

# OHALO II

Location: Sea of Galilee/Tiberias -212 m  
below sea level

Early Epipaleolithic = Kebaran

<sup>14</sup>C dates ca. 23,000 cal. BP Excavated  
by Dani Nadel (1989-1990)

Extraordinary organic preservation

Brush huts

Plant remains and wood

Skeleton



Dani Nadel, Barcelona 2012



Rina Castelsuovo for The New York Times

Israeli women last week in the Sea of Galilee, whose water level has dropped almost 20 feet since 1998. Behind them is a pole for tying up boats.

### **Tiberias Journal**

## *Israel Waits for Sea of Galilee's Low Tide to Turn*

By SERGE SCHMEMANN

lake. It is Israel's only sizable body

those turned out to be less severe



**Figure 3.** Air photograph of the Ohalo II area. Dark NNE trending bands under the water at the site area manifest depressed areas formed by folded tint colored sediment. The dark color of the bands was produced due to filling of the depressed areas by basaltic pebbles of the Sea of the Galilee shore. To the east of the site, traces of the fault that formed an underwater scarp parallel to the shore are seen. The prehistoric site is covered by plastic sheets and stones (rectangle in center of photo) for protection.



**Figure 4b.** A close-up view of the tilted strata to the east of the Ohalo II site (looking northwest). A trench (no. 79) through the archaeological layers is seen in the center, and the burnt remains of a round dark brush hut are seen to the left.

Photos from Belitzky and Nadel  
*Geoarchaeology* 17/5/453-464  
 (2002)

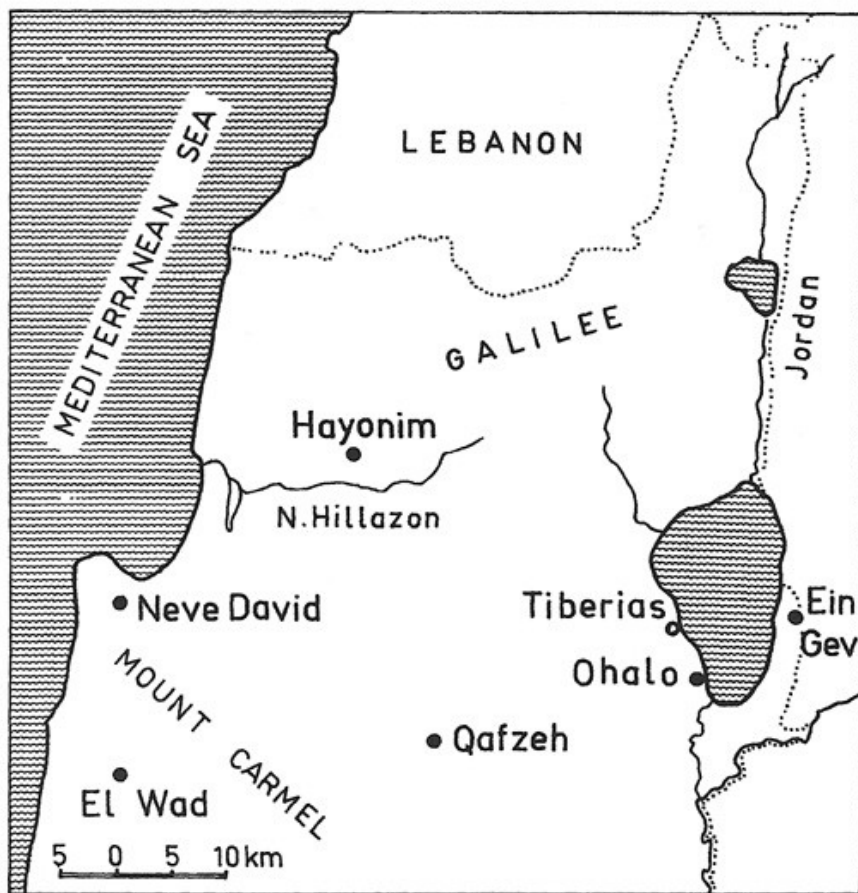


FIG. 1. Major Upper Palaeolithic and Kebaran sites with human remains in northern Israel.

TABLE I  
Radiocarbon Dates for Charcoal Samples  
from Ohalo II

Sample	Provenience	Date B.P.
Pta-5375	C88b 212.16-18	19,400 ± 220
Pta-5386	D89a 212.06-14	19,600 ± 400
Pta-5387	C85a 212.15-19	20,100 ± 440
OxA-2564	AB87a 212.12	18,680 ± 180
OxA-2565	C87d 212.20-25	19,310 ± 190
OxA-2566	C87d 212.25-30	19,110 ± 390
RT-1244	C89a 212.15-20	18,360 ± 230
RT-1246	AB87 surface	15,550 ± 130
RT-1248	B85c 212.15-16	19,800 ± 360
RT-1250	B89b 212.15-20	19,250 ± 460
RT-1251	B85b 212.12-14	19,000 ± 190
RT-1252	B89b 212.13-15	18,900 ± 400
RT-1297	E86b 212.38-43	17,500 ± 200
RT-1342	B88d 212.10	19,500 ± 170
RT-1343	C85c 212.10	18,600 ± 220
RT-1358	AB87c 212.15	18,700 ± 180

SOURCES: Kislev, Nadel, and Carmi n.d.; Carmi and D. Segal, personal communication, 1990; R. Housley, personal communication, 1990; J. Vogel, personal communication, 1990.

