class of 'broken backed bladelets'. These specimens usually lack only a short terminal fragment. The justification for this method is that very short terminal truncated fragments, which one would expect to occur if these items had been broken trapezes, are not present in the assemblage. Nevertheless, as Barton and Neeley (1996:142) point out, this is a difficult issue in Epipalaeolithic typology.

It is also worth observing that a considerable number of backed blade segments are snapped obliquely (Fig. 14:7-8), giving the impression that the direction of the snap has been controlled to produce an oblique truncation at one or both ends. It is difficult to be sure whether this was an intentional outcome as opposed to a product of accidental breakage, but this breakage type was rare or absent at the Wādī al-Ḥammeh Epipalaeolithic sites (Edwards *et al.* 1996) which also featured long, gracile backed blade products frequently broken (probably through treadage) with a straight snap.

With their major shape and retouch attributes recurring in different combinations, the Wādī Ḥisbān 5 microlith products give the distinct impression of being integrated in a reduction sequence which begins with the snapping and truncation of backed bladelets, mostly at one end but less often at both ends, to ultimately produce a long, gracile trapeze, or what has sometimes been called on account of its length and gracility a 'Prototrapeze' (Bar-Yosef 1970: 218; Fellner 1995a: 131). If so, one would expect the trapezes to be shorter on average than the single truncated backed bladelets, and this is indeed so, with the trapezes averaging 26.2 mm in length (N = 36, SD = 6.6) compared with complete non-geometric microliths averaging 29 mm (N = 11 , SD = 4.9). But one must caution that while these data are consistent with the model of trapezes being a reduction product of single truncated bladelets, they do not conclusively prove the case, because it should be expected that the doubly truncated trapezes should in any case be shorter on average than the singly truncated specimens even if they were not reduced indirectly from them, but fashioned *de novo* from primary bladelets.

In addition to the flaked stone, a small incised pebble with a grooved waist was found in Spot 1, Locus 1 (Fig. 14:5). This is an interesting and apparently unique piece from the Late Epipalaeolithic, adding to the rare corpus of pre-Natufian incised rock art.

