



The social role of food in the Natufian cemetery of Raqefet Cave, Mount Carmel, Israel



Reuven Yeshurun^{a,b,*}, Guy Bar-Oz^a, Dani Nadel^a

^a Zinman Institute of Archaeology, University of Haifa, Mount Carmel, 31905 Haifa, Israel

^b Program in Human Ecology and Archaeobiology, National Museum of Natural History, Smithsonian Institution, PO Box 37012, MRC 112, Washington, DC 20013-7012, United States

ARTICLE INFO

Article history:

Received 29 April 2013

Revision received 5 September 2013

Available online 8 October 2013

Keywords:

Epipaleolithic

Burial

Foodways

Mount Carmel

Zooarchaeology

Contextual taphonomy

Feasting

ABSTRACT

The archaeology of mortuary practices and related foodways in the Late Natufian (LN; ca. 14,000/13,500–11,700 BP) sheds light on the communal activities of the last hunter–gatherers in the Mediterranean Levant. We present a detailed analysis of the fauna from the LN cemetery of Raqefet Cave (Mount Carmel, Israel). Taphonomic evidence indicates that the animal bones are butchery and consumption leftovers. While the patterns of animal exploitation are reminiscent of Natufian habitation sites, the remains do not reflect the typical recurring post-discard damage resulting from continuous or repeating habitations in those sites. Hence the fauna is interpreted as the leftovers of punctuated, short-term events, rather than ‘ordinary’ Natufian household trash. Taking into account the special depositional context and site characteristics, we interpret the fauna as the intentionally-gathered and buried remains of simple funerary feasts. Elaborate mortuary behavior and symbolic role of food refuse were recently suggested at the contemporaneous cave of Hilazon Tachtit (Israel). The new data from Raqefet Cave probably reflect a somewhat different type of communal meals, adding to the diversity and complexity of pre-agricultural life-ways in the Levant.

© 2013 Elsevier Inc. All rights reserved.

Introduction

The transition from mobile foragers to sedentary farmers in the Mediterranean Levant has received considerable research attention, with the Natufian Culture (ca. 15,000–11,700 cal. BP) featuring prominently in all economic and social explanations for this process (e.g. papers in Bar-Yosef and Valla, 1991; Delage, 2004; and see Bar-Yosef, 1998; Belfer-Cohen and Goring-Morris, 2011; Henry, 1991; Kaufman, 1992; Valla, 2012; Zeder, 2012). The Natufian is commonly considered as the time when the first sedentary hamlets appeared, displaying repeatedly-constructed stone architecture, hewn bedrock mortars, and massive buildup of habitation refuse (Garrod, 1957; Goring-Morris and Belfer-Cohen, 2008; Hardy-Smith and Edwards, 2004; Weinstein-Evron, 2009); the economy shifts to habitual exploitation of a very broad spectrum of heavily-processed animal and plant resources (Bar-Oz, 2004; Munro, 2009a; Portillo et al., 2010; Weissbrod et al., 2012; Yeshurun et al., n.d.-a); and novel means of enhancing group cohesion, such as distinct cemeteries and art, are evident (Belfer-Cohen, 1991; Weinstein-Evron, 2009). All of these portray the Natufian

as a rather complex and sedentary forager society, chronologically positioned on the verge of agriculture.

Rich and valuable evidence for reconstructing the communal activities and social structure of Natufian communities comes from the study of their burial practices. Defined cemeteries, that are usually segregated (in space or time) from habitation deposits, are present in the Mediterranean zone of Israel (the ‘core area’ of the Natufian Culture) at the sites of el-Wad (Garrod and Bate, 1937; Weinstein-Evron, 2009; Weinstein-Evron et al., 2007), Kebara (Turville-Petre, 1932; Bar-Yosef and Sillen, 1993), ‘Eynan (Ain Mallaha; Perrot et al., 1988; Valla et al., 2007), Nahal Oren (Stekelis and Yizraely, 1963), Hayonim (Belfer-Cohen, 1988; Tchernov and Valla, 1997), Hilazon Tachtit (Grosman et al., 2008) and Raqefet (see below). Each of these burial grounds yielded several dozens of interments in diverse positions, sometimes displaying personal ornamentation, grave goods, built graves or associated stones. Throughout the Natufian, no patterns for particular age and sex groups are apparent. Early Natufian (ca. 15–14/13.5 ka) burials are more often decorated, whereas Late Natufian (LN; ca. 14/13.5–11.7 ka) burials sometimes exhibit secondary burial treatment, such as skull removal (Byrd and Monahan, 1995). Much new data was recently unearthed concerning LN burial practices, which appear more elaborate and complex than acknowledged before. Dozens of graves were discovered in Hilazon Tachtit Cave, accompanied by numerous artifacts and two small and seemingly

* Corresponding author at: Zinman Institute of Archaeology, University of Haifa, Mount Carmel, 31905 Haifa, Israel.

E-mail addresses: ryeshuru@research.haifa.ac.il (R. Yeshurun), gyubar@research.haifa.ac.il (G. Bar-Oz), dnadel@research.haifa.ac.il (D. Nadel).

non-domestic structures (Grosman and Munro, 2007). An especially elaborate interment of an elderly and disabled woman, which was found in a hewn grave accompanied by a particularly rich suite of grave goods, most notably tortoise shells, was interpreted as the interment of a shaman (Grosman et al., 2008).

Two intriguing and intermingled aspects of Natufian mortuary behavior are the identification of grave goods and the social role of food consumption as part of the funerary rituals. The association of artifacts, including faunal items such as gazelle horn-cores or tortoise shells (e.g., Belfer-Cohen, 1988; Garrod and Bate, 1937; Neuville, 1951) and human remains furnished hypotheses on ascribed social status (Wright, 1978, countered by Belfer-Cohen, 1995; Byrd and Monahan, 1995). The ubiquity of faunal remains in and around Natufian cemeteries evoked the notions of funerary feasts being conducted, probably at a modest scale (Hayden, 2004, 2011; Twiss, 2008). These phenomena are hard to define archaeologically; dismembered faunal remains in Natufian graves often pose the problem of separating pre-existing refuse in the occupation debris into which the grave was dug and faunal material associated with the burial. Recently, the integration of stratigraphic observations and vertebrate taphonomy at Hilazon Tachtit Cave led to the identification of deliberate deposition of butchered animal remains in two graves (Structures A and B), probably as remnants of burial feasts (Munro and Grosman, 2010; see below).

This paper contributes to the discussion on the meaning of faunal items in Natufian graves by presenting a new case study, the LN of Raqefet Cave (Mount Carmel, Israel) and by offering novel ways of separating habitation refuse from that resulting from punctuated feasting events. Raqefet Cave has recently been investigated to reveal numerous individuals buried in a small area, as well as ubiquitous human-made bedrock features. Hardly any architecture or living levels were found, and all clear Natufian deposits in the cave actually contain burials. Hence, Raqefet Cave emerges as a specialized Natufian locality, a burial site that was used only during the LN for many short visits (Nadel et al., 2012, 2013). In spite of the fact that the Natufian deposits at Raqefet are essentially grave deposits, they contain a remarkable amount of artifacts and disarticulated animal bones, raising the possibility that a pre-burial LN occupation had once existed in the cave (Nadel et al., 2008). Alternatively, it can be hypothesized that some or most of these items are related to the burial activity in some way and were intentionally deposited in the graves.

In order to characterize this *a priori* food refuse and learn why it was physically associated with human interments, and

consequently to shed light on one of the first specialized burial sites in the Levant, we present a detailed zooarchaeological and taphonomic analysis of the graveyard fauna. Through comparisons with the contextual taphonomy of domestic occupations at the nearby Natufian hamlet of el-Wad Terrace we establish our interpretation of the faunal remains as connected to the burial activity, and discuss the implications for the site and for its period.

Raqefet Cave

The cave of Raqefet is located in the southeast corner of Mount Carmel, 20 km southeast of Haifa and 16 km east of the present Mediterranean shore-line, on the eastern bank of Nahal Raqefet, ca. 200 m ASL, at the top of a steep and rocky slope (Fig. 1). The site is located 10 km east of the major Natufian site of el-Wad. Unlike el-Wad and the Natufian sites of Nahal Oren and Kebara Cave, Raqefet is situated in an inner wadi, not at the intersection of the mountain and the coastal plain. The cave is quite large (50 m long) and divided into five karstic chambers (Fig. 2A). A narrow bedrock terrace, overlooking the steep slope, is situated just outside the cave's entrance. No archaeological layers were preserved on the terrace but some 30 bedrock features, most likely Natufian, were discovered there (Nadel and Lengyel, 2009).

Raqefet cave was first surveyed by Ya'aqov Olami in 1956 (Olami, 1984). Two excavation projects took place at the site. The first, by Tamar Noy of the Israel Museum in Jerusalem and Eric Higgs of the University of Cambridge, lasted three seasons (1970–1972) and exposed a long stratigraphic sequence in the first two chambers of the cave (Noy and Higgs, 1971). An area of roughly 60 m² was excavated, but in only a portion was bedrock reached in depth ranging from ca. 10 cm to ca. 2 m. Later studies of the stratigraphy and lithic remains from these excavations identified late Mousterian through Bronze Age layers (Lengyel, 2007). The Natufian layer was confined to Chamber I, west of the 16/17 grid line and north of the H/J grid line, and was quite shallow except when filling hewn bedrock features or bedrock depressions (Fig. 2A; Lengyel et al., 2005). Four Natufian burials were found, near the northern wall of the cave, in an area later to be named the burial area of Loci 1 and 3 in the renewed excavation (Fig. 2; Bocquentin, 2003; Lengyel and Bocquentin, 2005). The fauna was studied by Garrard (1980), who argued for an exploitation of adult male gazelles in the Natufian layer of the cave.

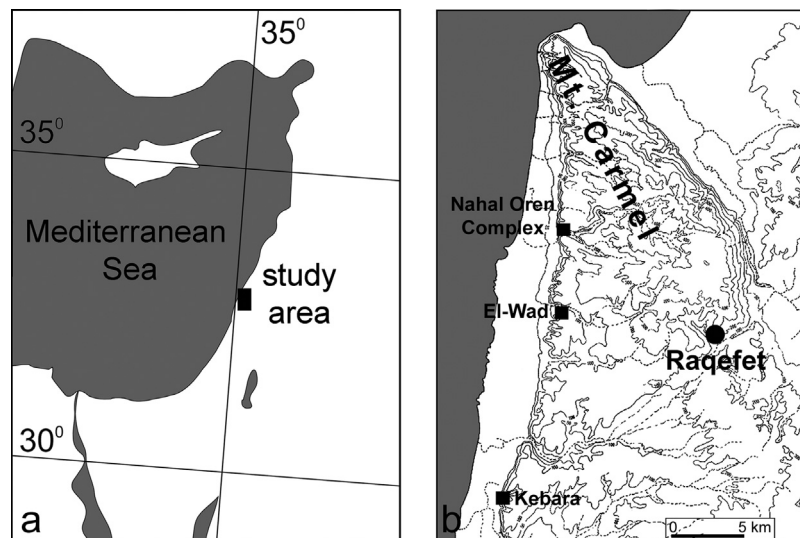


Fig. 1. Location map, showing the position of Raqefet Cave and other Natufian sites in Mount Carmel.

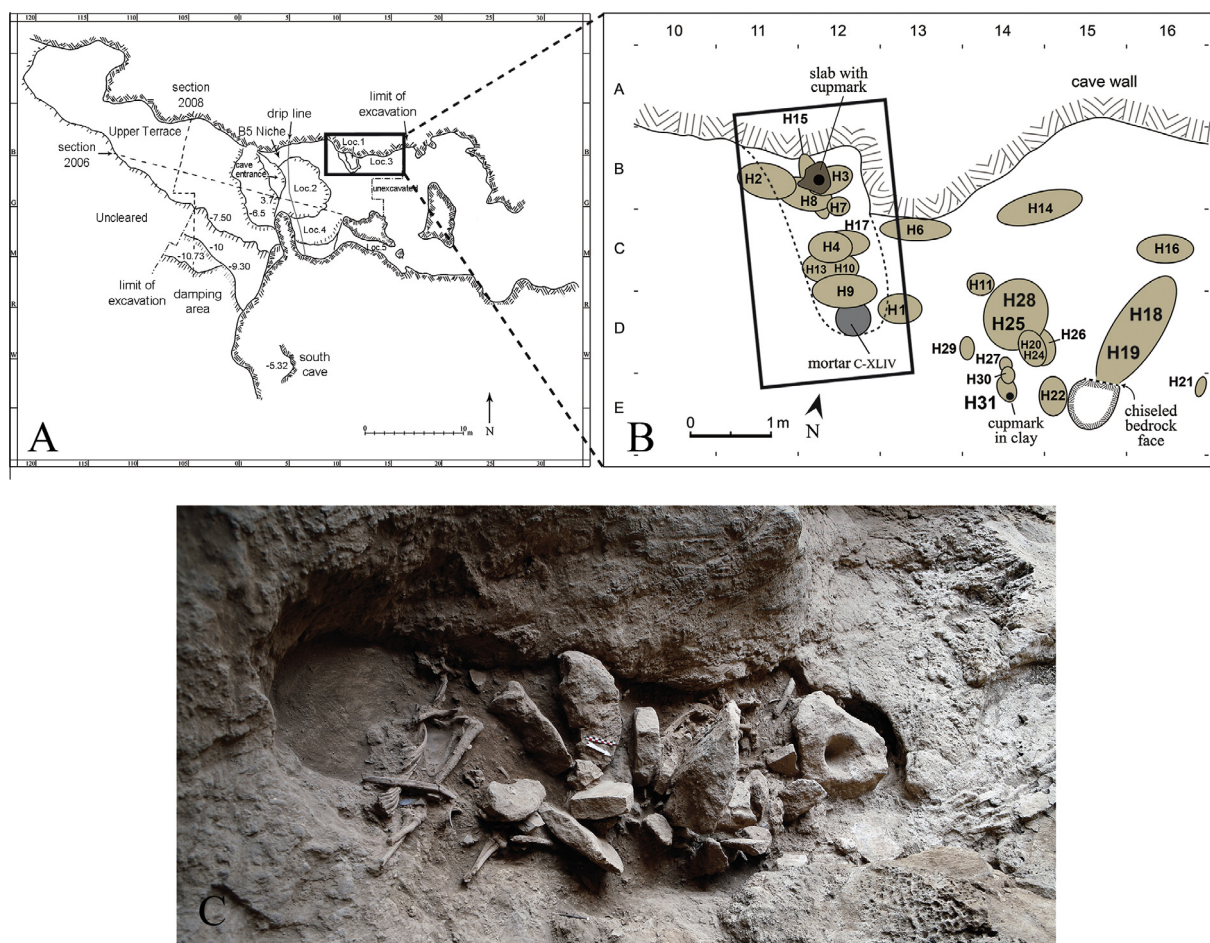


Fig. 2. The studied context: (A) A plan of Raqefet Cave, showing the location of Locus 1. (B) The Late Natufian cemetery of Loci 1 (framed) and 3, with the graves marked. The dashed line marks the border of the bedrock crevice defined as Locus 1 and the ovals denote burials that are either inside the crevice or above it. Locus 3 is a concentration of burials in an adjacent and shallower bedrock depression. (C) Locus 1 during excavation. Note the slab with hewn cup-mark, the articulated human bones and the stone slabs inside the Locus 1 crevice (ca. 2 m long).