Nadel and Herskovitz 1991 (*Current Anthropology*)

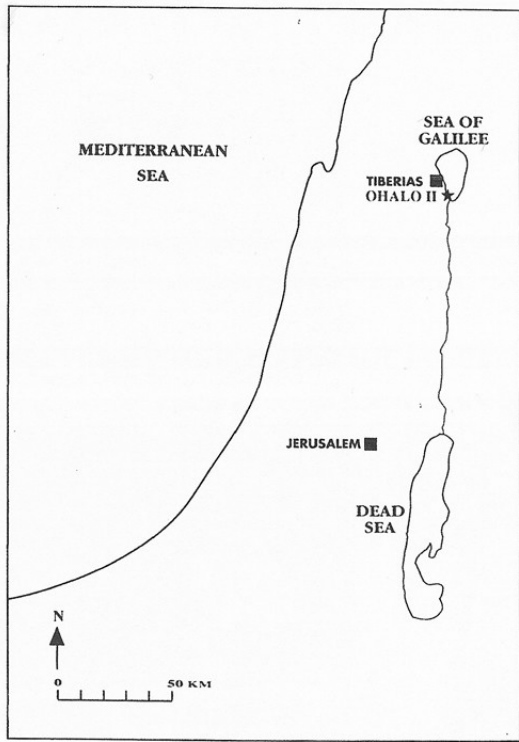


FIG. 1. - Map showing location of site.

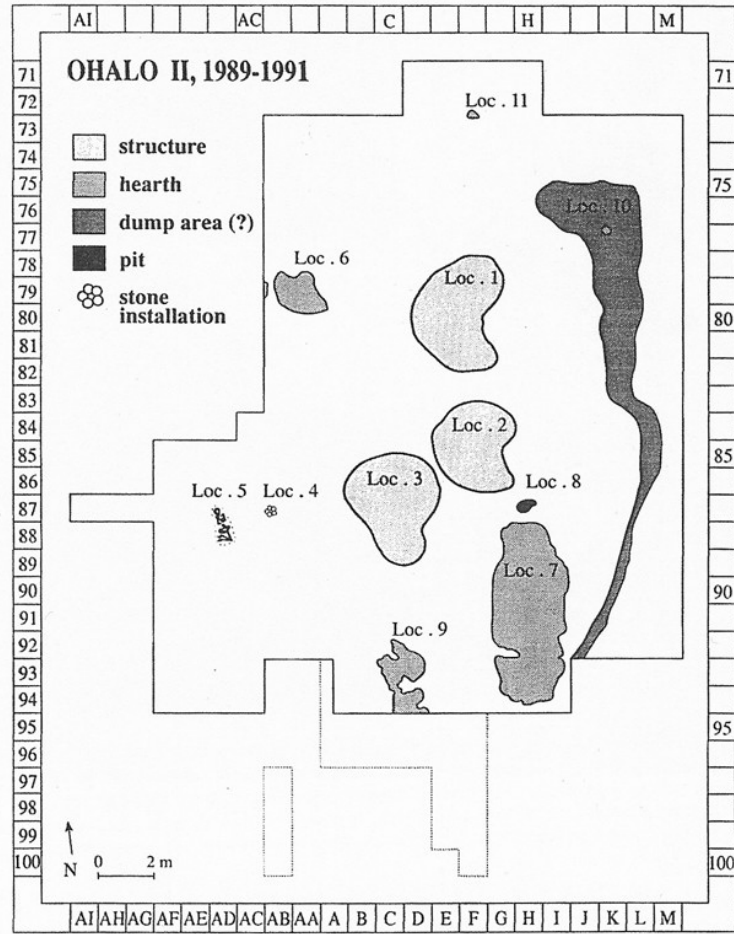
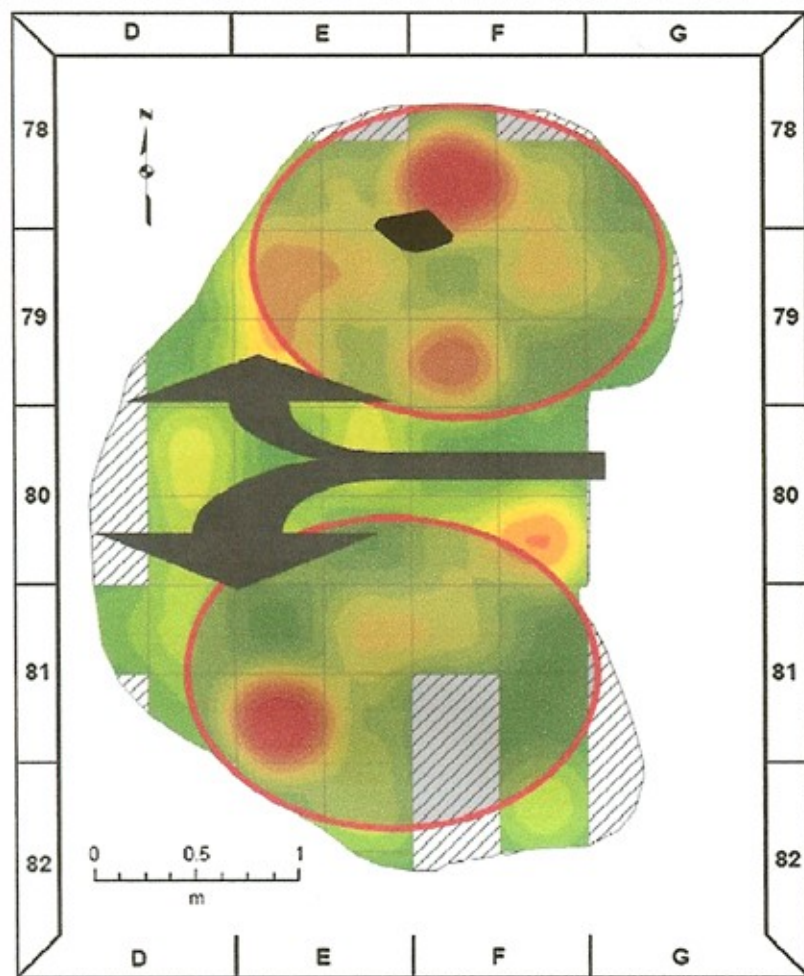


