

# New Prehistoric Cave Sites in Lower Nahal Oren, Mt. Carmel, Israel

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## ABSTRACT

*A 22-square km forest fire in Mt. Carmel (December 2010) opened new opportunities for surveying unexplored parts of the western slopes of Mt. Carmel. During the first year of exploration we found more than 30 sites, dating to various historic and prehistoric periods. Among these, we found several Late Natufian sites in Lower Nahal Oren, around the famous site with the same name.*

*The current paper describes the sites and provides details regarding their characteristics and the variety of surface finds. In particular, we found in all the sites described here a variety of bedrock mortars and cupmarks. These are used as chronological markers, indicating that most sites are Late Natufian, while a couple have also typical Pre-Pottery Neolithic A bedrock features.*

*Together, these finds place the Lower Nahal Oren Natufian Complex as a unique phenomenon in two ways. First, it has the highest reported density of Late Natufian sites in the Mediterranean Levant. Second, it provides the only Late Natufian – PPNA sequence in Mt. Carmel where structures of the latter are built directly above layers of the former. Both aspects indicate that this complex was of particular importance for communities of both periods, who continuously used its' central site as a focal location.*

## INTRODUCTION

A new concentration of Natufian and PPNA cave sites was recently found in Lower Nahal Oren, on the western slopes of Mt. Carmel (Figs. 1-3). The setting and density of Late Pleistocene sites in a small area (<0.5 square km) make this location unique on a regional scale.

Mt. Carmel is renowned for some of its prehistoric cave sites, especially with reference to the Lower and Middle Palaeolithic periods, and the Natufian culture. Excavations at sites such as Tabun, Skhul, Kebara and El-Wad caves began more than 80 years ago and immediately became land marks in Middle Eastern prehistoric research (Bar-Yosef and Garfinkel 2008; Belfer-Cohen and Bar-Yosef 1999; Garrod 1954, 1957; Garrod and Bate 1937; Ronen 1982; Turville-Petre 1932; Weinstein-Evron 2009).

Additional cave sites, as well as open-air sites, establish Mt. Carmel as having one of the longest prehistoric sequences for any part of the world, beginning with the lower layers of Tabun (probably more than 400,000 years old) and ending with the Chalcolithic period (6000 years ago). Furthermore, so far ca. 280 prehistoric sites were documented in an area of 232 square kilometers, reflecting the rich local resources on the one hand, and the continuous and sometimes intensive habitation of the area on the other (Olami 1984).

The early excavations at Shuqba and Kebara caves, and especially at El-Wad (Garrod 1932, 1942, 1957; Garrod and Bate 1937), already established the Natufian as a focal culture for understanding Late Pleistocene adaptations in general, and specifically the earliest shift to sedentary life coupled with domestication of cultigens and finally to agriculture-based economy.

Following the early phase of field work (late 1920's and early 1930's), research projects in Mt. Carmel can be divided into three very broad categories. The first is the renewed excavations at some of the important sites. These excavations are still on-going in several cases (e.g. Tabun until recently: Ronen 1991; El-Wad: Weinstein-Evron 2009), or were carried out mostly between the 1960's and the 1990's (e.g. Kebara: Bar-Yosef *et al.* 1992; Nahal Oren: Noy, 1989; Noy *et al.* 1973; Tabun: Jelinek 1982).

The second category of projects includes surveys focused on prehistoric sites. The most comprehensive was carried out by Olami, who found 283 sites in Mt. Carmel and its coastal plain (Olami 1984). Later works focused on specific issues, such as flint sources used by prehistoric groups (Delage 2007; Druck 2004). Furthermore, surveys of the Israel Antiquities Authority also took place, documenting all sites in a given 10X10 km map. However, the contribution of the latter works in terms of finding additional prehistoric sites was limited (see for example Olami *et al.* 2004; Ronen and Olami 1978).

The third category includes excavations at sites not belonging to the first 'wave' of work at Mt. Carmel, most of which are caves. These were known from the 1940's onwards, or found in the above-mentioned surveys. Examples include (from north to south) Tirat-Carmel

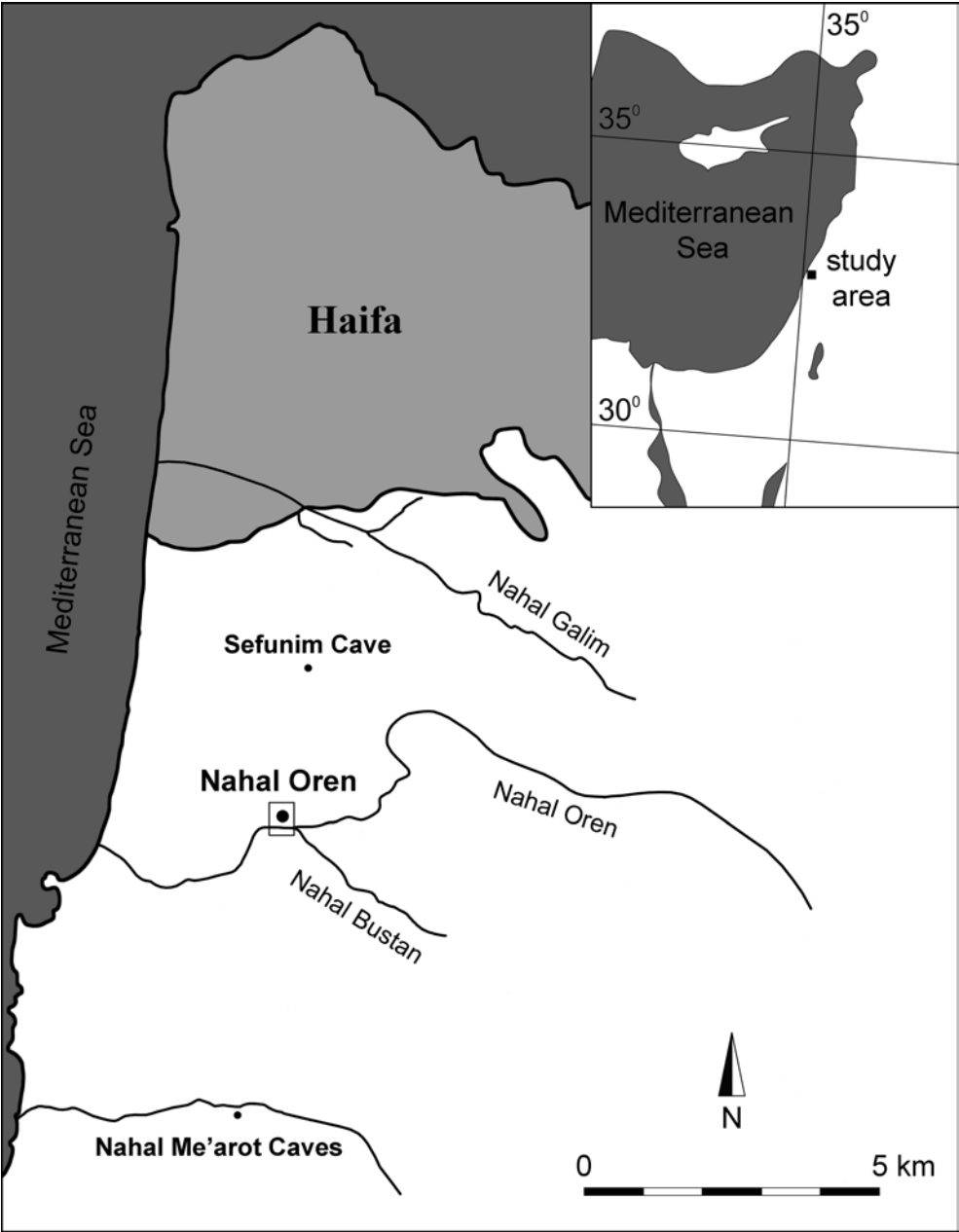


Fig. 1: Location map of the study area

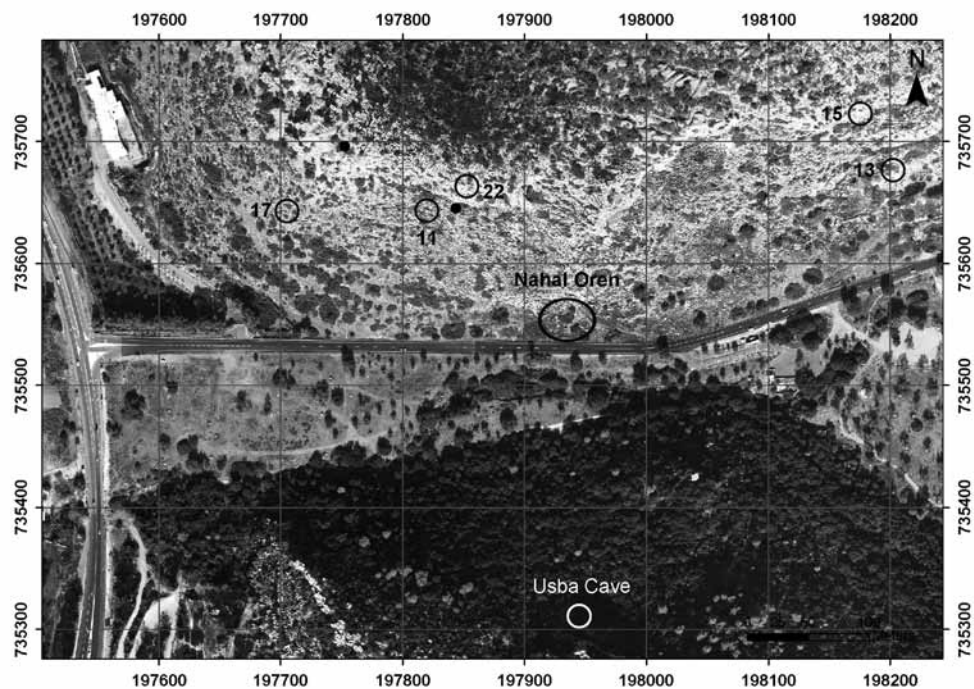


Fig. 2: An aerial photo of Lower Nahal Oren, at the exit to the coastal plain. Note the difference between the north-facing slope (covered by trees, bottom) and the barren south-facing slope (top)



Fig. 3: The northern escarpment of Lower Nahal Oren, looking north-east. Note the size of the Nahal Oren site, and the location of the smaller cave sites. Site 17 is out of photo, to the left

(Ronen 1974); Ornit (Olami 1965); Misliya (Weinstein-Evron *et al.* 2003); Nahal Oren (Noy 1989; Noy *et al.* 1973; Stekelis 1942; Stekelis and Yizraeli 1963) and Raqefet (Lengyel *et al.* 2005; Nadel *et al.* 2008, 2009a; Noy and Higgs 1971). Note that all but the latter are on the western slopes of Mt. Carmel.

