

Back to Raqefet Cave, Mount Carmel, Israel

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INTRODUCTION

The Raqefet Cave was excavated some thirty years ago by the late Tamar Noy and Eric Higgs (herein the 1970-72 excavation). Unfortunately, although they found a long cultural sequence and several Natufian burials, they hardly publish any details of their fieldwork or the stratigraphy. In the summer of 2004 we carried out a short reconnaissance project, in order to clean the main section and verify the unpublished stratigraphy (we have the original field documentations); establish the provenance of Early Upper Palaeolithic, Levantine Aurignacian and Epipalaeolithic (Late Kebaran) lithic assemblages; and assess the character of the Natufian layer.

The aims of this paper are to a) provide a short description of past work at the site (based on an unpublished report and the Raqefet Archive) and list the main studies conducted on the retrieved materials, and b) present the results of our short fieldwork. The latter include a report on the Natufian remains in the first chamber and a description of the long section in the second

chamber. Studied samples of flint, animal bones and beads are also presented. Depositional and post-depositional aspects are addressed through preliminary sedimentological studies and taphonomic observations on a sample of the 1970-72 animal bones.

Raqefet Cave is situated on the southeastern side of Mount Carmel, in an inner wadi (Raqefet) running north-west to south-east. The cave is about 0.5 km upstream from the confluence with wadi Yoqne'am that runs eastward into the Jezreel Valley, 3 km away. The site is also very close to the low hills of Ramat Menashe, which is an elevated plateau between the Coastal Plain and the Jezreel Valley (Fig. 1).

The cave is located at an altitude of 230 m above sea level and approximately 50 m above the wadi bed. It is on the left bank, facing west, at the bottom of a cliff. The slope from the cave to the wadi bottom is rocky and steep. In front of the cave there is a narrow terrace, immediately below the large entrance. Five chambers form the cave, among which the rear has an open chimney. The cave is 50 m long and its area is *ca.* 500 square m. At the front part of the second chamber, there is a large semi-rectangular block of rock (*ca.* 5 m long) in a north-south orientation (Fig. 2). The origin of this block is still obscure, as there is no apparent relevant scar on the walls or ceiling (Olami 1984).

The cave was discovered by Ya'aqov Olami in 1956 (Olami 1984). Three decades ago, between 1970 and 1972, Noy and Higgs conducted three seasons of excavations at the site. During the excavations two different recording systems were in use. The basic was a 1X1 m grid system. Over the grid, trenches marked by "R" and measuring 3X1.5 m, were excavated in 1970 and in the early 1971 season. Each trench was divided into east and west halves. During the remaining 1971 season and the 1972 season a 1X1 m grid was the only recording system. The cave deposits were excavated vertically by ten-centimeter spit levels. Deposits were distinguished by grain size: clay 1/250 mm, silt 1/16 mm, sand 2 mm, granules 4 mm. All sediments were coarse sieved through a 10 mm mesh and then either dry sieved through a 2 mm or wet sieved through a 1.25 mm gauge. Seed and soil samples were collected from various levels. This excavation procedure was designed for the collection of comprehensive samples of organic and artifact remains, without bias for size or other factors (Raqefet Archive).

The excavations exposed several archaeological layers from the Late Middle Palaeolithic to Pottery Neolithic periods (Higgs *et al.* n.d.). A brief excavation report was published only after the first season (Noy and Higgs 1971) and the archaeological remains from the cave were never published fully. However, later studies of various categories of finds were conducted, and they include comprehensive zooarchaeological analyses of the faunal remains (Garrard 1980, 1982) as well as analyses of flint samples (Ziffer 1978a, b). In recent years new studies on the Middle - Upper Palaeolithic transition (lithic assemblages, Sarel 2004) and on the Natufian human remains (Bocquentin 2003; and see Lengyel and Bocquentin this volume) were carried out. A detailed study of the Upper

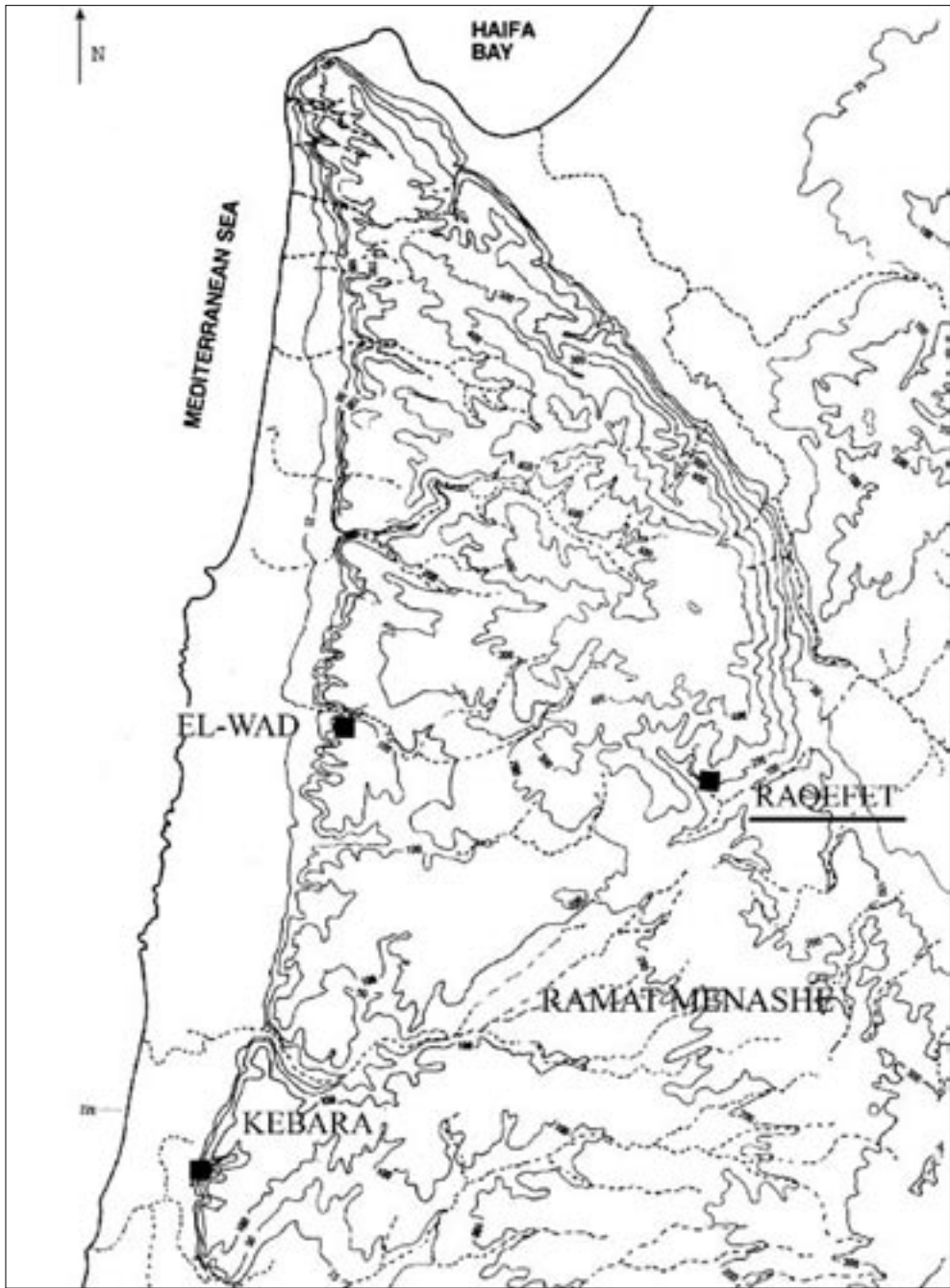


Figure 1: Map of the Carmel, showing the location of Raqefet Cave. Modified after Ronen 1984.

