'Atiqot 108, 2022

Early Bronze Age IA Settlement Remains at Ḥorbat Ḥammim (South), near Modi'in

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Ḥorbat Ḥammim (South) is located in the Shephelah region, southwest of the town of Modi'in, in an area that was designated for the expansion of Ispro Commercial Center (map ref. 196705–98/644142–237; Fig. 1).[1] The archaeological site lies west of Ḥorbat Ḥammim and east of Ḥorbat Nekhes. Since 1999, several excavations have been carried out at the site.[2]

The Excavation

Prior to the excavation in 2007, the soil layer covering the gently sloping limestone bedrock surface was removed mechanically under archaeological supervision. Four spots of potential archaeological interest were identified, two of which proved to be natural shallow bedrock pockets containing soil devoid of anthropogenic materials. The other two spots yielded a rock-cut basin and a cave within the limestone bedrock outcrop (for a preliminary report, see Brink 2007a).

[1] The excavation (Permit No. A-5203), financed by Mega Or Ltd., was carried out on behalf of the Israel Antiquities Authority, and directed by Edwin C.M. van den Brink (including photography), with the assistance of Eli Bachar and Shlomo Ya'aqov-Jam (administration), Tzach Kanias (archaeological supervision), Avraham Hajian (surveying), Natalia Zak (plan and section drawings), Tsila Sagiv (field photography), Mariam Menokian (pottery drawing) and Leonid Zeiger (flint drawings). The flint and ground-stone assemblages were processed by Ofer Marder; the faunal remains, by Liora K. Horwitz; and the shells, by Henk K. Mienis.

[2] Previous excavations carried out on behalf of the Israel Antiquities Authority were directed by Deborah Sklar-Parnes (Permit No. A-3161; Sklar-Parnes 2002), Amit Re'em (Permit No. A-4310), Tzach Kanias (Permit No. A-4319), Sigal Golan (Permit Nos. A-4409; A-4415), Amir Gorzalczany (Permit No. A-4693; Gorzalczany 2008) and Orit Segal (Permit No. A-4913; Segal 2010). We are grateful to Tzach Kanias, Amir Gorzalczany and Orit Segal for discussing their finds with us.

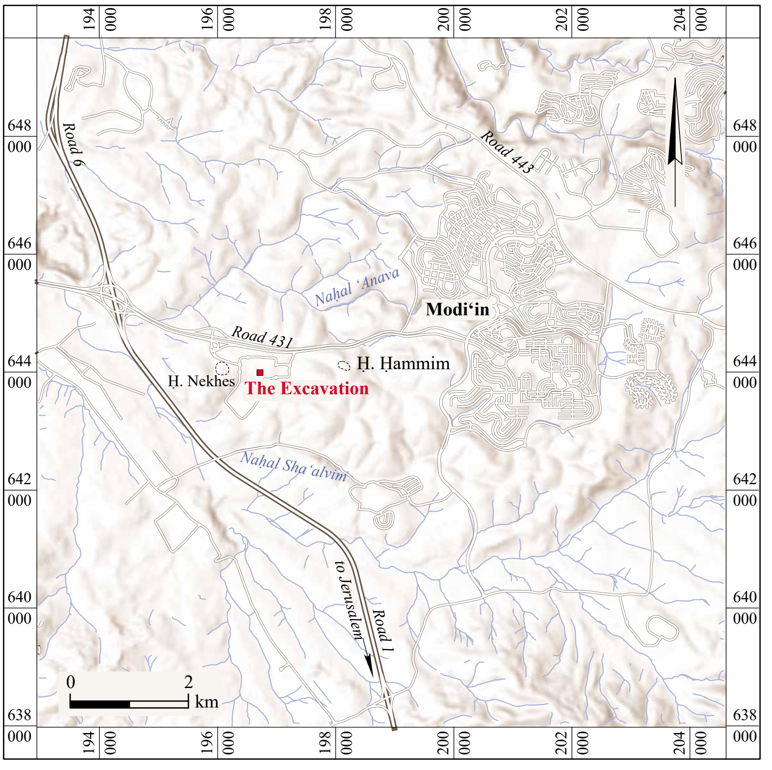


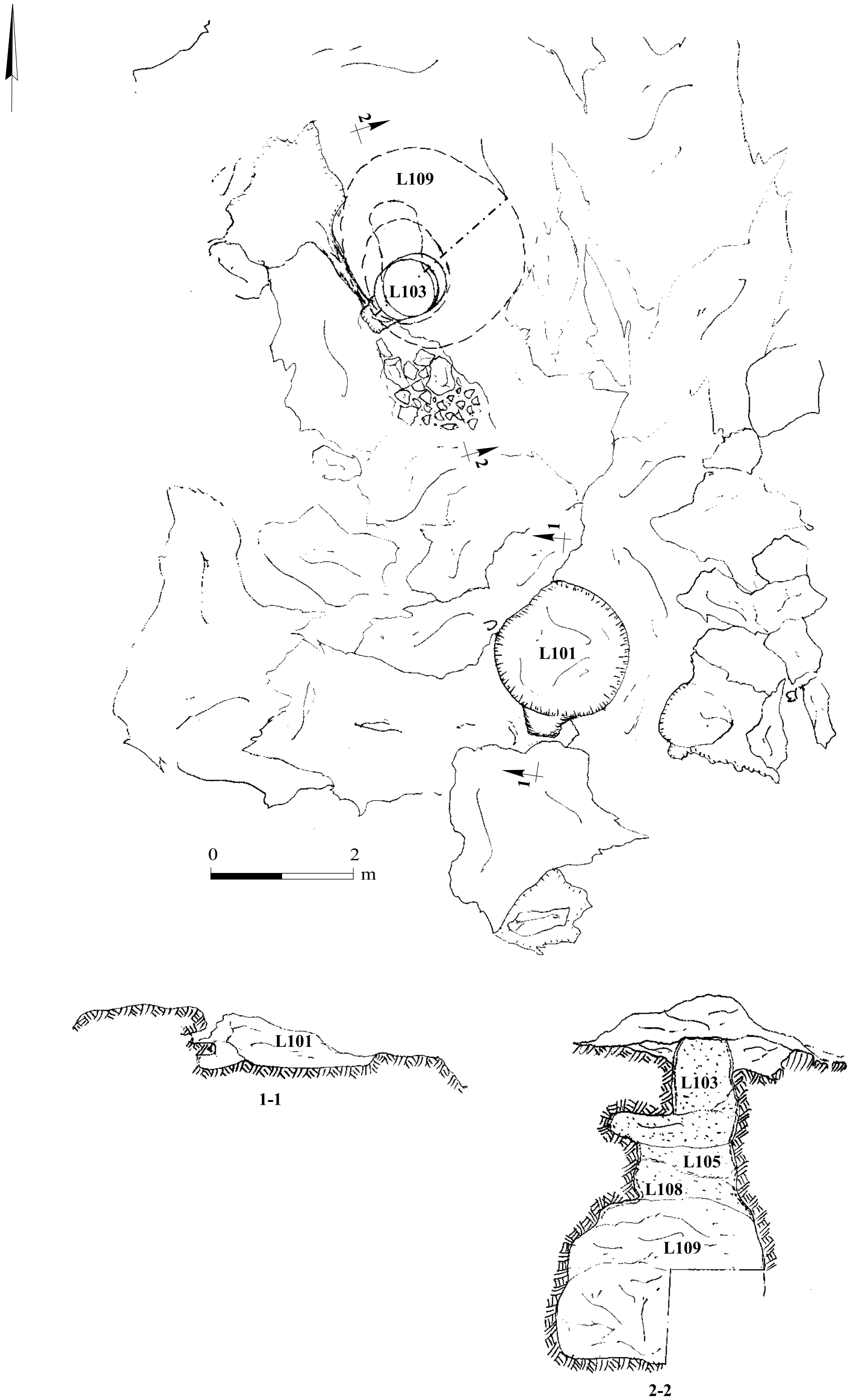
Fig. 1. Location map.

The Rock-Cut Basin

A large shallow, circular rock-cut basin with slightly tapering walls (L101), overlain by a thin layer of colluvial soil, was exposed (Plan 1: Section 1–1; Fig. 2). The basin was seemingly an isolated feature, and there were no diagnostic finds that could date it. However, scores of similar rock-cut installations exposed in previous excavations in the area south of Modi‘in, have been dated to the Chalcolithic period (Brink 2005; 2008: Figs. 3f, 3g, 6). This type of shallow circular installation may have served as a threshing basin (Brink 2008:6–8), although its function is still debated (Eitam 2009).

The Cave

About 4.5 m north of the circular basin, a natural, rounded opening in the bedrock (max. diam. 0.8 m) led down through a slightly oblique shaft (L103) into a manmade rock-cut cave that widened toward the bottom (max. diam. c. 3 m, depth 4.5 m; Plan 1: Section 2–2; Fig. 3). The shaft was full of colluvial sediments (L103, L105) mixed with many limestone rocks that were washed-in over the years from the surrounding gently sloping ground. A layer of small stones separated the bottom of the shaft from the fill layers inside the small cave; the upper (L108) and lower (L109) fills in the cave were distinguished by their soil consistency. The sediments from the shaft and the cave were dry-sieved using a 5 mm mesh, yielding many potsherds and stone tools, as well as a significant quantity of animal bones



Plan 1. The excavation, plan and sections.

Fig. 2. Circular basin (L101), looking south.

Fig. 3. Vertical shaft (L103) leading into cave, looking north.

Fig. 4. Selection of animal bones from cave fill.