Returning to the surveys, one thing was missing on all of the reported site maps. That is, the demarcation of the exact areas where the surveys were not conducted due to the thick and sometimes impenetrable vegetation cover of the landscape. Thus, when one looks at distribution maps of sites according to period or type, the picture is biased and usually north-facing slopes are less represented.

A devastating forest fire in Nahal Oren and its environs (December 2010) exposed large parts of this prominent drainage system, burning all vegetation. An immediate prehistoric survey was launched thereafter, using the opportunity to look at places where visibility was previously very limited. We focus here, as a preliminary report, on a concentration of new (recently found) cave sites in Lower Nahal Oren, with their flint samples and bedrock features.

## THE RENEWED SURVEY

Several large-scale fires occurred in Mt. Carmel in recent years. However, only after the December 2010 fire (total area – 22 square km) did we seize the opportunity to re-survey a chosen sector of the burnt area. We aimed at Lower Nahal Oren as the first case study (Figs. 1-3), for two reasons. The first was practical, as here the pine cover was low (some patches) and thus the vegetation recovery would be very quick. Other places, covered by burnt pines, would recover slowly giving us time to reach them later on the survey. The second reason was research interest, as the surroundings of the Nahal Oren site looked particularly promising.

In terms of field methodology, the actual survey turned out to be very slow due to the strategy of inspecting the terrain in a very detailed manner. We walked the slopes, the wadis and the tops of the hills with only a few meters between the participants (ranging between 3 to 10 m, according to topography and visibility). We walked all possible terrains, except for vertical cliffs.

Furthermore, we surveyed the slopes for small-scale surface scatters of flint, the rationale being that there are hardly any natural flint exposures on the slopes of Lower Nahal Oren (mostly hard limestone, Muhraqa Formation; Segev and Sass 2009 and see below), and thus each flint scatter or concentration would probably represent past human activities. Due to the steepness of the slopes, it is to be expected that such sites, if present, would be severely eroded and thus the assemblages small and under-represented. Indeed, several occurrences were located on the slopes, and a large one was identified on the top of the Nahal Oren ridge. As these are under study and not the focus of this report, their details will be presented elsewhere.

All rock-shelters and caves were thoroughly studied. We surveyed their interiors and their terraces, looking for potential material remains. Site documentation included a series of observations, a set of photos, and the drawing of plans and sections. Flint samples were collected from the surface, separating the finds from the cave and terrace. It should be pointed out that in most cases the bedrock cave floors were exposed, with no excavation potential. However, in some sites there is promising anthropogenic sediment on the terrace.

## NATUFIAN AND PPNA BEDROCK FEATURES

The most obvious remains in five new cave sites were bedrock features. These include a variety of mortars, cupmarks and small holes. As in some cases these were the only dateable remains, a note on their chrono-cultural aspects is relevant.

The range of types and dimensions is wide and past utilization of all types is yet to be established. Thus, the general terms ‘bedrock features’ and ‘human-made bedrock holes’ are used (see Nadel and Lengyel 2009 for discussion). Following previous works in Natufian and PPNA sites, and especially our work at Raqefet cave (Nadel *et al.* 2008, 2009a), Rosh Zin (Nadel *et al.* 2009b) and Huzuk Musa (Rosenberg *et al.* 2010; Nadel and Rosenberg in press), a general chrono-cultural affiliation of types is now established. Relevant here are two basic rules-of-thumb:

- a) The only prehistoric culture in the Mediterranean southern Levant with a wide range of types, from tiny holes (several cm across) to deep narrow cylindrical and funnel-shaped mortars (usually 20-50 cm deep) is the Late Natufian;
- b) The only prehistoric culture in the Mediterranean southern Levant with concentrations of cupmarks (usually about 5-15 cm across and a similar depth) on rock exposures and even on slabs set on floors of dwelling structures is the PPNA (in the Negev these are also found in Harifian sites; see Goring-Morris 1987; Rosenberg and Nadel 2011a). When found together, these are very dense, sometimes only a few cm apart from each other.

As will be shown below, the new cave sites found in the survey all belong to either the Late Natufian or the PPNA. The bedrock features themselves were documented by extensive photography, as well as hand drawings (plans and sections). In some sites we used photogrammetry in order to construct high-resolution 3D models of the features.

The sites were marked on a detailed map and on high-resolution aerial photos, taken after the forest fire. GIS applications will be used in the final analysis of survey results. Geological and geomorphological aspects are addressed throughout fieldwork, and site location is studied in these terms, too. There follows an abstract of the geological setting, before the sites are presented.

## THE GEOLOGICAL SETTING

The study area is located within the Nahal Oren drainage system (36 km<sup>2</sup>), near its exit to the Coastal Plain. The wadi has a narrow and steep V-shaped cross section, associated with the steep morphology of the western Carmel escarpment.

Lithologically, Mt. Carmel is composed of Cretaceous carbonate rocks – limestones, dolomites, chalks and marls (Karcz 1959; Segev and Sass 2009), as well as volcanic deposits. The area is intensively dissected by faults, fractures and joints, some of which have developed karstic features.

The slopes of Lower Nahal Oren are composed of bioclastic limestone of the Bina Formation (Muhraqa Member), characterized by massive layers with karstified inter-beds and a dense network of karstified fissures (Segev and Sass 2009). The lower part of the slope below Abu Usba Cave and eastward is characterized by Shefeya volcanics underlain by carbonate rocks of the Arqan Formation, both of Cenomanian age, giving rise to a wider, more gentle valley-bottom. The beds dip ~8 degrees westward.

Cliffs have formed mainly along the upper half of the slopes, where the limestone comprises an indurated Turonian reef deposit with abundant rudist fossils. Most caves developed within this hard, cliff-forming limestone. Three-dimensional spongework morphology seems to reflect the initial void pattern of the reef. While forming, the caves were isolated from surface flow, comparable to central Israel caves (Frumkin and Fischhendler 2005). Following the uplift of Mt. Carmel, the caves were dewatered from ground water. The downcutting of Nahal Oren breached the caves, creating entrances which facilitated human habitation. In spite of these modifications, cave morphology seems relatively stable over the last 15,000 years.

In terms of available water, the caves are dripping mainly during the wet winter and spring seasons, but there are some perennial drips. The drips have a relatively low discharge though fluctuations are considerable (Arbel *et al.* 2010). Within Mt. Carmel ridge, Nahal Oren catchment has the richest perennial water sources, with 14 small springs which probably sustained water flow along the stream, below the sites discussed here (Wittenberg *et al.* 2007, Fig. 1).

## THE LOWER NAHAL OREN CAVE SITES

### I. The Nahal Oren Late Natufian-PPNA Site

The most famous and largest Late Natufian site in the study area is the Nahal Oren site. It is located lower than all other cave sites here, 60 m above msl. Most of the bedrock floor in the cave is exposed, and thus archaeological work focused on the terrace where the excavators found a Late Natufian graveyard and a PPNA hamlet. A Kebaran layer was also revealed, and Upper Palaeolithic remains were found in a limited test pit (Bar-Yosef 1970; Noy 2002).

Stekelis was the first to test the site (Stekelis 1942). He later excavated again with Noy (Yizraely) in the 1950's, exposing a large Late Natufian graveyard and a PPNA hamlet (Stekelis and Yizraely 1963). The last excavations were conducted by Noy and colleagues (Noy *et al.* 1973; see Nadel *et al.* 1997 for additional work).

Stekelis and Noy distinguished two Natufian phases on the terrace; in the earlier they identified a stone walled camp and a graveyard near it (Stekelis and Yizraely 1963), while in the later they reported a dwelling structure. Somewhat different subdivisions were later proposed (Noy 1989; Grosman *et al.* 2005). Until the final stratigraphic report is published, the particular sub-phase(s) of the graveyard remains somewhat obscure, though it is definitely Late Natufian.

The Natufian occupation and graveyard are characterized by human burials, hearths and a variety of stone installations (Fig. 4). There were 45 individuals in the excavated burials (Crognier et Dupouy-Madre 1974; Noy 1989; Stekelis and Yizraely 1963). Bocquentin studied 44 skeletons of which 31 were adults, 8 infants/young children and 5 children/adolescents (2003: 168-186, Fig. 69). A large hearth was surrounded by big stone slabs, with a total diameter of ca. 1 m and an ash deposit 0.5 m thick (Stekelis and Yizraely 1963: 11). Several skeletons were placed near and around this hearth, some directly associated with



Fig. 4: The Nahal Oren large stone-lined hearth in the Late Natufian graveyard, with nearby human burials and stone features (courtesy of the Institute of Archaeology, The Hebrew University of Jerusalem)



the stone slabs (Bocquentin 2003; Crognier et Dupouy-Madre 1974; Ferembach 1977; Noy 1989; Stekelis and Yizraely 1963). The burials are typical Late Natufian; they are all flexed and none are decorated (Belfer-Cohen 1995; Bocquentin 2003).

Stone objects were very common in the cemetery, of which ‘boulder mortars’ (some were termed ‘stone pipes’) are conspicuous (Nadel and Rosenberg 2010; Nadel and Rosenberg 2011; Noy 1989). The reports include a description of a wall “built of dry stone blocks and large mortars which at that time were no longer used for domestic or ritual purposes” (Noy 1989; Stekelis and Yizraely 1963: 11). Several limestone mortars were set vertically, protruding ca. 20 cm above the surface, in most of the burial pits (Stekelis and Yizraely 1963: 11; Pl. 3: b-c). They were described as “about 70 cm high, roughly shaped on the outside and pierced through the bottom”. Stekelis and Yizraely (1963: 12) suggested that they may represent Natufian beliefs, regarding afterlife. They also suggested that they may have been tombstones. At least one of these was found to be “part of the stone structure surrounding the grave” (Noy 1989: 56). Most of the mortars have a breached base with a deliberately shaped hole at the bottom (see Nadel and Rosenberg 2010 Fig. 12).