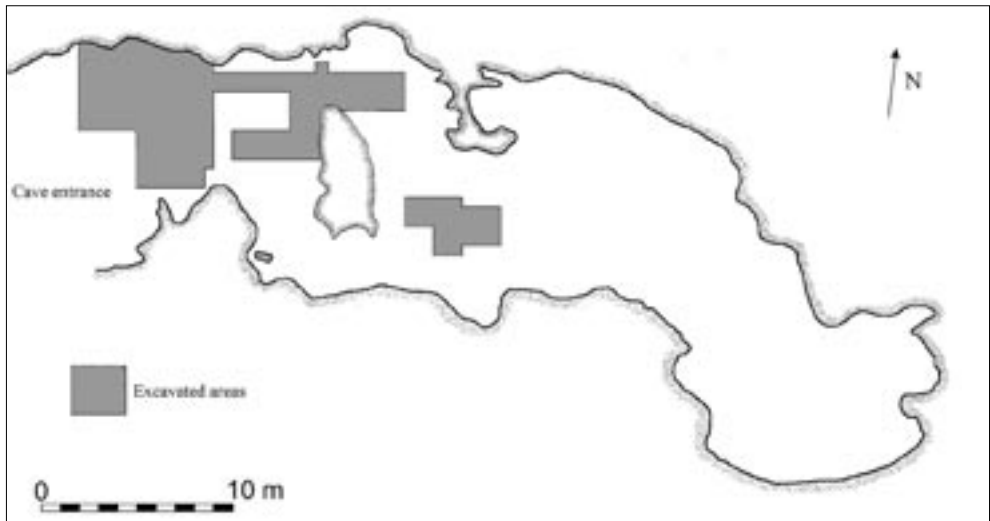


Figure 2: General plan of the Raqefet Cave, modified after Higgs *et al.* n.d.

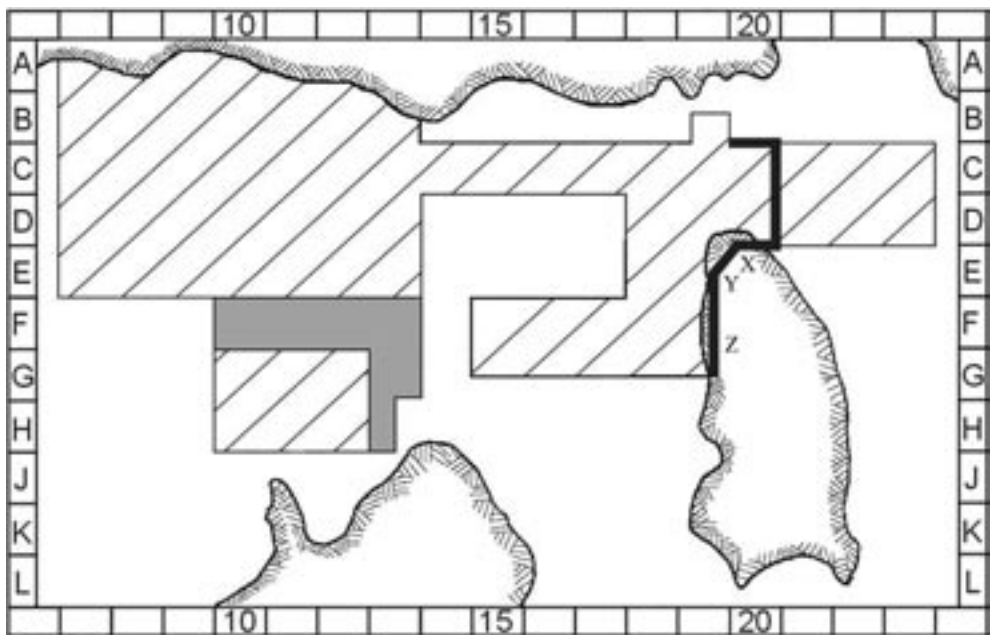


Figure 3: Enlarged plan of the excavated areas in the cave. Shading with lines are the trenches of the 1970-72 excavations, grey shade marks the newly excavated area, black bold line by the rock indicates the main section of area B-G/18-23. Letters X, Y, Z mark the location of the section presented in Fig 8. Note that in the original grid of the 1970-72 excavations coordinate "I" was not used.

Palaeolithic and Epipalaeolithic lithic industries of the site is still under way as a Ph.D. project of one of us (Lengyel in prep.).

The main section (second chamber, Fig. 3) yielded in squares B-G/18-23 the least disturbed layers of the long sequence, and accordingly provided the best flint samples for a diachronic study of lithic technology (Higgs *et al.* n.d.). A Geometric Kebaran component was recognized by one of us (G.L.) during the flint analysis. It came from squares J-M/24-28, embedded between disturbed layers. A Late Natufian flint assemblage recovered from squares D-E/12 in the first chamber is also under study (Lengyel in prep.).

As part of our new project Bar-Oz revisited the old bone assemblage (1970-72 excavation, stored at the Department of Archaeology, University of Cambridge). These bones were originally studied by A. Garrard (1980, 1982), and the sample used here is composed of *ca.* 300 bones (NISP). The bones have been re-examined from a taphonomic perspective in order to recognize preservation conditions, potential biases responsible for damage and fragmentation, and to assess the role of Upper and Epipalaeolithic humans in the accumulation and modification of the animal bones.

THE FIRST CHAMBER, SQUARES B-H/9-13

The first chamber has an area of *ca.* 70 sq m (Fig. 3). The bedrock floor is topographically very irregular. Near the walls there are tab-like basins that reach more than 1 m in length. In the center, the floor is very uneven with height differences exceeding 0.5 m. According to the eastern squares in this area (especially D-E/13), the floor dips towards the north-northeast.

During the 1970-72 campaign, the bedrock floor of the first chamber was exposed near the north and south walls, leaving in the center an unexcavated strip about 4 m long and 1 m wide (F/9-13). The height of the north and south sections along this strip varied, being very shallow in the west and up to 0.5 m in the east. Squares C/7-12, D-E/16-17 and G-H/10-12 were excavated to bedrock. Twenty-four bedrock mortars and cupmarks were exposed (Higgs *et al.* n.d.), and a few more were found near the entrance and on top of the inner block of rock (see also Olami 1984:167). Epipalaeolithic flint artifacts such as backed bladelets, trapezes, trapeze-rectangles, and lunates were recovered from the first chamber, coming from all deposits and all parts of the excavated area.