(Fig. 4). As no *in situ* finds were exposed, the original hewing date and the function of the cave—whether for storage or possibly for water collection—could not be determined. The fieldstones, pottery sherds, stone tools, animal bones and shells retrieved from the fills may either have been washed into the cave, or intentionally discarded in it. Based on the presence of a few diagnostic potsherds found in the deeper layers, the cave may have been quarried as early as the Late Chalcolithic period. However, the bulk of the pottery dates homogeneously to EB IA, definitively attesting to EB IA activities in the cave.

The Finds

The Pottery

The limited pottery assemblage retrieved from the shaft (L103, L105) and the cave (L108, L109) dates almost entirely to EB IA, and only a few sherds may be attributed earlier or later dates. Two small body sherds from the deeper levels in the cave—a combed fragment and a red-painted sherd (see Fig. 8:9, 10)—can be dated to a late phase of the Late Chalcolithic period (LC 2).[3] Two indented, loop-handled jar sherds (see Fig. 7:4, 5) from the shaft (L105) are characteristic of the subsequent, initial Late EB I (EB IB_1, also designated the Tel ʻErani C-horizon; see Yekutieli 2000: Table 8.2). In the absence of *in situ* pottery, the EB IA assemblage from the cave and the shaft is presented here typologically.

Bowls and Basins (Figs. 5, 6)
The assemblage includes small, medium and large bowls (the large deep bowls also classifying as basins). Some of the bowls are wide open bowls with straight flaring walls (Fig. 5), others are more hemispheric (Fig. 6). The rims are tapered or flattened, and either plain (Figs. 5:1–7; 6:1–4) or indented (Figs. 5:8, 10, 12; 6:5–7). Some bowls have a clay band decorated with a continuous indented pattern, applied slightly below the rim (Fig. 5:9, 11, 13). One large bowl is decorated on the interior with a row of five circular punctures, executed prior to firing (Fig. 5:3).

Holemouth Jars, Necked Jars and Pithoi (Figs. 7; 8:1–3)
The few holemouth jars have either a plain rim (Fig. 7:1) or a continuous clay band decorated with an indented pattern applied below the rim exterior (Fig. 7:2, 3), similar to the indented decoration on some of the bowls (see above). The more common necked jars have flaring rims, either plain (Fig. 7:6–9) or indented (Fig. 7:10, 11). Pithoi are attested by several thick-walled body sherds with a continuous indented clay band applied around the lower part of the neck (Fig. 7:12–14). Ledge handles are invariably indented (Fig. 7:15–18). Apart from the two indented jug loop handles attributed to the later Tel ʻErani C-horizon (Fig. 7:4, 5; Braun 2012:11, Fig. 4:1–5; see above), only a single small plain loop handle was found (Fig. 7:19). All the vessel bases are flat (Fig. 8:1–3).

Stopper (Fig. 8:4)
A single body sherd, reworked as a stopper, was retrieved.

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[3] The combed sherd (Fig. 8:9) is a regional, as well as a chronological marker, diagnostic of a late phase within the Late Chalcolithic (LC 2), foremost in the Shephelah (Gophna and Brink 2005:169–170). For the sub-phasing of the Late Chalcolithic and a definition of LC 2, see Brink 2013:53–54.

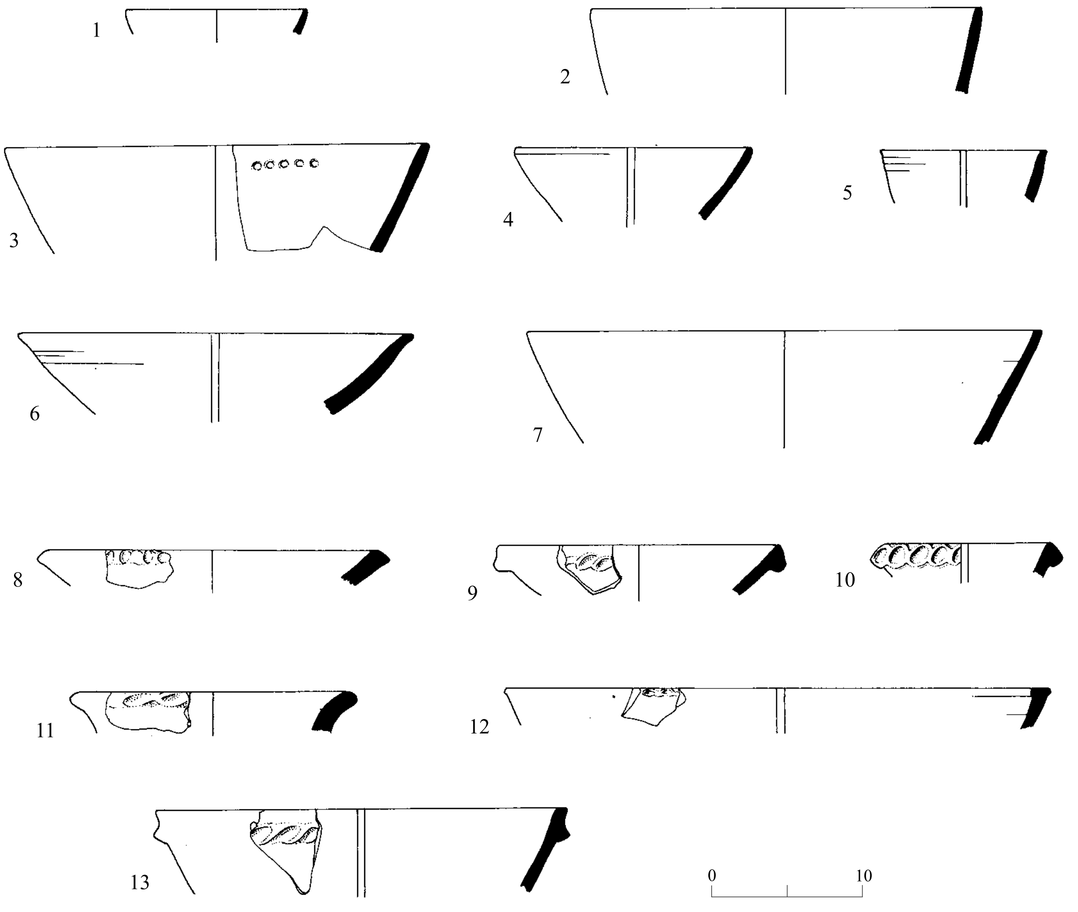

Fig. 5. Pottery: open bowls and basins.

No.	Vessel	Locus	Basket	Description
1	Small V-shaped bowl	108	1016/3	Buff-orange surface; black and white grits
2	Large deep bowl/basin	109	1023/6	Buff-orange surface, orange core; many white grits, well-fired
3	Large deep bowl/basin	108	1019/13 1020/1	Buff orange surface, orange core; many white and few gray grits; well-fired
4	Bowl	108	1019/12	Buff orange surface, orange core; many white grits
5	Small V-shaped(?) bowl	109	1023/17	Cream-white surface; white grits; wheel/striation marks on ext.
6	Large bowl	109	1022/11	Cream-white surface; white grits
7	Large deep bowl/basin	108	1020/14 1020/3	Buff orange surface; small and large white grits; well-fired
8	Large bowl	103	1008/4	Light brown surface; indented rim
9	Bowl	108	1019/11	Buf-orange surface; many white and gray grits, few mica inclusions; applied indented band
10	Bowl	109	1022/23	Brownish surface, soot on int. and ext.; flattened indented rim
11	Large bowl	109	1022	Buff-orange/cream-white surface; many black and few white grits, large mica inclusions; traces of red painted vertical lines; indented band below rim
12	Deep bowl/basin	103	1008/12	Light brown surface; white grits; flattened indented rim
13	Deep bowl/basin	109	1023/9	Cream-white surface; large gray and white grits, few mica inclusions; applied indented band

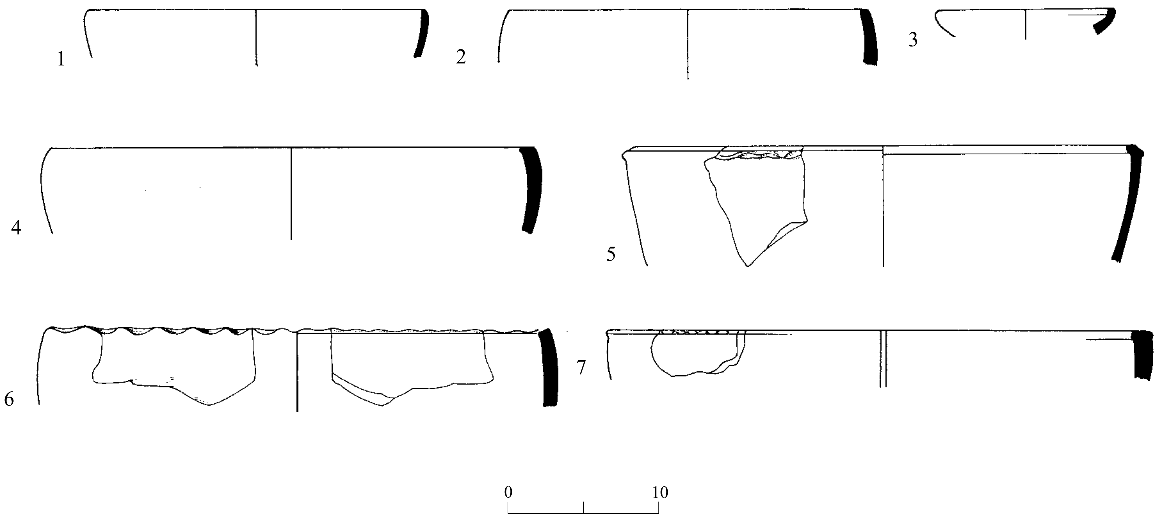

Fig. 6. Pottery: hemispherical bowls and basins.

