

THE FIRST TWO EXCAVATION SEASONS AT NMO: A MOUSTERIAN SITE AT THE BANK OF THE JORDAN RIVER

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Abstract

The Mousterian site at the Outlet of Nahal Mahanayem to the Jordan River (NMO) was discovered as a result of a drainage operation north of Gesher Benot Ya'aqov in the Southern Hula Valley. Survey and surface collection brought to light the presence of a rich lithic assemblage ascribed primarily to the Middle Paleolithic, Mousterian lithic tradition. Significant pre-excavation finds include a fragment of human skull and the skull and femur of a lion. In this paper, we present the data collected prior to excavation and the results of the first two excavation seasons at the NMO Mousterian site.

Key words: Mousterian, Gesher Benot Ya'aqov, open-air site, flora, human remains.

INTRODUCTION

In the fall of 1999, the Kinneret Drainage Authority undertook a large drainage operation aimed at deepening the channel of the Jordan River between the Pkak Bridge and the Ateret Fortress (Fig. 1; and see Sharon *et al.*, 2002 for details). A large volume of sediment was removed, damaging the Early-Middle Pleistocene deposits of the Benot Ya'akov Formation, as well as the Late Pleistocene Ashmora Formation comprising the upper portion of the geological sequence in this section of the river (Horowitz, 1979).

During the drainage operation, the presence of many stone tools and bones in mint condition within the piles of clay dug from the river trench was noted. The main concentration of archaeological finds was observed in the sediment piles on

the east bank of the Jordan River ca. 100 meters south of the present day artificial channel outlet of Nahal Mahanayem (the Mahanayem Stream) into the Jordan (Fig. 1; Coordinates: 33°001'40''N/35°037'50''E). In the summer of 2002, a geo-archaeological survey of sections of the Jordan River bank in the vicinity of Gesher Benot Ya'aqov was conducted.

The preliminary study in the vicinity of what is now known as the site of Nahal Mahanayem Outlet (NMO) exposed the great potential of the site for further investigation. Accordingly, two seasons of excavation were carried out at the site during the fall of 2007 and 2008. The seasons were planned and executed to address the following primary research questions: 1) to establish the general geological stratigraphy of the Jordan River bank at the site's vicinity; 2), to prove the actual presence of in situ archaeological horizons

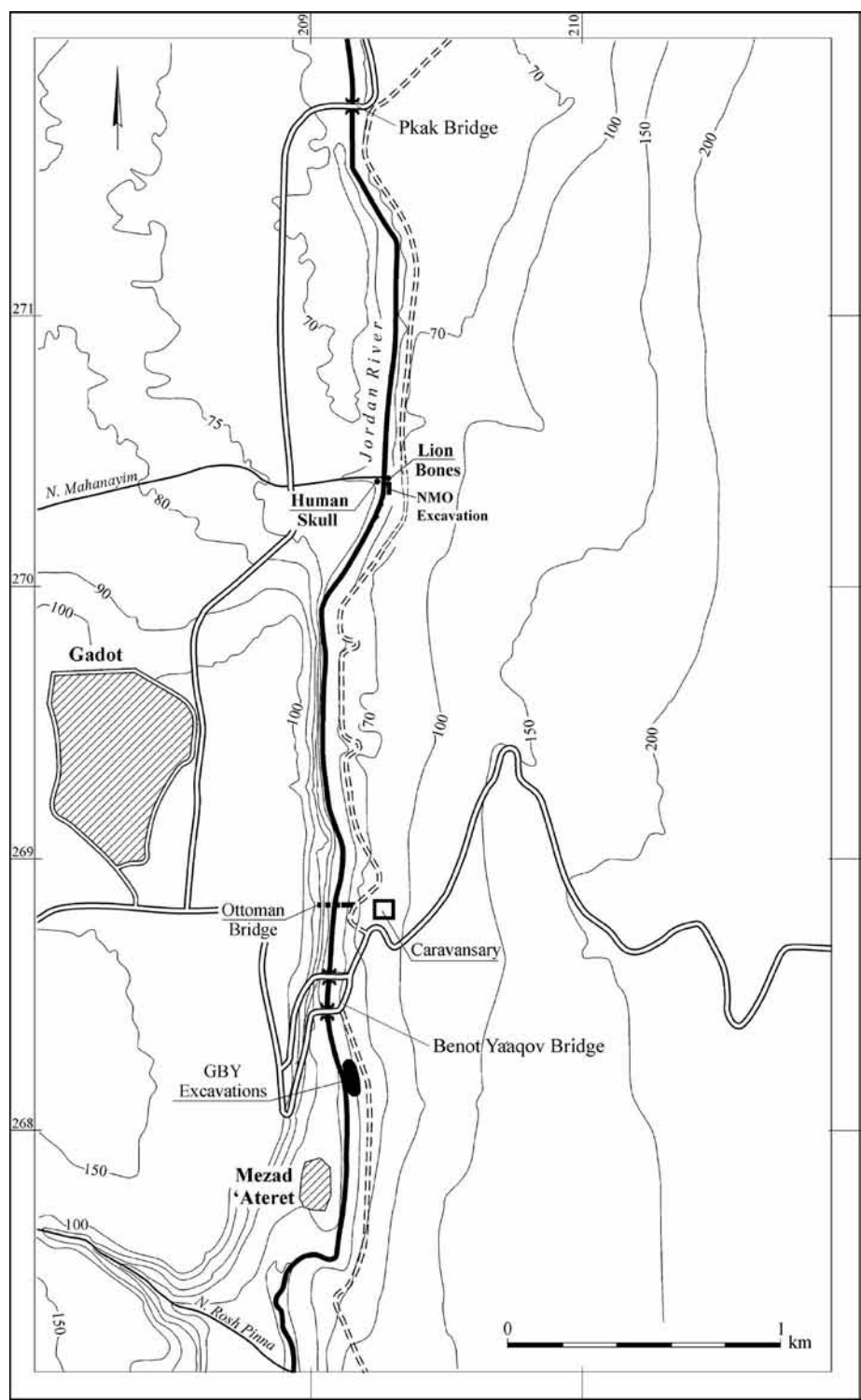


Fig. 1. Location of the NMO Site

given that the archaeological finds were all collected from the piles of damped sediments and from the Jordan River banks surface; 3) To explore the nature of the archaeological layers and their distribution; and 4) to assess the preservation condition of the lithic, fauna and flora assemblages.

During these two excavation seasons, an archaeological horizon was exposed containing many finds assigned to the Middle Paleolithic. Animal bones in excellent state of preservation were uncovered and the rich botanical assemblage of wood, seeds and fruits established the potential of the NMO site for the study of the region's paleo-environment. In addition, a general geological stratigraphy was established for the NMO locality as well as smaller scale stratigraphy for the archaeological layers.

The purpose of this paper is twofold: to report on the results and significant finds from the pre-excavation survey of the site and to present preliminary results from the two first excavation seasons at NMO. The study of the NMO site is in its primary stages, yet we have sufficient information to present the finds from the site as seen today keeping in mind that, as with any archaeological site, some of the views and suggestions presented here may look very different in light of the results of future research.

SURVEY RESULTS AND PRE-EXCAVATION FINDS

The human skull fragment

The large piles of sediments dumped onto the banks of the Jordan River during the 1999 drainage work were left untouched until their removal in 2003. While removing a pile from the west bank of the Jordan immediately south of the Nahal Mahanayem outlet (Fig. 1), Israel Antiquity Authority inspector O. Barzilai collected large quantities of bones and stone tools. Among the bones, a fragment of human skull was identified (Fig. 2a). These sediments probably originated from the west river bank, from an unknown depth.