During our work in the summer of 2004, excavation was carried out using the original grid. Work was done in units of 0.5 X 0.5 X 0.05 m or smaller. All undisturbed sediment was dry sieved through a 2 mm mesh, and the sediment from the bedrock mortars was wet sieved (1 mm mesh). Sediment samples from various locations were collected for further analyses. We cleaned the bedrock floor exposed previously (and backfilled at the end of the 1972 season), and excavated the F/9-13 strip and additional small patches of *in situ* sediment left near the south wall (squares G-H/12-13) to bedrock. We exposed

additional bedrock mortars with *in situ* remains (squares F/9-12 and G-H/13) and cleaned some sub-squares in C-D/12-13 where bedrock was not reached previously.

The top layer in the chamber was fine-grained, with many Bronze Age and later pits, and pottery sherds scattered in all depths (Higgs *et al.* n.d.). This situation is known from other Carmel cave sites, such as El Wad (Yankelevitz 1998) and Sefunim (Ben-Tor 1984).

A few hundred sherds were also found during our 2004 season (Table 1). Of the latter,

Table 1: Pottery sherds from the 2004 season of excavation. Note that the identified specimens comprise 25.7% of the assemblage.

Period	State of Preservation	Type	Identified	N	Square
MBII	Body sherd	1 Cooking Pot	4	17	B-E/10-13
MBII	Rim	1 Crater			
MBII	Body sherd	1 Pithos			
Iron Age I	Body sherd	1 Jar			
-	-	-	-	3	C/12-13
Iron Age	Body sherds	5 Jars/ Pithoy	9	13	C-D/15-18
Iron Age	Handle	1 Jar			
Iron Age	Body sherd	1 Crater			
Iron Age	Complete	1 Stopper			
Neolithic – Chalcolithic	Body sherd	1 unidentified			
LB – Iron Age	Body sherds	8 Jars	11	11	C-D/18-19
LB – Iron Age	Body sherds	2 Cooking Pots			
MB II - LB	Body sherd	1 Cooking Pots			
Iron Age	Body sherd	1 Jar 2 unidentified	3	4	D/12b
Iron Age	Rim	1 Jar	1	23	D/13a
MB II	Body sherd	1 Jar	11	66	D/13b
MB II	Body sherd	1 Cooking Pot			
MB II	Rim	1 Crater			
Iron Age I	Rim	1 Cooking Pot			
Iron Age I	Rim	1 Jar			
Iron Age I	Handle	1 Pithos			
Iron Age	Body sherds	3 Jars			
Hellenistic-	Body sherds	1 unidentified			
Roman	Rim	1 Cooking Pot			
Roman					

Period	State of Preservation	Type	Identified	N	Square
Roman	Body sherd	1 Jar	3	21	F/10
Roman	Body sherds	2 unidentified			
Roman	Body sherds	2	1	2	E-F/12
Roman	Body sherds	2 unidentified	3	5	F/9
Roman	Body sherd	1 Jug			
Hellenistic	Body sherds	3 Jars	11	18	F/10
Roman	Body sherds	7 unidentified			
Roman	Body sherd	1 Cooking Pot			
LB – Iron Age	Body sherds	2 Jars	3	9	F/10-13
LB – Iron Age	Handle	1 Jar			
Neolithic / Chalcolithic	Body sherd	1 unidentified	1	12	F/12
-	-	-		2	F/12-13
Neolithic	Body sherd	1 Jar	8	35	F/13
Chalcolithic	Body sherds	2 Jars			
- EB	Rim	1 Jar			
MB II	Body sherds	3 unidentified			
Roman	Body sherds	1 Pithos			
Iron Age					
-	-	-		2	G/13
EB	Body sherd	1 Jar	4	7	G/13a
MB II	Body sherd	1 Pithos			
MBII–Iron Age	Body sherd	1 Cooking pot			
Age	Body sherd	1 Cooking Pot			
Roman					
Iron Age	Body sherd	1 Cooking Pot	1	4	G/13c
MB IIb	Base, Body sherd	2 Jugs	2	6	G/11-12
-	-	-	-	4	H/12cd
Hellenistic-Roman	Handle	1 Jug	1	4	H/13a
-	-	-	-	2	H/13(a-c)
Roman	Body sherds		2	2	General
			79	272	TOTAL

several were identifiable, indicating that the cave was visited/inhabited during many periods, with remains identified to the Pottery Neolithic, Late Chalcolithic, Early Bronze Age, Middle Bronze Age II, Middle Bronze Age IIb, Late Bronze Age, Iron Age I, Late Hellenistic and Roman periods. The continuous human presence at the site effected the preservation of earlier archaeological layers. It is possible that the substantial historic intrusions into the prehistoric layers held back the 1970-72 excavators from creating a full stratigraphic correlation between all layers and features encountered at the two chambers (Higgs *et al.* n.d.).

In area D-E/7-13 six thin layers were described (Raefet Archive), among them the lower four (3-6) did not contain potsherds but mostly Late Natufian flint artifacts (Lengyel in prep.). According to our revision of the 1970-72 animal bones, only layer 5 yielded bone specimens (NISP=13; square DE/12). On these bones the weathering is relatively low and only two bones out of 11 (18%) were recorded beyond stage 2 of Behrensmeier's (1978) weathering scale.

Natufian burials were discovered 30 years ago in the first chamber, near the north wall in squares B-C/10-12 and D12, below a deposit of mixed material from several historic periods. According to the unpublished documents of the excavators (Raefet Archives), the skeletal remains belong to five individuals; the same conclusion was recently reached by Bocquentin (2003; and see Lengyel and Bocquentin this volume). In the 2004 season, we found additional unexcavated Natufian human remains in the same area. For example, in the north section of square D12, right foot bones were found in articulation.

These bones clearly show that at least one burial of an adult is still in the sediment. During cleaning of this area by removing some of the top deposit, several human bones of another individual were recovered (Table 2). In addition, we found a small fragment

Table 2: Human remains recovered during the 2004 season.

Square	Height [cm]	Skeletal part
D12b	90-95	3 rd Proximal phalange, right side, human
D12b	90-95	1 st proximal phalange (right side) 2 nd proximal phalange 4 th proximal phalange (arthritic changes) 1 st distal phalange 3 rd distal phalange Distal shaft of left radius
H13a	43	Small fragment of a parietal bone from a human skull, child (estimated age 3-5 years)
H13a	47-50	Right lower lateral incisor, human, adult, shovel-shaped (typical Natufian)

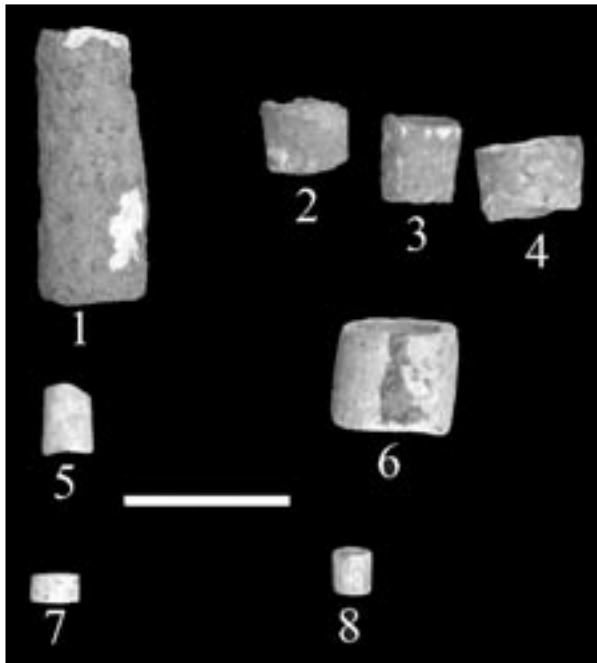


Figure 4: Dentalium beads. Scale 1 cm.

of a child's skull and an adult lateral incisor near the south wall of the chamber (squares G-H/13). The presence of shovel-shaped incisors and arthritic changes in the phalanges are typical of the Natufian population.