FIG. 2. - General plan of Ohalo II, central area. Loci 1-3: structures; locus 4: stone installation; locus 5: grave; loci 6, 7, 9, 11: hearths; locus 8: pit; locus 10: dump zone. Dotted line marks area of surface collection (after NADEL *et al.* in press).

Locus 1 is the brush hut

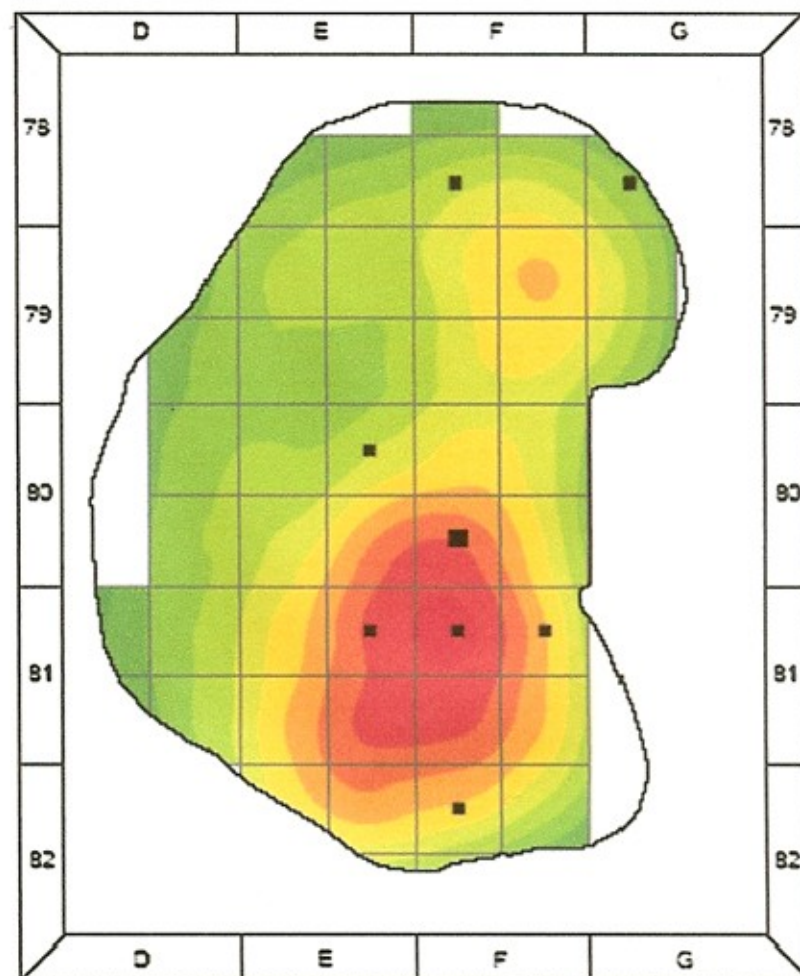


### Ohalo II, hut 1, floor II

All species except *S. palaestina/fruticosa*



Fig. 23. Suggested use of space on floor II, as inferred from distributions of plant remains.



### Cores



Blades and bladelets: density [n/m<sup>2</sup>]

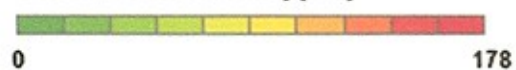
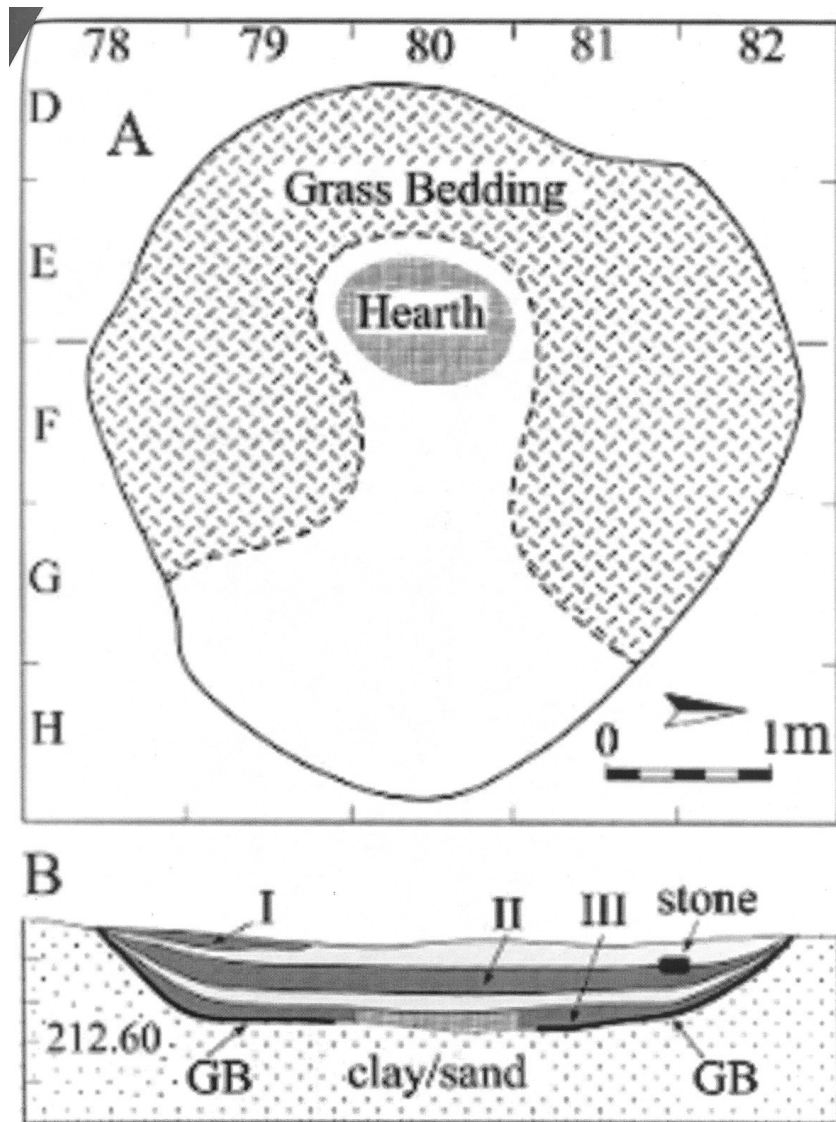


