

**PRELIMINARY REPORT ON THE
UNIVERSITY OF SYDNEY'S FIFTH
SEASON OF EXCAVATION AT PELLA
IN JORDAN**

by

Anthony McNicoll, Warwick Ball,
Susan Bassett, Phillip Edwards, Phil Macumber,
Dani Petocz, Timothy Potts,
Leanda Randle, Linda Villiers and Pam Watson

Introduction

The University of Sydney commenced its fifth season as partner with the College of Wooster, Ohio, in the Joint Expedition to Pella on 14 December, 1982. Digging ceased on 14 February, 1983, but work on the site continued until 3 March. The staff of the excavations numbered thirty-one, and up to ninety local labourers were employed.¹

This preliminary report is a compilation of contributions from ten members of the team, whose names are appended to the sections which they have written.

During the season excavations were undertaken at Khirbet Fahl and in the surroundings. On the main mound the following areas were dug: III (Middle Bronze and Iron Age occupation), IV (Byzantine, Hellenistic and Iron Age occupation), V (Byzantine church), VI (Roman tombs), XI (Hellenistic/early Ro-

man citadel (?) wall), XIV (Chalcolithic occupation) and XXIII (Medieval and Umayyad occupation). The location of these areas is shown in Figure 1. Other work included the commencement of excavations and a survey in the Wadi Ham-meh system which was recognised as a potentially informative area for research on early hominid activity in the area during Macumber's geo-morphological investigations in 1981. Reports on the palaeopathological and archaeo-botanical studies carried out in the 1982/3 season will appear in the second interim report of the Joint Expedition *Pella in Jordan 2*, scheduled for publication in 1984/5.

In this report the contributions on the excavations are presented in chronological order, followed by summaries of the survey and geomorphological investigations.

Anthony McNicoll

¹ The team consisted of the following: Co-directors Dr. Anthony McNicoll and Mr. Timothy Potts; survey team Mr. Dani Petocz and Ms. Linda Villiers; cataloguers: Dame Margaret Wheeler, Mssrs John Thorne and Ian Biggs; draughtspersons Ms's. Wendy Ball, Kathryn Eriksson and Leanda Randle; conservator Ms. Elizabeth Sandford Willcox; archaeobotanist Mr. George Willcox; house supervisor Ms. Maree Browne; palaeopathologist Mr. Chris Browne; geomorphologist Mr. Phil Macumber; photographer Mr. John Hargreaves; site supervisors Mr. Warwick Ball, Ms. Sue Bassett, Mr. Phillip Edwards, Mr. Jack Hanbury-Tenison, Mr. Stephen Hart, Ms. Leah McKenzie, Ms. Margaret O'Hea, Ms. Yvonne Reynolds, Mr. Ted Robinson, Ms. Kate Streat, Ms. Pam Watson and Mr. Greg Wightman; De-

partment representatives Mssrs. Sultan Shraideh and Hikmat Ta'ani; foreman Mr. Badri Hasan Maadi; cooks Abu Aref and Abu Sami.

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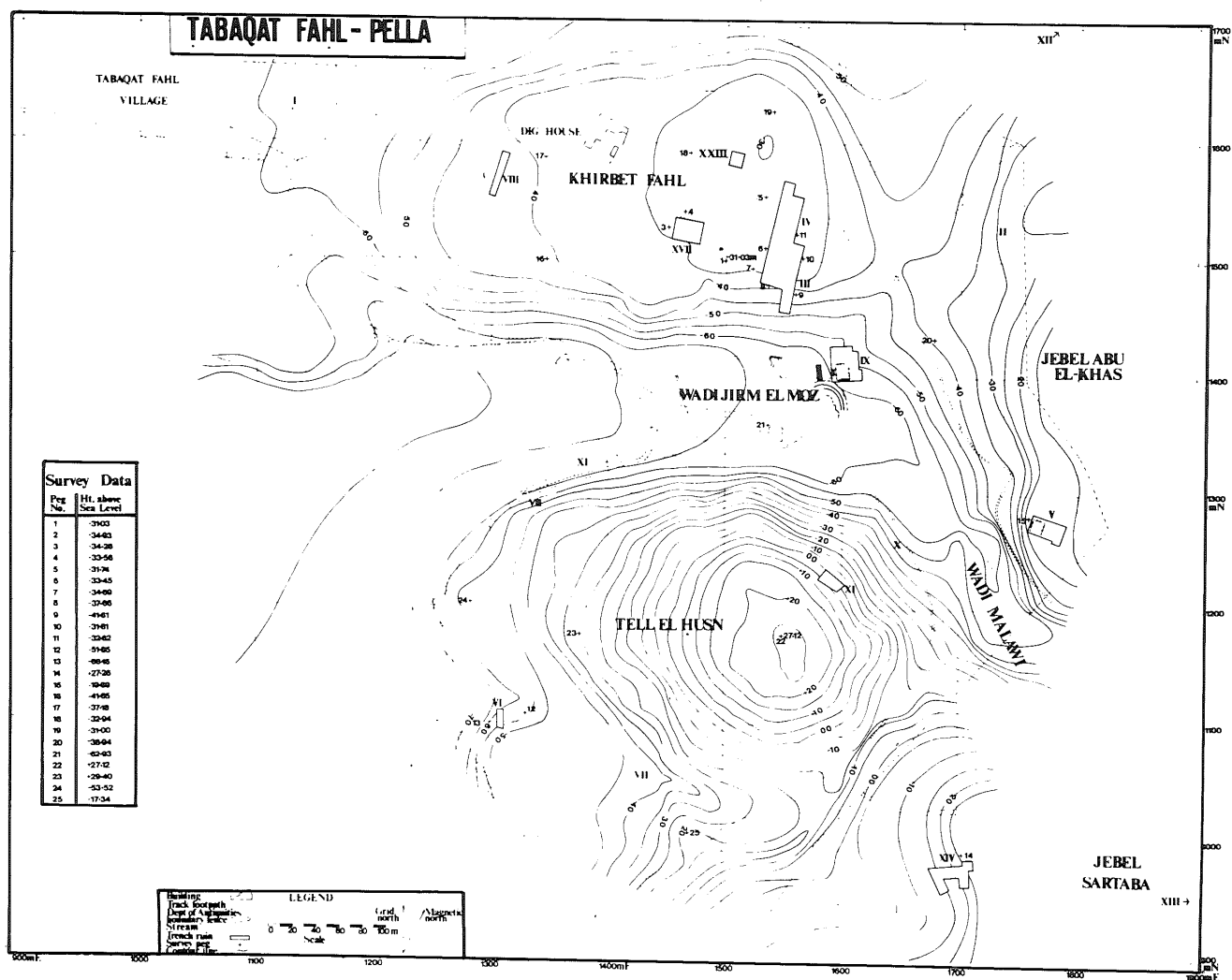


Fig. 1: Pella (Tabaqat Fahl) Excavations. Contour plan showing areas excavated.

Two Epi-palaeolithic Sites in the Wadi Hammeh (Area XX)²

Limited excavations were carried out at two Epi-palaeolithic sites, located respectively near to and at the top of the remnant valley fill in the Wadi Hammeh.

The earlier of the sites, Wadi Hammeh 26, is a Kebaran camp, stratified in natural section due to back incision by the Wadi Himār. Intervening between this and the more recent site of Wadi Hammeh 27, an extensive open-air Natufian settlement, are deposits of silt and travertine up to three metres thick representing the passage of seven millennia.

Wadi Hammeh 26-Kebaran (for location see Fig. 9):

Stratified in a palaeosol directly overlying a conglomerate band, Wadi Ham-

meh 26 is placed at an important transitional zone with respect to the chronology of geological events in the Jordan Valley (Macumber, below).

Within the palaeosol, a dark medium clay band 0.30-0.40 m. thick, finds of lithics, and bone and charcoal fragments were concentrated most densely at a point where an erosion gully had cut deeply through the site. Assuming that the visible section represents a slice through a unimodal, approximately radial scatter of artefacts, the area of the site is estimated at 20.00 m.²

Two features further indicate that the site is *in situ* though slightly moved: 1) two sets of conjoinable microliths were found, with both pieces lying within a half a metre of their mates: 2) the astragalus and calcaneum of a wild cat were found within

² These sites in the Wadi Hammeh are designated Area XX in the Pella System. The numbers used

in this article (nos 26 and 27), are the designations of the Wadi Hammeh survey (Petocz and Villiers, below), and will take precedence in publication.

half a metre of each other. The bones articulate well and appear to be derived from the same individual.

A total of 1.10 m.³ of deposit was excavated and dry-sieved through a 2 mm. mesh, with a certain amount of whole matrix being processed through a water flotation unit. Neither internal stratification nor constructional features were evident within the palaeosol. Groundwater flow and strong root action were two obvious agents which had led to its thorough mixing.

The 4,877 unretouched chert elements consist of 67.5% flakes, 23.8% bladelets, 8.2% blades with microburin technique at 0.5% (N=23). The proportion of cortex on flakes compared to blades and bladelets is high; cortical flakes may in large part represent the waste from the primary stages of core reduction, emphasizing bladelet production as the main focus of the industry. Indeed, 66% of the forty-one cores are small, prismatic bladelet cores of which the predominant type is a pyramidal-shaped core worked around one face, with a single striking platform (Fig. 2:18). A number of core tablets (18) attest to the practice of platform renewal by the striking of a transverse blow across the old platform. Bladelets are consistently thin and narrow with diffuse bulbs of percussion and punctiform butts.

The retouched tools (3.8% of total) are dominated by the category of obliquely-truncated backed bladelets (33.2%). (See table 1)^{3A} Considering that most of the broken bladelets (32.7%) are probably medial and distal fragments of obliquely-truncated backed bladelets (the conjoinable pieces are of this nature), the index of the latter category may have been up to 65%.

The obliquely-truncated backed bladelets of the Wadi Hammeh 26 are notable for their gracility (mean max. width=3.8 mm., range=2-5.75 mm., N=65). "Various backed bladelets" include a few examples of backing combined with very

fine dorsal retouch on the other lateral edge (Fig. 2:8, 2:3), backing combined with inverse retouch (Fig. 2:9), and backing carried on to form a convex truncation on the butt. A few retouched and backed pieces (Fig. 2:10-12) complete the microlithic component.

Larger retouched tools are few (Fig. 2:16), though alongside the formally patterned tools are a number of large blades and flakes with edge alteration which appear to have been utilised as knives and scrapers. Burins are mainly of the dihedral kind (Fig. 2:17).

One tiny, broken bone point was found, possibly fire-hardened, and exhibiting whittling facets (Fig. 2:19).

Fauna were identified from the new complete bones and diagnostic fragments present, which consisted mainly of phalanges and distal metapodia. Plant species were identified from charcoal fragments.³

- Gazella* sp. (gazelle)
- Ovis/Capra* sp. (sheep/goat)
- Sus scrofa* (wild pig)
- Felis sylvestris* (European wild cat)
- Lepus cf. europaeus* (cf. European hare)
- Rodentia* spp.
- Phasianidae* sp. (quail)
- Passeriformes* sp. (song bird)
- Testudo cf. graeca* (cf. Greek tortoise)
- Melanopsis praemorsa* (freshwater mollusc)
- Quercus* sp. (oak)
- Amygdalus* sp. (wild almond)

- Pistacia* sp. (wild pistaccio)

- Ramnus* sp. (buckthorn)
- Crataegus* sp. (hawthorn)
- Celtis* sp. (hackberry)

A large number of cut and burnt animal bones indicates that the butchering and cooking of animals was an important activity at the site. Of the identified species, *Gazella* and *Testudo* bones clearly show

³ Willcox, manuscript, 1983.

^{3A} Based on Bar-Yosef, O., *The Epi-paleolithic cultures of Palestine*, Jerusalem, 1970, pl. 2: 1-4.

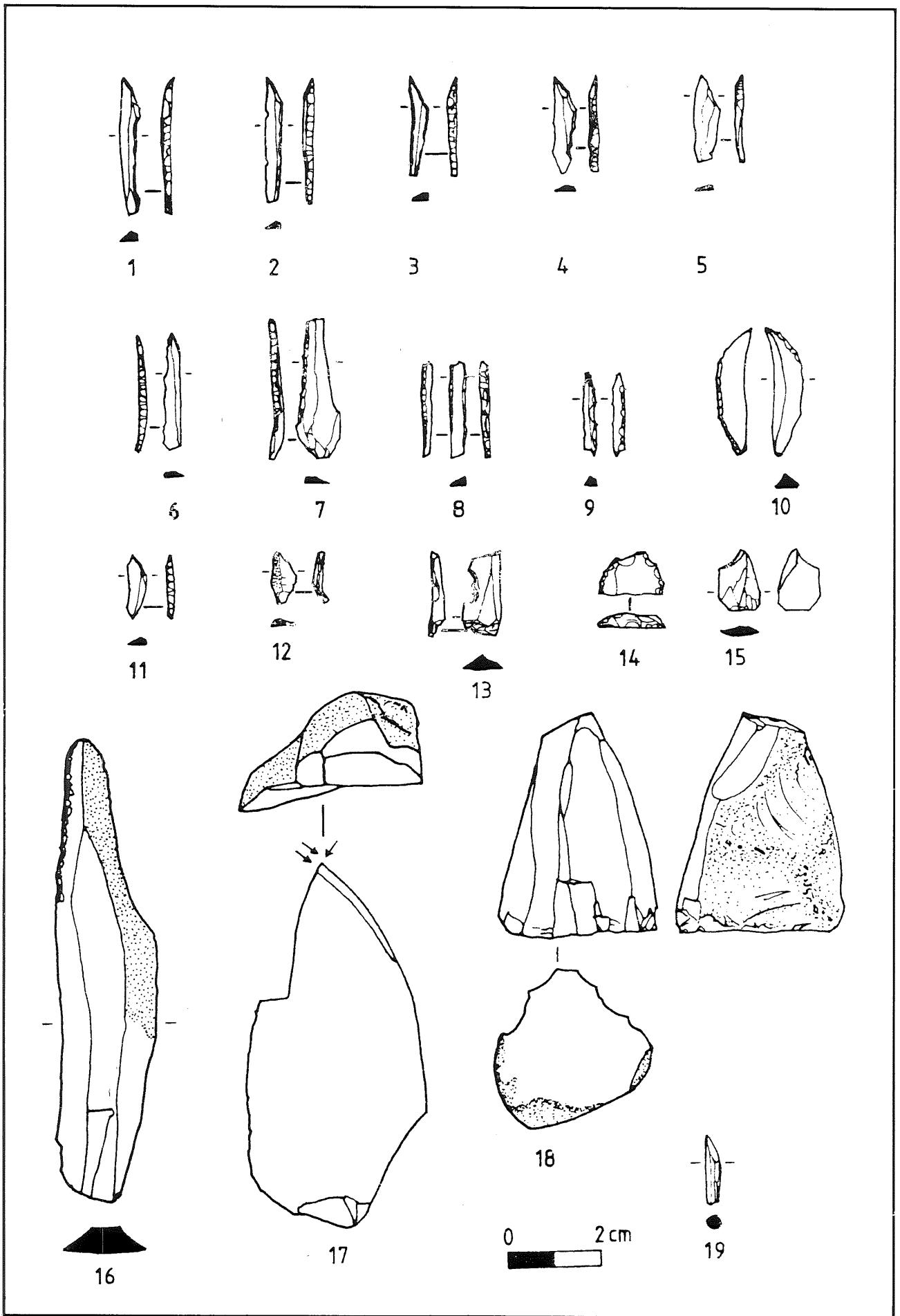


Fig. 2: Pella Area XX - Wadi Hammeh Site 26. Kebaran flaked tools.

traces of burning.