Many bedrock mortars and cupmarks were found all over the floor of the first chamber. They vary in size, from minute shallow marks to deep (>70 cm) narrow or wide mortars. Some were found with *in situ* remains, and some appear to be correlated to the burials.

Small finds such as *Dentalium* beads were also found during our work in the first chamber. In 1970-72, mixed layers containing Epipalaeolithic objects and ceramics yielded *Dentalium* beads. During our campaign, these minute finds were found in a clear Natufian context. Eight beads were recovered from the first chamber of the cave (Fig. 4). Seven of them are made of relatively large *Dentalium* shells that may belong to a Red Sea taxon. However, their state of preservation prevents us from making a more precise identification. All of the *Dentalium* shells have the original posterior and anterior end of the shell removed, either artificially or as a result of abrasion, thus they are suitable to be used as beads (Bar-Yosef Mayer 1991, in press). The eighth bead is also white, short and cylindrical; however, it is not made of *Dentalium*. This seems to be a bead made of burnt (or glazed) steatite. This type of bead is found in sites dating to the Chalcolithic and Early Bronze Age, like the Peqi'in

Table 3: ^{14}C dates from Raqefet Cave, conventional radiocarbon dating method. The samples were retrieved during the 1970-72 excavations.

Area	Layer	Date	Laboratory no.	Sample
B-G/18-23	IIIa top	15,460±200 BP	I-7031	charcoal
B-G/18-23	IIIa top	18,910±330 BP	I-6865	charcoal
B-G/18-23	IV	33,810±1740 BP	I-6866	charcoal
B-G/18-23	V	33,810±1740 BP	I-6867	charcoal
B-G/18-23	VII top	26,060±840 BP	I-6868	charcoal
B-G/18-23	VII bottom	34,600±1900 BP	I-6869	charcoal
B-G/18-23	Pit	10,980±260 BP	I-7032	bone
J-M/24-28	Geometric Kebaran and Late Natufian mixture	10,580±140 BP	I-7030	charcoal

Cave (Bar-Yosef Mayer *et al.* 2004). Although it was found inside a deep mortar (CXXIII, Fig. 3), it is apparently intrusive from later deposits at the cave.

The most abundant finds in the undisturbed deposits are flint artifacts. The newly recovered flint assemblages typologically date to the Late Natufian, which seems to be in accordance with two ^{14}C dates (10,980±260 BP; 10,580±140 uncal. BP) obtained from other sections during the 1970-72 seasons (Table 3).

In 2004 a large flint assemblage was found in the CI-II complex (two connected bedrock mortars) and a smaller one was found in the deepest bedrock mortar (CXXIII) (Fig. 5). The flints are sharp, fresh, with no signs of rolling and include many complete specimens. Some pieces coming from the CI-II complex have sediment concretions on their surface, impossible to remove without chemicals or mechanical aids.

The studied assemblages (Table 4) (N=850) include tools, cores, and all debitage categories. Tiny fragments (less than 15 mm in dimension), heat-shattered pieces and unidentified specimens are not included here.

The most abundant type of raw material in our sample is a yellowish brown, fine-grained good quality flint, comprising 34% of the assemblage. This flint occurs in the Deir Hannah Formation in the Carmel. The Ramat Menashe sources yield flint nodules in different sizes and quality, most of them are brown or grayish brown with white patches. This type of flint comprises 8% of the Raqefet Natufian assemblage. A low quality chalky type of flint from Ein Tut (Ramat Menashe, ca. 3 km west of the cave) is rare in the assemblage (0.4%). Fine-grained, purple-gray-blue flint, sometimes with small fossils, comes from Nahal Me'arot (13%). The sources of the rest of the raw materials are as yet not identified, but each of them is a fine-grained good quality flint.

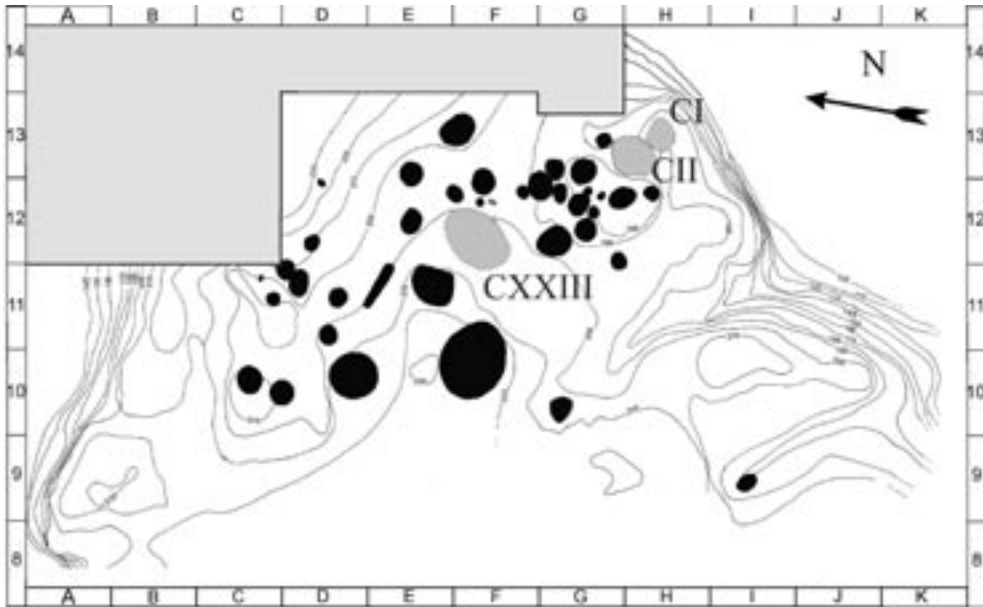


Figure 5: Bedrock mortars in the first chamber. CI-II and CXXIII are shaded gray, as they provide the only samples of flint assemblages from bedrock mortars studied here.

Table 4: The flint assemblages from two Natufian loci. CTE - core trimming and maintenance elements.

Locus	Tools	Cores	Bladelets	Blades	Flakes	Prim. e.	CTE	Burin spalls	Total
CXXIII	29	1	81	74	54	45	5	0	289
	10.0%	0.3%	28.0%	25.6%	18.7%	15.6%	1.7%	0.0%	99.9%
CI-II	38	69	106	89	131	91	34	3	561
	6.8%	12.3%	18.9%	15.9%	23.4%	16.2%	6.1%	0.5%	100.1%
Total	67	70	187	163	185	136	39	3	850
	7.9%	8.2%	22.0%	19.2%	21.8%	16.0%	4.6%	0.4%	100.1%

Table 5: Flint tool types from two loci.