The fossil bone fragment is part of a braincase. A hard, reddish brown, breccia-like incrustation covered the fragment's internal and exter-

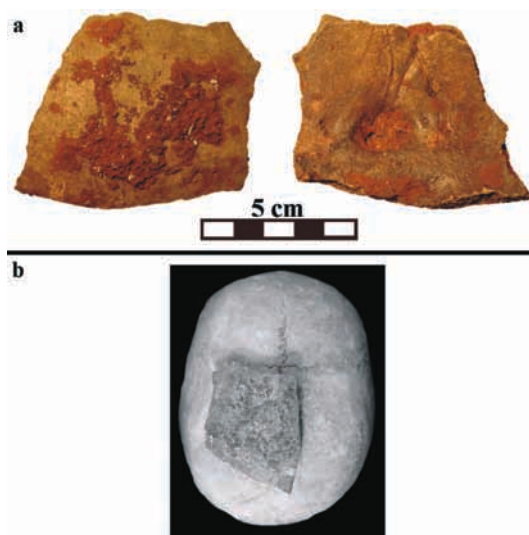


Fig. 2. a. The human skull fragment from NMO; b. Fossilized bone fragment superimposed on a modern calvarium to show the fragment's anatomical location

nal bone tables. Cleaning confirmed our original impression that the bone is that of a hominid calvarium. The fragment consists mainly of the left parietal and bears the anterior section of the sagittal suture and the eroded lateral (left) part of the coronal suture. Adjacent to the sagittal suture lie the remains of the medial part of the right parietal bone. The break along the broken lateral edge of the right parietal is fresh. The edge of the rest of the fragment is coated with the breccia-like incrustation.

Aligning the remains of the sagittal suture with the midline reveals the exact anatomical location of the fragment: it extends from just behind bregma (which is not preserved) to a point slightly anterior to obelion (Fig. 2b). The antero-posterior length of the fragment is about 75 mm, and its bilateral width is about 62 mm. Its thickness at the remaining anterior end of the sagittal suture is 5 mm; posteriorly, the bone thickens slightly, reaching 7 mm at the posterior end of the surviving sagittal suture.

The fragment weighs 30 grams and is 34% heavier than a dry fragment emanating from the dissection room and comparable in size, thick-



Fig. 3. Endocranial aspect of the fossilized bone fragment, showing the deep fossae for the arachnoid granulations

ness, and anatomical location. This discrepancy indicates a substantial degree of mineralization of the fossil fragment.

The sagittal suture is partially visible; only the anterior portion can be seen, and only on the exocranial aspect. Endocranially, the entire length of the suture is obliterated. This configuration indicates that at death, the individual was an adult of advanced age. We can see evidence of the age in the deeply excavated fossae for the arachnoid granulations on both sides of the midline (Fig. 3). Also on the endocranial aspect, well-marked grooves for the anterior branch of the middle meningeal artery and its second bifurcation are visible. The bone surface of the exocranial table is delicate and smooth, bearing no manifestation of the temporal lines. This topography, along with the slender and gracile appearance of the bone, suggests that the fragment belongs to a female.

A coronal cross section halfway down the fragment reveals that the summit of the calvarium was rather flat and that the bone surface curves abruptly 2 cm lateral to the sagittal suture and slopes downward toward the temporal bone. This curve creates a slight angulation of the contour. Given this topography, the fragment is not likely to be from a Neandertal calvarium, whose corresponding coronal cross-section is characterized by a continuous (unsegmented), rounded coronal contour extending from one side of the calvarium to the other.

The lithic artifacts associated with the human skull

A selection of tools collected from the same pile of sediments from which the fragment of human skull was found is shown in Fig. 4. This collection contains at least two lithic components. The first group (Fig. 4: 2–4) is of Levallois Mousterian origin and includes several tool types made on Levallois flakes and blades. The second component is possibly Upper Paleolithic (UP) or even Early Epi-Paleolithic (Fig. 4: 1, 5–8). The UP tools include various types of end-scrapers made mainly on blade blanks, burin on truncation and retouched blades. The small sample size collected from the pile does not allow a clear-cut definition of the assemblage. However, at least two different lithic industries, one of Middle Paleolithic and the other probably of Upper Paleolithic origin are represented. This view is consistent with the observation by Goren-Inbar & Alpersen-Afil (personal communication) of the assemblage collected from piles of sediments from the east bank of the Jordan within 50 meters from the human skull pile.

The pre-excavation fauna

Most of the bones collected at the site are in excellent state of preservation (Fig. 5). Numerous fresh breaks, probably resulting from the heavy machinery digging, were also observed. The bone assemblage was collected from the piles of sediments and the geo-archaeological context of most of them cannot be reconstructed. Hence, only general observations concerning the whole assemblage can be presented. The species and their frequency represented at the site are presented in Table 1. The rich diversity of species and their excellent state of preservation encouraged us to unearth the *in situ* remains.

The bone sample studied (N = 321, Table 1) includes aurochs (*Bos primigenius*, Fig. 5), mountain gazelle (*Gazella gazella*), red deer (*Cervus elaphus*), Mesopotamian fallow deer (*Dama mesopotamica*), boar (*Sus scrofa*), hippopotamus (*Hippopotamus amphibius*), canid (*Canis* sp.) and lion (*Panthera leo*). Antler fragments were assigned to Cervidae and horn core fragments to Bovidae. The rest of the fauna could only be assigned to body size groups of (Table 1): *Bos*, *Cervus*, *Dama* and *Gazelle* bones. Body represen-

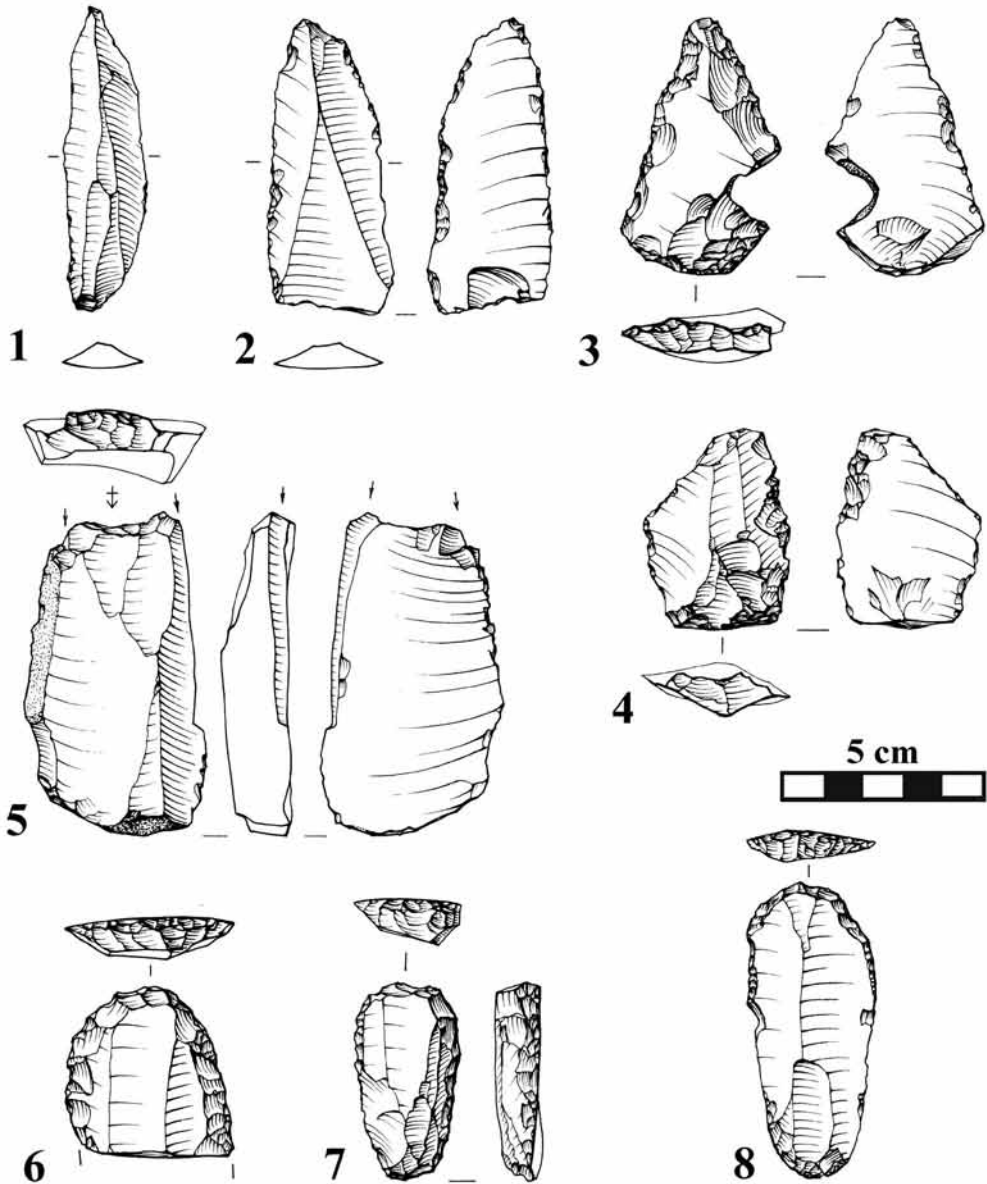


Fig. 4. Lithic artifacts found in association with the human skull fragment

tations include both cranial (antlers, horn cores, maxillary teeth) and postcranial elements (ribs, vertebrae, limbs, phalanges). Additionally, a few carapace fragments of turtle (*Testudo* sp.) and two bird bone fragments were uncovered. The data presented here provide additional information to that published earlier (Sharon *et al.*, 2002), yet the

general trend remains the same: cervids and bovids are the most common species.

