The Raqefet Cave 2008 Excavation Season

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ABSTRACT

The third season of the renewed project at Raqefet cave took place in the summer of 2008. In the first chamber additional Natufian human burials were exposed near the north wall of the cave. In the narrow crevice of Locus 1 and nearby, a total of 11 burials were so far excavated. This is indeed a very dense Natufian burial area. Furthermore, the Natufian layer to the east

of Locus 1 is also rich with burials. Here (Locus 3) three burials have already been excavated, but at least four additional graves are known and will be excavated in the future.

In Locus 5, a narrow elevated area in the southern part of chamber 1, the tufa covering the cave floor yielded a rich and well-preserved concentration of finds. The flint assemblage appears to be Kebaran, while the faunal remains from there also differ from the Natufian faunal remains at the site. This indicates that the cementation of sediments in the cave occurred during both the Early Epipalaeolithic (Kebaran) and Late Epipalaeolithic (Natufian).

Additional bedrock features (including mortars, cupmarks and tiny depressions) were found during this season, bringing the total number in the first chamber and terrace to over 90. The variety of types and dimensions indicate that they were used in various ways, most likely in more than just the processing of foods or minerals. The 3D documentation of these features (by photogrammetry) already enables new directions of analyses of these somewhat enigmatic features.

INTRODUCTION

This paper describes the third season of renewed fieldwork at Raqefet cave, held in the summer of 2008. The cave was discovered by Olami in 1956 (Olami 1984), and excavated by Noy and Higgs during 1970-1972 (Noy and Higgs 1971). The first excavations exposed a long sequence beginning in the Late Middle Palaeolithic and concluding with the Pottery Neolithic period. Our previous reports (Lengyel *et al*. 2005; Nadel *et al*. 2008) include a description of the cave and the setting. They also provide details regarding the Natufian remains at the site, with preliminary reports on the burials, the flint and ground stone assemblages, the bedrock features, the faunal remains, and small finds such as bone tools and shell beads.

The 2008 season of excavation focused on the first chamber and the terrace, with particular interest in the Natufian remains (Figs. 1, 2). In the first chamber, we continued excavations in Loci 1 and 3, where Natufian burials were found in dense concentrations. We also chiseled out tufa samples in two areas (Loci 4 and 5) in order to verify their age (by studying the flint assemblages) and analyzed their composition through the use of thin sections (still under study). As the remains from Locus 5 appear to be Kebaran, they are presented separately and thus the descriptions of these flint and faunal assemblages are separated from the paper section discussing the Natufian material remains.

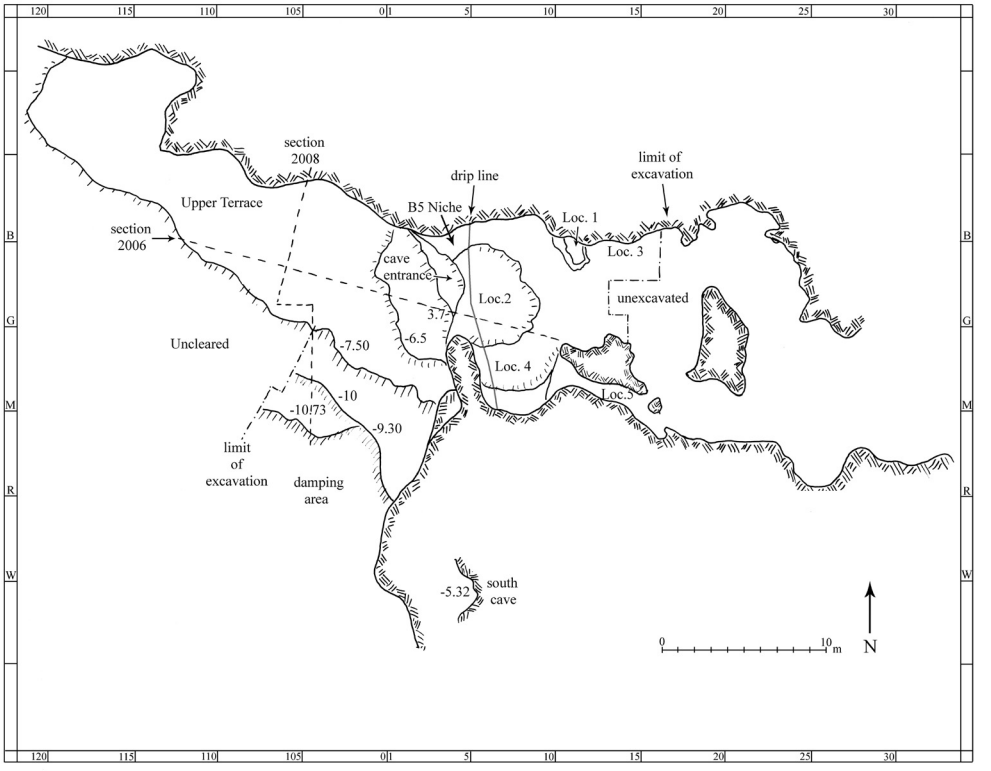

Figure 1: General plan of chamber 1 and the terrace, showing locations of loci and sections.

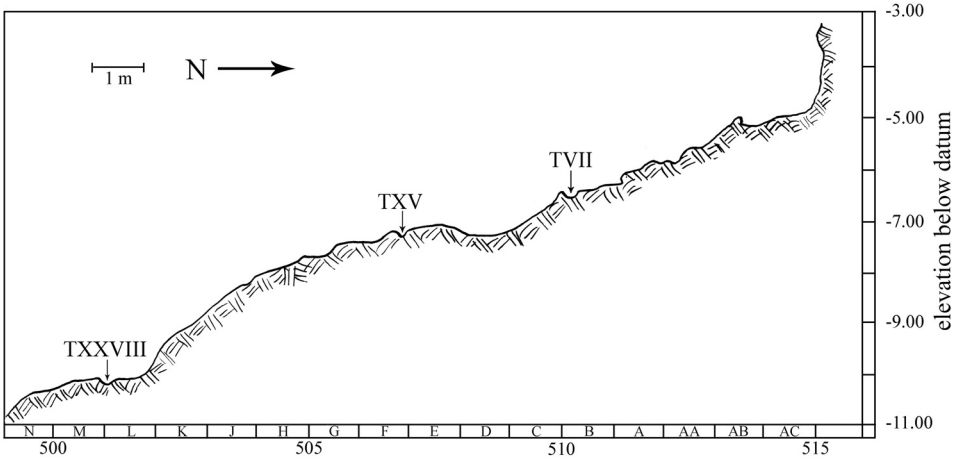

Figure 2: A north-south composed topographic section of the terrace (see Figure 1 for location). T-VII, T-XV and T-XXVIII are cupmarks / mortars hewn in bedrock.

LOCUS 1 (D.N.)

Locus 1 is a narrow, deep natural depression/crevice in the bedrock floor (Figs. 3-5). It is almost perpendicular to the northern cave wall, and adjacent to it. More than half of it was excavated during previous fieldwork (1970s excavation and during the 2006 season), and this

Figure 3: Locus 1 during excavation. A. A slab with a cupmark is set at the top of the northwestern end, and a boulder and ground stone implements are set in the niche near the human skeletons (towards the end of the 2006 season, looking west). B. The legs of Homo 15 exposed after the removal of the above.

Figure 4: The natural crevice of Locus 1, where humans were repeatedly buried (at the end of the excavation, looking north).

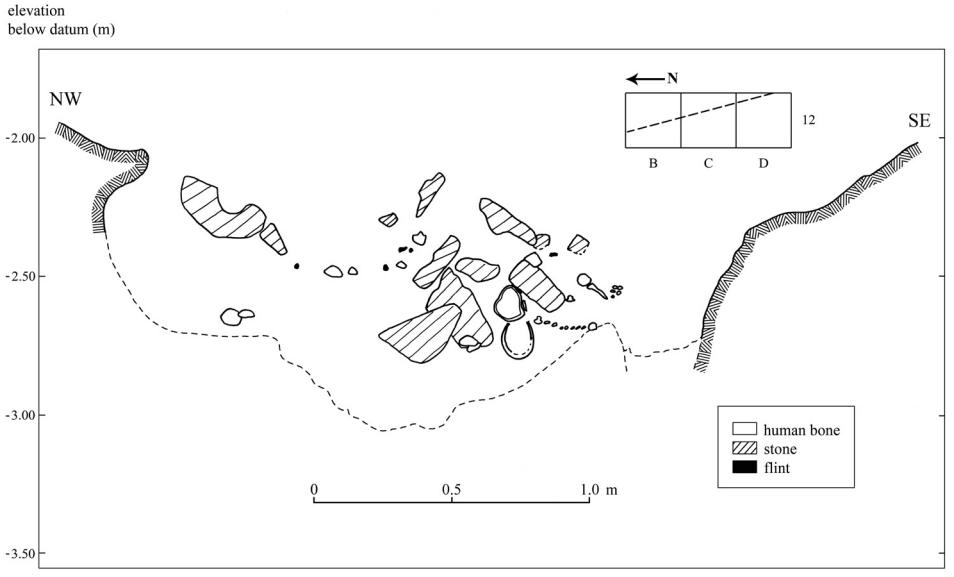

Figure 5: A composed section of Locus 1, showing the depth, density of stone implements, the slab with a cupmark, bedrock mortar C-XLIV at the bottom right of the crevice, and human remains. Grid location of section presented at the top. Note the irregular bottom, where tufa covers the bedrock (and thus the original bedrock line is not visible).

season we completed the work and reached bedrock. Locus 1 is about 2 m long and 1 m wide, and the accumulation of sediment excavated was 40-70 cm thick.

Most of the sediment in this crevice was soft reddish-brown, as was the case in other Natufian loci at the site. However, in the northern part of the locus, the sediment was very hard (tufa). It was cemented to the cave wall and the side of the crevice, containing within it a stone slab with a cupmark, several stone implements, animal bones, flints, and human bones of several individuals (H. 3, 8, 15; Fig. 6). At the bottom of the locus and decreasing from north to south was an irregular layer of hard tufa, in chunks and layers of various colors.

The entire crevice and probably also the bedrock mortar hewn at its bottom were used for repeated burials. Thus, skeletons H. 3, 4, 7-10, 13, 15 and 17 (nine altogether) were buried within the elongated narrow crevice. Skeletons H. 1-2 and 6 were buried immediately around the narrow niche (see below).

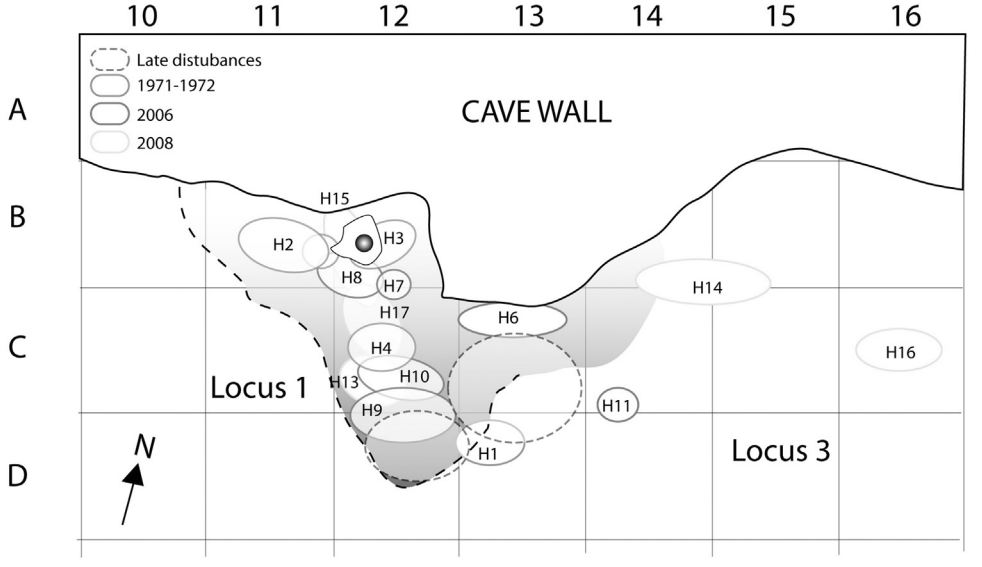

Figure 6: Plan of Loci 1 and 3, with schematic location of burials (drawing F.B.).