Willcox in discussion has pointed out the early manifestation of open forest species at this site, compared with pollen profile data from more northerly areas.⁴ He suggests that open forest associations may have occurred earlier in more southerly latitudes in the Levant, or else microhabitats around the margins of the former Lake Lisan may have allowed the survival of arboreal species.

A radiocarbon date was obtained from a sample of pooled charcoal from the palaeosol: $19,500 \pm 600$ b.p. (SUA 2101). The result is apparently the earliest radiocarbon date so far reported for a Kebaran site.

Wadi Hammeh 27-Early Natufian

Overlying the travertine cap-rock of the Wadi Hammeh bluff, towards its northern end, is a dark clay layer up to half a metre thick. On the eroded, south-westerly face of the bluff this layer is traceable in section for a distance of seventy metres. Surface collections made at various levels on the plateau emphasized the high concentration of chert pieces exuding from this layer, which included hundreds of retouched Natufian tools (Table 1, surface).

At a point where several worked basalt fragments were strewn about four colinear limestone blocks, a 3.00 m. x 2.00 m. *sondage* was sunk back into the hillside. These limestone blocks subsequently proved to be unrelated to an ancient surface; however beneath them, separated by topsoil, were two dry-built wall segments constructed of limestone rubble (Fig. 3, plan; F. 3 and F. 4. Stones are represented by heavy line, pits by thin line; dashed line marks original extent of stone-lines vandalised during the course of excavation). The basal stones of F. 3 were set onto the travertine upon a footing delineated on its west side by a cutting.

Together F. 3 and F. 4 probably represent a section of wall. The gap in between them may have served as a door. Close to the foot of F.4 was an inset basalt bowl (F. 11).

To the west, or "outside" of the wall

were but a few centimetres of deposit, whereas a rich occupation deposit with a depth of 0.40 m. lay to the east of the wall sealed below topsoil layers. The travertine cap-rock which was utilised as a living floor was heavily pitted. While some of these pits appear to have resulted from or been extended by rodent tunnelling, *e.g.*, north of F. 12) others were more clearly man-made and contained several fine objects; a bone point (Fig. 3:9), an agate, a tiny basalt bowl (Fig. 3:10), and lumps of red and yellow ochre together with ochrestained fragments of artiodactyl long bones.

A sample of 2,391 unretouched lithics together with ten single platform and twelve multiplatform bladelet cores were recovered from the test trench. Many of the cores have a soapy texture, as do many of the retouched bladelets, indicating the practice of thermal pre-treatment of chert blanks.

Retouched tools from the *sondage* are fewer than those from the surface (Table 1) but in both collections the type categories represented and the numbers contained therein bear strong resemblances. This is particularly evident with the bladelet categories, which are dominated by Helwan-retouched and inverse-retouched bladelets (Fig. 3:7), notches and denticulates (Fig. 3:3) and Helwan lunates (Fig. 3:4). Microliths other than Helwan lunates are few (Fig. 3:5, abrupt backing, and 3:6). There is a wide range of scrapers in both collections (Fig. 3:1). Burins are dominated by the truncation variety, the commonest type of which is a burin on convex truncation which often resembles an endscraper broken in half (Fig. 3:2). Conspicuous is a fine Helwan-retouched awl (Fig. 3:8), which showed signs of heavy use along both lateral edges. No sherd, or retouched lithic not referable to a Natufian industry was found in any layer of the *sondage*.

Most of the basalt artefacts were broken and re-used in the construction of F. 3 and F. 4. The collection consists of a mortar, a cylindrical, bullet-headed pestle and two pestle fragments, four grinding

⁴ J.L. Bintliff and W. Van Zeist, *Palaeoenvironments and Human Communities in the Eastern*

Mediterranean in Late Prehistory, BAR International Series 133, Oxford, 1982.

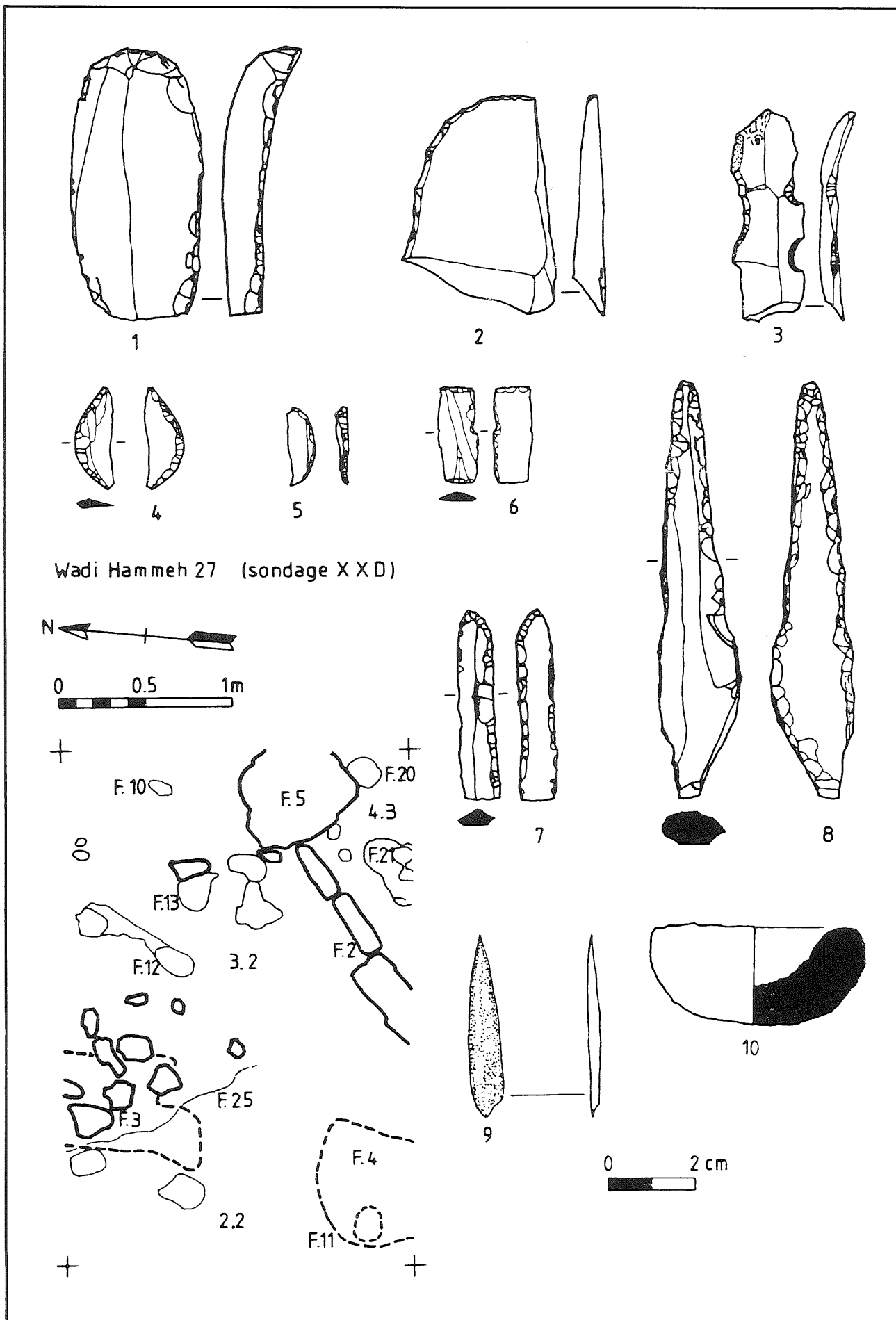


Fig. 3: Pella Area XX - Wadi Hammeh Site 27. Natufian artefacts and plan of sondage.

stones, a large bowl and two miniature bowls.⁵

The plant remains identified from seeds and charcoal fragments provide material evidence for the on-site processing of food plants already suggested by the basalt apparatus and bladelets bearing silica sheen (nineteen examples).

Quercus sp. (Oak)

Hordeum spontaneum (Wild barley)

Chenopodium sp. (Goosefoot)

Gazella sp.

Ovis/Capra sp.

Crustacea sp.

Bromus sp. (Brome)

Echinochloa sp. (Grass)

cf. *Caryophyllaceae* sp. (Camp family)

cf. *Lens* sp. (cf. Lentil)

cf. *Cicer* sp. (cf. Check-pea)

cf. *Pisum* sp. (cf. Pea)

Dentalium sp.

Melanopsis praemorsa

Numbers of *Chenopodium* seeds were found massed together, apparently fused during carbonisation. *Chenopodium* is an example of the sort of food resource that early plant processors may have experimented with, before their shift to the systematic exploitation of a few staple grasses.⁶ Among the scant faunal remains to be noted are the marine *Dentalium* shell and the burnt pincer of a crustacean.

Running obliquely across the *sondage* was a series of three slabs of decayed, calcareous mudstone. They were set on edge on the floor and supported with a backing of rubble. A large limestone boulder was jammed up against the eastern end

(Fig. 3, plan F. 2). The southern face of each slab was engraved with an array of concentric square motifs. Root and water action had led to hairline cracks in the slabs, which broke up upon lifting. The reconstructed faces of the slabs are shown in Figure 4.

The two shorter slabs of F. 2 were originally parts of a single slab. This had either cracked *in situ* due to thermal shattering, or more likely, had been rearranged during the lifetime of the settlement. The latter alternative is supported by the find of various carved fragments found at the foot of F.2, and one fragment which was located to the west of F. 3 and F. 4.

The initial, albeit small, sample of lunates have a high proportion of Helwan retouch (81%, N=47). The chronological implications of this factor,^{7A} when taken with the other material parallels to 'Ain Mallaha in the single stratigraphic phase so far discovered, and the homogeneity of both lithic collections all point to the existence of a single-period, Early Natufian site, tentatively assignable to the tenth millennium B.C.

The University of Sydney plans to extend its operations at Wadi Hammeh 27 in its forthcoming 1983/4 season. Chief objectives will be the elucidation of the context of the engraved stones, and the investigations of the extent of the settlement across the top of the bluff.⁷

Phillip C. Edwards

⁵ J. Perrot, Le gisement natoufien de Mallaha (Eynan), Israel, *L'Anthropologie*, 5-6 (1966) p. 437-483.

⁶ Wilcox, *op. cit.*

⁷ I would like to thank my postgraduate supervisor Professor J.B. Hennessy for the encouragement to go ahead with this work; Dr. A.W. McNicoll for his support during the 1983 Pella season, and Mr. P. Macumber and Mr. G. Willcox for the opportunity to work with them in the investigation of Wadi Hammeh 26 and Wadi Hammeh 27.

Thanks are also due to the following people

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^{7A} Henry, D.O. "An analysis of settlement patterns and adaptive strategies of the Natufian" in *Préhistoire du Levant*, (Colloques internationaux du Centre National de la Recherches Scientifique). 1981, Paris.

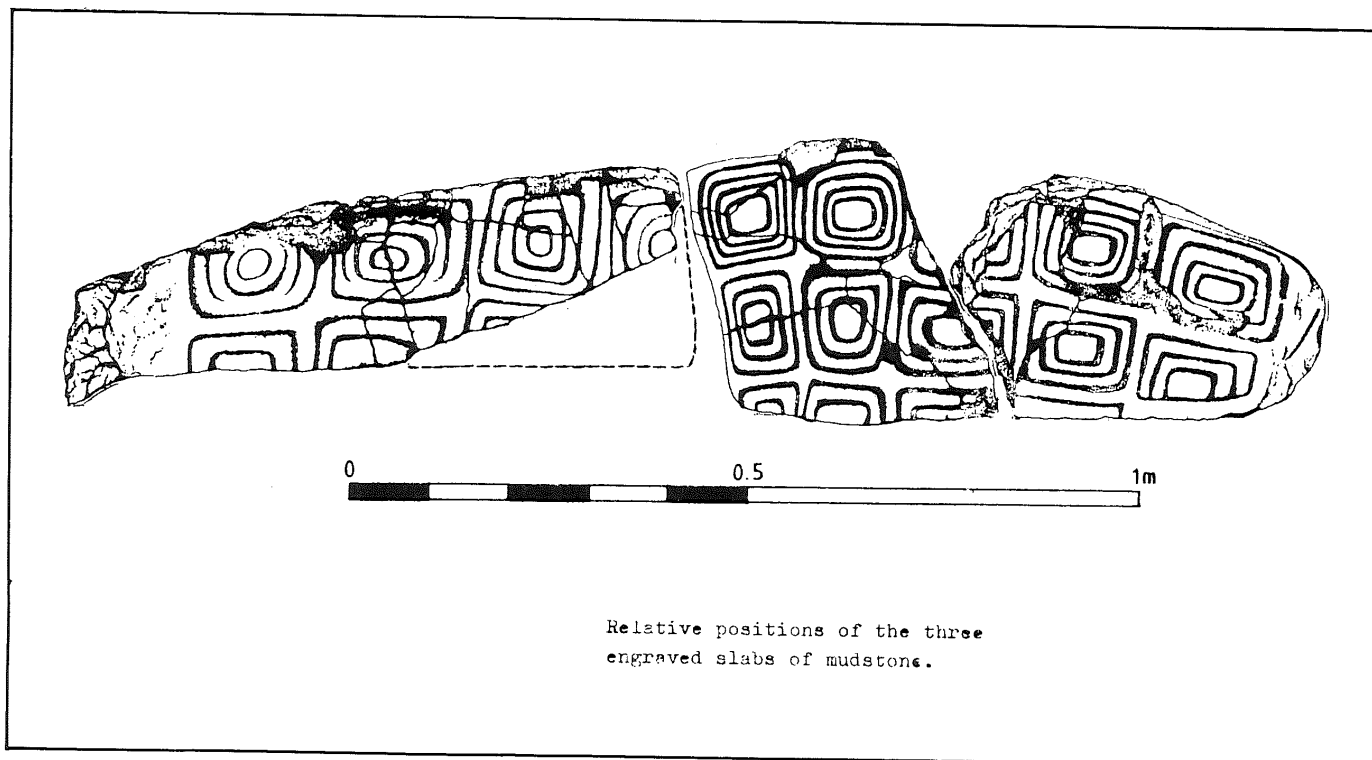


Fig. 4: Incised Natufian stones, arranged as found.