Wādī Ḥisbān 6

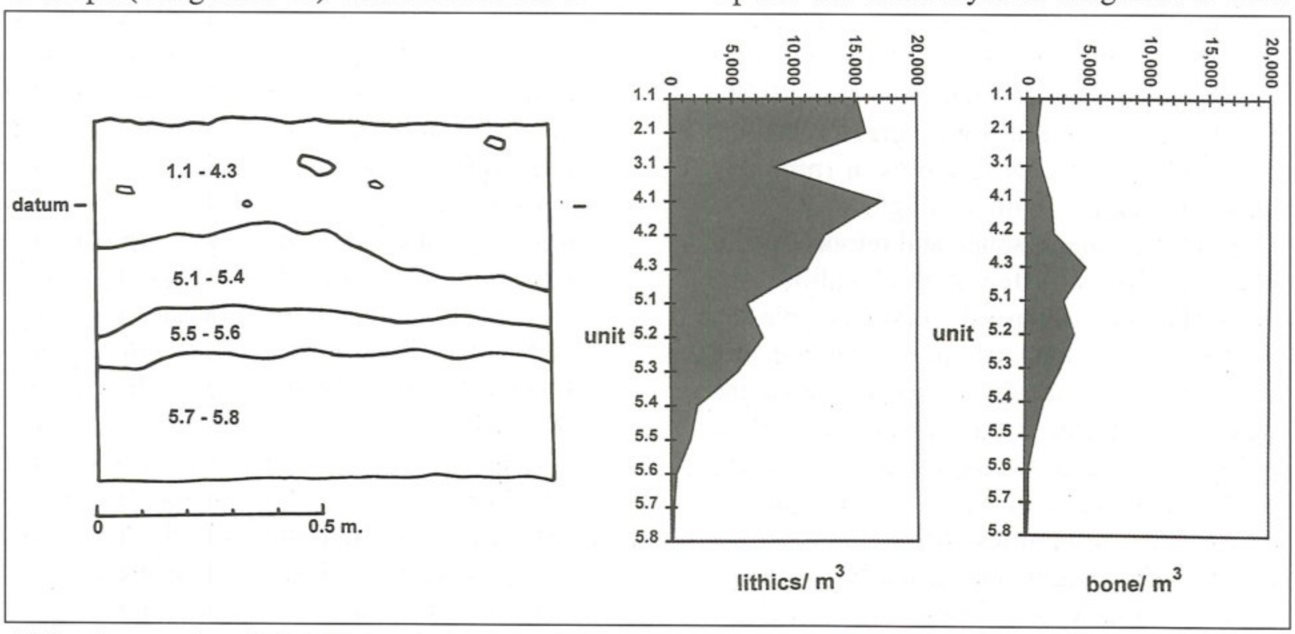
Site Characteristics and Stratigraphy

Wādī Ḥisbān 6 is the uppermost site in the sequence, located about 100 metres further west of Wādī Ḥisbān 5 (see Fig. 4). Flaked stone artefacts including backed lunates, backed and straight truncated bladelets, small multiple platform cores, and numerous burnt and multi-coloured pieces of chert debitage were found scattered over a circular area of about 600-800 square metres. The artefact scatter was limited to a raised circular remnant of sediment, a situation which may account for the restriction of Natufian lithics to this part of the terrace. It should be noted that while Wādī Ḥisbān 6 (at -150.1 m) is a metre lower in absolute altitude than the earliest site Wādī Ḥisbān 2 (at -149.1 m), this is accounted for by the riftward tilt of the terrace in this area (most clearly evident in Fig. 3). The presence of eroded pottery sherds and occasional metal items such as soft drink can ring-pulls embedded in topsoil together with eroding Natufian lithics indicates that the terrace top has remained stable since the Natufian period, at which time sediment aggradation in the wadi must have ceased.

An excavation pit measuring 2 x 1 m was placed over an eroding patch of burnt pebbles. Upon excavation of the deposits to ten centimetres depth (Fig. 7), three distinct features of this type were found resting on Locus 3.1, a compacted Very Pale Brown silty clay, (10YR 7/4). The first one (F.1) consisted of a mass of rounded and angular limestone fragments and alluvial pebbles, many of which were reddened or blackened by burning. Next to this, some 0.3 metres away, lay a concentration of similar material (F.2), albeit arranged in a semi-circular pattern. A third loose scatter of burnt pebbles (F.3) was distributed in the western half of the pit.

Underneath the stone arrangement F.2 lay a dark patch of burnt sediment, at a depth of 0.2 m (Loc. 4.3a). Some indeterminate animal bone fragments were retrieved from this area. Ten centimetres away to the west a small, roughly-hewn limestone bowl (see Fig. 10:10) lay upside down, embedded in the lower unit Locus 5.3a. The eastern half of the pit (designated 'a') was excavated to a depth of 0.83 m (Fig.15). Although stone arrangements were restricted to the upper quarter metre of the pit, burnt stone fragments continued to occur down to the bottom. Lithics of Natufian type, animal bone fragments, gastropods, fragments of red ochre and burnt sediments also continued to the base of the pit, though artefacts occurred in reduced numbers compared to the top quarter metre. Artefact densities were highest coincident with the stone clusters in the top quarter metre but burnt animal bone fragments reached their highest densities in the quarter metre below this (Fig. 15).

A radiocarbon determination was run on the collagen fraction of burnt bone from Locus 4.3, yielding a determination of 5,740 ± 220 bp (ANU-9406), once again far too recent like the bone dates from the earlier two sites. In this case we have begun running our batch of samples in other materials. A determination run on the terrestrial gastropod *Xeropicta vestalis*, also from Locus 4.3, yielded a date of 12,950 ± 140 bp (ANU - 9407). This date is early, even for an Early Natufian site, however determinations of a similar antiquity have been found from widely-spaced Natufian sites, for example 12,950 bp for the basal layer at Mugharet el-Wad



15. Southern section of Wādī Ḥisbān 6 with flaked stone and faunal densities from the excavation.

(Weinstein-Evron 1991), 12,800 - 12,100 bp for the Wādī Judayid (J2) site (Henry 1995: 321) and 12,900 - 12,100 bp for Bayḍa (Byrd 1989b: 26).