Fig. 24. Distribution plan of flint objects on floor II, brush hut 1: cores and blades-bladelets. Presented as densities calculated for  $0.5 \times 0.5$  excavation units (Nadel et al., 2006).



**Fig. 25.** A reconstruction of brush hut 1 showing the location of two activity areas on the floor: flint knapping on the left and seed processing on the right. Drawing by Rachel Brown-Goodman (Nadel et al., 2006).







Harvard Postdoctoral Fellow in Anthropology Ehud Weiss says that plant remains from an ancient site will lead to changes in the understanding of agriculture's roots.

Grass seeds were principal food, along with acorns, almonds, pistachios, olives, raspberries, figs and grapes. Some wild wheat and barley.

Small grass seeds require much labor to harvest and process – low return on labor.

“The first proof that the broad spectrum hypothesis applies to plants as well as to animals,” according to Wilma Wetterstrom.

## Charred edible plant remains from Ohalo II -

Plant name	Plant organ	Quantity <sup>1</sup>	
		a	b
<b>Grasses with edible grains</b>			
<i>Aegilops geniculatoperegrina</i>	grain	110	12
<i>Avena barbata</i> Pott ex Link	grain		4
<i>Avena sterilis</i> L.	grain	8	
<i>Bromus</i> sp.	grain	1	4
<i>Catabrosa aquatica</i> (L.) Beauvois	grain	1	65
<i>Hordeum bulbosum</i> L.	grain	10	12
<i>Hordeum glaucum</i> Steudel	grain	6	20
<i>Hordeum spontaneum</i> C. Koch	grain	588	41
<i>Hordeum spontaneum</i>	rachis node		30
<i>Triticum dicoccoides</i> (Koernicke) Aaronsohn	grain	20	1
<i>Triticum dicoccoides</i>	spikelet base	1	8
Unidentified grasses	grain	15	91
<b>Edible wild fruits</b>			
<i>Amygdalus</i> sp.	nutshell fragment	2	
<i>Crataegus</i> sp.	stone	12	
<i>Nitraria schoberi</i> L.	stone	153	12
<i>Olea europaea</i> L.	stone fragment	1	
<i>Pistacia atlantica</i> Desfontaines	nutshell fragment	1	1
cf. <i>Pyrus syriaca</i> Boissier	seed	1	
<i>Quercus</i> sp.	nut fragment	14	29
<i>Vitis vinifera</i> L.	pip	2	
<i>Ziziphus spina-christi</i> (L.) Desfontaines	stone fragment	2	
<b>Other edible wild plants</b>			
<i>Atriplex</i> sect. <i>Rosea</i>	fruit		1
Chenopodiaceae	embryo	1	2
<i>Erodium</i> sp.	seed		1
<i>Lens</i> sp.	seed	1	
<i>Malva</i> sp.	seed		7
<i>Scirpus littoralis</i> Schrader	nutlet		3
<i>Suaeda</i> sp.	seed		211
Vicieae	seed	1	
<b>Other wild plants</b>			
<i>Arundo/Phragmites</i>	culm fragment	1	
<i>Chara</i> spp.	nucule		806
<i>Galium</i> sect. <i>Kolgyda</i>	fruit	2	3
<i>Hippocrepis</i> sp.	seed		1
<i>Potamogeton</i> sp.	fruitlet		11
<i>Potamogeton pectinatus</i> L.	fruitlet	28	16
<i>Styrax officinalis</i> L.	stone fragment		2
Umbelliferae	fruit		1
Unidentified	fruit/seed	34	54

