

KHIRBAT DIN'ILA, WESTERN GALILEE: THE SURVEY AND EXCAVATIONS OF THREE OIL PRESSES

RAFAEL FRANKEL AND NIMROD GETZOV

INTRODUCTION

Khirbat Din'ila (map ref. NIG 2234/7746, OIG 1734/2746; Fig. 1) is located in a wooded area on a small hill (392 m asl) at the northern end of a spur situated between two valleys—Naḥal Sarakh to the east and Naḥal Galil to the west. Both streams flow northward into Naḥal Beẓet.¹

The site is very close to the border delineated in *Baraita di-Tehumin* (Baraita of the Borders), which deals with the “land held by those who came up from Babylon” (Frankel and Getzov 1997; Frankel et al. 2001:111–113). Therefore,

one of the aims of this paper is to ascertain whether finds from the site show affinities to the Phoenician coastal area or to Jewish Upper Galilee (see also Avshalom-Gorni and Getzov 2002:76).

Khirbat Din'ila is mentioned in two historical documents from the Crusader period (Strehlke 1869:43–44 [Doc. 53, 1220 CE]; 47–48 [Doc. 58, 1226 CE]) that are almost identical, and Röhricht (1893:934) treats them as one. Both documents confirm the transfer of areas in Galilee from the descendants of Joscelin de Courtenay to the Teutonic Knights and include a long and detailed list of places. Din'ila

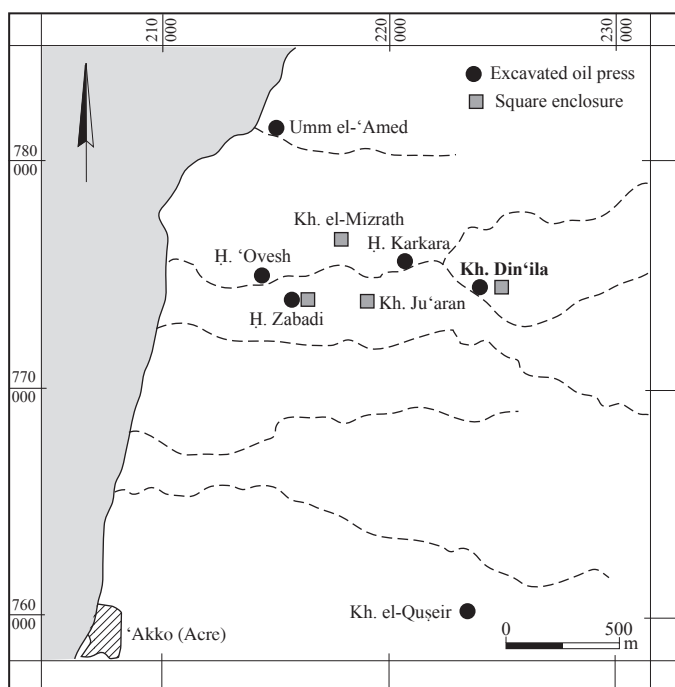


Fig. 1. Location map of the site and related sites in the western Galilee.



Plan. 1. Plan of the site, marked with the three excavation areas (A, B, C) and the items found by the survey: (1, 2) crushing basins; (3) crushing stone; (4) installation for anchoring beam; (5–10) cisterns; (11) Din'ila weight; (12) screw-press base; (13) lintel with incised cross; (14) crushing stone; (15) cistern; (16) round stone; (17) trough; (18) cist grave; (19) cistern; (20) sarcophagus lid fragments.

appears as Danehyle and Danehile (Röhricht also gives Dane[p]hile). This place name, identified in the past with other sites, clearly refers to Din'ila, as the 'h' represents the 'ayin, which appears after the 'n' in Din'ila (see Frankel 1988, esp. p. 269). From the document we learn that Danehyle was part of the territory of Chastiau de Roi, present-day Mi'ilya, located almost five kilometers south of the site, where the Crusader castle can still be seen. However, the name is not in the list of places of this fief from the previous century (Röhricht 1893:341, 1160 CE).

In 1978, the western Galilee team of the Archaeological Survey of Israel surveyed the site² (Plan 1) and in 1984 and 1986, excavations were conducted by Rafael Frankel (Oil Press A: Frankel 1985; Oil Presses B and C: Frankel 1986).³ Large parts of the site were restored by the Conservation Department of the Israel Antiquities Authority, with the financial support of the Jewish National Fund (Keren Kayemet LeIsrael). Excavations were carried out preparatory to restoration by Ayelet Tatcher in 2001–2003, mainly in Areas A (see Plan 2: L002, L005) and C (see Plan 3: L001; Tatcher

2005). Note that in Tatcher's report, the areas were designated differently from Frankel 1986; in this report, Tatcher's Oil Press B is our Oil Press C and her Oil Press C is our Oil Press B. In some cases, considerable changes were made to the site during its restoration.⁴

ARCHAEOLOGICAL SURVEY (Plan 1; Table 1)

Khirbat Din'ila, which proved to be very well-preserved, was measured and a detailed plan was drawn. Pottery from the Byzantine and Crusader/Mamluk periods was collected

Table 1. Description and Dimensions of Installations

Oil Press Provenance	Locus/Wall or Survey No. (see Plans 1–5)	Element	Type (Frankel 1999)	Description
A	W63	Installation for anchoring beam	4234	Eastern pier: H 1.34 m, W 0.63 m, Th 0.32 m Angular channel: W 12 cm, D 8 cm, L 30 cm, H 27 cm Western pier: H 1.20 m, W 0.66 cm, Th 0.39 cm Horizontal channel: H 23 cm, W 11 cm, De 9 cm, 21 cm below lintel Distance between piers: 55 cm Lintel: L 1.25 m, W 0.65 cm, H 0.53 cm
A	L52	Press bed	46210	Four stone slabs Circular groove: ext. D 1.4 m; int. D 1.3 m; De 4 cm
A	L53	Collecting vat		Ext. D 1.29 m, int. D 0.93 m, De 0.61 m, D of sump 0.2 m, De of sump 0.14 m
A	L55	Weight pit		Converted to water cistern in Mamluk–Ottoman periods
A	L54	Din'ila screw weight	6221	D 0.9 m, H 0.9 m Channel W at top 22 cm, at bottom 28 cm., socket D 19 cm
A	L58	Work pit		Built walls, bedrock floor L 2.2 m, W 2.0 m, D 0.35 m
A	L72	Crushing basin	351	Lip damaged Ext. D 1.7 m, H 0.8 m+, De 0.6 m+ Socket D 9 cm, De 14 cm
A	L75	Eastern vat		Ext. D 1.1 m, int. D 0.85 m, H 0.66 cm, De 0.54 m Sump D 9 cm, De 9 cm
A	L74	Central vat		Ext. D 1.1 m, int. D 0.85 m, De 0.75; no sump
A	L73	Western vat		Lip damaged Ext. D 1.2 m
A	L56	Separating vat		Cut in bedrock L 1.8 m, W 0.7 m, De 0.8 m Ledge (for lid?) W 10 cm, De 3 cm Channel leads to No. 12 (L65)
A	L76	Separating vat		Cut in bedrock Connected to No. 11 (L56) by channel: L 1.0 m, W 0.6 m, De 0.25 m, D of exit bore 0.05 m
A	L77	Rectangular vat		Cut in bedrock L 0.96 m, W 0.69 m, De 0.5 m Ledge L 1.02 m, W 0.80 m

H = height; W = width; Th = thickness; D = diameter; De = depth; L = length

Table 1. (cont.)

Oil Press Provenance	Locus/Wall or Survey No. (see Plans 1–5)	Element	Type (Frankel 1999)	Description
A	L78	Rectangular vat		Cut in bedrock, damaged. W 0.8 m, De 0.32 m; no ledge
B	W30	Installation for anchoring beam	4234	Eastern pier: H 0.58 m, W 0.7 m, Th 0.29 m Angular channel: W 8 cm, De 10 cm, L 31 cm, H 17 cm Western pier: H 53 cm, W 85 cm, Th 35 cm, 16 cm below lintel Round hole: D 14 cm, De 19 cm Distance between piers: 50 cm Niche: H 80 cm Lintel: L 1.0 m, W 0.70 m, H 0.53 m
B	L27	Press bed	46210	Cut in bedrock Circular groove: ext. D 1.10 m, int. D 0.96 m, W 0.07 m
B	L25	Collecting vat	4721	Ext. D 1.00 m, int. D 0.77 m, De 0.75 m, D of ledge 0.88 m
B	L24	Weight pit		Irregular rectangle L 1.4 m, W 1.1 m, min. De 0.45 m
B	L28	Din'ila screw weight	62211	D 0.8 m, H 0.7 m+ Channel: W at top 23 cm, W at bottom 27 cm, De 14 cm Socket: De 14 cm
B	L26	Work pit		Cut in bedrock Irregular rectangle: L 1.9 m, W 1.6 m, De 0.6 m
B	L21	Crushing basin	32	Damaged Ext. D 1.63 m, int. D 1.30 m, H 0.85 m, original De 11 cm, De after wear 16 cm Socket: D 34 cm
C	W32	Installation for anchoring beam	4234	Eastern pier: H 1.02 m, W 0.78 m, Th 0.33 m Angular channel: W 15 cm, De 11 cm, L 40 cm, H 30 cm Western pier: H 1.04 m, W 0.55 m, Th 0.50 cm Round hole: D 15 cm, De 11 cm, 36 cm below lintel Distance between piers: 70 cm Lintel: L 1.50 m, W 0.58 m, H 0.50 m
C	L11	Press bed	4524	Built of truncated triangular segments with rounded ends Ext. D 1.9 m, Th 0.25 m Groove: ext. D 1.5 m, W 0.05 m Central hole: 0.73 m
C	L13	First collecting vat		Cut in bedrock D 0.6 m, De 0.5 m Sump: D 0.12 cm, De 7 cm
C	L16	Second collecting vat	4722	Cut in bedrock Int. D 0.9 m, De 0.9 m Ledge: D 1.05 m Sump: D 15 cm, De 10 cm
C	L14	Weights pit		Cut in bedrock, rectangular L 2.75 m, W 1.75 m, De 1.50 m

Table 1. (cont.)