No.	Vessel	Locus	Basket	Description
1	Thin-walled bowl	103	1008/2 1008/9	Orange surface, irregular gray and orange core; many white grits
2	Deep bowl	103	1003/2	Light brown surface, orange core; small white and few gray grits
3	Small bowl	108	1015/10	Buff orange surface; white grits
4	Large deep bowl/ basin	103	1004/3/6	Buff-orange surface; many white grits
5	Large deep bowl/ basin	105	1012/6	Orange/cream-white surface; white grits; flat indented rim; well-fired
6	Large deep bowl/ basin	108	1019/14	Buff-orange surface, soot on ext.; many white grits; indented rim; well-fired
7	Large deep bowl/ basin	103	1004/7	Buff-orange surface, orange oxidation zones, gray core; many white and few black grits; flattened rim with indented edge

Decorated Potsherds (Fig. 8:5–10)

A few body sherds are decorated with red or black vertical and diagonal painted lines, usually applied directly over the vessel surface (Fig. 8:5, 6), or in one instance, applied over limewash (Fig. 8:7). One body sherd has red lines painted in 'pyjama-style' (Fig. 8:8; see Braun 2012:14–17). Two decorated potsherds seem to be of earlier, Late Chalcolithic-period date (see above).

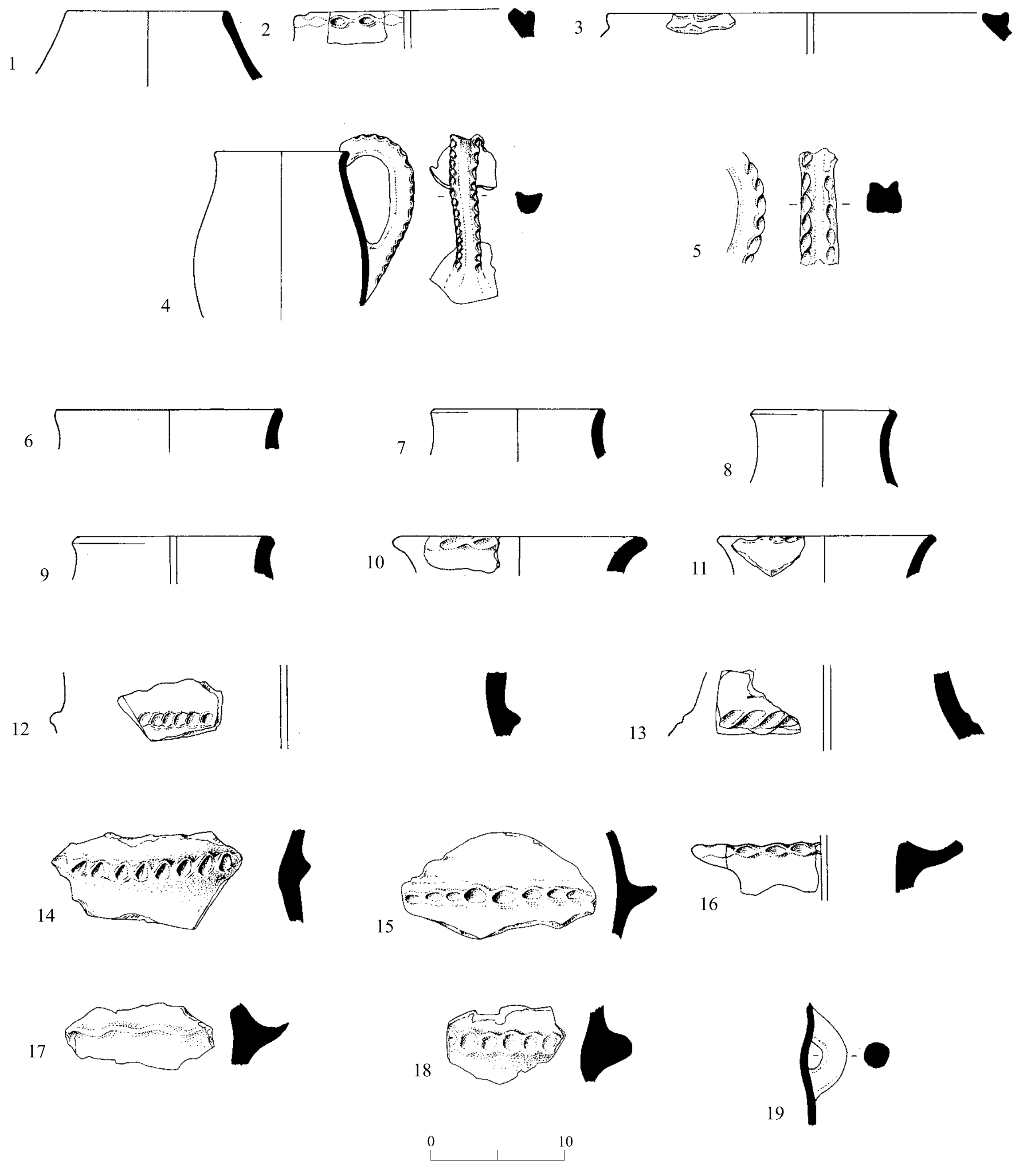

Fig. 7. Pottery: holemouth jars, necked jars, pithoi and handles.

◂ **Fig. 7**

No.	Vessel	Locus	Basket	Description
1	Holemouth jar	109	1023/3	Light brown surface; many black, few white grits
2	Holemouth jar	108	1016/5	Light brown/buff orange surface, thin orange oxidation zones, gray core; many black and white grits and some mica inclusions; indented band below rim
3	Holemouth jar	105	1012/12	Light brown surface; black grits and mica inclusions; indented band below rim
4	Indented loop handle of jar	105	1009/5 1009/8	Orange surface; many white grits visible on surface
5	Indented loop handle fragment	105	1008/8	Orange surface, traces of soot
6	Necked jar	109	1022/14	White and gray grits
7	Necked jar with rounded everted rim	108	1021/3	Light brown surface; white grits
8	Necked jar with rounded everted rim	108	1020/10	Cream-white surface; white grits; well-fired
9	Necked jar	109	1022/19	Cream-white/light brown surface; large gray grits
10	Necked jar	103	1003/13	Many white grits; indented rim
11	Necked jar	103	1003/11	Orange surface; gray and white grits; indented rim
12	Neck/shoulder fragment of pithos	108	1020/2	Light brown/grayish surface; many black, few white grits; applied indented clay band; well-fired
13	Pithos	109	1023/1	Buff orange surface, thin orange oxidation zones, thick gray core; white and black grits; applied indented band
14	Pithos	103	1003/5 1003/6	Cream-white surface, light brown core; many large white grits; applied indented clay band
15	Indented ledge handle of jar	103	1003/1	Plain surface, buff orange; many white, few black grits; indented ledge handle
16	Indented ledge handle of jar	108	1019/2	Light orange surface, soot traces on int. and ext.; large white grits; well-fired
17	Indented ledge handle of jar	108	1020/8	Buff orange/light brown surface; large white grits; well-fired
18	Thumb-impressed ledge handle of jar	108	1010/12	Gray core; many white, few black grits, mica inclusions
19	Loop handle of jar	109	1022/4	Buff orange-light/brown surface; white grits; well-fired

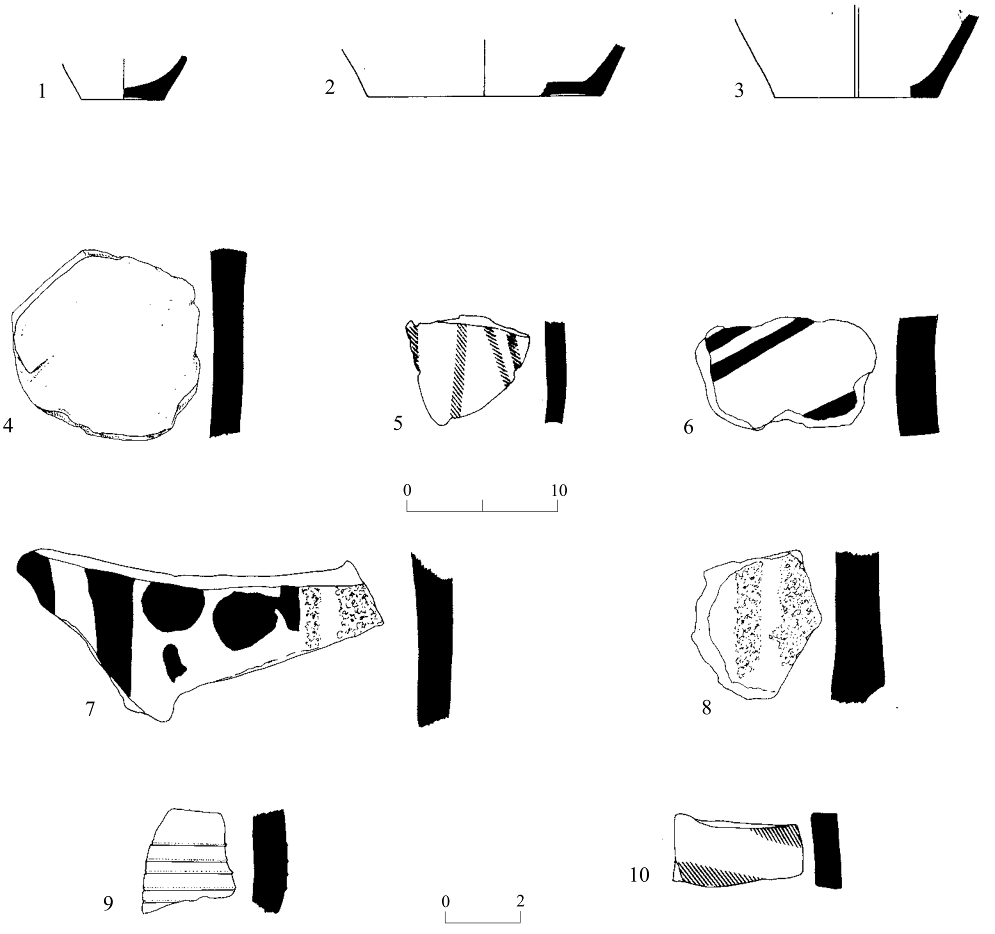

Fig. 8. Pottery: bases, stopper and decorated body sherds.