Table 1: Tool types of Wadi Hammeh 26 and Wadi Hammeh 27

<i>Tool Types</i>	<i>W.H. 26</i>	<i>W.H. 27</i>	
		<i>Sondage</i>	<i>Surface</i>
Endscraper on flake	—	4	—
Endscraper on retouched flake	1	—	1
Thumbnail scraper	10	1	—
Rounded scraper on flake	1	3	3
Oval scraper on flake	—	—	1
Endscraper on blade	—	—	1
Endscraper on retouched blade	—	1	1
Nosed scraper, thick	—	4	—
Carinated narrow scraper	—	1	—
Nucleiform scraper	—	1	—
Dihedral burin	7	2	4
Dihedral burin, offset	1	2	2
Dihedral burin, angled	1	—	4
Burin on natural surface	—	5	5
Burin, double dihedral	—	—	1
Burin on straight truncation	—	—	1
Burin on oblique truncation	—	4	3
Burin on concave truncation	—	2	4
Burin on convex truncation	—	5	9
Burin, transverse on lateral retouch	—	1	3
Nucleiform burin	1	—	—
Ventral burin	1	4	6
Blade partly retouched on one edge	4	1	1
Blade retouched on both edges	2	—	—
Blade, inversely retouched	—	—	2
Backed blade	—	—	1

Tool Types	W.H. 26	W.H. 27	
		Sondage	Surface
Curved backed blade	—	—	1
Broken retouched or backed blade	1	2	7
Sickle blade, not retouched	—	—	1
Truncated backed piece	—	—	2
Truncated piece	—	2	—
Partially retouched bladelet	2	—	2
Completely retouched bladelet	—	—	1
Bladelet retouched on both edges	1	1	—
Alternately retouched bladelet	2	—	—
Inversely retouched bladelet	—	7	15
Partially or completely backed bladelet	8	—	3
Obliquely-truncated bladelet	3	—	—
Obliquely-truncated backed bladelet	65	—	—
Narrow curved pointed backed bladelet	2	—	—
Narrow micropoint	1	—	—
Helwan bladelet	—	16	25
Various backed bladelets	6	—	2
Broken backed bladelets	63	1	3
Rectangle	—	1	—
Proto-lunate	1	—	—
Lunate	—	1	8
Helwan lunate	—	11	27
Piece with small notch	1	—	—
Piece with large notch	3	5	11
Piece with notches	—	8	24
Denticulated piece	2	4	8
<i>Piece esquillée</i>	—	3	9
Retouched flake	1	5	1
<i>Raclette</i>	—	—	2
<i>Racloir</i>	—	—	2
Perforator/awl	—	3	9
Borer	—	—	6
<i>Lame à machure</i>	—	6	1
Pick	—	—	1
<i>Varia</i>	3	7	11
Total	194	124	235

The Chalcolithic site on Jebel Sartaba (Area XIV)

During the 1982/3 Sydney session work continued on the Chalcolithic site located on the lower western slopes of Jebel Sartaba (Fig. 1). Further structures of the terraced settlement were uncovered.⁸ The constructional technique of the latest buildings uncovered is similar to that previously reported — walls of unshaped limestone, founded on bedrock,

were freestanding to a height of 0.30-1.00 m., presumably with a superstructure of mud-brick. Floors were of tamped mud and plaster. No evidence of roofing was recovered. The function of the buildings is unclear. Some were presumably domestic, while others, apparently open to the west may have been work and storage areas and possible stables for herded animals. The recovery of two large pithoi bases *in situ* is further evidence of storage above ground as well as in pits.

⁸ A.W. McNicoll, R.H. Smith, J.B. Hennessy

Pella in Jordan 1, Canberra, 1982, p. 31-34.

Among the botanical remains recovered by water flotation were two-row hulled barley and emmer wheat; legumes included pea, chickpea and lentil. Olives either wild or domestic, also played a significant part in the economy of this Chalcolithic settlement.

The chipped stone (chert) repertoire includes chisels, fan scrapers, and a fragmentary "mace-head". Among the fragments of ground stone and ceramic vessels are a fenestrated stand, bowls and the storage jars mentioned above — an assemblage comparable with the upper layers of Teleilat Ghassul, excepting the "cornet", which is absent at Pella. The artefacts suggest a date in the middle or second half of the 4th millennium.

Anthony McNicoll

The Bronze and Iron Ages (Area III)

The Middle Bronze Age

Some excavation of the Middle Bronze Age levels in plot IIIC was carried out on the west side of the city wall (wall 3 in McNicoll, Hennessy and Smith, 1982: fig. 6a, pl. 8a). These operations were undertaken on a small scale and their results will be published together with those of the forthcoming sixth season during which more attention will be devoted to this area.

The Iron Age: Architecture and Stratigraphy (Areas III and IV)

Towards the end of the season Iron Age deposits were beginning to appear below the Hellenistic levels in plots IVD and IVE. This material also will be published with next season's results when we should have more material and a better understanding of its stratigraphical and architectural context.

The bulk of this year's Iron Age material came from plot IIIN, immediately to the west of IIIC where contemporary deposits were excavated in the 1979 and 1980 seasons (then designated phase 1a)⁹

At the end of the 1982 season the centre of the plot was occupied by an apsidal structure adjoining on the east a stone-paved room extending into plot IIIC which had been destroyed by a fierce fire.¹⁰ It was assumed that the floor of this apsidal structure (16.4) was contemporary with the stone-paved floor, the other side of wall 11/17 and it is clear that the apsidal room as exposed last season is the latest modification of an earlier, originally rectilinear, structure. It is this rectilinear building and the lowest of the four floors which is contemporary with (though slightly lower than) the stone-paved floor to the east. The renovations after the conflagration which destroyed this building (*i.e.*, the apsidal phases) apparently did not extend east of wall 11/17 or, if they did, have been completely removed by later erosion. (This, however, is less likely since the destruction debris in the paved room was preserved immediately under topsoil to a maximum height of 1.35 m. and any higher floor would therefore have involved a significant discrepancy in levels).

All of the 1983 season was taken up in excavating down to the destruction surface of the rectilinear structure over virtually all of the plot. The results will be described from earliest to latest.

The plan of the rectilinear building destroyed by the early Iron Age fire is incomplete, its southern extent having been eroded away and its northern reaches extending beyond the limits of the plot where it cannot be excavated. What we have consists of the stone-paved room bridging plots IIIC/N and adjacent to it on the west a larger unpaved room whose southern wall (wall 46) continues westwards that of the paved room (wall F.18). The northern wall (wall 50) is on a slightly different alignment and stops short of the southern wall with a very small (*ca.* 0.35 m.) western return, more in the nature of a buttress. Continuing the line of the "buttress" are three chert and limestone pillar bases which define the western limit of the room, and at this point the floor (29.5)

⁹ Ibid, p. 56 and Fig. 7a.

¹⁰ J.B. Hennessy, et. al., Report on a third season of excavations at Pella, ADAJ, XXVI (1982) Fig. 2.

begins to slope irregularly down to the west to a series of pits (not yet fully excavated). West of the pits near the baulk lay a stone mortar set into the floor, its top flush with the surface; and nearby a basalt quern and its rubbing stone (POs 137 and 141). This all indicates a simple domestic context. In the south-west corner of the plot another wall (wall 47) abutts wall 46 from the south. The area to its east is largely eroded away but to the west of wall 47 remains of a floor (28.3), which may prove to be the continuation of floor 29.5 around the western end of wall 46, are preserved. A small area of contemporary surface north of wall 50 (floor 18.9/19.9) was exposed.

All of the walls consisted of stone for at least the bottom few courses with a brick superstructure, though none of the latter remained *in situ*. The stone foundations of wall 50 were preserved to a maximum height of 0.75 m.

The surfaces of this phase were all covered with a collapse of heavily burnt brick charcoal preserved to a maximum height of 0.80 m. in the western baulk. The charcoal was clearly from roofing beams. Also present, especially in the western half of the plot, were large quantities of carbonised grain, bucket-loads of which were recovered by flotation and proved to be mainly barley with some flax. The artefacts recovered from the debris include a piece of rectangular, blue composition box with relief decoration on the exterior (PO 139; pl. X:1), and a rim fragment of a calcite/alabaster vessel.

There is some later disturbance in this phase. The southern-most 1.50-2.00 m. of the plot have been largely eroded away (except floor 28.3), and the pits from the subsequent apsidal phase (see below) cut through floor 29.5 and wall 46. In the later Iron Age (the penultimate phase represented in IIIN) a semi-subterranean room was sunk down 1.10 m. in the north-west corner of the plot to the level of the destruction floor.

After the destruction the debris was levelled off and the central room rebuilt with an apse at its western end (wall 19)

where previously the "buttress" had been. The apse is narrow and completes its semi-circle in only half the distance to wall 46, which was probably left in disrepair. Two pits (F. 65, F. 69) were cut from the floor south of the apse (floor 23.4), the southern one (F. 65) cutting through the middle stretch of wall 46 whose stones were used for lining its sides. In it were found large quantities of animal bones. Two closely stratified floors were excavated inside the apsidal room (16.5 and 16.7) and to its south (23.2 and 23.4), where a multicoloured frit bead (PO 127) was recovered. A small pit (F. 63), found lined with grey ash, was cut from floor 16.7 towards the western end of the room. Two walls ran westwards from the widest points of the apse (walls 40 and 41). On the floor between them (22.2) were found eight complete and five fragments of large, spherical unbaked clay loom-weights (PO 125, Pl. X: 2), which had been piled up against the outside of the apse, and four fragments of a basalt quern (PO 124). A small stretch of the wall of a room built on a different alignment, slightly later in the phase, cut across the south-west corner of the plot (wall 45). The late Iron Age wash gully (11.3) extended further north at this level almost to the southern tip of the apse thus destroying most of what remained above ground of wall 46.

The last apsidal phase was excavated in the 1982 season and described in the preceding report.¹¹ The walls of the previous phase all remained in use. The only significant architectural change was the addition of wall 25 running northwards from midway along the northern wall of the apsidal room (wall 19) creating two rooms where previously there had been one. Also now attributed to this phase is wall 44, the rebuilding of the western end of wall 46, with its western return wall 43, running north towards wall 41. As was explained above, the stone-paved room and the deposits further east in IIIC must now be divorced from this apsidal phase and correlated with the original rectilinear building.

¹¹ Ibid.

Iron Age Pottery

As the parallels cited below indicate, the pottery associated with the destruction level and the levels immediately above it appear to date to the Early Iron I period *i.e.*, ca. 1200-1075 B.C.¹² Of the Iron Age I types, the handle (Fig. 5:2), the cooking pot (Fig. 5:3) and the various jar (Fig. 6:7-9) and bowl forms (Fig. 6:3,4) may be noted. The presence of Philistine ware (Fig. 5:1) supports an early twelfth to early eleventh century B.C. date for the associated pottery from these levels.

Figure 5

1. CN 3730. IIIN 29.1. Philistine bichrome body sherd (jar/jug). Fine, well mixed clay with many tiny, sandy grits, fired light terracotta throughout. Painted decoration of black vertical lines and hatched lozenge between horizontal red bands.
2. CN 3687. IIIN 29.1. Jar handle. painted buff. Coarse fabric with many medium chert, lime and sandy grits, fired yellowish-buff throughout, smoothed exterior. Painted decoration in red-brown paint, cross on handle and bands on shoulder above. Parallels: Beth Shan, Fig. 49.5 (Level VI).
3. CN 4075. IIIN 29.3. Cooking pot rim. Very coarse with grits. Parallels: Deir 'Allā 1, fig. 56.43 (Phase D).
4. CN 4098. IIIN 29.5. Cooking pot rim. Very coarse with grits. Parallels: Deir 'Allā 1, fig. 61.41 (Phase F).
5. CN 4074. IIIN 29.3. Cooking pot rim. Very coarse with grits. Parallels: Deir 'Allā 1, fig. 53.58 (Phase C).
6. CN 4101. IIIN 29.4. Cooking pot rim. Gritty, coarse ware. Rim rounded to grooved line interior. Parallels: Similar to Deir 'Allā 1, fig. 61.43 (Phase E).