Type	CI-II	%	CXXIII	%	Total	%
Burin	4	10.5%	-	-	4	6.0%
Scraper	2	5.3%	-	-	2	3.0%
Carinated Scraper	1	2.6%	-	-	1	1.5%
Microlith	4	10.5%	4	13.8%	8	11.9%
Geometric Microlith	11	28.9%	16	55.2%	27	40.3%
Retouched Blade	1	2.6%	3	10.3%	4	6.0%
Backed Blade	3	7.9%	0		3	4.5%
Retouched Flake	1	2.6%	2	6.9%	3	4.5%
Notch - Denticulate	5	13.2%	2	6.9%	7	10.4%
Awl-borer-bec	1	2.6%	1	3.4%	2	3.0%
Retouched Fragment	1	2.6%	-	-	1	1.5%
Sickle Blade	-	-	1	3.4%	1	1.5%
Double	3	7.9%	-	-	3	4.5%
Massive Tool	1	2.6%	-	-	1	1.5%
Total	38	99.8%	29	99.9%	67	100.1%

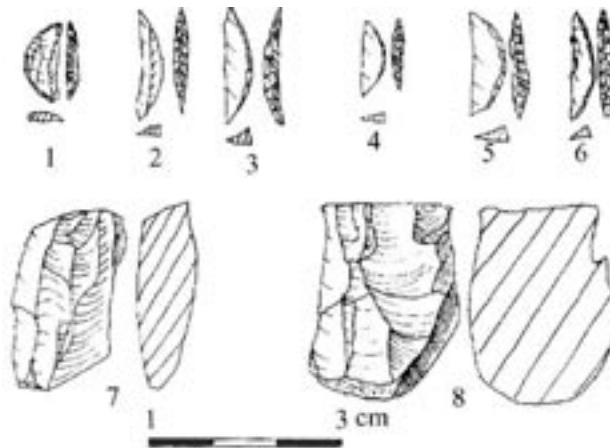


Fig. 6: Late Natufian flint artifacts. Lunates: 1-6, cores: 7-8.

The tools (N=67, Table 5) are made on all debitage categories, and show a variety of types and manufacture investment. Geometric microliths (N=27, 40.3% of the tools) are the most common category in both assemblages. Of these, lunates comprise 70%, while one lunate in preparation, broken trapezes (3), broken rectangles (2) and triangles (2) comprise the rest (Fig. 6). Lunates (N=19) were found in both loci, in high frequencies (Table 6). Eleven are complete, and can tentatively be grouped into two sub-categories, according to dimensions and retouch (Table 7). Thus, the smaller lunates tend to be abruptly retouched, while the longer ones have bipolar retouch. The range of lengths in both samples is similar, and overall they are between 11-18 mm, with an average of 15.2 mm. Importantly, eight of the lunates are 15-18 mm long, while only three are much shorter. Ten of the lunates are

Table 6: Numbers and frequencies of lunates in the two studied samples.

Locus	N	% of lunates among tools
CI-II	9	23.7
CXXIII	10	34.5
TOTAL	19	27.9

Table 7: Dimensions (mm) and retouch type of complete lunates from two loci, presented by ascending length. Numbers in each locus represent height. Note the presence of abrupt retouch on smaller lunates, and bipolar retouch on the larger ones.

Locus	L	W	Retouch
CXXIII 85-90 north	11	4	abrupt
CI 54-60	12	5	abrupt
CXXIII 80-82	12	4	abrupt
CI 30-35	15	5	abrupt
CII bottom	16	5	abrupt
CII bottom, 67-73	16	4	bipolar
CXXIII 85-90 south	16	3	bipolar
CXXIII 90-95 south	16	5	abrupt
CXXIII 105-110 south	17	4	bipolar
CI 40-43	18	5	bipolar
CI 47-50	18	4	bipolar
AVERAGE	15.2	4.4	
STD	2.4	0.7	

4-5 mm wide. These characteristics and measurements of the lunates place the assemblage in the Late Natufian (Bar-Yosef and Valla 1979; Valla 1984).

Comparing between the Late and Final Natufian according to lunate measurements (Valla 1984) does not always provide a clear-cut separation, though a general trajectory of diminishing average length is observable (Fig. 7, Table 8). The Raqefet sample is very similar to Nahal Oren layer VI, in terms of range and average length, and should be assigned to the Late Natufian - but not the very final phase, according to the length of lunates. The two radiocarbon dates from the site also support this contention (Table 3). It should be remembered that the Raqefet lunate sample is small, and that intra-site variability could affect the samples analyzed here.

Microliths (N=8) include retouched, backed and truncated types, and three blades have a partial backing on one side, probably representing the beginning of backed microlith manufacture. Burins (N=4) and endscrapers (N=2) comprise together less than 10% of the tools. The use of the microburin technique is not a systematic part of the assemblage (only one piece, counted with the bladelets in Table 4). The rest of the types are represented in low frequencies, with notches / denticulates slightly more frequent. There are also one borer, one bec and one sickle blade, with a very strong sheen. One massive tool is made on chert.

The two studied samples are similar in that they are composed of all debitage categories, they have similar frequencies of tools, and the geometric microliths (mostly lunates) comprise in both a substantial portion of the tools. However, the two are different in four important ways. First and foremost, the CI-II assemblage includes a very high number of cores (N=69) relative to the very small excavated area, while from a similar volume in the CXXIII bedrock mortar only one core was retrieved. Accordingly, the frequencies of

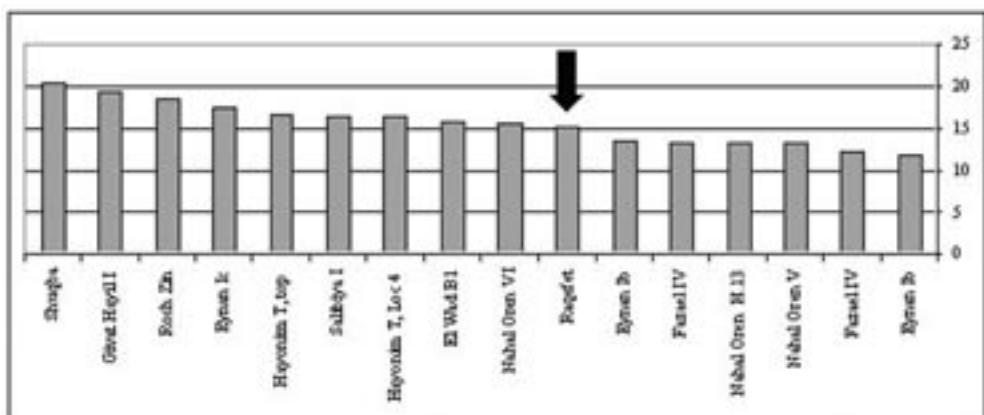


Figure 7: Average length of lunates (mm) from various Natufian sites. Raqefet Cave is marked by the arrow.

Table 8: Frequencies and length of lunates from Late and Final Natufian sites. Note the resemblance of the Raqefet lunates to Nahal Oren VI and Nahal Oren H.13 (which could be either). Note the absence of some relevant data (Not Available). The Raqefet sample can be either of the two periods by the range of length, and between the two by the average length.