Fauna

Wādī Ḥisbān 6 continued the pattern of the earlier two sites in yielding hundreds of small, smashed fragments of burned bone (Table 1). Virtually no bone elements were retrieved from this assemblage except for a single phalanx from a small mammal. Otherwise, the terrestrial gastropods *Xeropicta vestalis* and *Sphincterochila zonata* were common, as they usually are in these terrace sediments, and some freshwater gastropods *Melanopsis praemorsa* were present. A single phalanx of the Freshwater crab *Potamon potamon* was found. The novel addition in this sequence was the smattering of *Dentalium sp.* fragments that occurred generally throughout the site's deposits. Both ribbed and unribbed types occurred but all were very short fragments and it was not possible to source them from either the Mediterranean or Red Seas.[5]

The Flaked Stone Assemblage

Wādī Ḥisbān 6 has a typically Natufian lithic industry, quite different in character than those of the earlier sites. A wide range of coloured cherts were selected for use. Double lustre (both matt and highly lustrous) on some artefacts attest to the use of heat treatment on the raw material. Short flakes were produced from globular, multiple platform cores (Fig. 10:7), although there were a few flakes of quartzite (Fig. 10:8), an unusual material in the east Jordan Valley Epipalaeolithic. Compared to the total numbers of flaked stone pieces there is a very small number of retouched lithics, (eighteen in all) which occurred throughout the deposits down to locus 5.3, but none occurred below this. Except for a single scraper (Fig.10:9) all retouched tools are microlithic. Half of them are non-geometric microliths, including truncated and backed bladelets (Figs. 9:12,14 and 10:12) typical of Natufian sickle elements. Three oblique truncations on broad bladelets were found: one on a complete bladelet (Figs. 9:13 and 10:13) and two on broken sections (Figs. 9:9 and 10:14). The geometric microliths comprise five abruptly backed lunates (Figs. 9:7,10 and 10:11), and a single example each of a triangle and a trapeze (Figs. 9:6,8 and 10:11). The geometrics are distributed evenly from the topmost unit down to Locus 5.3.

Chronology, Comparisons and Further Prospects

Chronology

The three Epipalaeolithic sites of Wādī Ḥisbān 2, Wādī Ḥisbān 5 and Wādī Ḥisbān 6 provide an excellent opportunity to chronicle the development of the Middle to Late Epipalaeolithic in the eastern Jordan valley region, north-east of the Dead Sea. Each of the sites is rich in artefacts, uncontaminated by intrusive artefacts, separated one from the other by intervening deposits and superimposed in a straight forward manner. These considerations obviously commend the acquisition of a radiocarbon dating series but as described above these efforts have so far not been very successful. Accordingly, a conclusive chronological discussion is premature here, though several preliminary observations and comparisons are pertinent.

Wādī Ḥisbān 2 is a new addition to the so-called 'Triangle phase' of the Epipalaeolithic (Fellner 1995a) known from a small number of sites including Nahal Oren, where triangles occur from Layers IX through V though peaking in number in Level VII (Noy *et al.* 1973: 81-84); Ein Gev IV (Bar-Yosef 1970: 126-130) which shares with Wādī Ḥisbān 2 the microgravette form, backed

5. The Dentalium specimens were kindly examined by Dr David Reese of the Field Museum of Natural History, Chicago.

bladelets, concave truncations, small triangles and extensive use of the microburin technique; Nahal Hadera V (Saxon *et al.* 1978: 262); and Wādī Jilat 6, Upper Phase (Byrd 1989a), which Wādī Ḥisbān 2 strongly resembles in its production of diminutive triangles via the microburin technique, and even in its sole microgravette, though Wādī Ḥisbān 2 entirely lacks the larger scalene triangles of Jilat 6. Wādī Jilat 6, Upper Phase, is the only well-dated site of the 'Triangle Phase' at 16,000 - 15,500 bp (Garrard and Byrd 1992).

Diminutive triangles made by microburin technique also occur in 'Nizzanan' (Mushabian) sites in the Negev, for example at Azariq IX, Hamifgash IV and Shunera III (Goring-Morris 1987: 147-200), but they consistently recur there with other forms such as scalene bladelets and arched-backed bladelets that are entirely lacking from Wādī Ḥisbān 2. So, although the erection of a short-lived 'Triangle Phase' (after Fellner 1995a) may prove to be warranted, triangles do co-occur with a variety of other microlithic forms in several sites across the Levant and the pressing need is clearly to radiocarbon date more of the sites that contain them before we can be sure.