Oil Press Provenance	Locus/Wall or Survey No. (see Plans 1–5)	Element	Type (Frankel 1999)	Description
C	L14	Weight		Damaged
C	L18	Crushing basin	351	Ext. D 1.92 m, int. D 1.64 m, H 0.83 m, De 0.60 m Socket: D 20 cm, De 10 cm
C	L001	Round slab		Possibly addition to crushing basin Widest D 0.96 m, narrowest D 0.66 m, Th 0.40 m, H 0.26 m
C	L79	Water cistern		Bell shaped D of opening 0.6 m, visible De (not excavated) 2.5 m Capstone (not <i>in situ</i>): ext. D 0.7–0.8 m, int. D 0.5 m, H 0.4 m Ledge for lid: 0.53 × 0.53 cm
Survey	1	Crushing basin	322	Ext. D 1.52 m, int. D 1.29 m, original De 8 cm, De after wear 12 cm Socket: ext. D 26 cm, int. D 9 cm
Survey	2	Crushing basin	351	Ext. D 1.49 m, int. D 1.22 m, De 0.32 m Socket: D 18 cm, De 18 cm
Survey	3	Crushing stone	322	D 1.02 m, Th 0.42 m, hole D 0.42 m
Survey	4	Installation for anchoring beam	4234	Eastern pier: W 0.68 m, Th 0.31 m Angular channel: W 14 cm, De 10 cm Western pier: W 75 cm, Th 31 cm Elliptical hollow: H 32 cm, W 13 cm, De 9 cm Lintel: L 1.65 m, W 0.65 m, H 0.33 m
Survey	5	Water cistern		Bell shaped, top damaged Visible De 3.20 m
Survey	6	Water cistern		Bell shaped, rectangular opening 75 × 50 cm Visible De 3.30 m
Survey	7	Water cistern		Bell shaped, rectangular opening 60 × 50 cm Visible De 3.60 m
Survey	8	Water cistern		Remains of vaulted ashlar roof W 2.7 m, L 1.7 m, visible De 6.0 m
Survey	9	Water cistern		Irregularly shaped, opening 2.4 × 2.1 m Visible De 2.5 m
Survey	10	Weight		Only partly exposed H 70 cm, probable D 65 cm
Survey	11	Din'ila weight	6211	D 1.00 m, H 0.92 m Channel: W at top 21 cm, W at bottom 23 cm, De 18 cm Socket: De 13 cm
Survey	12	Single fixed screw-press base from winepress	83112	Rectangular L 0.74 m, W 0.57 m Central closed dovetail mortice: L 40 cm, narrow W 24 cm, wide W 29 cm, De 14 cm
Survey	13	Lintel with cross		Damaged H 0.5 m, Th 0.3 m, preserved L 1.5 m, L to center of cross 1.25 m (original L 2.5 m?) Frame around cross 41 × 41 cm

Table 1. (cont.)

Oil Press Provenance	Locus/Wall or Survey No. (see Plans 1–5)	Element	Type (Frankel 1999)	Description
Survey	14	Crushing stone		Only partly exposed D 0.65 m(?), W 0.4 m, D of hole 0.2 m(?)
Survey	15	Water cistern		Only partly exposed
Survey	16	Round stone		Round stone with central opening, probably cistern capstone Ext. D 0.9 m, int. D 0.5 m, H 0.3 m Ledge: D 0.56 m
Survey	17	Trough		Ext. size 0.85 × 0.85 m, int. 0.4 × 0.4 m, De 0.25 m
Survey	18	Opening of cist grave or shaft tomb and fragment of gable-shaped lid with altar		Opening: L 1.8 m, W 0.7 m Ledge: L 2.00 m, W 0.88 m, total L 2.20 m, total W 1.15 m Visible De 0.6 m Lid: W 1.17 m, H in center 0.37 m, H at edges 0.2 m Protrusion below cover: W 0.83 m Altar at end of lid: L 24 cm, W 19 cm, H 12 cm
Survey	19	Water cistern		Bell shaped, opening 1.0 × 1.3 m, visible De 2.7 m
Survey	20	Two fragments of gable-shaped sarcophagus lid		W 0.9 m Protrusion below lid: W 65 cm

(Frankel et al. 2001: Site 201, Pp. 28, 86, 92) and eight coins dating to the fourteenth–fifteenth centuries⁵ were retrieved (Table 2). From the plan, it was possible to discern two main stages in the development of Kh. Din'ila and traces of a third. Initially, the site consisted of a square enclosure 33 × 33 m (1.1 dunam) that apparently consisted of rooms around a courtyard. At this stage, the site was clearly a self-contained integrated unit—a farmstead or villa. In the second stage, the site was larger, measuring approximately 72 × 88 m (6 dunams), and had apparently evolved into a small village. A two-meter-wide street led into the village center from the west and from this street, a narrower path led northward to a small courtyard with a water cistern (Plan 1: No. 7) in its center. Two large cisterns (Plan 1: Nos. 8, 9) were recorded to the south of the square enclosure and many smaller cisterns

were documented throughout the site. Traces of a third stage could also be discerned: at the southern end of the site was a building complex that was aligned and constructed in a different manner, with stones bonded with mortar, as opposed to dry-built construction, which characterized the other buildings.

Many elements from oil presses were also noted by the surveyors: four crushing basins (Plan 1: Nos. 1–3, 14), four pairs of anchoring piers (Plan 1: No. 4 and three that were later excavated in Oil Presses A, B and C) and three screw weights (Plan 1: Nos. 10, 11 and the weight in Oil Press B). The excavations revealed two more crushing basins (for details, see Table 3) and one more screw weight. Not all the documented elements appear in Plan 1.

In the western part of the site, a rock-hewn cist grave (Plan 1: No. 18; Fig. 2) and fragments of gable-shaped lids (Plan 1: Nos. 17, 20) were

Table 2. Coins (Bronze)

Survey/ Locus	Basket	IAA Reg. No.	Mint	Minting authority	Date (CE)
Survey	-	106731	Damascus	Al-Ashraf Nasīr al-Din Sha'aban II ⁱ	1363–1377
Survey	-	106732	Alexandria?	Al-Salīh Salah al-Din Hajji II, 1st reign ⁱⁱ	1381–1382
Survey	-		Damascus	Same	Same
Survey	-		-	Mamluk?	14th–15th c.
Survey	-		-	Mamluk?	14th–15th c.
Survey	-		-	Mamluk	14th–15th c.
Survey	-		-	Mamluk?	14th–15th c.
Survey	-		-	Mamluk?	14th–15th c.
Survey	-		-	Unidentifiable	-
26	226		-	Late Roman	361–346
24	217		-	Unidentifiable	-

ⁱ *Obv.*: السلطان الملك الأشرف شعبان, spindle-shaped cartouche with fleur-de-lys edges, inside: حسن / بن;
Rev.: Concave-sided linear octolobe with decorated tips, in center: بد / مشق / ضرب; *Æ fals*, 2.97 g, 19 mm;
 Balog 1964: No. 458.

ⁱⁱ *Obv.*: حاجي بن / شعبان; *Rev.*: [سكندرية / ---]; *Æ fals*, 3.64 g, 22 mm;
 Cf. Balog 1964: No. 523.

Table 3. Crushing Basins

Oil Press/ Survey No.	Type (Frankel 1999)	Inner Diameter (m)	Depth (cm)	Diameter of Socket (cm)
A	351	1.50	60	9
B	32	1.30	11	
C	351	1.64	54	
1	322	1.29	8	9
2	351	1.22	32	18

**Fig. 2.** The cist grave (see Plan 1: No. 18).



Fig. 3. Fragment of the gable-shaped sarcophagus lid with a small protruding altar (see Plan 1: No. 17).

recorded. Especially interesting is one with a small protruding altar (Fig. 3). Altars of this type are common in Phoenicia and several examples have been discovered in the western Galilee, but not in other parts of the country (Frankel and Getzov 1997:47*). The altars usually appear on sarcophagi, but in this case, as the grave is rock-hewn, the altar is on the lid.

THE EXCAVATIONS

The aims of the 1984 and 1986 excavations were twofold: to elucidate the stratigraphy of the site, thereby dating the three stages that were observed in the survey,⁶ and to increase our knowledge of the technology and history of the production of olive oil. The excavations revealed that there had been four stages at the site, during the Roman, Byzantine, Crusader and Mamluk periods. These periods could not be distinguished stratigraphically, but only by observing the structural and stylistic changes. Khirbat Din'ila is a stone ruin (*khirba*/*horba*) whose original floors were in use throughout the site's existence. Hence, traces of stratification at the site are minimal.

STAGE I: THE ROMAN PERIOD (Plans 2–4)

Architectural Elements

Square Central Enclosure. The survey had already shown that the first stage consisted of the square enclosure in the site's center; the excavations revealed that it dated to the Roman period.

The building excavated in Area C, within the square enclosure, was used in at least three periods, the Roman, the Byzantine and the Mamluk. However, in the two later stages, the occupants used the original Roman-period floor, which is why these periods can be distinguished only by the structural changes that took place inside them. Moreover, in L61 in Area A (see Plan 3), a stone threshold with a hewn socket opens to the east, into an area that was later cut away to be the weight pit of Byzantine Oil Press A. This would suggest that before the construction of this oil press, a building existed outside the square enclosure that may have been either Late Roman or early Byzantine in date.

Oil Press C. The press was clearly used in both the Roman and Byzantine periods, which makes it difficult to determine the exact form of the early press. As, however, two additional Byzantine oil presses were also excavated at the site, it can be presumed that those elements that differ from the elements in the other two presses are from the original Roman press.