Site	% geometrics	% lunates of geometr	L range (mm)	AVG	Source
LATE NATUFIAN					
Eynan Ic	5.7	75.0	11-29	17.5	Valla 1984
El Wad B1	17.1	90.5	15-28	15.8	Valla 1984
Hayonim T, Loc 4	15.3	78.1	N A	16.5	Valla 1984
Hayonim T, top	21.5	85.1	10-24	16.6	Valla 1984
Shuqba	N A	N A	15-24	20.3	Valla 1984
Rosh Zin	28.4	93.7	12-30	18.6	Henry 1976
Nahal Oren VI	20.7	75.0	10-19	15.6	Valla 1984
Salibiya I	15.4	78.7	10-24	<i>ca.</i> 16.5	Belfer-Cohen & Grosman 1997
Givat Hayil I	32.8	85.4	10-30	19.5	Goring-Morris 1997
FINAL NATUFIAN					
Eynan Ib	10.9	65.2	10-23	13.5	Valla 1984
Eynan Ib	8.9		9.2- 18.6	11.7	Valla <i>et al.</i> 2001
Nahal Oren V	15.3	80.7	9-20	13.2	Valla 1984
Fazael IV	30.4	75.4	11-17	13.3	Valla 1984
Fazael IV	16.9	60.1	10-20	<i>ca.</i> 12.3	Grosman <i>et al</i> 1999
Nahal Oren H.13	22.5	60.9	11-16	13.2	Nadel <i>et al.</i> 1997
Raqefet	40.3	70.0	11-18	15.2	

CTE are high in the first and low in the second. The third aspect regards the size of the flints. Whereas in CXXIII all finds are small, and pieces longer than 5 cm are very rare, in CI-II there are many blades and flakes longer than 5 cm. It is therefore not surprising that larger tools, such as burins and scrapers, are limited to CI-II, while smaller tools such as microliths form 69% in CXXIII and only 39.4% in CI-II. The fourth difference relates to the blade + bladelet/flake ratio. In mortar CXXIII it is 2.87, while in the CI-II assemblage it is half – 1.43. As in both cases it is impossible to consider the assemblages

as truly *in situ* within the original knapping locales, representing original compositions. Rather, the differences may reflect discard patterns and purposeful caching, as well as site formation processes.

THE MAIN SECTION (CHAMBER 2)

The longest sequence at the site is exposed in trench B-G/18-23, located in the second chamber (Figs. 2, 3). The section was dug in 1970-72; it is five m long in a north-south orientation, just under the west edge of the big block of rock. In the deepest part, in the middle, the section is 2.3 m deep, while it is 0.6 m deep in the north and 1.5 m deep in the south. It is exposed down to bedrock all along (Fig. 8).

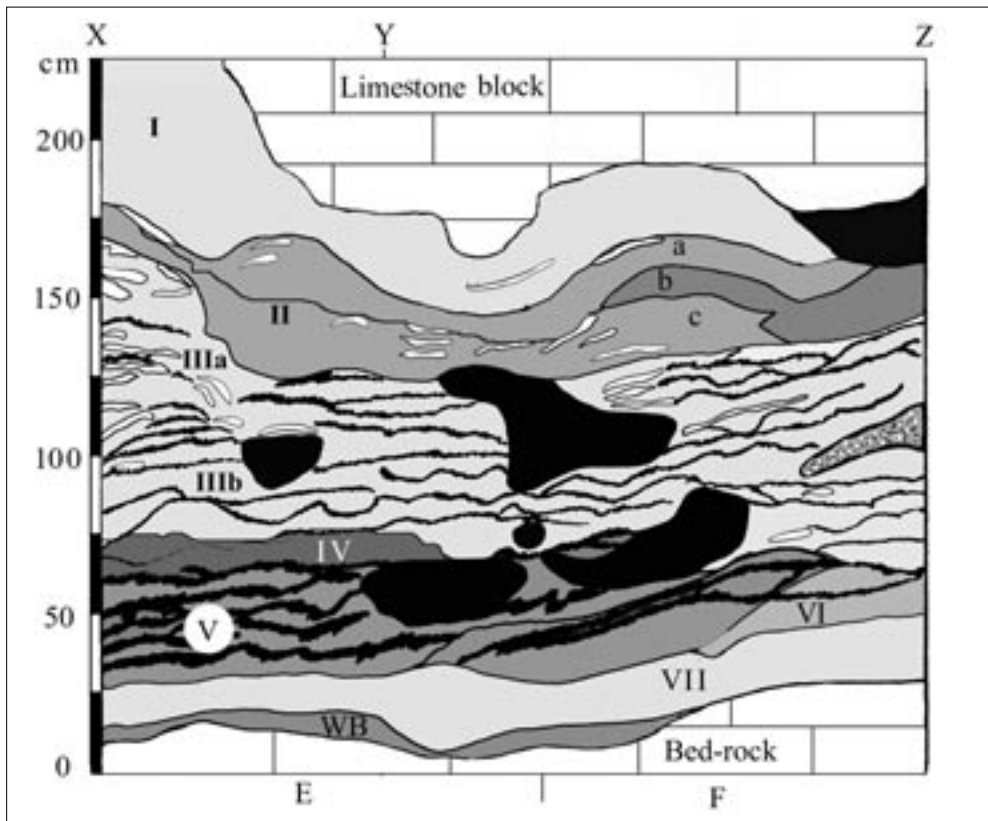


Figure 8: Stratigraphy in the main section in chamber 2 (see Figure 3 for location). Black areas represent animal burrows; black wavy lines in layers III-VI represent lamination; white lenses in layers I-III represent yellow patches. WB = Weathered Bedrock.

The section yielded the least disturbed cultural sequence of deposits and assemblages. Nonetheless, eleven pits were dug into the prehistoric layers, most of them containing pottery sherds and even some bronze artifacts. The fill of the pits was easily separated from the horizontal layers since their sediment had clear borders and was very different in color and texture. Squares E-G/18 and D-G/19 were excavated down to bedrock. Squares C-D/21-23 were only partially excavated on account of deep intrusions. In C-D/20 the bedrock shelved steeply towards the back of the cave (Raqefet Archive).

There follows a description of the section. It includes sedimentological and cultural (flints, bones and ^{14}C dates) data and observations. The details are provided in order to establish a main and common reference section that includes both the 1970-72 and our observations. It should be stressed that we only cleaned the section, without excavating it. The data concerning lithics, bones and ^{14}C samples derive from the 1970-72 seasons.

The excavators of the 1970-72 seasons recorded eight layers (see also Sarel 2004); our observations recognized seven layers with some subdivisions (Table 9). Apart from that, it should be stressed that our stratigraphic division of the exposed layers is very similar to the original one.

Four cultural layers have been recognized. The earliest is Early Upper Palaeolithic and the latest is Late Kebaran. At the bottom and the top of the sequence heavy mixtures appear. A discussion of site formation processes, dating and taphonomy (*e.g.*, the faunal assemblages) follows the strata description.

Layer I (0.15 - 0.4 m) is a loose un laminated brownish loam, including several limestone stones *ca.* 30 cm in size that fell down from the roof. The lower boundary is distinct, albeit

Table 9: Stratigraphy of the main section in area B-G/18-23: correlation of the 1970-1972 and 2004 stratigraphic units.

1970-1972 (after Higgs et al. n.d.)	2004
Pit J	Layer I
Layer I	Layer II
Layer II	Layer III
Layer III	Layer IV
Layer IV	Layer V
Layer V	Layer VI
Layer VI	Layer VI
Layer VII	Layer VII
Layer VIII	Layer VII

possibly distorted by a rock-fall. This layer yielded Kebaran, Natufian and PPN artifacts, and abundance of charcoals and bone fragments.