TABLE III

Ripening seasons of some of the edible plants listed in Table I

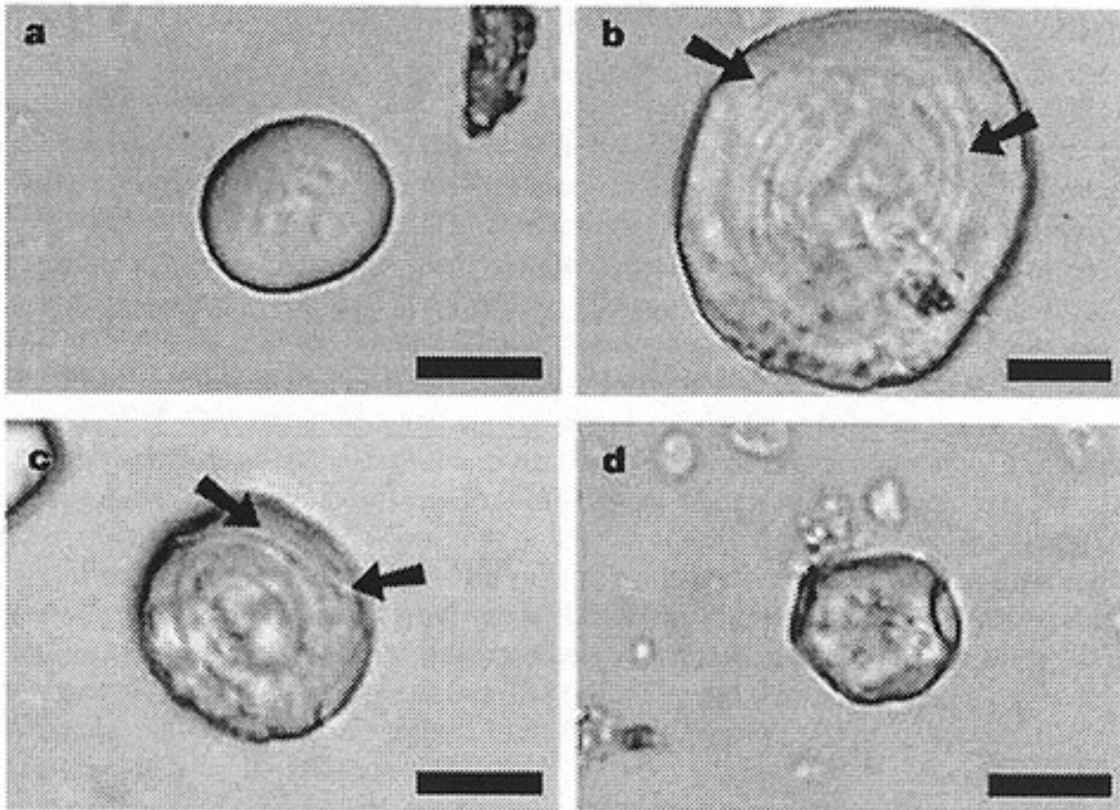
Plants	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
<b>Edible grasses</b>												
<i>Aegilops</i> spp.				+	+							
<i>Avena sterilis</i>					+							
<i>Hordeum spontaneum</i>					+							
<i>Triticum dicoccoides</i>					+							
<b>Wild fruits</b>												
<i>Amygdalus</i>								+	+			
<i>Crataegus</i>									+	+		+
<i>Olea europaea</i>										+		+
<i>Pistacia atlantica</i>								+	+	+		
<i>Quercus</i>										+		+
<i>Vitis vinifera</i>									+	+		
<i>Ziziphus spina-christi</i>					+			+	+	+	+	+

Kislev et al 1992 (*Review of Palaeobotany and Palynology*)<sup>1</sup>plant organs retrieved by: a = 2 mm- and b = 0.5 mm-mesh.

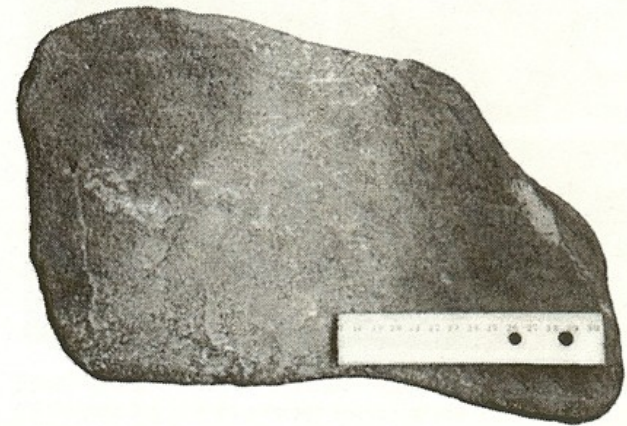
# Baking Bread?

- Starch grains found on grinding stone in hut at Ohalo.
- Grains are of *Hordeum* (barley)
- Basalt stone supported on floor with pebbles
- Stone-paved, oven-like hearth
- Did they bake dough on hot stones?
- Baking increases nutritive value of grain