Although the 'Triangle Phase' is dominated typologically by its diminutive geometric microliths, it is considered to be earlier and apparently unrelated to the later Geometric Kebaran sites which are clustered mostly in the Sinai and Negev, and which feature larger geometric microliths in the form of short, thick trapezes and rectangles. The dates of 9,490 and 11,560 bp for Wādī Ḥisbān 2 seem unlikely to be reliable granted the site's strong similarity to Wādī Jilāt 6, Upper Phase, and also given the date of 12,950 bp from the uppermost Natufian site Wādī Ḥisbān 6. Similarly, the earliest attempt at dating Wādī Jilat 6 yielded two anomalously late dates of ca. 11,500 bp from the underlying Jilat 6 middle phase (Phase B), one of which at least was also run on burnt bone (Garrard and Byrd 1992).

The date from Wādī Ḥisbān 6 comes from halfway up the sequence in Locus 4.3 (Fig. 15). We hope to run further paired datings on the terrestrial gastropod *Xeropicta vestalis* and the freshwater gastropod *Melanopsis praemorsa* to evaluate the date already obtained, and indeed to gauge the temporal extent of Wādī Ḥisbān 6 which may be extensive. The few lunates from Wādī Ḥisbān 6 are abruptly retouched, which would suggest a Late Natufian age, and they all derive from deposits above the radiocarbon date, but microburins continue in every unit from the top of the excavations to the one below Locus 4.3. Wādī Ḥisbān 6 has an extremely small percentage of retouched lithics compared to the two earlier Epipalaeolithic sites, and in this regard it is similar to the recently excavated Natufian site of Wādī Khawwan 1 from Ṭabaqāt Faḥl (Edwards *et al.* 1998).

The middle site in the sequence, Wādī Ḥisbān 5, may herald the appearance of an early facies of the Geometric Kebaran industry following the Triangle phase of Wādī Ḥisbān 2. It is characterised by a sharp decrease in microburins (only incidentally produced) and numbers of elongate trapezes or 'prototrapezes' (the latter seems an anachronistic term since it defines an artefact type solely in relation to future developments).

The abandonment of the microburin technique in Wādī Ḥisbān 5 is comprehensible in terms of its microlithic component. As Goring-Morris (1996: 132) notes the microburin technique is a useful way of controlling oblique snaps, and so was useful in the delicate process of producing the 'tiny triangles'. Since the trapezes of Wādī Ḥisbān 5 can easily be manufactured by simply trimming the primary blades' terminations, then the microburin technique is unnecessary.

If Wādī Ḥisbān 2 equates in time with Wādī Jilat 6, Upper Phase, then Wādī Ḥisbān 5 could be expected to date in the interval 15,500 -14,000 bp. In the earliest east Jordan Valley Epipalaeolithic site of Wādī al-Ḥammeh 26, dated 19,500 bp (Edwards *et al.* 1996), the elongate geometrics are absent, but one appears in Wādī al-Ḥammeh 31 dated before 16,800 bp. The subsequent site Wādī al-Ḥammeh 50, dated 15,300-14,500 bp, takes a different turn and does not include any backed geometrics or non-geometric microliths at all. Only a secure radiocarbon series from the Wādī Ḥisbān sites will tell whether the differences between them and the Wādī al-Ḥammeh sequence are due to temporal or geographic differences.

Patterns and Production of Levantine Epipalaeolithic Microliths

The technological and typological diversity of the Wādī Ḥisbān lithics makes for instructive evidence regarding recent debates over the rationale behind the production of Levantine microliths. Neeley and Barton (1994) have argued that the development of geometric microliths arose as a means of solving raw material shortages and were produced from the further reduction of non-geometric microliths. Ultimately, they deny the existence of successive Levantine cultural entities characterised by differing sets of formally patterned geometric microliths. These arguments appear to be grounded in their strongly held doctrine that microlithic types were not ethnic markers but the inadvertent outcomes of reduction strategies. In doing this they specifically argue that microlithic types (including geometric ones) were not intended to be made in their final forms in one operation, nor that any predetermined, discrete types actually exist. Barton and Neeley's paper drew several strong responses from the regional specialists (Fellner 1995b; Kaufman 1995; Goring-Morris 1996; Phillips 1996; Henry 1996), who in various measures highlighted problems with it. As Fellner (1995b:383) points out, it is unnecessary to deny the existence of the well demonstrated Levantine Epipalaeolithic cultures because one does not believe them to be unambiguous or straightforward ethnic markers of specific human social groups.