Layer II (0.2 - 0.5 m) is a relatively hard unlaminate clayey loam that was subdivided into the upper sub-layer IIa of grayish hue, the middle sub-layer IIb of darker gray and the lower sub-layer IIc of brownish gray color. The layer contains scattered lenses (5-7 cm thick and up to 30 cm wide) of soft to hard yellow nodules possibly composed of phosphates, and a few pieces of ochre. Occasionally, sinuous laminae are present with a dip of *ca.* 10° north. The lower boundary is gradual. Charcoal is abundant in this layer but bones are scarce. It yielded a Kebaran lithic assemblage with obliquely truncated backed bladelets. The layer contained 103 pieces of bones of which 86% (N= 65) of the long bones were recorded in weathering stages 0-1 (Behrensmeier 1978), smoothed or rounded surface was not recognized.

Layer III (0.5 - 0.9 m) is a clearly laminated clayey loam provisionally divided into upper IIIa and lower IIIb. Layer IIIa has abundant patches of yellow, possibly phosphate-rich, stripes and nodules, and scattered charcoal pieces up to 1 cm in length. In square F, at *ca.* 0.8 m depth, a lens with more intense charcoal concentrations, scattered small yellow nodules and weathered basaltic rocks was encountered. North of the lens in square F, the remnants of a big animal burrow more than 20 cm in diameter was found at 0.5 m depth. The unidentified blade industry contains no characteristic elements of any Palaeolithic cultures. On the basis of its archaeo-stratigraphical position, the industry is generally determined as Late Upper Palaeolithic. A carbon sample from the top of the yellow patchy laminated layer (IIIa) was dated to 18,910±330 BP (I-6865), and a sample from the contact between the layer and a Natufian pit (?) gave a date of 15,460±200 BP (I-7031). The former date was published elsewhere as belonging to the Kebaran layer of the site (Noy *et al.* 1973:96). A very low number of bones were found in this layer, and 90% (N=27) of the assemblage was recorded in weathering stages 0-1 (Behrensmeier 1978). No smoothed or rounded surface was found on the bones.

The lower part of the layer, Layer IIIb, is dominantly gray and more uniform than IIIa with thick, 1-2 cm, regular sinuous laminae dipping northward. Bones were not found in this layer and the archaeological material resembles that of Layer IIIa.

Layer IV (0.1 - 0.2 m) is brecciated and more grayish and clayey than Layer III. It includes large numbers of flint artifacts and charcoal fragments. In F-G the layer disappears and in B19 its lower part becomes red. The artifacts are typical of the Levantine Aurignacian industries that were recovered, for example, from Hayonim Cave layer D (Belfer-Cohen and Bar-Yosef 1981) and Ksar Akil 8-7 (Bergman 1987; Bergman and Goring-Morris 1987). A charcoal sample was dated to 33,810±1740 BP (I-6866). Bones are totally absent.

Layer V (0.2 - 0.4 m) is traced through B-D and partially in E. In F it is reworked

by a huge burrow, in-filled with relatively soft unlaminated loam. In square G the layer is completely missing. The layer is light-grayish laminated gley with scattered charcoal and a discontinuous charcoal strip less than 1 cm thick at its lower boundary. Charcoal is abundant especially in the dark bands of lamination. In B19 the lamination disappears. Flint artifacts, mostly fine blades and bladelets, are observed in the layer. The industry, according to its stratigraphical position and the characteristics of the flint assemblage, is identified as Early Upper Palaeolithic. Further archaeological cultural identification is not yet possible. A carbon sample gave the date of $33,810 \pm 1740$ BP (I-6867). According to the first excavators, the equivalent of layer V in square C18 (by the cave wall) was a deposit heavily cemented with calcite. Most of the lithic materials of this breccia are typologically close to the industry of Layer V. It contains simple blades and flakes and a few tools such as end-scrapers, including a carinated type. Here the faunal material is abundant (NISP=152). Over 83% (of 54 examined long bone shafts) of the specimens were recorded in weathering stages 0-1 (Behrensmeyer 1978). Smoothed and rounded fracture edges were found on no more than 4% (two bones of 54 examined long bone shafts).

Layer VI (0.2 - 0.4 m) is locally present at the southern part of the section, in F-G/19-20. It is gley clayey loam, more uniform than above, though it also contains sinuous *ca.* 1 cm thick darker bands dipping gently northward. Scattered charcoals and very few uncharacteristic flint artifacts are also present. No traces of bone preservation were observed.

Layer VII (0.1 - 0.2 m) contains very high densities of rolled Mousterian flint artifacts overlying bedrock. The bedrock in the eastern corner is slightly weathered soft limestone, while in the western corner it shows a complex red brown soil-like weathering profile. The bottom of the layer was dated to $34,600 \pm 1900$ BP (I-6869), the top to $26,060 \pm 840$ BP (I-6868). Bones were totally absent in the layer.

Site Formation Processes

In order to identify the depositional and post-depositional processes that contributed to the site formation, detailed laboratory studies, including mineralogical and micromorphological analyses, are under way. Meanwhile, the present description of the section is viewed as tentative. However, from field observations we may infer at least two types of post-depositional disturbances, one of biological nature and the other related to running water. The latter seems to be responsible for the strong lamination of all deeper layers, for gleying effects, and probably for the absence of *in situ* anthropogenic structures such as hearths. Significantly, the water-lain deposits seem to occur in the deeper part of the sequence while the uppermost layers have been less affected by water erosion. The strongest karstic activity, possibly due to permanent running water, appears to have taken place at the end of Middle Palaeolithic / beginning of Upper Palaeolithic. This event washed away most

of the Middle Palaeolithic deposit in the studied area, left heavily eroded artifacts, and created hard breccia bearing Mousterian artifacts on the entrance's floor. This phenomenon was recognized in other Levantine caves (Bar-Yosef and Vandermeersch 1972).

Breccia appears to be commonly associated with Middle Palaeolithic artifacts in Levantine caves (see Garrod and Bate 1937; Olami 1984; Weinstein-Evron *et al.* 2003 for Carmel caves examples). However, in Raqefet Cave, near the wall of the second chamber (sq. C18), a thick but relatively soft brecciated deposit contains an Aurignacian end-scraper and a few blades and bladelets. This breccia is also found on the wall of the first chamber near the bedrock floor, bearing flint artifacts that also do not seem to belong to the Mousterian culture. In addition, in one of the Natufian bedrock mortars in the first chamber, flint artifacts were found in a similar breccia.

Dating

Most of the ^{14}C dates were obtained from charcoal samples at the beginning of the 1970's using the conventional method (Table 3). The dates of $26,060\pm 840$ BP and $34,600\pm 1900$ BP obtained from the Mousterian layer show a contamination of the layer from above. Since the thin layer contains a large number of eroded and battered flint artifacts lying on each other, which is the result of strong water erosion that washed away most of the original layer and left the artifacts, it is likely that the charcoal samples taken from this layer could not be contemporaneous with the flint tools. The dates of the Upper Palaeolithic have a large standard deviation that makes them less reliable. In addition, the ^{14}C dates of the Early Upper Palaeolithic and the Levantine Aurignacian are identical. This may be due to vertical movement of charred remains. The dates from the top of the Upper Palaeolithic deposit (layer IIIa) also show contaminations from later periods. A new series of charcoal samples for dating was taken by us, and is now under preparation.