The species represented in the current sample are largely similar to that of numerous Southern Levantine Mousterian and Upper Paleolithic sites (Rabinovich, 2003; Stiner, 2005; Tchernov, 1988). Yet, of particular interest are a few rare



Fig. 5. *Bos* distal humerus fragment collected from surface at NMO

species. The presence of hippopotamus (represented by a single tooth fragment) in this Upper Pleistocene assemblage is a quite rare phenomenon, which revives an old debate concerning the survival of this species along the Levantine coast versus its disappearance inland (Horwitz and Tchernov, 1990). Recently, continuous presence of hippopotamus along the Jordan Valley during the later Pleistocene and Holocene was observed (Rabinovich, personal observation).

The lion skull and femur

During the 2002 survey, a skull of a lion (*Panthera leo*, Fig. 6) and a lion femur (Fig. 7) were excavated from the banks of the Jordan River at the NMO site (Fig. 1). The skull was found *in situ* embedded in black, organically rich clay and the femur was excavated immediately below it.

The bones are in excellent state of preservation. The femur was found complete and was broken during excavation. The skull was found broken into many small pieces with some fragments missing, probably due to the activity of heavy mechanical equipment at this locality. Part of the left nasal bone is missing, and a distortion was observed towards the left part of the skull. The general outline of the skull and its size suggest a male lion. The completeness of the femur is quite rare in archaeological assemblages in the Levant. Lastly, based on field association and size, the skull and femur belong to the same animal.

Table 1
Fauna from the NMO site

Species	N
<i>Gazella gazela</i>	7
<i>Bos primigenius</i>	42
<i>Cervus elaphus</i>	10
<i>Dama mesopotamica</i>	19
<i>Sus scrofa</i>	3
<i>Hippopotamus amphibious</i>	1
<i>Canis</i> sp.	1
<i>Panthera leo</i>	2
<i>Bovidae</i>	6
<i>Cervidae</i>	9
BSGB (<i>Bos</i> size)	34
BSGC (<i>Cervus</i> size)	44
BSGD (<i>Dama</i> size)	62
BSGE (<i>Gazella</i> size)	6
<i>Testudo</i> sp.	4
Bird	2
Unidentified bones	69
Total	321

Additional bone fragments, including a bovid molar, were found next to the lion bones. No stone tools were found in the immediate vicinity of the bones, although a few flint flakes were found during other visits to the site, embedded in the same black clay. Large felids are rare in archaeological sites of all periods. In the prehistoric Levant, lion bones are known primarily from Qafzeh Cave (Dayan, 1989; Rabinovich, 2002, 2003).

EXCAVATION RESULTS

As stated above, the aim of the first excavation season at the NMO site (2007) was to establish the stratigraphic context and to gain better understanding of the nature of the archaeological occurrences in this locality. The excavation took place on the east bank of the Jordan River, opposite the outlet of Nahal Mahanayeem to the Jordan from the west. The excavation included the following (see Fig. 8):

1. Three small excavation areas, areas A to C along the banks of the river, in localities that were identified as showing archaeological potential.
2. Ten geological sections along the east bank



Fig. 6. Five views of the lion skull. **a.** right view; **b.** left view; **c.** frontal view; **d.** posterior view; **e.** dorsal view

of the Jordan River, aiming to achieve a correlated stratigraphy of the study area.

3. A deep geological trench (Trench I), some 30 meters long and 3.5 meters deep, dug by excavator tractor on the flood plain of the river.

The data gained from the above excavations and sections allow us to establish the geological and stratigraphical framework for the NMO layers presented below

NMO stratigraphy and geology

The geological layers north of Gesher Benot Ya'aqov and towards the Hula Valley are all assigned by Horowitz (1979) to the Ashmora Formation. This formation was defined as comprising primarily layers of clay and peat that were suggested to have been formed by the swampy Lake Hula during the Late Pleistocene and Holocene. As a result of the Jordan River trench deepening during drainage work over the last decades, the Jordan River currently flows in a channel that is a few meters below its course at the beginning of the twentieth century. The data obtained from the



Fig. 7. Lion femur

newly exposed sediments illustrate a much more complicated stratigraphy than previously suggested.

The data collected from the clearing and study of 10 sections of the river bank combined with the data from the geological tractor trench I and the excavation of three archaeological areas (Fig. 8) has enabled us to gain preliminary understanding of the study area's geology and general stratigraphy. Fig. 9a presents the combined drawing of all 10 sections dug during the 2007 season. Fig. 9b is a drawing of the east section of geological Trench I. For location of the sections please

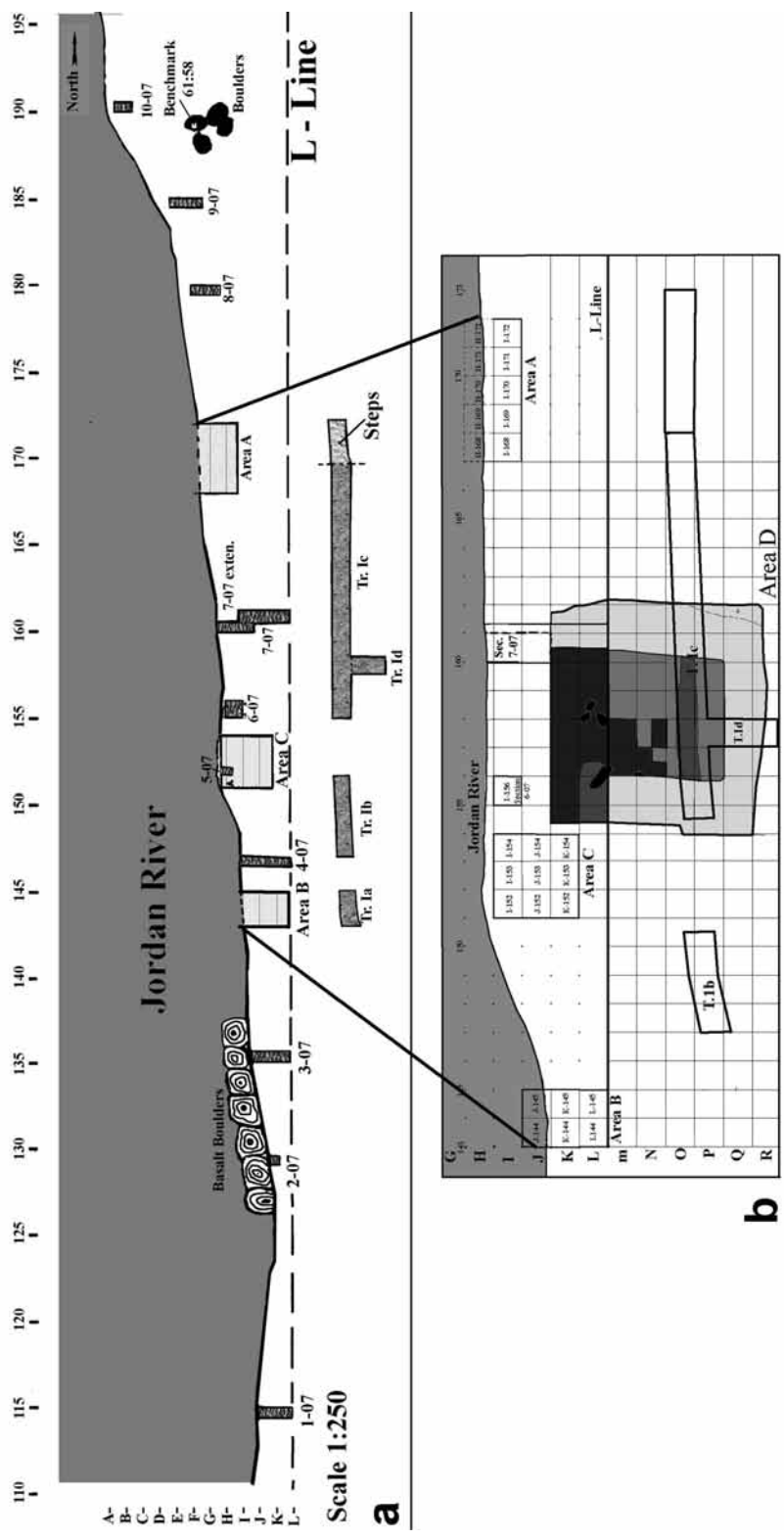


Fig. 8. a. Location map of excavation areas, river bank section and geological trench. b. Location of Area D