We disbelieve this interpretation ourselves. However, in this case, the Wādī Ḥisbān sites conclusively demonstrate that the production of geometric microliths, whether long and thin or extremely small, is not associated with economy of raw materials nor that geometrics are necessarily derived from the resharpening of non-geometric ones. In the first place, Wādī Ḥisbān forms an abundant chert source and this fact is reflected in the profligacy of the use of chert. Cores are minimally worked, rarely if ever rejuvenated and the microliths lie embedded in piles of unretouched but suitable flake and blade blanks. As to the other argument about the derivation of geometrics from non-geometrics, the 'tiny triangles' of Wādī Ḥisbān 2 are produced *de novo* by the microburin technique and have clearly been produced by a separate reduction pathway than the one followed to make the non-geometric backed bladelets.

This is not to deny that in some instances microlithic types grade together in form as Goring-Morris (1996: 131) points out, for example in the case of trapezes and rectangles. For the extremely diminutive triangles of Wādī Ḥisbān 2, the retouch on the tiny trihedral blank was not always added quite symmetrically and in such cases the result is a tiny lunate or in some cases a tiny trapeze. Subtle transitions between microlithic types also occur in Wādī Ḥisbān 5. Its elongate trapezes fit nicely into a scenario of further reduction from non-geometric microliths, though it seems that the case is difficult to isolate from an alternative one where both the non-geometrics and geometrics were simultaneously desired endpoints of the reduction process. But these instances are quite unrelated to the reality that many quite different microlithic and geometric microlithic types occur in different time periods and cannot be reduced to a single reduction process. Barton and Neeley deny this, a belief which is exemplified in their Figure 6 on their 1994 paper which shows numerous types of geometrics such as triangles, lunates and trapezes produced as outcomes of a single reduction pathway. (Taken at face value the diagram demands that all types of geometrics underwent a stage of existence as La Mouillah points, a quite unfeasible scenario since La Mouillah points were quite restricted in time and space within the Levantine Epipalaeolithic). The clear message from Wādī Ḥisbān is that a unidimensional explanation in terms of reduction strategies cannot explain the variability or form in the microliths of Wādī Ḥisbān 2 and Wādī Ḥisbān 5.

Further Prospects

Finally, we return to the research aims outlined in the Introduction. Certainly the novelty of the Wādī Ḥisbān sequence lived up to expectations: many of the other aims will ultimately depend on the success of a second round of radiocarbon determinations.

Animal species representation amongst the charred and smashed bone fragments was poor, though at least the condition of the faunal remains raises the interesting question about whether the bone assemblage reflects butchering and cooking methods or preservational factors. The latter is suspected, though it is hoped that the analysis of sediment thin sections will shed light on whether unburned bone had been selectively attacked chemically and removed from the deposits.

In terms of types, Wādī Ḥisbān 2 and 5 fit well within the range anticipated from the pre-Natufian Epipalaeolithic, in that they consist of relatively small sites densely packed with lithics and animal bone fragments, and contain few architectural embellishments beyond stone hearths. Wādī Ḥisbān 6 however presents a striking contrast with the larger architecturally and artefactually complex Early Natufian sites like the nearby Jericho (Tall as-Sulṭān) across the Jordan (Kenyon 1981), and Wādī al-Ḥammeh 27 to the north. Once again it is like Wādī Khawwan 1 in this regard (Edwards *et al.* 1998) and also in the eclectic nature of its artefact types and imported marine molluscs.

The presence of a Natufian site in the top levels of the terrace also bears on the question of the disappearance of Lake Lisān in the terminal Pleistocene. Incision by Wādī Ḥisbān after the deposition of Wādī Ḥisbān 6 may have been a response to a new lowered base level, as was the case in Wādī al-Ḥammeh (Macumber and Head 1991). It is therefore of great relevance to this event to date the top of the Wādī Ḥisbān 6 sediments.

The sites were not rewarding in terms of charred plant remains, though these may ultimately prove invaluable samples for AMS dating, as will samples of *Melanopsis* and *Xeropicta* molluscs. More radiocarbon dates need to be gained before many of the issues raised above can be usefully revisited, and this search will form our next research aim.

Phillip C. Edwards
Department of Archaeology
La Trobe University
Bundoora, 3083
Victoria,
Australia.