The Main Section Faunal Assemblage

The sample from the main section (1970-72) is composed of Early Upper Palaeolithic (NISP=152), Late Upper Palaeolithic (NISP=30) and Late Kebaran (NISP=103) specimens. The species mainly include mountain gazelle (*Gazella gazella*) and Persian fallow deer (*Dama mesopotamica*). Other large mammals, such as aurochs (*Bos primigenius*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*) are represented in small proportions.

Relatively good conditions of bone preservation are present in the cave, though they vary between the strata. Heavy chemical alterations seem to have taken place in some parts, as can be seen in the low density or the absence of bones there. This is also evident in the strong phosphate accumulation in the upper part of the deposit (especially Layer IIIa). The presence of cemented sediment (square C18), which contains a relatively high

density of bones, made it somewhat difficult to extract bones intact. Heavy coating of carbonate concentration characterizes the Late Kebaran bones, thus making it difficult to observe and identify bone surface modifications. However, the presence of porous and low density bones, as well as those of young and small game, attest to the general good state of bone preservation and point to minor loss of bone fragments owing to density-mediated attritional processes that occurred due to decomposition processes and/or post-depositional processes.

Analysis of the breakage patterns and bone surface modification examined on all long bone epiphyses and near epiphyses shaft fragments (according to fracture angle, fracture outline, and fracture edge; see Villa and Mahieu 1991 for typological description of the fractures) reveal that human foragers were the dominant agents of bone accumulation and bone damage at all layers of Raqefet Cave. Virtually all long bones were split open to obtain marrow, as evident by the high rate of fresh (green) fractures (over 80% in all layers were characterized as oblique, jagged and V-shaped fractures; following Villa and Mahieu 1991 typology). The high rates of fresh bone breakage eliminate the possible effect of trampling and sediment compaction and indicate butchering behavior.

The long bone assemblage contains minor signs of surface damage. The low weathering profile probably results from rapid burial and protection of the anthropogenic layers. Similarly, the effect of abrasion is low, and bones with smoothed and rounded fracture edges are almost absent. Also, traces of animal activities are almost absent from the identifiable elements of the entire assemblage. Only two long bone fragments from the cemented Early Upper Palaeolithic layers bore signs of carnivore's gnawing. Rodent gnaw marks are also extremely rare and were observed only on four bone fragments from the Early Upper Palaeolithic. These results suggest that neither carnivores nor rodents played a major role in biasing the Raqefet Cave bone assemblage.

DISCUSSION

The renewed project at the Raqefet Cave confirmed the two importance aspects of the site, found in the past but never published in detail: the long cultural sequence and the Natufian burial complex.

The long cultural sequence includes layers belonging to the Early Upper Palaeolithic, the Levantine Aurignacian, the Kebaran, the Geometric Kebaran and the Natufian; and disturbed layers that contain remains of Pre-Pottery and Pottery Neolithic, as well as several later historic periods. Similar sequences (though usually not with all the above-mentioned cultures) have been reported from other cave sites such as Kebara (Bar-Yosef *et al.* 1992), el-Wad cave and terrace (Garrod and Bate 1937; Weinstein-Evron 1998) and Hayonim cave and terrace (Bar-Yosef 1991; Belfer-Cohen and Bar-Yosef 1981; Henry *et*

al. 1981; Valla *et al.* 1991). However, in Kebara and el-Wad several of these layers have been completely excavated long ago and a renewed study of the long Upper Palaeolithic – Kebaran – Geometric Kebaran – Natufian sequence is not possible any more.

Focusing on the Natufian, Raqefet is the only cave site in the Carmel – Menashe Range where a Late Natufian layer is still present. Documenting and understanding the Late Natufian is essential for reconstructing the cultural process that culminated in the establishment of permanent villages and adoption of agriculture as the basic mode of subsistence. Indeed, the process began at least as early as the Early Natufian (Bar-Yosef and Belfer-Cohen 1992), but it is important to stress the archaeological evidence for marked differences between the Early and Late Natufian. The main aspects are site size, investment in architecture and length of occupation, and there appears to have been a shift to more ephemeral settlements toward the end of the Natufian, accompanied by a decrease in art manifestations (Bar-Yosef 1998; Bar-Yosef and Belfer-Cohen 1999; Belfer-Cohen 1991a, b; Valla *et al.* 2001 and many others). Burial customs also changed through time (Bocquentin 2003; Grosman 2003). In addition, there appears to be a high inter-site variability in many of these parameters, and thus it is important to meticulously study each of the available Natufian sites in order to monitor the details and causes of change.

It is within this framework that the Late Natufian graveyard at Raqefet should be evaluated, and especially compared to Hilazon Tachtit (Grosman 2003). The two caves are similar in that in both the Natufian burials are in the first chamber, which is relatively small. Both have narrow terraces with no documented burials. Importantly, the two caves have no Early Natufian layers. This is in contrast to the larger sites of Hayonim and el Wad, and even the open-air site of Eynan, where there are both Early and Late Natufian occupation (and burial) layers. Other Late Natufian sites are known even from marginal zones such as the Lower Jordan Valley and the Negev, outside the main Mediterranean core area.

At Raqefet, the Late Natufian use of the site is well-documented with the presence of burials and a large number of bedrock installations that include basins, mortars and cupmarks. This complex is unusual, even for the wide variety of Natufian cave use and burial customs, as there are no Late Natufian caves where such a variety of bedrock installations are present. This issue will be elaborated upon both in further publications and additional excavations.

A preliminary study of the Natufian flint assemblage shows that flint knapping took place in the cave, using a variety of raw materials from various close and more distant sources. Such a pattern has been established for other Natufian sites (Delage 1997). It has also been shown that basalts (Weinstein-Evron *et al.* 1999) and beads (Bar-Yosef Mayer *in press*) from various sources were imported into many Natufian sites.

The studied faunal assemblage provides two insights, which are important at this stage

of work. First, the taphonomic history of the Raqefet Cave assemblage suggests minor loss of bones owing to various diagenetic processes and indicates that most bone destruction occurred during the time of occupation, probably as a result of exploiting bones for marrow consumption. Second, the faunal assemblage displays limited variability over time and represents repeated visits by hunters targeting mainly mountain gazelle and Persian fallow deer. The prehistoric environment points to a majority of species associated with Mediterranean maquis and open woodland vegetation types. Positioned at a relatively low altitude on a steep slope, the site provides an ideal location for ambushing these prey species. Compared with Epipalaeolithic ungulate bone assemblages from the western parts of Mount Carmel and the coastal plain (*e.g.*, Bar-Oz 2004; Garrard 1980, 1982), coupled with other Middle Palaeolithic assemblages (Rabinovich and Hovers 2004; Rabinovich and Tchernov 1995), the zooarchaeological data from Raqefet Cave displays a similar taxonomic diversity. The conservative nature of traditions of food exploitation does not support any general trend during the occupational levels of the site.

It is hoped that with the new studies of the Raqefet Cave material remains (Bocquentin 2003; Lengyel in prep.; Sarel 2004) and the renewed excavations, the Raqefet cultural sequence will be now accessible and incorporated into regional syntheses regarding human subsistence, settlement patterns and social dynamics during the Late Pleistocene and Early Holocene in the Levant.

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