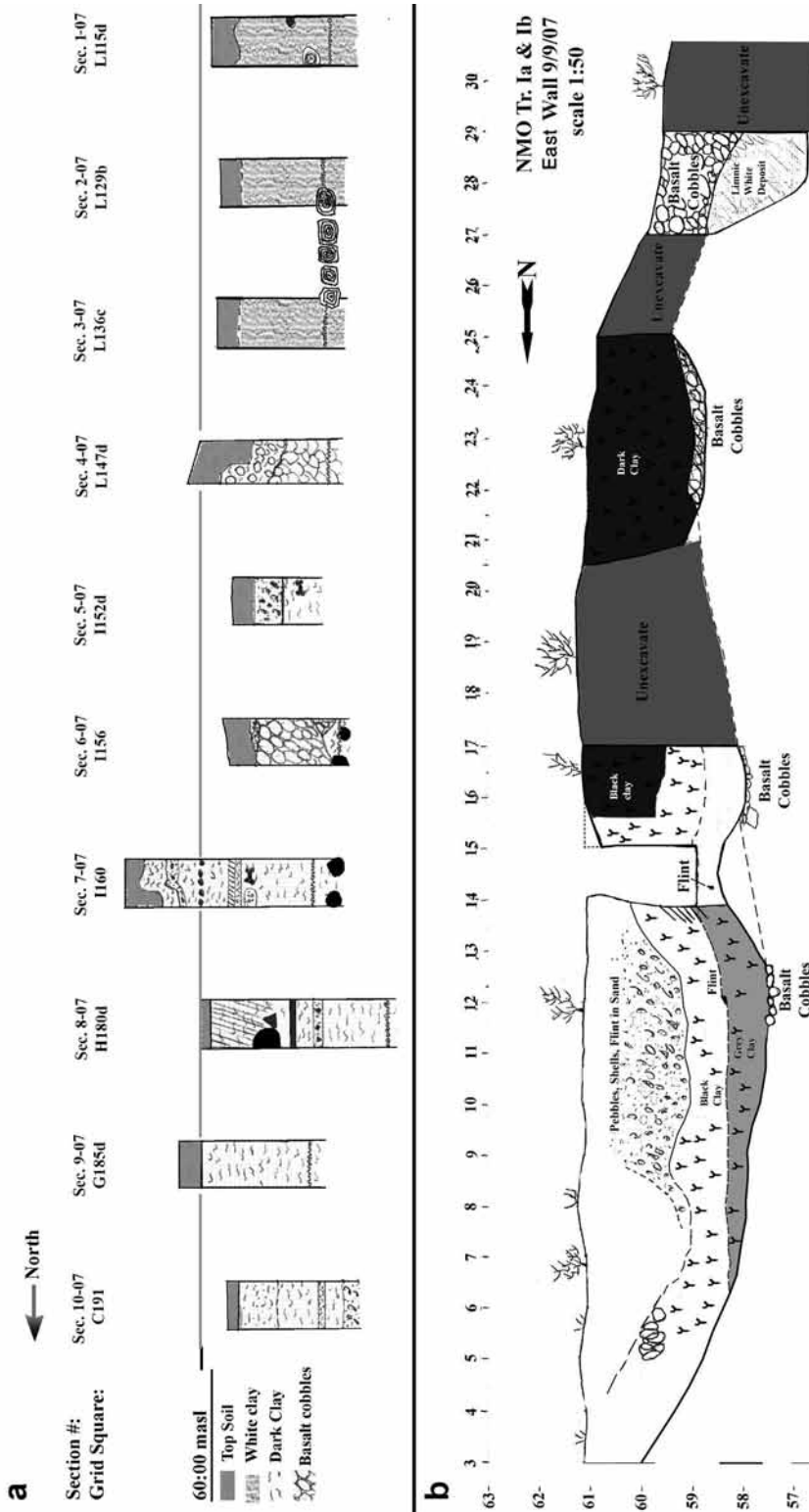


Fig. 9. a. The NMO 2007 sections. b. Trench I east wall Section



Fig. 10. Section 3-07 showing the top soil overlying light colored limnic sediments



Fig. 11. Heavily exfoliated basalt boulders on the bank of the Jordan River between Section 07-2 and 07-3

refer to Fig. 8. When combining the data from all sources including the 2008 excavation of Area D (see below) a general stratigraphy of NMO can be suggested as follows:

At the southernmost section of the study area the Jordan Bank is formed by a thick layer of light gray limnic sediment with lenses of darker brown clay (Fig. 10). The upper part of this layer is cut by heavy machinery activity, and a geological trench dug to a depth of 3.5 meters below present day surface did not reach the bottom of the layer (Fig. 9b). Embedded within this layer are occasional very large, heavily exfoliated boulders of basalt, whose presence in this low energy accumulating sediment awaits explanation. Field observations did not result in a conclusive explanation as to the origin of these basalt boulders (Fig. 11). It was suggested that they might represent the upper part of a basalt flow underlying the limnic sediments. On the other hand, they seem to be surrounded by the limnic sediments and may represent a remnant of flood covered by the lime sedi-

ments. Preliminary study of a geological core, 10 meters deep, that was drilled ca. 50 meters south of the NMO sections indicates the presence of a basalt flow at this locality (C. Feibel, personal communication). This might support the suggestion that the boulders originate from a basalt flow. Further work is needed before any conclusions can be presented. This layer was probably formed in a paleo-lake with a water depth of a few meters. In either case, all of our observations have shown that this layer of limnic sediments is archaeologically sterile and that the study should focus on the northern section of the study area.

The light-colored limnic sediments are in sharp vertical contact with a layer of large basalt cobbles and boulders to the north. This contact, visible in both Area B (Fig. 12) and in Geological Trench 1a (Fig. 9b) seems to be very sharp and sudden. At the present state of our knowledge, it seems that the best explanation for this geological contact lies in the presence of a tectonic fault line where the older limnic sediments were uplifted,

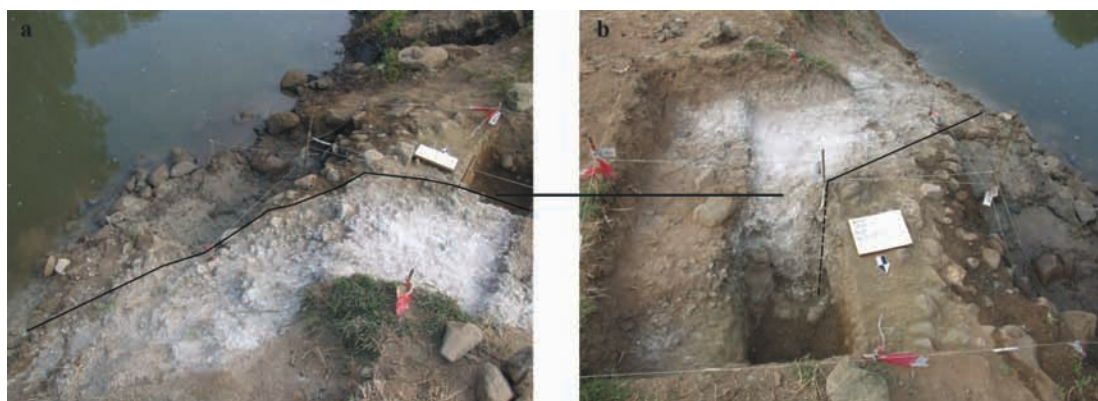


Fig. 12. Area B 2007. **a.** Contact between white limnic sediments to the south and basalt cobbles Layer 5 to the north; **b.** Area B from the north. Line indicating the vertical contact between the limnic and basalt layers

with the basalt layer representing a younger feature.