New excavations, initially aimed at reassessing Noy and Higgs' stratigraphy and then focusing on the LN sediments that were not attained by their excavation, commenced in 2004 under the direction of Dani Nadel and György Lengyel, on behalf of the University of Haifa (Lengyel et al., 2005; Nadel et al., 2008, 2009a, 2012). The new excavation confirmed the limited spatial extent of the Natufian layer. Two sedimentological units were delineated in the Natufian sediments of Chamber I: Unit 1, soft and gray sediment with Natufian and later material (some pottery shards); and Unit 2, reddish sediment, either soft or concreted to bedrock, containing Natufian material. The only Natufian phase represented in the cave is the LN, on the basis of the prevalence of short, abruptly retouched lunates. The Natufian sediments are essentially fills of several bedrock mortars or natural crevices and depressions in the cave's bedrock. They were only preserved in the 1st chamber of the cave, predominantly in two adjacent bedrock depressions (Loci 1 and 3) along the north wall; in a bedrock depression at the cave's entrance, Locus 2, where they were disturbed by later activities; and in shallow patches in the center and south wall of the 1st chamber (Fig. 2A). Test-pits were dug in all chambers of the cave by the previous and the current expedition, which yielded Upper- and Epipaleolithic material preceding the Natufian but no LN sediments (Lengyel et al., 2005; Nadel et al., 2008). No structures were discerned. However, the site is exceptionally rich in hewn bedrock features ('mortars', 'cupmarks' and large basins). Thus far approximately 100 bedrock features of extremely diverse

types were discovered throughout the site (Nadel et al., 2008; Nadel and Lengyel, 2009; Nadel and Rosenberg, 2010). The burials were found in Loci 1–3. Twenty-nine individuals were excavated to date, including four exposed by the old excavations. Most are primary burials, representing several repeated episodes of reopening the graves to add more individuals, and there are four cases of double burials. In many cases, younger graves seem to have been cut into older graves and to have damaged them. Most of the burials were found in Unit 2, close to bedrock, and some were found in clear association with hewn bedrock features or boulder mortars (Bocquentin, 2003; Lengyel and Bocquentin, 2005; Nadel et al., 2008, 2009a, 2012).

Two main locations of Natufian burial activity have been investigated under the current project (Fig. 2A): the adjacent Loci 1 and 3, together forming an area where repeated burial activity took place; and Locus 2, a wide bedrock depression containing Natufian sediments and disturbed by later activities. In Locus 2, one tightly flexed (though incomplete) human skeleton and one cluster of human bones were discovered, associated with two large boulder mortars. Some of the Locus 3 graves exhibit unique traces of vegetation lining, including preserved impressions and abundant phytoliths of flowering plants (Nadel et al., 2013; Power et al., n.d.). As remnants of earlier occupations were distributed in Chamber I in isolated patches, it is possible that pre-Natufian layers had once existed there and were cleared by the Natufians in order to manipulate the bedrock, i.e., cut bedrock features, modify natural basins

for burial, and bury some of the dead on the bedrock (Nadel et al., 2009a). The following analysis is based on the Locus 1 faunal assemblage – numerous animal bone fragments found within the graves' matrix (see detailed description of our sampling below).

Framework for interpretation

Following a detailed presentation of the faunal assemblage, three hypotheses will be raised as explanations for the deposition of archaeofauna in direct association with multiple human burials in Locus 1 of Raqefet Cave (Table 1). The first hypothesis is that the animal remains represent butchery refuse from earlier LN occupations in the cave, and that sediments from these habitation layers were used to fill the graves (it is unlikely that they represent pre-LN deposits, because the lithic industry in Locus 1 is characteristically LN). Such a depositional scenario only allows one to make broad inferences about LN economic patterns. The second hypothesis is that the animal bones represent consumption events that were synchronous with the funeral activities. Consumption refuse was discarded inside Locus 1 for any number of hygienic or ritualistic reasons. The former option would constitute a particular case of Natufian refuse disposal behavior, while the latter option suggests that the food refuse was meaningful, likely indicating the consumption of 'ritual meals', or feasts, upon burying the dead (e.g., Hayden, 2004, 2011; Miracle, 2002; Munro and Grosman, 2010). The third hypothesis is that faunal remains were purposefully interred into the graves as grave goods, perhaps to signify certain individuals (e.g., Grosman et al., 2008). Obviously, these hypotheses need not be mutually exclusive. The disentanglement of these depositional scenarios will shed important light on the nature of the LN use of the site.

We test the three hypotheses by the integration of vertebrate taphonomy and archaeological context, hence contextual taphonomy, and by inter-site comparisons (Table 1), employing the widely-used terminology relating to refuse classifications (LaMotta and Schiffer, 1999; Schiffer, 1976; see also Hardy-Smith and Edwards, 2004). Our first hypothesis is a case of *tertiary refuse*, the unintentional re-deposition of material away from its original location (e.g., removal of older sediment containing faunal refuse in the course of burial activities); The second hypothesis constitutes *secondary refuse*, intentional discard/removal away from the place of consumption (e.g., systematic discard of consumption refuse in the graves); and the third hypothesis, burying faunal remains as grave goods, is a specific case of *primary refuse*, the result of depositing items in their original location of use.

The most important difference between habitation deposits and 'special' (i.e., non-domestic) deposits in the Natufian may be the extent of post-discard taphonomic damage inflicted upon the

faunal remains in the course of recurring habitations. This is because the Natufians normally discarded their trash at the place of consumption, without systematic cleaning, creating amalgamations of faunal remains in primary deposition (Hardy-Smith and Edwards, 2004; Edwards and Martin, 2007; Samuelian, in press; Yeshurun et al., in press, n.d.-b). These remains subsequently suffered unintentional damage by recurring occupations in the same place, such as bone burning and trampling, as seen in all Natufian domestic contexts (e.g., Bridault et al., 2008; Munro, 2012; Edwards and Martin, 2013; Yeshurun et al., n.d.-a). Conversely, post-discard damage is significantly less pronounced in non-domestic Natufian contexts (see below).

To determine whether the faunal remains diverge from the 'normal' Natufian domestic trash, thereby refuting the first hypothesis, it could have been helpful to compare the Locus 1 fauna to domestic areas in Raqefet. However, no substantial Natufian deposits that are *not* connected with burial activities were found in the cave. Hence, a comparison with the closest site in time and space, Natufian el-Wad Terrace (EWT; Fig. 1), is performed. Unlike Raqefet Cave, EWT acted as a major hamlet for diverse activities through much of its long and rich Early to Final Natufian habitations (Weinstein-Evron, 2009; Weinstein-Evron et al., in press).

At EWT, a broad faunal spectrum was utilized, primarily including mountain gazelle (*Gazella gazella*) and an array of small game species. Contextual taphonomic analysis at late Early Natufian EWT identified several types of archaeofaunal depositions, including recurring primary deposition of domestic refuse in a living area and secondary deposition of material outside of the living area (Yeshurun et al., n.d.-b). Taphonomically, the occurrence of heavy post-discard damage stands out. Frequent non-nutritional fragmentation, trampling, some carnivore (possibly domestic dogs) ravaging, and indirect burning from fires lighted over the course of repeated overlying habitations were found in the habitation levels of a dwelling (Structure II) area. Together with frequent evidence of minimal movement (anatomical articulations, fragile specimens in a complete state, refitted ancient breaks and large specimens lying horizontally) the assemblage was interpreted as primary deposition of consumption refuse in a series of dwellings (Yeshurun et al., n.d.-b). In contrast, the taphonomic properties of Locus 25, a pile of stones just outside of the habitation area, are remarkably different in their preservation. They provide significantly weaker evidence of post-discard damage. Bone burning and trampling are rare, but weathering and gnawing damage are elevated compared to the dwelling area, probably because these remains were subject to less damage from recurring human activity and were exposed for a longer time due to less buildup of habitation refuse (Yeshurun et al., n.d.-b). The EWT results and

Table 1
Testing the three hypotheses on the origin of the Locus 1 fauna, using inter-site taphonomic comparisons.

	Depositional scenario	Typical taphonomic damage	Example and reference
<i>Hypothesis 1:</i> Locus 1 fauna derives from pre-existing habitation refuse, used to fill the graves	Consumption trash discarded in and around Natufian dwellings, suffering post-discard damage, then reshuffled to fill the graves	Widespread but indirect burning, high trampling and non-nutritional breakage, low weathering, small fragments	El-Wad Terrace, late Early Natufian: Structure II Area (Yeshurun et al., n.d.-b)
<i>Hypothesis 2:</i> Locus 1 fauna was consumed synchronously with the funerary activity and deposited inside the graves	Consumption trash that was either sporadically tossed or systematically cleaned inside a non-habitation area, unexposed to damage from repeated occupations	Low burning and trampling, larger bone specimens, more larger ungulates. In the former case more weathering and carnivore gnawing	El-Wad Terrace, late Early Natufian: Locus 25 (Yeshurun et al., n.d.-b)
<i>Hypothesis 3:</i> Locus 1 fauna was deposited as grave goods, either as animal parts or as bones	Insertion of animals or animal parts to graves	Frequent anatomical articulations and high completeness, meager post-discard damage	Hilazon Tachtit Cave, Late Natufian: esp. Structure B (Munro and Grosman, 2010) Hilazon Tachtit Cave, Late Natufian: fauna in Structure A (Grosman et al., 2008)

interpretations concur with similar patterns of primary deposition of habitation refuse in other ‘core area’ Early through Final Natufian hamlets, e.g., Wadi Hammeh 27 (Hardy-Smith and Edwards, 2004; Edwards and Martin, 2013), Iraq ed-Dubb (Edwards and Martin, 2007) and ‘Eynan (Samuelian, in press). Importantly, the LN phase of EWT echoes the late EN phase in economic and taphonomic patterns and inferred discard behavior, even though that phase did not yield architecture (Yeshurun et al., n.d.-a; see also Bar-Oz et al., 2004).

Thus, the taphonomic characteristics of the Locus 1 fauna, especially the degree of post-discard damage, will be compared to the EWT domestic sample on one hand, and to the EWT secondary deposition on the other hand, in order to distinguish the first two hypotheses: consumption refuse that was originally deposited in domestic context and later used to fill Locus 1, as opposed to consumption refuse that was the product of short-term events synchronous with the burial activity and was thrown in Locus 1 shortly after consumption (Table 1). If the Locus 1 fauna derives from preexisting habitation/s in the cave, then it should be displaying the characteristic taphonomic signature of Natufian domestic trash, as known in virtually all such occupations.

The other (secondary) depositional scenario was recently demonstrated in the LN burial cave of Hilazon Tachtit. The integration of stratigraphic observations and vertebrate taphonomy led to the identification of deliberate deposition of butchered animal remains in two graves (Structures A and B), probably as remnants of burial ceremonies and feasts (Munro and Grosman, 2010). The faunal remains in these contexts were interpreted as feasting deposits because they contained an exceptionally high number of identified macrofaunal specimens (NISP = 9669) from a small excavation volume, were connected with a few episodes of human burials, and displayed unusually high proportions of aurochs and tortoise remains. In addition, the putative non-mundane character of the structures (being too small to serve for a domestic purpose) and the remarkable effort invested in their planning and construction indicated that the structures and their faunal contents had a special meaning beyond just refuse deposition (Munro and Grosman, 2010).

The Hilazon Tachtit case exemplifies the third mechanism, too. One of the graves (Structure A) exhibited strong evidence for placing animal remains as grave goods (Grosman et al., 2008); several uncommon and unusually complete and articulated faunal elements were found in a grave built for an elderly woman. They consisted of numerous butchered tortoises (including many complete carapaces), an aurochs tail, marten skulls, an eagle wing and a wild boar forearm. The faunal grave goods and elaborate grave construction for an elderly and handicapped woman led to the identification of this feature as a shaman burial (Grosman et al., 2008). Complete tortoise carapaces, articulated canid skeletons, gazelle horn-cores and other faunal elements appear in human graves at other Natufian sites (Belfer-Cohen, 1988; Garrod and Bate, 1937; Neuville, 1951; Tchernov and Valla, 1997) and one pre-Natufian case (Maher et al., 2011). Their interpretation as grave goods is a strong possibility due to their completeness and anatomical articulation that are very different from the disarticulated and fragmented vertebrate remains in the surrounding matrix.

The hitherto described depositional modes make a useful ‘domestic’ vs. ‘ritual’ or primary vs. secondary refuse comparisons to the Locus 1 fauna (Table 1). If the fauna in Locus 1 derived from preexisting habitation debris used to fill the graves, then intensive post-discard damage from those habitations would be expected. In contrast, if the Locus 1 fauna originated at consumption that was synchronous with the burials, namely a refuse deposition, it would display significantly lower evidence of post-discard damage since no fires were lighted above it, trampling was probably low and, given the well-preserved context – no carnivores had access to the

collection following deposition inside Locus 1. If fauna was deposited in Locus 1 as grave goods, frequent anatomical articulations and high completeness would be expected, along with meager post-discard damage.

Sampling and methods

Sampling

All material in this work originates from the new excavations in the best preserved burial area, Locus 1, which was clearly defined as a deep and elongated bedrock depression oriented perpendicularly to the northern wall of the cave (Fig. 2). Locus 1 was completely filled with LN sediments containing articulated human remains, artifacts, animal bones and stones (some worked). The depression is about 2 m long, 0.8 m wide and 0.8 m deep, but these dimensions are highly irregular. The locus is undisturbed by post-Natufian occupations below its uppermost part, ca. 215 cm below datum. Natufian deposits in this feature lay on the bedrock; pre-Natufian layers were not present or had been cleared beforehand, thus ensuring the temporal integrity of the samples. The lithic industry is typical LN, with the dominant tools being short, abruptly retouched lunates (Nadel et al., 2008).