No.	Vessel	Locus	Basket	Description
1	Jar base	103	1004/6 1004/3	Orange oxidation zones, gray core; small black and few white grits
2	Jar base	109	1019/10	Light orange/brown surface, light brown core; white grits
3	Base of holemouth or cooking pot(?)	109	1022/10	Buff-orange surface, soot on int.; white grits; well-fired
4	Stopper	108	1021/4	Plain surface, reworked; many white grits
5	Sherd with red-painted stripes	103	1004/21	Buff-orange surface; many small black, few white grits
6	Sherd with black-painted lines	105	1012/2	Grayish surface; few white grits, many large mica inclusions
7	Jar sherd with black-painted stripes and dots	109	1024/1	Cream-white surface; white slip or wash on ext.
8	Sherd with red-painted stripes	109	1022/16	Light brown/cream-white surface; large white grits
9	Combed sherd	108	1021/21	Cream-white surface; many white, few black grits
10	Red-painted sherd	108	1020/26	White grits; well-fired

Discussion of Pottery

The limited ceramic assemblage, comprising open and hemispherical bowls and basins, holemouth jars, necked jars and pithoi, morphologically aligns with other early EB IA ceramic assemblages in the region, for example, the EB IA ceramic repertoire from Ḥorbat Ḥadat, just south of Modi'in (Brink and Kanias 2010). It is also similar to repertoires from adjacent regions, such as Azor in the central coastal plain (Golani and Brink 1999: Figs. 4–8) and Ashqelon, Afridar Area E, at the western edge of the southern coastal plain (Golani 2004: Figs. 23–27). The similarities between the Ḥorbat Ḥammim (South) and the other early EB IA ceramic assemblages are further underlined by their predominant mode of decoration, consisting of indenting the vessel rims, or applying an indented clay band around the upper part of the vessel. A date for the assemblage within the early EB I horizon (EB IA) is therefore ascertained.

The few Late Chalcolithic sherds (Fig. 8:9, 10) were either washed into the cave at a later date, or more probably, were residual, reflecting an earlier use of the cave, possibly in association with the adjacent rock-cut circular basin. Alternatively, they may reflect pre-EB IA activities in the vicinity.[4] Excavations carried out at nearby Ḥorbat Ḥadat in Modi'in, have exposed extensive Late Chalcolithic settlement remains (Brink 2005; 2007b; 2007c).

The two diagnostic Tel 'Erani C sherds (Fig. 7:4, 5), considered to belong to a cultural horizon associated with the onset of late EB I (EB IB_1), may be intrusive, reflecting post-EB IA activities in the area. Alternatively, they may be an integral part of the EB IA assemblage, first manufactured toward the end of early EB I (EB IA_2). The present state of the knowledge on early EB I ceramic assemblages precludes a clear distinction between the earlier and later phases within early EB I (Yekutieli 2001). However, since no significant late EB I (EB IB) remains have been exposed to date in the Modi'in area, I consider that the Tel 'Erani C fragments were probably an integral part of the early EB I Ḥorbat Ḥammim (South) ceramic assemblage, thus supporting a later rather than earlier date for the assemblage (EB IA_2), a stage closer to the initial EB IB ('Erani C-horizon), although still within early EB I.

The Stone Assemblages (Figs. 9–13)

The stone assemblages comprised a flint assemblage, and a ground stone and knapped limestone assemblage.

The Flint Assemblage

The flint assemblage consists of 804 artifacts (Table 1). Most of the assemblage is debitage, and only a few tools and cores were retrieved. The high proportion of debitage and debris (mostly artifacts <20 mm) is attributed to the systematic sieving at the site.

[4] For a brief summary of Late Chalcolithic settlement remains excavated within the municipal boundaries of Modi'in (Moriah Quarter), see Brink 2011; 2013.

Table 1. Flints: Waste Material Frequencies

Item	No.	%
Primary elements	80	19.7
Flakes	277	68.2
Blade/lets	28	6.9
Burin spalls	1	0.2
Core tablets	1	0.2
Ridge blades	4	1.0
CTEs	11	2.7
Overpassed	4	1.0
Total Debitage	*406*	*100.0*
Chips	179	51.1
Chunks	171	48.9
Total Debris	*350*	*100.0*
Debitage	406	50.4
Debris	350	43.5
Tools	*19*	*2.2*
Cores	29	3.9
Total	*804*	*100.0*
Tool/Core	0.7	
Debitage/Core	14.0	
Debitage/Tool	21.4	

Raw Material. Small fist-sized (up to 10 cm), medium- to high-quality nodules, mostly broken, were retrieved from the cave; they are irregularly shaped with randomly distributed protrusions on the surface, and their color varies from gray to dark brown. Some larger (up to 25 cm), medium- to high-quality cobbles were also found. The nodules and the cobbles were both suitable for the production of ad hoc tools (usually <10 cm). In addition, a few, low-quality boulders made of breccia were found; they were mainly used as working slabs, and only rarely utilized for flint production.

Flint and chert nodules are abundant in the Modi‘in area (Varoner 2017). At the Pre-Pottery Neolithic A Site F3, located in the Modi‘in-Buchman compound, c. 3.5 km northeast of Ḥorbat Ḥammim, flint-sourcing analysis indicated that most of the tools were made of local nodules of Campanian/Senonian flint from the Mishash formation. Occasionally, Eocene Zor‘a chert, originating from younger conglomerates, was used (Segal et al. 2005). It is reasonable to assume that most of the nodules found at the site originated from the local Mishash formation outcrops.

Waste Material. Flakes dominate the assemblage, and blades and bladelets are infrequent (Table 1). It is noteworthy that the frequency of primary elements (19.7%), most of which are flakes, is a good indicator for on-site production. This frequency aligns with the 19–21% frequencies from other Chalcolithic and Early Bronze Age sites in the Modi‘in area (Khalaily 2003; Vardi, Gilead and Yegorov, forthcoming).

Table 2. Flints: Core Type Frequencies

Core Type	No.	%
Single-striking platform flakes	7	24.1
Single-striking platform blade/lets	2	6.9
Single-striking platform flakes or blade/lets	1	3.4
Two-striking platform flakes	4	13.8
Two-striking platform flakes or blade/lets	1	3.4
Discoidal	2	6.9
On flake	2	6.9
Amorphous	6	20.8
Fragment	3	10.3
Tested	1	3.4
Total	*29*	*99.9*

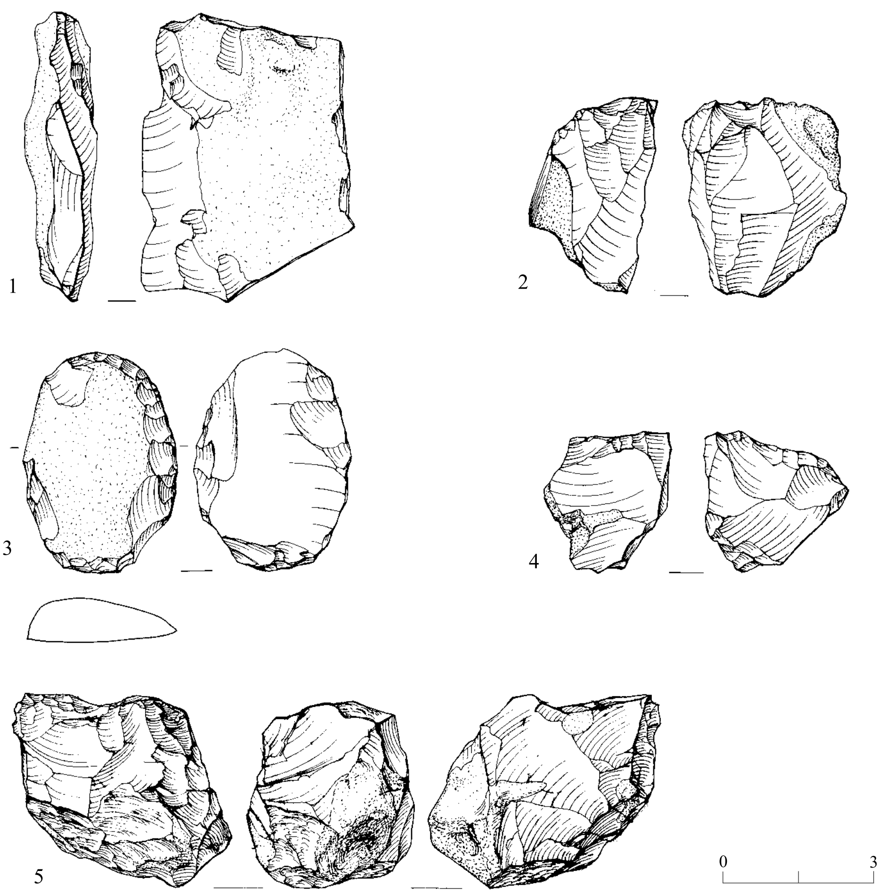

Fig. 9. Flints: cores.