Moving further north, the basalt cobble layer slants northward and dramatically to the east and west. The nature and geomorphological origin of this basalt layer is one of the main questions the NMO site poses to future research. The layer is comprised of basalt ranging in size from boulders to pebbles. Basalt is the sole rock type within this layer. The upper part of the layer includes generally well-rounded cobbles and boulders. When this thin upper level is removed, additional cobbles and boulders are exposed but they are weathered and exfoliated. According to the exposure of this layer in section 4 (Fig. 8), the degree of weathering increases in depth until ca. 1 meter below surface, where the basalt has almost entirely deteriorated into clay.

During the 2008 season the nature of the basalt cobble layer, Layer 5 (see below), was further studied. The layer surface was exposed in a relatively large area (Fig. 13). The main feature of this layer is its topography. The layer is a “pile” or a “river bar” formed from basalt boulders and rounded cobbles. It can be described as a small hill of basalt slanting in a moderate slope towards the north from 59.60 in square K155 to 58.80 in square K159, resulting in a gradient of 80 cm over ca 5 meters. In contrast, to the east, and probably to the west, the layer slants dramatically from 59.25 in square K157 to 58.40 in square N157. However, the basalt Layer 5 is also exposed in the geological Trench Ic at a level of 57.40 in square

O158. This gives an estimated gradient of 1.85 meters over 5 meters. One way to explain this peculiar topography is to suggest that we are looking at a bar (created by a flood?). Yet, Layer 5 is comprised of only basalt. The only source for the basalt in the region is the basaltic slopes of the Golan. In addition, if as suggested by the rounded nature of the cobbles, Layer 5 was deposited by water activity, then the landscape to the west does not allow for such high energy accumulation. An additional option is that the unique topography is a result of tectonic activity. At the current state of research this can only be brought as a hypothesis for further research.

An attempt to understand the nature of Layer 5 was executed by means of excavating 1 square meter of the layer to a depth of ca 50–70 cm below its surface in square K156 (Fig. 14). The cobbles were removed one by one, their size measured and their roundness and level of weathering recorded. The study has shown that all along the section exposed, basalt is the only rock type present in the layer. Below the first layer of cobbles that are relatively un-exfoliated, the degree of weathering increases with depth, and the cobbles and boulders at a depth of ca 50 cm have almost completely deteriorated into clay (Fig. 14). This is a somewhat unexpected result; if the weathering of the basalt is atmospheric, the situation should have been reversed and the exfoliation state should have increased towards the surface. More work is needed, apparently, in order to answer these questions.



Fig. 13. Area D at the end of excavation, 25.9.08

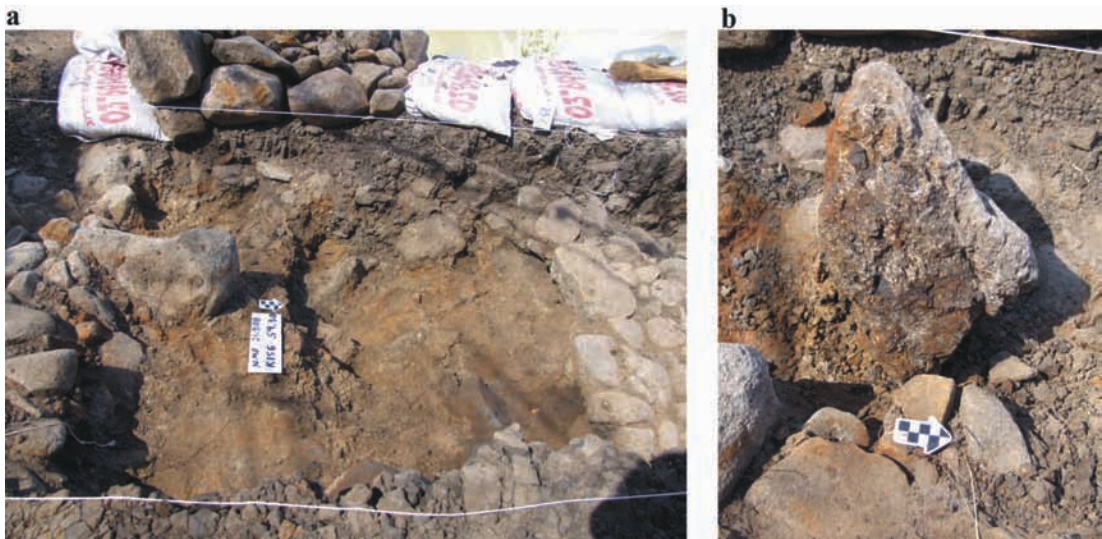


Fig. 14. a. Basalt deteriorated into clay at ca 50 cm below the surface of Layer 5 in square K156; b. Basalt boulder showing increasing degree of exfoliation (downward from right to left in the figure)

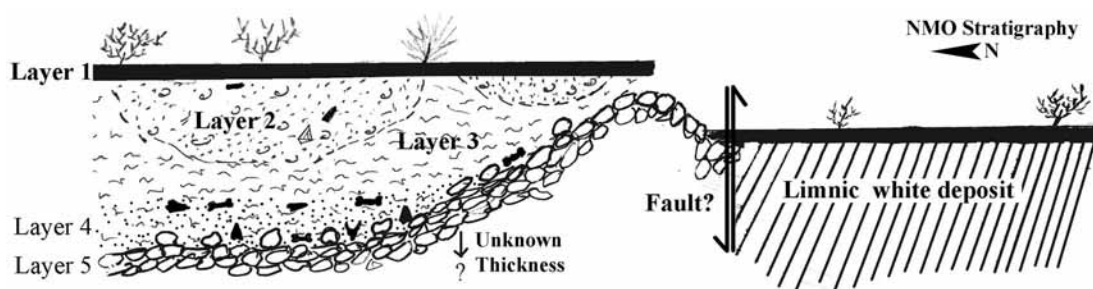


Fig. 15. General stratigraphy of the NMO site

On top of the basalt layer is a layer of dark clay embedded with many small pebbles of limestone. This is the layer containing the MP tools and animal bones. Many of the bones were laying immediately on the basalt cobbles in its contact with the overlying clay. However, the results of the 2008 excavation demonstrate that this layer is thickening towards the north as the basalt layer is slanting downward. At this part of the site, the next layer is comprised of a series of organically rich, gray clays with areas of oxidized orange spots. Many slick and slide surfaces are visible and further study is needed to define the nature of these clays. An occasional flint artifact or bone was found, in most cases as an isolated find. Into this layer of clay cut much younger channels that deposited sand with numerous pebbles of limestone, flint and basalt. The presence of rolled flint and limestone pebbles suggest that these are probably channels of ancient rivers running from the west into the South Hula Valley. Eastern (or northern) origin for such streams would bear only a basalt component. These may be the predecessors of the present day Mahanayeem Stream. Their age can be estimated to few hundred years by the presence of ceramics and lead fishing net weights found in them. Nevertheless, some of these channels penetrate quite deep into the clay layers and may be of much earlier age, up to thousands of years old. Many stone tools were found within these channels including Neolithic axes, arrowheads and grinding stones suggesting the presence of a Neolithic site in the vicinity. Such Neolithic sites were indeed reported from the lower slopes of the Golan Heights ca. 1 km north of NMO. The stratigraphic sequence of the site is sealed by a layer of top soil, ca 25 cm thick, laid

by the Jordan River since the end of drainage work in the year 2000.

A general preliminary reconstruction of the site's stratigraphy is presented in Fig. 15. In summary, the southern section of the study is comprised of a white limnic deposit that is archaeologically sterile. This layer is cut from the north by a layer of basalt cobble and boulders possibly due to a tectonic fault. The northern section of the study shows the following stratigraphy from top to bottom:

Layer 1 – recent top soil laid by the modern Jordan River.