Nine individual skeletons in various states of completeness but always in anatomical articulation (Homo 3, 4, 7–10, 13, 15 and 17) were buried within the elongated narrow crevice, and two more individuals (Homo 1–2 and 6) were buried adjacent to it. The buried individuals within Locus 1 included adults and children in diverse positions, though naturally most of them are aligned along the axis of the bedrock depression (Fig. 2B and C; Nadel et al., 2008, 2009a).

We focused on the middle and lower sediments of Locus 1, excavated in the 2006 and 2008 seasons (elevations 215 below datum and lower) to get as clean a sample as possible of LN faunal remains in clear association with repeated burial activity (Nadel et al., 2009a; Fig. 5). The sampled volume of excavation contains the remains of seven human skeletons (Homo 7–10, 13, 15 and 17). Some patches of hard tufa containing Natufian finds were present in Locus 1. Since cemented sediments suffer from major biases in quantitative archaeofaunal analysis (Bar-Oz et al., 2005; Yeshurun and Bar-Oz, 2008) they were excluded from this study. All sediment was saved, wet sieved through a 1 mm mesh, and then separated into two fractions by sieving with a 2 mm screen. During fieldwork, bones that were exceptionally long and complete were plotted using three coordinates. All faunal remains that were not plotted in the field were picked from the 2 mm sieves and kept. These sieve-recovered pieces comprise the bulk of the faunal assemblage. The following procedures concern both plotted pieces and sieve-recovered faunal remains.

Faunal analysis procedures

Carbonate concretions on the bone surfaces were cleaned by immersion in diluted acetic acid solution (10%) for 1–8 h. Following this, the bones were soaked in KOH solution to buffer the acid, and then washed in fresh water and left to dry slowly in the shade. All bones were saved and the identifiable specimens (henceforth Number of Identified Specimens, NISP; defined as fragments whose precise location in the skeletal element, or portion thereof, can be determined and quantified, and can be assigned to species or size class) of macromammals, birds larger than Passeriformes and reptiles were selected for analysis. Macromammals were defined here as all mammals excluding rodents, insectivores and bats. Body-part identification was as inclusive as possible, focusing on long bone articular ends and long bone shaft fragments, teeth,

cranial fragments, ribs, vertebrae, and all other recognizable bone fragments. Recorded avian elements included long bone articular ends and shafts, toes, vertebrae, sternum, pelvic and wing parts. Recorded reptilian elements included every recognizable carapace, plastron, limb and pelvic girdle part of tortoises, as well as skull, limb and vertebrae of snakes and lizards.

Body-part profiles were assessed by calculating Minimum Number of Element (MNE; Lyman, 1994) values for each bone portion (e.g., humerus proximal shaft) and then deriving MNE for each bone (e.g., humerus), group of bones (e.g., carpals) or anatomical region (e.g., upper limb). The MNE values were then standardized by dividing them by the number of elements in the complete animal skeleton, creating the Minimum Animal Unit (MAU; Binford, 1981) values. Standardizing the MNE while taking also bone side and age into account produced the Minimum Number of Individuals (MNI) figures.

Anatomical identifications and taxonomic affiliation of the faunal remains were based on the comparative collections of the Laboratory of Zooarchaeology, Zinman Institute of Archaeology, University of Haifa. Due to the high fragmentation of the bone assemblage, the majority of the identified specimens were assigned to a size class rather than species. Mammal size classes are small mammal (hare, *Lepus capensis* and small carnivores, mostly fox, *Vulpes vulpes*); small ungulate (overwhelmingly represented by mountain gazelle, *G. gazella*); medium ungulate (including mainly wild boar, *Sus scrofa* and Mesopotamian fallow deer, *Dama mesopotamica*); and large ungulate (represented by the aurochs, *Bos primigenius*).

All identified specimens but isolated teeth and squamate vertebrae were systematically examined for bone-surface modifications, using a stereoscopic microscope (Olympus SZX7) with a high intensity oblique light source, at 8–56 magnification, following the procedure described in Blumenschine et al. (1996). We searched for cutmarks (Binford, 1981) and hammerstone percussion marks, including conchoidal notches (Bunn, 1981; Capaldo and Blumenschine, 1994; Pickering and Egeland, 2006) and percussion pits and striations (Blumenschine and Selvaggio, 1988; Blumenschine et al., 1996; Pickering and Egeland, 2006). Evidence for bone-working, ubiquitous in many Natufian contexts, was recorded based on intentional shaving, grooving, abrading and piercing of bones, on finished bone artifacts as well as on production debris or indeterminate fragments (Campana, 1989; Le Dosseur, 2008). The integration of worked bone fragments into the taphonomic analysis is necessary because working bones is an activity manifested at the site and may impact the selection, discard and survival patterns of body parts, or the distribution of cutmarks and other bone-surface modifications. Additionally, the discard and post-depositional patterns of the worked bone assemblages provide another line of evidence for the contextual patterns in the analysis (e.g., Outram, 2006; Russel, 2001). Burning presence and intensity were recorded by bone color, generally following Stiner et al. (1995). Bones with external and internal faces were assigned two burning codes according to their external and internal surfaces (Cain, 2005). Specimens that displayed isolated dark spots or reddish-brownish color were counted as unburned. The assignment of burning categories was made using the binocular microscope, in order to achieve greater accuracy and consistency in identification. We also looked for carnivore punctures, scoring and digestion marks (Binford, 1981; Stiner, 1994) as well as rodent gnaw marks (Brain, 1981; Fisher, 1995) and biochemical (root) marks (Dominguez-Rodrigo and Barba, 2006, 2007). Trampling striations (Behrensmeyer et al., 1986; de Juana et al., 2010; Dominguez-Rodrigo et al., 2009; Gaudzinski-Windheuser et al., 2010) and abrasion of bone edges (Shipman and Rose, 1988) were sought, and weathering was noted (Behrensmeyer, 1978).

The mode of bone fragmentation was assessed by recording shaft fracture-plane typology, shaft circumference and fragment lengths. The morphology of the fracture planes was noted for limb bones (on either shaft fragments that retained a portion of epiphysis or for the shaft near an epiphysis), mandibles and 1st phalanges. We recorded fracture angle, fracture outline and fracture edge, to determine the stage at which the bones were broken (i.e., fresh-green vs. old-dry), following Villa and Mahieu (1991). Circumference (full, more than half complete or less than half complete) was noted for all limb bone shaft fragments, following Bunn (1983). Additionally, to facilitate intra-assemblage comparisons, the maximum length of every identified specimen was measured to the nearest mm using a caliper (Bar-Oz, 2004). Specimens with recent breaks were excluded from this procedure.

Mortality profiles were constructed for gazelles using tooth eruption and wear and bone fusion data (following Munro et al., 2009). Sexing was attempted for gazelle using applicable character traits and multiple measurements, as defined by Munro et al. (2011) for modern, known-sex mountain gazelles from Israel.

Statistical significance was tested at $\alpha = 0.05$ level (Shennan, 1988), using PAST freeware (Hammer et al., 2001) and SPSS version 19 software. We employed the χ^2 distribution for comparing nominal variables, such as the relative abundance of species or taphonomic variables. When comparing many variables Adjusted Residuals (AR) were calculated for each cell and presented along the composite χ^2 , in order to discern which cells most significantly differ from the expected values. AR values are standard normal deviates, indicating the probability that a single-cell comparison is statistically significant. Significant ARs have values equal to or greater than ± 2 (Everitt, 1977; see Grayson and Delpech (2008) for an archaeological application). For comparing measurements (such as fragment lengths) we used Student's *t*-test and Analysis of Variance (ANOVA).

The faunal assemblage

Locus 1 yielded 1353 identified specimens (NISP; 664 specimens excluding squamate vertebrae), representing a minimum number (MNI) of 36 individual animals (excluding squamate vertebrae) belonging to 17 mammal, bird and reptile taxa. The total bone mass was 6147 g, of which 1910 g of bone was identified (31% of total bone mass). The volume of excavation from which this material was recovered is roughly estimated as 0.5 m³, meaning an approximate volumetric density of 2706 identified specimens, or 12,294 g of bones, per cubic meter. The vast majority of specimens, as other types of finds in Locus 1, were dispersed throughout the entire crevice with no apparent concentrations. The faunal items were positioned in a variety of orientations and inclinations. No articulated specimens were found (aside from teeth embedded in jaws).

Species representation and body-size classes

Species representation is presented here using NISP, as the MNI tallies are highly comparable and strongly correlated with the NISP counts (Spearman's rho: $r = 0.96$, $p < 0.001$; Table 2). Squamates and ungulates are the most numerous in NISP terms (54% and 35%, respectively), followed by tortoises (6%), small mammals (4%) and birds (1%). Most of the squamate remains are isolated vertebrae. The only squamate that was identified to species at this stage, based on the dentary, is the legless lizard (*Ophisaurus apodus*). It is quite a large lizard, reaching 1.2 m in length and weighing 300–600 g (Amitai and Bouskila, 2003). Judging by the dentaries, at least five individuals are present in the assemblage.

In addition five other indeterminate (smaller) individual squamates are present (Table 2).

Ungulates make up about one-third of the assemblage. Mountain gazelle (*Gazella gazella*, NISP = 153) is by far the most common ungulate species. Larger ungulates are represented by Mesopotamian fallow deer (*D. mesopotamica*, NISP = 16), wild boar (*S. scrofa*, NISP = 10, all teeth) and *Capra* sp. (probably bezoar goat, *Capra aegagrus*; NISP = 2). Most of the ungulate specimens were identified to size-class rather than species, with the small ungulate (gazelle-size class) dominating (NISP = 258), followed by the medium ungulate (NISP = 22, probably belonging to fallow deer) and the large ungulate size class (NISP = 7) (Table 2). The latter almost certainly belongs to aurochs (*B. primigenius*), which was positively identified in other Natufian samples in the cave (Garrard, 1980; Nadel et al., 2009a). The sporadic presence of roe deer (*Capreolus capreolus*) was previously noted at the site (ibid.), but this species was not found in the current sample.

The NISP of carapace, plastron and limb remains of spur-thighed tortoise (*Testudo graeca*) is 78 (MNI = 4). Small mammals are well represented by the Cape hare (*L. capensis*, NISP = 11) and by five species of small carnivores: red fox (*V. vulpes*, NISP = 18), beech marten (*Martes foina*, NISP = 6), cat (*Felis* sp., probably *Felis sylvestris*; NISP = 2), Eurasian badger (*Meles meles*; NISP = 1) and Egyptian mongoose (*Herpestes ichneumon*, NISP = 1) and by their corresponding size class.

Bird taxa include chukar partridge (*Alectoris chukar*, NISP = 6) and some diurnal raptors (Falconiformes, NISP = 8). One specimen of the Ardeidae family was identified. Also, three identified specimens belong to medium-size birds (partridge-size) and two specimens belong to large-size (large raptor size) birds. Altogether, the bird bones represent at least five individuals (Table 2).

Table 2

Taxonomic composition. NISP counts, as well as MNI counts for mutually exclusive taxa, are presented.

	NISP	MNI	Notes
Ungulates			
<i>Gazella gazella</i>	153	7	
Small ungulate	258		
<i>Dama mesopotamica</i>	16	1	
<i>Capra aegagrus</i>	2	1	
<i>Sus scrofa</i>	10	2	All teeth
Medium ungulate	22		
Large ungulate	7	1	
Fetus/neonate ung.	1		
Small mammals			
<i>Lepus capensis</i>	11	1	
Small mammal (indet.)	11		
<i>Vulpes vulpes</i>	18	3	
<i>Martes foina</i>	6	2	
<i>Felis</i> sp.	2	1	
<i>Meles meles</i>	1	1	Complete metapodial
<i>Herpestes ichneumon</i>	1	1	
Small carnivore (indet.)	4		
Birds			
<i>Alectoris chukar</i>	6	1	
Ardeidae	1	1	
Falconiformes-small	1	1	
Falconiformes-med.	1	1	
Falconiformes-large	6	1	
Bird-medium	3		
Bird-large	2		
Reptiles			
<i>Testudo graeca</i>	78	4	
<i>Ophisaurus apodus</i>	22	5	All skull/jaw fragments
Lizard	92		All vertebrae
Snake	597		All vertebrae
Squamata (indet.)	21	5	All jaws (excluding <i>Ophisaurus</i>)
Total	1353	36	

Bone-surface modifications

Counts of bone-surface modifications are detailed in Table 3 for the four mammal size classes, as well as the tortoises, birds and squamates. The three ungulate size classes exhibit bone burning, cutmarks, and (except for the small sample of large ungulate remains) percussion marks, identifying these bones as the remains of human food refuse. In contrast, the bones of the small mammal group (NISP = 54) do not display these modifications. The cutmarks of the gazelle size class (NISP = 13, 3.5% of relevant NISP) can be related to all stages of the butchery processes – skinning, dismemberment and filleting (following Binford, 1981). Percussion marks, mainly represented by conchoidal notches (Pickering and Egeland, 2006), were found on 8% of the relevant small and medium ungulate bones ($n = 15$ and 2, respectively), where processing for marrow is feasible. In the small ungulate class percussion marks were found on all types of long bones and on first phalanges, in roughly equal proportions.

Burning (indicated by bone color) appears on 6% of NISP (Table 3). This is a low burning frequency compared to other Paleolithic and Epipaleolithic faunas in Mount Carmel (Bar-Oz and Dayan, 2003; Yeshurun et al., 2007, 2009, n.d.-a). Such a small burned assemblage makes it difficult to pinpoint intra-skeletal variation of burning.

Some signs of carnivore and rodent gnawing hint at the possible role of animals in the deposition or modification of the assemblage. Carnivore modification, especially scoring, crenellations and possible gastric etching, appear on 4–6% of small ungulate, small mammal and bird NISP. Rodent gnawing appears on 2% of NISP on average (Table 3). Most of the carnivore marks in the gazelle size class (NISP = 17) appear on epiphyses or near-epiphyseal shafts of limb bones, or on toes, suggesting feeding on defleshed bones (Kent, 1981), although the sample here is too small for this to be demonstrated quantitatively (e.g., Dominguez-Rodrigo and Pickering, 2003). No traces of large carnivores or their coprolites were identified in the Natufian of Raqefet to date, the largest being a single wolf or dog (*Canis lupus*) specimen in the sediments overlying the current sample. Thus, it can be suggested that the gnawers were small to medium carnivores, not large bone-crunching carnivores such as hyenas. It is possible that dogs, foxes, or even humans (Martínez, 2009) gnawed the bones.