Figure 6

1. CN 4078. IIIN 29.3. Cooking pot rim. Very coarse gritty ware. No thickening at rim. Parallels: Similar to Deir 'Allā 1, fig. 61.43 (Phase F).
2. CN 3908. IIIN 29.3. Cooking pot rim. Coarse clay with many small mica grits, fired black with thin brown inner and outer faces. Parallels: Deir 'Allā 1, fig. 53.53 (Phase C). Deir 'Allā 1, fig. 61.38 (Phase F).
3. CN 4130. IIIN 29.9. Base. Buff ware. Fairly well levigated clay, medium sized grits, numerous, mainly chert, some lime, fired grey at core, buff towards edges, buff in and out surfaces. Small circular flat base, string cut. Parallels: Taanach 1, fig. 14.4 (Period IB). Deir 'Allā 1, fig. 48.3 (Phase B). Deir 'Allā 1, fig. 53.13 (Phase C). Deir 'Allā 1, fig. 56.8 (Phase D). Deir 'Allā 1, fig. 58.3 (Phase E).
4. CN 3745. IIIN 29.1. Bowl. Buff ware. Fine, well mixed clay with few small lime grits, fired pale brown-buff throughout. Parallels: Madeba no. 17.
5. CN 3743. IIIN 29.1. Bowl. Buff painted ware. Coarse, gritty ware, with many small to medium sandy and lime grits, fired creamy-buff throughout. Red painted band on lip interior and exterior. Parallels: Madeba no. 33. Ashdod II-III, fig. 74.5 (Area G, str. 7).
6. CN 3904. IIIN 29.3. Bowl. Buff ware. Coarse, gritty ware, with many small to medium sandy and lime grits, fired creamy-buff throughout. Parallels: Beth Shan, fig. 53.2 (Level VI). Ain Shems IV, pl. LX 12 (Str. III)
7. CN 4125. IIIN 29.4. Ridged neck jar rim. Buff ware. Fairly well levigated

¹² Good parallels can be found, for example, from Beth Shan level VI; Deir 'Allā 1 Phases A-F; Taanach 1 Period LB; Megiddo II Str. VIB, VI; and the Early Iron Age tomb at Madeba.

The dates for the Madeba tomb and Deir 'Allā and Megiddo levels follow R.H. Dornemann, *The Cultural and Archaeological History of the Transjordan in the Bronze and Iron Ages*.

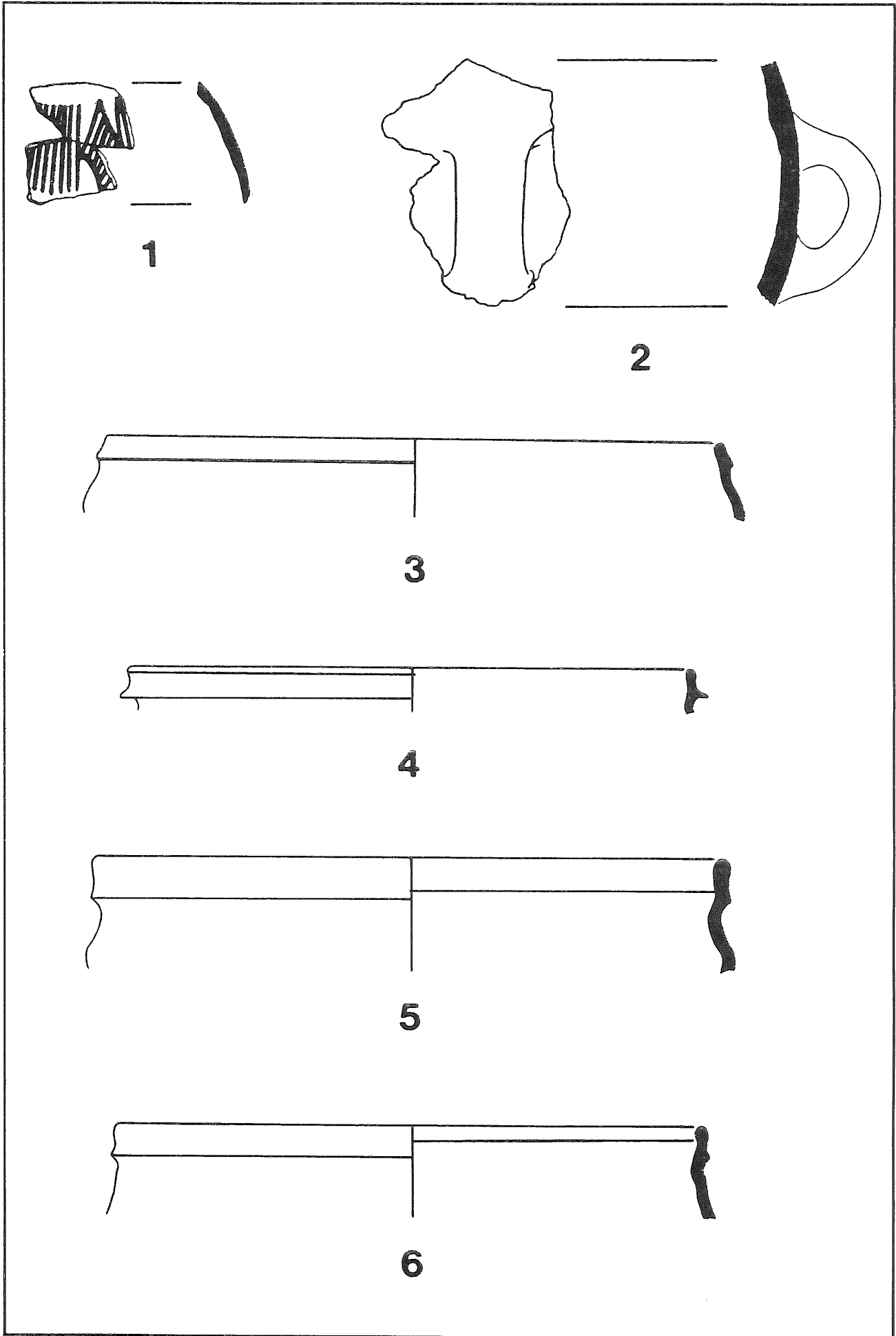


Fig. 5: Area IIIIN. Iron Age pottery.

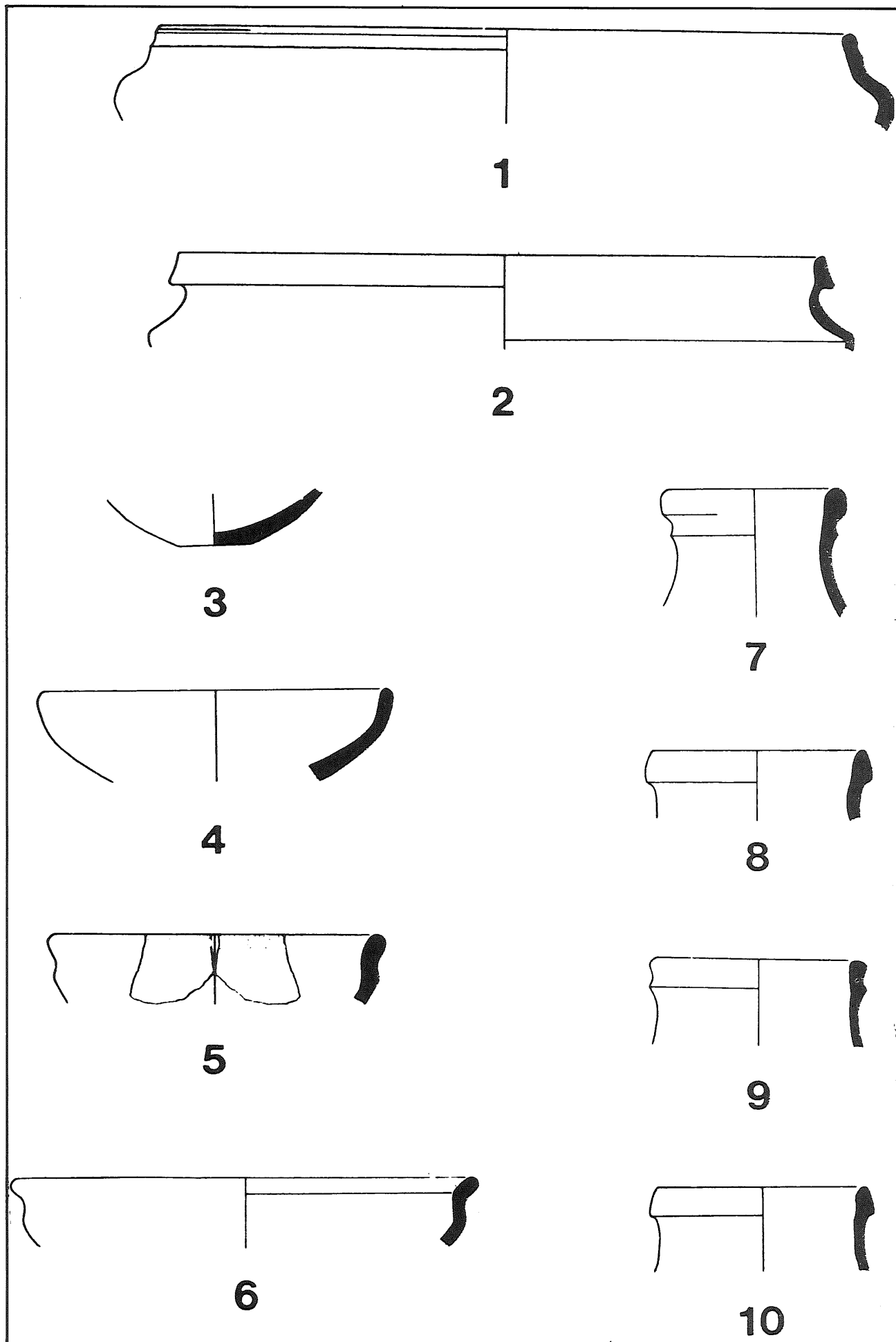


Fig. 6: Area IIIN. Iron Age pottery.

clay with medium and fine grits of chert and lime, fired buff throughout. Slightly burnt in places. Upright neck with ridge.

Parallels: Taanach 1, fig. 11.7, 11 (Period IB).

8. CN 3733. IIN 29.1. Jar rim. Buff ware. Well mixed clay, many small to medium black and chert grits, fired grey-brown but red-brown exterior surface.
Parallels: Hennessy, J.B. et al. (forthcoming).
Deir 'Allā 1, fig. 47.2 (Phase A).
Taanach 1, fig. 6.6 (Period IA).
9. CN 3688. IIN 29.1. Jar rim. Painted buff. Well mixed clay with small to medium sandy grits, fired greenish-buff throughout. Parallels: Megiddo II, pl. 73.8 (Str. VIB).
10. CN 3701. IIN 29.1. Jar rim. Buff ware. Well levigated with fairly fine chert and white grits, fired to brown-grey at core. Upright neck, rim swollen to collar exterior.
Parallels: Deir 'Allā 1, fig. 47.2 (Phase A).

Leanda Randle

Hellenistic and Early Roman (Areas III, IV and XI)

During the 1982/3 season small but significant deposits of late Hellenistic material dating to the late second century and early first century B.C. were found in Areas IV and XI.

Area IV

In IVD under the Byzantine street part of a room of a late Hellenistic house was unearthed. It was built of mudbrick, and possibly pisé, on stone foundations which rose to roughly 1.00 m. above ground level. In contrast to the late Hellenistic house unearthed in IIIB/C,^{12A} the IVD building may well have had an upper

floor. In the decayed mudbrick and pisé (?) collapse within the room were a score or so fragmentary and complete plates, jugs, juglets and lamps, some of which are illustrated on Fig. 7, nos 1-6, both locally made and imported. Whereas small bowls predominated in the repertoire of the IIIB/C house, here plates were most common. It is worth noting that whereas only three small fragments of Eastern Sigillata A were recorded, imported black glazed plates were still being used in the IVD dwelling, which was probably destroyed in the Hasmonean sack of 83/2 B.C.¹³ The most precise evidence for the floruit of the house was provided by the five identifiable specimens among the seven bronze coins found; three appear to belong to the quasi-autonomous issue of Akko-Ptolemais in the second half of the second century¹⁴ while two can be identified as coins of Seleucus XII Dionysus (88-84 B.C.)¹⁵

In plot IVE adjacent to IVD, the stumps of late Hellenistic walls were found, but in most loci the floor surfaces and occupation débris had been removed by the builders of the Byzantine houses which overlaid them.

Area XI

High on the steep north-east slope of Tell Husn a 10.00x15.00m. trench was opened immediately south of plot XIA¹⁶ The new trench would, it was hoped, lie athwart the line of the late Hellenistic citadel wall. This expectation was based on the belief that the structure found in XIA was a tower rather than a house. After the removal of topsoil and wash deposits over the whole of XIB it was decided to make a N-S 2.00 m. wide cut in order to locate the wall. In the course of excavation of the 2.00 m. wide trench a sterile layer of loose pebbly conglomerate, more than 4.00 m. deep at the south end of the trench, was encountered. It is evidently part of the infilling of the ancestral pre-Quaternary

^{12A} McNicoll, Hennessy and Smith, *op. cit.*, p. 68-71.

¹³ Josephus, *Antiquities*, XIII, XV, 2-4.

¹⁴ L. Kadman, *Coins of Akko-Ptolemais*, Jerusalem, 1961, p. 94-100.

¹⁵ P. Gardner, *Catalogue of Greek Coins in the*

British Museum, The Seleucid Kings of Syria, Bologna, 1963, nos. 1 and 4.

¹⁶ J.B. Hennessy, et. al., Preliminary report on a fourth season of excavations at Pella, *ADAJ*, XXVII (1983).

Wadi Malawi belonging to a geological epoch preceding the incision of the *awdiyah* (wadis) which exist today. The surface of this conglomerate slopes steeply north, and into it was cut the foundation trench of the sought-after wall, three courses of which were eventually exposed along 5.00 m. of its length (pl. XI: 1,2) after the removal of large numbers of fallen stones.

The front face of the wall is constructed of well-cut tooled-faced ashlar limestone blocks of moderate size (e.g. 0.72 m. x 0.45 m. x 0.18 m.) laid as headers and stretchers. Between some of these were small snecking stones, perhaps indicative of later repair. The headers were bound into a core of large rubble stones set in clay mortar. Because of the steepness of the slope, the rear face, built of roughly shaped blocks, would have been concealed to a considerable height. Lime mortar was used as a bedding layer between the courses.

As fortification walls go, it is quite narrow, but its width, 1.30 m., is sufficient when one considers the impossibility of attack by any sort of engine on Tell Husn's precipitous flanks.

The precise date of the wall is still uncertain. The bulk of the pottery found in the trench consists of fragments consonant with a late Hellenistic date, particularly metallic buff and metallic terracotta wares (most commonly found in storage jars and cooking pots respectively), but several "Herodian" lamp spouts were found in and beneath the tumble of the wall. Since the surfaces relating to the period of the wall's construction have not yet been reached on its north side, these fragments probably indicate no more than that the wall was still in use in the period 25 B.C.-mid-second century A.D. (accepting tentatively the chronology followed by Rosenthal and Sivan)¹⁷. So, while the bulk of the pottery points to a late Hellenistic date, and while

the style of the wall itself is by no means at variance with such dating, it remains a possibility that the wall was constructed in the Early Roman period.