Layer 2 – channel deposit of an old Jordan River bed comprised of sand and cobbles with numerous mollusks. The presence of ceramic and metal artifacts dates them to recent time.

Layer 3 – a series of clays, mostly gray in color with occasional flint tools or bones.

Layer 4 – the archaeological layer containing MP flint tools and many animal bones. The finds are concentrated directly in the contact between Layer 4 and the basalt Layer 5 below it with the layer is thickening towards the north.

Layer 5 – basalt cobbles and boulders of unknown depth forming the bottom of the stratigraphic sequence at the site.

Area A

This small area comprises the excavation of a total of 10 square meters along the Jordan River bank at the northern section of the site (Fig. 8). The five westernmost squares were partially underwater, depending upon daily changes in the water level of up to 50 cm as a result of artificial control of the water flow in the Jordan River. The area was selected for excavation due to the expo-



Fig. 16. Area A at the end of the 2007 excavation season

sure of large basalt cobbles and boulders in the river bank and the numerous flint tools collected prior to excavation. The excavation of Area A exposed a series of clay levels, ranging in color from gray to black with occasional large boulders “floating” within them. These clays are very poor in archaeological finds. The clay is generally rich with botanical material, and show many changes in color and texture. At the lower part of the section a very flat and even “polished” surface was exposed resulting probably from “slick and slide” activity of the clay.

Within the clay layers a concentration of large basalt cobbles and boulders ca. 1.5 meters in width was exposed. This concentration probably represents a buried channel, although the presence of large boulders in such a small channel suggests that the geomorphological nature of this channel is complicated. Fig. 16 presents a general view of Area A at the end of excavation, while

Fig. 17 shows a close-up drawing of the area’s eastern section. The large basalt cobbles and boulders are embedded within quartz silt-fine sand containing many black manganese oxide particles. These results are compatible with the water inundated swampy environment. Interestingly, the sediment contains zirconium and titanium, most likely originating from heavy minerals found within the quartz sand (R. Gross, personal communication 2007).

In-between the basalt cobbles and boulders a wealth of flint artifacts was excavated. This is, to date, the richest lithic assemblage excavated from the site and its analysis is ongoing. Preliminary observations suggest that while most of the artifacts are waste products that cannot be typologically attributed with certainty to any lithic tradition, a few very distinct Upper Paleolithic (UP) artifacts were found. This assemblage might be the source of the UP artifacts collected from the

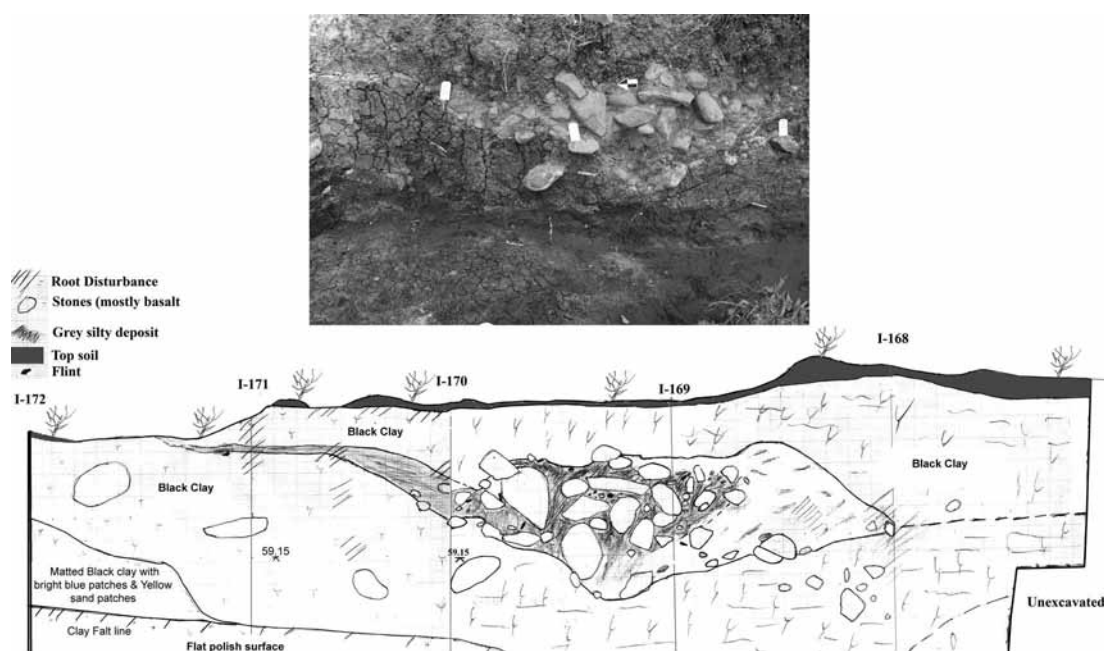


Fig. 17. Section drawing of Area A east section

piles of sediments dug by heavy machinery during the drainage operation in 1999 (Sharon *et al.*, 2002; Goren-Inbar, personal communication). Most of the artifacts are made on light gray flint which lacks the dark patina typical of many of the Middle Paleolithic artifacts collected from the site. They are also very fresh, showing no evidence for weathering caused by water transportation. Bones are practically absent from this area. Further excavation and the enlargement of the sample are needed in order to clarify observations.

Area B

This location (Fig. 8) was chosen for excavation due to the presence of MP flint artifacts as well as animal bones embedded amongst basalt cobbles and boulders on the Jordan River bank at water level. Many flint tools and bones were collected at this locality during visits to the site prior to excavation and it was assumed that this area would have the best potential for exploring the presence of Middle Palaeolithic occupation at the site. Six square meters were opened to test the nature of this archaeological occurrence. After a short excavation it was clear that the area is com-

prised mostly of archaeologically sterile layers, representing the margins for the exposure of the MP layers of the site. The contribution of Area B to our understanding of the NMO site geology and general stratigraphy is important and will be discussed in the geology section below. Yet, in terms of the archaeology, the area has very little to offer and was closed within a few days of excavation.

Area C

It became clear after excavating the river bank sections and Area B, that in order to find the MP layer of the site, it was necessary to locate an area between sections 4 and 6, which had already revealed Mousterian finds. Hence, nine meters were excavated in area C that exposed a layer bearing MP artifacts and bones, located mainly in a small section of squares I152, I153 and I154 at the western margins of the area (Fig. 18). Within a layer of dark clay, lying on top of a layer of basalt cobbles (see below). The numerous animal bones excavated included primarily the bones of *Bos primigenius*. The most significant find in this layer is a part of a *Bos* skull and two horn cores excavated in square I152 (Fig. 19). The skull was



Fig. 18. NMO Area C 2007 at the end of excavation. Arrow indicates find point of *Bos* skull in square 1152

found lying upside-down with a few flint artifacts scattered around it. It should be noted that a layer of relatively recent river channel sediments comprised of mainly sand and pebbles was covering the upper part of the skull and possibly removed the other part of it. Nevertheless, the skull was well-embedded within the layer of dark clay holding only MP artifacts and bones. Upon refitting of the skull, the presence of the base of the skull including part of the parietal bone, the occipital condyle and the one processus cornus (horn core) is now observable. The enormous size of the bones in comparison to present day cows is most notable (Fig. 19b). The few flint artifacts excavated from this layer included Levallois flake and points. They are un-weathered but show dark, almost black patina.

As noted above, the Mousterian layers were exposed in a very small area, totaling less than 5 square meters. The main finds are Levallois

blades and flakes including a few typical Mousterian points. The lithic artifact density seems to be relatively low, but the tools found are very well made and indicative of the Mousterian period. In contrast to the lithic assemblage, the faunal assemblage of these layers is rich and in excellent state of preservation. Apart from the skull of *Bos* described above, animals found include cervids, wild boar and turtles. Preliminary study has shown that the botanical remains are well preserved within the clay layers, together with charcoal that is found in large quantities.