Recently we found in the cave three bedrock mortars, one of which appears to be particularly deep with a stone firmly set in its shaft. A similar phenomenon was recorded for a deep bedrock mortar at Raqefet cave (Nadel *et al.* 2009a) and for several mortars at Rosh Zin (Nadel *et al.* 2009b). Several bedrock features were also observed on the terrace, above the Natufian graveyard.

Four terraces were leveled on the slope below the Cave, accommodating 14 stone structures, comprising the only known PPNA hamlet in Mt. Carmel. Many structures had a hearth, stone slabs with cupmarks and limestone platters/bowls on their floors (Stekelis and Yizraely 1963; Rosenberg 2008; Rosenberg and Nadel 2011a).

## II. The Usba Cave

Usba cave is the only cave site discussed here to be located on the south bank of the Nahal Oren canyon; it is 90 m above the wadi floor, 140 m above msl and *ca.* 250 m from the Nahal Oren site (Fig. 1). It is the largest cave in the study area, and one of the largest in Mt. Carmel. The site was excavated by Stekelis in the early 1940’s. He found here a rich Middle Palaeolithic layer and Late Natufian remains, of which the most apparent were flint implements (Stekelis 1942, 1943; Stekelis and Haas 1952). The latter include lunates and products of the micro-burin technique. Neolithic and Ghassulian flints and pottery shards were mixed with the Natufian assemblage. This mixture was erroneously interpreted by Stekelis as an archaeological entity, the ‘Usbian’. Thus, for a long time the site was excluded from most Natufian discussions and syntheses (though see Weinstein-Evron 1998: 177, for a rare differing attitude). Indeed, no Natufian *in situ* features (structures, graves) were reported from the site.

In our reconnaissance work at Usba cave we encountered six bedrock features (Fig. 5). The deepest was found near the entrance. It is badly eroded but a complete longitudinal section of a deep (*ca.* 30 cm) narrow mortar is preserved. Another wide mortar was found on a rock ledge, with breccia adhered to the bottom. One funnel-shaped specimen, carved into a boulder and split by half was also documented on the terrace. Three small specimens were found in a high niche near the cave. Typologically, these appear to belong to the Late Natufian, though the small ones could also belong to the PPNA.

### III. The new cave sites

During our survey of the northern escarpment of Lower Nahal Oren, we found five caves with remains that are tentatively dated to the Natufian and PPNA (Figs. 1-3). They were visited in previous surveys, but not reported as prehistoric sites. They are all only a few minutes' walk from the Nahal Oren site, and up to tens of m higher (Figs. 2, 3). The new sites have bedrock features in the caves and also on the terrace outside one cave. Their serial numbers follow the order of discovery during the survey, and they are hereby described from west to east.

Noteworthy, we found small patches of worked flints on the slopes near and under the sites discussed here. These can be interpreted in two alternative ways. The first suggests that they



Fig. 5a

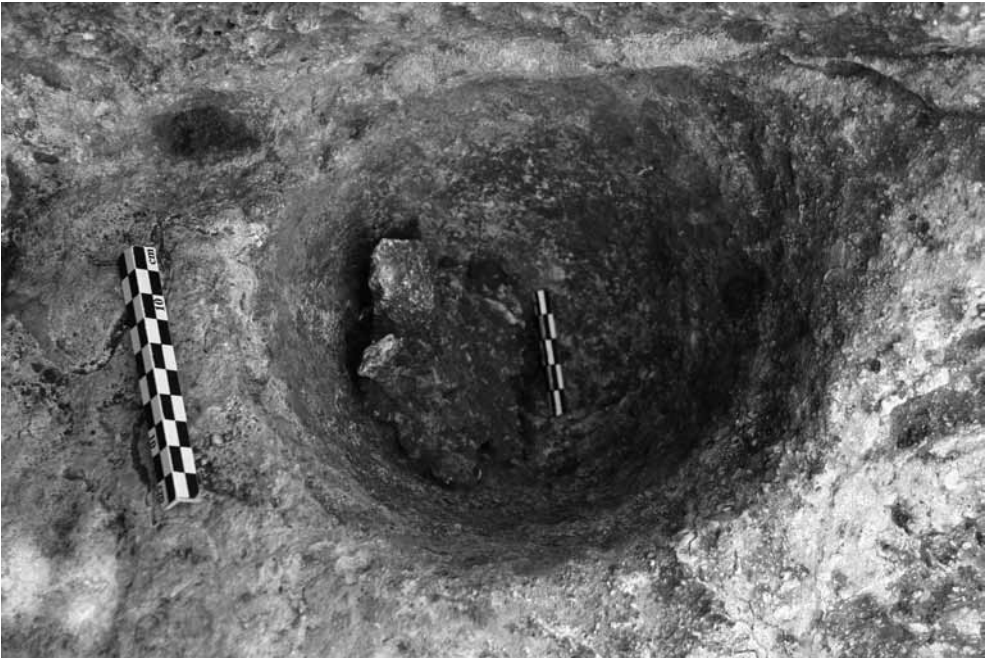


Fig. 5b



Fig. 5c



Fig. 5d: Bedrock and boulder features at the terrace of Usba cave, all found in the current survey and never reported before. A) A broken boulder mortar, B) A wide bedrock mortar, C) A couple of cupmarks, D) A deep narrow mortar, in an advanced state of erosion. Scales in cm

represent material washed down the slopes from the plateau above (where there is a larger open-air site). The second suggests that the flint occurrences represent local flint knapping, at and especially near the cave sites. This site and the small flint assemblages collected from the slopes are under study. Once all assemblages are analyzed, it may be possible to test these two hypotheses.

### Site 17

A small cave facing southwest, 80 m above msl (Figs. 2, 6). It has an uneven floor, steeply inclined outward. The cave is ca. 4 m wide across at the entrance, and almost 3 m deep. The ceiling is irregular and high, almost 4 m at the entrance. The terrace is covered by vegetation, and it was not possible to look for bedrock features on rock exposures out here, or even collect flint. In the cave there is one mortar hewn into the floor, with a small adjacent shallow cupmark (Fig. 7). The large mortar had a few elongated stone fragments, found lying horizontally near the bottom (Figs. 8, 9). It is 30 cm deep and ca. 20 cm across at the rim. The small cupmark is 8 cm across and 5 cm deep. The size of the two features and their proximity are very similar to settings documented at Late Natufian Raqefet cave (Nadel and Lengyel 2009) and Rosh Zin (Nadel *et al.* 2009b).

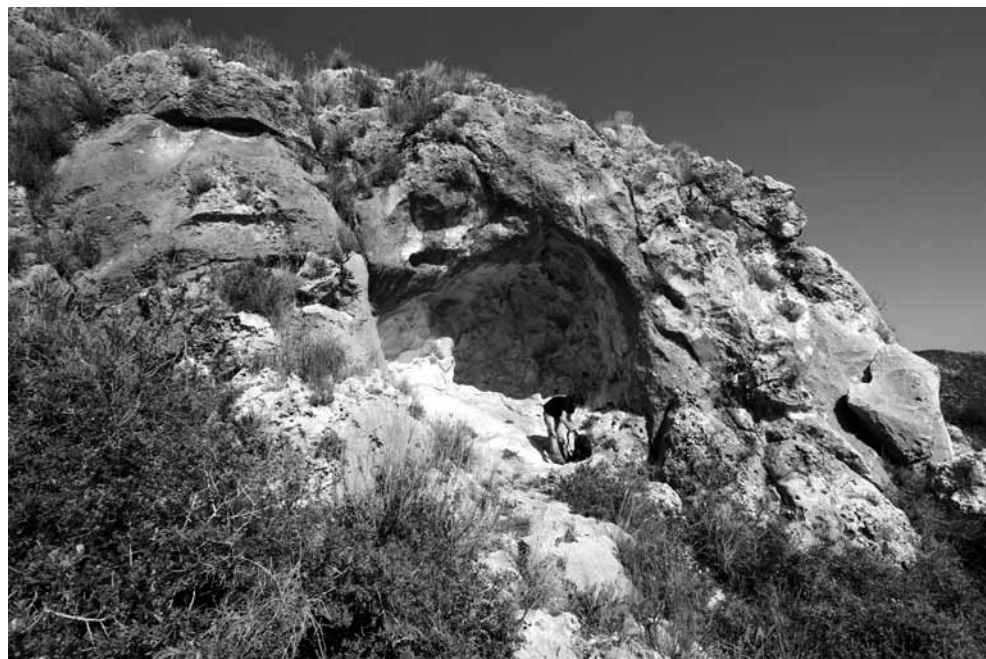


Fig. 6: Site 17 looking east. The bedrock features are on the floor, to the left of the person

### Site 11

A cave facing south, located at 103 m above msl (Figs. 2, 3, 10). There are two main chambers, the first is 2.5 m wide at the entrance, 5.5 m deep with an irregular ceiling ca. 2.5 m high (Fig. 11). The floor of the inner chamber is lower. The floor in the first chamber is more or less horizontal, with six bedrock features. In the nearby cliff, to the east of the site, there are several smaller cavities. There are several bedrock exposures on the terrace, as well as a large wall.

There are two bedrock mortars at the entrance, one on each side (Fig. 11). Further inside there are four specimens. Three of the mortars have a stone in their shafts (Figs. 12, 13). The phenomenon of setting an isolated stone firmly in a narrow shaft is known from Raqefet cave and Rosh Zin, as well as at the Nahal Oren cave (see above). The variety of types and the three cases of stones in the shafts suggest this is a Late Natufian site.

### Site 22

A cave situated immediately and above site 11, at 110 m above msl (Figs. 2, 3, 10, 14). It is the largest of the new caves above Nahal Oren (Fig. 15). The eastern chamber has an irregular eroded floor, with various levels. It is about 4 m across, 2-3 m deep, with several ledges and small cavities around it. A narrow passage leads to a larger chamber to the west. The terrace is wide, with high potential for excavation.