LOCUS 3 (D.R.)

During the 2006 season it became clear that here there is a rich Natufian layer (partially disturbed at the top by Iron Age activities) which includes the construction of a small round/oval structure (see Nadel *et al*. 2008). During the 2008 season this area also proved to be rich in Natufian burials.

The 2008 operations

During the 2008 season, work started with clearing and straightening the southern and eastern sections, and removing loose and trodden sediments accumulated since 2006. Most of the squares were excavated to a depth of 5-20 cm.

The sediments were usually gray-brown and more reddish when close to the bedrock and wall (and thus this reddish sediment characterizes the burials of H.14 and H.16). In most of the excavated area (specifically in squares C-D/15-16), large numbers of charred fragments were found between elevations 190 and 210 cm below datum. It seems their origin is from a higher elevation, as they were present in the eastern section of C16 at -175 cm. The (mainly gray) sediments, which included these charred remains, were present immediately above the skeletons (see below) and were partly intermixed with the sediments where three human skulls were embedded. This gray-brown sediment, as well as the reddish sediments, contained human skeletal remains, flint items, animal bones, and stone and bone tools. However, they also contain both early material (Upper Palaeolithic and Kebaran/Geometric Kebaran flint items) and a few pottery sherds. Many stone implements, some of them very large, were encountered over the entire area (Fig. 7).

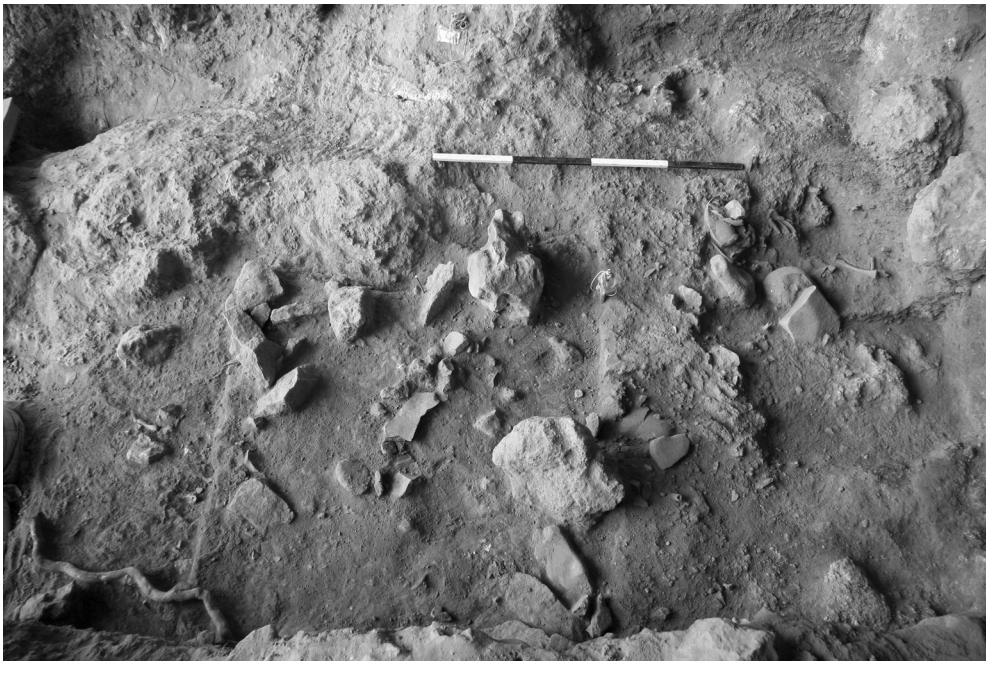

Figure 7: A general view of Locus 3 during excavation with Homo 16 partially excavated, looking north.

The sediments at the northern area of the locus were mainly reddish and brown/gray, and after removing only a few centimeters, the remains of an individual (H.14, see Fig. 6 and below) lying on its right side, head to the east, facing the cave wall were encountered. The skeleton was found almost completely on the bedrock, with only a thin layer of grayish/reddish sediment separating it from the bedrock surface. After the removal of H.14, excavation in this square and the neighboring ones continued until bedrock was reached (mainly in squares C14 and C15).

In square C16c, a skeleton of an infant (H.16) was found lying on its right side (Figs. 6, 7 and below) at 195 cm below datum. It was placed more or less in an east-west axis, with the face to the south. Again, a very thin layer of sediment separated it from bedrock. It seems that the skeleton created a barrier, which formed an accumulation of sediment and calcified material, attached to the skeleton on its northern side.

A few centimeters southeast of H.16, human skull remains were noted at about 203 cm, partially covered with a stone slab (Fig. 7). Further to the south (*ca*. 60 cm south of H.16 and the skull), another skull was encountered (in square D16ac). An additional skull was noted in square D14bd. All three skulls were left in place and not excavated during this season. A few large flint items and bones were also left in place, in the same layer.

The bedrock surface in Locus 3

The bedrock descends from the northern cave wall southward, though it is irregular. In a shallow depression near the wall, and parallel to it, the skeleton of an adult individual (H.14) was uncovered. Further east, another individual (H.16) was found placed on the "sloping" bedrock.

The bedrock is covered by tufa and other cemented sediments, characterized by a wide variety of colors, hardness and texture, most likely reflecting the dynamics of chemical activities in this area of the cave. The material is black near the eastern section and seems that in this area (square C16) it corresponds with disturbances originating in later levels. In other areas, the rock is covered mainly by whitish or yellowish chunks and crusts. Similar sediments were noted in square D16d, and in the bottom of Locus 2, during the 2006 excavation season.

Two small crevices

We explored two small niches in the northern wall of the cave, higher than the loose sediments of Locus 3. However, the lower sediments of these reach the top sediments of the rest of Locus 3, and thus they are grouped together. Niche B16 was excavated from its top and is characterized by many stones of various dimensions embedded in red-brown and gray sediments. The compaction of the sediments here varies and the material includes Natufian

remains, as well as isolated Palaeolithic and later specimens. The lower parts of the niche are characterized by tufa, specifically in its eastern side. Niche A15 is very small, and a variety of stone implements were found here (Fig. 8).

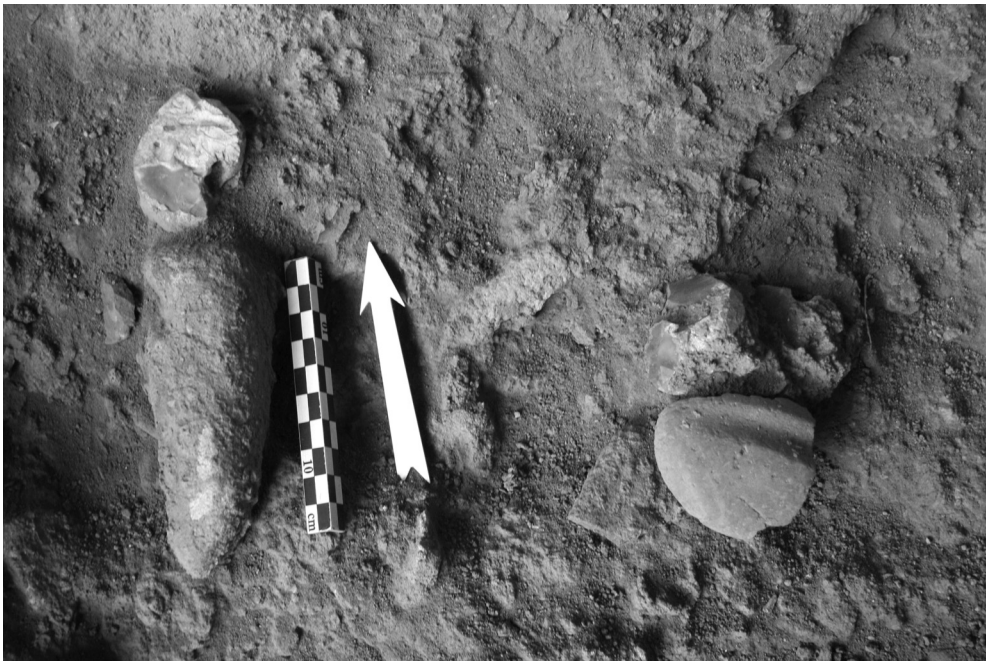

Figure 8: Bedrock niche north of H.14 with stone implements.

The southern section

No clear layers could be identified in this long section (Fig. 9). Most of the sediments are brown-gray and occasionally reddish in the upper part of the section. Near the border between squares C and D, a concentration of stones was noted, probably corresponding to a late (Iron Age?) disturbance. At square C16, near the southeast corner, whitish/yellowish hard sediments appear in the section (*ca*. 190-200 cm below datum).

The eastern section

This section expresses a complex picture (Fig. 10), yet it features only a few stones. It includes a light brown top layer, the remains of a pit or shallow depression (reddish-brown sediment), several unclear patches and disturbances of various shades, and animal burrows (also noted in square D16).

Figure 9: The south section of Locus 3, scale bar – 50 cm.

Figure 10: The east section of Locus 3, scale bars – 100 cm and 50 cm.

The lower part of the section is characterized by various layers, visible directly on top of the hard sediments (185/190 cm below datum), and mostly near the southern corner of the section. These are dark brown to brownish-gray in color, and some are characterized by relatively large amounts of charcoal, also noted in most of the excavated area at this elevation. The section at C16b and B16bd is less clear and features a massive stone and cemented sediments, the latter continuing toward the northern wall of the cave. Beneath this, a different dark sediment (also disturbed by a root) was noted and seems to correspond with charcoal found in different areas of the locus (between elevations 175 cm below datum in square C16 and at least down to 210 cm below datum in square D16). In this area (the eastern part of C16) the legs of a young individual (H.16) penetrate the section.

LOCUS 4 (D.N.)

Locus 4 is located in the southern part of the first chamber, near the entrance. We chiseled out a tufa sample in one square, H7d (Fig. 11). It was chosen due to the thickness of the tufa, and the presence of large embedded stones. The volume of removed material was *ca*. 0.02 cubic meters. The section shows that the accumulation was *ca*. 20 cm deep. Bones were scarce and very fragmented. Flint items were also rare, and included tools and debitage. Several large fragments of snails were visible in the section and in nearby exposures of the tufa.

Figure 11: The section in the tufa of Locus 4 (square H7d) showing the sloping bedrock, the 20-cm thick tufa, and isolated flints.

LOCUS 5 (D.N.)

Locus 5 is a long narrow niche at the southern side of chamber 1, separated from it by a steep high rock (squares K-L/11-15; Fig. 12A). The floor is covered by whitish cemented sediment (tufa), very rich in faunal remains and flint artifacts (Fig. 12B). A sample was chiseled out from squares L-M/14. The volume of removed material was *ca*. 0.04 cubic meters. As flints appear to be earlier and different from the Natufian remains at the site, they are described here and not with the Natufian remains recovered from Loci 1 and 3.

The flint assemblage

Flint artifacts are sharp and fresh. All stages of the reduction sequence are present, and a wealth of debris is also preserved in the tufa. There are 166 pieces larger than 1.5 cm (Table 1). These include 12 cores (7.2%), most of which are bladelet cores. The cores are larger and different from the small Natufian cores typical of the cave assemblage (Figure 13). Bladelets

Figure 12A: General view of the tufa covering the floor of Locus 5 (looking west). Scale bar 20 cm.

Figure 12B: Close-up view of the rich faunal assemblage embedded in the tufa.

are the most common product (27.7%) and together with the blades (9%) the industry is clearly bladelet/blade oriented.

The tools (n=31, 18.7%) are dominated by microliths (*ca*. 90%), while only one scraper, one massive scraper and one retouched flake are not made on small laminar elements (Table 2). Kebaran points are the most common type (n=13, 41.9%; Fig. 13), some of which are small and very delicate. A variety of other types are present, including backed and delicately retouched narrow bladelets. In terms of general counts, the Locus 5 assemblage is closer to the Kebaran than Natufian assemblages at the site (Fig. 14).