Oil Press C was a beam press. The beam was anchored in a perforated niche 0.85 m wide and 2 m high (Plan 2: W32; Fig. 4). On the inner face of one side of the niche was a round hole (Fig. 5:A) and on the inner face of the other, an angular groove (Fig. 5:B). These secured a rod to which the fixed end of the beam of a lever (or beam)-and-weights press was attached. The top of the niche consisted of a large stone block that added weight to counteract the pressure exerted during pressing. The beams in Oil Presses A and B were anchored in a similar manner. Perforated niches and piers in Israel

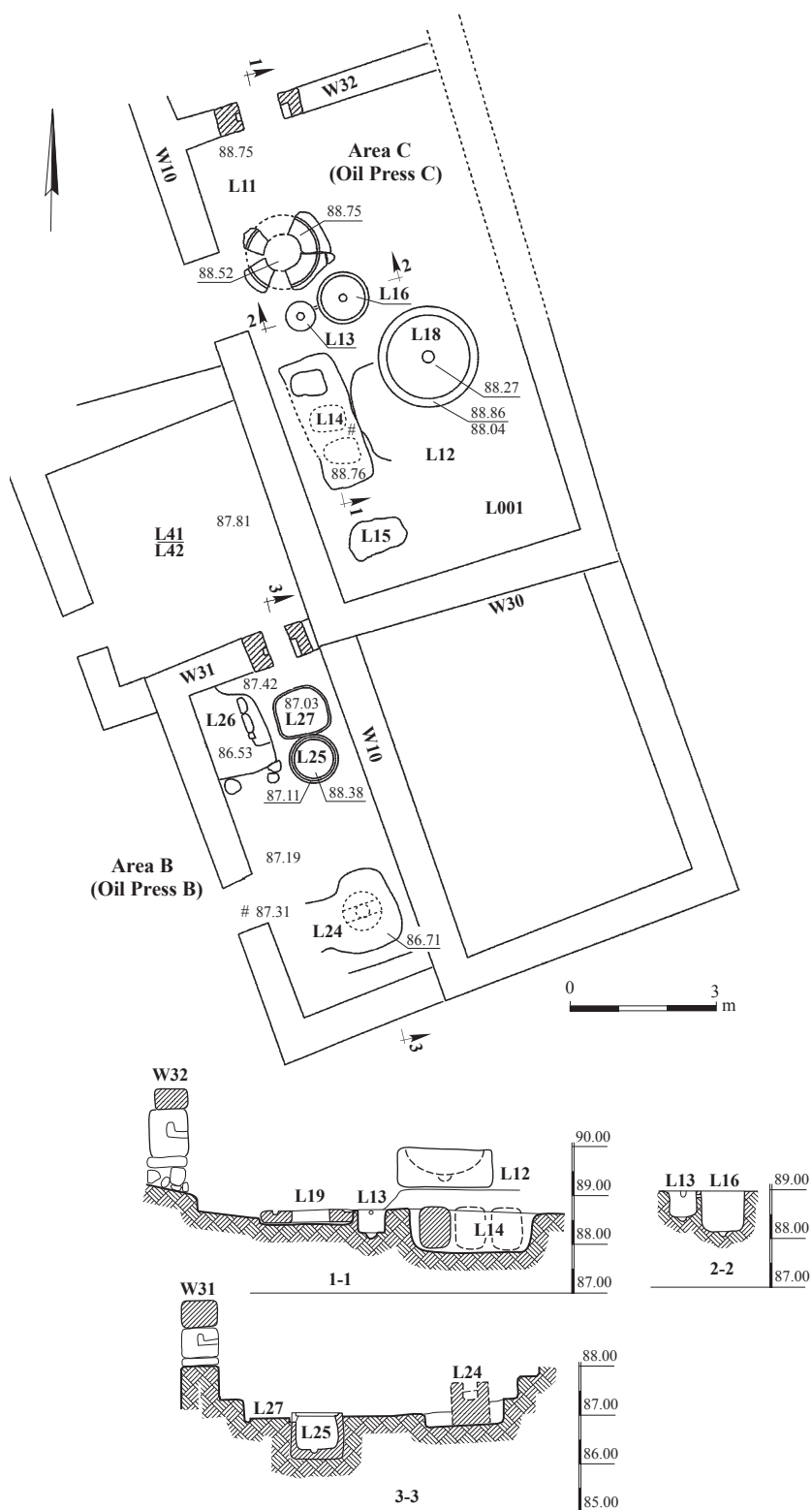




Fig. 4. Oil Press C: the press piers and press bed (L11) after sections of the bed had been returned to their original position, looking north (see also Fig. 22).

are usually associated with lever-and-screw presses (Frankel 1999:82–83), but during the Roman period, the lever/beam presses in this region were lever-and-weights presses. Therefore, the perforated niche in Oil Press C was probably not part of the Roman-period press, when the beam was apparently anchored in some other manner.

The other parts of Oil Press C were, however, very different from those of Presses A and B. The press bed (Fig. 6, and see Figs. 4 and 22) was unique; it was built of several stones that were found in disarray as part of the paving of the floor of the room in its final stage, when it no longer housed an oil press (L19; Fig. 22). However, it was not difficult to rearrange and restore them to their original state. Originally, the stones formed a round press bed with a circular channel and a round hole in the center. Next to the press bed were two round adjacent collecting vats: the expressed liquid first flowed into the small collecting vat (L13) and thence, the floating oil flowed into the second, larger vat (L16). The press bed, however, is typical of the perforated covers of central vats (Frankel



a



b

Fig. 5. Press piers of Oil Press C: (a) the western pier, looking northwest; (b) the eastern pier, looking northeast.



Fig. 6. Oil Press C: the press bed, settling vat and collecting vat (after sections of the press bed had been returned to their original position; see Fig. 16), looking south.



Fig. 7. Oil Press C: the weights pit, with one remaining cylindrical weight, its top missing, inside, looking south.

1992: Fig. 19). It operated on the principle of central collection as opposed to the more usual lateral collection, where the expressed liquid flows from the press bed to a separate lateral collecting vat, as in all the presses at Kh. Din'ila. In central collection however, instead of two components—press bed and collecting vat—there is only one central vat. The olives are placed on crisscrossing laths above the central opening of the central vat and the expressed liquid flows directly down through the central opening, into the vat. Oil Press C at Din'ila is an anomaly. While the press bed has a central opening, there are lateral collecting vats instead of a central vat, and the expressed liquid must have seeped out under the press bed to reach the collecting vats. It is as if the builder or owner of the press had copied the installation from a press with central collection without understanding exactly how central collection

actually worked; see, for example, Khirbat el-Quseir (Frankel 1992:49–62), where there are four installations with central vats.

The weight pit of Oil Press C (L14; Fig. 7) also differs from those of Oil Presses A and B. It is rectangular, and probably originally contained more than one weight as opposed to the pits of Oil Presses A and B, which were constructed to accommodate one weight alone. However, only one weight was actually found in the pit of Oil Press C, which was large enough to accommodate three; the top of the weight was damaged, perhaps when the pit was filled and a floor lay above it in a later phase, making it impossible to ascertain its type. It follows that the Roman-period press was intended to hold three beam weights while the single weight was a screw weight similar to those of Oil Presses A and B, discussed below. The length of the press beam would have been



Fig. 8. Oil Press C: the crushing basin.

approximately 8 m. The center of the press bed was 3 m from the anchoring point and the distance from the anchoring point to the center of the weights pit was approximately twice that length, 6.5 m, so that the mechanical advantage was $\times 2$. Therefore, the effective weight of the press weights would have been double their actual weight.

On the eastern side of the press room (L12), opposite the weight pit, was an unusual basin (L18; Fig. 8). It was similar in size to a crushing basin, but was concave in section with no central protrusion, suggesting that if indeed it was a crushing basin it was of a very unusual type. The preparatory excavations carried out close to this vat prior to restoration works uncovered an unusual stone similar to a concave crushing stone but without a socket (see Table 1: L001; Plan 2; Fig. 9); its purpose is not clear. It may have been meant to be placed in the crushing basin in order to make it more similar to a standard one (e.g., Oil Press B).

A bone scraper found in the weights pit in Oil Press C (B130, L14) was identified by Reuben Yeshurun as a scapula of a cow. Similar scrapers have been found in the past in oil presses, e.g., at Khirbat Karkara (Frankel, Avitsur and Ayalon 1994: Fig. 98B) and at Alone Abba (Porat, Frankel and Getzov 2012).

Pottery (Fig. 10)

The majority of the scanty pottery from the Roman period retrieved during the excavations was from Oil Press C. While some residual



Fig. 9. Oil Press C: the unusual-shaped stone (L001).

Roman sherds were found in predominantly Mamluk loci, in L14 (the weights pit), most of the sherds were from both the Roman and Byzantine periods and all the sherds from B125, B130 and B133 were from the Roman period.

Some Roman-period sherds were retrieved during a small probe conducted in the central enclosure (see Plan 3: L62) in Area A. However, within the area of the square enclosure, only Oil Press C was excavated (Plan 2). The western wall (W10) of this press was the western wall of the central enclosure. The large number of Roman-period sherds and the Roman lamp (Fig. 10:8) found in L14 (the weight pit) and the solely Roman-period sherds found in a small natural hollow in the bedrock (L15), also in Oil Press C, date both the square enclosure and the first stage of Oil Press C to the Roman period.

The majority of the identifiable vessels and the vessels appearing in the pottery plates are storage jars. There were also examples of Eastern Terra Sigillata ware (ETS; Frankel et al. 2001:63) that were not drawn.

The storage jars can be divided into three groups:

1. The Phoenician jar, the most common type, cone shaped with a thickened rim (Fig. 10:1–5; Getzov 2000: Fig. 7:19–23; Frankel et al. 2001:63–64). The Phoenician character of this vessel is demonstrated by the fact that

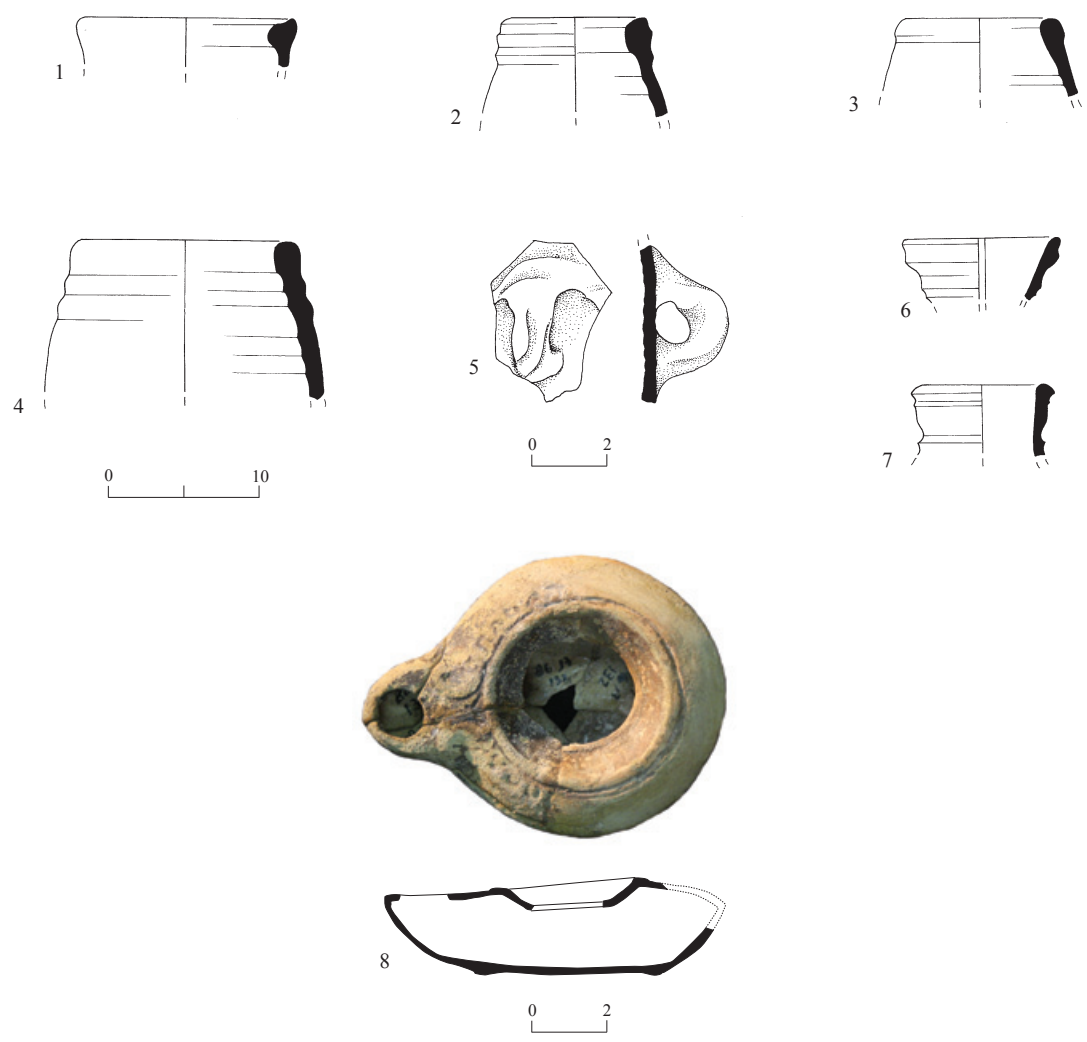


Fig. 10. Pottery from the Roman period.