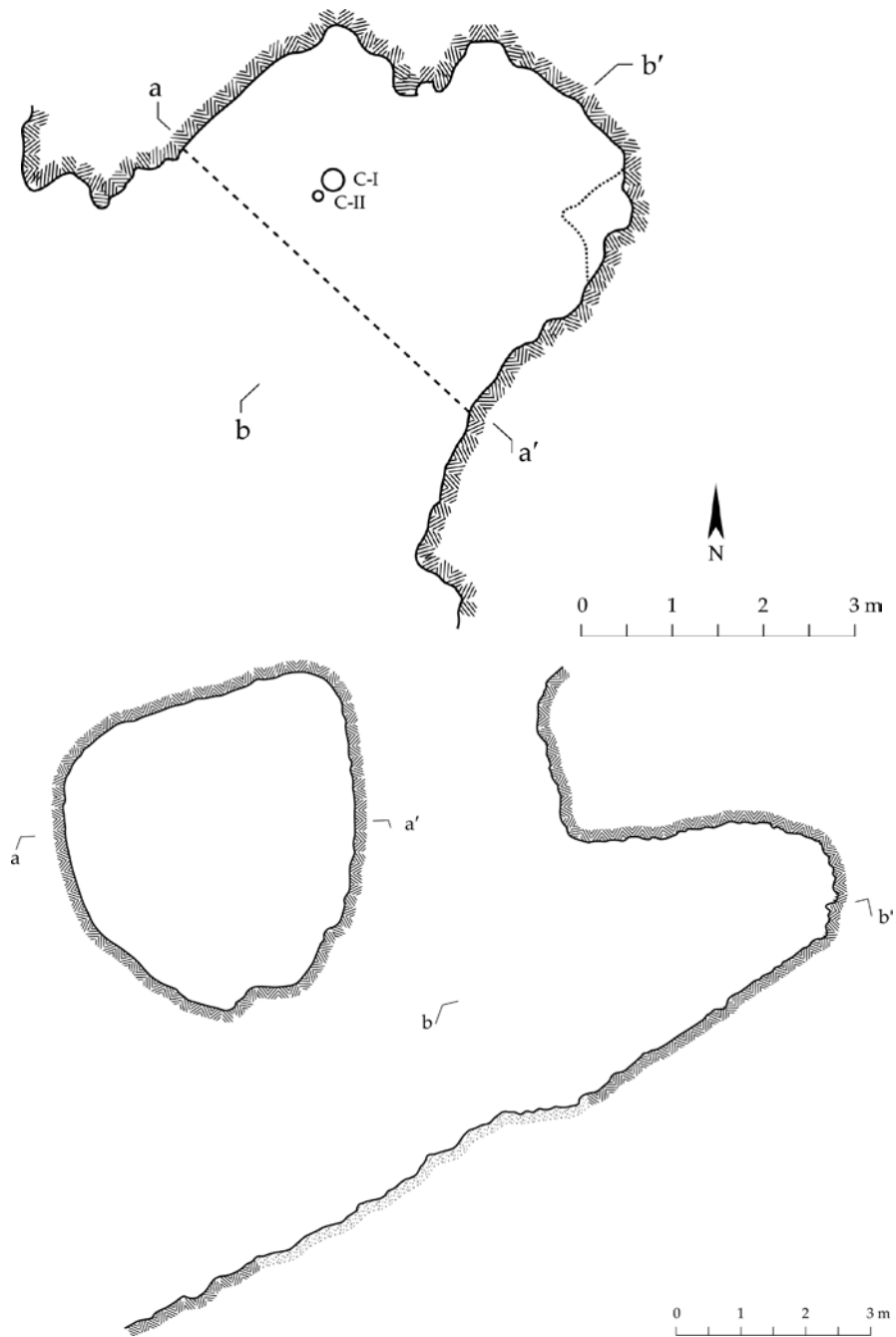


Fig. 7: Site 17. A) Plan of site, with location of bedrock features (top). B) Cross sections at the site (bottom)

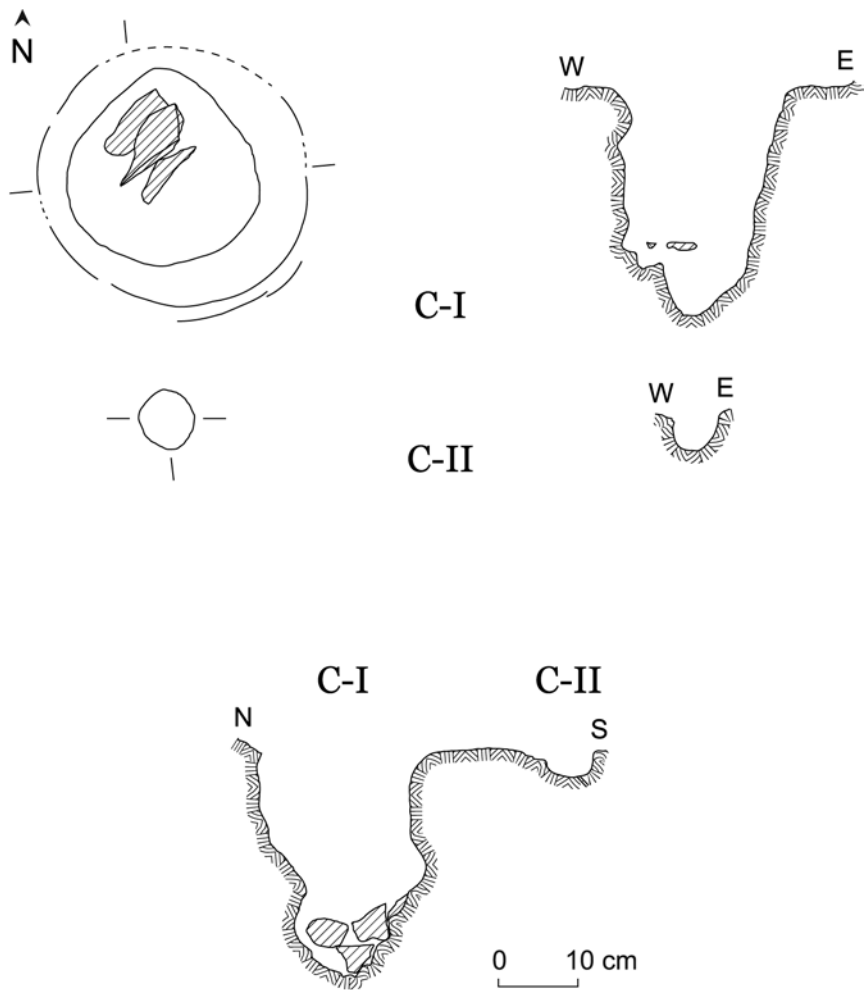


Fig. 8: Bedrock features, site 17. Note the stones found near the bottom of the large mortar (C-I)

The bedrock features in the cave include one mortar (C-I; C for cave features, T for terrace features) (Fig. 16) and one possibly eroded specimen (C-II). The top of the C-I mortar is eroded and missing; it is currently 20 cm deep, with a stone in the shaft (Fig. 17). There are three shallow cupmarks in the western chamber, very close to one another (C-III, C-IV, C-V) (Fig. 18). This concentration appears to be of PPNA origin, judging by the size of the features and their density.

There are two bedrock mortars on the terrace. The first (T-I) is a cracked mortar 20 cm deep and 20 cm across, set on a rock exposure (Fig. 19). The bottom is round and well-preserved,



Fig. 9: The deep mortar (C-I) on the floor of site 17. Note stones inside (scale bar – 20 cm)



Fig. 10: A general view looking up-slope at sites 11 and 22. The arrow marks the location of an isolated bedrock mortar (site 12)



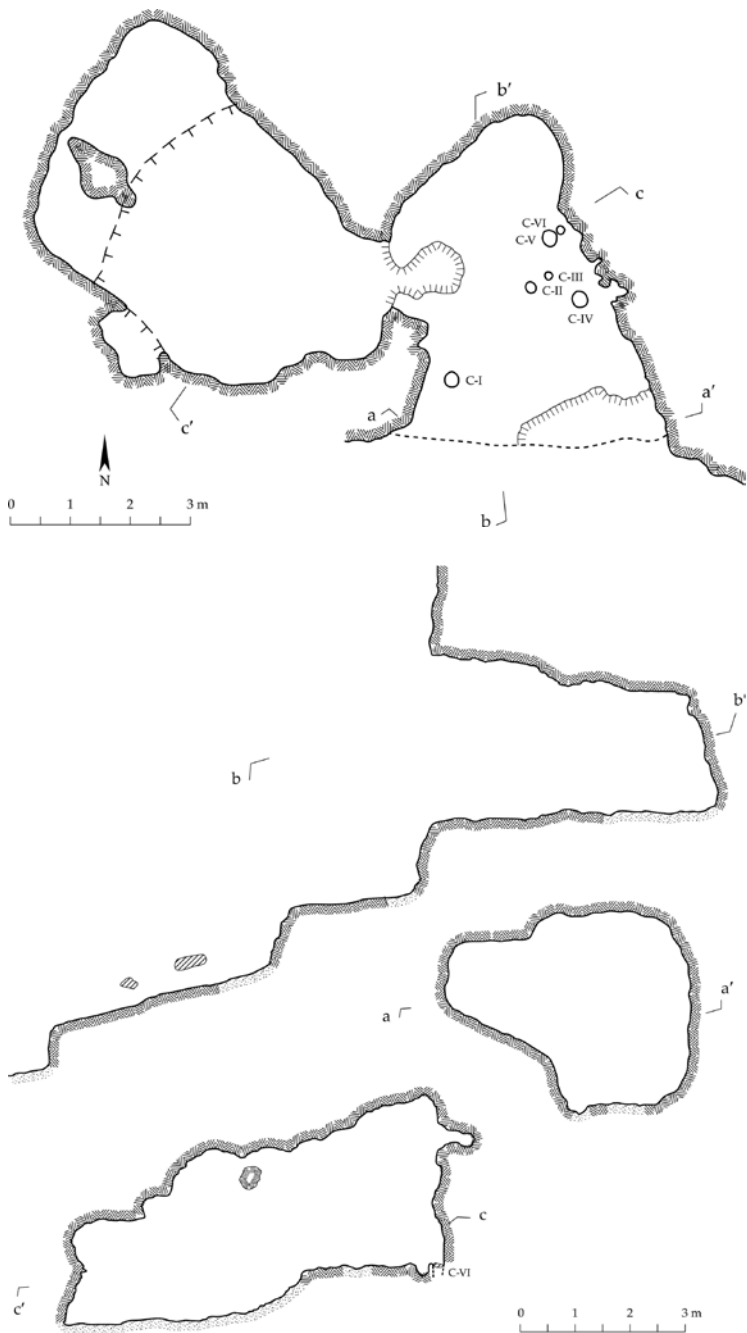


Fig. 11: Site 11. A) Plan of the site, with the location of six bedrock features in the eastern chamber (top). B) Cross sections at the site (bottom)