Sub-aerial weathering had almost no impact on the assemblage, as the specimens bearing weathering at stage 3 is only 0.5%, and bones attributed to higher weathering stages were not found at all. Root (biochemical) marks are abundant on all taxonomic groups, appearing on 25–57% of NISP (excluding isolated teeth) and trampling striations and traces of physical abrasion appear in small numbers (Table 3).

Limb-bone fracture patterns

The analysis of breakage patterns was conducted on 105 mammal long-bone and first phalanx shaft fragments. The results (Table 3) indicate that about half of the ungulate bones display green, or fresh, fractures, attributed to deliberate fracturing for nutritional purposes by humans or carnivores in order to access the bone marrow. This high percentage is in line with a consumed assemblage that subsequently suffered additional cycle/s of breakage while the bones were already dry, resulting in intermediate and dry breaks, not of an assemblage whose primary breakage took place *in situ* in the post-depositional stage (Villa and Mahieu, 1991). The majority of ungulate limb shafts retained less than 50% of their original circumference (Table 3). When considered in tandem with the high percentage of 'green' fracture morphology, this also suggests frequent deliberate breakage of long bones and toes for marrow extraction. The nutritional rather than attritional primary

Table 3

Bone-surface modifications and bone fracture patterns for all taxonomic groups.

		Small mammal	Small ungulate	Medium ungulate	Large ungulate	Tortoise	Lizard/Snake	Bird	Total
NISP		54	411	50	7	78	734	20	1354
Burning	<i>n</i>	0	22	1	2	3	50	3	81
	%	0.0	5.4	2.0	28.6	3.8	6.8	15.0	6.0
Shaft fracture	Green	3	41	7	1				52
	Dry	5	23	3	0				31
	Inter.	0	16	2	0				18
Shaft Circ.	<50%	3	65	9	2			0	79
	>50%	1	1	1	0			0	3
	100%	7	11	2	0			8	28
Weathering (stage 3–5)	<i>n</i>	0	2	0	0	1		0	3
	of	48	367	41	7	78		20	604
	%	0.0	0.5	0.0	0.0	1.3		0.0	0.5
Cutmarks	<i>n</i>	0	13	4	2	0		0	19
	%	0.0	3.5	9.8	28.6	0.0		0.0	3.1
Percussion marks	<i>n</i>	0	15	2	0				17
	of	32	182	24	5				243
	%	0.0	8.2	8.3	0.0				7.0
Working	<i>n</i>	0	4	0	0	0		0	4
	%	0.0	1.0	0.0	0.0	0.0		0.0	0.3
Gnawing (carnivore)	<i>n</i>	3	17	1	0	0		1	22
	%	6.3	4.6	2.4	0.0	0.0		5.0	3.6
Gnawing (rodent)	<i>n</i>	0	10	0	0	3		0	13
	%	0.0	2.7	0.0	0.0	3.8		0.0	2.2
Root-marks	<i>n</i>	12	116	19	4	19		6	186
	%	25.0	31.6	46.3	57.1	24.4		30.0	30.8
Trampling striations	<i>n</i>	2	20	8	1	0		0	31
	%	4.2	5.4	19.5	14.3	0.0		0.0	5.1
Abrasion	<i>n</i>	1	23	1	0	3		0	28
	%	2.1	6.3	2.4	0.0	3.8		0.0	4.6

breakage is further attested by the full circumference preservation of bird limb bones, which have no marrow and thus did not need to be split (Table 3).

Worked bone taphonomy

Bones with clear signs of working form a small fraction of the faunal assemblage in Raqefet Cave (Table 3). In Locus 1, the ratio of worked bones to NISP (expressed here as *worked bones/NISP X 100*) is 0.89%, which is similar to the figure for LN el-Wad Terrace (Yeshurun, 2011; for a fuller account of the worked bone industry see Nadel et al., 2012). Most of the tools are points or awls, which were probably shaped by shaving with a flint edge, because they display typical longitudinal scratches all over the bone implement (compare Campana, 1989: pl. 4, 18). The pointed implements were made on metapodials and tibiae of small ungulates, usually mountain gazelle (*G. gazella*).

No apparent 'production waste' was found in the assemblage, but taphonomic evidence may help in elucidating whether the manufacture of bone tools took place on-site. The average fragment length of pointed implements made on small ungulate limb shafts is 54.5 mm, significantly longer than the average length of gazelle-sized limb bone shafts in the unworked faunal assemblage (40 mm; $t = 3.12$, $p = 0.003$). This could mean that bone craft was performed elsewhere, not using the inadvertently created 'blanks' (fractured limb shaft fragments) and reducing them in process. Burning damage, mostly carbonization, was apparent on three worked specimens (25%), which is markedly higher than the frequency of burning in the unworked assemblage (6% of NISP; $\chi^2 = 8.67$, $p < 0.001$). Two interesting possibilities for this discrepancy are that it constitutes further evidence for making bone artifacts off-site; or that making some of the bone tools entailed moderate heating to make the bone tools firmer or nicely colored, and later (post-discard) burning did not mask this activity. Thus, while it is possible that intermittent on-site bone working took place, the observations that bone implements are longer than their

potential blanks and more frequently burned possibly imply that bone craft took place elsewhere, importing tools to the site as finished and curated items.

Skeletal-element representation and fragmentation

The raw NISP and MNE data for each ungulate bone portion are available as Supplementary Data. The skeletal-element profile of the most abundant mammal group, the small ungulate size-class, indicates that the best-represented bones are the ulna, patella and skull (including maxillary teeth). The mandible, humerus, tarsals, metapodials and toes are fairly well represented, and other elements are less frequent, especially the horns, vertebrae and ribs (Table 4; Fig. 3).

The relative frequency of the small ungulate skeletal elements is positively and significantly correlated with bone mineral density ($r = 0.32$, $p < 0.001$; based on BMD_{1,2} CT-derived density values of *Connachaetes taurinus* from Lam et al., 1999: Table 1), but the correlation coefficient (r^2) accounts for only 10.6% of element survival. This somewhat ambiguous result is emphasized by the very high representation of the proximal ulna and the patella, two elements of medium density which are rarely as common in Epipaleolithic faunas from the region as they are here (compare Bar-Oz, 2004; Munro, 2012; Marom and Bar-Oz, 2008). Further examination of this issue comes from comparing dense and less-dense portions (based on MNE) of the same skeletal element, which was likely carried to the site in its entirety (Binford, 1981; Stiner, 1994). The bony parts of the skull are modestly underrepresented compared to skull dentition (3:5) and dense limb-bone shafts are better represented than cancellous limb-bone ends (21:16). However, the proximal (porous) vs. distal (dense) ends of the humerus and the tibia are similarly represented (Supplementary Data). The weak correlation coefficient of bone survivorship vs. mineral density and the results of the specific tests of attrition suggest that some density-mediated attrition had occurred in the assemblage, nevertheless playing a relatively mild role.

No significant correlation is apparent between skeletal-element frequency (MAU) and the Food Utility Index (FUI, after Metcalfe and Jones, 1988) for the high-survival set (defined, following Marean and Cleghorn (2003) as the limbs, mandible and maxilla, and additionally the pelvis; $r = 0.13$, $p = 0.74$; Fig. 4). The largely even representation of the high-survival set of bones supports the insignificant correlation with the FUI and suggests an ‘unconstrained’ strategy of carcass transport (Faith and Gordon, 2007), meaning that complete gazelle carcasses were probably transported to the site. This is not surprising given the small size of the mountain gazelle (17–25 kg; Mendelsohn and Yom-Tov, 1999). Larger ungulates are represented by most body parts but their rarity at Raqefet precludes quantitative comparison to elucidate differential inter-taxonomic transport patterns.

The ungulate bones are fragmented (Supplementary Data). The extent of bone completeness is measured here using the MNE/NISP ratio (Lyman, 1994). A ratio of one means that the skeletal element was complete, while a decreasing ratio means that more identified fragments were needed to establish the minimum number of possible complete elements (MNE) and thus the element is more fragmented. The small ungulate class displays a low total Completeness Index (MNE/NISP ratio) of 0.30 – most limb bones and toes are lower and carpals, tarsals, horns, patella and the ulna are higher. A significant inverse correlation exists between the average marrow content of bones of *G. gazella* (Bar-Oz and Munro, 2007: Table 10) and their completeness in the assemblage (MNE/NISP; $r = -0.73$, $p = 0.03$; Fig. 5). Looking at the entire range of body parts, marrow-bearing elements and the fat-rich skull are significantly less complete than non-marrow bearing elements (Mann-Whitney: $u = 3.5$, $p < 0.001$). This relation can hardly be explained by density-mediated attrition or bone shape, because fragile, spongy or elongated elements, as well as round and compact elements, are both less fragmented than marrow-bearing elements.

Together, the presence of hammerstone-percussion marks on 8.2% of the small ungulate marrow-bearing elements, the high frequency of ‘green’ limb fractures and shaft fragments with <50% shaft circumference, and the significant and positive relation between marrow content and bone fragmentation suggest that marrow was systematically exploited at Raqefet. Percussion marks (NISP = 17) appear on all limb bones and on three 1st phalanges of gazelle-sized ungulate, but no marks were detected on 2nd phalanges which have a lower marrow content (Bar-Oz and Munro,

Table 4

Skeletal-part frequency for the small ungulate group, and the Completeness Index (MNE/NISP).

	NISP	MNE	MAU	%MAU	MNE/NISP
Horn	4	2	1	17	0.50
Skull	34	5	5.0	83	0.15
Mandible	37	6	3.0	50	0.16
Cervical	11	6	0.9	14	0.55
Thoracic	4	2	0.2	3	0.50
Lumbar	18	6	1.0	17	0.33
Ribs	46	19	0.7	12	0.41
Scapula	7	4	2.0	33	0.57
Humerus	17	6	3.0	50	0.35
Radius	12	3	1.5	25	0.25
Ulna	14	12	6.0	100	0.86
Carpals	7	4	2.0	33	0.57
Pelvis	8	2	2.0	33	0.25
Femur	25	3	1.5	25	0.12
Patella	12	12	6.0	100	1.00
Tibia	14	4	2.0	33	0.29
Tarsals	18	8	4.0	67	0.44
Metapod	46	11	2.8	46	0.24
Toes	77	10	2.5	42	0.13
Total	411	125			0.30

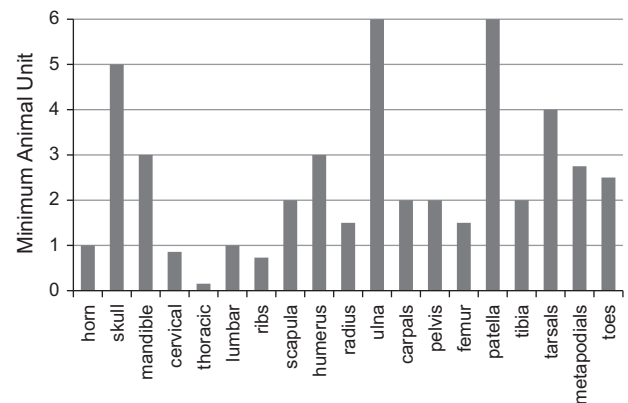


Fig. 3. Skeletal-element profile of the small ungulate group, based on Minimum Animal Unit (MAU). Data are from Table 4.

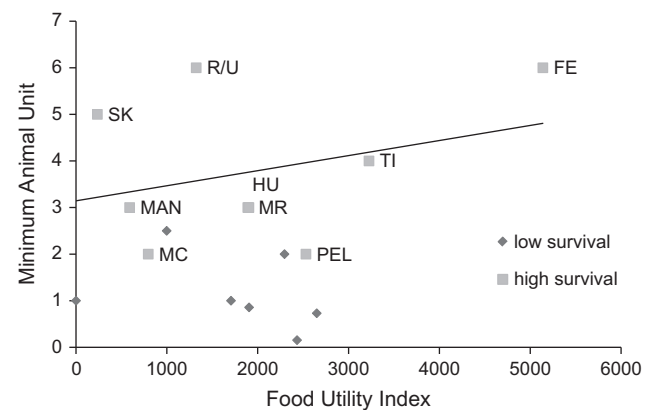


Fig. 4. The relation between body-part utility (Food Utility Index, after Metcalfe and Jones, 1988) and frequency in the assemblage (Table 4). The trend line represents only the high-survival set of bones, including the pelvis. The femur MAU also includes the patella representation.

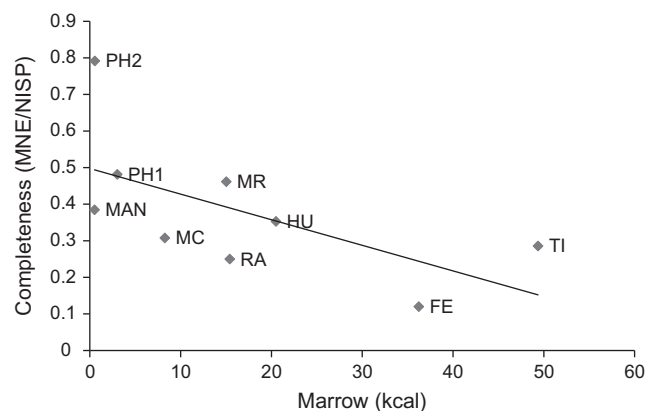


Fig. 5. The relation between bone fragmentation of the small ungulate group (excluding isolated mandibular teeth) and average marrow content (Bar-Oz and Munro, 2007: Table 10).

2007) and also happen to be the least fragmented marrow-bearing element in the assemblage (Fig. 5). This probably means that 2nd phalanges, unlike 1st phalanges, were not breached because of their minute amount of marrow. Thus, marrow processing was responsible for the initial fragmentation of the marrow or fat-bearing elements in the assemblage.

Table 5

Aging data for gazelle mandibular teeth. Each row represents an individual tooth.

	Wear code	Age (months)
dP4	0	0
	20	2–7
	14+	2–7
M3	6	18–26
	5–9	18–26
	10	36–96
P4	1	18–20
	1	18–20
	1	18–20
	1	18–20
	4	36+

Note: Wear codes and absolute age assignments follow Munro et al. (2009).

Age and sex profiles

The sample of ageable gazelle skeletal elements is small, and the most detailed information was provided by dental eruption and wear, specifically the dP₄–P₄ sequence, covering the entire life-span of the animal (Munro et al., 2009). The results indicate the presence of several young adult animals, 18–20 months of age, along with fawns (2–7 months) a fetus or neonate and an old adult animal (Table 5; Fig. 6). Therefore, mainly fawns and young adults were deposited in Locus 1.