The Hellenistic Fortress on Jebel Hammeh

In 1981 the Sydeny team's field director Mr. Alan Walmsley found traces of walls on Jebel Hammeh and recognized surface sherds as late Hellenistic. His dating was confirmed by further sharding during the 1983 season. The site is referred to in Petocz and Villier's report (below) as no. 17.

As far as can be seen, the fortress is somewhat larger than that on Jebel Sartaba, excavated by the Wooster team.¹⁸ It is apparently rectilinear in plan and may have had a similar berm-like *proteichisma*. While it evidently could have served as a signal station — Mt. Tabor (Attabyrium), Qarn Sartabē (Alexandrium), Pella and the Jebel Sartaba fort are all visible from it — its size suggests that its primary function was to prevent movement down the Hammeh, as the Sartaba fort inhibited attacks down or alongside the Wadi Malawi.¹⁹

Area XIV

The Hellenistic burial ground of Pella is yet to be located, but a clue to its whereabouts may be the imported white ground lagynos (Fig. 7, no. 7) found in a fragmentary state in the topsoil of the Chalcolithic site (Area XIV). Possibly it had been washed thither from a graveyard higher up the slopes of Jebel Sartaba, although more mundane explanations of its presence (e.g. suburban housing, a rubbish dump) can be advanced. Parallels from Aegina and elsewhere²⁰ suggest a date in the second half of the second century B.C.

Hellenistic Pottery (Fig. 7)

1. CN 3926. IVD 10.12. Plate, wall and rim. Imported black glazed ware. Well levigated buff ware, lustrous black glaze

¹⁷ Rosenthal and Sivan, 1978, p. 80.

¹⁸ McNicoll, Hennessy and Smith, *op. cit.*, p. 65-67.

¹⁹ A.W. McNicoll, Pella: une ville de la Décapole à l'époque greco-romaine, *Le monde de la Bible*, 22 (1982) p. 36.

²⁰ E. Walter-Karydi, V. Felten and R. Smetana-Scherrer, *Ostgriechische Keramik, Lakonische Keramik, Attische Schwrszfigurige und Rotfigurige Keramik, Spatklassische und Hellenistische Keramik in Alt-Ägina II*, 1, Mainz, 1982, p. 83-85.

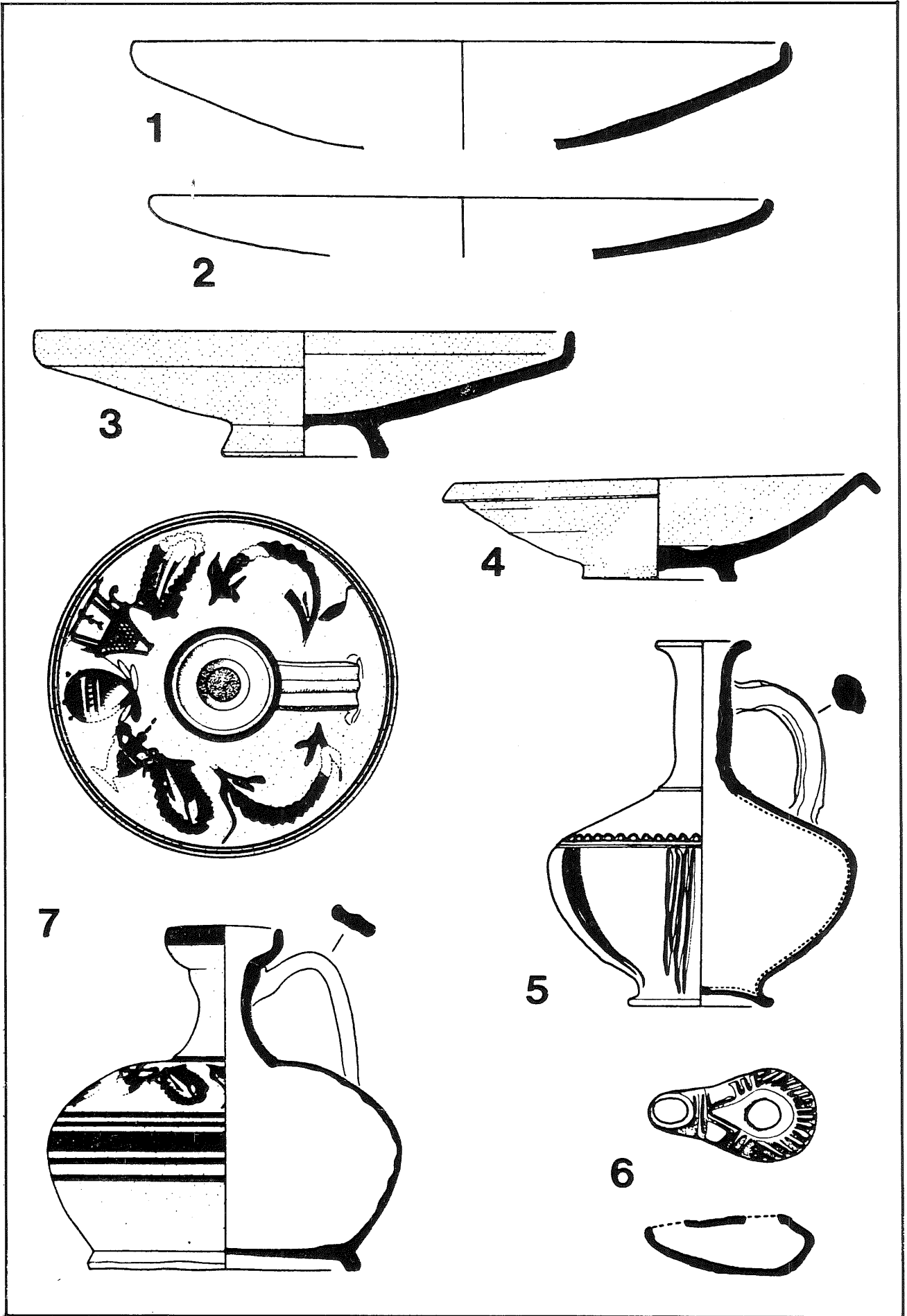


Fig. 7: Areas IVD and XIVJ. Hellenistic pottery.

- i. and o.
2. CN 3930. IVD 10.12. Plate, wall and rim. Imported black glazed ware. Well levigated buff ware, lustrous black glaze i. and o.
 3. CN 3449. (Reg. no. 62002). IVD 10.10. Plate. Coarse light brown ware, core 7.5YR 8/4, surfaces 7.5YR 6/4, with reddish wash i. 2.5YR 6/8, and o. 2.5YR 3/1-4/4, Mohs 6.0.
 4. CN 3450. (Reg. No. 62003). IVD 10.10. Plate. Coarse light brown ware, core 5YR 7/6, with reddish wash i. 2.5 YR 4/4-6/8, and o. 2.5YR 3/1-4, Mohs 5.
 5. CN 3457. (Reg. no. 62005). IVD 10.10. Jug. Coarse light brown ware, core 2.5YR 7/4-6 with dark red slip, mostly 2.5YR 4/1, with patches 2.5YR 6/6, Mohs 4.5. Incised decoration.
 6. Reg. no. 62013. IVD 10.10. Lamp. Grey ware, mould made. Core 10YR 7/1, surface 10YR 4/1, Mohs 6. Impressed decoration.
 7. CN 3276. (Reg. no. 62026). XIVJ 2.2, 1.2, +. Lagynos. Imported red on white ware. Fine well-levigated pink fabric with tiny micaceous and other inclusions, surface i. 5YR 7/4, core n.a. Thick white slip o., 10YR 8/3, with orange to black-orange painted decoration, 5YR 6/6 with variants 5YR 5/8 to 7/6, consisting of parallel horizontal lines at maximum girth, and on upper body and shoulder swags, garlands, an oenochoe and a gazebo/ birdcage (?). Base and body to approx. 1 cm. above base reserved, 5YR 7/4, Mohs 3.5.

Anthony McNicoll

Roman Period Tombs (Area VI)

Throughout the season, the search for tombs continued under the supervision of Mr. Sultan Shraideh of the Department of Antiquities.

Some time was spent investigating Areas XXI and XI, to the north of the

main *tell* and along the lower western slopes of Tell el Husn respectively, where recent robber activity suggested further investigation may have been fruitful. However, when this was not the case, work resumed in Area VI to the south of Tell el Husn where unrobbed tombs from the Roman period (notably Tomb 39A)²¹ have been discovered in previous seasons.

Tomb 52

Immediately to the south of Tomb 39A, and with an entrance from the western edge of the same limestone hill-ock, a Roman tomb (Tomb 52) with a rock-cut staircase leading down through the dromos was found. Well-constructed retaining walls of finely dressed limestone blocks flanked the staircase on either side, standing to a height of approximately 1.50 m. At the base of the steps a massive stone door could still be swung on its stone pivots which were housed in the threshold and which projected into a lintel set in the bedrock.

The tomb proper consists of a rectangular central chamber (ca. 4.50 x 3.75 m.) hewn from the limestone, with eight loculi opening from it. Five limestone sarcophagi were contained in two of these loculi, but unfortunately all had been both opened and vandalized by robbers smashing their way in through another tomb to the south. Cleaning inside Tomb 52 yielded no objects.

Tomb 53

However, outside this tomb was found a single free-standing limestone sarcophagus (Tomb 53) and, although no lid was present, the contents remained undisturbed. Associated with six individuals were objects which seem to reflect two separate periods of use in the late second/third and fourth centuries A.D. At its base were two burials together with five tall opaque balsamaria characteristic of late second/third century types.²² Overlying

²¹ McNicoll, Hennessy and Smith, *op. cit.*, p. 87-101.

²² J.W. Hayes, *Roman and Pre-Roman Glass in the*

Royal Ontario Museum, Toronto, 1975, nos. 227, 236, 240; S. B. Matheson, Ancient Glass in the Yale University Art Gallery, Yale, 1980, nos. 159, 160.

these were a further four burials with associated artefacts including five bracelets (four bronze and one bone), one bronze earring with glass bead, and an opaque double unguentarium with trailed handles and spiral thread, dating to the fourth century A.D.²³

If this interpretation is correct, it is probable that the sarcophagus was initially sealed after the second/third century interments but the lid was not replaced after the sarcophagus was opened and re-used in the fourth century A.D.

Tomb 54

Towards the end of the digging season, an intact rock-cut Early Roman tomb (Tomb 54) was discovered on the edge of a small track south-east of Tombs 52 and 53 in Area VI. The entrance from the west consisted of a simple irregularly-shaped opening in the natural rock-face. Sealing Tomb 54 was a finely dressed limestone slab surrounded by smaller snecking stones.

Roof-fall within the tomb had been extensive (up to 2.00 m.) and this process was accelerated after opening when both the humidity and the temperature decreased rapidly. This problem was further intensified as the tomb had been hewn from a particularly weak sector of rock (a "crush-zone" which became extremely friable when allowed to dry and cool. Consequently, progress was severely hindered within the tomb and the obvious dangers led to its closure before the clearance could be completed.

The tomb itself comprises a large rectangular central chamber (ca. 7.50 x ca. 3.80 m.) with an original height of ca. 1.60 m. Thirteen unsealed loculi open from this main chamber, their height being 0.91 m. Of these, only four (3, 4, 8 and 11; Fig. 8) and a free-standing limestone sarcophagus (16) located in the central chamber were cleared, yielding some fine glass vessels and several other objects.

Unlike other intact tombs found in the Pella region, Tomb 54 is notable for the vast quantity of well-preserved wood it contained (comparatively small amounts of

fragmentary wood were noted in Tombs 12 and 13)²⁴, and for the high degree of preservation of the skeletal material.

Large beams of cedar lay amongst the roof collapse within the central chamber, being concentrated around its perimeter, especially along the southern wall. Here the narrow dividing walls between some of the loculi had also fully or partially collapsed. The position of some of these large beams within the rock-fall strongly suggests that they were employed to support the roof during the period throughout which the tomb was in use. It is also highly probable that the tomb had begun to collapse before its projected closure. This would account for the fact that two of the excavated loculi (3 and 4), the entrances of which were blocked with cedar beams and roof-fall, were not utilized at all, and that a carved and decorated limestone sarcophagus in one of the northern loculi (15) remained unsealed while its lid lay broken on the floor nearby.

In addition to the cedar beams, thin planks of pine were found or observed within most of the other loculi. These planks represent the remains of collapsed wooden coffins and, in one loculus (9) on the eastern wall, the central region of a coffin remained standing. Examples of nail holes and dowels were recorded in several planks removed from the excavated loculi.

The collection of complete glass vessels recovered from Tomb 54 includes five balsamaria, four shallow dishes, four bowls, two tumblers and an aryballos. Three ceramic lamps, a small ceramic juglet, a bronze ladle and a pair of leather sandal soles were also among the total object assemblage, none of which would seem inconsistent with a tomb-use period spanning 100 years from the mid-first to mid-second centuries A.D. These objects were associated with a total of six excavated individuals, as shown in Figure 8.

As further work in the loculi became increasingly hazardous after the clearance of the main central chamber, Tomb 54 was re-sealed and the dromos back-filled be-

²³ Hayes, *Ibid.*, no. 361; Matheson, *Ibid.*, no. 324.

²⁴ McNicoll, Henessy and Smith, *op. cit.*, p. 84-86.