No.	Vessel	Locus	Basket	Description
1	Phoenician jar	14	126	Pink-orange fabric, well-levigated, small, light grog inclusions
2	Phoenician jar	14	130	Pink-orange fabric, well-levigated, small and medium-sized light inclusions
3	Phoenician jar	52	532	Reddish fabric, well-levigated, small and medium-sized light inclusions
4	Phoenician jar	40	400	Red fabric, various inclusions
5	Phoenician jar	14	133	Pink-orange fabric, well-levigated, small light inclusions including grog
6	Amphora	53	528	Red fabric, small light inclusions
7	Bag-shaped jar	14	130	Brown-red fabric, various inclusions
8	Oil lamp	14	132	Yellow-orange fabric, well-levigated, red slip

at Yodefat, a site in Lower Galilee outside the Phoenician sphere of influence, there are no examples of this jar (Avshalom-Gorni and Getzov 2002).

2. The Masref amphora, with a thickened rim and an external protruding ridge just below it, and a narrow, vertical neck (Fig. 10:6). This type is found in contexts from the third–fourth centuries CE and is also typical of the Phoenician coastal region (Frankel et al. 2001:64).

3. The bag-shaped (barrel-shaped) jar with a thickened rim and a vertical neck (Fig. 10:7); a few examples were found. This jar is found in large numbers in the Jewish settlements of Upper Galilee, e.g., at Horbat Shema' (Meyers, Kraabel and Strange 1976: Pl. 7.20:26, 27) and at Meron (Meyers, Strange and Meyers 1981: Pl. 8.2:8).

Fragments of an oil lamp (Fig. 10:8) were found in the weights pit of Oil Press C; after the lamp was repaired, it became clear that the rim of the round filling hole had been intentionally broken in antiquity. The lamp is a discus type, dated to the end of the first and the second centuries CE (Hadad 2002: Type 7, Variant 1). The intentional breaking of the rim of the filling hole of oil lamps is attributed to Jews (Vitto 2011:48*–52*).

Regarding chronology, the presence of ETS ware shows that the site was already occupied in the early stages of the Roman period. The occurrence of Masref amphorae indicates that the site was occupied in the third or fourth centuries CE. As for the cultural affinities of the inhabitants of Kh. Din'ila, the ETS ware, the Phoenician jars and the Masref amphorae clearly show that the settlement was closely connected to the Phoenician coastal settlements, as revealed by the rarity of other types, such as Kefar Hananya Ware (Adan-Bayewitz 1993), the bag-shaped jars typical of the mountains of Upper Galilee and the oil lamp. The presence of an oil lamp inside the oil press suggests that work was carried out there at night (see also Alone Abba: Porat, Getzov and Frankel 2012).

Coins

Two coins were unearthed during the excavation. One coin, from L26, was attributed to the Late Roman period (361–346 CE) and the other, from L24, could not be identified (see Table 2), although it was found in a Roman-period context.

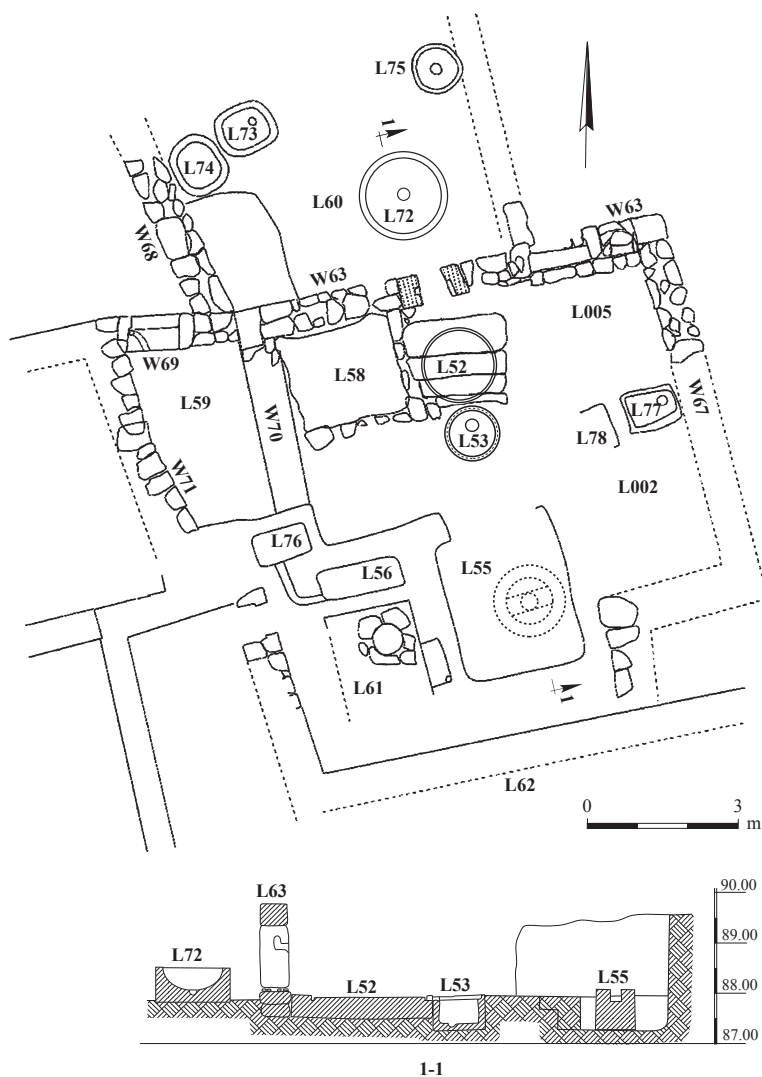
STAGE II: THE BYZANTINE PERIOD

After the Roman period, the site was apparently abandoned, and after a hiatus, resettled in the Byzantine period, when its plan and character were completely different (see Plan 1). During the Byzantine period, the site expanded, and evolved from a villa or farmhouse into a small village. A comparison with other Roman-period courtyard sites in the vicinity that did not continue into the Byzantine period (see discussion below), as well as the complete change in the site's plan and character, suggest that there was a break between the Roman and Byzantine occupations. In all three oil presses two architectural stages could be discerned; during the first stage, the oil presses were active and during the second, they were no longer in use (see below, The Mamluk Period). Thus, the evidence suggests that the presses were in use in the Byzantine period and that the site was reoccupied in the Mamluk period, when the new inhabitants used the floors in the press areas, but not the oil presses.

Architectural Elements

Oil Press A. Oil Press A (Plan 3; Figs. 11–14) was uncovered in the northern end of the site, north of the square, central enclosure. It was enclosed by W70, W63 and W67, parts of which were visible before excavation. Oil Press A was also a lever press.

The beam was anchored in W63 in a similar manner to that of Oil Press C, except that here, instead of a built niche, the anchoring point consisted of two monolithic perforated press piers (1.3 m high), standing approximately 0.5 m apart. As in Oil Press C, there was an elliptical hole in the inner face of one pier and



Plan 3. Plan and section of Area A, Stages I–II.

an angular groove in that of the other. These also served to secure a rod to which the fixed end of the beam of a lever press was attached. As in Oil Press C, above the piers lay a large stone block that added weight to the piers to counteract the pressure exerted during pressing. To the west of the press bed was a sunken working area (L58) shaped like an imperfect square. Being lower than the press bed, work was made easier, as the workers did not have to bend too much. The center of the round press bed (L52), on which the frails of olive mash were placed during pressing, was situated

1.75 m from the center of the anchoring point and had a circular groove.

From the press bed, the expressed liquid flowed to the round collecting vat (L53). The center of the weight pit (L55) was 6.75 m from the anchoring point (mechanical advantage $\times 4$); thus, the length of the press beam would have been approximately 8 m.

A screw weight of a type known as a Din'ila weight was found within the area of the press, albeit not *in situ*. The screw weight originally stood in the weight pit (L55; Plan 3), which shows this press to have been of the lever-and-



Fig. 11. Oil Press A: general view before the removal of W64 and the screw weight not in its original findspot, looking east; in foreground, separating installation.



Fig. 12. Oil Press A: general view before the removal of W64, looking north.



Fig. 13. Oil Press A: general view after restoration, looking northeast.



Fig. 14. Oil Press A: rectangular vat, looking south.

screw type. The Din'ila screw weight is one among several types of screw weights found in Israel and will be discussed in detail (see below, Conclusions).

Three phases can be discerned in the oil-press building in the Byzantine period. In the first phase, W70 served as the western wall of the entire complex. In the second phase, a small room (L59) was added to its west and in the

third phase, W70 was dismantled and the press room expanded to the west to include L59. On a rock surface to the south of the press, about one meter above the floor level of the press room, was a rectangular rock-cut depression (L56). A shallow channel led from the western end of the depression to another shallow depression (L76), whence a bore led to the edge of the rock surface (Fig. 11). This installation was



Fig. 15. Oil Press B: general view, looking north.

probably used to separate the floating oil from the watery lees and was presumably added during the third phase. This may have been one of the reasons the press room was widened westward. To the east of the oil press were two additional rectangular depressions (Fig. 14; L77, L78). These, however, were not connected by a channel and it is unclear what purpose they served.

In a room (L60) to the north of the press room were three large stone basins (L73, L74, L75) that probably also served to separate the oil from the lees, and a larger basin (L72), similar to that found in Oil Press C (L18). This unusual crushing basin is apparently a local type that continued through the Roman and Byzantine periods.