Most of the cores are single-striking platforms (34.4%; Fig. 9:2; Table 2), two-striking platforms (17.2%; Fig. 9:4) and amorphous (20.8%; Fig. 9:5). Other core types, such as discoidal, on flake, and tested (preform), are less common (Fig. 9:1, 3). Most of the cores

Table 3. Flints: Tool Type Frequencies

Tool Type	No.	%
Scrapers	1	5.3
Awls	3	15.7
Borers	1	5.3
Retouched flakes	3	15.7
Retouched blades	2	10.6
Denticulates/Notches	7	36.8
Canaanean sickle blade fragment	1	5.3
Multiple tool	1	5.3
Total	*19*	*100.0*

were used for flake production, while blade and bladelet knapping was only occasionally practiced (c. 17% of the cores, e.g., Fig. 9:2). The predominance of flakes, compared to blade/lets production, is also evident in the scar pattern on the cores' removal surfaces. On each removal surface, no more than three or four items were removed (average 3.4 SD ±1.3 per removal surface), mostly flakes (c. 75%). Core dimensions vary between large cores, ranging between 95–75 × 77–68 × 59–44 mm (mainly amorphous or single platform), to small cores, ranging between 43–22 × 41–25 × 32–18 mm. Most of the cores (80%) display up to 50% of cortex on their circumference (Fig. 9:2, 3, 5). Core trimming elements are common (4.9%; Table 1), probably reflecting on-site knapping of ad hoc tools.

Tools. Tools are rare (n = 19, 2.2%; Tables 1, 3), and c. 95% are ad hoc, apart from a single possible fragment of a Canaanean sickle blade (Fig. 10:3). Notches/denticulates (Fig. 10:4), perforators (Fig. 10:2, 6) and retouched flakes (Fig. 10:7) dominate the tool assemblage, while other types, such as retouched blades (Fig. 10:1), a multiple tool (Fig. 10:5), and a burin on core fragment (varia) were also retrieved. Noteworthy is an atypical burin spall with sickle gloss, made on dark brown, possibly Eocenian raw material (Fig. 10:3). This artifact was probably removed from a Canaanean sickle blade and recycled into a burin.

Most of the tools were made on flakes (n = 13), while the others were made on blades (n = 4) or even chunks (n = 2). The ratio of debitage to tools is high (c. 21:1), while the ratio of tool to core is extremely low (less than one tool per core; Table 1). For a discussion of this phenomenon, see below.

The Ground Stone and Knapped Limestone Assemblage

The stone tool assemblage (n = 36) can be divided into two main groups: ordinary ground stones (n = 17) and knapped limestone artifacts (n = 18; Table 4); one unidentified item was found.

The most common ground stone artifacts are hammerstones, pounders and battering items (n = 13; Fig. 12). In addition, two grinding slab fragments were recorded. Limestone

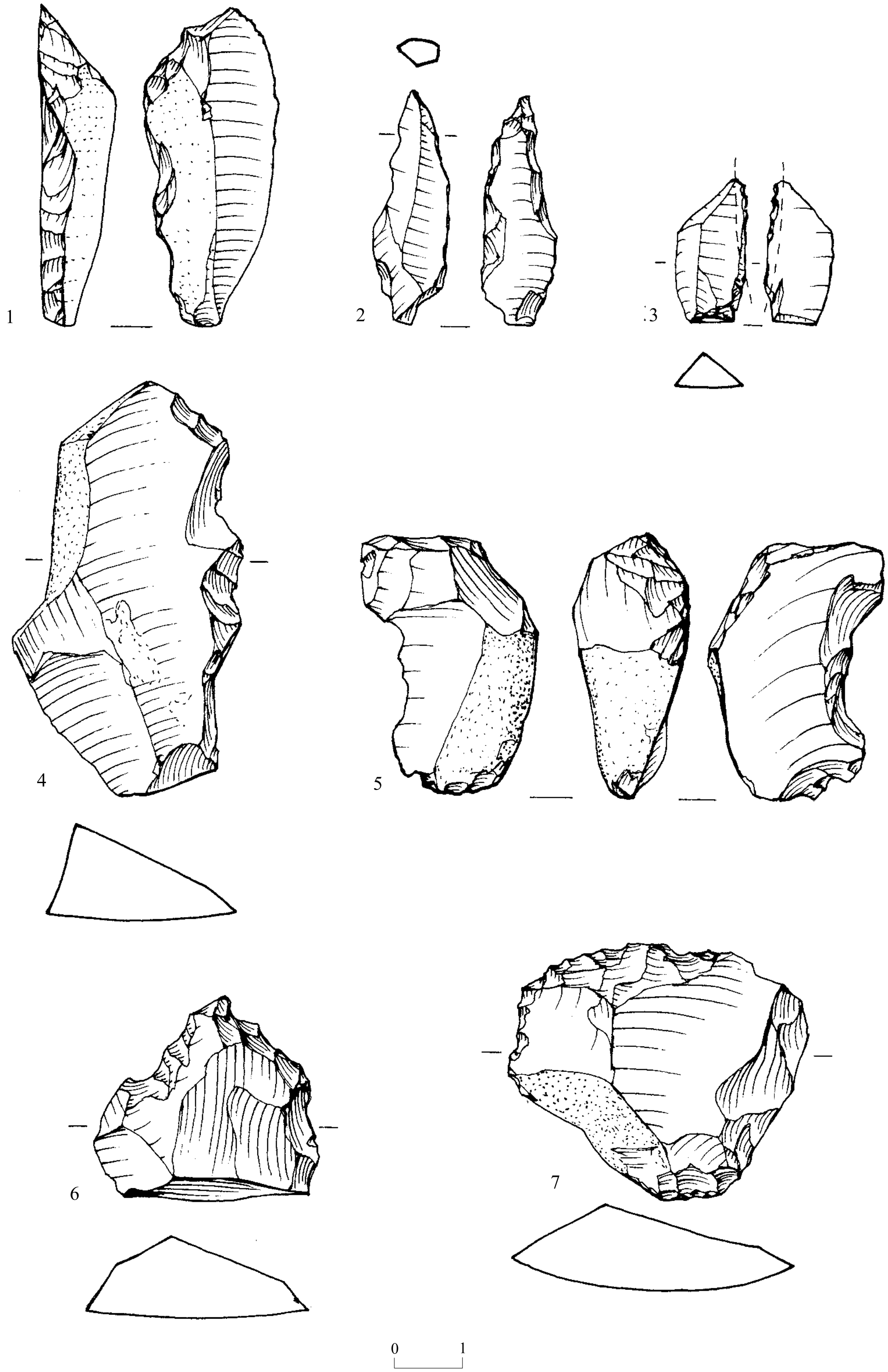

Fig. 10. Flints: Retouched blade (1), perforators (2, 6), Canaanean sickle blade (3), notch/denticulate (4), multiple tool (5) and retouched flake (7).

was used for pounders and battering artifacts, while flint was the preferred raw material for hammerstones (Table 4). There is a massive hammerstone, possibly made of quartzolite (Fig. 11:1). Noteworthy are two roundish limestone cobbles displaying a few battering marks at one or both ends (Fig. 11:2, 3). Only two basalt items were found, half of a perforated ring or whorl (Fig. 12:1), and a bowl wall fragment (Fig. 12:2).

The hammerstone and battering pieces are heavier (530–703 g) than the pounders (212–404 g), and the hammerstones and pounders exhibit rougher treatment at the working edges than the battering artifacts. This possibly reflects differences in function. While the hammerstones and pounders were used for more prolonged and intensive pounding and knapping activities, the battering artifacts were utilized for briefer and finer hammering or for pounding actions.

The knapped stone artifacts comprise mostly flakes and primary flakes, as well as debris, one tool and an elongated primary blade (Fig. 13:1), all made of limestone (Table 4). Most of them are byproducts of ad hoc tool reduction sequences, intended for the preparation of scrapers, retouched flakes, notches and denticulates. In addition, some cortical and unmodified flakes could be the products of pounding and hammering activities. Notable is an oval limestone sidescraper modified by partially bifacial retouch (Fig. 13:2).

Table 4. Ground Stone Tools: Frequencies according to Raw Material

Tool Type	Raw Material					
	Chalk	Limestone	Flint	Quarzolite	Basalt	Total
Perforated ring (whorl)					1	1
Bowl					1	1
Grinding slab fragments		1	1			2
Pounders		4				4
Hammerstones			3 (1)	1		4
Hammerstones/pounders	1	1 (1)	1 (1)			3
Battered pieces		2				2
Sub-Total Ground Stones	*1*	*8*	*5*	*1*	*2*	*17*
Primary flakes		8				8
Primary blades		1				1
Unmodified flakes		6				6
Chips		1				1
Chunks		1				1
Tools		*1*				*1*
Subtotal Knapped Stones		*18*				*18*
Unidentified fragment		1				1
Subtotal, others		1				1
Total	*1*	*27*	*5*	*1*	*2*	*36*

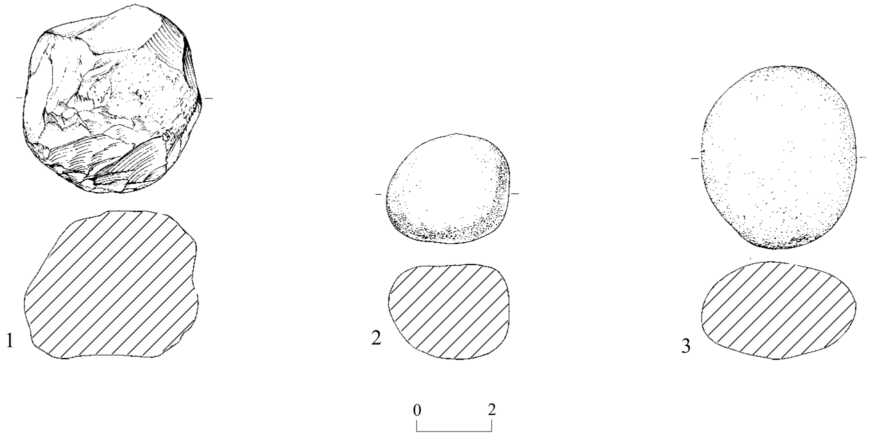

Fig 11. Ground-stone artifacts.