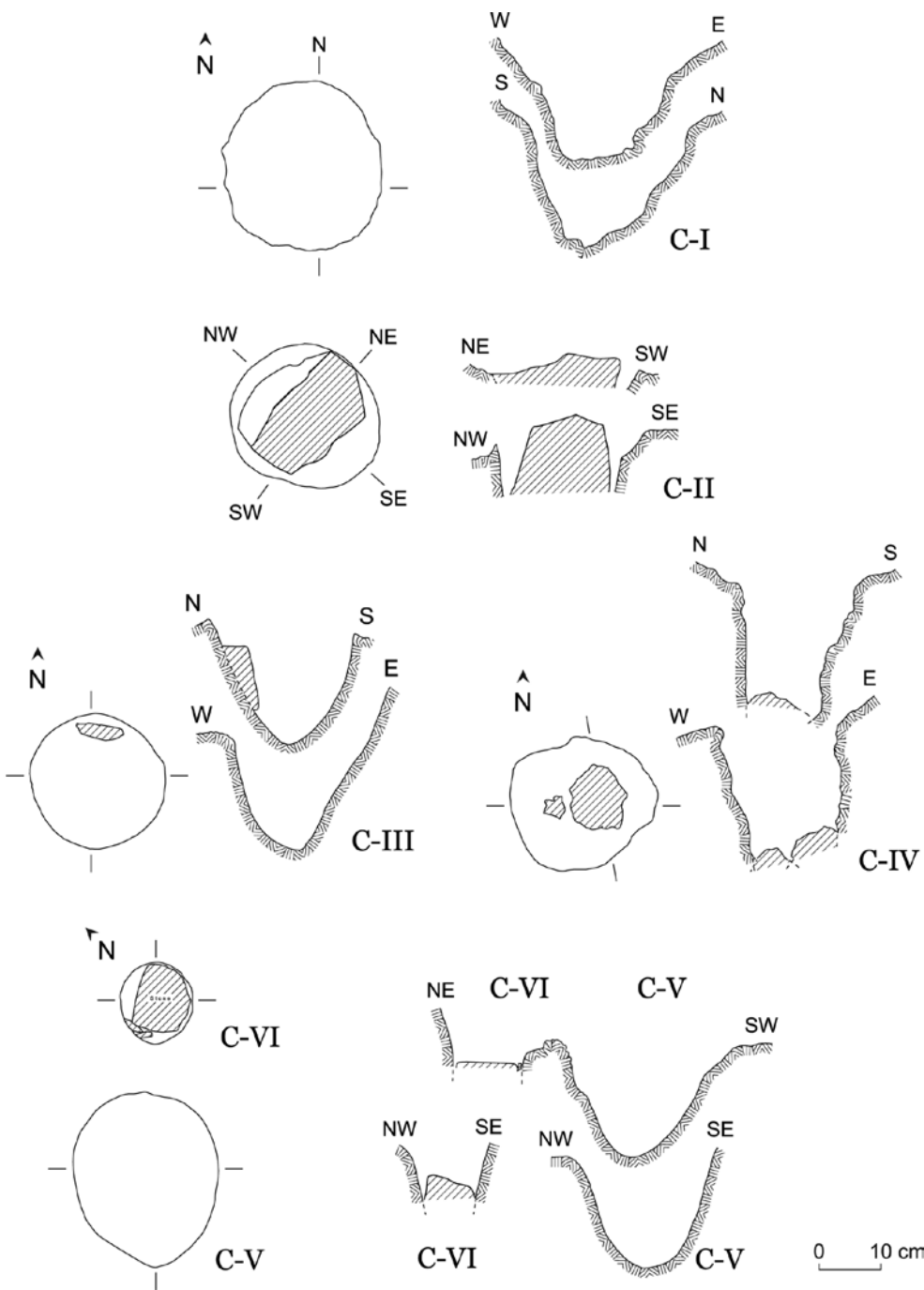


Fig. 12: Bedrock features at site 11. Note the stones in the shafts



Fig. 13: Two bedrock features at site 11, with a stone set in the shaft of one (left). Scale 10 cm



Fig. 14: A general view of site 22, looking north north-west. The person is standing by the eastern entrance



Fig. 15a: Site 22. Plan of site and terrace

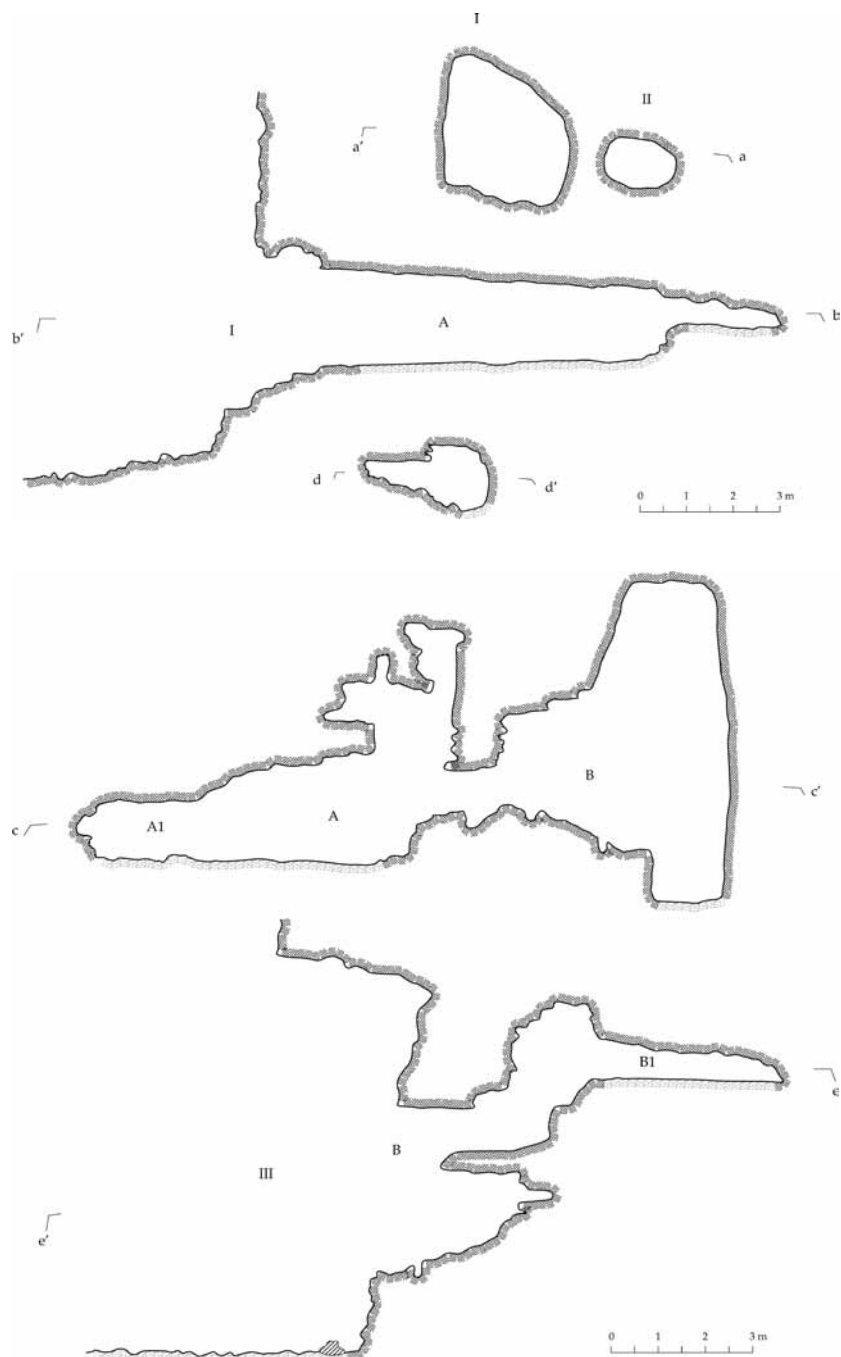


Fig. 15b-c: Site 22. Cross sections at the site

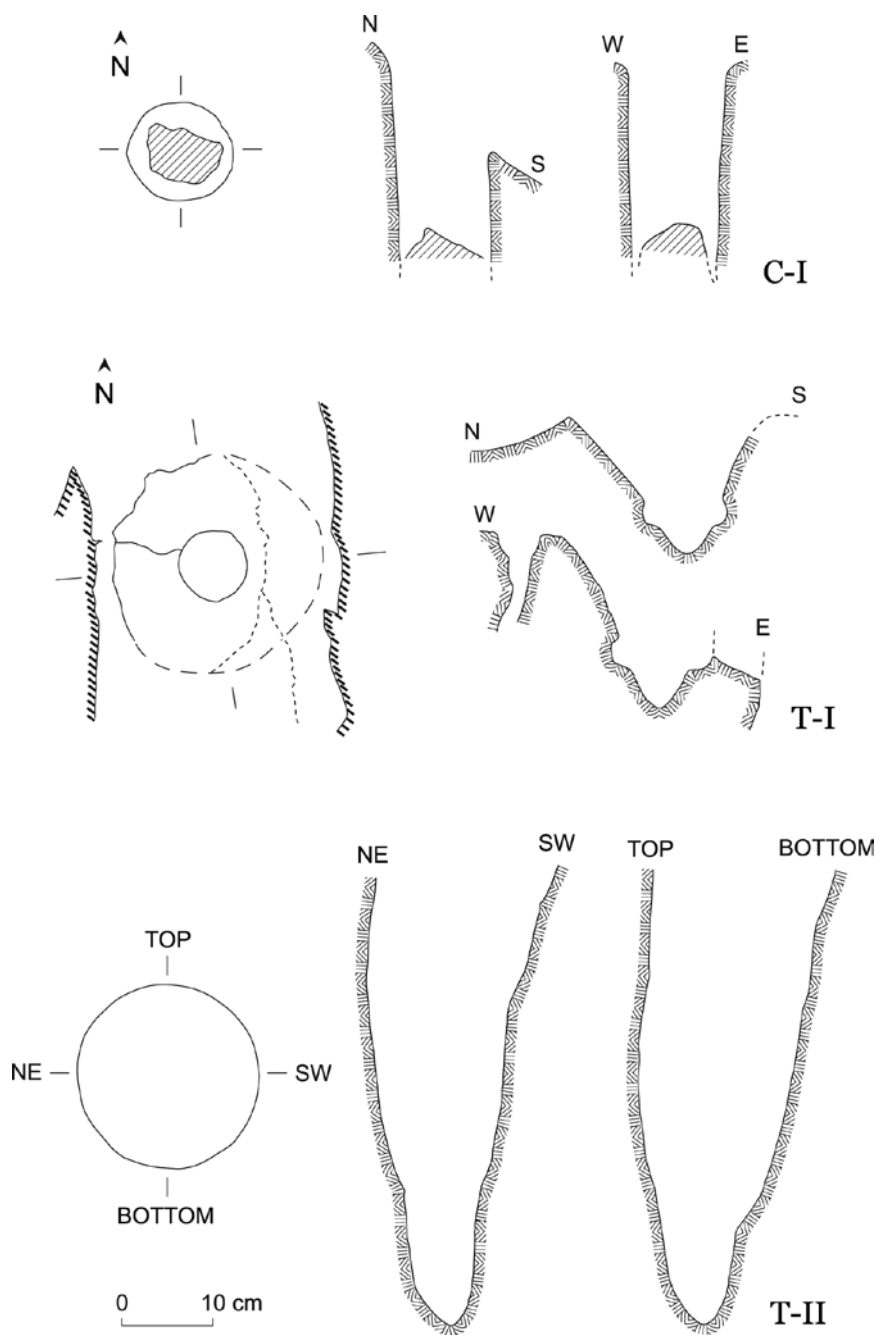


Fig. 16. Bedrock features at site 22. C-I is located in the eastern chamber; T-I and T-II on the terrace