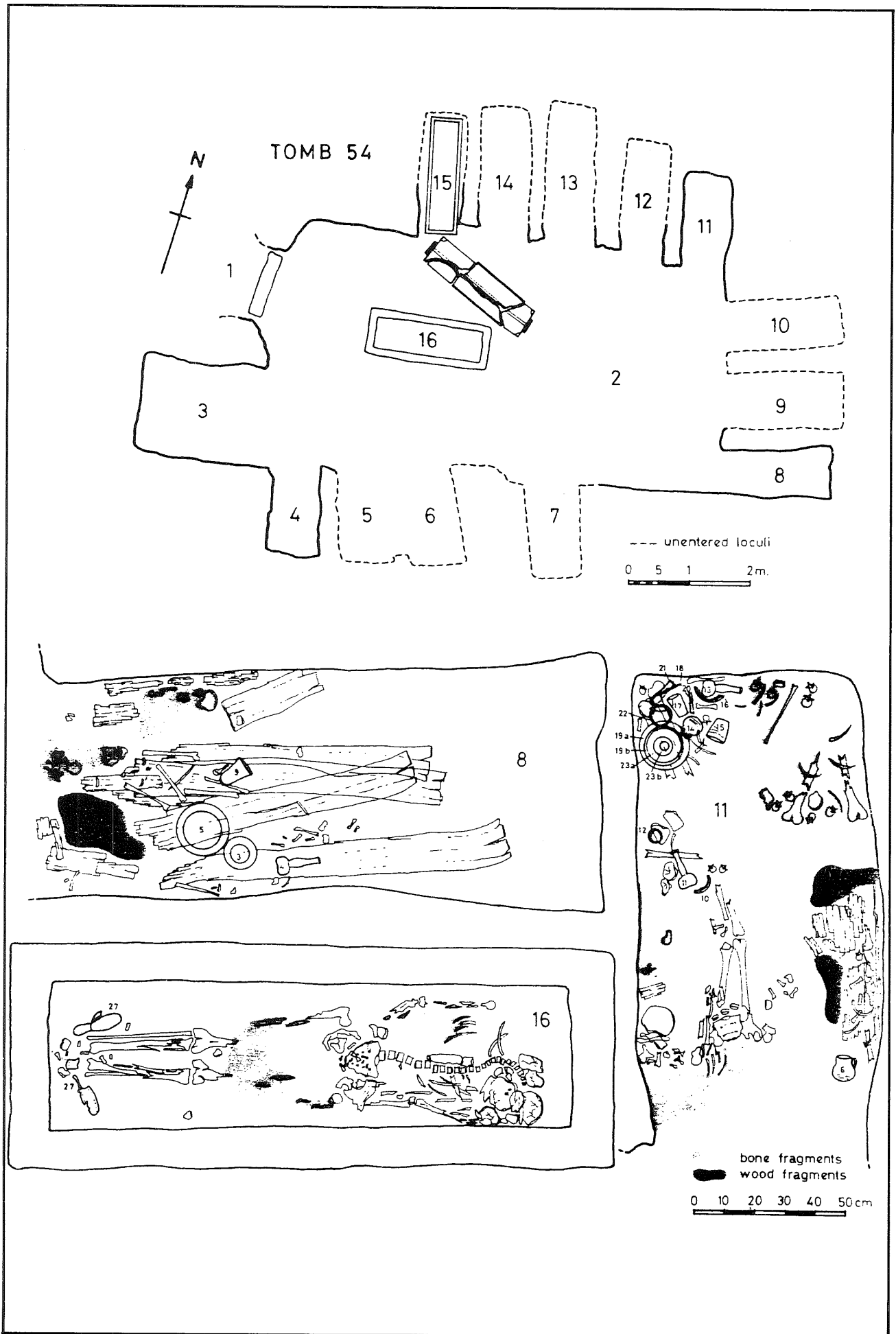


Fig. 8: Tomb 54: plan.

fore the remainder could be safely excavated.

Susan L. Bassett

Byzantine (Areas IV and V)

Area IV

Continued excavation in IVE and a brief survey of further deposits has helped to clarify the phases of Byzantine occupation as set out in the preliminary report on the fourth season at Pella.²⁵

Late Byzantine

Again the latest chronological indications are provided by the imported late Roman red slip wares (classifications and dating are from Hayes, 1972 and 1980). A bowl of Late Roman C/Phocaeen Ware, Form 10A and another of African Red Slip Ware, Form 104C, were found within a floor matrix. They suggest a late sixth century date for phase III. An African Red Slip Ware, Form 99C (dated between 560/80-620 A.D.) could extend this into the seventh century, although the subsequent phase IV contains material no later than the early seventh century. The latest imported ceramic from phase II is a Late Roman C/Phocaeen Ware, Form 3F, dating to the second quarter of the sixth century.

The sixth and seventh centuries would thus appear to have been an active period in domestic building at Pella.

The earliest architectural phase referred to in the previous report, phase I, has proved to be Hellenistic. The sixth century Byzantine walls were built directly on top of the dismantled Hellenistic walls. No indications of occupation during the Roman period have been found in IVE and a similar situation was found in IVD to the north (see the discussion of the street, below).

Early Byzantine

There are, however, traces of earlier

Byzantine occupation of a somewhat insubstantial nature. A number of loci contained floor levels without any associated architecture. One exception is a poor construction in the west that may have been a rough uncoursed wall (F. 76). Nearby was an ash pit (F. 70), which ran beneath a sixth century wall (22) and partly over a Hellenistic wall (26). To the east, the well-preserved remains of a *tabun* (F. 33), partly underlies a sixth century wall (12), and its associated surface (9.9/15.1) overlies a dismantled Hellenistic wall (27). This suggests that the Hellenistic walls had been demolished well before the next extant architectural phase (II), while the latter has completely obliterated any structures of the intervening period. The only imported red slip piece from the deposits is an African Red Slip bowl Form 91, dating to the first half of the fifth century.²⁶

The Byzantine street

The northern building of phases III, IV and V in IVE, extends further north into IVD, where it opens onto a street.²⁷ A follis of Maurice Tiberius was found in 1980 embedded within the street surface, which was provisionally dated on this evidence to the end of the sixth-early seventh century. During the 1983 season the street was excavated. The latest imported ceramics are African Red Slip Ware, Form 106 (600-660 A.D.) and Cypriot Red Slip Ware, Form 9C (580/600-end of the seventh century).

A second street surface was revealed beneath the first street level, containing African Red Slip Ware, Form 106, with nothing else later than the mid-sixth century. These two street phases, one earlier in the seventh century and one later in the seventh century, agree with the broad chronology of architectural phases IV and V in IVE. A third surface, separated from the second by an 0.08 m. soft fill, contains little clearly diagnostic material and none of the typical late Byzantine ceramic wares and forms. More analysis is required be-

²⁵ Hennessy, 1983, *op. cit.*

²⁶ J.W. Hayes, *Supplement to Late Roman Pottery*,

London, 1980, p. 516.

²⁷ J. B. Hennessy, et. al., Report on a second season of excavations at Pella, *ADAJ*, XXV (1981).

fore a date can be suggested. Lying immediately beneath this deposit was a thick pure Hellenistic collapse, echoing the sequence revealed in IVE.

Pamela M. Watson

The Byzantine East Church (Area V)

The excavations of earlier seasons had uncovered the atrium and parts of the nave and aisles of the basilical East Church, which dates in all probability to the 5th or 6th century A.D. During the 1982/3 season the main aim was to delineate the eastern end of the church; additional excavation was carried out along the southern wall to ascertain whether or not there was evidence for the conversion of the church into a mosque in the Early Islamic period.

Excavation of the east end revealed that the church is triapsidal, with an external central apse and an inscribed apse terminating the southern aisle. The eastern end of the north aisle has yet to be excavated but its apse is probably also inscribed. The maximum length of the church (excluding the atrium) is 28.23 m. Each of the two colonnades between nave and aisles was composed of seven columns approximately 2.60 m. apart. The ground plan is slightly asymmetrical as a result of the misalignment of the church's south wall which was constructed either along a natural drop in the escarpment on this side of the building or to follow the line of an earlier wall. Thus the internal width of the church at its western end is 15.61 m., while at the western edge of the chancel it has narrowed to 14.77 m. The asymmetricality is augmented by the main apse being skewed slightly to the north.

Erosion from the western slope of Jebel Abu el Khas above the church had filled the eastern sector of the building to a depth of about 4.00-5.00 m. The main apse stands to a height of 4.78 m. above the threshold of the central door. With the restoration of a fallen block a minimum height of 5.26 m. for the apse is reached, without any trace of springing for a hemidome.

At the east end of the church several of the usual church fittings, or fragments or

traces of them, were found — the chancel, chancel screen, *synthronus*, reliquary container and relic.

The *synthronus* consists of a semi-circular bench set against the central apse, ca. 1.00 m. wide and 1.00 m. high, with three steps leading up to it. The steps' risers were 0.25 m., and the treads 0.23 m. too shallow to sit on with comfort. As with all other elements of the East Church found to date, the *synthronus* had been stripped of its veneer of tiles and stone cladding (in this case marble and slate) before the church's final collapse, so that generally only imprints of the cladding remain in the *synthronus*' mortar.

The *chancel* rose 0.46 m. above the floor of the church aisle. It is not yet fully excavated so there remains some uncertainty whether it extended into the aisles or was confined to the central area. Its projection into the nave appears to have been somewhat less than in many contemporary churches in the area. The chancel was reached by a centrally-placed, finely-dressed marble step 0.22 m. high; between this and the chancel is a marble slab, the top of which is 0.09 m. above the present robbed-out surface of the chancel, presumably at the level of the original floor. Along the front of the chancel are post-holes and slots for the screen, marble fragments of which were found scattered through the surrounding debris. The south end of the screen terminated at a post which stood close to the second column of the nave; how far the screen then ran eastwards — whether to the first column or to the respond — cannot yet be said. In the surviving surface of the south-western sector of the chancel was found a number of amorphous holes which may be related to the *ambo*, now entirely vanished.

The *reliquary container* was found sealed and set into the surface of the chancel. It consists of a beautifully dressed limestone *cippus* or drum with mouldings. Measuring 0.60 m. in height and a maximum of 0.60 m. in diameter, it underwent some rather rough reshaping before it was implanted in the East Church, notably by the cutting of a central round-bottomed hollow (diameter 0.20 m., depth 0.20 m.)

in the top of the drum. The shape of this hollow may indicate that its original function within the church was that of a *thalassa* rather than a reliquary container. Be that as it may, it was later used as the repository for the East Church's reliquary, and the central hollow was sealed by a stout bronze cover which fitted neatly inside it. On top of the bronze cover were four loops, through which pointed iron bars were driven and secured in holes in the sides of the hollow. The spikes were then sealed with lead lugs, which were also partly set in the stone. The whole closure was extremely secure, and no way could be found to remove the cover other than by breaking the iron bars.

The reliquary chamber was filled with fine dust, presumably seepage from outside. Within the dust were some fragments of wood, and a relic casket and lid, both finely carved out of gypsum, in the shape of a miniature sarcophagus 7.5 cm. long, 5.1 cm. wide and 7.5 cm. high (Pl. XII: 1). Within the sarcophagus were a perforated silver tube 7.3 cm. long with a gold band, and an amorphous friable crystalline object, a fragment of which is being analysed at the Institute of Medical and Veterinary Science, Adelaide.

Space does not permit a detailed discussion of the reliquary, but it seems certain that it served some quite different function before its deposition as the relic of the East Church, for its lid and base were both pierced by holes. The hole in the lid was evidently designed to hold the silver tube.

Another major find in Area V was the bronze incense burner suspended on three chains (Pl. XII. 2). Originally it had three feet, but at some point these were broken off, leaving only stumps.

Warwick Ball and Anthony McNicoll

Wadi Hammeh Survey

Introduction

The impetus for the survey derived from two previous studies: an analysis of the Lower Paleolithic site of Abu el Khas, located above the Wadi Himār, a tributary of the Hammeh;²⁸ and a preliminary geological study of the Tabaqat Fahl area with emphasis on the Wadi el Hammeh, carried out in 1981.²⁹ Both studies highlighted the significance of the Wadi el Hammeh, and the adjacent Bronze Age tomb group discovered at a point of debouchment of the Wadi el Hammeh into the valley by the East Jordan Valley Survey,³⁰ also indicated potential for ceramic period sites.

The survey of the Wadi el Hammeh commenced in December 1982, and it was originally hoped to cover the area intensively in one season. Owing to the abundance of cultural material encountered however, a second season will have to be undertaken.

Survey area

The boundaries of the survey area were decided partly on biogeographic features and partly by arbitrary limits. The primary concern was to cover the Wadi el Hammeh drainage system, from its descent from the western edge of the 'Ajlun Highlands to its mouth in the Jordan Valley. The Jordan Valley road thus formed a convenient western limit. The eastern boundary was roughly along the 150.00 m. a.s.l. contour, to exclude the lower wooded areas of the 'Ajlun Highlands which are part of a different physiographic unit. The southern boundary was aligned with the Wadi Himar, its tributaries and the edge of the broad Tabaqat Fahl plain. An unnamed wadi formed most of the northern boundary.

Wadi el Hammeh lies north of the

²⁸ L.E. Villiers, First report on Palaeolithic sampling at Abu el Khas, Pella, *ADAJ*, XXIV (1980) p. 163-167; and, *Explorations of the lower Palaeolithic period in Jordan: the Abu el Khas site*, unpublished MA Thesis, Canberra, 1981.

²⁹ P. Macumber, *Geology of the Tabaqat Fahl Area, Northern Jordan*, manuscript: University of Sydney, 1981.

We would like thank the Co-director of the Sydney University Expedition to Pella, Dr. A.W. McNicoll, for his support of this project. Our thanks are also due to the British School of Archaeology in Jerusalem for their much-appreciated financial assistance.

³⁰ M. Ibrahim, J.A. Sauer and K. Yassine, The East Jordan Valley Survey, 1975, *BASOR*, 222 (1976).

Decapolis city of Pella, and originates as the Wadi abu Saleh in the 'Ajlun Highlands (at approximately 600 m. a.s.l.), between the villages of Khanzira and Kufr Rakib. It drains a fertile upland area before descending the scarp where at about -20 m. b.s.l. it is joined by a tributary and becomes the Wadi el Hammeh (Fig. 9). This wadi is fed by hot springs — the Hammamat abu Dhabli — and flows permanently.

Survey aims and methods

The aims of the survey were threefold:

1. to locate, record and identify all cultural remains within the survey area, from the prehistoric to recent periods,
2. to commence collection and identification of lithic artefacts from the stratified deposits of the Wadi Himar, as part of an effort to establish a local chronostratigraphic sequence. The potential of this area had been noted in 1981 during the geological survey,³¹
3. to assess the cultural relationship between the Wadi el Hammeh and Pella, in order to establish a more integrated picture of the history of the Tabaqat Fahl region.