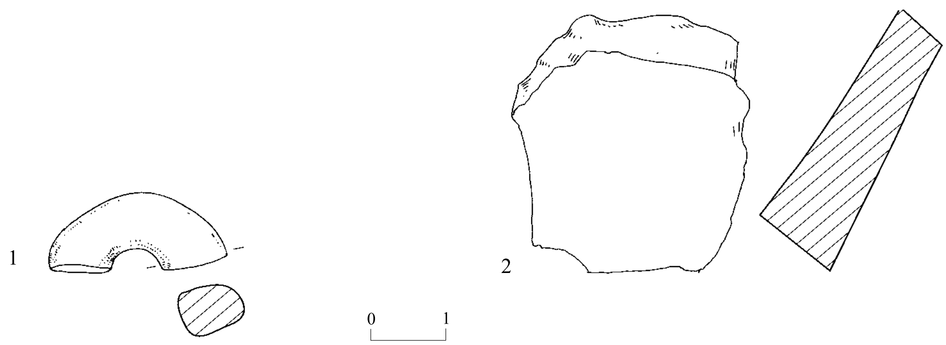

Fig. 12. Basalt objects.

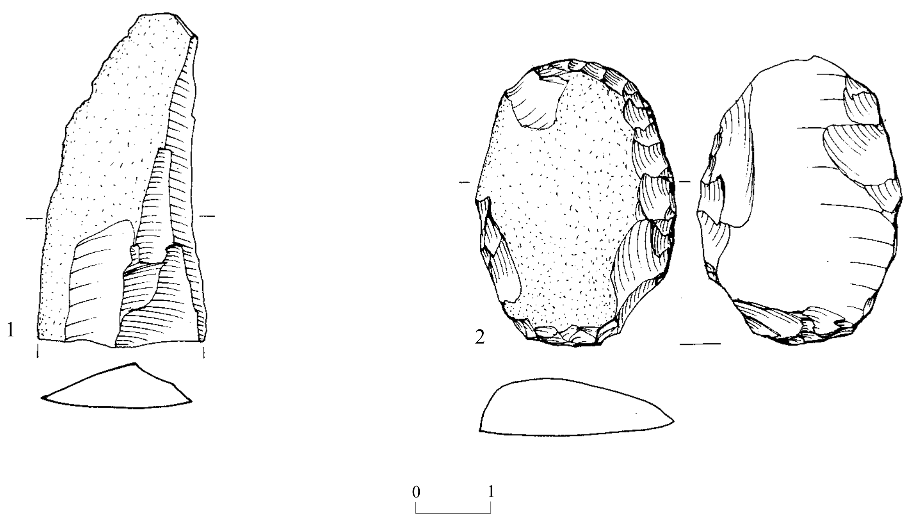

Fig. 13. Limstone tools: primary blade (2) and sidescraper (3).

Discussion of the Flint and Stone Tool Assemblages

The flint assemblage is characterized by much waste material, and very few tools. In addition, primary element frequency is high, core-trimming elements are well manifested and debitage to core ratio is standard. The ground stone tool assemblage is dominated by hammerstones and pounders, products of intensive knapping and pounding activities. In light of the above, it appears that a knapping post for ad hoc tools was extant in the vicinity of the cave, and that resharpening of sickle blades possibly also took place there.

The extremely low tool to core ratio, and high debitage to tool ratio indicate that some of the tools and possibly some of the cores are absent. This phenomenon can be variously explained. The lithic component is incomplete, since the cave was used as waste or refuse pit, and only part of the material was discarded here. Alternatively, there was an extremely low efficiency of blank-production and consequently, no more than two artifacts were extracted from each core, while from some of the cores, no tools were produced. It is also highly probable that some of the tools were removed from the knapping post for some domestic activity at another locality.

It is difficult to attribute the lithic assemblage to any specific lithic industry or period since it is mainly composed of waste material and ad hoc tools. On the other hand, similar ad hoc tools were found in Early Bronze Age flint assemblages (Khalaily 2003; Bankirer 2004; Vardi, Gilead and Yegorov, forthcoming). The possible Canaanean sickle blade fragment retrieved from the assemblage corroborates with the attribution of the pottery assemblage to EB IA.

The Faunal Remains

Faunal remains were recovered from the sieved fill within the shaft (L103, L105) and the cave (L108, L109). A total of 282 animal bones were recovered, of which over half (NISP = 159; 56%) were diagnostic to species and skeletal element (Table 5). Species were identified with reference to the comparative mammalian collection of the Hebrew University, and are presented as NISP counts (number of identified bones) as well as MNI counts (minimum number of individuals), the latter based on the most common bone part, taking size and age into account. The use of MNI counts is justifiable since the fill probably represents an accumulation over a limited period.

Domestic species were by far the most common, comprising caprines (sheep/goat, with only goat [*Capra hircus*] specifically identified), cattle (*Bos taurus*), donkey (*Equus asinus*), pig (probably domestic *Sus scrofa* dom.), and especially dog (*Canis familiaris*; Table 6); scanty remains of wild taxa belonged to gazelle (*Gazella* sp.) and songbirds (Passeriformes). There are few anthropogenic modifications to the bones, with only one bone (a goat astralagus) exhibiting a cut mark associated with butchery and eight bone fragments and one sheep/goat mandible corpus that exhibit signs of burning.

Table 5. Animal Species Representation

Species	NISP	MNI
Goat (*Capra hircus*)	11	1
Sheep/Goat (*Capra hircus/Ovis aries*)	40	3
Cattle (*Bos taurus*)	3	1
Pig (*Sus scrofa* dom.)	17	2
Donkey (*Equus asinus*)	11	1
Dog (*Canis familiaris*)	72	2
Gazelle (*Gazella* sp.)	4	1
Birds (Passeriformes sp.)	1	1 (2)
Total	*159*	

Table 6. Dog Remains from Locus 108 in the Cave[i]

Basket No. / Body Part	1021	1020
Cranial	5 skull fragments 1R upper PM4 1L lower mandible corpus 1R lower mandible corpus	6 cranial fragments 2 canines 2L carnassial teeth 1L mandible condyle 4 mandible corpus fragments
Total	*8*	*15*
Trunk	3 ribs	7 ribs 1 lumbar vertebra
Total	*3*	*8*
Forelimb	1R scapula whole 1 R humerus shaft 1L ulna proximal 1L radius proximal 1 distal radius shaft	1L scapula distal 1R humerus distal 1L ulna proximal 1R ulna proximal 1 radius shaft
Total	*5*	*5*
Hindlimb	2 fragments of acetabulum 1 femur shaft 1 proximal femur epiphysis fusing 1L and 1R tibia shafts	1 tibia shaft
Total	*6*	*1*
Foot	1L calcaneum 2 1st phalanges 4 distal metapodials 4 proximal metapodials 2 metapodial shaft	1st phalanx 2 distal metapodials 5 proximal metapodials
Total	*13*	*8*
Total NISP	*35*	*37*

[i] L = left; R = right; MNI is based on two carnassials with different wear.

Sheep/Goat

Caprines were represented by 51 bones. Most of the remains could not be separated by species due to their poor state of preservation, and they were placed in a combined sheep/goat category. Using standard criteria for separating the species based on postcranial remains (e.g., Boessneck 1969; Prummel and Frisch 1986), only 11 bones were positively identified as those of domestic goat (*Capra hircus*). They probably represent the same animal, an extremely large and robust adult ram (Table 7).

Few complete bones and no complete jaws were preserved, severely limiting the ageing of the animals in the assemblage. Three isolated upper premolar teeth (PM3's and PM4's) were unworn (c. 6–12 months old), while a lower jaw with heavy attrition on both PM3 and PM4 was aged at least 4 years old (based on wear stages in Payne 1973). The limited age data based on bone fusion rates (Silver 1969) indicates that two unfused bones derive from animals that died aged <12 months, while another two bones derive from animals aged 24–36 months. No bones belonged to animals aged more than 36 months; however, the paucity of bones with preserved ends may have skewed this result.

Examination of sheep/goat body parts (Table 8; Fig. 14) indicates an abundance of meat-rich upper hind-limb elements, but also of foot elements (phalanges) which are considered poor in meat. Cranial remains were well-represented, the majority being isolated teeth (17.6 % of identified remains) which are the most robust element in the skeleton, while trunk elements are few (7.8% of identified remains), these being elements that have relatively low bone mineral density (BMD) values due to their high trabecula bone composition. This suggests a diagenetic bias for the skeletal element distribution, a contention supported by the fact that the single, most common bones in the assemblage are complete first phalanges (toe bones, 13.7% of identified remains) which have some of the highest BMD values ranging from 0.43 to 0.55 (Lyman 1994: Table 7.6). Consequently, these data imply that the assemblage has undergone a significant degree of bone density mediated attrition (Lyman 1994) such that the skeletal element distribution does not solely reflect human selection.

Cut marks were found on only one caprine bone: on the mid-dorsal aspect on the lateral side of a right goat astragalus (Fig. 15). A pathology, in the form of a bony exostosis, is visible on the medial aspect of the shaft of a goat metacarpal, with a deep canal visible on the dorsal aspect of the midshaft (Fig. 16). These pathologies may relate to a trauma, such as a healed fracture. On another bone, a goat astragalus, slight bony lipping is evident on the medial aspect, as well as small perforations on the upper dorsal aspect. These are probably age-related arthritic changes (see Fig. 15).