Oil Press B (Plan 2). This press is situated to the west of W10, outside the central enclosure. It is very similar to Oil Press A, except that there is



Fig. 16. Oil Press B: angled groove in the eastern pier, looking east.

a press niche (W31; Fig. 15) similarly to Oil Press C, also with a round hole and an angular groove (Fig. 16) instead of press piers. As in Oil Press A, the press bed (L27) is more-or-less round, and situated 1.5 m from the anchoring point. There is one round collecting vat (L25), a weight pit (L24) and a sunken working area (L26) to the west of the press bed, in exactly the same position as that of Oil Press A, but smaller. The beam would have been approximately 7 m in length, shorter than the beam of Oil Press A, with a mechanical advantage of $\times 4$. As in the case of Oil Press A, the screw weight, identical to that of Press A, was not in its original position (Fig. 17), but outside the press room, next to the path leading to it. The weight originally stood in the weight pit (L24; Plan 2: Section 3–3). This press was also a lever-and-screw press. The crushing basin (Fig. 18) was found in the building to the north of the weight pit (L24). A coin found on the floor of the weight pit was dated to the mid-fourth century CE.

North of Oil Press B was another room (L41/L42) with a bedrock floor and its entrance on the west. No installations were found.

Oil Press C (Plan 2). The Roman-period oil press continued in use in the Byzantine period, as evidenced by the Byzantine pottery that was



Fig. 17. Oil Press B: the screw weight as found outside the building, looking east.



Fig. 18. Oil Press B: the crushing basin as found in the background and the weight pit (L24) in the foreground, looking north.

found in the weight pit (L14). Both the beam niche and weight were probably changed during this stage, although we know neither the form of the original beam niche nor the original form of the damaged weight found in the weight pit.

Pottery (Fig. 19)

Residual sherds from the Byzantine period were found in all the excavated areas together with Mamluk pottery (see below), but in no locus were they predominant. The Byzantine pottery was similar to that found at other sites in the western Galilee (e.g., Ḥorbat 'Ovesh: Aviam and Getzov 1998) and included many imported wares, among them Cypriot bowls of Types CRS 9A (Fig. 19:1) and CRS 11 (Fig. 19:2), dated by Hayes (1972:379–383) to the sixth and seventh centuries CE. The basins, with very large wide flat trapezoidal-sectioned rims (Fig. 19:3; Frankel et al. 2001:68), were imported from Cyprus during the same period.

In the past, we suggested that the globular cooking pot with a concave rim (Fig. 19:4) was also imported from Cyprus (Frankel 1992:49;

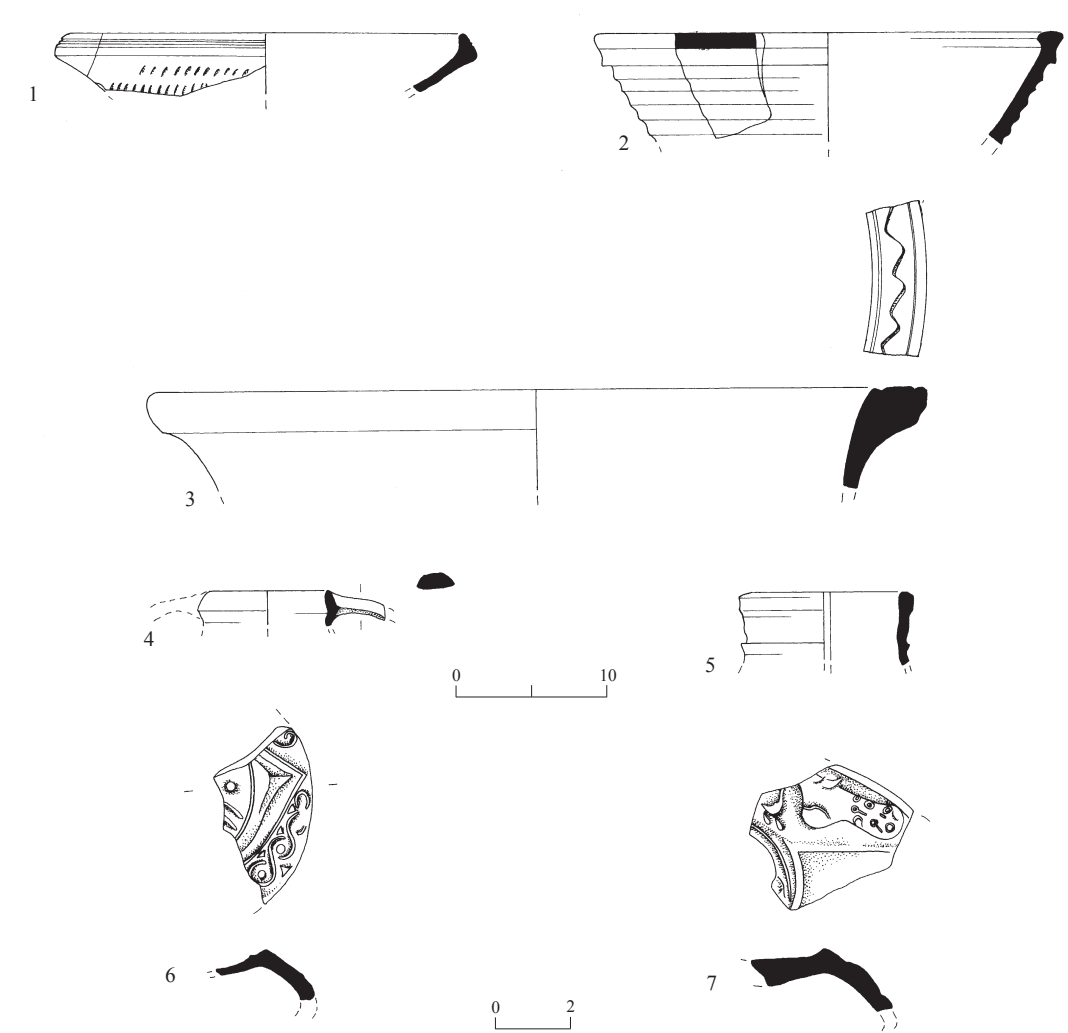


Fig. 19. Pottery from the Byzantine period.

No.	Vessel	Locus	Basket	Description
1	Bowl	55	621	Orange fabric, well-levigated, rouletted decoration, red-brown wash
2	Krater	57	615	Brown fabric, well-levigated, red-brown wash
3	Basin	57	616	Brown-pink fabric, various small inclusions, incised wavy decoration
4	Cooking pot	53	528	Brown-red fabric, small white inclusions
5	Jar	14	125	Brown-gray fabric, small white inclusions, gray surface
6	Lamp	5	17	Orange fabric, well-levigated, molded
7	Lamp	57	616	Brown-pink fabric, molded

Fig. 15). However, recent excavations have shown that it is very common in the western Galilee, and was probably produced locally (e.g., Aviam and Getzov 1998: Fig. 9:11).

Other locally made vessels are the Galilean Jar (Fig. 19:5)—a variant of the Palestinian bag-shaped jar (Frankel et al. 2001:66), and ovoid oil lamps (Fig. 19:6, 7; Aviam and Getzov

1998: Fig. 11). These were common types in the sixth and early seventh centuries.

All the Byzantine pottery types were common in the sixth and seventh centuries CE and there is no clear evidence that the site was occupied in the fourth or fifth centuries CE. However, because of the small size of the assemblage and because all the finds are residual in character, it cannot be categorically determined based on the pottery alone, whether occupation at the site continued without a gap between the Roman and late Byzantine periods or whether the site was abandoned and then resettled. Many types of imported wares occur in the western Galilee in the Byzantine period, while in Upper Galilee, imported wares are rare (Frankel et al. 2001: Pls. 36–37).

Thus, just as in the Roman period, the ceramic evidence shows that in the Byzantine period, the settlement at Kh. Din'ila was closely connected to the Phoenician settlements of the coastal area, in spite of its position in the mountains, and not to those of central Upper Galilee.

STAGE III: THE CRUSADER PERIOD

Enough Crusader-period sherds were found to show that the site was occupied to some extent during this period (see Stern, this volume). A group of buildings at the southern end of the

site that differ from the other structures both in alignment and in building techniques, especially in the use of mortar as opposed to dry-wall construction, hint at a Crusader construction style. However, only further excavations can verify whether these buildings are indeed from the Crusader period.

STAGE IV: THE MAMLUK PERIOD

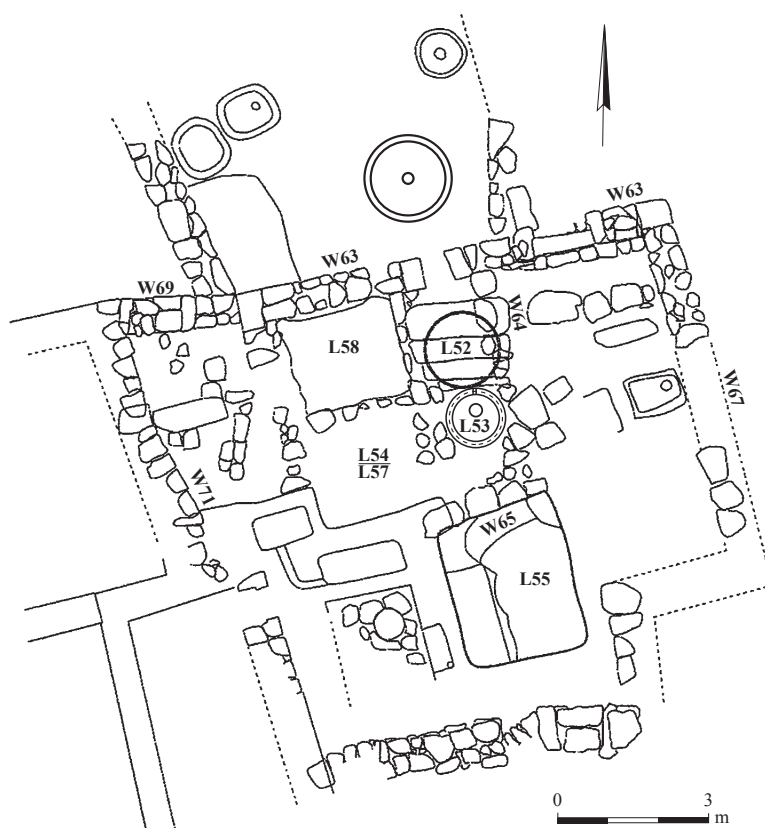
There is clear evidence from all three excavated areas that the oil presses were no longer in use during the final stage of occupation and that the rooms in which they were found served other purposes. In all three areas, the latest pottery found dated to the Mamluk period. Large quantities were recovered, including complete and restorable vessels. It is, therefore, clear that the final, post-oil press stage, should be dated to the Mamluk period.