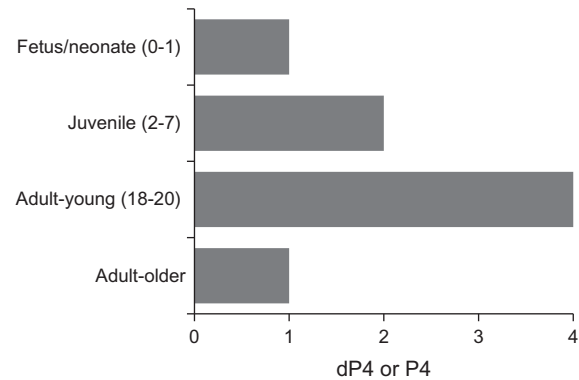
Sexing evidence is scanty. Parts of at least two sexually dimorphic gazelle horn-cores were found, belonging to males. No other character traits were preserved (such as the caudal wing tips of the atlas or an indicative portion of the pubic shaft). No evidence for the preferential collection of male horn-cores was found (in contrast to Hayonim Cave, where a cache of these elements was discovered: Munro, 2009b). Therefore, the prevalence of male horn-cores may be a reliable measure of sex ratios at Raqefet and, coupled with the dental data, cautiously suggests gazelle exploitation geared towards fawns and young adult males.

Interim summary

The main results of the zooarchaeological and taphonomic analysis at Locus 1 may be summarized as follows. Mountain gazelles and occasionally larger ungulates (Mesopotamian fallow deer, wild boar, bezoar goat and a large ungulate, most likely aurochs) were hunted. Gazelle fawns and young adult males were possibly preferred. Tortoises and small mammals were acquired and probably eaten, too, along with some birds, lizards and snakes, all of which show similar depositional patterns to the anthropogenic ungulates and are known to have been consumed at many other Natufian sites (e.g., Bar-Oz, 2004; Bridault et al., 2008; Edwards and Martin, 2007, 2013; Munro, 2001, 2012; Yeshurun et al., 2009). The gazelles were transported complete to the site, with minimal or no off-site treatment, and then processed for meat and marrow. Following butchery and consumption, the remains were discarded with little evidence to suggest curation of certain body-parts or other kinds of special treatment. The disarticulated, fractured and discarded faunal remains underwent some mild density-mediated destruction in the pre- and post-burial stages. During the former, some carnivore activity impacted the remains, and subsequently biochemical activity in the soil affected the bones.

Testing the depositional scenarios for the Locus 1 fauna

The three hypotheses put forward for the origin of fauna in Locus 1 are tested here by the integration of vertebrate taphonomy

**Fig. 6.** Gazelle mortality profile constructed using the dP₄–P₄ series. The numbers in parentheses indicate age in months.**Table 6**

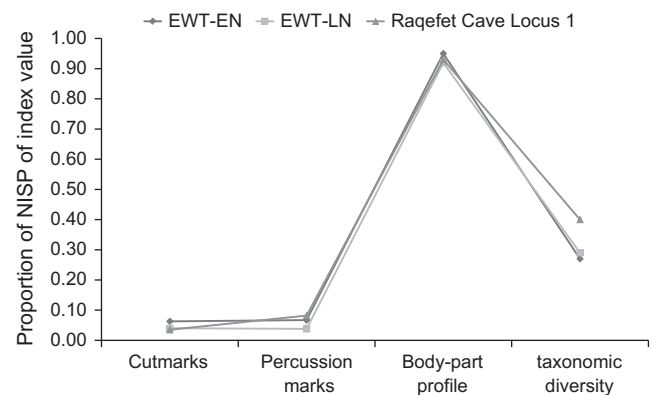
Comparison of markers for human exploitation in the Locus 1 assemblage (this paper) vs. the Early and Late Natufian samples of el-Wad Terrace (Yeshurun, 2011).

	EWT-EN	EWT-LN	Raqefet Cave Locus 1
Cutmarks ^a (%)	6.30	4.00	3.50
Percussion marks ^a (%)	6.70	3.80	8.20
Body-part profile ^b	0.95	0.92	0.93
taxonomic diversity ^c	0.27	0.29	0.40

^a % of relevant small ungulate NISP.

^b Evenness Index for the high-survival set of small ungulate bones. The Evenness Index (Shannon H divided by the natural log of the number of taxa or categories) is used here for supplementing utility correlations in comparisons of skeletal-element profiles, as well as for assessing the level of evenness of the values of a given variable across anatomical elements, or the evenness of the relative frequencies of taxa. In this case, the value of the index approaches 1 in a sample with similar representation of skeletal elements (Faith and Gordon, 2007).

^c Evenness Index for genera. See explanation above. In this case, the more similar the proportion of different taxa in the assemblage, the more the index approaches 1.

**Fig. 7.** Comparison of markers for human exploitation in Raqefet Cave – Locus 1 and three samples from the Early and Late Natufian el-Wad Terrace (Yeshurun, 2011). Data are from Table 6.

and archaeological context (hence contextual taphonomy) and by inter-site comparisons (Table 1).

The hypothesis of tertiary deposition from earlier living levels

Under this hypothesis we would expect the Locus 1 fauna to display the characteristic economic and taphonomic signature of a Natufian habitation (as defined in EWT, the Structure II Area) from which the fauna-bearing sediment could have been reshuffled.

Table 7

Comparison of markers for post-discard damage in the Locus 1 assemblage and three samples from the Early and Late Natufian el-Wad Terrace (Yeshurun, 2011), using Adjusted Residuals (AR).

	EWT-EN primary refuse	EWT-EN secondary refuse	EWT-LN	Raqefet Cave Locus 1
Total NISP	1786	107	998	411
Burned NISP	427	11	262	22
% within sample	23.90	10.30	26.30	5.40
Adjusted residual	3.1	−2.9	4	−8.7
NISP excluding Isolated teeth	1707	103	965	367
NISP with trampling striations	136	8	76	20
% within sample	8.00	7.80	7.90	5.40
Adjusted residual	0.8	0	0.3	−1.7
NISP excluding isolated teeth	1707	103	965	367
NISP with gnawing marks	106	11	61	17
% within sample	6.20	10.70	6.30	4.60
Adjusted residual	0	1.9	0.2	−1.3

Note: Positive AR values denote over-representation of a specific category, while negative values denote under-represented categories, in each sample.

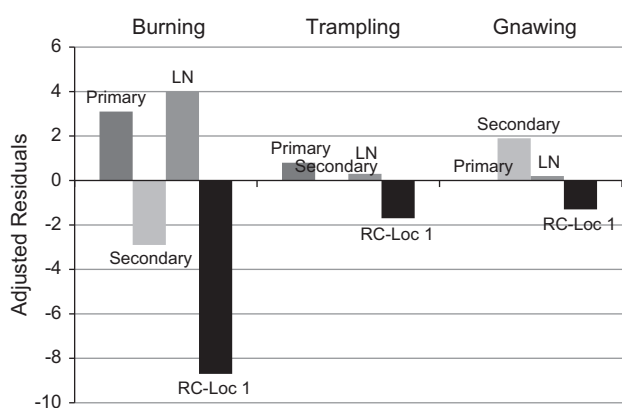


Fig. 8. Comparison of markers for post-discard damage in Raqefet Cave – Locus 1 and three samples from the Early (primary and secondary depositions) and Late Natufian el-Wad Terrace (Yeshurun, 2011), using Adjusted Residuals (AR). Positive AR values denote over-representation of a specific category, while negative values denote under-represented categories, in each sample. Data are from Table 7.

The fauna is expected to display widespread but indirect burning, high trampling and non-nutritional breakage, low weathering and high fragmentation.

The Locus 1 assemblage exhibits consumption modifications (cutmarks and percussion marks) in similar proportions to the el-Wad Terrace (EWT) samples (either Early or Late Natufian), along with an equally even representation of body parts and a similar taxonomic diversity (Table 6; Fig. 7). These measures probably mean that gazelles in Raqefet were exploited similarly to the EWT gazelles during the Natufian, and that the spectrum of game

was similarly broad. While the consumption stage may be indistinguishable in both sites, the taphonomic histories of Raqefet and EWT part ways in the discard stage. The EWT samples were heavily affected by post-discard burning, but in Locus 1 bone burning is notably infrequent, and trampling and gnawing exhibit slightly lower values, too (Table 7; Fig. 8). It is telling that all Natufian sediments in the cave are grave deposits; no remnants of a hypothesized LN occupation were preserved anywhere outside of Locus 1.

The hypothesis that the Locus 1 fauna are remnants of reshuffled living deposits in the cave may be supported by the consumption-stage taphonomic evidence, but is unsupported by the discard-stage taphonomic evidence. The latter, especially the issue of bone burning, does not fit with an origin in living deposits consisting of repeated or intensive occupations, as known from EWT and elsewhere (see above).

The hypothesis of refuse deposition synchronous with the burials

Under this hypothesis we would expect the Locus 1 fauna to display low burning and trampling, larger bone specimens and more larger ungulates. These patterns are characteristic of Natufian secondary depositions, as defined in EWT (Locus 25).

The post-discard taphonomic measures align Locus 1 closer to Locus 25 in EWT (a refuse deposition outside of the main living area) than to either the dwellings area (EN) or the LN living levels at EWT (Fig. 8), where archaeofauna in primary deposition, suffering from recurring post-discard damage, was found (Yeshurun et al., n.d.-b). However, an important discrepancy between Locus 1 (Raqefet) and Locus 25 (EWT) is the rates of post-discard exposure – negligible in the former vs. relatively long in the latter, which exhibits much more weathered and gnawed specimens. This

Table 8

Comparison of bone fragment lengths (NISP excluding Squamata) in Raqefet Cave – Locus 1 and three samples from the Early and Late Natufian el-Wad Terrace (Yeshurun, 2011): (a) statistics of bone fragment lengths; (b) results of Tukey's standardized tests (*q* values and their probabilities) for each pair of samples. Significant values are marked in bold.

	EWT-EN primary refuse	EWT-EN secondary refuse	EWT-LN	Raqefet Cave Locus 1
(a)				
N	2461	143	1324	549
Mean (mm)	21.2	23.1	18.2	28.6
Variance	250.172	356.051	83.739	430.185
Large fragments (≥ 40 mm)	193	20	39	95
	7.8%	14.0%	2.9%	17.3%
(b)				
ANOVA $F = 54.34$, $p < 0.001$				
EWT-EN primary refuse		$p = 0.247$	$p = 0.025$	$p < 0.000$
EWT-EN secondary refuse	$q = 2.63$		$p < 0.000$	$p < 0.000$
EWT-LN	$q = 3.98$	$q = 6.61$		$p < 0.000$
Raqefet Cave- Locus 1	$q = 9.90$	$q = 7.27$	$q = 13.88$	

variance likely stems from a different archaeological nature, namely a cemetery in Locus 1 vs. a heap of material from anthropogenic activities and colluvial processes in Locus 25.

More insights are provided by the taphonomic comparison of worked bones and unmodified faunal remains in Locus 1. The bone points are longer on average than their possible blanks (gazelle limb-bone shaft fragments) and significantly more burned (see above), suggesting off-site production, and less severe post-discard breakage affecting the bone tools in the post-discard stage. Contrasting evidence, namely on-site bone-working and subsequent deposition of worked items along with the rest of the butchery refuse, succumbing to the same destruction processes, was found in the domestic area of EWT (Yeshurun et al., n.d.-b).

It has been demonstrated ethnographically (e.g., Binford, 1978; O'Connell, 1987; Simms, 1988) as well as archaeologically for Natufian EWT (Yeshurun et al., n.d.-b) that a secondary refuse deposit may be differentiated by larger bone fragment size and larger taxa. In Natufian contexts, this phenomenon results from two factors: the occasional toss of larger and bulkier faunal parts away from the habitation area, and reduced fragmentation from ongoing trampling and indirect burning. Locus 1 displays a relatively large mean bone fragment size for a Natufian assemblage, significantly higher than even the refuse deposition in Locus 25 of EWT (Table 8). Additionally, the proportion of large (≥ 40 mm) bone fragments is comparatively high in Locus 1 (Table 8), despite having a similar range of taxa, butchered and consumed in much of the same way.

Hence, three lines of evidence – reduced post-discard damage (particularly bone burning), possibly imported bone tools, and larger bone fragment size – converge to suggest that food refuse in Locus 1 was little affected by unintentional damage from recurring occupations. In conjunction with the lack of Natufian sediments outside of the cemetery, the evidence indicates that the vertebrate remains are the intentionally-gathered refuse of relatively short consumption events.

It is theoretically possible that this pattern corresponds to an earlier occupation (not related to the burial events) that was particularly ephemeral so as to not leave significant post-discard damage and that was completely destroyed by grave digging or other mechanisms through time. However, such an ephemeral occupation that is not connected with a specific task (internments, in this case) is actually unknown in the Natufian realm; the rich archaeological record contains either camps where occupation was repetitive and intensive enough to create the characteristic amalgamations of faunal remains with noticeable habitation damage, or small specialized sites such as Hilazon Tachtit Cave. Therefore we view this option as unlikely; chances are that refuse not corresponding to the taphonomic patterns that are known in virtually all Natufian habitation sites in the 'core area' would be connected to short consumption events connected to the burial activity in Raqefet Cave, and not to a preexisting 'ephemeral' occupation.

The hypothesis of depositing animal parts as grave goods

Under this hypothesis we would expect to find frequent anatomical articulations and high completeness in conjunction with meager post-discard damage. The lack of anatomical articulations and the fact that it is a butchered and consumed assemblage make it clear that no complete animal carcasses, or substantial parts thereof, were interred in Locus 1. This pattern contrasts with the undamaged animal skeletons found in some graves at 'Uyun al-Hammam, 'Eynan and Hayonim Terrace (Davis and Valla, 1978; Maher et al., 2011; Tchernov and Valla, 1997). Another possibility is that animal bones, or specific body parts, were interred as grave goods. Such an activity is harder to detect in archaeofaunal assem-

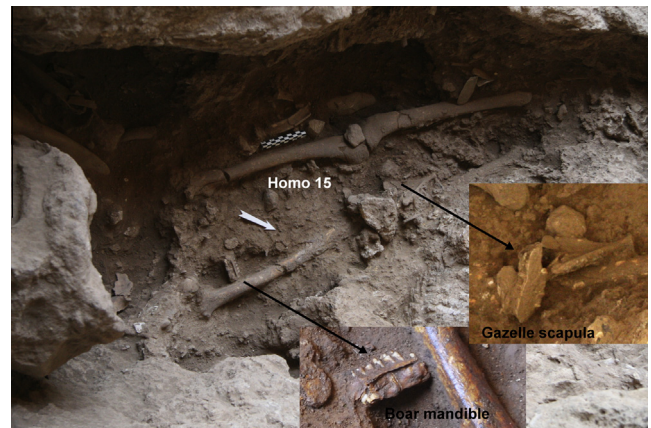


Fig. 9. the burial of Homo 15 in Locus 1, with two exceptionally complete faunal specimens adhering to its legs.

blages but may be indicated by the existence of skeletal elements that are markedly more complete compared to the general state of the faunal remains. Earlier examples of such interments are known from the Levantine Middle Paleolithic, such as a complete red deer maxilla in a Neanderthal burial at Amud Cave, which stands out compared to the high fragmentation of the rest of the faunal assemblage (Hovers et al., 2000; Rabinovich and Hovers, 2004).