Fig. 17: Bedrock mortar C-I in the eastern chamber of site 22. Note the missing rim and upper shaft. Scale 20 cm

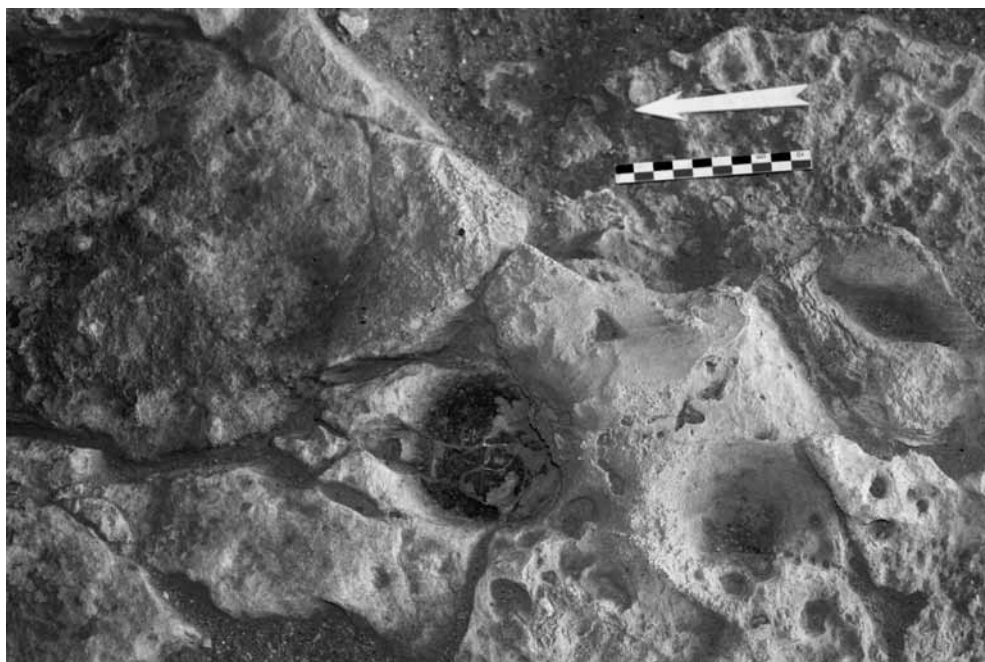


Fig. 18: Bedrock cupmarks C-III, C-IV, C-V in the western chamber of site 22. Scale 10 cm



Fig. 19: A) Bedrock mortar (T-I) on the terrace, top view. B) Side view. Note the preserved bottom part, and the eroded top. Scale 10 cm





while the top and the eastern wall are eroded. Similar bedrock features were documented at Huzuk Musa in the Lower Jordan Valley (Nadel and Rosenberg in press; Rosenberg *et al.* 2010). The deepest mortar encountered in the five sites (T-II) is in a large angular boulder, tipped on its side (Fig. 20). The rim is 25 cm across, and the depth is 50 cm.

A small flint assemblage (N=9) was collected from the terrace (Fig. 21, Table 1). A rough heavy duty tool, measuring 9.7X4.8X4.2 cm, appears to be a crude biface (also used as a core?). There is a delicate sharp broken bladelet (2.2X0.5X0.2 cm). In addition, there are three small flakes (2.5-4.0 cm), one of which is burnt and fractured, and chunks (two burnt). This surface assemblage is indeed very small, having been exposed to steep slope-wash and wild fires. Yet, it may be tentatively assigned to the Natufian.



Fig. 20: The top of the T-I mortar, on its side (compare with Fig. 16). The rim is below the scale, to the right. Scale 20 cm

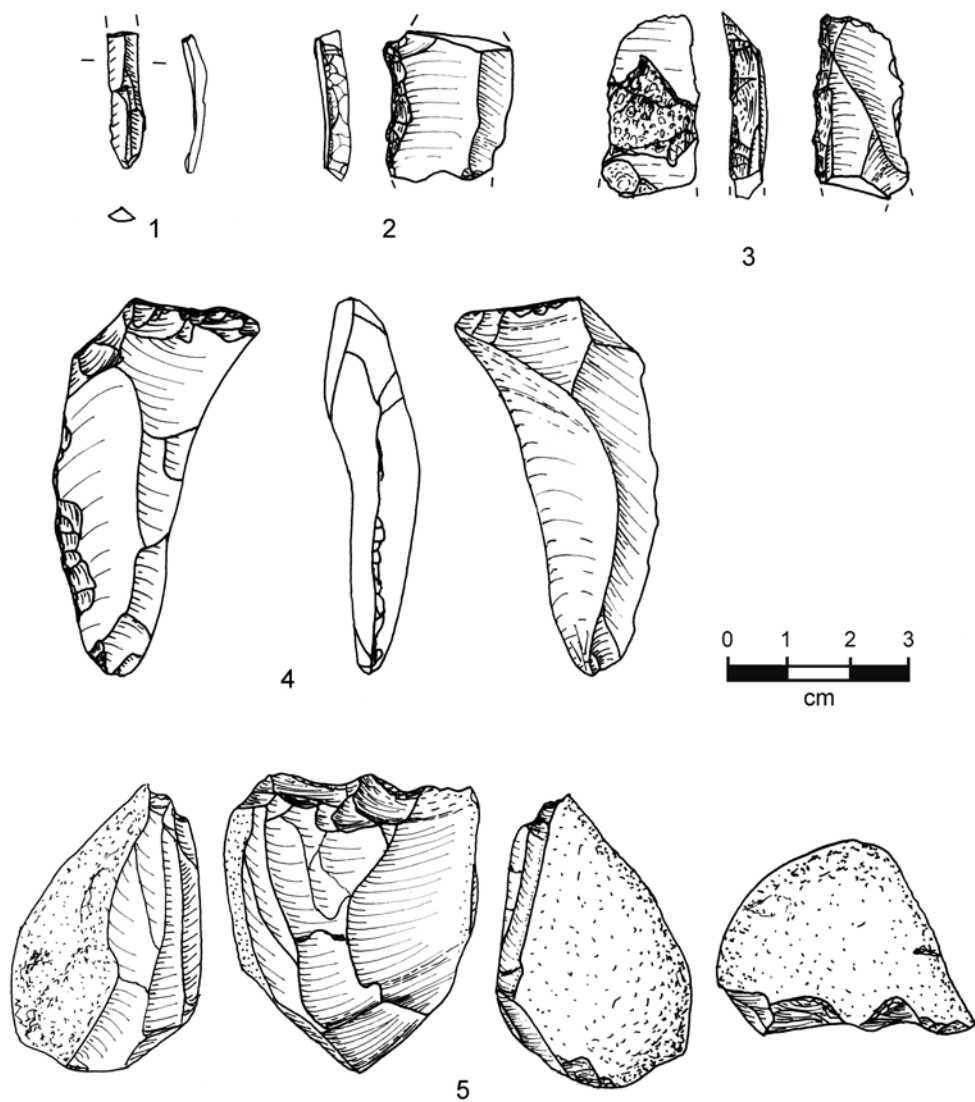


Fig. 21: Flint objects from site 22 (1) and site 15 (2-5).

Table 1. The flint assemblages collected during the survey at cave sites in Lower Nahal Oren

SITE	tools	cores	bldlts	blades	flakes	cte	axe spall	chunks	chips	heavy patination	raw material	total
13	1											1
15	2	1	1	4	13	3	1	6	8	3	2	44
22	1		1		3			4				9

A sea shell (*Glycymeris insubrica*) with a hole and a shell fragment were found on the terrace (Fig. 22). They probably represent decorative elements brought to the site in the past.

Noteworthy, several m below site 22 and about 15 m east of site 11, there is a small bedrock ledge (Fig. 10). On it we found one bedrock mortar, with no other associated material remains.



Fig. 22. A sea shell (*Glycymeris insubrica*) and a shell fragment, found on the terrace of site 22

### Site 13

The lower of the two cave sites found to the east and above the main Nahal Oren site (Figs. 2, 23). It is located on a south-facing cliff, half way up the slope (109 m above msl). The cave is about 5 m deep, the entrance is 4 m across and the ceiling is irregular (Fig. 24). The terrace is flat, 5 m across. There is a smaller cave adjacent on the west, and there are additional small caves and cavities to the east, along the cliff.

The bedrock features in the cave (N=7, Fig. 24) include a row of three mortars, leading from the entrance inward. The outer (C-I) has a top diameter of 15 cm, while the second is smaller (C-II), with top dimensions of 10X12 cm. The third (C-III) is somewhat irregular and has water sipping into it, even in the summer. In diameter and depth it is very similar to several well-preserved mortars in the major Nahal Oren site and in other Late Natufian sites. There are also smaller cupmarks further inside (Figs. 25, 26). One flint implement was found here, a retouched broken blade (Table 1).