# Starch Grains on Ohalo Stone



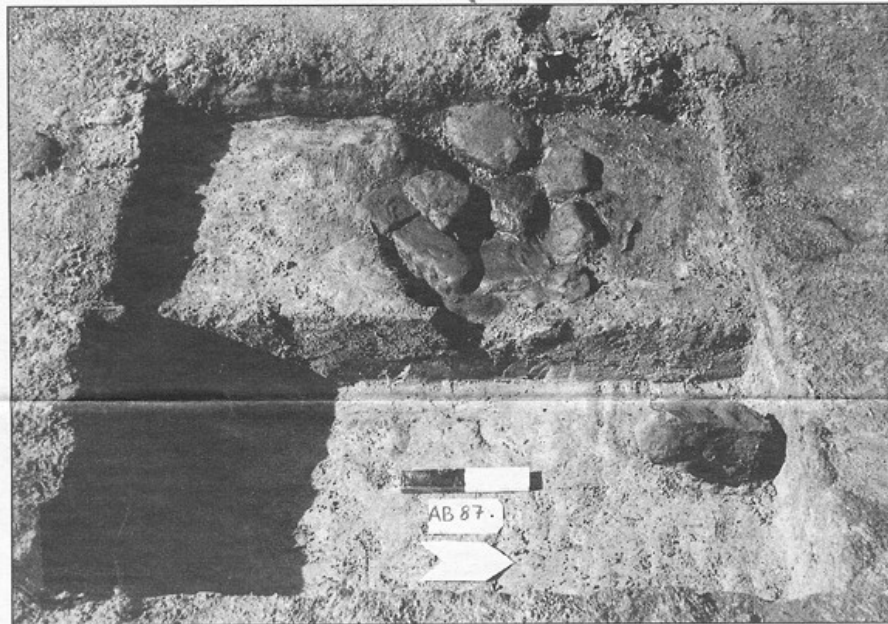
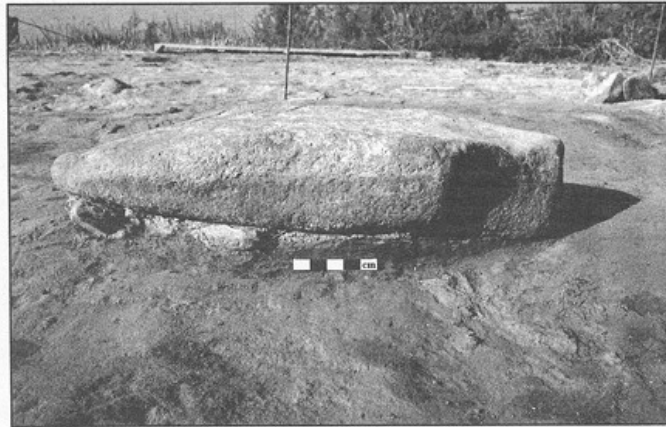
**Figure 3** Starch grains recovered from the stone implement. **a**, Lenticular grain from the AHT taxa group. **b**, **c**, Lenticular grains with lamellae (right arrow in **b** and left arrow in **c**) from *Hordeum*. They also have surface depressions (other arrows) characteristic of the genus. **d**, Compound starch grain. Scale bars, 10  $\mu\text{m}$ .



**Figure 1** The stone implement analysed from Ohalo II.

Piperno et al  
*Nature* 2004

*New find in Israel shows that cereal production predates agricultural societies by millennia*



Photos by Dani Nadel/Haifa University

Since no root or tuber starches were found embedded in the foot-long stone (top photo), it is believed that it was used for cereal. In the vicinity, a hearthlike oven was found (above).

Harvard Gazette  
2004

**Researchers find earliest known oven**

# Avian fauna

- Most birds are waterfowl
- Environment was lakeside/marshy
- Large birds – ducks, geese, swans - dominate
- 16 families, 40 genera, 68 species
- Grebes are the most abundant can be snared or netted in the water
- Autumn and spring harvesting predominate
- Most bones burned (roasted)



*Tachybaptus ruficollis* (little grebe)

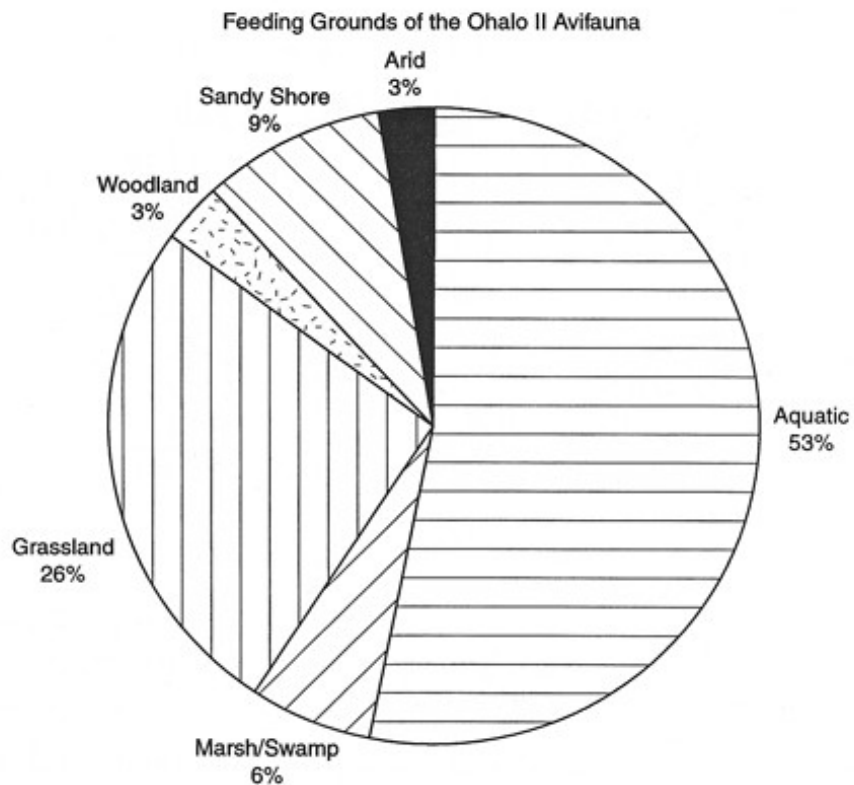


Figure 7. Feeding habitats of the Ohalo II avifauna.