Several points should be mentioned; first, although all reduction stages are present, there are high frequencies of cores and tools. Second, there are no identifiable Natufian elements in the assemblage – neither in terms of debitage (cores and bladelets are different, for example) nor retouched tools.

The densities are also very high. Although the small excavated volume may not represent the entire layer, tool (*ca*. 770/cubic meter) and cores densities (*ca*. 300/cubic meter) are high. In short, the assemblage embedded in Locus 5 appears to be Kebaran in its characteristics, and resembles the assemblage retrieved from the section excavated by Noy and Higgs and analyzed by Lengyel (2007).

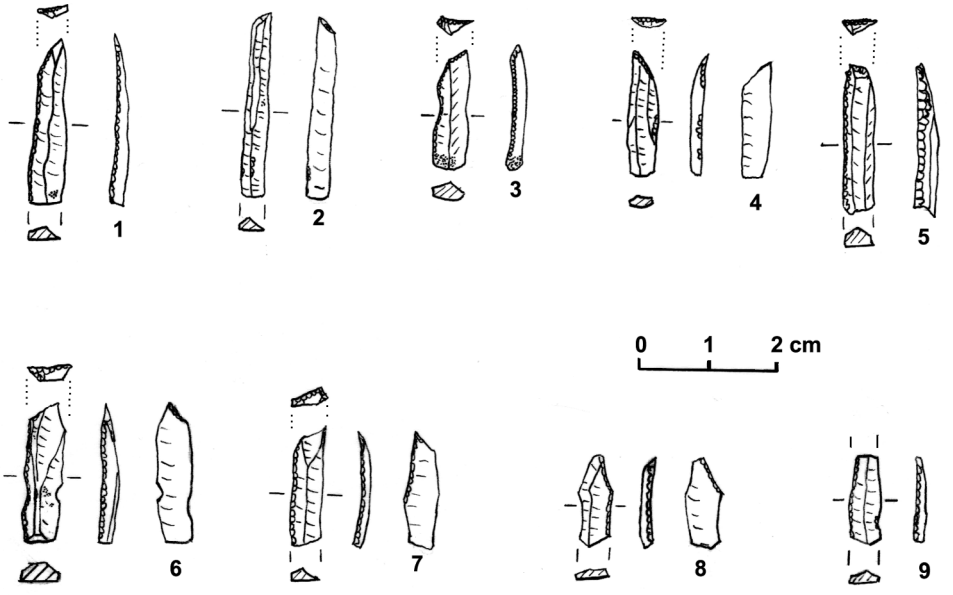

Figure 13: Retouched flint bladelets from Locus 5 (except #2, un-retouched).

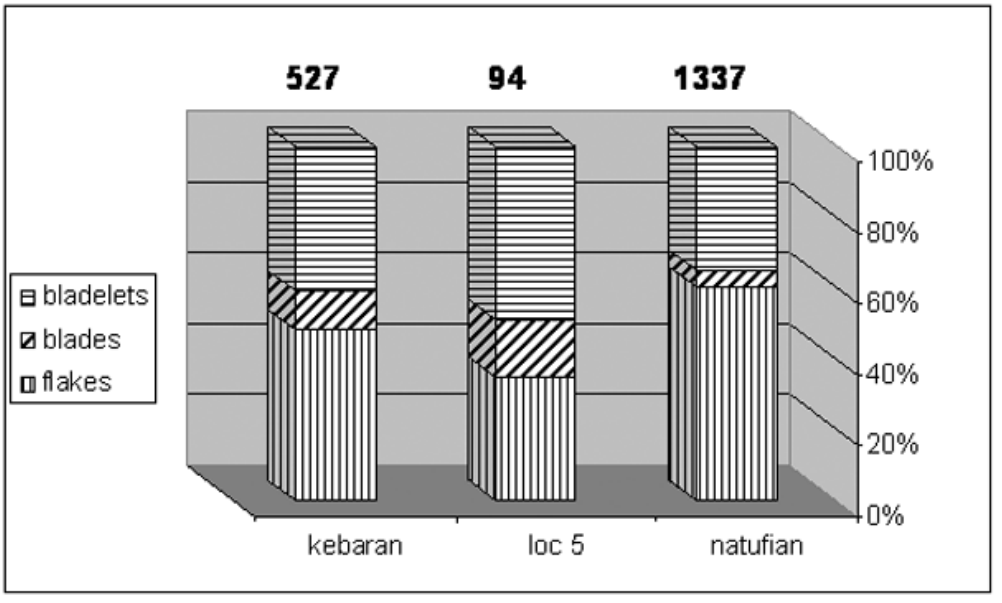

Figure 14: Relative frequencies of flakes, blades and bladelets in a Kebaran assemblage from the cave (Lengyel 2007), Locus 5 (tentatively Kebaran) and the Natufian assemblage from the cave (Loci 1 and 3).

Table 1. The flint assemblage from Locus 5, a general breakdown

square	height	tools	cores	bldlts	blades	flakes	c.t.e.	pr. el.	total
L14c	42-65	4	1	7	3	4	3	8	30
L14c	42-48	13	2	21	8	11	3	8	66
L14c	41-58	3	8	14	1	11	1	3	41
M14a	37-55	1			1	3		1	6
L14a	48-60	3		2	2				7
L14ac	56-65	2				4	1	1	8
L14c	60-65	2	1						3
cleaning		3		2					5
total	**N**	**31**	**12**	**46**	**15**	**33**	**8**	**21**	**166**
	%	**18.7%**	**7.2%**	**27.7%**	**9.0%**	**19.9%**	**4.8%**	**12.7%**	**100.0%**

Table 2. The retouched tools from Locus 5

square	height	Kebaran points	microliths	scrapers	massive scrapers	retouched flakes	total
L14c	42-65	1	1	1		1	4
L14c	42-48	6	7				13
L14c	41-58	2	1				3
M14a	37-55	1					1
L14a	48-60	1	2				3
L14ac	56-65		2				2
L14c	60-65		1		1		2
cleaning		2	1				3
total	**N**	**13**	**15**	**1**	**1**	**1**	**31**
	%	**41.9%**	**48.4%**	**3.2%**	**3.2%**	**3.2%**	**99.9%**

The faunal remains (R.Y. and G. B.-O.)

The animal bones from Locus 5 are different from the Natufian specimens recovered from the site so far. A preliminary analysis of all bones that were readily identifiable as to anatomical part and species was carried out.

Ninety-one bones and teeth were identified and recorded (hence NISP). This is a high NISP to come from such a small volume of excavation. As with most Paleolithic assemblages, most of the bone fragments are unidentified, outnumbering by far the identified portion (the NISP). The bone assemblage is dominated by all skeletal parts of ungulates. Many complete elements, such as phalanges, jaws and epiphyses, are present. Aside from the recovery problems associated with cemented sediments, the assemblage appears to be well-preserved, as many spongy and weak bone elements are present, including bones of juvenile animals. Furthermore, many limb-bone fragments display spiral fractures indicating ‘green’ bone

breakage, probably to extract marrow. It is interesting to note that only two possibly burned bones were recorded.

The most abundant species found (Table 3) are mountain gazelle (*Gazella gazella*, 62%), Mesopotamian fallow deer (*Dama mesopotamica*, 23%) and wild boar (*Sus scrofa*, 5%). Red deer (*Cervus elaphus*), aurochs (*Bos primigenius*) and three species of small carnivores, red fox (*Vulpes vulpes*), pine marten (*Martes foina*) and cat (*Felis* sp.), were also found. Some rodent and small bird bones complete the faunal spectrum from this locus. Body parts include primarily head parts (mandibles, maxillae and isolated teeth) as well as limb bone fragments (both bone-ends and bone shafts) but other body parts are also found (Table 4).

Table 3. Animal species found in Locus 5

Taxon	**NISP**	**MNI**
Gazella gazella	56	4
Dama mesopotamica	21	3
Sus scrofa	5	1
Bos primigenius	1	
Cervus elaphus	1	
Vulpes vulpes	1	
Martes foina	1	
Felis sp.	1	
Rodent	3	
Bird (small)	1	
TOTAL	**91**	

Table 4. Animal skeletal parts (NISP) of the represented species. All 'head' parts are teeth; 'axial' refers to ribs, vertebrae, pelvis and scapula; 'limbs' are long bones and carpals/tarsals; and 'toes' are phalanges and sasemoids

Taxon	**Head**	**Axial**	**Limbs**	**Toes**
Gazella gazella	17	4	30	5
Dama mesopotamica	8	5	6	2
Sus scrofa	3	0	1	1
Bos primigenius			1	
Cervus elaphus			1	
Vulpes vulpes	1			
Martes foina	1			
Felis sp.				

Several Epipalaeolithic (Kebaran, Geometric-Kebaran and Natufian) sites are known from the Mount Carmel area (Olami 1984). Some of these sites yielded sizeable faunal assemblages, which underwent detailed zooarchaeological and taphonomic studies. Kebaran

and Geometric-Kebaran faunas in Mount Carmel and the northern coastal plain are dominated by high frequencies of gazelle, fallow deer and occasionally aurochs, supplemented with small amounts of small game such as tortoises, hares and birds (Bar-Oz *et al*. 1999; Bar-Oz and Dayan 2002, 2003; Noy *et al*. 1973). In Natufian assemblages from the same region, the frequency of larger ungulates decreases markedly and small game species become more important (Bar-Oz 2004; Bar-Oz *et al*. 2004; Munro 2004; Rabinovich 1998).

Thus, the faunal spectrum in Locus 5, associated with a Kebaran lithic industry, appears to correspond more closely to Kebaran faunal assemblages than to those of Natufian sites. The high frequency of fallow deer and the low abundance of small game stand in contrast to Natufian faunas from Mount Carmel in general, and from Raqefet cave in particular (Garrard 1980; Nadel *et al*. 2008).

THE TERRACE (D.N.)

Work on the terrace focused on clearing a low step of the bedrock surface (Figs. 1, 2). This was done on a low ledge, to the southwest of the entrance, just above a small bedrock exposure that during the 2006 season yielded three small bedrock cupmarks. We found here two additional bedrock features, to be described in a separate section. We also cleared the western edge of the top bedrock ledge, and found here another badly preserved bedrock feature.

THREE-DIMENSIONAL DOCUMENTATION (S.F. and R. B.-G.)

In the previous report we introduced the background and certain aspects of 3D documentation based on terrestrial photogrammetry. It was applied to the Raqefet Cave floor, terrace and bedrock features (see Nadel *et al*. 2008). The location of the cave on a steep mountain slope did not allow for carrying heavy surveying instruments such as laser scanners, and the topographic complexity of the cave floor and terrace could not be properly described via traditional surveying practices. In this regard, photogrammetry was an optimal solution, allowing maintaining accuracy and high-resolution visual quality. Based on global, medium-range sets of images acquired in the previous season (Nadel *et al*. 2008), the cave floor was documented, allowing bedrock mortars and cupmarks to be embedded within three-dimensional space.

For detailed documentation of the actual geometry of each specimen, a set of close-range images was acquired. Depth and lack of illumination conditions within the cave require deploying artificial light sources to obtain a sufficient visual environment. Generally, a stereoscopic image-pair should suffice for 3D documentation. However, multiple images from different positions and vantage points were required to obtain complete coverage and sufficient detail. Orientation was carried out in two steps, first the local “mini-block”

was adjusted to maintain mortar/cupmark consistency, and then the image set was oriented towards the surrounding surface (cave floor or terrace) to properly locate them in 3D space. This way both local and global consistency was obtained.