### Site 15

A small cave facing south/south-east, located above site 13 and the highest among the sites described here (140 m above msl) (Figs. 2, 27). The cave is 8 m wide, 5.5 m deep and 6.5 m



Fig. 23: A general view of site 13 looking east

high at the entrance (Fig. 28). A pile of stones is located on the west side of the cave, most probably of recent age. The terrace is flat, 5 m across, with boulders along the edge.

There is a cluster of four cupmarks near the western wall (Fig. 29). They are 6-10 cm across and less than 5 cm deep. The top bedrock layer is cracking and peeling, and thus the cupmarks are missing their tops and rims. However, according to their inside wall inclinations and the thickness of eroded rock layers, these features were probably about 10-15 cm deep. The erosion phenomenon of cupmark-bearing bedrock layers was observed in many sites in Mt. Carmel and elsewhere (Nadel *et al.* 2008, 2009b; Rosenberg and Nadel 2011b). There could have been more cupmarks that broke away during the peeling of the surface. The density (less than 10 cm between neighboring cupmarks) and size strongly suggest that they are PPNA in terms of cultural affiliation. Similar clusters are known from several PPNA

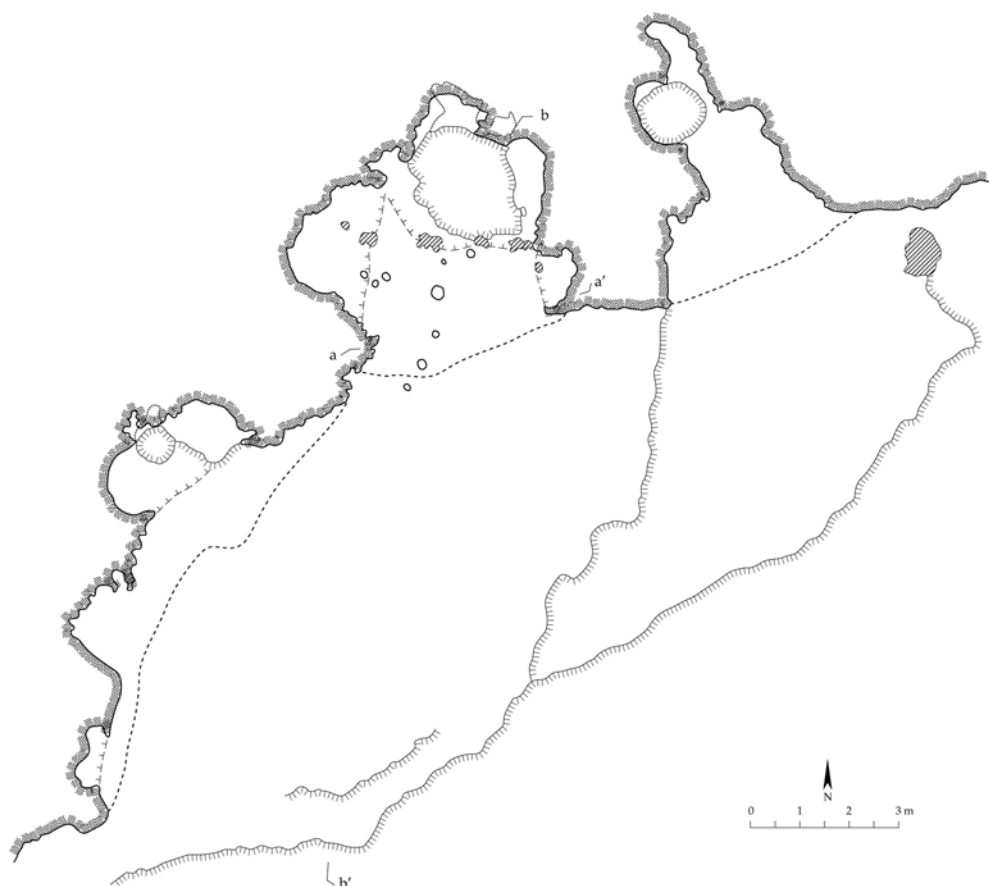


Fig. 24a: Plan of site 13 and its surroundings

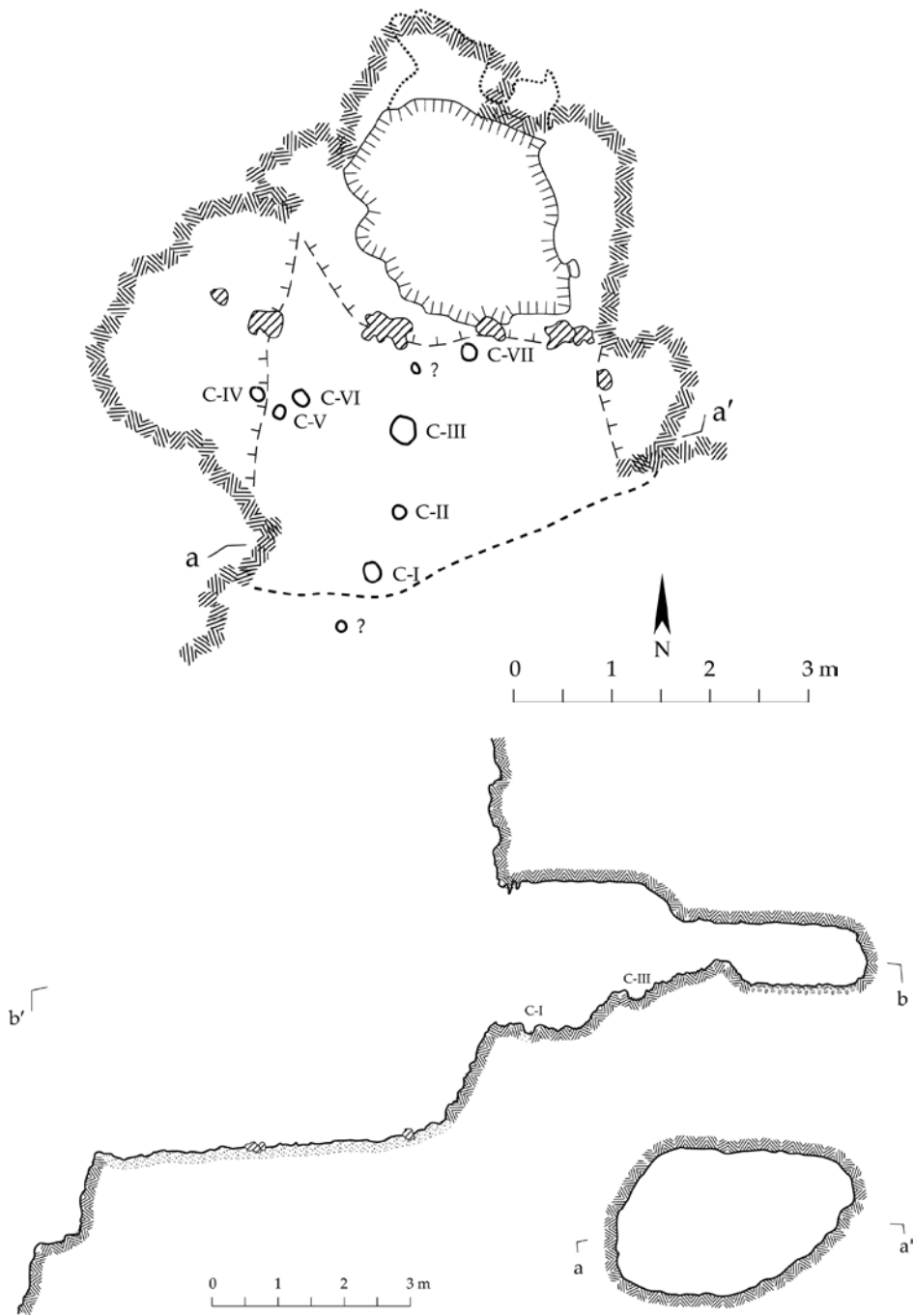


Fig. 24: B) Plan of the cave (top). C) Cross-sections at the site (bottom)



Fig. 25: A general view of three cupmarks in site 13. Scale 10 cm

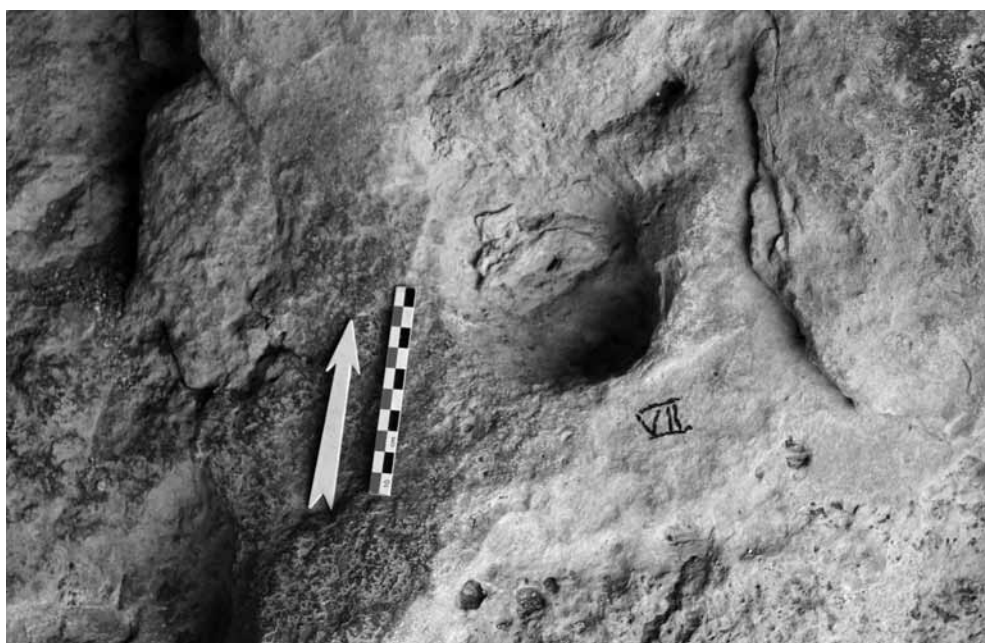


Fig. 26: A general view of cupmark C-VII in site 13. Scale – 10 cm



Fig. 27: A general view of site 15 looking north-west, with the terrace in front

sites (Rosenberg and Nadel 2011a), including many cases where there are stone slabs with cupmarks set on floors of PPNA dwelling structures (see Rosenberg and Nadel 2011a for summary and references).