Pig, Cattle and Donkey

The 17 pig bones primarily include cranial elements and meat-rich upper limb elements (Tables 5, 8). Body parts poor in meat, such as feet or lower leg elements, were not recovered. At least two of the pig remains belong to a neo-natal/foetal animal. No complete jaws were available for ageing, but the isolated molar teeth either represent tooth germs of permanent teeth (an unerupted M3), deciduous teeth (a lower m3) or unworn permanent

Table 7. Bone Measurements (in mm)[i]

Dog				
Mandible Dentition	*Greatest Length*	*Greatest Breadth*		
PM4 left	10.0	6.0		
Carnassial (M1) left	20.4	8.3		
Carnassial (M1) left	19.8	7.3		
M2 right	8.7	6.7		
	Ht infront of M1			
Mandible corpus left	17.0			
Maxilla				
PM4 right	16.3	7.5		
Scapula	*GLP*	*BG*	*SLC*	
Right	21.0	13.2	(15.2)	
Left	22.0	13.4		
Humerus				
	GL	*Bd*	*BT*	*Distal Condyle Height*
Right (no complete ends)	>(95.0)			
Right		25.1	19.2	9.7
Calcaneum	*GLP*	*GB*		
Left	34.7	11.8		
Goat				
	GL	*Bd*	*Bp*	*SD*
1st phalanx (hind)	36.0	12.9		
1st phalanx (fore)	33.7	11.5	11.7	10.7
1st phalanx (fore)	34.8	11.3	11.9	10.0
1st phalanx (fore)	34.1	11.1	12.0	10.3
2nd phalanx (fore)	24.2	9.8	12.5	
2nd phalanx (?hind)	22.7	10.7	12.1	
Distal Metacarpal	*Trochlea Breadth*	*Large Trochlea Condyle Depth*	*Small Trochlea Condyle Depth*	*Index*
	11.6	15.5	9.6	61.9
Donkey				
Metatarsal	*Bd*	*Dd*	*Bp*	*Dp*
Left	38.7	30.1		
No side			43.9	38.5
	GL	*Bp*	*SD*	
1st phalanx	65.4	41.9	25.0	
2nd phalanx	37.4	34.4	37.7	
Pig				
Mandible	*Greatest Length*	*Greatest Breadth*		
Deciduous m3	19.6	7.4		
Left M1	17.6	10.4		
Right M1	17.6	10.5		

[i] Based on Driesch 1976; metapodial index = Boessneck 1969.

Table 8. Skeletal Element Representation

Species / Skeletal Element	Sheep/Goat	Pig	Cattle	Donkey
	NISP	NISP	NISP	NISP
Cranium	3	2		
Mandible	5	2		
Loose upper teeth	4		1	
Loose lower teeth		2		
Vertebra-lumbar	2			
Vertebra fragment	2	1		
Rib fragment	5	2		
Scapula distal	3	1		
Humerus shaft		1		
Radius shaft	1		1	
Ulna proximal				1
Ulna shaft		1		
Carpals				1
Metacarpal shaft	1			1
Pelvis acetabulum	2	3		
Pelvis pubis	1			
Pelvis ischium	1			
Femur shaft	2			1
Femur distal		1		
Tibia shaft	2	1		
Tibia dist	2			
Calcaneum proximal	1		1	
Calcaneum distal	1			
Astragalus	2			
Metatarsal proximal				2
1st phalanx	7			1
2nd phalanx	2			1
3rd phalanx	2			1
Metapodial proximal				1
Metapodial distal				1
Total NISP	*51*	*17*	*3*	*11*

teeth (two lower M1's), signifying that the majority of pig remains that could be aged in this assemblage derive from immature animals. A cull pattern dominated by immature animals slaughtered young for meat characterizes domestic pig herd management aimed at meat exploitation (Zeder 1996). However, given the small sample size of pig remains, this interpretation should perhaps be related to with caution. The three cattle remains include a tooth and trunk and limb elements, all deriving from adult animals.

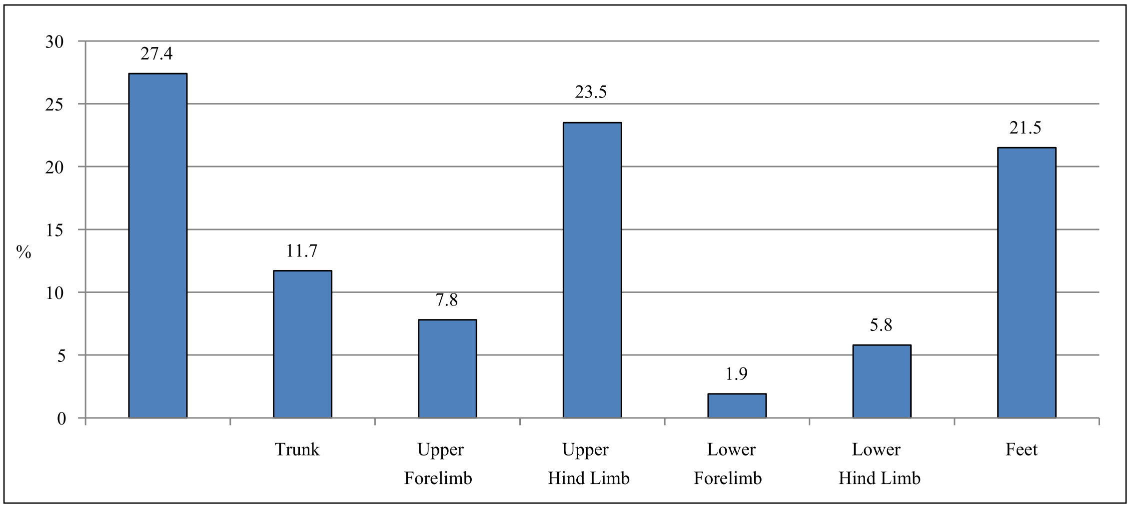

Fig. 14. Histogram showing sheep/goat skeletal element representation at Ḥorbat Ḥammim (South). Primary butchery elements poor in meat: cranial (loose teeth, skull, maxilla and jaws); lower forelimb (metacarpal, carpals), lower hind limb (metatarsal, tarsals, astragalus, calcaneum) and feet (phalanges). Consumption elements rich in meat: trunk (vertebrae and ribs); upper forelimb (scapula, radius, ulna); upper hind limb (pelvis, femur, tibia, fibula).

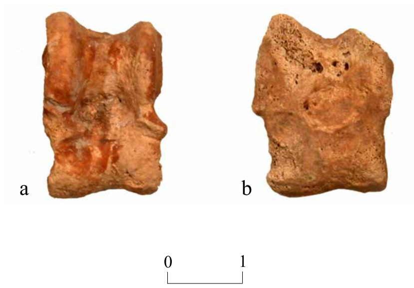

Fig. 15. Two goat (*Capra hircus*) astragali dorsal aspect: (a) astragalus with cut mark on the lateral side; (b) astragalus with bony lipping on the lateral side.

Eleven equid post-cranial bones were identified as representing domestic donkey (*Equus asinus*), based on the small size and gracility of the remains, since no teeth that could facilitate morphological analysis of their enamel pattern, were recovered. This result is demonstrated in Fig. 17, which shows the size resemblance of an equid first phalanx from the site, to donkeys from other Chalcolithic and Early Bronze Age sites in the region, and their smaller size relative to the Early Bronze Age horses from ʻArad (Grigson 2012).

Fig. 16. A goat (*Capra hircus*) metacarpal with pathology: (a) Dorsal aspect of bone showing the bony exostosis on the medial aspect of the shaft and the presence of a deep canal on the midshaft region; (b) side view of the medial aspect.

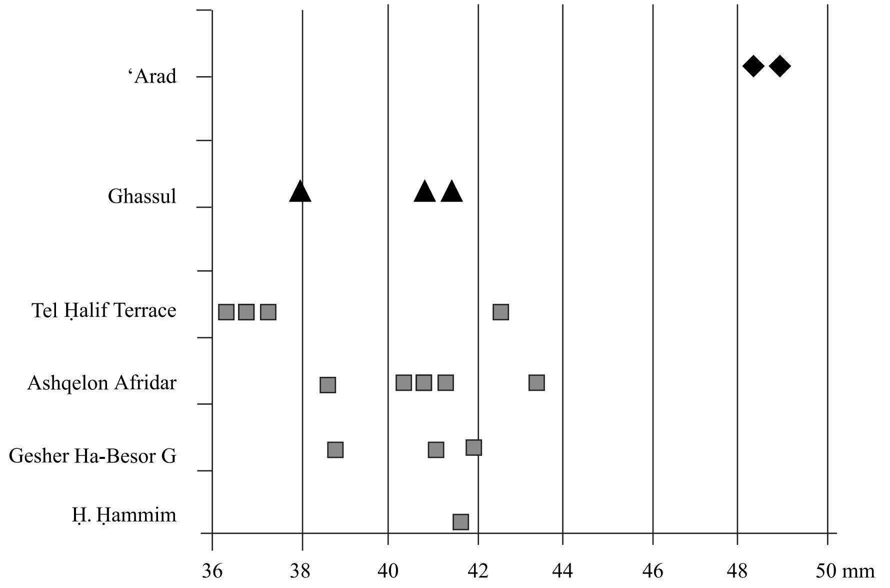

Fig. 17. Comparison of equid proximal, first phalanx breadth measurement (Bp) in mm. Each bar represents an individual bone. Sources of data other than Ḥorbat Ḥammim (South): 'Arad and Ghassul (Grigson 1993); Tel Ḥalif Terrace (Whitcher 1999); Ashqelon, Afridar Areas E, F, G (Whitcher 2004); Gesher Ha-Besor (Horwitz 2002).