Architectural Elements

Area A (Plan 4). Two phases could be discerned of Stage IV. Not only were the finds from the first phase of Stage IV unearthed directly on the floors of the Byzantine period, but they were also in the work pit (L58; Fig. 20) and in the collecting vat (L53). The first Mamluk-period settlers presumably cleared the debris that had accumulated after the site was abandoned in the



Fig. 20. Oil Press A. Mamluk-period jug in the corner of the work pit.



Plan 4. Plan of Area A, Stage IV.

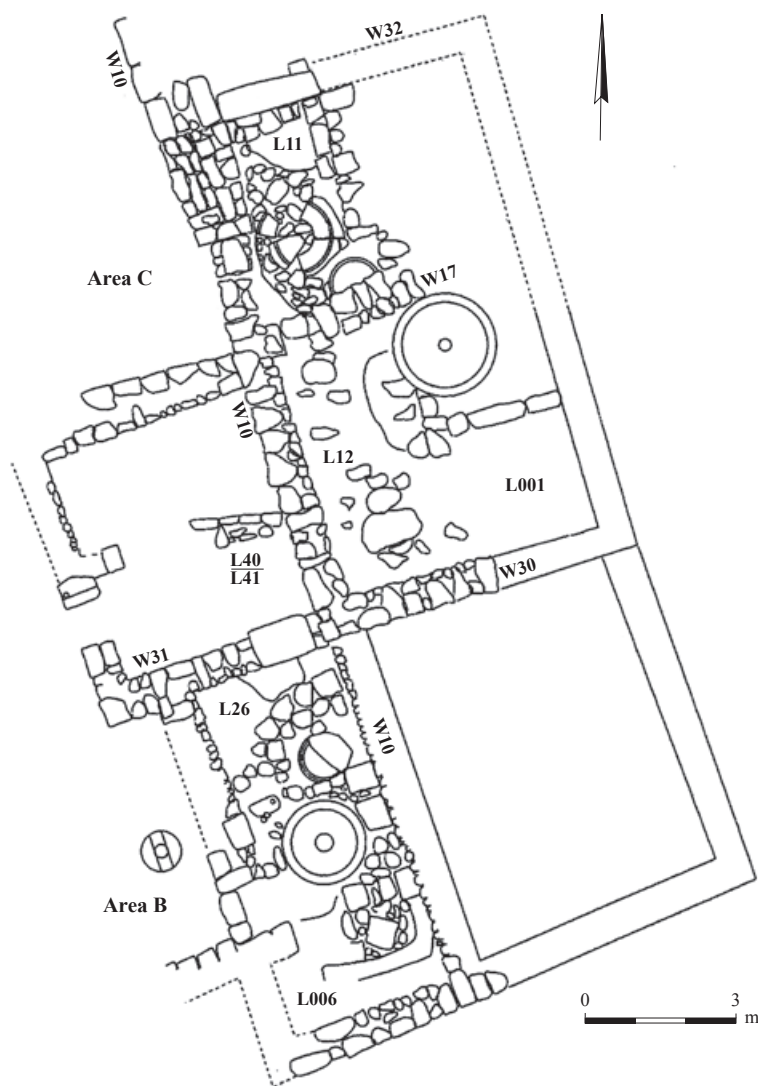
Byzantine period, using the actual floors of this period. During the second phase, the weight pit (L55) was converted into a water cistern by constructing W65, which blocked off the open northern end of the pit, and by plastering the walls of the pit and W65. It is clear that, at least in Area A, the site was abandoned again—during the time between the two Mamluk-period phases—because the screw weight that was taken out of the pit was found above a 40 cm thick layer of debris that had accumulated between the two phases. Wall 64 was built over the same layer of debris. A complete cooking pot from the second phase was found on the floor of the weight pit/water cistern (L55; see Stern, this volume).

Area B (Plan 5). Here too, the screw weight was taken out of the weight pit and the crushing

basin was brought into the pressing room and placed between the collecting vat and the weights pit, thus making it impossible to operate the press. Most of the rim of the crushing basin was removed, but it is not clear what purpose it served in its new position. It may have served as a table.

In Press B, the arch that supported the roof was found. The abutments of the arch were exposed *in situ* and the stones of the arch itself were found lying in order, where they had fallen. The stones were not on the floor but on a layer of accumulations, showing that the arch collapsed after the site was deserted. During this stage, a floor (L23; Fig 21) was built over the weight pit (L24).

Area C. Three main changes were made in this area. First, the weight pit was filled



Plan 5. Plan of Areas B and C, Stage IV.

in and the top of the weight in the pit was broken flush with a floor that was built above it (L12). Secondly, an east–west wall (W17) was built above the collecting vats. This wall did not reach the western wall of the room (W10), thus dividing the pressing room into two compartments, but leaving a doorway to connect them. Thirdly, the sections of the press bed were rearranged so that they now served as floor slabs (L11; Fig. 22).

Pottery

The Mamluk-period pottery is discussed by Stern (this volume) and Shapiro (this volume), who show that the pottery from Stage IV at Kh. Din'ila is characteristic of a rural site. They date the pottery, which was found in nearly all parts of the excavation in large quantities, including on the actual floors,⁷ to the Mamluk period, as well as the beginning of the Ottoman period.



Fig. 21. Oil Press B: paving in the weight pit, looking south.



Fig. 22. Oil Press C: the paved floor (L11), looking north (see also Fig. 4).

CONCLUSIONS

STRATIGRAPHY

The Site

One of the most striking characteristics of Kh. Din'ila is its remarkable degree of preservation. The site could almost be described as a deserted village. Khirbat Din'ila is, however, typical of many ancient sites in its immediate vicinity. The explanation for this phenomenon is that the region around the site has been almost devoid of settlement in recent times. This can be discerned clearly on the map of the Survey of Western Palestine (Conder and Kitchener 1881), where occupied sites are marked in red (see also Frankel et al. 2001: Pl. 19). In other areas, such as the coastal plain, closer to occupied villages, many sites that were still well-preserved in the nineteenth century (see *SWP*, Conder and Kitchener 1881; Guérin 1880) have since almost

completely disappeared, a result of the removal of building stones and other architectural elements for reuse as building material.

Based on the plan of the site drawn up during the survey, three stages could be distinguished and the excavations have shown that these can be assigned to the Roman, Byzantine and Mamluk periods. These stages, however, should not be regarded as three strata. In fact, although small deposits of finds representing the two earlier stages were retrieved and changes in the plan can be attributed to the second and third stages, in all three stages the floors were at the same level. In Area C, the occupants in the later stages used the same floor as the inhabitants in the Roman stage; in Areas A and B, the inhabitants in the Mamluk stage used the same floor as was used in the Byzantine stage.

Stage I (Roman period). During this stage, the site consisted of a square enclosure comprising

rooms around a courtyard. The outer wall was a well-demarcated square measuring 33 × 33 m and the site was clearly a farmstead or villa. Farmsteads of the same period, similar in shape and size, have been recorded in the vicinity, for example at Khirbat Ju'aran (40 × 42 m; Frankel and Getzov 1997: Site 2.129, pp. 97*, 145, 146), at H. Zabadi (38 × 38 m; Frankel 1992:42, Fig. 2) and at Kh. el-Mizrath (35 × 45 m; Frankel and Getzov 1997: Site 2.39; Cohen, Avshalom-Gorni and Porat 2013). At Kh. Din'ila, Oil Press C was part of the Roman farmstead, as was the case of the twin oil press at H. Zabadi. Although there were more sites in the region in the Byzantine period than in the Roman period (Frankel et al. 2001:126–127, Table 5.1, Fig. 5.1), the square enclosure sites at Kh. Ju'aran and H. Zabadi did not continue into the Byzantine period. The drastic change in the plan at Kh. Din'ila during the Byzantine period suggests that here too, occupation was not continuous between the Roman and Byzantine periods, but that the site was abandoned and then resettled. We have suggested that “The abandonment of the farmsteads may have been linked to the economic crisis that spread throughout the Roman Empire in the third century CE and may have affected the markets on which these farms depended” (Frankel et al. 2001:114).

Stage II (Byzantine period). During this stage, the walls of the first stage were reused, but the plan and character of the site changed completely. The site became a village. Two of the three oil presses (A and B) are from the Byzantine period and use of the third (C) was probably renewed. Surprisingly, no public building, such as a church or a synagogue, could be identified.

The ceramic evidence and the sarcophagus recorded at the site show that in spite of its position in the mountains, the village reveals a cultural affinity to the Phoenician coastal plain and not to the mountain areas, which, at least in the earlier periods, were primarily Jewish.

Stage III (Crusader period). Amongst the pottery retrieved from the site, five sherds from the Crusader period were identified. The site is also mentioned in Crusader documents (see Introduction). A group of buildings at the southern end of the site is probably from this period.

Stage IV (Mamluk period). The site was reoccupied in the Mamluk period. During this stage, some walls were added, all three of the excavated oil presses went out of use and the press rooms were converted to other purposes. The new inhabitants used the floors in the press areas, but not the oil presses. The site was abandoned late in the Mamluk, or perhaps, early in the Ottoman period and was never resettled.

The Oil Presses

It is not certain exactly how many oil presses there were at Kh. Din'ila, but the extant evidence suggests that there were at least seven. In addition to the three excavated presses, other components of oil presses were identified during the survey: an additional pair of perforated piers; two crushing basins, very close to one another; and two weights. One weight was identifiable as a Din'ila weight, but the other was partly obscured and thus, its type was not determined. The remarkable similarity in the dimensions of the various components strongly suggests that they were made at the same time, and perhaps, by the same craftsmen.