Most of the human skeletons in Locus 1 do not have faunal specimens associated with them in this way. One notable exception was Homo 15, an adult whose extended legs were preserved in articulation, and the only case of unfolded legs in the cave (Nadel et al., 2009a). Here, a wild boar mandible and a complete gazelle scapula were found in close physical contact with the legs (Fig. 9). A complete ungulate scapula, preserving the thin and fragile parts, is very rare in the Mount Carmel Natufian assemblages, and indeed in most of the anthropogenic Paleolithic assemblages in the region (e.g., Bar-Oz, 2004; Yeshurun et al., 2007). Wild boar is uncommon at Raqefet and is mostly represented by isolated specimens, not by intact pieces of jaw with several teeth as is the case here. While not constituting unambiguous evidence, these remains may indicate a purposeful insertion of at least two animal parts, from two different species, to the grave of one of the deceased as burial offerings. Their exceptional state of preservation is thus explained in the fast and deliberate covering following their insertion.

Discussion

The integration of vertebrate taphonomy and archaeological context, assisted by comparisons with the EWT results, enabled the assessment of the three hypotheses put forward as explanations to the faunal deposition in Locus 1. From the levels of disarticulation and abundant evidence for butchery and consumption it is clear that no complete animal carcasses, or large parts thereof, were interred in Locus 1. Deliberate interment of several animal bones, or single skeletal elements, as grave goods is a possibility in only one burial (Homo 15). The hypothesis that the Locus 1 fauna is remnants of earlier living deposits in the cave that were reshuffled to fill the graves is supported by the consumption-stage taphonomic evidence, but not by the discard-stage taphonomic evidence. The latter, especially the dearth of bone burning, does not agree with origin in living deposits consisting of many repeated occupations, as known from EWT (Yeshurun et al., n.d.-b) and other Natufian hamlets (Bridault et al., 2008; Munro, 2012). Rather, it accords better with short and punctuated episodes of cave use whose consumption refuse were discarded into Locus 1.

This, along with other lines of indirect evidence (worked-bone taphonomy and bone fragment size) supports the hypothesis of refuse (secondary) deposition that likely was synchronous with the funerary activity in the cave.

The nature of this refuse deposition is not easy to determine. Some evidence suggests that it had a social meaning beyond simply using Locus 1 as a trash pit. The fact that no LN 'domestic' sediments bearing faunal refuse were found in the extensively-excavated cave implies that the faunal refuse was habitually gathered and cleaned into Locus 1 at the end of each period of activity, rather than being occasionally tossed into the crevice. In the latter scenario, remnants of Natufian trash would have been found in the cave as 'habitation deposits', which is not the case here. This rather thorough cleaning is inconsistent with the Natufian 'domestic norms' of simple refuse maintenance as observed at EWT (Yeshurun et al., *in press*, n.d.-b) and other sites (Edwards and Martin, 2007; Hardy-Smith and Edwards, 2004; Samuelian, *in press*), suggesting some special, non-domestic meaning for the observed refuse maintenance. A similar habit of disposing consumption debris inside graves was also discovered at the contemporaneous burial cave of Hilazon Tachtit (Munro and Grosman, 2010), where low bone-burning intensity was observed as well (Grosman and Munro, 2007).

Locus 1 presents us with a special case of 'depositional clarity': repeated but otherwise well-preserved burials in a bedrock crevice, not cutting into pre-existing levels with refuse and undisturbed by later occupations (LN or other). In contrast, LN graves in most other sites cut into older occupation sediments, with stratigraphic problems arising when trying to isolate 'ritual meals' or grave-associated items (e.g., Belfer-Cohen, 1988; Stekelis and Yizraely, 1963; Valla and Bocquentin, 2008; Weinstein-Evron, 2003, 2009; Weinstein-Evron et al., 2007). Hence, Locus 1 provides a clearer burial context than most Natufian sites, making it possible to offer a reconstruction of the activities performed by the LN visitors of the cave and providing a glimpse into their 'ritual meals' (following Hayden, 2011).

Several punctuated burial events took place in the cave. Seven deceased were interred in succeeding and discrete events, some cutting former graves (Nadel et al., 2009a). Considering animal MNI counts in Locus 1, and proceeding with the theoretical exercise that the identified fauna represents the fully deposited refuse of seven burial events, it may be suggested that a gazelle, several small animals and sometimes a larger ungulate (wild boar, fallow deer and probably aurochs) were consumed in each event. Estimating the number of participants in these ceremonies is speculative; however, taking into account the area of the lighted first cave chamber (roughly 150 m²), providing a good eye-sight of the burial area, up to eighty people could have taken part in the burial ceremony (following the figure of 2 m² per person; Hayden, 2011). The high, vault-shaped cave ceiling would make it possible to accommodate dozens of people without getting too overcrowded. The modest amount of game consumed in each event, according to this exercise, could perhaps mean that the number of participants was smaller. In any case, a minimum amount of ca. 15 kg of meat would have been available in each event – a gazelle supplemented by smaller animals. In half the cases, the consumption of a larger ungulate in addition to gazelle would have raised this figure. The exploited bone marrow would have provided as much as 900 kilocalories per gazelle, though this is heavily dependent on the season and nutritional status of the animal (Bar-Oz and Munro, 2007). Both meat and marrow, probably joined by plant foods (Power et al., n.d.) and possibly drinks (e.g., Hayden et al., 2013), would have made for a fine meal for a group totaling a few dozens of people. The leftovers would then be collected and buried with the deceased, creating the artifact-rich fill of Locus 1.

It is tempting to classify the Locus 1 archaeofauna as remains of funerary feasts; indeed, the context of consumption and discard points to the fauna being deposited as part of a specialized event including burial of the dead. Several ethnographic-driven traits for identifying an Epipaleolithic or Early Neolithic feast in the archaeological record have been suggested (Hayden, 1995, 2004, 2011; Miracle, 2001, 2002; Twiss, 2008). Of these, primary indicators were a specialized location; large quantities of faunal remains; specialty foods; special food-preparation and food-serving vessels; large hearths; and special associated artifacts and prestige items. The principal difficulty in correctly assessing these measures in an Epipaleolithic, rather than recent ethnographic context is insufficient stratigraphic and contextual resolution. Extraordinary stratigraphic resolution is needed, for example, to assess the number of game animals per event, and clean contextual resolution is required to correctly identify 'special' foods or items when intermingled with everyday refuse. How does one recognize archaeologically a feast of moderate scale, which uses surpluses of the same available spectrum of resources as 'mundane' consumption episodes? Importantly, such moderate feasts using available resources are the very kind of feasting activity that is to be expected from a complex hunter-gatherers society (Hayden, 2011). These problems were recently addressed in the recognition of LN feasting at Hilazon Tachtit Cave (Munro and Grosman, 2010, see above) and may now be circumvented in Raqefet Cave using contextual taphonomy and the unique preservational context of Locus 1.

The funerary activity in a remote and topographically high cave matches the first criterion for feasting. The meaning of large quantities of faunal refuse is difficult to establish in most Natufian sites because of insufficient stratigraphic resolution; as discussed above, Locus 1 may provide the depositional clarity needed to state that, indeed, good quantities of meat and marrow were available for short events. However, the animals consumed at Raqefet cannot be considered 'specialty foods' in the sense that they are the most abundant Natufian game in virtually all sites from the Mediterranean zone of the southern Levant, including the large domestic habitations (e.g., Bar-Oz, 2004; Bridault et al., 2008; Munro, 2004). Special food-preparation vessels may be overwhelmingly represented by the ubiquity of hewn bedrock features in the cave, totaling ca. 100 mortars, cupmarks and basins displaying extremely variable shapes and sizes. This phenomenon was already suggested to have been connected with ritual uses and to have formed a part of the LN social and spiritual worlds, because of the high manufacture costs of these features, the evidence for 'cancelling' deep mortars by burying artifacts and stones inside them, and the habit of placing them as graves goods/markers (Nadel et al., 2008, 2009b; Nadel and Lengyel, 2009; Nadel and Rosenberg, 2010; see also Stekelis and Yizraely, 1963). Hence, it is possible that some of the mortars were used for food preparation during burial events, or for other uses entailing public display during these events (Nadel and Lengyel, 2009; Rosenberg and Nadel, n.d.). To date, large hearths have not been found in the cave; however, investigations of thin sections in the sediments of Locus 1 concluded that the sediments were mainly anthropogenic, with a strong ash component represented by calcite ash mixed with chips of bones, pulverized soil material and charcoal (Nadel et al., 2009a). This could point to hearth material being swept into Locus 1. Special associated artifacts and prestige items are not common at Raqefet, small quantities of Scaphopod shell beads and stone beads notwithstanding (Lengyel et al., 2005; Nadel et al., 2008).

In sum, several 'feasting indicators', namely a specialized location; significant quantities of faunal remains per event; and possibly special food-preparation equipment support the notion that burial feasts were conducted at Raqefet during the Late Natufian. The amount of available meat was probably smaller than at

Hilazon Tachtit Cave, where taphonomic and stratigraphic evidence exists for deposition of three aurochs individuals in a single event, representing a vast amount of meat (Munro and Grosman, 2010; see also Goring-Morris and Horwitz, 2007, for a PPNB case-study). We could thus conceive of Raqefet Cave as a site that witnessed sporadic burial rituals, performed by bands of Natufians who went up the rocky slope to the cave, ate locally available foods and interred the deceased, purposely collecting their consumption remains into the grave before covering it with earth and stones. Judging by ethnographic markers, meat and marrow consumption at Raqefet would be classified as feasting of moderate scale, albeit higher than the nuclear family level (Hayden, 2011). Focusing on the discard stage, faunal taphonomy and inter-site comparisons in this study augment the notion that Raqefet Cave served a special ritual task and was probably not used for regular, intensive and recurrent habitations during LN times (Nadel et al., 2012, 2013).

The LN period in the Mediterranean southern Levant was sometimes viewed as one of cultural decline compared to the Early Natufian and a return to a more mobile way of life, due to the dwindling of architecture, elaborate burials and art in some key sites (Belfer-Cohen and Bar-Yosef, 2000; Garrod, 1957; Grosman, 2003; Henry, 1991; Munro, 2004). However, the rich LN occurrences of Nahal Oren (Noy, 1991; Stekelis and Yizraely, 1963) and Hayonim Terrace (Valla, 2012) and the new fieldwork at 'Eynan (Valla et al., 2007), Huzuk Musa (Rosenberg et al., 2010) and Nahal Ein Gev II (L. Grosman, pers. comm.), unveiled significant architectural and artistic findings in LN sites. Elaborate funerary customs are now known in Hilazon Tachtit Cave (Grosman et al., 2008) together with evidence of feasting (Munro and Grosman, 2010). It is against this background that our interpretation for the Raqefet Cave archaeofauna should be viewed. Minimally two specialized burial caves with evidence of elaborate funerary rituals, including feasting, are represented in the 'core area' Late Natufian, as well as domestic habitations and cemeteries in Nahal Oren and Hayonim Terrace. The diverse site types and rich finds may suggest stable – or even growing – LN populations in the Mount Carmel-Galilee region, corresponding with the evidence for geographic expansion of settlements and the emergence of novel technological and social adaptations in this period (e.g., Bar-Yosef, 2002; Conard et al., 2006; Grosman et al., 2008; Henry, 1976; Nadel et al., 2013; Richter et al., 2013; Rosen, 2010; Valla et al., 2007; Weinstein-Evron, 2009; Yeshurun et al., n.d.-a). The inferred communal consumption of meat and careful gathering of the leftovers at Raqefet Cave adds further support to the ubiquity of such feasting events during a time of significant transformations, when people needed a uniting social mechanism (Belfer-Cohen and Bar-Yosef, 2000; Twiss, 2008). Directly preceding the transition to agriculture, Raqefet Cave contains evidence for elaborate mortuary behavior and probably testifies to increasingly numerous and complex Natufian populations in the Mediterranean region of the southern Levant.

Acknowledgments

This paper is based on R.Y.'s doctoral research at the University of Haifa, generously funded by the Graduate Studies Authority, the Hecht Scholarship, The Wolf Foundation Scholarship and the Carmel Research Center Grant. The paper was written during his Fulbright post-doctoral fellowship in the Smithsonian Institution. Fieldwork was generously supported by the CARE Archaeological Foundation, the National Geographic Society and the Wenner-Gren Foundation. We thank M. Weinstein-Evron, M.A. Zeder and two anonymous reviewers for providing helpful comments on previous drafts. A. Regev prepared the digital figures.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jaa.2013.09.002>.