Area D

During the 2008 excavation season, a large area was chosen for excavation based on the previous finding of MP archaeological remains in surrounding exposures and soundings excavations including Area C, Sections 07-6 and 07-7 and the geological Trench Ic (Fig. 8). This new

area opened is named Area D (Figs 8b and 13). After studying the site stratigraphy, it became evident that in order to reach the archaeological layer, a substantial amount of earth needed to be removed, particularly towards the eastern portion of the site. A JCB digger was used to remove the top soil and upper levels and expose the layers for excavation. A total of ca 64 m² was excavated by the tractor, but only part of it (ca 28 m²) was excavated to archaeological layer depth.

PRELIMINARY RESULTS OF THE 2008 SEASON

Fauna

The study of the faunal remains from the 2008 season is ongoing. Yet it is clear that the finds of this season have enlarged both the variety of animal species represented at the site and the sample size for the animals previously found. The bones are fragile and require careful conservation treatment for future research. Taxon representation includes remains of mollusks, aves, chelonia and mammals. The mammals include *Gazella gazella*, *Dama mesopotamica* (Fig. 20), *Bos primigenius*, *Equus* sp and *Sus scrofa*. In addition, many bone fragments were identified to body size (BSGB, BSGC, BSGD). Preliminary observation indicates the presence of cut marks on a few bones, as well as the presence of carnivore gnawing and scratches. This assemblage includes the base of a male aurochs' skull, a complete sacrum of an aurochs and other teeth and post cranials.

Flora

Wood

The presence of large pieces of wood as well as numerous seeds and fruits in the layer bearing MP archaeological remains was confirmed during the 2008 season. A few branches of wood were excavated. The largest, measured to ca 30 cm in length, was exposed in square K158 (Fig. 21). The study of the NMO wood pieces by Prof. E. Werker is ongoing. The two largest branches were both identified as Oak, *Quercus boissieri*. This is a species that lives today at elevations above 500 meters above sea level and was not found in the wood assemblage of the lower Paleolithic site of GBY. Additional identifications include *Fraxinus syriaca*, *Salix*, *Amygdalus*

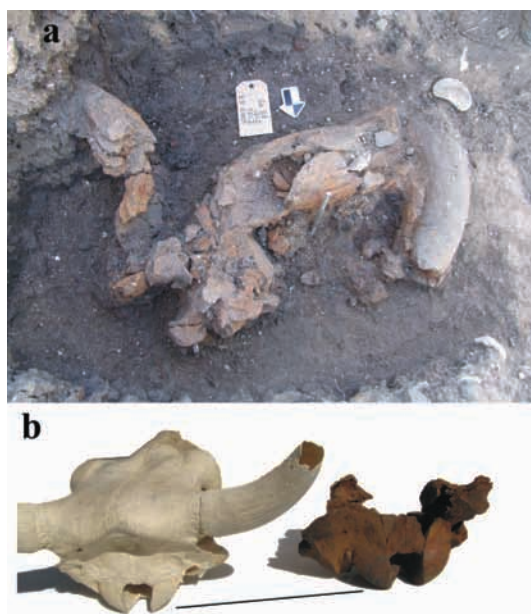


Fig. 19. a. Skull of *Bos* ventral view, with horn cores and lithic artifacts during excavation at Area B, square I152; b. refitted *Bos* skull excavated at Area C presented against recent, full-sized, skull of a cow

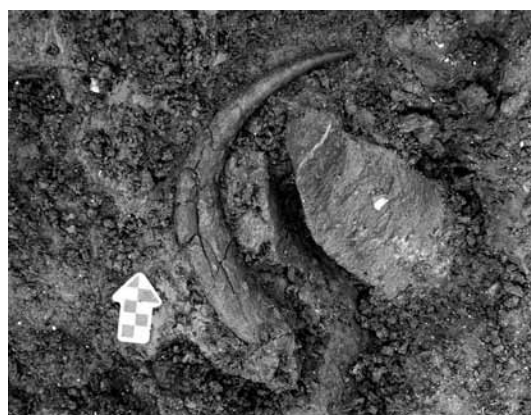


Fig. 20. Antler tip of *Dama* in square L159

and many pieces of bark. Finally, it seems that a few of the wooden remains are scorched.

Seeds and fruits

The site's sediments have yielded numerous seeds and fruits that are under study. The species identified to date include *Ceratophyllum demer-*



Fig. 21. Oak branch, ca 30 cm long in square K158

sum; *Chenopodium/Suaeda*; *Cladium mariscus*; *Cyperus* sp. a; *Cyperus* sp. b; *Lycopus europaeus*; *Ranunculus* subgen. *Batrachium*; *Scirpus* cf. *holoschoenus*; *Scirpus lacustris*; and *Silybum marianum*.

Some seed and fruit remains could not yet be identify. They seem to belong to exotic species unfamiliar within the recent *Flora Palaestina* region. Attempts to identify these species are in the focus of our efforts. These remains are of great interest since they have a potential to expose habitats, environments and even climate different from those prevailing the present day Hula Valley.

The botanical remains were found waterlogged and most of them retained their original morphology. The species identified to date are found today in wet as well as dry habitats (Table 2). The most common remains are those of *Scirpus lacustri*, an emergent plant of fresh or brackish shallow water which is a frequent habitat in the Jordan River banks. Free floating plants, such as the water fern *Salvinia* cf. *natas*, are very common in the NMO assemblage and probably floated in open water or loose stands of emergent water plants. *Salvinia* cf. *natas* was considered as an extinct species in Israel until lately, when it became naturalized in the coastal plain of Israel (Danin, 2004:20). Winter-flooded soils species are represented at NMO by *Heliotropium spicatum*. The above combination of plant species indicate an environment of lake margins with moderate slope and springs in the vicinity of the site.

Of special interest are the numerous seeds (~1500) of Holy thistle (*Silybum marianum*) un-

earthed in square K159 of Area D. The seeds were found at a depth of over 2 meters below present day surface. They were exposed at the contact between the dark clay of layer 4 and its underlying large basalt boulder of layer 5 (Fig. 15). It is assumed that these seeds did not resulted from human activity. The main agents candidate for their accumulation are the harvester-ants (*Messor semirufus*), known to collect large amounts of Holy Thistle seeds (Danin and Yom-Tov, 1990). The question as to the age of these seeds accumulation still awaits an answer.

The rich palaeobotanical assemblage of NMO provides an opportunity to explore additional chronological segment of the palaeo-vegetation sequence of the Hula Valley. The results of this palaeobotanical research joint with those of the Lower Palaeolithic and Epi-palaeolithic sites in the vicinity of Gesher Benot Ya'aqov (Melamed, 2003; Sharon *et al.*, 2002) will enable better understanding of the nature and changes in the vegetation and environment at the Hula valley during the Middle and Upper Pleistocene.

The lithic assemblage

The lithic assemblage excavated from Layer 4 at Area D is small yet very significant. The total number of flint artifacts larger than 2 cm excavated during the entire 2008 season is only 125. The lithic artifacts were found in the Layer 4 dark clay, mostly in vertical position as if they were stuck in the mud. While this might suggest that they are not fully in primary context, they clearly show no evidence of any transportation in water and are extremely fresh (Fig. 22). In addition, some of the flints show clear association with the bones.

It is interesting to note that only very few of the flint artifacts show evidence of burning. The assemblage of small micro-artifacts, on the other hand, has higher numbers of burned pieces.

Preliminary observations regarding the 2008 flint assemblage have yielded the following:

1. The assemblage is obviously small and the density of lithic artifacts is very low in comparison to most other Mousterian sites excavated (Gilead, 1980; Goren-Inbar, 1990; Jelinek, 1981).