As the three excavated presses were all in use in the Byzantine period, the others were also almost certainly in use at that time. This, in turn, suggests that similarly large numbers of oil presses documented by the survey at other sites in the region were also from this period (e.g., at H. Karkara: seven oil presses; one, excavated, from the Byzantine period; Frankel 1992:46–49). The large quantities of oil produced at these sites were almost certainly sold and partly, at least, exported. Amphorae from the region from this period have been found at

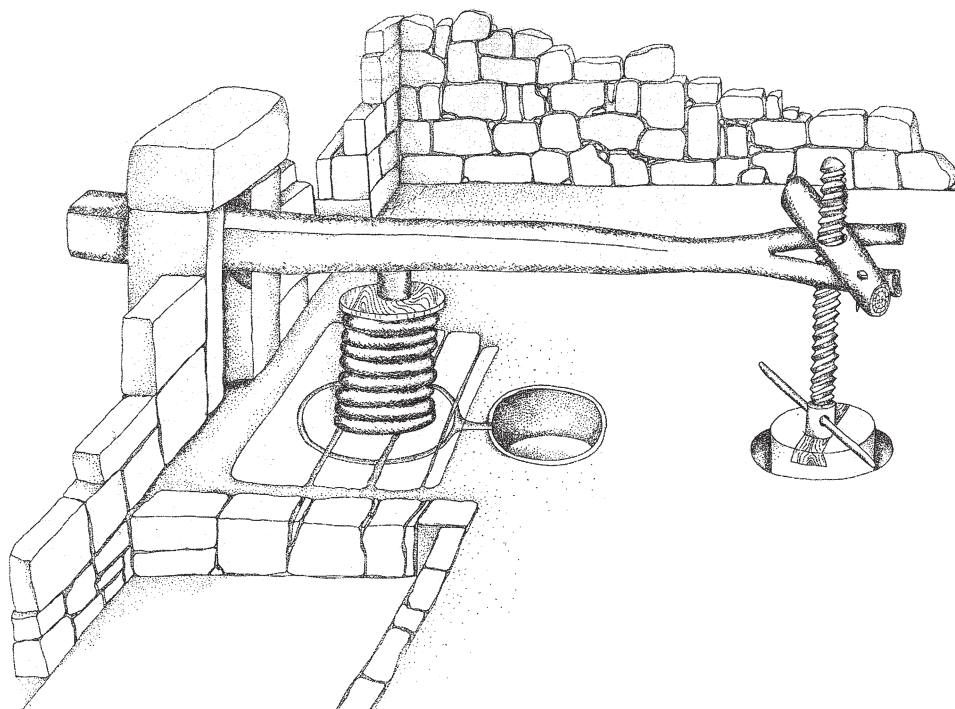


Fig. 23. Reconstruction of the lever-and-screw press in Oil Press A.

many sites throughout the Mediterranean. Some of these vessels probably contained wine, but others undoubtedly contained oil (see Kingsley 1994–1995; Frankel 1997:84, n. 72). It is of great significance for the history of both ancient regional agriculture and Mediterranean trade that all three oil presses were no longer in use in the Mamluk period.

The Oil Presses

Oil Press C. This press clearly served in both the Roman and Byzantine periods, but we cannot determine exactly what the press was like in either. We suggest, tentatively, that in the Roman period it was a lever-and-weights press, which would explain why there was room for more than one weight in the weight pit, but in the Byzantine period, it was a lever-and-screw press (Fig. 23), which could explain why we found only one weight. It is very probable that during the Roman period, the beam was anchored differently from the way it was

anchored in the final stage, but there is no hint as to what method was used.

Oil Presses A and B. These presses, both dating to the Byzantine period, were almost identical, and the way they functioned is completely clear. They were lever-and-screw presses in which the beam was anchored in perforated piers or niches. Oil collection was lateral, with one collecting vat, and the force applied was that of a Din'ila screw weight.

We will now attempt to compare the Din'ila presses to other presses from the region (Table 4).

TECHNOLOGY AND HISTORY OF OIL PRODUCTION

The oil presses nearest Kh. Din'ila that have been excavated are two twin presses from H. Zabadi and H. Karkara (Frankel 1992:40–49), and a single press from H. 'Ovesh (Avshalom-Gorni 2000). The oil press from H. Zabadi

Table 4. Oil Presses

Oil Press	Beam Length (m)	Space between Piers (cm) ⁱ	Min. Diam. of Channel or Bore in Piers (cm) ⁱⁱ	Press Bed D (m) ⁱⁱⁱ	Volume of 1st Vat (liter)	Volume of 2nd Vat (liter)	Weight of Screw Weight (kg) ^{iv}	Width of Channel in Screw Weight (cm) ^v	Mechanical Advantage
A	8	55	11	1.30	410	-	1400	22	1:4
B	7	50	10	0.96	350	-	850+	23	1:4
C	10	70	15	1.40	141	570	-	-	1:2.5
No. 4	-	57	13	-	-	-	-	-	-
No. 10	-	-	-	-	-	-	600	-	-
No. 11	-	-	-	-	-	-	1700	21	-

ⁱ Maximum diameter of beam.

ⁱⁱ Maximum diameter of rod to which beam is anchored.

ⁱⁱⁱ Internal diameter of circular groove—maximum diameter of frails.

^{iv} Based on specific gravity of 2.5.

^v Maximum diameter of screw.

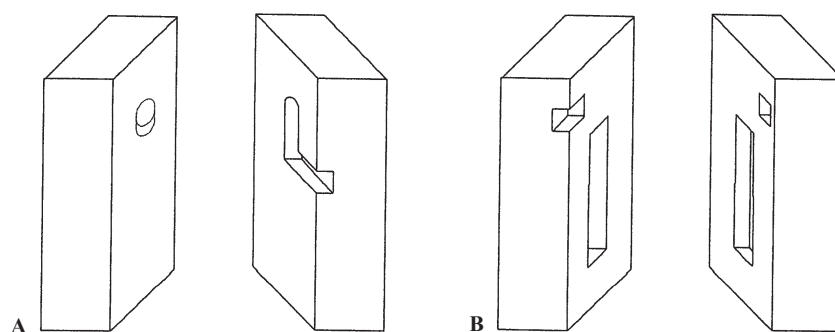


Fig. 24. Schematic illustration of (A) perforated piers and (B) slotted piers.

is from the Roman period, while those from the latter two sites are from the Byzantine period. Many oil presses were also excavated at Umm el-‘Amed in southern Lebanon, two of which were published in detail—one from the Hellenistic period (Dunand and Duru 1957:80–81, No. 35, Figs. 16; 19) and the other from the Byzantine period (Dunand and Duru 1962:97–98, Pl. XLV). The discussion below is organized according to the various components in an attempt to reconstruct the technological development of the oil press in this region over time.

Technological Elements

Piers. At Kh. Din’ila, the beam was anchored in perforated piers in all three presses, as well as the fourth, unexcavated press (see Plan 1: No. 4), and oil collection was lateral. We call this type a Mavo Modi‘im press (Porat, Frankel and Getzov 2012). Those with perforated piers (Fig. 24:A) and central collection we have called the Ka‘akul press.

In the presses at H. Zabadi, H. Karkara and H. Ovesh, as well as in the Byzantine press at Umm el-‘Amed, the beam was anchored in slotted piers (Fig. 24:B); we have called

this type of press a Zabadi press (Frankel 1999:77–82). At Umm el-‘Amed, the beam of the Hellenistic press was anchored in a slotted niche. Slotted piers, found in large numbers in the western Galilee and Southern Lebanon, can be regarded as the typical Phoenician device for anchoring the beam. They apparently developed from the slotted niche (Frankel 1999:77–82). As opposed to slotted piers, which are not found in the southern parts of the country at all, perforated piers are found both in the north and the south (Frankel 1999:82, Map 13). This unusual distribution pattern is difficult to explain. It is possible that the large gap mid-country (Samaria) is more apparent than real and is the result of lack of information.

In North Africa, perforated piers were used with lever-and-weights presses (Frankel 1999:94–95), but in Israel, they seem to be associated only with screw weights. At Kh. el-Quşeir, the change from slotted to perforated piers is clearly evident (Frankel 1992:49–58; 1999:82). The type of perforated piers that occur at Kh. Din‘ila, in which one pier has a round hole and the other an angular groove, is common in the immediate vicinity (Frankel 1999:82, Map 13:T4234). As we have already pointed out, however, the presses at H. Karkara, which are lever-and-screw presses, have slotted, and not perforated, piers. At H. Zabadi, each press has two beam weights, but those at H. Karkara each have one beam weight and one screw weight. This would suggest that originally, the presses at H. Karkara were lever-and-weights presses and only later were they converted to lever-and-screw presses, which would explain the piers being slotted. Yet, the Byzantine presses at Umm el-‘Amed and the press from H. ‘Ovesh have the same arrangement: one screw weight and one beam weight, showing that this arrangement was not unique to H. Karkara, but was common in the region. Therefore, we must conclude that there were two parallel developments, one in which lever-and-screw presses continued using the previous method of slotted piers, e.g., the presses at H. Karkara and Umm el-‘Amed, and

the other, in which lever-and-screw presses used the new method, that of perforated piers, for example, the presses at Kh. Din‘ila and Kh. el-Quşeir.

Collecting Vats. One characteristic that distinguishes Oil Presses A and B at Kh. Din‘ila from Oil Press C is that in the former, there is only one collecting vat while in the latter, there are two, one slightly larger than the other. At H. Zabadi, H. Karkara, H. ‘Ovesh and the Byzantine press at Umm el-‘Amed, the presses also have two adjacent vats each. At H. Zabadi and H. Karkara, the two vats are of similar size, while at H. ‘Ovesh, as in Oil Press C at Kh. Din‘ila, one vat is slightly larger than the other. In all cases, however, the two vats clearly served to separate the oil from the lees, the floating oil flowing to the second vat. In the case of presses with one collecting vat, oil separation was probably carried out in other vats and installations (e.g., Oil Press A at Kh. Din‘ila). It is noteworthy that as is the case at Byzantine Oil Presses A and B at Kh. Din‘ila, all the Hellenistic presses at Umm el-‘Amed have only one collecting vat (Durand and Duru 1962: Nos. 32, 35, 51, 65). The evidence suggests, therefore, that in this case as well, two technological traditions existed side by side. During the Roman period, the inhabitants of Kh. Din‘ila followed one tradition and in the Byzantine period, the other. Results from future excavations will no doubt help to clarify the picture.