To provide a complete description of the mortar geometry, the measured mortar points were further analyzed. First, each specimen (mortar, cupmark) was extracted from the complete 3D model of the cave floor (including measured points and surface texture). Each individual dataset offers a visual reference for catalogue documentation and later comparison (see Figs. 15 & 16 for details). The separation required isolation of mortar related points from their surroundings (cave floor related points) and then analysis of point density and distribution. Both analyses are mandatory for the provision of true depiction of the mortar and for the extraction of derived shape parameters. Control of density and distribution during the acquisition phase is complex, as the modeling component is eventually implemented on the images themselves, with little feedback as to shape and geometry. Point density and distribution were analyzed via triangulation of the point and assessment of the average arc lengths and entrapped area per

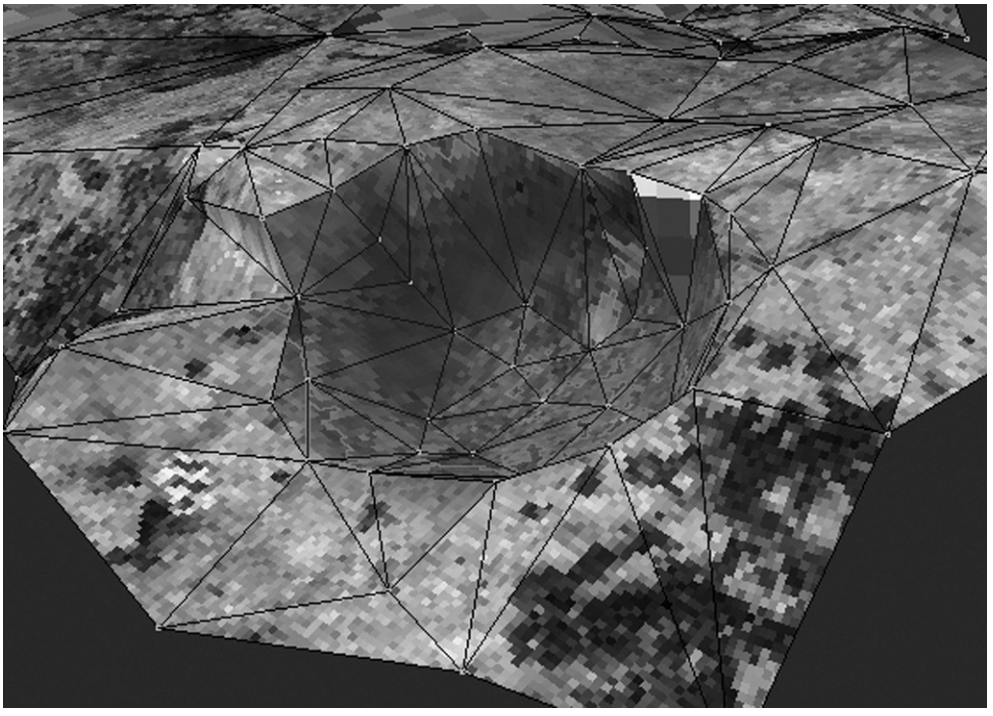

Figure 15: Example of bedrock mortar separated from the large grid model; the diameter of the mortar rim is *ca*. 35 cm. Points were placed along the surface to define contour. Three points were then "joined" by a triangular surface, which is then filled in by using a photograph of that area.

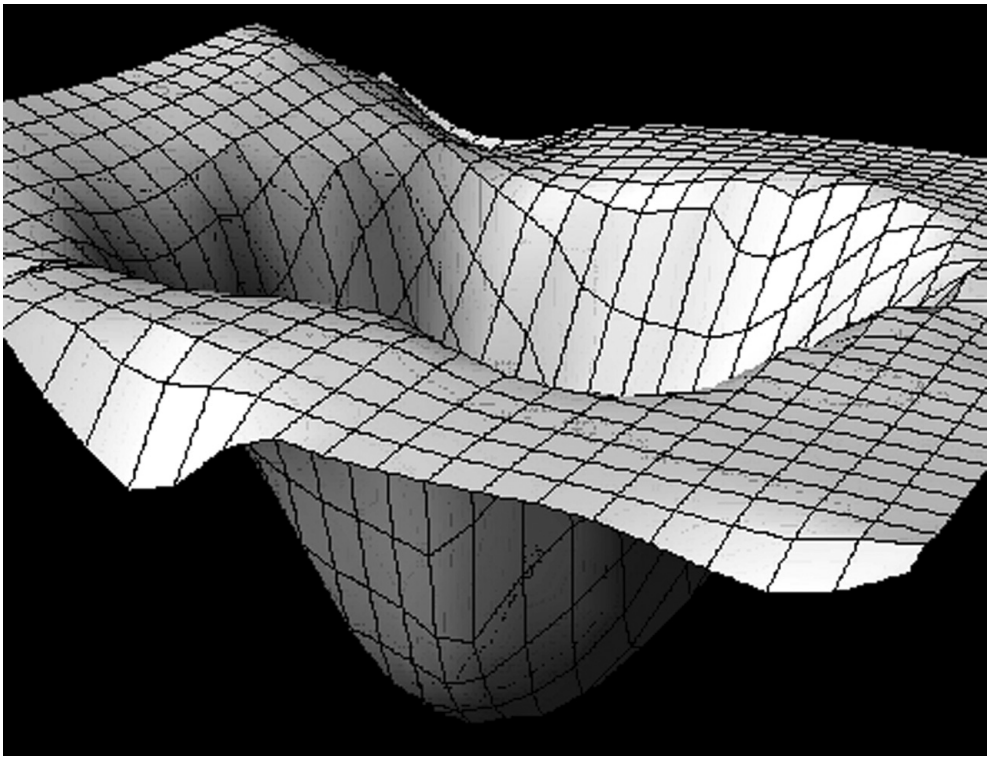

Figure 16: Example of bedrock mortar extracted from the larger model. Here, a flat grid has been laid over the object to enhance visual surface contours.

triangle. Regions that were identified as under-sampled were further densified, and within an iteration or two detailed description of the mortars was achieved.

For the formation of a mortar/cupmark database and for further analysis, the resulting cloud of 3D points was transferred into a Geographic Information System (GIS) database (results illustrated in Fig. 17). Computational analysis included such parameters as shape, volume, slope angle, etc. Predefined shapes in the form of analytical surfaces were fitted to the 3D point set as a means to characterize the geometry of the specimen. One of the main advantages of surface-based characterization is the ability to summarize 3D information into a set of surface parameters and surface type definitions. Quality of the fitting was evaluated by analyzing the residuals of the measured points. Small, millimetric level residuals indicate that the surface characterizes the object's geometry very well. Alternatively, large residuals indicate an anomalous behavior. This fitting process provides the first step towards classifying the bedrock features into groups based on surface types and parameters.

number of points	65
height[cm]	68.5
after the morphological filter	
number of points	43
Radius	2
Angle	-20
height[cm]	63.2
sigma[cm]	
Bilinear	18.8
biquadratic	1.36
Bicubic	1.29

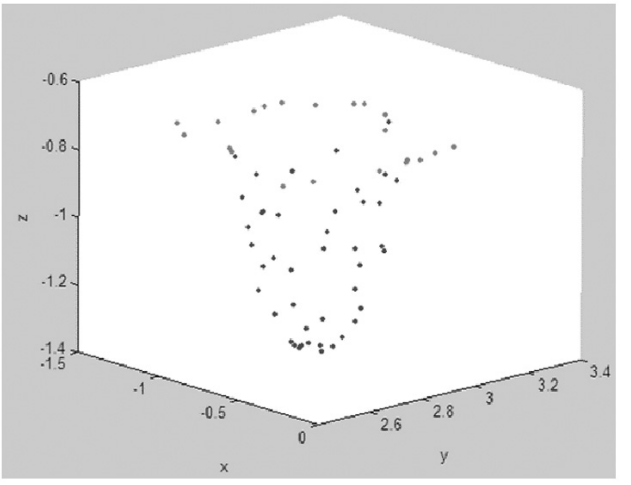

Figure 17: Example of data acquired during analysis of a bedrock mortar. Left – fitting output, right – point distribution.

From the information gathered, we are able to match a predefined shape to each specimen, which can then be used to categorize them regardless of individual size or slight deviation by examining properties such as slope or angle of curve, and surface parameters.

GEOARCHAEOLOGY (A.T.)

Thus far geoarchaeological investigation at Raqefet focused on thin section analysis of deposits found in Locus 1, as well as Loci 2 and 3. Thin sections were prepared after impregnation of undisturbed blocks by polyester resin under vacuum. All thin sections were analyzed with a light polarizing microscope Olympus BH-2 and described according to Bullock *et al*. (1985), and interpreted according to Courty *et al*. (1989) and Goldberg and Macphail (2006).

The current study focuses on a sequence of a section starting at the top of Locus 1 and ending within a bedrock mortar (C-XLIV) at the bottom of the locus. It includes sediments above, near, and below a burial. Near the top, the deposits at 190 cm exhibit a heterogeneous, loosely packed, occasionally calcareous microfabric, with less than 10% unsorted quartz silt; the deposit is aggregated and porous (Fig. 18); aggregation is basically manifested by simple sub-rounded brown-stained aggregates *ca*. 0.2-0.4 mm in size; pores occupy *ca*. 30% of the volume and are represented by vughs and vesicles. Further below, at 197 cm, the microfabric appears substantially denser and is composed of two key components: 1) reddish decalcified soil materials (obviously derived from *terra rossa* washed into the cave as erosional material), and 2) strongly calcified areas of predominantly micritic/microsparitie

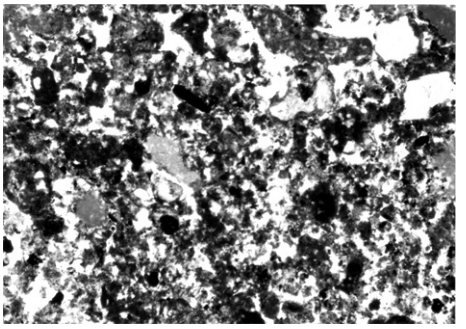

Figure 18: Loose, heterogeneous anthropogenic deposit at the top of Locus 1. Plane polarized light (PPL), width of frame 2.4 mm.

calcite with embedded soil aggregates, sand-sized calcite crystals from the bedrock, and comminuted charred particles (Fig. 19a,b). Striking evidence for the presence of heated materials in this layer is large fragments of fractured charcoal embedded in the dense clay and ash-rich deposit (Fig. 20).

At 205-230 cm, the sediment below the excavated skeletons appeared in the field as brown and greenish patches. The brown deposit in thin sections shows a clearly clay-rich ashy deposit somewhat similar to that described above. However, its microfabric is more porous, less dense and less calcareous. The heterogenic ashy deposit encompasses remnants of land snails and chips of bones (Fig. 21a,b).

In contrast, greenish patches at the same stratigraphic level, albeit at lower depth (226 cm), exhibit in thin sections strong compaction of the phosphatized clayey groundmass with few elongated cracks. Heterogeneity manifests itself as light yellow rounded aggregates ranging in size between 0.05-0.8 mm, embedded in the brownish dense groundmass (Figure 22). An aggregate of irregular shape can be also identified due to the presence of opaque dark-brown lining. The clear differentiation of the two microfabric types in the same horizon immediately beneath the skeleton will be discussed below. Outside the skeleton, the deposits in thin

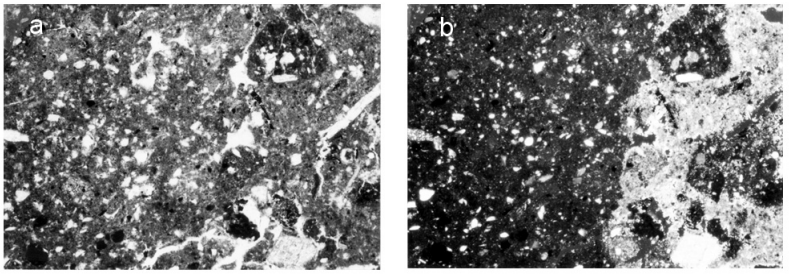

Figure 19: A (left), B (right). Terra rossa aggregate leached from carbonates (left) superimposed on micritic brown stained groundmass of recrystallized plausibly ashy materials (right), A – PPL, B – crossed polarized light, width of frame 2.4 mm.