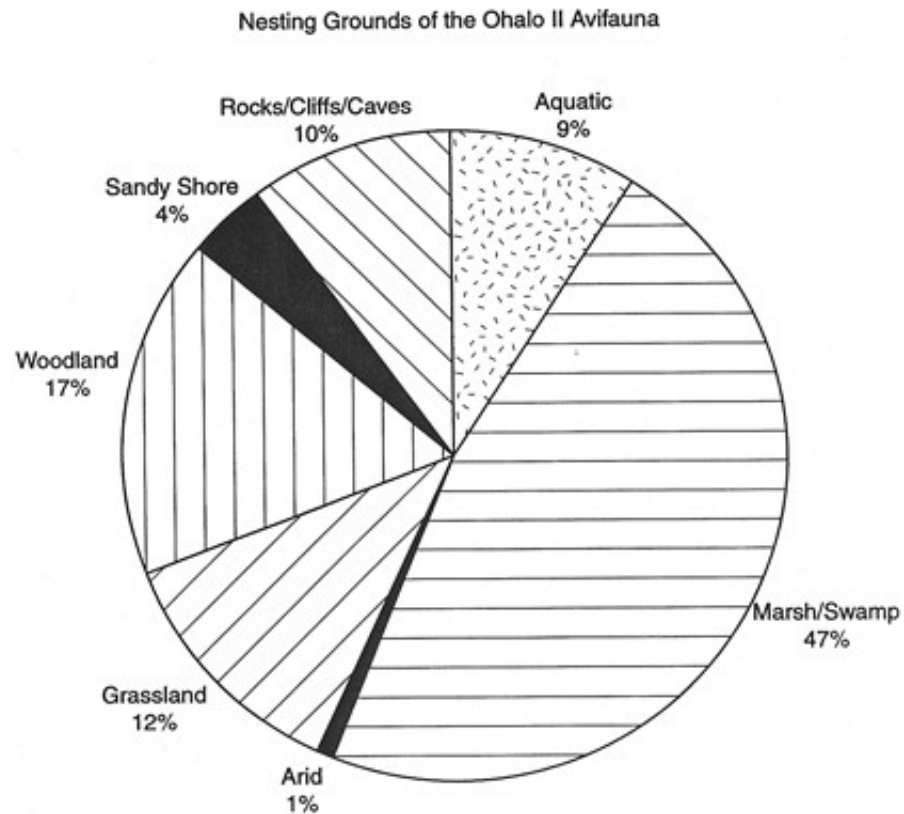


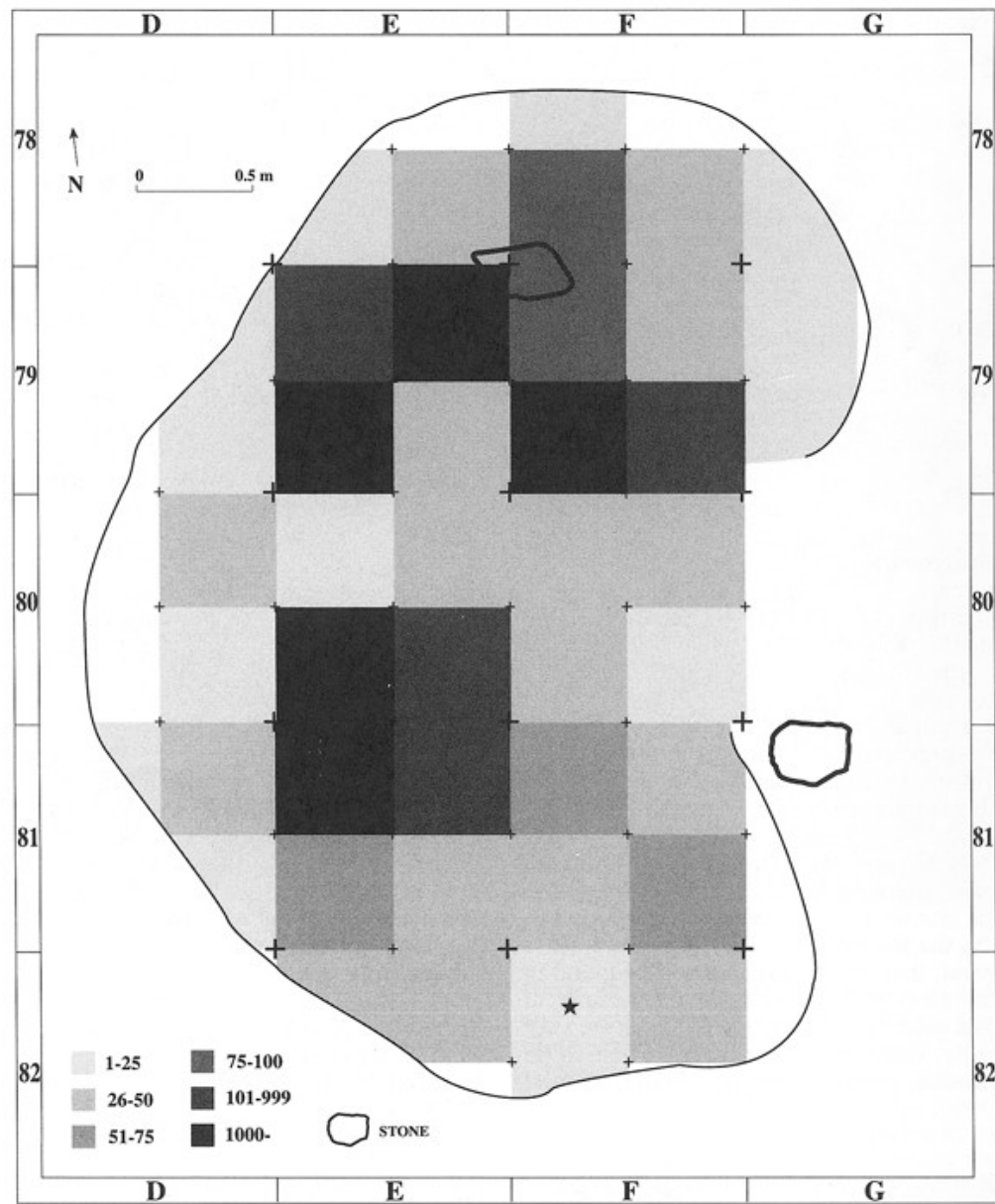
Figure 8. Nesting habitats of the Ohalo II avifauna.