References

- Amirai, P., Bouskila, A., 2003. *Handbook of Amphibians and Reptiles in Israel*. Keter, Jerusalem (Hebrew).
- Bar-Oz, G., 2004. Epipaleolithic Subsistence Strategies in the Levant: A Zooarchaeological Perspective. ASPR Monograph Series, Brill, Boston.
- Bar-Oz, G., Dayan, T., 2003. Testing the use of multivariate inter-site taphonomic comparisons: the faunal analysis of Hefziba in its Epipaleolithic cultural context. *Journal of Archaeological Science* 30, 885–900.
- Bar-Oz, G., Munro, N.D., 2007. Gazelle bone marrow yields and Epipaleolithic carcass exploitation strategies in the Southern Levant. *Journal of Archaeological Science* 34, 946–956.
- Bar-Oz, G., Dayan, T., Kaufman, D., 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.
- Bar-Oz, G., Livne, P., Zaidner, Y., Weinstein-Evron, M., 2005. Fragments of information: preliminary taphonomic results from the Middle Palaeolithic breccia layers of Misiya Cave, Mount Carmel, Israel. In: O'Connor, T. (Ed.), *Biosphere to Lithosphere: New Studies in Vertebrate Taphonomy*. Oxbow Press, Oxford, pp. 128–136.
- Bar-Yosef, O., 1998. The Natufian culture in the Levant, threshold to the origins of agriculture. *Evolutionary Anthropology* 6, 159–177.
- Bar-Yosef, O., 2002. Natufian: a complex society of foragers. In: Fitzhugh, B., Habu, J. (Eds.), *Beyond Foraging and Collecting: Evolutionary Change in Hunter-Gatherer Settlement Systems*. Kluwer Academic/Plenum Publishers, New York, pp. 91–147.
- Bar-Yosef, O., Sillen, A., 1993. Implications of the new accelerator date of the charred skeletons from Kebara Cave (Mt. Carmel). *Paléorient* 19, 205–208.
- Bar-Yosef, O., Valla, F.R. (Eds.), 1991. *The Natufian Culture in the Levant*. International Monographs in Prehistory, Archaeological Series 1, Ann Arbor.
- Behrensmeyer, A.K., 1978. Taphonomic and ecological information from bone weathering. *Paleobiology* 4, 150–162.
- Behrensmeyer, A.K., Gordon, K.D., Yanagi, G.T., 1986. Trampling as a cause of bone surface damage and pseudo-cutmarks. *Nature* 319, 768–771.
- Belfer-Cohen, A., 1988. The Natufian graveyard in Hayonim Cave. *Paléorient* 14, 297–308.
- Belfer-Cohen, A., 1991. The Natufian in the Levant. *Annual Review of Anthropology* 20, 167–186.
- Belfer-Cohen, A., 1995. Rethinking social stratification in the Natufian culture: the evidence from burials. In: Campbell S., Green, A. (Eds.), *The Archaeology of Death in the Ancient Near East*. Oxbow Monograph 51, Oxford, pp. 9–16.
- Belfer-Cohen, A., Bar-Yosef, O., 2000. Early sedentism in the Near East: a bumpy ride to village life. In: Kuijt, I. (Ed.), *Life in Neolithic Farming Communities: Social Organization, Identity and Differentiation*. Plenum Publishers, New York, pp. 19–37.
- Belfer-Cohen, A., Goring-Morris, A.N., 2011. Becoming farmers: the inside story. *Current Anthropology* 52, S209–S220.
- Binford, L.R., 1978. Dimensional analysis of behavior and site structure: learning from an Eskimo hunting stand. *American Antiquity* 43, 330–361.
- Binford, L.R., 1981. *Bones: Ancient Men and Modern Myths*. Academic Press, New York.
- Blumenschine, R.G., Selvaggio, M.M., 1988. Percussion marks on bone surfaces as a new diagnostic of hominid behavior. *Nature* 333, 763–765.
- Blumenschine, R.G., Marean, C.W., Capaldo, S.D., 1996. Blind tests of inter-analyst correspondence and accuracy in the identification of cut marks, percussion marks, and carnivore tooth marks on bone surfaces. *Journal of Archaeological Science* 23, 493–507.
- Bocquentin, F., 2003. *Pratiques funéraires, paramètres biologiques et identités culturelles au Natoufien: une analyse archéo-anthropologique*. PhD Thesis. Université Bordeaux 1.
- Brain, C.K., 1981. *The Hunters or the Hunted? An Introduction to African Cave Taphonomy*. University of Chicago Press, Chicago.
- Bridault, A., Rabinovich, R., Simmons, T., 2008. Human activities, site location and taphonomic process: a relevant combination for understanding the fauna of Eynan (Ain Mallaha), level Ib (final Natufian, Israel). In: Vila, E., Gourichon, L., Choyke, A., Buitenhuis, H. (Eds.), *Proceedings of the 8th International Meeting of the ASWA. Maison de l'Orient et de la Méditerranée*, Lyon, pp. 99–117.
- Bunn, H.T., 1981. Archaeological evidence for meat-eating by Plio-Pleistocene hominids from Koobi Fora and Olduvai Gorge. *Nature* 291, 574–577.
- Bunn, H.T., 1983. Evidence on the diet and subsistence patterns of Plio-Pleistocene hominids at Koobi Fora, Kenya, and Olduvai Gorge, Tanzania. In: Clutton-Brock, J., Grigson, C. (Eds.), *Animals and Archaeology 1: Hunters and Their Prey*. British Archaeological Report, Oxford, pp. 21–30.
- Byrd, B.F., Monahan, C.F., 1995. Death, mortuary ritual, and Natufian social structure. *Journal of Anthropological Archaeology* 14, 251–287.

- Cain, C.R., 2005. Using burned animal bone to look at Middle Stone Age occupation and behavior. *Journal of Archaeological Science* 32, 873–884.
- Campana, D.V., 1989. Natufian and Protoneolithic Bone Tools: The Manufacture and Use of Bone Implements in the Zagros and the Levant. *British Archaeological Reports* 494, Oxford.
- Capaldo, S.D., Blumenschine, R.J., 1994. A quantitative diagnosis of notches made by hammerstone percussion and carnivore gnawing on bovid long bones. *American Antiquity* 59, 724–748.
- Conard, N.J., Kandel, A.W., Masri, M., 2006. The 2004 excavation at Baaz Rockshelter. In: Conard, N.J. (Ed.), *Tübingen – Damascus Excavation and Survey Project 1999–2005*, Kerns Verlag, Tübingen.
- Davis, S.J.M., Valla, F.R., 1978. Evidence for the domestication of the dog 12,000 years ago in the Natufian of Israel. *Nature* 276, 608–610.
- de Juana, S., Galán, A.B., Domínguez-Rodrigo, M., 2010. Taphonomic identification of cut marks made with lithic handaxes: an experimental study. *Journal of Archaeological Science* 37, 1841–1850.
- Delage, C. (Ed.), 2004. *The Last Hunter–Gatherer Societies in the Near-East*. BAR 1320, Oxford.
- Domínguez-Rodrigo, M., Barba, R., 2006. New estimates of tooth mark and percussion mark frequencies at the FLK Jinj site: the carnivore–hominid–carnivore hypothesis falsified. *Journal of Human Evolution* 50, 170–194.
- Domínguez-Rodrigo, M., Barba, R., 2007. Five more arguments to invalidate the passive scavenging version of the carnivore–hominid–carnivore model: a reply to Blumenschine et al. (2007a). *Journal of Human Evolution* 53, 427–433.
- Domínguez-Rodrigo, M., Pickering, T.R., 2003. Early hominid hunting and scavenging: a zooarchaeological review. *Evolutionary Anthropology* 12, 275–282.
- Domínguez-Rodrigo, M., de Juana, S., Galán, A.B., Rodríguez, M., 2009. A new protocol to differentiate trampling marks from butchery cut marks. *Journal of Archaeological Science* 36, 2643–2654.
- Edwards, Y.H., Martin, L., 2007. Fauna from the Natufian and PPNa cave site of Iraq ed-Dubb in Highland Jordan. *Paléorient* 33, 143–177.
- Edwards, Y.H., Martin, L., 2013. Animal bones and archaeozoological analysis. In: Edwards, P.C. (Ed.), *Wadi Hammeh 27, An Early Natufian Settlement at Pella in Jordan*. Brill, Leiden, pp. 321–352.
- Everitt, B.S., 1977. *The Analysis of Contingency Tables*. Wiley and Sons, New York.
- Faith, J.T., Gordon, A.D., 2007. Skeletal element abundances in archaeofaunal assemblages: economic utility, sample size, and assessment of carcass transport strategies. *Journal of Archaeological Science* 34, 872–882.
- Fisher, J.W., 1995. Bone surface modifications in zooarchaeology. *Journal of Archaeological Method and Theory* 2, 7–68.
- 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., 1957. The Natufian culture: the life and economy of a Mesolithic people in the Near East. *Proceedings of the British Academy* 43, 211–227.
- Garrod, D.A.E., Bate, D.M.A., 1937. *The Stone Age of Mount Carmel. Excavations at the Wadi Mughara, vol. I*. Clarendon Press, Oxford.
- Gaudzinski-Windheuser, S., Kindler, L., Rabinovich, R., Goren-Inbar, N., 2010. Testing heterogeneity in faunal assemblages from archaeological sites. Tumbling and trampling experiments at the Early-Middle Pleistocene site of Gesher Benot Ya'aqov (Israel). *Journal of Archaeological Science* 37, 3170–3190.
- Goring-Morris, A.N., Belfer-Cohen, A., 2008. A roof over one's head: developments in Near Eastern residential architecture across the Epipaleolithic–Neolithic transition. In: Bocquet-Appel, J.-P., Bar-Yosef, O. (Eds.), *The Neolithic Demographic Transition and Its Consequences*. Springer, Dordrecht, pp. 239–286.
- Goring-Morris, A.N., Horwitz, L.K., 2007. Funerals and feasts in the Near Eastern Pre-Pottery Neolithic B. *Antiquity* 81, 902–919.
- Grayson, D.K., Delpech, F., 2008. The large mammals of Roc de Combe (Lot, France): the Châtelperronian and Aurignacian assemblages. *Journal of Anthropological Archaeology* 27, 338–362.
- 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., 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., Belfer-Cohen, A., 2008. A 12,000-year-old Shaman burial from the southern Levant (Israel). *Proceedings of the National Academy of Sciences of the USA* 105, 17665–17669.
- Hammer, Ø., Harper, D.A.T., Ryan, P.D., 2001. PAST: Paleontological Statistics software package for education and data analysis. *Palaeontologia Electronica* 4, 9.
- Hardy-Smith, T., Edwards, P.C., 2004. The garbage crisis in prehistory: artifact discard patterns at the Early Natufian site of Wadi Hammeh 27 and the origins of household refuse disposal strategies. *Journal of Anthropological Archaeology* 23, 253–289.
- Hayden, B., 1995. Pathways to power: principles for creating socioeconomic inequalities. In: Price, T., Feinman, G. (Eds.), *Foundations of Social Inequality*. Plenum Press, New York, pp. 15–86.
- Hayden, B., 2004. Socio political organization in the Natufian: a view from the northwest. In: Delage, C. (Ed.), *The Last Hunter–Gatherers in the Near East*. BAR International Series 1320, Oxford, pp. 263–308.
- Hayden, B., 2011. Feasting and social dynamics in the Epipaleolithic of the Fertile Crescent: an interpretive exercise. In: Jiménez, G.A., Montón-Subías, S., Romero, M.S. (Eds.), *Guess Who's Coming to Dinner: Feasting Rituals in the Prehistoric Societies of Europe and the Near East*. Oxbow, Oxford, pp. 30–63.
- Hayden, B., Canuel, N., Shanse, J., 2013. What was brewing in the Natufian? An archaeological assessment of brewing technology in the Epipaleolithic. *Journal of Archaeological Method and Theory* 20, 102–150.
- Henry, D.O., 1976. Rosh Zin: a Natufian settlement near Avdat. In: Marks, A.E. (Ed.), *Prehistory and Palaeoenvironments in the Central Negev*. Southern Methodist University Press, Dallas, Israel, pp. 317–347.
- Henry, D.O., 1991. Foraging, sedentism, and adaptive vigor in the Natufian: rethinking the linkages. In: Clark, G.A. (Ed.), *Perspectives on the Past: Theoretical Biases in Mediterranean Hunter–Gatherer Research*. University of Pennsylvania, Philadelphia, pp. 353–370.
- Hovers, E., Kimbel, W.H., Rak, Y., 2000. The Amud 7 skeleton – still a burial. Response to Gargett. *Journal of Human Evolution* 39, 253–260.
- Kaufman, D., 1992. Hunter-gatherers of the Levantine Epipaleolithic: the socio-ecological origins of sedentism. *Journal of Mediterranean Archaeology* 5, 165–201.
- Kent, S., 1981. The dog: an archaeologist's best friend or worst enemy? The spatial distribution of faunal remains. *Journal of Field Archaeology* 8, 367–373.
- Lam, Y.M., Chen, X., Pearson, O.M., 1999. Intertaxonomic variability in patterns of bone density and the differential representation of bovid, cervid and equid elements in the archaeological record. *American Antiquity* 64, 343–362.
- LaMotta, V.M., Schiffer, M.B., 1999. Formation processes of house floor assemblages. In: Allison, P. (Ed.), *The Archaeology of Household Activities*. Routledge, New York, pp. 19–29.
- Le Dousseur, G., 2008. La place de l'industrie osseuse dans la néolithisation au Levant Sud. *Paléorient* 34, 59–89.
- Lengyel, G., 2007. Upper Palaeolithic and Epipaleolithic Lithic Technologies at Raqefet Cave, Mount Carmel east, Israel. *BAR International Series* S1681, Oxford.
- Lengyel, G., 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., Hershkovitz, I., 2005. Back to Raqefet Cave, Mount Carmel, Israel. *Journal of the Israel Prehistoric Society* 35, 245–270.
- Lyman, R.L., 1994. *Vertebrate Taphonomy*. Cambridge University Press, Cambridge.
- Maher, L.A., Stock, J.T., Finney, S., Heywood, J.J.N., Miracle, P.T., Banning, E.B., 2011. A unique human–fox burial from a pre-Natufian cemetery in the Levant (Jordan). *PLoS One* 6 (1), e15815. <http://dx.doi.org/10.1371/journal.pone.0015815>.
- Marean, C.W., Cleghorn, N., 2003. Large mammal skeletal element transport: applying foraging theory in a complex taphonomic system. *Journal of Taphonomy* 1, 15–42.
- Marom, N., Bar-Oz, G., 2008. “Measure for measure”: taphonomic reconsideration of the Kebaran site of Ein Gev I, Israel. *Journal of Archaeological Science* 35, 214–227.
- Martínez, G., 2009. Human chewing bone surface modification and processing of small and medium prey amongst the Nukak (Foragers of the Colombian Amazon). *Journal of Taphonomy* 7, 1–20.
- Mendelsohn, H., Yom-Tov, Y., 1999. *Fauna Palestina: Mammalia of Israel*. The Israel Academy of Sciences and Humanities, Jerusalem.
- Metcalfe, D., Jones, K.T., 1988. A reconsideration of animal body part utility indices. *American Antiquity* 53, 486–504.
- Miracle, P.T., 2001. Feast or famine? Epipaleolithic subsistence in the northern Adriatic basin. *Documenta Praehistorica* XXVIII, 177–197.
- Miracle, P.T., 2002. Mesolithic meals from Mesolithic middens. In: Miracle, P.T., Milner, N. (Eds.), *Consuming Passions and Patterns of Consumption*. McDonald Institute Monographs, Cambridge, pp. 65–88.
- Munro, N.D., 2001. *A Prelude to Agriculture: Game Use and Occupation Intensity during the Natufian Period in the Southern Levant*. Unpublished PhD Dissertation. University of Arizona, Tucson.
- Munro, N.D., 2004. Zooarchaeological measures of hunting pressure and occupation intensity in the Natufian: implications for agricultural origins. *Current Anthropology* 45, S5–S33.
- Munro, N.D., 2009a. Epipaleolithic subsistence intensification in the southern Levant: the faunal evidence. In: Richards, M.J., Hublin, J.-J. (Eds.), *Evolution of Hominid Diets: Integrating Approaches to the Study of Paleolithic Subsistence*. Springer, Dordrecht, pp. 141–155.
- Munro, N.D., 2009b. Integrating inter- & intra-site analyses of Epipaleolithic faunal assemblages from Israel. *Before Farming* 2009/1 article 4.
- Munro, N.D., 2012. The Natufian faunal assemblage from Hayonim Terrace. In: Valla, F.R. (Ed.), *Les Fouilles de la Terrasse d'Hayonim, Israël 1980–1981 et 1985–1989*. De Boccard, Paris, pp. 321–348.
- Munro, N.D., Grosman, L., 2010. Early evidence (ca. 12,000 B.P.) for feasting at a burial cave in Israel. *Proceedings of the National Academy of Sciences* 107, 15362–15366.
- Munro, N.D., Bar-Oz, G., Stutz, A.J., 2009. Aging mountain gazelle (*Gazella gazella*): refining methods of tooth eruption and wear and bone fusion. *Journal of Archaeological Science* 36, 752–763.
- Munro, N.D., Bar-Oz, G., Hill, A.C., 2011. An exploration of character traits and linear measurements for sexing mountain gazelle (*Gazella gazella*) skeletons. *Journal of Archaeological Science* 38, 1253–1265.
- Nadel, D., Lengyel, G., 2009. Human-made bedrock holes (mortars and cupmarks) as a Late Natufian social phenomenon. *Archaeology, Ethnology and Anthropology of Eurasia* 37, 37–48.
- Nadel, D., Rosenberg, D., 2010. New insights into Late Natufian bedrock features (mortars and cupmarks). *Eurasian Prehistory* 7, 65–87.
- Nadel, D., Lengyel, G., Bocquentin, F., Tsatskin, A., Rosenberg, D., Yeshurun, R., Bar-Oz, G., Bar-Yosef-Mayer, D.E., Be'eri, R., Conyers, L., Filin, S., Hershkovitz, I.,