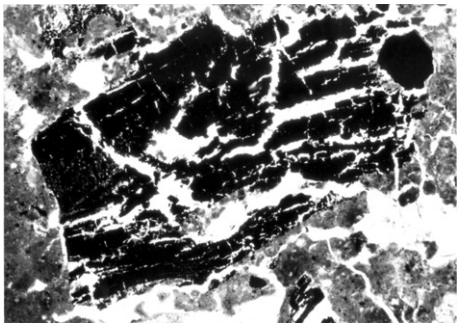

Figure 20: Partially fragmented charcoal embedded in the reddish clayey anthropogenic deposit, a direct indication of former hearth, PPL, width of frame 0.98 mm.

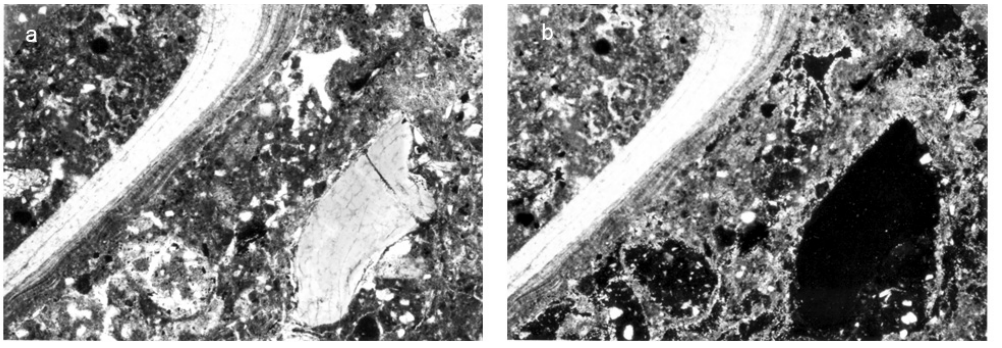

Figure 21: A (left) B (right). Heterogenic brown stained ashy deposit encompassing a large land snail shell (center) and a yellowish chip of bone (right below), (A) PPL, (B) XPL, width of frame 2.4 mm.

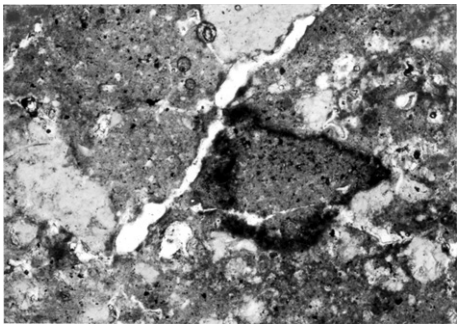

Figure 22: A very dense, strongly phosphatized mass incorporating strongly weathered chips of bones, PPL, width of frame 2.4 mm.

sections at 215 cm depth show a heterogeneous, loosely-packed microfabric with simple sub-rounded brown stained aggregates and bioliths (fragments of snails, sponge spicules) embedded in the matrix (Fig. 23a,b). This type of fabric closely resembles the uppermost deposit.

The infill of the bedrock mortar (C-XLIV) shows in thin sections a dense ashy deposit composed of calcareous ash and decalcified compacted ash, possibly phosphatized (Fig.

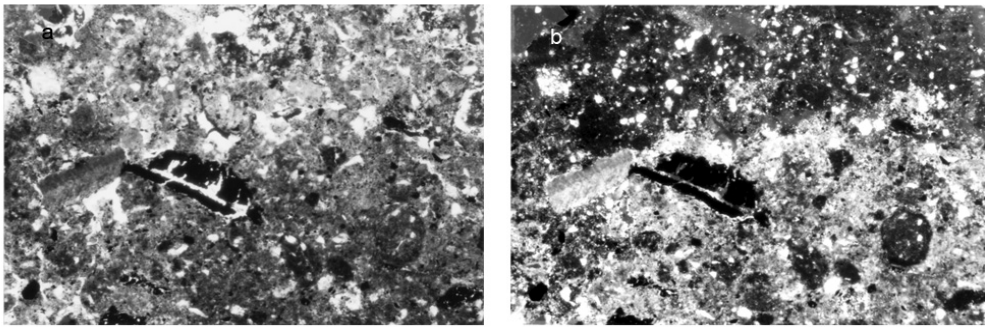

Figure 23: A (left) B (right). Superposition of decalcified patches (upper) and heterogeneous, brown-stained calcareous ash encompassing calcified spicules and charred pieces (below), (A) PPL, (B) XPL, width of frame 2.4 mm.

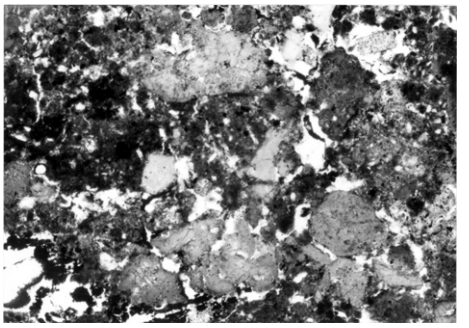

Figure 24: Strongly phosphatized yellow rounded aggregates and chips of bones embedded in a dense heterogeneous anthropogenic deposit, PPL, width of frame 2.4 mm.

24). Calcareous micro-areas exhibit strong heterogeneity brown and red-brown rounded soil aggregated pulverized within the ashy calcareous mass staining the deposit in brown coloration. Fragments of shells and charcoal are embedded within the calcareous matrix. Decalcified areas are lighter in color and less dense, with porosity ca. 20% represented by vughs and vesicles. In some areas light-yellow isotropic rounded aggregates are embedded in the brown heterogeneous mass (Fig, 24). These aggregates are likely to originate from bones weathering and incorporation into the groundmass under conditions of increased water saturation and compaction during the diagenetic, post-depositional stage of development.

In sum, the analysis of thin sections in Locus 1 confirms that the sediments are mainly anthropogenic, with a strong ash component represented by calcite ash mixed with chips of bones, pulverized soil material and charcoal. The presence of bioliths is also characteristic. The infill of the bedrock mortar is different from the samples studied earlier (Nadel et al. 2008); this will be investigated further. Significantly, the strongly phosphatized deposit below the skeleton may indicate that the phosphatization occurred not from guano deposition and subsequent interaction with anthropogenic materials, but is rather related to weathering of the materials associated with the burial.

THE NATUFIAN BURIALS (T.C. and F.B.)

During the 2008 season, five individuals were excavated in two different loci (Table 5). In order to avoid confusion, the skeletons found during the 2008 season were numbered following previous discoveries (Lengyel and Booquentin 2005; Nadel *et al*. 2008). Therefore, the first skeleton dug in the present season was numbered Homo 13.

Locus 1

The remains of the first individual dug during 2008 (Homo 13) were already visible during the previous season. This individual was buried directly under Homo 10. As is the case for Homo 10, only the upper part of Homo 13 was preserved, with the rest of the body missing, probably as the result of the burial of Homo 9 that cut into the double burial of Homos 10 and 13 (Figs, 6, 25). However, the preserved remains show that Homo 13 (a child between 12 and 15 years old, according to its dental development) was lying on his back, slightly on his right side.

Figure 25: HOMO 13. A child between 12 and 15 years old buried directly under Homo 10. It was deposited lying on its back (supine position) with a NW-SE orientation. As can be observed, only the upper part of Homo 13 was preserved, with the rest of the body missing, probably as the result of the burial of Homo 9 that cut the double burial of Homos 10 and 13.

All bones recovered from this individual, with the exception of the atlas, were found in anatomical connection. The cranium appeared somewhat displaced towards the back, lying on its right side and slightly upwards, with the superior maxilla in *facies* oclusal. The axis and the remainder of the cervical vertebrae appeared in anatomical connection between them and with the right and left ribs. The mandible was broken in the symphysis, the left part collapsed inside the superior maxilla, while the right part appeared in anatomical position, following the longitudinal axis of the cervical vertebrae. The relative position of the atlas in relation to the block axis-rest of cervical vertebrae and the mandible indicated that the displacement of the skull happened some time after the individual was buried, once the muscles of the neck had already disappeared. Additionally, the presence of a long stone slab in direct contact with the skull (although not directly on top of it) may have contributed to the previously described movement of the skull. Finally, it is worth noting that, as happened with Homo 10, the right humerus appeared connected to the right scapula but was cut at midshaft, probably by the burial pit of Homo 9.

The second individual (Homo 15) dug in Locus 1 is an adult (Figs. 3B, 6). The skeleton was very fragmentary, and only the lower extremities and fragments of both hip bones were found. Homo 15 was probably cut by the burial pit of Homo 17. However, despite its fragmentary state, the skeleton was preserved well enough to say that the corpse was deposited with both legs extended to the north-west and head opposite the cave wall. It is worth mentioning that, although this position is quite exceptional for the Late Natufian (and more frequent in the context of cave burial of the early Natufian), it is not the first skeleton found in this position at Raqefet – Homo 8, dug during the 2006 season, was also deposited with the legs extended. All bones were found in anatomical connection. Finally, the amount of faunal remains (such as maxilla and scapula of *Dama mesopotamica* and maxilla of *Gazella gazella*) that appeared in direct contact with the bones of Homo 15 is remarkable.

Homo 17 was an adult represented only by the upper part of the body, the rest probably cut by the double burial pit of Homos 13 and 10. Despite its fragmentary state of preservation, enough was preserved to determine the corpse was deposited on its right side, with both upper extremities flexed. The vertebral column appeared in anatomical connection and in *facies* antero-lateral left. The atlas, however, appeared in *facies* anterior, indicating that a slight backwards movement of the skull occurred during the decay of the corpse. This can indicate the head was originally in an elevated position, and thus a perishable 'cushion' was possibly placed under it. The relative position of the clavicles (oblique to the longitudinal axis of the body) and the sternum indicate the individual was buried with both shoulders somewhat elevated and compressed; therefore the use of a funerary bag constricting the corpse is very likely.

Homo 17's left hand appeared extended between the skull and the right hand, with all carpals, metacarpals and phalanges in anatomical connection. The right upper extremity was

in a similar position, and the hand appeared in a vertical position, covering the left hand. The phalanges were found in anatomical position indicating that decay took place in a filled space with an immediate earth infilling. The carpal bones, as well as some metacarpals, were not preserved; as several hand bones were found isolated at an upper level, a late bio-disturbance of this part of the grave is possible. Close to the palm of the hand (although not in direct contact with it), there was a horn core of *Gazella gazella*.

Finally, it is worth noting that on top of Homo 17 several isolated human bones (such as fragments of skull, mandible and the proximal half of a femur) not belonging to Homo 17 were recovered. Some of these remains were in direct contact with the skeletal remains of Homo 17 but may belong to Homo 15, which was cut at mid-skeleton.