Survey method involved two complementary techniques. Firstly, through the use of aerial photographs, likely archaeological sites were identified and noted for specific investigation. Secondly, and again using aerial photographs, geographic units (e.g. terraces, plateaux, alluvial fans etc.) were delineated and intensively surveyed on foot in closely spaced transects. Sites encountered were recorded on standard pro-forma sheets, and sampled selectively (purposive sampling)³², for the purposes of cultural identification. Controlled random sampling (probability sampling, *ibid.*) was used on two of the major sites (Sites 1 and 13) in order to obtain representative samples from different

areas of the sites. In the case of tomb groups, such as Sites 7, 9, 12, 8, 14, 22, 23, a total collection of all visible cultural material from within the tombs and their associated scree slopes was taken in view of the active erosion and tomb looting occurring. At Site 6, 10% of the presently visible fifty-five tombs were sampled.

Site definition was based on the presence of architectural features and/or concentrations of lithic or ceramic materials. As pottery and lithics were collected on all transects, "concentrations" were defined in relation to the overall density of such material occurring in the survey area.

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Results of the 1982/3 season

During this season slightly over one-third of the survey area was covered. Twenty-nine sites were found, including twelve sites with lithic concentrations, twelve tomb sites, three quarries, and five settlement sites.

Lithics

It became evident this season that the main concentration of relatively *in situ* Lower and Middle Paleolithic remains occurs in the upper eastern reaches of the Wadi el Hammeh system. Most of the material in the lower reaches of the Hammeh, where the survey concentrated this year, is in a secondary (redeposited) context, with the possible exception of artefacts found on the high ground of the travertine-conglomerate outcrops. Lower Paleolithic material has so far been found on top of the eastern foothills and ridges at Abu el Khas,³³ and at Site 30 (Fig. 10). The

³¹ Macumber, *op. cit.*, 1981.

³² C.L. Redman, *Productive Sampling Strategies for Archaeological sites in Sampling in Arc-*

haeology, Tucson, 1975.

³³ Villiers, *op. cit.*; and, Final report on Palaeolithic sampling at Abu el Khas, North Jordan, ADAJ, XXVII (1983).

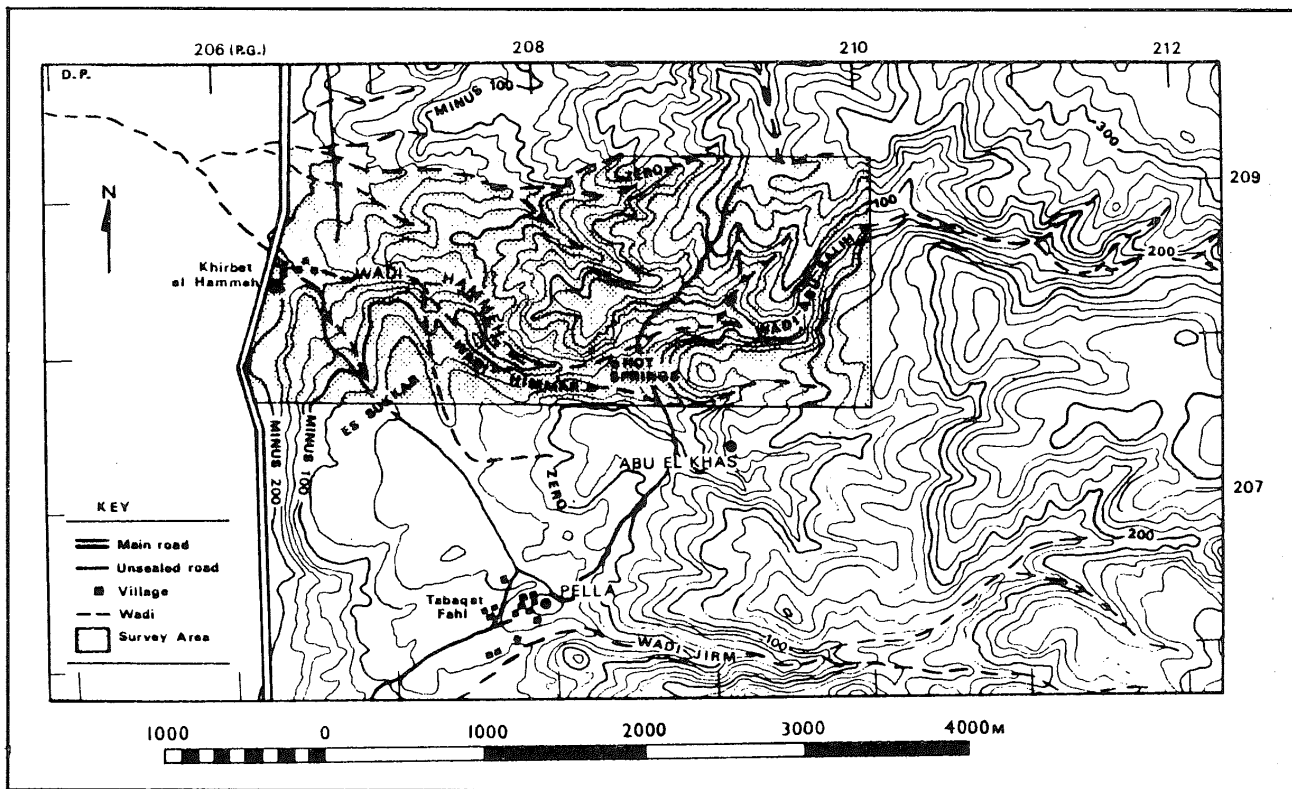


Fig. 9: Wadi Hammeh survey area.

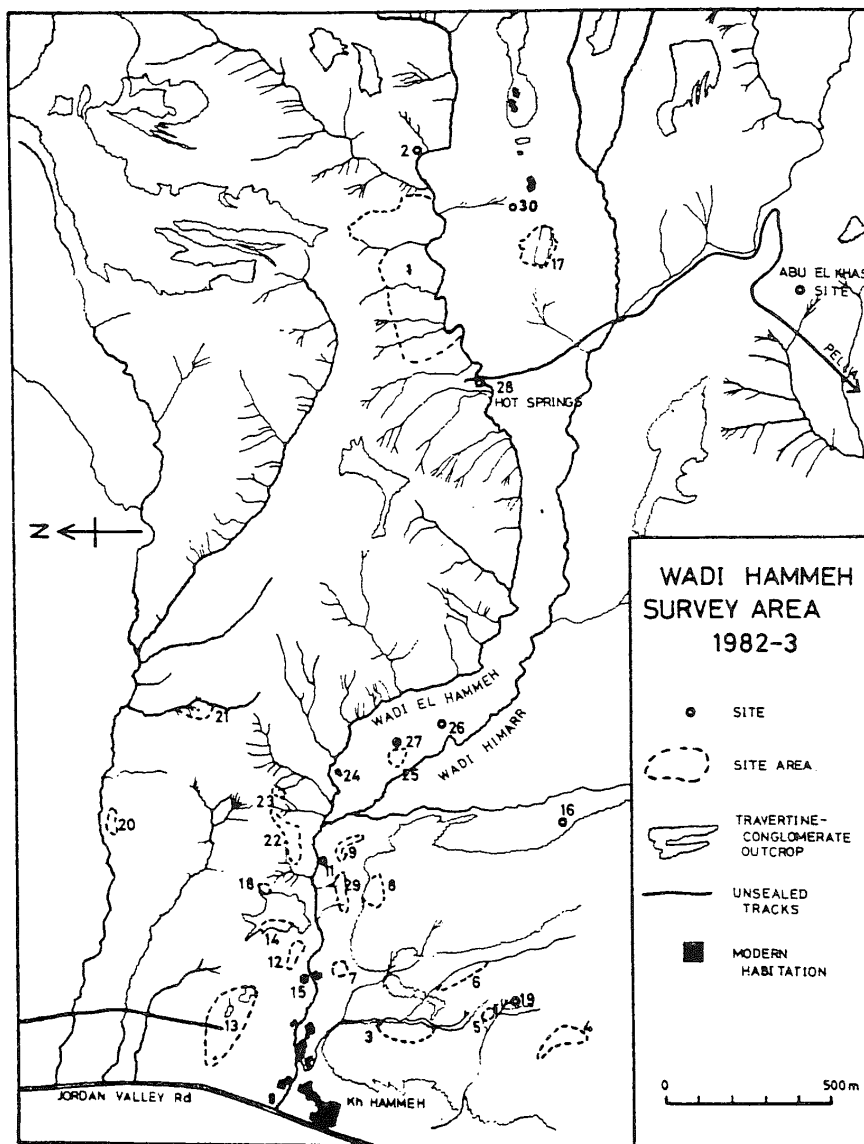


Fig. 10: Survey sites in Wadi Hammeh (map 2).

Middle Paleolithic site of El Hor (Site 1) is located on a series of tongues of land beside the upper Wadi el Hammeh. It is a major quarry/workshop site with possible Acheulian and post-paleolithic material present. Preliminary examination of all survey samples suggests that a number of discrete periods within the Lower-Middle Paleolithic are represented. Confirmation of this by technological and typological analysis would firmly establish the Wadi el Hammeh as an important focus of activity during this period.

The Upper Paleolithic period is sparsely represented. A major problem here however is that assemblages of this period are poorly defined, grading into the Middle Paleolithic and Epipaleolithic at either end. Certainly some indeterminate samples may belong to this period, and it is hoped that analysis of the stratified material exposed in the Wadi Himār will shed some light on this problem.

There is an extraordinary density of Epipaleolithic sites associated with an unusual geological feature: a remnant travertine cap on the high edges of the Wadi el Hammeh along its lower course. At Site 26, an *in situ* Kebaran assemblage was excavated from the base of this formation, while on its top a Natufian habitation site discovered in 1981 (Site 27) was sounded (P.C. Edwards, above). The travertine cap extends westwards on both sides of the Wadi el Hammeh, and Natufian sites and scatters occur over most of its surface (Sites 9, 12, 22, 23). Clearly during the Epipaleolithic period a rich combination of natural resources such as springs, possible swamp or marsh areas, adjacent ecotones of savannah grasslands and open oak forest and the game it supported,³⁴ would have made this area highly attractive.

No Neolithic sites were found this season although some possibly Neolithic material occurs on the south side of the

Hammeh on an intermediate terrace, and on the high ground of the travertine-conglomerate outcrops there.

The distribution of lithics attributable to the Chalcolithic-Early Bronze period is interesting, being largely restricted to the north side of the Hammeh. There is a concentration around Site 13, a workshop at Site 18, and scatters were found north of Site 18 and between Sites 20 and 21. This pattern tends to suggest that the small tell of site 13 may harbour some settlement remains of this period (see below).

Archaeological investigations of the Quaternary deposits in the Wadi Himār were commenced this season. Artefacts in this sequence ranged from the Lower-Middle Paleolithic periods up to the Epipaleolithic (above and below the travertine cap). It is hoped that charcoal recovered from the middle part of the sequence, in association with artefacts, will provide a radiocarbon date around which a chronostratigraphic sequence may be formulated. Further work in this location should provide a schema of cultural succession which may well have applicability outside of this area. It will also enable much of the culturally indeterminate surface collections to be identified.

Pottery

Preliminary analysis of pottery collections indicated that the Early Bronze I-III, and 'Abbassid-Fātamid periods were totally absent from the Wadi el Hammeh, while evidence for a Mamluk, Roman and Chalcolithic presence was negligible.

In the lower reaches of the survey area, where the Hammeh is at its greatest point of divergence from Pella, a dense concentration of E.B. IV material was found. Of the seven major tomb groups in this area (sites 6, 7, 9, 12, 22/23), five were found to belong to the E.B. IV period. Moreover a degree of contemporaneity

Villiers, 1982, *op. cit.*

among the five sites was seen in the ceramics. A common feature was the "trickle" painted pottery known from excavations at Megiddo, Tomb 1098,³⁵ and El Husn.³⁶ Although a circular, domed chamber was common to all, two different types of entrance ways were observed within this group. Tombs cut into the hill-slope had a shallow, sunken dromos, while those cutting directly down possessed a typical E.B. shaft entrance. A potential E.B. IV occupation horizon was also indicated on the nearby settlement Site 13, Khirbet el Hammeh. The 1975 Jordan Valley Survey listed Khirbet el Hammeh as having great potential for excavation.³⁷ The site itself is not under immediate threat (other than the long-term effects of ploughing), but the potentially associated E.B. tomb groups are continually being damaged and looted as new tombs are uncovered. An investigation of the relationship between Site 13 and these burial groups therefore has a high priority.

The Middle Bronze Age and Late Bronze Age in the Wadi el Hammeh was restricted to a small group of five tombs (Site 8). In type they were identical to the E.B. IV tombs of Site 6 and may have been re-used. Only one of these tombs (Tomb 3) produced diagnostic pottery which was clearly dated to the MB-LB transitional period.

Iron Age pottery was sparse except for a scatter on and around Site 7. The remains of a small but substantial building were found here, but the association between sherds and structure remains unclear.

Hellenistic material was found throughout the survey area but with two clear focal points. The first centered around a potential occupation horizon at Khirbet el Hammeh (Site 13), while the second was concentrated on the hill fort of El Husn, above the hot springs (Site 17).

This site was not within the 1982-3 survey area although sherds collected by dig personnel were included in the preliminary analysis. The pottery indicated a late Hellenistic date for El Husn, based on parallels with the assemblage from Jebel Sartaba above the Wadi Malawi, south-east of Pella.³⁸ It is possible that both forts were part of an eastern defensive network which guarded the area from the hot springs (Site 28) to the main urban centre of Pella.

The major portion of the transect material throughout the survey area belonged to the late Byzantine-Early Umayyad period. A contemporary cultural phase is indicated at Site 13: a square, rock-cut cistern, located in a travertine outcrop at the western end of the site, can be dated to this period. The ceramic evidence from here and Pella suggests that the Tabaqat Faḥl-Wadi el Hammeh area was in intensive use during the Late Byzantine-Early Umayyad period.

D. Petocz and L. Villiers

Geology and Geomorphology of the Lower Wadi Hammeh Sites

Introduction

In this brief report it is not intended that detailed geological and chronological correlations with other sequences along the Jordanian Rift Valley will be attempted. Instead it is intended that the Wadi Hammeh sequence with its evidence of continuous occupation through the Palaeolithic Era should be initially considered on its own merits, and emphasis thus placed on the environmental reconstruction of the varying occupational regimes. The one departure from this structure arises with the necessity to relate the sedimentary sequences and erosive events to those of the ancient Lake Lisan, the nearby presence and fluctuations of which

³⁵ P. L. O. Guy and R.M. Engberg, *Megiddo Tombs*, Chicago, 1938.