2. Within this small assemblage, the percentage of tools is very high, reaching ~31% of the flake assemblage.

Table 2

The seeds and fruit remains

Plant name	Organ	Square and sample colume (cc)				
		K158d	k159c+d	L159c	N158d	N175b
		850	1340	300	300	400
Emergent plants in shallow water						
<i>Alisma</i> sp.	seed	++	+	++	+	+++
<i>Butomus umbellatus</i>	seed		+			
<i>Cladium mariscus</i>	nutlet	++	++			
<i>Cyperus</i> sp.	nutlet	+	+	+		++
<i>Lycopus europaeus</i>	fruit		++	+	++	++
<i>Polygonum</i> cf. <i>lapathifolium</i>	nutlet					++
<i>Scirpus</i> cf. <i>holoschoenus</i>	nutlet	+				
<i>Scirpus lacustris</i>	nutlet	+++	+++	+++	+++	+++
<i>Typha</i> sp.	seed					+
<i>Verbena officinalis</i>	fruit	+	+			++
Floating and submerged plants in open water						
<i>Ceratophyllum demersum</i>	nutlet	++	++	+	+	++
<i>Myriophyllum spicatum</i>	fruit		+			+
<i>Potamogeton</i> cf. <i>crispus</i>	nutlet	+	++		+	+
<i>Potamogeton</i> cf. <i>trichoides</i>	nutlet	+	++	+	+	+
<i>Potamogeton</i> sp.	nutlet	+	++	+	+	+
<i>Ranunculus</i> subgen. <i>Batrachium</i>	fruit	+++	++	+++	+	+++
<i>Salvinia</i> cf. <i>natans</i>	macrosporangium					+
Plants in brooks and springs						
<i>Chara</i> sp.	oospores		+	+		
cf. <i>Mentha</i> sp.	fruit		+	+		
cf. <i>Nasturtium officinale</i>	seed			+		+
Plants in flooded soils						
<i>Heliotropium supinum</i>	fruit		+			
<i>Ranunculus</i> cf. <i>scandicinus</i>	fruit	+	+			
Herbaceous vegetation of dry habitats						
<i>Adonis</i> sp.	fruit				+	
<i>Beta vulgaris</i>	fruit		+			
<i>Chenopodium</i> sp.	seed	+	+	++	+	+++
cf. <i>Geranium</i>	seed		+			
<i>Silybum marianum</i>	fruit	+	+++			
<i>Thymelaea passerina</i>	nutlet	+		+		
Other						
Cruciferae	seed		+++			
cf. <i>Hypericum</i>	seed	+				++
Labiatae	fruit			+		
<i>Medicago</i> sp.	fruit	+				
<i>Rumex</i> sp.	nutlet					
Umbelliferae	fruit	+	++	+	+	++

Frequency: + = 1–3, ++ = 4–10, +++ = >10



Fig. 22. Flint artifacts from Area D, 2008 excavation season at NMO

3. The primary morpho-types represented are points (9.3% of the total flake assemblage; $N=9$) and retouched blades (Fig. 22). Knives, naturally or retouch backed, are also significant (5.2%; $N=5$).

4. Many of the artifacts show edge damage.

5. The assemblage is clearly laminar in nature and most of the points are elongated (Fig. 22). 41% ($N=25$) of the blanks excavated from Layer 4 in Area D were recorded as blanks with an additional 11.5% of the blanks identified as elongated points.

6. Although Levallois flakes are present, the majority of the artifacts were probably produced by means of the laminar core method (Wojtczak, in press; Meignen, 1998, 2007, in press).

7. Seven cores were excavated from Area D during the 2008 season. Only one of them is over 10 cm in maximal dimension, the others being much smaller. Four of them are defined as "core on flake" while the other three are amorphous in shape. None of the cores could be defined as Levallois.

The lithic assemblage excavated during the 2008 season suggests that the lithic industry of the NMO site (at least the one represented in Layer 4) may be assigned to the Early Mousterian tradition of the Levant (Copeland, 1975; Garrod and Bate, 1937; Meignen, in press; Shea, 2003). If this is indeed the case, the NMO site is the only open-air site in north Israel that can be assigned to this early phase of the Middle Paleolithic. This suggestion is also chronologically significant as it places the site within the earlier stages of the MP estimated at present to be ca 200 Ka (Bar-Yosef, 1998; Mercier *et al.*, 2007; Shea, 2003).

Additional significance of the NMO lithic assemblage is found in its low number and density combined with its low percentage of waste products. Archaeological observations presented above demonstrate that the site represents a short term occupation, suggesting that hominids came to this locality for hunting, butchery and meat processing activity. The presence of a very limited number of tool types, including primary points and blades that could have been used for meat slicing, may suggest a task specific nature for the NMO occupation. A very specific tool kit that represents only what the NMO inhabitants selected to carry with them to the hunt, would ex-

plain why waste products as well as other tool types such as burins or scrapers are either absent or under-represented.

It should be noted, of course, that these suggestions are based on the excavation of only a limited area and are preliminary. They might be true only specifically for Area D Layer 4 while other localities at the site may show a different nature of occupation, as suggested by the assemblage of tools collected from the piles of sediments at in the vicinity of the NMO site (Goren-Inbar and Alperson-Afil, personal communication).

SUMMARY AND CONCLUSIONS

The results of a geo-archaeological survey and two excavation seasons at the outlet of the Mahanyeem Stream into the Jordan River exposed a Middle Palaeolithic horizon rich in fauna and botanical remains as well as a significant lithic assemblage. Important finds resulting from survey work and surface collection include: a) a small fragment of human skull collected from a pile of sediment discarded on the bank of the Jordan River. b) a rich lithic assemblage collected from the same pile containing both MP and UP tool types that cannot, therefore, by itself establish a more precise chronological assessment for the human skull. c) a skull and femur of a large lion (*Panthera leo*), found embedded within dark clay on the banks of the Jordan River.

Two excavation seasons at the site enabled the establishment of a stratigraphic framework for the site. The Middle Palaeolithic archaeological horizon (Layer 4) is embedded within a clay layer overlying a layer of basalt cobbles and boulders (Layer 5), which is the base of the stratigraphic sequence at this locality. The topography and geological context of Layer 5 are still unclear. Whatever may be the explanation of the topography of Layer 5, it can be assumed, on taphonomic and stratigraphic grounds, that the inhabitants of NMO during their short occupation saw its current topography. In other words, it was probably a small hill of basalt in the middle of the swampy mud that surrounded it. This may explain the attractive nature of this location to the hominids, who found within the swamp stable ground suitable either for an ambush or as a place to bring the hunt for butchering and processing.

The clay of Layer 4 is rich in fauna remains dominated by the bones of very large *Bos primigenius* in excellent state of preservation. Preliminary study of the wood remains demonstrated the presence of well-preserved wood and bark fragments identified as belonging to a variety of species. Some of the wood pieces show evidence of fire. The study of fruit and seeds from the site is ongoing, yet the large variety of species already identified indicate a swamp environment.

The lithic assemblage excavated is small, yet significant. It is comprised primarily of elongated blades with a high percentage of tools to waste. Significant tool types are points and retouched blades. The elongation of the assemblage may suggest that the industry should be assigned to the early stages of the Levantine Mousterian, yet the sample size must be enlarged before any further conclusion can be presented. Nevertheless, the typological composition of the assemblage and the low frequency of knapping waste products suggest a unique nature for the NMO lithic assemblage. The NMO site probably represents a short-term occupation and task specific activity. The lithic assemblage can be interpreted as representing the tool kit of the Middle Paleolithic hominids used during a specific task that probably involved hunting, meat processing or both.

The NMO site provides a unique opportunity to explore many areas of humanity's cultural and biological origins, development and variation. The first area is the behavioral pattern and subsistence strategies of Middle Palaeolithic hominids in the Northern Dead Sea Rift. The site is open air and suggested to be of short-term and task-specific nature. This nature of occupation will allow us to study the behavior pattern of the MP hunters, their task-related lithic tool-kit and their subsistence as evidenced by the animal bones they left behind. The data retrieved from long sequence Levantine Mousterian cave sites normally does not permit such resolution. The Mousterian culture is, at present, almost unknown from the Northern Dead Sea Rift (with the exception of the Nahal Amud cave sites) and, in particular, the presence of early Mousterian has rarely been documented.

The second area of exploration is the environmental background for the human activity at the site and the human interrelation with it. The pres-

ervation of botanical material is unique among MP sites in the Levant, enabling this study. The preservation of seeds, fruits and wood enable us to learn about the plant food diet of MP humans. And finally, clear indication of the presence of Upper Palaeolithic tools in one of the site's excavated assemblages suggests that the chronological and cultural margins of the site's layers covers a wide range of archaeological periods.

We look forward to the upcoming excavation seasons at NMO that will undoubtedly reveal new and exciting data shedding light on human activity and its environmental background at the swamps that surrounded the Paleo Hula Lake in the Middle Pleistocene.

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