Locus 3

Two individuals were excavated here during the 2008 season. The first individual, Homo 14, was an adult and his remains were very badly preserved, with the bones compacted and embedded in cemented sediments (Figs. 6, 26). The poor degree of preservation of its skeletal remains as well as the fact that the bones were compacted and calcified together

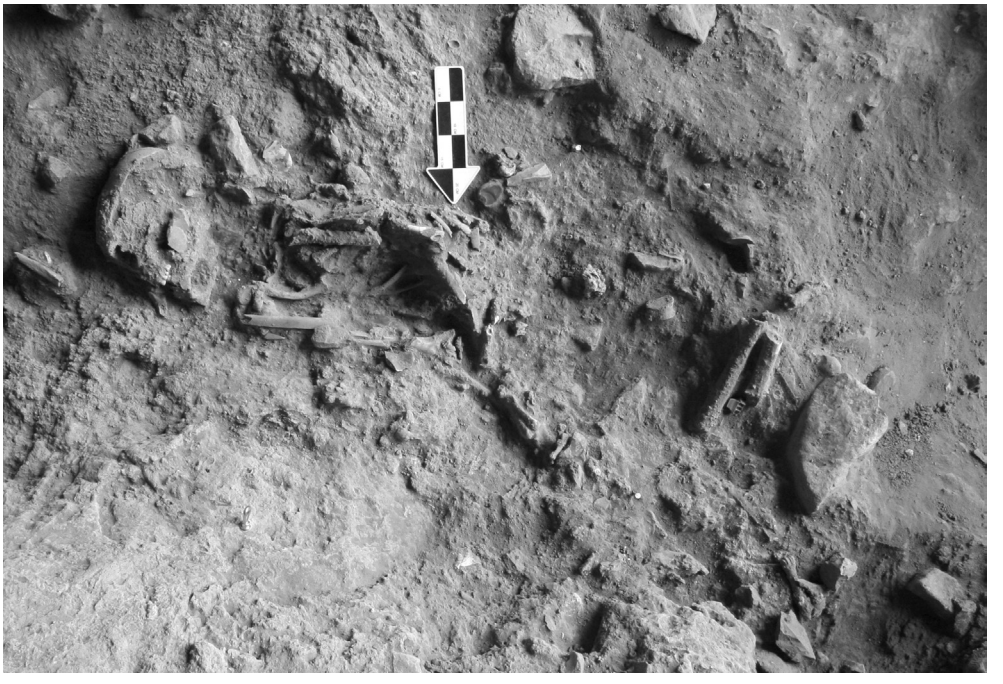

Figure 26: HOMO 14. An adult individual deposited lying on his right side, facing north and the cave wall, with an ESE-WNW orientation (scale 20 cm).

made it difficult to establish in detail the original position in which the corpse was deposited. However, it is possible to say that this adult was deposited directly on the surface of the bedrock, lying on his right side, facing the wall of the cave (north) and with two stones of medium size placed directly on top of the skull and the thorax. Despite the fact that these skeletal elements appeared very disturbed it was possible to observe that they kept anatomical connection.

All the skeletal elements of the right and left upper extremities were found, as well as the ribs of both sides, in anatomical connection and their position indicated that this individual was placed lying with both arms parallel to the body. Additionally, the position of the right clavicle (almost parallel to the vertebral column) should be interpreted as the result of the compression produced during the decay of a body laid out in a lateral position (Duday 1990).

The lower half of the body was very fragmentary, and only a small fragment of coxal, the diaphysis of both femurs and a lumbar vertebra were preserved. All of these skeletal elements appeared isolated, so their association to Homo 14 should be considered with caution. However, owing to their relative location and position, it was temporarily supposed that these remains belong to only one individual (Homo 14), even though this assumption needs a definitive confirmation in the laboratory. Additionally, and slightly towards the west,

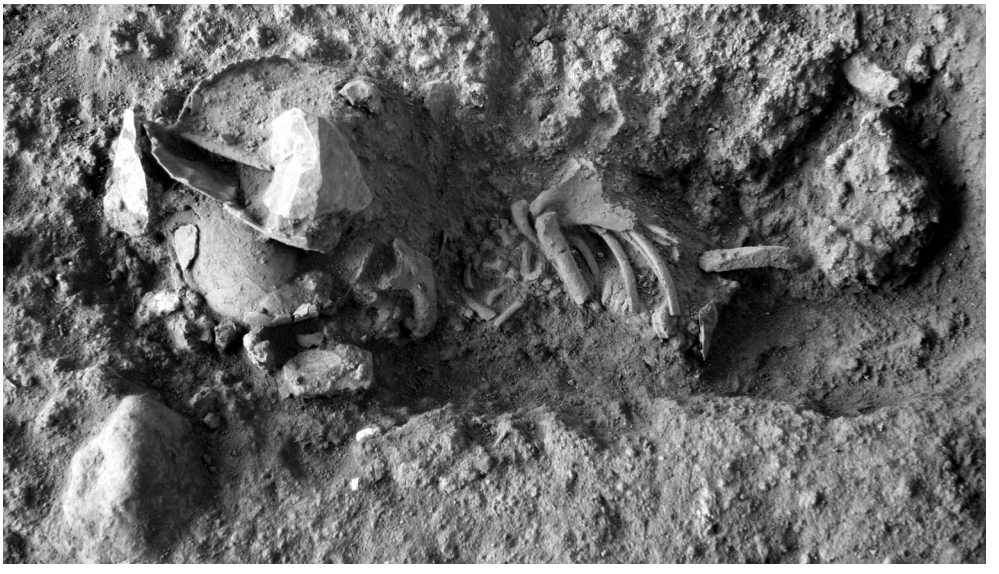

Figure 27: HOMO 16. A young child (18-24 months), deposited on its right side and facing SSE. Except a few isolated bones, the rest of the body was not found. It is likely that the pit of a different individual (an adult skull was discovered immediately at the south and left *in situ*) cut the skeleton of Homo 16.

the bones of both knees (the distal half of both femurs, the right patella and the proximal half of the right and left tibias as well as the left fibula) were recovered in a flexed position.

The last skeleton unearthed during 2008 (Homo 16) was a young child of between 18 and 24 months (Figs. 6, 27). The analysis of the remains allow us to establish that this individual was buried lying on his right side, facing SSE. The skull and mandible were in articulation, as well as the cervical and thoracic vertebrae, left ribs and clavicle, scapula and both humerus. It is worth mentioning that the left humerus was cut at midshaft. The right arm was elevated and flexed, with the hand under the skull. The lower part of the body was very fragmentary, although the position of the right femur, tibia and fibula (that were recovered almost in articulation), as well as other bones that were found isolated (such as the left tibia and several tarsals, metatarsals and foot phalanges), allowed us to state that this individual was probably buried with both lower extremities flexed, with the left ankle crossed under the right thigh at midshaft level. The rest of the body was not found. It is likely that a pit cut the skeleton, as suggested by the thorax. An adult skull discovered immediately at the south of the child might be part of a complete grave, which should explain the cutting of grave 16. However, these remains were not yet excavated and the skull was left *in situ*.

The five new graves raise the range of funerary treatments characteristic of the population that made use of this cave during the Late Natufian. Compared with the finds of the 2006 season (a clear preference for the N-S or E-W cardinal points and a majority of bodies placed lying on their backs), the discoveries of the last season show that, although the orientation of the graves also presents a recognizable preference for the cardinal points N-S or E-W, the positions in which the bodies were placed varies more markedly; three individuals were found in lateral position while only two were lying on their backs.

Finally, it is worth noting that although the funerary use of Locus 1 is very clear, the discovery of two more graves (and three additional ones that have not been excavated yet) in Locus 3 seem to indicate that the area used for funerary purposes was not restricted to the bedrock crevice of Locus 1 and extended further east (see also Bocquentin 2003; Lengyel and Bocquentin 2005).

Table 5. Individuals excavated during the 2008 season

Individual	**Age**	**Locus**	**Position and orientation**
Homo 13	Child: 12-15 yrs	1	On its back, NW-SE
Homo 14	Adult	3	Lateral right, ESE-WNW
Homo 15	Adult	1	On its back, SE-NW
Homo 16	Child: 18-24 months	3	Lateral right, W-E
Homo 17	Adult	1	Lateral right, NW-SE

THE HUMAN-MADE BEDROCK HOLES (D.N.)

During this season *ca*. 10 new human-made bedrock holes (HBHs, bedrock mortars, cupmarks and other holes and cavities, see Nadel *et al*. 2008) were encountered in chamber 1, and three on the terrace. Thus, the total number of specimens at Raqefet is at least 90, though the entire floor of chamber 1 (the richest part of the site) and the rock surfaces at the terrace have not as of yet been completely exposed. As such, Raqefet cave is one of the richest Natufian sites in terms of bedrock features, and indeed presents one of the most varied assemblages, from tiny holes to extremely large mortars and basins.

As several tiny HBHs were encountered during the previous season, a rigorous inspection of a smooth bedrock surface in the center of chamber 1 was conducted again, near some of the deep mortars known from 2006. We studied here *ca*. 10 additional tiny holes. All belong to our type A category – the smallest we identified (small, round shallow holes, 2-5 cm across and 2-5 cm deep, width:depth=$\pm$1). One is annexed to a deep narrow mortar (C-XXI), and a small quantity of hard sediment was cleaned out of it (Fig. 28). A few others were observed at other parts of the chamber floor, indicating that types and dimensions are not location-specific.

Figure 28: Bedrock features in chamber 1. In the foreground is the deep bedrock mortar C-XXI. Annexed to it, to the south, is a tiny carved hole (C-XXIa, north of the scale). It was full with hard sediment. To the west of C-XXI is C-XXV (*ca*. 10 cm across), where hard tufa and a reddish stone were found inside. Note the presence of additional tiny holes.

Another aspect under investigation is the variety of small "channels" and "connections" hewn between couples of bedrock features, or annexed to single bedrock mortars or cupmarks. Several have been identified in previous work at the site, and they have also been observed in other sites. These indicate that cupmarks and mortars represent only one aspect of a wide range of rock carving. The elongated specimens (channel-like) are yet another aspect. They usually appear annexed to a hewn bedrock cavity (of any type and dimensions). They thus indicate that it is not only vessels or containers (cupmarks and mortars) that the Natufians carved out of the bedrock; they also made these narrow elongated features, of which the purpose is yet to be verified.

A set of two annexed mortars, C-I and C-II, was excavated in 2006 (Nadel *et al*. 2008; Nadel and Lengyel 2009). Here, two phenomena were noted. The first was the fact that flat slabs of limestone were set on edge within C-II, two of which conjoin. The second concerns the flint assemblage. Here, a concentration of 70 cores was found, while additional flints (including cores) were left embedded in the tufa covering the bottom of C-I. This season we removed additional pieces from the tufa, and cut a small section down to bedrock. It was thus revealed that the bedrock mortar (C-I) was almost completely excavated in 2006. Only a thin layer of tufa remained, *ca*. 5 cm thick. It is through this bottom layer that the section in 2008 was made.

The last aspect highlighted in 2008 concerns two HBHs. In a cave specimen (C- XXV, Fig. 28) and T-XIII (on the terrace), a reddish stone was embedded in the tufa, filling the hewn hole. Such raw material is foreign to the site. It was not encountered elsewhere at Raqefet, according to a preliminary study of the groundstone industry. It is thus reasonable to suggest that these manuports were used at the site, and incorporated in the utilization of some bedrock features. This, again, may hint at the use of at least some bedrock mortars and cupmarks in ways other than food / mineral preparation or storage (Nadel and Lengyel 2009; Nadel *et al*. 2009).

THE NATUFIAN FLINT ASSEMBLAGE (Gy.L.)

Previous descriptions of the Raqefet cave Natufian flint assemblages are available (e.g. Lengyel 2007; Nadel *et al*. 2008). The sample studied here derives from human graves in Loci 1 and 3 of season 2008. It consists of 1493 items, excluding numerous chips smaller than 1 cm.

The lithic assemblage according to the presence of chips, fragments, blanks, tools, cortical items, core trimming elements and cores is representative of the flint knapping process (Table 6). It is striking to note that cortical elements are often flakes and rarely laminar products. If cortex appears on laminar items, either on blades or bladelets, its extension on the dorsal surface rarely reaches 50% of the total area. Taking into account the number of cortical

elements and the extension and appearance of the cortex by the types of the products, it seems that the raw material nodules were brought into the cave almost complete. Most cores were tested for knapping quality elsewhere, as there are many cortical elements at the site but only very few elements with 76-100% cortex (representing the first quality test and pealing stages). The very low ratio of cortical bladelets against the non-cortical ones shows that the decortication focused on the bladelet cores. Flakes with extent cortex cover may represent the on-site performance of the decortication process.