M. John Head
National Laboratory of Loess
and Quaternary Geology
Chinese Academy of Sciences
22-2 Xi Ying Rd
Xian 710054
Shaanxi
Republic of China

Phillip G. Macumber
Ministry of Water Resources
PO Box 213, Code 112
Ruwi
Sultanate of Oman

Bibliography

Bar-Yosef, O.
1970 *The Epi-palaeolithic cultures of Palestine.* Unpublished Ph.D. thesis, Jerusalem: Hebrew University.

Barton, C.M. and Neeley, M.P.
1996 Phantom cultures of the Levantine Epipalaeolithic. *Antiquity* 70: 139-147.

Byrd, B.F.
1989a Late Pleistocene settlement diversity in the Azraq Basin. *Paléorient* 14/2: 257-264.
1989b *The Natufian encampment at Beidha: Late Pleistocene adaptation in the southern Levant.* Moesgord: Jutland Archaeological Society.

Edwards, P.C.
1991 Wadi Hammeh 27: an Early Natufian site at Pella, Jordan. Pp. 123-148 in O. Bar-Yosef and F.R. Valla (eds), *The Natufian Culture in the Levant.* Ann Arbor: International Monographs in Prehistory.

Edwards, P.C., Macumber, P. G. and Green, M.K.
1998 Investigations into the early prehistory of the east Jordan Valley: results of the 1993/1994 La Trobe University survey and excavation season. *ADAJ* 42: 15-39.

Edwards, P.C., Macumber, P.G. and Head, M. J.
1996 The Early Epipalaeolithic of Wadi al-Hammeh. *Levant* 28: 117-132.

Fellner, R.O.
1995a *Cultural change and the Epipalaeolithic of Palestine.* Oxford: BAR Int. Ser. 599.
1995b Technology or typology?: a response to Neeley & Barton. *Antiquity* 69: 381-83.

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

Goring-Morris, A.N.
1996 Square pegs into round holes: a critique of Neeley and Barton. *Antiquity* 70: 130-135.
1987 *At the Edge: Terminal Pleistocene hunter-gatherers in the Negev and Sinai.* Oxford: BAR Int. Ser. 361 (i).

Henry, D.O.
1996 Functional minimalism versus ethnicity in explaining lithic patterns in the Levantine Epipalaeolithic. *Antiquity* 70: 135-136.
1995 *Prehistoric cultural ecology and evolution: insights from southern Jordan.* New York: Plenum Press.
1974 The utilization of the microburin technique in the Levant. *Paléorient* 2: 389-398.

Kaufman, D.
1995 Microburins and microliths of the Levantine Epipalaeolithic: A Comment on the Paper by Neeley and Barton. *Antiquity* 69: 375-381.

Kenyon, K. M.
1981 Excavations at Jericho: Volume III. *The Architecture and Stratigraphy of the Tell.* London: British School of Archaeology in Jerusalem

Macumber, P.G.
1992 The geological setting of Palaeolithic sites at Tabaqat Fahl, Jordan. *Paléorient* 18/2: 31-44.

Macumber, P.G. and Head, M. J.
1991 Implications of the Wādī al-Ḥammeh sequences for the terminal drying of

Lake Lisan, Jordan. *Palaeogeography, Palaeoclimatology, Palaeoecology* 84: 163-173.

Neeley, M.P. and Barton, C.M.
1994 A new approach to interpreting late Pleistocene microlith industries in southwest Asia. *Antiquity* 68: 275-288.

Neev, D. and Emery, K.O.
1967 The Dead Sea, depositional processes and environments of evaporites. *Geological Survey of Israel Bulletin* 41: 1-147.

Noy, T., Legge, A.J. and Higgs, E.S.
1973 Recent excavations at Nahal Oren, Israel. *Proceedings of the Prehistoric Society* 39: 75-99.

Phillips, J.L.
1996 The real nature of variability of Levantine Epipalaeolithic assemblages. *Antiquity* 70: 137-138.

Saxon, E.
1978 Nahal Hadera V: an open-air site on the Israeli littoral. *Paléorient* 7: 73-91.

Weinstein-Evron, M.
1991 New radiocarbon dates of the Early Natufian of el-Wad Cave, Mt. Carmel, Israel. *Paléorient* 17: 95-98.