The flint assemblage is the largest among the sites discussed herein (Fig. 21, Table 1). It includes 25 identifiable knapped objects, as well as 14 chips and chunks, three heavily patinated flakes and two pieces of natural (broken) flint. Most are sharp and fresh, and nine are heavily burnt (black and/or fractured). There is one complete core, with most of the back covered by brown cortex. It has one striking platform, directly from the cortex. The debitage surface is triangular, used for the production of small flakes. The height is 4.6 cm, while the other two maximum measurements are 2.7 and 4.2 cm. There are also three small core trimming elements. One is a burnt core tablet, the second is a ridge bladelet and the third is a front-cleaning short thick blade.

There are two tools, both broken abruptly retouched blades. Their dimensions are 2.4X2.1X0.5 cm and 3.0X1.5X0.6 cm. One is burnt, with heavy damage on the ventral surface. Of particular interest is a complete axe spall (5.9X2.3X0.8 cm) with black fire signs. It represents the tranchet technique, and previous to its removal there were two bifacial tranchet blows. There are tiny scars on the active edge.



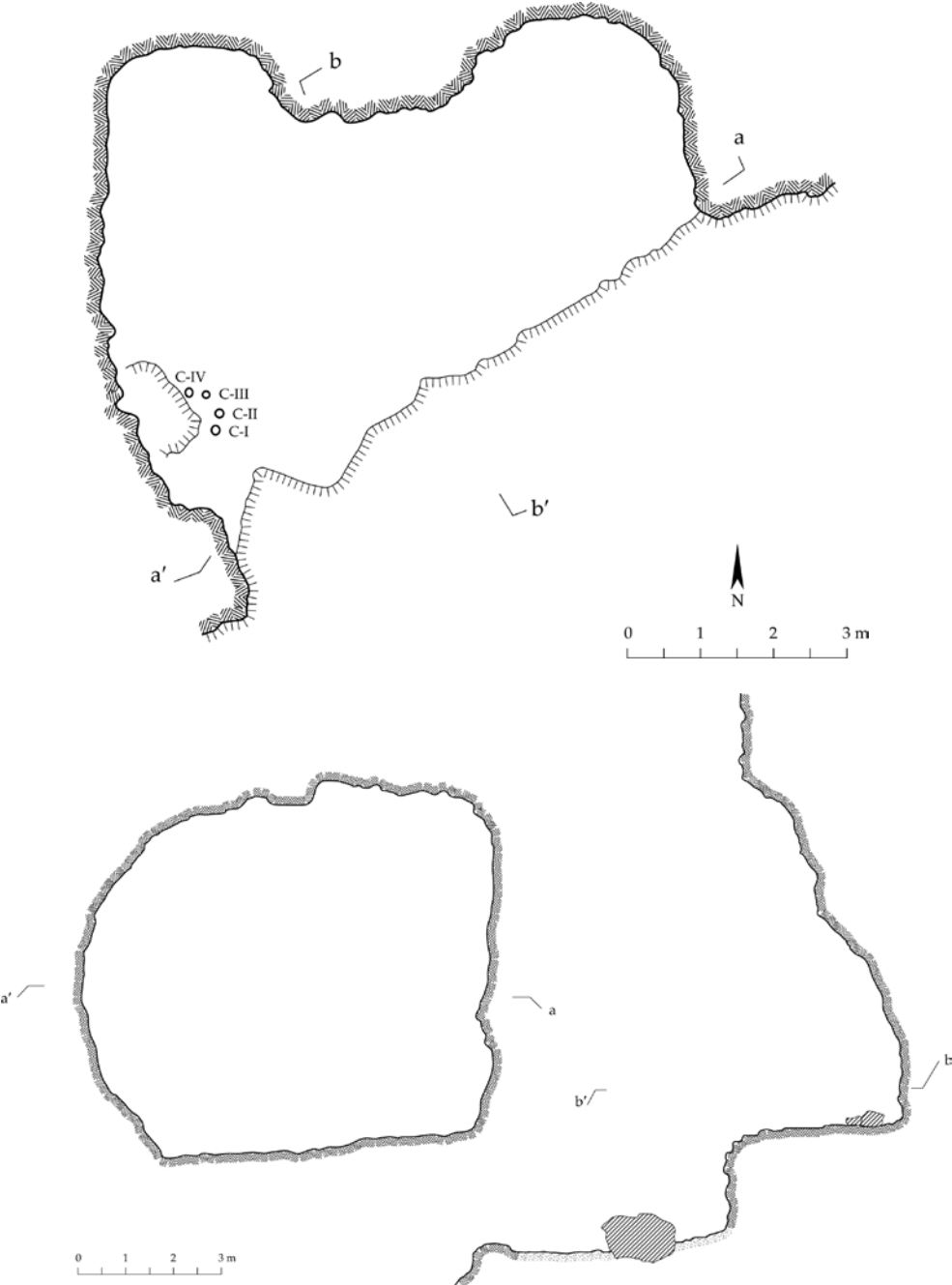


Fig. 28: Site 15. A) Plan of site with location of cluster of small cupmarks near the west wall of the cave (top). B) Cross sections at the site (bottom)



Fig. 29: A general view of the four cupmarks in site 15. Scale – 10 cm

There are 13 small flakes, all 2.0-4.0 cm long. There are also four blades, the largest of which is 5.5X2.6X1.2 cm, while two smaller specimens are 1.1 and 1.3 cm wide. One delicate broken bladelet measures 1.7X0.9X0.3 cm.

Based on this small sample, only a tentative cultural affiliation can be suggested. The most diagnostic specimen is the tranchet spall. It is common in PPNA and PPNB flint assemblages in the southern Levant (such axes were found at Nahal Oren, e.g. Stekelis and Noy 1963; see also Barkai 2011 and Nadel 1997). The presence of retouched blades, as well as unreduced blades and a bladelet could belong to either Neolithic phase. Combined with the characteristics of the cupmarks, the site is tentatively dated to the PPNA, though a PPNB component should not be ruled out. Several potsherds indicate that in later period(s) the site was also used.

## DISCUSSION

The Nahal Oren drainage system is unique in Mt. Carmel, as it is one of the richest in terms of springs, caves available for human utilization, and the richest in terms of rock shelters. It has commonly been cited in Natufian studies for one site, Nahal Oren. The Abu Usba cave, studied by Stekelis already in the early 1940's, is hardly mentioned in general Natufian

discussions, except for the work of Weinstein-Evron (e.g. 1998: 177). However, the picture emerging at this stage of field work differs from general Natufian discussions (Nadel and Rosenberg 2011). It is now apparent that within an area of less than 0.5 square km there are six Late Natufian cave sites (Nahal Oren, Abu Usba, and the new sites 11, 13, 17 and 22) and three PPNA cave sites (Nahal Oren, sites 15 and 22). Furthermore, there are knapped flint occurrences on the slopes near and below the discussed sites, some of which may belong to either of these two cultures.

This concentration of Late Natufian – PPNA cave sites merits a discussion focusing on two important issues: a) the density and hence the settlement pattern of the Late Natufian at Lower Nahal Oren, and b) the Late Natufian – PPNA continuity.

Though the general distribution of Natufian sites, especially burial sites, is well known for the Mediterranean southern Levant (e.g. Bar-Yosef 1983, 2002; Belfer-Cohen 1988, 1991; Bocquentin 2003; Garrod 1932, 1942, 1954; Grosman 2003; Grosman *et al.* 2008; Valla 1986, 1995; Weinstein-Evron 1998, 2009), a density of Late Natufian cave sites similar to the one discussed here has never been reported. The Nahal Oren sites include a large site (with an open-air graveyard) and small sites (each with a few bedrock features). The scale of Natufian remains at Abu Usba is yet to be defined.

It was suggested elsewhere (Nadel and Rosenberg 2011) that the pattern observed here does not directly reflect a settlement organization based on economic parameters, simple to explain in terms of optimal foraging strategies or even central place theory. Rather, the variety of sites appear to reflect one complex composed of several locales only tens to 250 m from each other; thus the cultural landscape paradigm seems to fit here (e.g. Bradley 1991; Evans and Gould 1982).

At this preliminary stage of research, only survey results are available for the recently discovered sites. However, among a variety of research and interpretation possibilities, examples from the Pueblo culture in the Southwest of the United States are of relevance, as in both areas mortars and cupmarks are conspicuous on the landscape (we do not deny the huge chronological and cultural differences between the two). In the Nahal Oren complex, all cave sites (regardless of size, elevation and orientation), as well as several isolated rock exposures, have bedrock mortars and/or cupmarks. In the Pueblo culture, the marking of the landscape was commonly done by using large boulders, big stones set on edge, a variety of carved depressions, and especially cupmarks and mortars carved in bedrock and into boulders set along trails and important locales (Fowles 2009; Snead 2002, 2004). The use of stone features, many times stone cupmarks, as small 'shrines on the landscape' is specifically noted (Fowles 2009: 450, 451, 460).

This is not to say that the small Nahal Oren sites functioned solely as shrines on the landscape, or land, trail, territorial and symbolic markers. However, as a cautionary approach, one should bear in mind that the Nahal Oren sites may have served as more than small

habitation places, workshops, production locales, and observation points for tracking game animals, enemies or visitors. Whatever their past function, they were part and parcel of one dense complex, not just 'isolated islands' on the landscape.

The last issue to be addressed here concerns tradition and continuity, clearly evident at the central Nahal Oren site. A long occupational sequence is documented, with Late Natufian and PPNA remains being the most elaborate in terms of burials (Late Natufian) and construction (PPNA). A Late Natufian – PPNA sequence in one site is not a frequent phenomenon in the southern Levant. Thus, the local sequence is of importance. Furthermore, in Mt. Carmel such continuity is only weakly evident in the sites of el-Wad, Kebara, Sefunim and Raqefet, mostly based on isolated PPNA flint implements found above rich Natufian layers (e.g. Belfer-Cohen and Goring-Morris 2007). Nonetheless, the Nahal Oren complex differs from these sites as it contains the only built PPNA hamlet in Mt. Carmel.

The Nahal Oren location played a central role during both the Late Natufian and the PPNA. Interestingly, in both periods the central site was surrounded by smaller localities, whether used in a mundane and/or symbolic ways, as part of one complex. In fact, the site was used for millennia, from the Upper Palaeolithic onwards. However, only by the Late Natufian did it become a central ritual locale, where burials and related activities took place.

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