Table 6. Observations regarding the main blanks

	flake	**blade**	**bladelet**	**total**	**%**
complete	339	23	173	535	40.0%
fragment	301	21	264	586	43.8%
cortical fragment	57	2	8	67	5.0%
1-25% cortex cover	41	3	13	57	4.3%
26-50% cortex cover	23	5	1	29	2.2%
51-75% cortex cover	10		1	11	0.8%
76-99% cortex cover	7	1		8	0.6%
100% cortex cover	1			1	0.1%
Levallois	7	1		8	0.6%
with abrasion on surface	18	2		20	1.5%
core striking platform rejuvenating flakes	6			6	0.4%
neo-crest		3	2	5	0.4%
microburin			4	4	0.3%
total	**810**	**61**	**466**	**1337**	**100.0%**

A total of 60.6% of removals are flakes. Bladelets are also frequent (34.9%), although fewer than flakes, and blades are extremely rare (Table 7). The three types of cores (flake, bladelet, and blade) almost exactly follow the ratio of the blanks removed from them (Table 8). This feature proves that the Late Natufian industry focused on the production of flakes and bladelets. As already has been demonstrated on the assemblage recovered earlier (Lengyel 2007), the low number of blade cores compared to that of the blades probably reflects the transformation of most blade cores into bladelet cores, forming a continuous laminar production sequence, from the size of blades to that of bladelets. The few core striking platform rejuvenation flakes (Table 6) also support the longitudinal reduction of core size during the knapping process.

Analyzing the shape of the debitage face of the bladelet cores shows that the bladelets were removed mostly from wide and semi-circular surfaces (Table 9). This tendency fits well with the observation of Belfer-Cohen and Goring-Morris (2003), that the Late Epipalaeolithic

industries of the Southern Levant preferred exploiting cores on wide surfaces in order to obtain wide bladelets, while the Early Epipalaeolithic method (similar to the Upper Palaeolithic knapping schemas) operated on narrow surfaces for removing thin bladelets.

Table 7. Types of blanks by squares of excavation

square	flake	blade	bladelet	total
B12	38		18	56
B14	15	7		22
B15	17	1	5	23
B16	293	20	191	504
C12	6	1	4	11
C15	42	13	24	79
C16	211	12	122	345
D12	3		4	7
D15	99	1	73	173
D16	86	6	25	117
total	**810**	**61**	**466**	**1337**
%	**60.6%**	**4.6%**	**34.9%**	**100.1%**

Table 8. Core types by squares of excavation

square	flake	blade	bladelet	total
B12	1			1
B15	3		2	5
B16	20	2	9	31
C12	1			1
C15	5		2	7
C16	5		6	11
D12			1	1
D16	2		3	5
D15	3		1	4
total	**40**	**2**	**24**	**66**
%	**60.6%**	**3.0%**	**36.4%**	**100.0%**

Table 9. Bladelet cores, the shape of their debitage fronts (n – narrow, w – wide, sc – semi-circular, sc-w – semicircular and wide on two striking platform cores, n-sc – narrow and semi-circular on two striking platform cores)

Core front shape	N	W	SC	SC-W	N-SC	Total
Number	**7**	**9**	**5**	**1**	**2**	**24**

The tool kit is highly dominated by geometric microliths. The most frequent tool type is the lunate, especially simple ones with unipolar backing (Table 10). Bipolar backing on lunates

or the bifacial Helwan type is uncommon. The blanks of the lunates are exclusively bladelets. The frequency of the different tool types is basically identical to the earlier recovered Late Natufian assemblage at Raqefet (Lengyel 2007; Nadel *et al*. 2008).

Raw materials of the retouched lithic tools derive from four identified sources. Good quality flints belong to Deir Hannah formation found north of the cave and in Nahal Mearot on the western side of Mount Carmel. These sources yielded more than 50% of the tools almost in equal frequencies (Table 11). It is striking that the lunates and other types of bladelet tools were often made of good quality flints (Table 12), while flake tools and non-microlithic tools were frequently made of mediocre quality flints of Ramot Menashe source located south of Raqefet. Low quality flints of Daliyat al-Carmel hardly entered the site and these were used for flake and blade tools. Among the raw materials a chalcedony type also appears, which is similar to that found in the Negev Epipalaeolithic sites (Marder 2002).

Table 10. Tool types

type	**flake**	**blade**	**bladelet**	**total**	**%**
endscraper	3	2		5	5.6%
endscraper on retouched		1		1	1.1%
carinated endscraper	1			1	1.1%
nosed endscraper	2			2	2.2%
angled burin	2	2		4	4.4%
dihedral burin	1		1	2	2.2%
transversal burin	1			1	1.1%
borer			1	1	1.1%
retouched	7	2	1	10	11.1%
inverse retouched			2	2	2.2%
marginally retouched			3	3	3.3%
abrupt retouched			6	6	6.7%
aurignacian blade		1		1	1.1%
pointed			2	2	2.2%
backed		1	4	5	5.6%
arch backed			1	1	1.1%
Kebara point			1	1	1.1%
oblique truncated	1		5	6	6.7%
trapeze-rectangle			1	1	1.1%
trapeze			1	1	1.1%
lunate with unipolar backing			18	18	20.0%
lunate with bipolar backing			3	3	3.3%
Helwan lunate			3	3	3.3%
notched	3		1	4	4.4%
denticulate	1	4		5	5.6%
sidescraper	1			1	1.1%
total	**23**	**13**	**54**	**90**	**98.8%**

Table 11. Raw materials of the tools by blanks (ram – Ramot Menashe mediocre quality, DH – Deir Hannah good quality, NM – Nahal Mearot good quality, DC – Daliyat al-Carmel low quality, Chalcedony – good quality)

raw material	flake	blade	bladelet	total	%
RAM	16	8	13	37	41.1%
DH	3	2	21	26	28.9%
NM	3	2	18	23	25.6%
DC	1	1		2	2.2%
Chalcedony			2	2	2.2%
total	**23**	**13**	**54**	**90**	**100.0%**

Table 12. Raw materials of the tools by types

Type	RAM	DH	NM	DC	Chalcedony	total
endscraper	3	2				5
endscraper on retouched	1					1
carinated endscraper	1					1
nosed endscraper	2					2
angled burin	2			2		4
dihedral burin	1				1	2
transversal burin		1				1
borer		1				1
retouched	9		1			10
inverse retouched	1	1				2
marginally retouched	1	2				3
abrupt retouched	3	2	1			6
aurignacian blade	1					1
pointed	1		1			2
backed	1	2	2			5
arch backed		1				1
Kebara point	1					1
oblique truncated	2	3	1			6
trapeze-rectangle					1	1
trapeze	1					1
Lunate, unipolar backing	2	8	8			18
lunate with bipolar backing		2	1			3
Helwan lunate			3			3
notched			4			4
denticulate	3	1	1			5
sidescraper	1					1
total	**37**	**26**	**23**	**2**	**2**	**90**
%	**41.1%**	**28.9%**	**25.6%**	**2.2%**	**2.2%**	**100.0%**

During the excavation it was not possible to distinguish between Natufian layers and no burial pits were recognized. Consequently, as also shown by the micromorphological analysis, all lithics belong to the same geological unit. The lithic assemblage contains some intrusive elements from archaeologically earlier periods. These include twenty-eight Levallois cores and other types with abraded edges and surfaces, found in great numbers in the so-called "Middle to Upper Palaeolithic transitional" layers of Raqefet (Sarel 2004); Aurignacian types such as nosed and carinated endscrapers, the Aurignacian blade; and finally a single Kebaran point. In spite of these pieces, the outline of the above-described lithic assemblage retrieved from the graves fits well the Late Natufian industrial characteristics.

THE NATUFIAN FAUNAL ASSEMBLAGE FROM LOCUS 3 (R.Y. and G. B-O)

As part of our ongoing zooarchaeological and taphonomic study of material from the renewed excavation at Raqefet Cave, we conducted a preliminary study of the faunal remains from the Late Natufian burial area at Locus 3. Because the top sediments in this area of the cave underwent some mixture from historical periods (mainly Iron Age) we studied only the fauna retrieved from 200 cm below datum or deeper. We reviewed all bone bags from the 2008 season and recorded the relative frequency of mammal species according to teeth, which are well-preserved and readily identifiable. The presence of other, non-mammalian taxa was noted. Numerous identifiable bone fragments still remain unrecorded in the bags, and will form the basis for the ongoing comprehensive analysis.

Locus 3 yielded a rich faunal assemblage composed of all parts of the ungulate skeleton, usually fragmented, and numerous skeletal elements of small animals. Fragmentation of the ungulate bones is not intense, as some intact jaws with teeth, appendicular elements and complete limb-bone ends were found. Many bones were charred as a result of exposure to fire. Twenty teeth and jaw specimens were recorded (Table 13), belonging to mountain gazelle (*Gazella gazella*, 40% of NISP), roe deer (*Capreolus capreolus*, 15%), pine marten (*Martes foina*, 15%) and red fox (*Vulpes vulpes*, 10%). Mesopotamian fallow deer (*Dama mesopotamica*), aurochs (*Bos primigenius*), wild boar (*Sus scrofa*) and goat or sheep (*Capra/Ovis*) were represented by one specimen each. Many tortoise (*Testudo graeca*) shell and limb fragments were encountered, as well as legless lizard (*Ophisarus apodus*) jaws and numerous lizard and snake vertebrae.

Comparing the species representation at Locus 3 with other areas previously published for Raqefet (Table 13) shows its similarity to Locus 1. Both areas are rich in gazelle and deer bones, as well as small animal remains (tortoise, legless lizard, marten and fox). Large ungulates and caprines are scarce. The two loci may have belonged to a single Late Natufian burial area so the similarities are not surprising. Loci 1 and 3 differ from Locus 2, which is

rich in caprovine remains and is a Natufian layer disturbed by later occupations (Nadel *et al*. 2008). They also differ from Locus 5, in which a faunal assemblage associated with Kebaran industry was excavated in 2008. Locus 5 is richer in large ungulates and displays less small game (see above). Thus, Loci 1 and 3 could be pooled to represent the faunal spectrum utilized by the Natufians of Raqefet. This spectrum is similar to the previous analysis of Natufian fauna from the old excavation at the cave (Garrard 1980, Lengyel *et al*. 2005) and to other Natufian faunas from Mount Carmel and the Galilee (Bar-Oz *et al.* 2004, Munro 2004, Noy *et al*. 1973, Rabinovich 1998). However, typical woodland taxa, such as roe deer, boar and marten, seem to occur more frequently at Raqefet than at other nearby Natufian occupations. This is perhaps due to the relatively inner location of the cave within the maquis of Mount Carmel.

Table 13. Summary of Species composition (by teeth NISP only) in Loci 1-3 and 5. The context and dating are indicated

	Locus 1	**Locus 2**	**Locus 3**	**Locus 5***
	Natufian burial area	Mixed Natufian	Natufian burial area	Kebaran
	Nadel *et al*. 2008		Present Study	
Gazella gazella	22	11	8	17
Dama mesopotamica	1	1	1	8
Sus scrofa	3	1	1	3
Bos primigenius		1	1	present
Cervus elaphus				present
Capreolus capreolus	1	1	3	
Capra/Ovis		10	1	
Canis sp.	1			
Vulpes vulpes	2		2	1
Martes foina		1	3	1
Felis sp.				1
Fish	present			
Tortoise	present	present	present	
Lizard/Snake	present	present	present	
TOTAL MAMMALS	**30**	**26**	**20**	**31**

(*) Teeth only; see detailed NISP count above. Ungulates marked as 'present' are represented only by post-cranial elements.

The rich and well-preserved Late Natufian faunal assemblage from Raqefet provides an opportunity to study human utilization of animal resources at a small burial site, markedly different from large Natufian 'base camps'. The context of the animal bones, associated with

multiple human burials at a restricted area of the cave, is of prime interest here, given the recent evidence for placing animals within Natufian graves (Grosman *et al*. 2008). Some faunal remains unveiled during the 2008 season in Loci 1 and 3 seemed to be in their primary depositional context inside the graves, such as complete gazelle scapulae, gazelle and fallow deer jaws, and gazelle tarsals in articulation. It is conceivable that these isolated animal remains are associated with the Natufian deceased. This would explain why these skeletal elements did not suffer greatly from pre- and post-depositional bone fragmentation and loss of articulation. The ongoing faunal analysis will attempt to clarify the roles of these animal parts in relation to the human burials.

DISCUSSION

The sequence of occupations at the cave of Raqefet is long, as has already been established (e.g. Lengyel 2007; Lengyel *et al*. 2005; Nadel *et al*. 2008; Noy and Higgs 1971). It includes several layers belonging to the Upper Palaeolithic, as well as Kebaran and Geometric Kebaran layers (in addition to the widely documented Late Natufian presence at the site). These layers were all visible in the deep section made by the first excavators in the inner part of chamber 1, and some were visible in an additional test pit in the second chamber.