- Kurzawska, Weissbrod, L., 2012. Raqefet Cave: the 2006 excavation season. *Journal of the Israel Prehistoric Society* 38, 59–131.
- Nadel, D., Lengyel, G., Cabellos, T., Bocquentin, F., Rosenberg, D., Yeshurun, R., Brown-Goodman, R., Tsatskin, A., Bar-Oz, G., Filin, S., 2009a. The Raqefet Cave 2008 excavation season. *Journal of the Israel Prehistoric Society* 39, 21–61.
- Nadel, D., Rosenberg, D., Yeshurun, R., 2009b. The deep and the shallow: the role of Natufian bedrock features at Rosh Zin, Central Negev, Israel. *Bulletin of the American Schools of Oriental Research* 355, 1–29.
- Nadel, D., Lambert, A., Bosset, G., Bocquentin, F., Rosenberg, D., Yeshurun, R., Weissbrod, L., Tsatskin, A., Bachrach, N., Bar-Matthews, M., Ayalon, A., Zaidner, Y., Beeri, R., Grinberg, H., 2012. The 2010 and 2011 seasons of excavation at Raqefet Cave. *Journal of the Israel Prehistoric Society* 42, 35–73.
- Nadel, D., Danin, A., Power, R.C., Rosen, A.M., Bocquentin, F., Tsatskin, A., Rosenberg, D., Yeshurun, R., Weissbrod, L., Rebollo, N., Barzilai, O., Boaretto, E., 2013. Flowers and fragrance in 13,700–13,000-year-old Natufian burials at Raqefet Cave, Mt. Carmel, Israel. *Proceedings of the National Academy of Sciences* 110, 11774–11778.
- Neuville, R., 1951. *Le Paleolithique et le Mesolithique du Desert de Judee*. Masson, Paris.
- Noy, T., 1991. Art and decoration of the Natufian at Nahal Oren. In: Bar-Yosef, O., Valla, F.R. (Eds.), *The Natufian Culture in the Levant*. International Monographs in Prehistory, Archaeological Series 1, Ann Arbor, pp. 557–568.
- Noy, T., Higgs, E.S., 1971. Raqefet Cave. *Israel Exploration Journal* 21, 225–226.
- O'Connell, J.F., 1987. Alyawara site structure and its archaeological implications. *American Antiquity* 52, 74–108.
- Olami, Y., 1984. Prehistoric Carmel. Israel Exploration Society and Stekelis Museum of Prehistory, Jerusalem and Haifa.
- Outram, A.K., 2006. Juggling with indices: a review of the evidence and interpretations regarding Upper Palaeolithic horse skeletal part abundance. In: Olsen, S.L., Grant, S., Choyke, A.M., Bartosiewicz, L. (Eds.), *Horses and Humans: The Evolution of Human Equine Relationships Symposium*. Archaeopress, pp. 49–60.
- Perrot, J., Ladiray, D., Soliveres-Massei, O., 1988. *Les Hommes de Mallaha (Eynan) Israël*. Association Paléorient, Paris.
- Pickering, T.R., Egeland, C.P., 2006. Experimental patterns of hammerstone percussion damage on bones: implications for inferences of carcass processing by humans. *Journal of Archaeological Science* 33, 459–469.
- Portillo, M., Rosen, A.M., Weinstein-Evron, M., 2010. Natufian plant uses at el-Wad terrace (Mount Carmel, Israel): the phytolith evidence. *Eurasian Prehistory* 7, 99–112.
- Power, R.C., Rosen, A.M., Nadel, D., n.d. The Economic and Ritual Utilization of Plants at the Raqefet Cave Natufian Site: The Evidence from Phytoliths.
- Rabinovich, R., Hovers, E., 2004. Faunal analysis from Amud Cave: preliminary results and interpretations. *International Journal of Osteoarchaeology* 14, 287–306.
- Richter, T., Bode, L., House, M., Iversen, R., Arranz, A., Saehle, I., Thaarup, G., Tvede, M.L., Yeomans, L., 2013. Excavations at the Late Epipalaeolithic site of Shubayqa 1: preliminary report on the first season. *Neo-Lithics* 2012 (2), 3–14.
- Rosen, A.M., 2010. Natufian plant exploitation: managing risk and stability in an environment of change. *Eurasian Prehistory* 7, 117–131.
- Rosenberg, D., Nadel, D., n.d. The Sounds of Pounding: Boulder Mortars and Their Significance to Natufian Burial Customs.
- Rosenberg, D., Yeshurun, R., Groman-Yaroslavski, I., Winter, H., Zertal, A., Brown-Goodman, R., Nadel, D., 2010. Huzuq Musa – a preliminary report on the test excavation at a Final Epipalaeolithic/PPNA site in the Jordan Valley. *Paléorient* 36, 189–204.
- Russel, N., 2001. The social life of bone: a preliminary assessment of bone tool manufacture and discard at Çatalhöyük. In: Choyke, A. (Ed.), *Proceedings of the Second Meeting of the Worked Bone Research Group*. BAR International Series, Oxford, pp. 241–249.
- Samuelian, N., in press. A study of two Natufian residential complexes: structures 200 and 203 at Eynan (Ain Mallaha), Israel. In: Bar-Yosef, O., Valla, F.R. (Eds.), *Natufian Foragers in the Levant: Terminal Pleistocene Social Changes in Western Asia*, Ann Arbor.
- Schiffer, M.B., 1976. *Behavioral Archaeology*. Academic Press, New York.
- Shennan, S., 1988. *Quantifying Archaeology*. Edinburgh University Press, Edinburgh.
- Shipman, P., Rose, J., 1988. Bone tools: an experimental approach. In: Olsen, S.L. (Ed.), *Scanning Electron Microscopy in Archaeology*. British Archaeological Reports, Oxford, pp. 303–335.
- Simms, S.R., 1988. The archaeological structure of a Bedouin camp. *Journal of Archaeological Science* 15, 197–211.
- Stekelis, M., Yizraely, T., 1963. Excavations at Nahal Oren: preliminary report. *Israel Exploration Journal* 13, 1–12.
- Stiner, M.C., 1994. *Honor among Thieves: A Zooarchaeological Study of Neandertal Ecology*. Princeton University Press, Princeton.
- Stiner, M.C., Kuhn, S.L., Weiner, S., Bar-Yosef, O., 1995. Differential burning, recrystallization, and fragmentation of archaeological bone. *Journal of Archaeological Science* 22, 223–237.
- Tchernov, E., Valla, F.R., 1997. Two new dogs, and other Natufian dogs, from the Southern Levant. *Journal of Archaeological Science* 24, 65–95.
- Turville-Petre, F., 1932. Excavations in the Mugharet el-Kebarah. *Journal of the Royal Anthropological Institute* 62, 271–276.
- Twiss, K., 2008. Transformations in an early agricultural society: feasting in the southern Levantine Pre-Pottery Neolithic. *Journal of Anthropological Archaeology* 27, 418–442.
- Valla, F.R. (Ed.), 2012. *Les Fouilles de la Terrasse d'Hayonim, Israël 1980–1981 et 1985–1989*. De Boccard, Paris.
- Valla, F.R., Bocquentin, F., 2008. Les maisons, les vivants, les morts: le cas de Mallaha (Eynan), Israël. In: Córdoba, J.M., Molist, M., Pérez, M.C., Rubio, I., Martínez, S. (Eds.), *Proceedings of the 5th International Congress on the Archaeology of the Ancient Near East*. Centro Superior de Estudios sobre el Oriente Próximo y Egipto, Madrid, pp. 521–546.
- Valla, F.R., Khalailiy, H., Valladas, H., Kaltnecker, E., Bocquentin, F., Cabellos, T., Bar-Yosef Mayer, D.E., Le Dosseur, G., Regev, L., Chu, V., Weiner, S., Boaretto, E., Samuelian, N., Valentin, B., Delerue, S., Poupeau, G., Bridault, A., Rabinovich, R., Simmons, T., Zohar, I., Ashkenazi, S., Delgado Huertas, A., Spiro, B., Mienis, H., Rosen, A.M., Porat, N., Belfer-Cohen, A., 2007. Les fouilles de Ain Mallaha (Eynan) de 2003 à 2005: Quatrième rapport préliminaire. *Journal of Israel Prehistoric Society* 37, 135–383.
- Villa, P., Mahieu, E., 1991. Breakage patterns of human long bones. *Journal of Human Evolution* 21, 27–48.
- Weinstein-Evron, M., 2003. In B or not in B: a reappraisal of the Natufian burials at Shukbah Cave, Judea, Palestine. *Antiquity* 77, 96–101.
- Weinstein-Evron, M., 2009. *Archaeology in the Archives: Unveiling the Natufian Culture of Mount Carmel*. ASPR Monograph Series, Brill, Boston.
- Weinstein-Evron, M., Kaufman, D., Bachrach, N., Bar-Oz, G., Bar-Yosef Mayer, D.E., Chaim, S., Druck, D., Groman-Yaroslavski, I., Hershkovitz, I., Liber, N., Rosenberg, D., Tsatskin, A., Weissbrod, L., 2007. After 70 years: new excavations at the el-Wad Terrace, Mount Carmel, Israel. *Journal of the Israel Prehistoric Society* 37, 37–134.
- Weinstein-Evron, M., Kaufman, D., Yeshurun, R., in press. Spatial organization of the Natufian el-Wad through time: combining the results of past and present excavations. In: Bar-Yosef, O., Valla, F.R. (Eds.), *Natufian Foragers in the Levant: Terminal Pleistocene Social Changes in Western Asia*, Ann Arbor.
- Weissbrod, L., Bar-Oz, G., Yeshurun, R., Weinstein-Evron, M., 2012. Beyond fast and slow: the mole rat *Spalax ehrenbergi* (order Rodentia) as a test case for subsistence intensification of complex Natufian foragers in southwest Asia. *Quaternary International* 264, 4–16.
- Wright, G.A., 1978. Social differentiation in the Early Natufian. In: Redman, C.L., Berman, M.J., Curtin, E.V., Langhorne, W.T., Versaggi, N.H., Wanser, J.C. (Eds.), *Social Archaeology: Beyond Subsistence and Dating*. Academic Press, New York, pp. 201–223.
- Yeshurun, R., 2011. *The Zooarchaeology of Natufian el-Wad Terrace and Raqefet Cave, Mount Carmel: Taphonomic and Diachronic Intra- and Inter-Site Analysis*. Unpublished PhD Dissertation. University of Haifa.
- Yeshurun, R., Bar-Oz, G., 2008. Digging in the museum: Middle Paleolithic and Epipalaeolithic faunal remains from Olami's prehistoric survey of Mount Carmel. *Journal of the Israel Prehistoric Society* 38, 41–58.
- Yeshurun, R., Marom, N., Bar-Oz, G., 2007. Differential fragmentation of different ungulate body-size – comparison of gazelle and fallow deer bone fragmentation in Levantine prehistoric assemblages. *Journal of Taphonomy* 5, 137–148.
- Yeshurun, R., Bar-Oz, G., Weinstein-Evron, M., 2009. The role of foxes in the Natufian economy: a view from Mount Carmel, Israel. *Before Farming* 2009/1 article 3.
- Yeshurun, R., Bar-Oz, G., Kaufman, D., Weinstein-Evron, M., in press. Domestic refuse maintenance in the Natufian: Faunal evidence from el-Wad Terrace, Mount Carmel. In: Bar-Yosef, O., Valla, F.R. (Eds.), *Natufian Foragers in the Levant: Terminal Pleistocene Social Changes in Western Asia*, Ann Arbor.
- Yeshurun, R., Bar-Oz, G., Weinstein-Evron, M., n.d.-a. Rising Intensification, Sedentism and Territoriality in the Terminal Pleistocene Natufian Sequence of el-Wad Terrace (Israel).
- Yeshurun, R., Bar-Oz, G., Kaufman, D., Weinstein-Evron, M., n.d.-b. Purpose, Permanence and Perception of 14,000 Years-Old Architecture: Contextual Taphonomy of Food Refuse.
- Zeder, M.A., 2012. The Broad Spectrum Revolution at 40: resource diversity, intensification, and an alternative to optimal foraging explanations. *Journal of Anthropological Archaeology* 31, 241–264.