Screw Weights (Fig. 25). One last subject we must touch upon is the type of screw weight used at Kh. Din‘ila and how it functioned. Our knowledge as to how the lever-and-screw press functioned is based on the fact that pre-industrial presses of this type were still active until very recently and we have several detailed descriptions of the procedures used (e.g., Paton and Myres 1898; Drachman 1932: Appendix 1, pp. 122–124, Figs. 15, 40, 41; Frankel 2010). The screw weights from Kh. Din‘ila are all of one type, which we have chosen to call

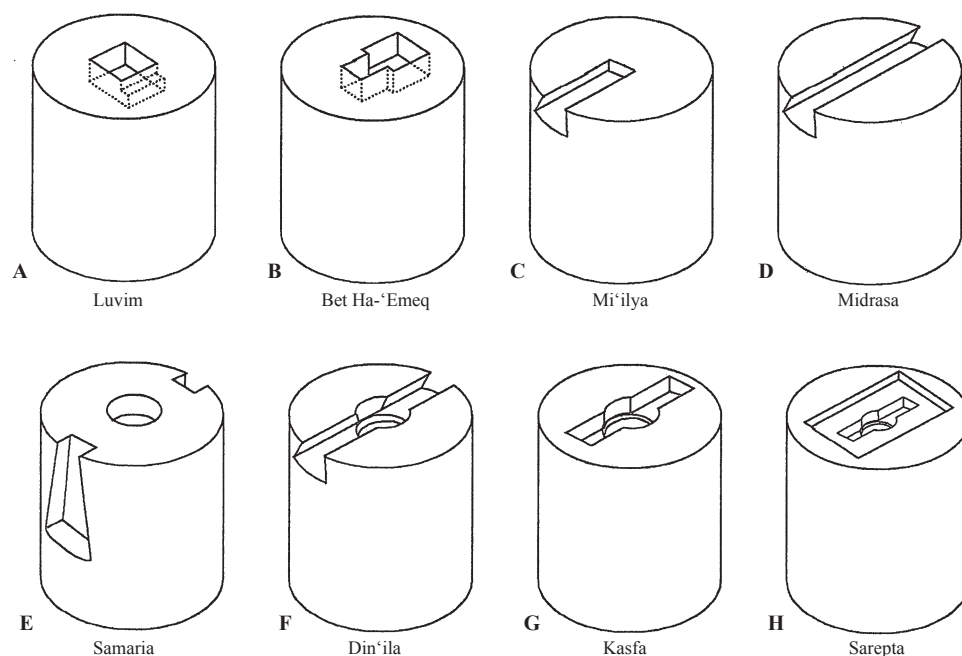


Fig. 25. Schematic illustration of screw weight types.

the Din'ila weight (Fig. 25:F). This weight is cylindrical in shape, as are nearly all the screw weights of the Levant, as opposed to those of many other regions (e.g., the Aegean and Anatolia), where they are rectangular. The Din'ila weight has a round socket in the center of an open dovetail mortise that cuts across the whole upper surface of the weight. Two dovetail tenons were introduced from opposite ends of the mortise, to hold the bottom end of the long screw. Thus, the screw was connected to the weight, rotating in the socket while turning the screw in a nut (a board with a female thread) attached above the free end of the beam, first lowering the beam and then raising the weight into the air.

Several types of screw weights were in use in Israel in antiquity, characterized by a remarkable degree of regional diversity (Frankel 1999:111–118). We will discuss here only those types connected to the Din'ila weight. However, to complete the picture, we include the two other main types, the Samaria weight (Fig. 25:E), found mainly in the central

regions of the country, and the Luvim weight (Fig. 25:A), found on and around Mount Carmel and in the Sharon coastal plain.

The Din'ila weight is one of a group of screw weights found in Upper Galilee, Lebanon and Syria, all based on dovetail mortises, that almost certainly developed with influences of the one on the other within these regions. Three of the weights lack sockets. The Bet Ha-'Emeq weight (Fig. 25:B) has a central dovetail mortise, the Mi'ilya weight (Fig. 25:C) has an open dovetail mortise that cuts across half of its upper surface and the mortise of the Midrasa weight (Fig. 25:D) cuts across its entire upper surface. In presses equipped with these weights, the screw was fixed to the weight; it was the nut above the beam that was turned. It is probable that after the weight was raised off the ground, the nut was fixed in position and then the screw was turned together with the weight. It is of interest that the Mishna mentions a seat attached to the press beam (*Kelim* 20.3). Two other weights that are clearly related to the Din'ila weight are the Kasfa and Sarepta weights (Fig. 25:G, H).

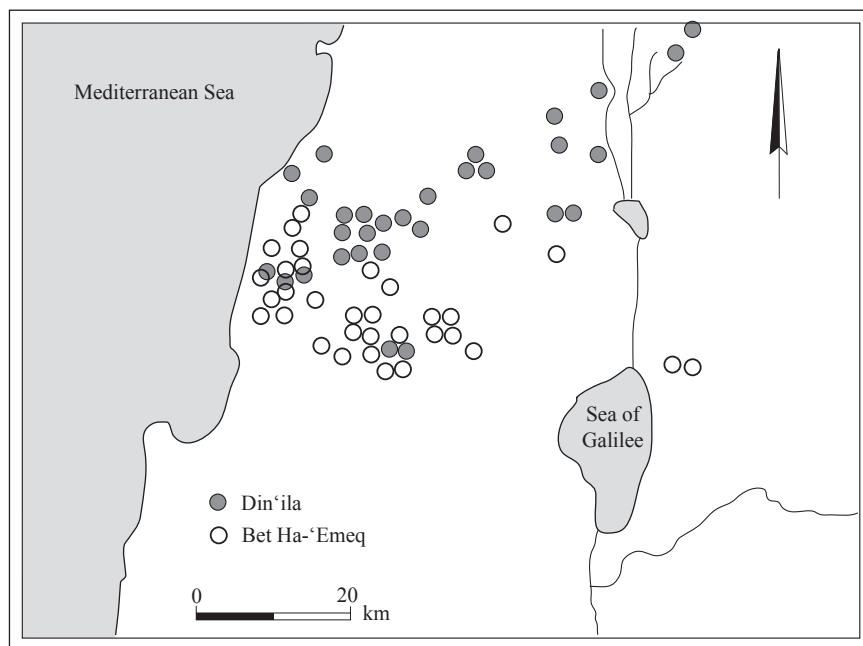


Fig. 26. Distribution map of Din'ila-type and Bet Ha-'Emeq weights.

These have central sockets, similarly to the Din'ila weight, but instead of having an open dovetail mortise, as in the Di'nila weight, they have a closed dovetail mortise. The difference between the two is that in the Sarepta weight, the socket and mortises are in a rectangular depression, which is lacking in the Kasfa weight. The Din'ila weight almost certainly developed from either the Mi'ilya or the Midrasa weight, while the Kasfa and Sarepta weights almost surely developed from the Din'ila weight. It is of interest that Hero of Alexandria describes a screw weight that appears to be identical to the Din'ila weight, showing that the type was known to him, thus providing us with a *terminus ante quem* for its appearance (Hero *Mechanica* III, 15; Drachman 1963:117, 121–122; Frankel 1993:110). There has been controversy as to when Hero lived, but Neugebauer (1938) writes that Hero mentioned an astronomical eclipse that took place in 62 CE, which shows that he was active in the first century CE.

A comparison of the distribution patterns of the Din'ila and the Bet Ha-'Emeq weights is also of interest (Fig. 26). Both weights occur in

the same region, Upper Galilee, but the Bet Ha-'Emeq weight is found mainly in the valleys to the west and south of this region while the Din'ila weight is known mainly in the more remote mountain regions, such as the area of Kh. Din'ila (Frankel 1999:113, Map 20; 116, Map 22). The reason for this is, apparently, that when the lever-and-screw press was first introduced into the region, the more primitive Bet Ha-'Emeq weight prevailed. At this initial stage, the new technology only penetrated into the more easily accessible peripheral regions. By the time the technique reached the mountain areas, the more sophisticated Din'ila weight had developed. Therefore, the Din'ila weight is that which occurs in these areas (for further discussion of screw weights see Frankel 1993; 1997; 1999:111–121; 2012).

As opposed to the Samaria screw weight, which was the most common screw weight throughout the Mediterranean and was almost certainly introduced to the Levant from afar, probably Italy, the Din'ila weight and other Phoenician weights almost certainly developed in the region. Screw weights with fixed screws,



Fig. 27. The lintel with the carved cross (Plan 1, No.13).

such as the Bet Ha-‘Emeq, Mi‘ilya, Luvim and Midrasa weights, are known only in the Southern Levant. Apparently, the concept of a lever-and-screw press reached Phoenicia from afar, without the details, which led to its independent development in this region (Frankel 2012:117–126).

Historical Conclusion

As we remarked at the outset, Kh. Din‘ila is very close to the border delineated in the *Baraita di-Tehumin* (‘Baraita of the Borders’). Nevertheless, the ceramics and sarcophagus

found at the site point to a close cultural affinity to the Phoenician coastal area. Indeed, the oil presses share similar traits, e.g., oil collection is lateral and not central, the screw presses are of the lever-and-screw type and not direct-pressure screw presses and lastly, the screw weight is a Din‘ila type, found only in the Phoenician areas (Frankel 1999:113, Map 20).

A lintel with a cross, documented south of the site (see Plan 1: No. 13; Fig. 27), suggests that in the Byzantine period, the inhabitants of Kh. Din‘ila were Christians.

NOTES

¹ Today, a road that skirts the spur to the east, north and west leads to a car park to the west of the site. The car park is the starting point of a footpath that leads north to the National Parks Naḥal Sarakh and Naḥal Bezet.

² In the Survey of Western Palestine (Conder and Kitchener 1881:176), the site appears as Kh. Inaileh (Sheet III, Md) and is described, “Traces of ruins; some large stones”. In the Record Files of the Mandatory Department of Antiquities (Israel Department of Antiquities and Museums 1976:3), the site appears as Kh. Din‘ila (Kh. Nu‘eila) and is described, “Ruins of buildings, foundations, presses, cisterns”. Both the site name and the description are the same in the Schedule of Monuments and Historical Sites of the State of Israel (*Reshumot* 1964:1354). On the 1942 British Mandate map

(scale 1:20,000), the site does not appear, but the field name of the area around the site appears as Dan‘ila. When the Israeli authorities copied the map, the field names were omitted. For a long time, the site did not appear on maps of the Survey of Israel; recently the site has again been added (e.g., a map printed in 1994, scale 1:50,000).

³ The survey was headed by Rafael Frankel. The chief participants were Yigal Tepper, Nimrod Getzov, Shlomo Grotkirk and Shmuel Baer.

⁴ Wall 65 in Oil Press A, constructed in order to convert the oil press into a cistern, was removed by the restorers. The smaller round vat and the weights pit of Oil Press C were filled and can no longer be seen.

⁵ The coins, identified at the time by Danny Syon, were subsequently lost.

⁶ The 1984 excavations were conducted on behalf of the Israel Department of Antiquities and the 1986 excavations, on behalf of the University of Haifa, both directed by Rafael Frankel with assistance from Nimrod Getzov (surveyor) and Uri Kahana. Participants included students of the University of Haifa and youth groups from the Akhziv Field School with their instructors, Yehuda Gelb, Y. Federken, A. Naveh, E. Hartuv, L. Lerner, A. Ben-Dor, A. Nisim,

R. Yisraeli, Y. Bley and M. Dekslar. The Ma'ale Yosef Regional Council offered much assistance. The pottery was restored by Yosef Averbuch and Leea Porat and drawn by Hagit Tahan.

⁷ While excavating Oil Press A, parts of the press bed were raised and Mamluk pottery was found under them. This led us, after the first season of excavations, to date Oil Press A to the Mamluk period (Frankel 1985:113).

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