Dog

The most numerous bones were of dogs, belonging to at least two adult animals (Tables 5–7). The dogs were represented by all skeletal elements (Table 6), suggesting that at least two complete, or almost complete, animals were disposed of in the cave. Based on length and breadth measurements of the lower M1 (carnassials) (Table 7; Fig. 18), the two dogs appear to have been of similar size (M1 length 20.4 and 19.8 mm; M1 breadth 8.3 and 7.3 mm respectively), while the slight attrition on the teeth indicates that both were young adults.

In the absence of complete limb bones from which to calculate withers height, the lower M1 measurements of the Ḥorbat Ḥammim (South) dogs were compared with those of modern animals of known breeds from the Hebrew University collection. They are slightly smaller than modern Pariah dogs (9 males and 1 female) from Suez, Egypt (M1 length range: 21.2–24.8 mm; M1 breadth range 7.9–9.1 mm). The dogs are smaller than the lowest values for the Pariah dogs, which were taken on an adult female. Further comparison of both molar tooth and post-cranial measurements from Ḥorbat Ḥammim (South) with dogs from the Chalcolithic site of Gerar, indicate that the Gerar specimens are also larger, falling well within the size range of the modern Pariah dogs (M1 length range: 20.1–24.4 mm; M1 breadth range 8.1–9.7 mm; Grigson 2006: Appendix 6.6a and 6.6b). Taking into account individual variation, as well as sexual dimorphism, tooth measurements taken on three dogs from the Late Chalcolithic/EB I deposits in the Sha‘ar Efrayim Caves (Horwitz 2011), correspond well to those from Ḥorbat Ḥammim (South), with an average M1 length of 20.7 mm and average breadth of 8.1 mm. These results indicate that the dogs were probably females or belonged to a slightly smaller breed than the modern Pariahs, and the Chalcolithic dogs from Gerar.

No cut marks or burning were observed on the dog remains, suggesting that their presence in the cave may not be related to anthropogenic activities. They may represent natural mortality of animals that used the cave, or perhaps were trapped in it, although the former is unlikely as no bones with typical carnivore-derived damage indicative of canid feeding (gnawing, puncture holes; see Lyman 1994), were found in the cave. The

Fig. 18. Two left dog carnassials (lower M1).

completeness of the dog skeletons supports the hypotheses of natural mortalities within the cave, or alternately, that their carcasses were intentionally discarded in the cave by people. There is no evidence that the dogs were intentionally buried, contra, for example, the proposed EB I dog burial from Nesher-Ramla (Horwitz 2010). At Nesher-Ramla, a partial dog skeleton was associated with a human skeleton although it did not display any anthropogenic or other modifications. This context differs significantly from the articulated EBI dog specimen from Ashqelon Afridar (Area E) which, although described by Golani (2004) as having been intentionally buried, showed no butchery or other damage, and no evidence for associated mortuary activities, special architectural or other unique features, which are critical contextual elements needed to support a contention of intentionality. Without these features, it is impossible to distinguish a deliberate burial of an animal, from one that was simply disposed of as refuse, especially when it is associated with other non-articulated faunal remains, as in the case of both the Ashqelon Afridar and the Ḥorbat Ḥammim (South) dogs (see Horwitz, Master and Motro 2017, and discussion therein).

Wild Taxa

A single right calcaneum of a gazelle was found, this isolated bone precluding identification of the gazelle species. The bird bones all belong to small Passeriformes songbirds. At least one of the bird bones is fresh in appearance, suggesting accidental intrusions.

Discussion of Fauna

The range of species recovered from the cave is characteristic of EB I assemblages from sites in Israel in general, such as Me‘ona (Horwitz 1996), Azor (Horwitz 1999), Gesher Ha-Besor and Taur-Ikhbeineh (Horwitz et al. 2002), Ashkelon, Afridar (Kansa 2004), Naḥal Tilla (Kansa, Kansa and Levy et al. 2006), Ḥorbat ‘Illin Taḥtit (Allentuck 2013). However, some faunal species found at these sites, such as wild carnivores, cervids and fish, are absent at Ḥorbat Ḥammim (South). This is to be expected given the small size of this assemblage, and the fact that the other assemblages represent food remains from village sites, and not from cave fill. It is consequently difficult to assess the significance of the taxon representation at Ḥorbat Ḥammim (South).

Perhaps the most intriguing question relating to this bone assemblage is the origin of the bones. The excavator, Edwin van den Brink, suggested that they were either washed into the cave, or intentionally discarded there. The latter option seems more likely, given the presence of two almost complete dog skeletons, as well as the paucity/absence of typical intrusive taxa such as rodents, reptiles and bird remains. Moreover, the bones' surface is not especially weathered, nor were marked differences found in preservation status between them, suggesting a similar depositional history. Thus, it seems more likely that the cave was used for rubbish disposal. The dearth of cut marks, the few burned bones, and the presence of two almost complete dog skeletons, suggests that the majority of the remains were refuse, not necessarily associated with food preparation/consumption activities. Despite some evidence for selective preservation of the more robust skeletal elements, the sheep/

goat, cattle and pig samples contain the full range of body parts suggesting the presence of complete animals, or animal joints. For sheep/goat, the cranial plus lower limb and foot elements combined comprise 59% of the assemblage, indicating a slight predominance of primary butchery elements over the meat-rich upper limbs and trunk parts preferred for consumption, although biased preservation of phalanges and teeth may partly be responsible for this patterning. Thus, it seems likely that the cave served as a refuse pit, possibly for a nearby EB IA settlement.

The Shells

The excavation revealed five shell remains in three loci (L103, L105, L108). Although the material was rather fragmentary, all the items could be identified to subspecific level. The shells belong to two different species: a terrestrial snail and a freshwater mussel.

Gastropoda Snails
Family Helicidae: *Levantina spiriplana caesareana* (Mousson 1854)
L103, B1008: a fragment of the apex consisting of about 2.5 whorls.
L105, B1012: a fragment of the lower part of the columella and the adhering basal part of the lip of the aperture.

Bivalvia Mussels
Family Iridinidae: *Chambardia rubens arcuta* (Cailliaud 1823)
L103, B1008: a disintegrated fragment of the posterior part, including the ligament grove.
L108, B1016: a small disintegrated fragment.
L108, B1019: a small disintegrated fragment.

Discussion of Shells

The five shell fragments provide some important information. The two land snail fragments found in the shaft (L103, L105) belong to a local species *Levantina spiriplana caesareana*, which still lives abundantly among the rocks in the vicinity of the excavation. Although it is an edible species, it is quite possible that the fragments are of recent origin.

By contrast, the three disintegrated fragments of *Chambardia rubens arcuta* found in the shaft and in the cave (L103, L108) are a species with an origin in the Nile, Egypt. Their presence in the cave reflects the intensive contacts which existed between the populations in the Levant and in Egypt, during the Chalcolithic and Early Bronze periods (see also Braun and Brink 2008:646–649).

Summary and Conclusions

The dating of finds derived from secondary contexts, i.e., from the fills in the cave, rather than from floors, is problematic. Apart from the two jar handles characteristic of Tel ‘Erani

C-horizon found in the shaft, and the two Late Chalcolithic combed and painted body sherds from the cave, all the ceramic remains are characteristic of a phase within early EB I (EB IA). This homogeneous assemblage supports the latest use of the cave in early EB I, not later. However, it may have been quarried earlier, for example, when the adjacent circular basin was hewn into the bedrock, probably in the Late Chalcolithic period.

The absence of structural features and in situ finds on the floor indicates that the cave was not intended for dwelling or storage. The presence of two almost complete dog skeletons seems to negate the possibility that they, and the other finds, had simply washed into the cave. This observation is further corroborated by the absence of typical intrusive, washed-in, faunal taxa such as rodents and reptiles. It therefore seems most likely that the cave was exploited, either primarily or secondarily, as a waste or refuse pit, thus evincing human occupation at the site at least as early as EB IA. This conclusion is further corroborated by the composition of the flint assemblage, i.e., the abundance of waste and debris and almost no tools. In turn, the flint finds clearly point to the presence of a flint-knapping post in the nearby vicinity.

The presence of a few Nilotic shell fragments of *Chambardia rubens* shows once again the intensive contacts between the Southern Levant and Egypt in the Chalcolithic and Early Bronze Age I (see Braun and Brink 2008:646–649).

As noted above, several salvage excavations have been carried out within the premises of Ispro Center, at least four of which have yielded EB IA remains. Early Bronze Age IA pottery, including several Gray Burnished Ware sherds, were uncovered in a badly damaged cave located c. 40 m northwest of the present site (Sigal Golan pers. comm.). Several cupmarks and rock-cut installations associated with EB IA pottery sherds were uncovered nearby (Tzach Kanias, pers. comm.). Remains of two walls and a floor, a hearth and a spread of *in situ* EB IA pottery sherds and flint, as well as a number of rock-cut installations were exposed in another nearby excavation (Gorzalczany 2008). In addition, a rock-cut pit, situated less than 30 m northwest of the present site, yielded an appreciable amount of exclusively EB IA pottery (Segal 2010).

The accumulated data strongly supports the presence of a small community of early EB I dwellers in this area, who possibly lived in nearby caves, processing and storing their agricultural commodities in various rock-cut installations. This data ties in well with the noted presence of early EB I dwellers settled south of Modi'in (Buchman Compound), living in open-air dwellings (Brink 2007a, referring to the Deep Deposits Strata 3–1; Brink and Kanias 2010, referring to the plateau), as well as in caves (Brink 2007b: Hill C, Cave 2).

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