The finds from Locus 5 demonstrate, for the first time, the presence of a Kebaran layer in another part of the cave. Here, these remains are embedded in a hard tufa layer. They are well-preserved, and the densities of flints (including delicate bladelets and obliquely truncated backed points) and animal bones are high. This layer indicates that the Kebaran layer was not horizontal, and that it covered a larger area than previously known.

Furthermore, Kebaran and Geometric Kebaran microliths were abundant also in the mixed layer covering a large part of the first chamber. It is thus tentatively suggested that the Natufians cleared most (if not all) of the cave floor, in the first chamber. This was done in order to enable the carving of a variety of basins, mortars, cupmarks, and holes into the cave floor. Furthermore, the Natufian burials at the cave appear to be concentrated on the cave floor or very near it. This is probably the reason that the Early Epipalaeolithic layers were not preserved in most of the first chamber. They were only preserved further inside the cave, or in a narrow elevated area in the first chamber, separated from the main area of occupation and activities.

The burials at the northern side of chamber 1 are found in a dense concentration (Locus 1). In one narrow crevice and its immediate surroundings, 11 burials were unearthed. These were accompanied by large numbers and a wide variety of natural stones and worked stone implements. The repeated burial in the same place also caused damage to previous burials. The presence of bedrock mortars, cupmarks and tiny holes under and around this

concentration appears to be of some significance, potentially hinting at a certain correlation between the burials and specific bedrock features (e.g. Nadel and Lengyel 2009).

To the east of this unique place, another area rich with burials was excavated (Locus 3). Here, again, there are at least seven burials in a small area. And here, too, many stone implements of a wide variety are found associated and near the burials. As stated several times, the concentrations of burials and bedrock features in one part of the cave are unique to the site. In other Late Natufian burial places, the bedrock features are scarce or missing altogether (e.g. El-Wad Cave and Terrace – Garrod and Bate 1937; Weinstein-Evron 1998, 2009; Eynan – Perrot 1966; Valla *et al*. 1998; Valla *et al*. 2001; Hayonim Cave and Terrace – Belfer-Cohen 1988a,b; Valla *et al*. 1991; Hilazon Tachtit Cave – Grosman 2003; Grosman and Munro 2007).

The large quantities of flints found in the Natufian sediments may reflect a previous Natufian occupation phase at the site. We suggest that many of these flints are there as "background noise", attesting to a pre-burial layer rich with Natufian flints. Furthermore, the large quantities of cores and of all stages of the reduction sequence indicate that flint knapping at the site was common, before the utilization of the place for repeated burials. It is also noteworthy that many of the raw materials knapped at the site were brought from a variety of sources, some of which are several kilometers away.

The faunal remains, which are in the midst of a detailed research, already contribute in several ways. First, they suggest that the environment of Raqefet cave was somewhat more forested than the western side of Mt. Carmel. Second, the Natufians butchered and consumed at the site several species of ungulates (with an emphasis on the gazelle), as well as a variety of small species. Third, chosen skeletal parts were probably incorporated in several burials, where they were set by human limb bones or other parts of the body.

Of particular interest are the results of the micromorphological studies. We have described thin sections from tufa and hard crusts covering bedrock mortars in the cave and on the terrace, as well as thin sections of sediments from several loci. The details will not be repeated here (see above and also Nadel *et al*. 2008), but two aspects should be emphasized. First, these sections provide valuable data regarding site-formation processes, especially those creating the hard sediments. These Natufian cave tufas have not been the focus of any detailed study in the past, and their contribution to understanding the complex processes occurring in the caves during and after the Natufian occupation episodes are indeed important. Second, several samples contain charred plant material. As floral remains are frustratingly scarce in Natufian sites in the southern Levant, the potential of studying the microscopic plant remains appears to be very promising. It may also provide hints as to why the macro-botanical remains are so rare, though they are found in many earlier and later sites in the same ecological settings and even in earlier layers at the same caves.

The on-going analyses of the remains from Raqefet cave and terrace suggest that the site was occupied by a Late Natufian group(s), and then used for burial, especially in the first chamber. It is also possible that some of the earlier burials are contemporaneous with the occupation period. The variety of the bedrock features is unique in the Late Natufian settlement system, and is thus a focus of several detailed comparative studies. The flint and faunal assemblages provide insights into Late Natufian production technologies and hunting strategies. Though far from final, the results are provided so that at least preliminary comparative analyses can be conducted by all interested scholars.

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BIBLIOGRAPHY

Bar-Oz G. 2004. *Epipaleolithic Subsistence Strategies in the Levant: A Zooarchaeological Perspective*. ASPR Monograph Series, Boston: Brill.

Bar-Oz G. and Dayan T. 2002. “After 20 Years”: a taphonomic re-evaluation of Nahal Hadera V, an Epipalaeolithic site on the Israeli coastal plain. *Journal of Archaeological Science* 29: 145-156.

Bar-Oz G. and Dayan T. 2003. Testing the use of multivariate inter-site taphonomic comparisons: the faunal analysis of Heftziba in its Epipalaeolithic cultural context. *Journal of Archaeological Science* 30: 885-900.

Bar-Oz G., Dayan T. and Kaufman D. 1999. The Epipalaeolithic faunal sequence in Israel: a view from Neve-David. *Journal of Archaeological Science* 26: 67-82.

Bar-Oz G., Dayan T., Kaufman D. and Weinstein-Evron M. 2004. The Natufian economy at el-Wad Terrace with special reference to gazelle exploitation patterns. *Journal of Archaeological Science* 31: 217-231.

Belfer-Cohen A. 1988a. *The Natufian Settlement at Hayonim Cave. A hunter-gatherer band on the threshold of agriculture*. Unpublished Ph.D. Thesis, The Hebrew University, Jerusalem.

Belfer-Cohen A. 1988b. The Natufian graveyard in Hayonim Cave. *Paléorient* 14: 297-308.

Belfer-Cohen, A. and Goring-Morris, A. N. 2003. Current Issues in Levantine Upper Palaeolithic Research. In Goring-Morris, A. N. and Belfer-Cohen, A. (eds.), More Than Meets the Eye: Studies on Upper Palaeolithic Diversity in the Near East, pp.1-12. Oxford: Oxbow.

Bullock P., Fedoroff N., Jongerius A., Stoops G. and Tursina T. 1985. *Handbook for soil thin section description*. Wolverhampton: Waine Research Publication.

Courty M.-A., Goldberg P. and Macphail R. 1989. *Soils and Micromorphology in Archaeology*. Cambridge: Cambridge University Press.

Duday H., Courtaud P., Crubezy E., Sellier P. and Tillier A.-M. 1990. L'anthropologie de «terrain»: reconnaissance et interpretation des gestes funeraires. *Bulletins et Memoires de la Societe d'Anthropologie de Paris*. t.2(3-4): 26-49.

Garrard A. N. 1980. *Man-Animal-Plant Relationships during the Upper Pleistocene and Early Holocene*. Unpublished PhD Thesis, University of Cambridge.

Garrod D. A. E and Bate D. M. A. 1937. *The Stone Age of Mount Carmel*. Vol. I. *Excavations at the Wadi Mughara*. Oxford: Clarendon Press.

Goldberg, P. and R. I. Macphail 2006. *Practical and Theoretical Geoarchaeology*. Malden, MA: Wiley-Blackwell.

Grosman L. 2003. Preserving cultural traditions in a period of instability: The Late Natufian of the Hilly Mediterranean Zone. *Current Anthropology* 44: 571-580.

Grosman L. and Munro N. D. 2007. The sacred and the mundane: domestic activities at a Late Natufian burial site in the Levant. *Before Farming* 4: 1-14.

Grosman L., Munro N. D. and Belfer-Cohen A. 2008. A 12,000-year-old shaman burial from the southern Levant (Israel). *Proceedings of the National Academy of Sciences* 105: 17665-17669.

Lengyel G. 2007. Upper Palaeolithic and Epipalaeolithic Lithic technologies at Raqefet Cave, Mount Carmel East, Israel. (BAR International Series 1681). Oxford.

Lengyel G. and Bocquentin F. 2005. Burials of Raqefet Cave in the context of the Late Natufian. *Journal of the Israel Prehistoric Society* 35: 271-284.

Lengyel G., Nadel D., Tsatskin A., Bar-Oz G., Bar-Yosef Mayer D. E., Be'eri R. and Hershkovitz I. 2005. Back to Raqefet Cave, Mount Carmel, Israel. *Journal of the Israel Prehistoric Society* 35: 245-270.

Marder O. 2002. *The Lithic Technology of Epipalaeolithic Hunter-Gatherers in the Negev: The Implications of Refitting Studies*. Unpublished Ph.D. Thesis, The Hebrew University, Jerusalem.

Munro N. D. 2004. Zooarchaeological measures of hunting pressure and occupation intensity in the Natufian: implications for agricultural origins. *Current Anthropology* 45: S5-S33.

Nadel D., Lengyel G., Bocquentin F., Tsatskin A., Rosenberg D., Yeshurun R., Bar-Oz G., Bar-Yosef-Mayer D. E., Beeri R., Conyers L., Filin S., Hershkovitz I. Kurzawska A. and Weissbrod L. 2008. Raqefet Cave: the 2006 Excavation Season. *Journal of the Israel Prehistoric Society* 38: 59-131.

Nadel D. and Lengyel G. 2009. Costly signaling in the Late Natufian: Human-made Bedrock Holes (mortars and cupmarks) as a social phenomenon. *Archaeology, Anthropology and Ethnology in Euroasia.*

Nadel D., Rosenberg D. and Yeshurun R. 2009. The deep and the shallow: The role of Natufian Human-made Bedrock Holes (HBHs) at Rosh Zin, Central Negev, Israel. *BASOR*.

Noy T. and Higgs E. S. 1971. Raqefet Cave. *Israel Exploration Journal* 21: 225-226.

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

Olami Y. 1984. *Prehistoric Carmel*. Jerusalem and Haifa: Israel Exploration Society and M. Stekelis Museum of Prehistory.

Perrot J. 1966. Le gisement Natoufien de Mallaha (Eynan), Israel. *L'Anthropologie* 70 (5-6): 437-484.

Rabinovich R. 1998. Taphonomical aspects of the recent excavations at El-Wad (appendix III). In

Weinstein-Evron M. (ed.), *Early Natufian el-Wad revisited*, pp. 199-224. Liege: ERAUL 77.

Sarel J. 2004. The Middle-Upper Paleolithic Transition in Israel (BAR International Series 1229). Oxford.

Valla F. R., Le Mort F. and Plisson H. 1991. Les fouilles en cours sur la Terrasse d'Hayonim. In Bar-Yosef O. and Valla F. R. (eds.), *The Natufian Culture in the Levant*, pp. 93-110. Ann Arbor: International Monographs in Prehistory, Archaeological Series 1.

Valla F. R., Khalaily H., Samuelian N., Bocquentin F., Delage C., Valentin B., Plisson H., Rabinovich R. and Belfer-Cohen A. 1998. Le Natufian final et les nouvelles fouilles a Mallaha (Eynan), Israel 1996-1997. *Journal of the Israel Prehistoric Society* 28: 105-176.

Valla F. R., Khalaily H., Samuelian N. March R., Bocquentin F., Valentin B., Marder O., Rabinovich R., La Dosser G., Dubreuil L. and Belfer-Cohen A. 2001. Le Natufian final de Mallaha (Eynan), Deuxième repport préliminaire: Les fouilles de 1998-1999. *Journal of the Israel Prehistoric Society* 31: 43-184.

Weinstein-Evron M. 1998. *Early Natufian el-Wad Revisited*. Liege: ERAUL 77.

Weinstein-Evron M. 2009. *Archaeology in the Archives. Unveiling the Natufian Culture of Mount Carmel*. ASPR Monograph Series. Boston: Brill.