³⁶ G. L. Harding, *Four Tomb groups from Jordan*,

APEF, VI (1953).

³⁷ Ibrahim, et. al., *op. cit.*

³⁸ McNicoll, Hennessy and Smith, *op. cit.*

Table 1A. Sites located in the Wadi Hammeh Survey, 1982-3

<i>Site Type</i>	<i>No. of Tombs</i>	<i>Geographic Position</i>	<i>P. G. Co-Ords</i>	<i>Periods Represented</i>	<i>Preliminary Cultural Identifications</i>	<i>Dominant Periods</i>
Lithic concentration	—	Terrace	208.9E-208.3N	L. Pal; Neolithic?		
Tomb	2	Wadi bank	209.4E-208.6N		Middle Paleolithic	
Lithic conc., Military site	—	Hill slope	206.6E-208.3N	LP/MP?; Epipaleolithic	Roman-Byzantine?	
Quarry	—	Hill slopes	206.6E-207.8N	LP/MP?; Epipaleolithic	Modern; Natufian	
Quarry	—	Hill slopes	206.7E-208 N	Epipaleolithic	—	
Tombs	55	Wadi bank	206.8E-208 N	LP/MP, Epipaleolithic	Early Bronze IV (EB-MB)	
Tombs and settlement	3	Terrace	206.9E-208.4N	LP/MP	Early Bronze IV (EB-MB)	
Tombs	5	Plateau edge	207.1E-208.4N	Epipaleolithic	Early Bronze IV (EB-MB)	
Tombs and lithic concentration	6	Terrace	207.2E-208.4N	Epipaleolithic; EB IV	MB/LBA Transition	
Military site	—	Terrace	207.3E-208.3N		Natufian; Early Bronze IV	
Olive Press	—	Wadi bed	207.2E-208.5N		Modern	
Tombs	24	Terrace	206.9E-208.6N	Epipal; EB IV; Byzantine	Early Bronze IV	
Settlement	—	Alluvial plain	206.7E-208.8N	MP; Epipal; Chalco-EB; Hell.	Byzantine/Umayyad; EB IV	
Tombs, quarry, lithic conc. Mill?	10	Hill slope	206.9E-208.7N	MP; UP; EB IV/Byzantine	Middle Paleolithic;?	
Cave/tomb	1	Plateau edge	207.3E-207.8N		Ottoman Mandate?	
Fort	—	Hill top	209 E-207.8N	LP-MP	?	
Lithic concentration	—	Hill saddle	207.2E-208.7N	MP; Chalco-EB	Hellenistic	
Tombs	2	Hill slope	206.9E-208 N	MB/LB; Byzantine	Chalcolithic-Early Bronze	
Lithic concentration	—	Alluvial plain	207.1E-209.1N	MP; Post Paleolithic	Middle Paleolithic	
Lithic concentration	—	Alluvial plain	207.2E-209.1N	LP-MP; Epipaleolithic	Natufian	
Tombs and lithic concentration	23	Terrace	207.3E-208.6N	Epipaleolithic; EB IV	Natufian; Early Bronze IV	
Settlement	—	Wadi terrace	207.4E-208.4N		Ottoman/Mandate	
Settlement and lithic conc.	—	Terrace	207.5E-208.2N	Epipaleolithic	Natufian	
Lithic concentration	—	Plateau	207.5E-208.3N	Epipaleolithic	Kebaran	
Settlement and lithic conc.	—	Plateau	207.6E-208.1N	Epipaleolithic	Natufian	
Building	—	Wadi edge	208.5E-208 N	Hellenistic?; Romano-Byz.?	?	
Tombs	1+	Terrace edge	207.1E-208.5N		Early Bronze IV?	
Lithic concentration	—	Hill saddle	209.2E-207.9N	LP-MP	Lower Paleolithic	

have clearly had a primary influence on human occupation during the Epi-palaeolithic times, and probably throughout much of the Pleistocene.

Physiography

Wadi Hammeh is a westward flowing tributary to the Jordan River which enters the Jordan Valley near the village of Meshariah, about 30 km. south of Lake Tiberias. It is a perennial stream fed by the thermal springs at Hammet Abu Dhabli which emerges at a point several kilometres upstream from the Jordan Valley.

The Hammeh Valley is deeply incised through sequences of Upper Cretaceous to Lower Tertiary limestones, cherts and marls, and Neogene conglomerates, calcareous siltstones, clays and tufa. Prior to entering the Jordan Valley the Wadi Hammeh is joined by the Wadi Himar, a normally dry stream which rises in Cretaceous to Eocene limestones south east of the thermal springs and runs parallel to Wadi Hammeh for several kilometres before joining it. In the vicinity of the spring, the interfluvium between the wadis forms a broad red-brown terrace which, on passing downstream narrows to become a ridge falling steeply northwards towards Wadi Hammeh but less steeply to the shallower Wadi Himar. At the junction of the two wadis the valley widens to form a small basin which extends downstream towards the rift valley, some 600.00 metres further on.

The ridge is largely composed of a sequence of Quaternary fluvial conglomerates and interbedded red-brown pebbly clays. These sediments in turn overlie a steeply dipping sequence of mudstone, bituminous shales and conglomerates which form the floor and lower slopes of the Wadi el Hammeh. Due to a lesser degree of incision, this older sequence is only occasionally seen in Wadi Himar, the floor of which consists largely of conglomeratic sediments.

Wadi Hammeh Conglomerates

The Wadi Hammeh conglomerates

with their interbedded red-brown clays are a remnant of a thick fluvial sequence which once partly back-filled a single ancestral valley whose width spanned both those of the present day *awdiyah* (valleys). Remnants of similar conglomeratic valley fills occur in westward flowing wadis tributary to the Jordan River, for instance Wadi Jirm on which Pella is situated and Wadi Yabis — both of which are to the south of Wadi Hammeh. In all three wadis the pre-conglomerate physiography was essentially similar to that which exists today, *i.e.* east to west running valleys incised into Cretaceous-Tertiary sediments during an earlier phase of graben development.

The pre-conglomeratic landscape has been partially exhumed by a more recent phase of valley incision leading to the present day wadi physiography. The incision is of the order of 20 to 30 metres and this has left conglomeratic residuals to form either hills as at Tabaqat Fahl, or terrace remnants plastered on the walls of wadis, or the ridge between the wadis el Hammeh and Himar; elsewhere, where erosion has not completely removed the conglomerates, they form a pebble base to the valley floors as in the Wadi Himār and Wadi Jirm.

On passing westwards along the ridge between the Wadi el Hammeh and Wadi Himar towards the Jordan Valley, the conglomerates are overlain by a calcareous sequence consisting of grey limey marls, calcareous silts and tufa with a harder travertine cap. These calcareous sediments have a freshwater molluscan fauna containing *Melanopsis praemorosa*. The cap rock forms a small plateau on which a dense accumulation of small scrapers, blades and flakes was noted during the 1981 field season. These occur in a dark grey clay about 0.5 m. thick.

Situated between the calcareous cap and the conglomeratic sequence was a 2.00 m. thick darkish grey clay which contained a number of chert flakes and blades and small pieces of bone and charcoal (Macumber 1981 ms.). The development within the clays of several horizons showing prismatic

soil structure suggests that there was interruption to sedimentation for sufficient time to enable pedogenic processes to operate. At this site there is strong evidence for *in situ* occupation. A detailed account of the site is given by Edwards (loc cit) who has demonstrated the existence of a Kebaran culture and obtained a radiocarbon age of $19,500 \pm 600$ B.P. (SUA 2101). Based on the presence of Helwan retouch on a large percentage of lunates in the extensive chert tool industry in the thin clay unit *overlying* the calcareous cap, Edwards considers the site to be Early Natufian with a possible age dating to the 10th millennium. The calcareous suit on the Plateau therefore dates from between 19,500 B.P. and 10,000 B.P.

At its western edge the Plateau ends abruptly, giving way to a low saddle which in turn rises to a small butte marking the termination of the ridge where the wadis meet. The butte — here termed the knob — is capped by a somewhat thickened calcareous sequence of calcareous silts, pisolitic limestone and tufa. The uppermost calcareous suite on the Plateau and on the knob are remnants of a once more extensive sedimentary unit which was deposited in the lower regions of the Hammeh valley where it widens prior to entering the Jordan Valley. Downstream from the Knob additional remnants of these sediments occur as terraces on either side of Wadi el Hammeh where they have been extensively used for tomb sites.

At the knob the greatly thickened calcisiltite suite is underlain by a 2.50 m. thick light coloured sequence of 5 calcareous cemented conglomerate bands. The lowermost of these bands is overlain by a carbonaceous silt containing charcoal fragments, and underlain by a bright red-brown gypseous clay — this taken together is interpreted as a palaeosol. Beneath the gypseous clay the sequence reverts to the

normal conglomerates and interbedded red-brown clays found elsewhere up-valley. While only one fine unrolled flake was noted in the calcisiltite sediments, large numbers of chert artefacts occur throughout the underlying conglomeratic sequences — those in the five calcareous bands suggesting a Middle Palaeolithic age, and those closer to the base of the sequence indicating a possible lower Palaeolithic age.³⁹ In this region chert artefacts are eroding from the conglomerates and occur scattered over the surface on hillslopes, saddles and at valley bottoms.

Down valley, the calcareous sequence continues to thicken and the conglomerates become light-grey as the red-brown clay matrix is replaced by a calcareous matrix; the conglomerates in turn gradually become subordinate to the calcareous silts, pisolitic limestones and tufas. There is thus a partial lateral facies change from non-calcareous to calcareous sediments as the valley widens immediately prior to joining the Jordanian Rift Valley.

Occupational Environment

The lateral facies change from conglomerates and non calcareous red-brown clays to a calcareous suite of sediments as the Wadi el Hammeh widens on approaching the rift valley is interpreted as indicating the passage from a valley fill depositional environment towards a rift valley setting where lacustrine conditions exist and chemical deposits predominate. During the late Pleistocene the Jordanian Rift Valley was occupied by Lake Lisan (Neeve and Emery, 1967)^{39A} and it is likely that the calcareous sequence was deposited at the head of an embayment of Lake Lisan formed by the mouth of the Wadi Hammeh. That the Wadi el Hammeh conglomerates and their calcareous equivalents were being deposited during the

³⁹ L. Villiers, Personal Communication.

^{39A} Neeve, D. and Emery, K.O., "The Dead Sea, depositional processes and environments of evaporites." *Geol. Survey Israel Bull.*, 41, 1967.

lifetime of lake Lisan is shown by the 19,500 years B.P. date from the grey clays beneath the calcareous sediments on the Plateau. The range of Palaeolithic industries within the conglomerates at stratigraphically lower levels indicates that deposition of this sequence spanned a considerable period of time at least covering that of Lake Lisan which has been variously dated to a period ranging from 80,000 — 60,000 B.P. up to 18,000-15,000 B.P.⁴⁰

Large numbers of artefacts occur scattered throughout the conglomeratic sequences in the vicinity of the embayment, and although in situ occupational sites have been confirmed only towards the top of the sequence (Edwards, *ibid*), the density of artefact scatter suggests a local source. The distribution of artefacts when placed in the context of facies variations down the Wadi el Hammeh, points to a fairly stable occupational regime existing through Palaeolithic and Epipalaeolithic times. The physical environment suggested by the interfingering lithologies present within the embayment formed at the mouth of the wadi indicates a lake margin setting with perhaps marsh/lagoon and narrow marginal floodplain passing rapidly upstream into a fluvial sequence. It seems likely that the calcareous suite represents a marsh environment with the source of lime being derived from upwelling carbonate enriched groundwaters outseeping along a groundwater discharge zone marginal to the lake.

While Lake Lisan (and perhaps its predecessors) has strongly influenced the physical environment and therefore occupation regime in the lowermost limits of Wadi Hammeh close to the margin of the rift valley, the perennial Hammet Abu Dabli thermal spring is seen as providing an extremely favourable albeit more localized environment especially at times of climatic stress as in the cooler glacial times and during periods of higher aridity.

The combination of hot springs and nearby megalake are clearly the attraction responsible for occupation of this region during palaeolithic times.

Neo Tectonics and Wadi Evolution

No discernible dip can be seen in the conglomeratic unit upvalley beyond the Plateau, however the calcareous sediments on the plateau have a very slight tilt of perhaps 1° away from the rift valley. On passing onto the saddle between the Plateau and the Knob there is a significant change perhaps marked by local faulting and thereafter the sediments dip at about 7° towards the rift valley. The terrace developed on the calcareous unit is similarly tilted. Since the tilted sequences at the Knob contain Upper Palaeolithic artefacts, the age of tilting is certainly post Upper Palaeolithic; furthermore since a 1° back tilt also appears on the Plateau sediments, it is likely that this event post dates the Kebaran site dated at 19,500 years B.P. which occurs beneath the calcareous cap.

The incision of the wadi system to give the present day physiography occurred after the deposition of the Plateau sequence; it also appears to post date deposition of the uppermost clay unit in which the Natufian sequence occurs.

This event may coincide with that recorded by Schuldenrein and Goldberg (1981) who suggest that a major erosional phase occurred towards the end of the Pleistocene. Commenting on late Quaternary palaeoenvironments and prehistoric site distribution in the lower Jordan Valley, they note that the primary Epipalaeolithic sites are found at elevations above 180 m., but subsequent Natufian sites occur lower in the landscape, post dating the erosional event. In the case of the Wadi Hammeh however, the early Natufian site lies virtually at the top of the

⁴⁰ Neeve, and Emery, *op. cit.*, Kaufman, A., "U-Series of the Dead Sea basin Carbonates", *Geochim, Cosmochim Acta* 35, 1269-1281; Vogel, J.G. and Waterbolk, H.T., "Groningen radio -

carbon dates. Geological Samples Dead Sea Series, Israel (Lisan). *Radiocarbon* 14/1, 1972, 46-47.

valley-fill sequence and the incision of the wadis closely post dates this site. Given the close proximity of the site to the rift valley, the erosion must be directly linked to the

drying up of Lake Lisan.

P. G. Macumber

Anthony McNicoll, Warwick Ball
Susan Bassett, Phillip Edwards
Phil Macumber, Dani Petocz
Timothy Potts, Leanda Randle
Linda Villiers, Pam Watson