Simmons and Nadel (1998) *International Journal of Osteoarchaeology*



# Hunted Animals

- Lots of fish – Lots of Cyprinidae
- Fish bones found in “piles” on floors
- Some fish were very small – probably netted
- Gazella gazella most common
- Also Dama, Vulpes and Cervus elaphus



Density and  
Distribution of fish  
vertebrae on house  
floor. May have  
been kept in bags.

Nadel et al. *Current  
Anthropology*  
(1994)

FIG 8. Distribution of fish vertebrae on floor of locus 1. Star, where fragments of twisted fibers were found.

# Wooden objects

- No remains of hunting, gathering or fishing equipment such as bows, arrows, spears or hooks
- 8 wooden objects at Ohalo II.
- Pencil-shaped pieces with longitudinal shavings
- Incised bone object in grave

# Wooden Objects

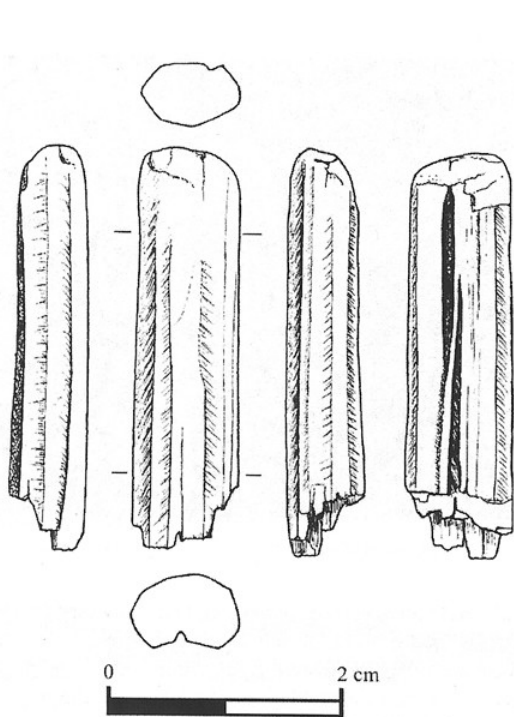


Fig. 21. Drawing of object V, showing four faces and sections.

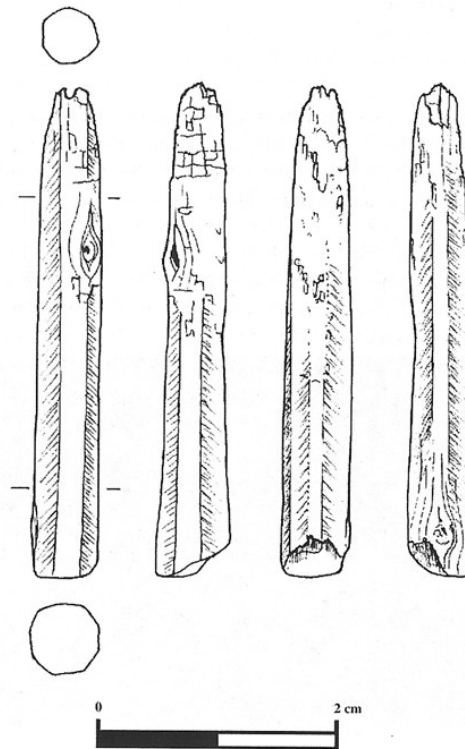


Fig. 19. Drawing of object IV, showing four faces.

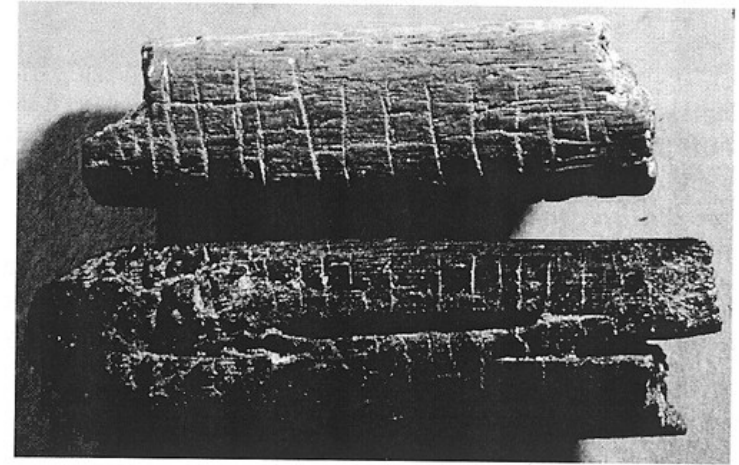
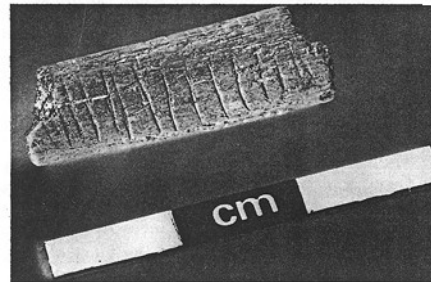
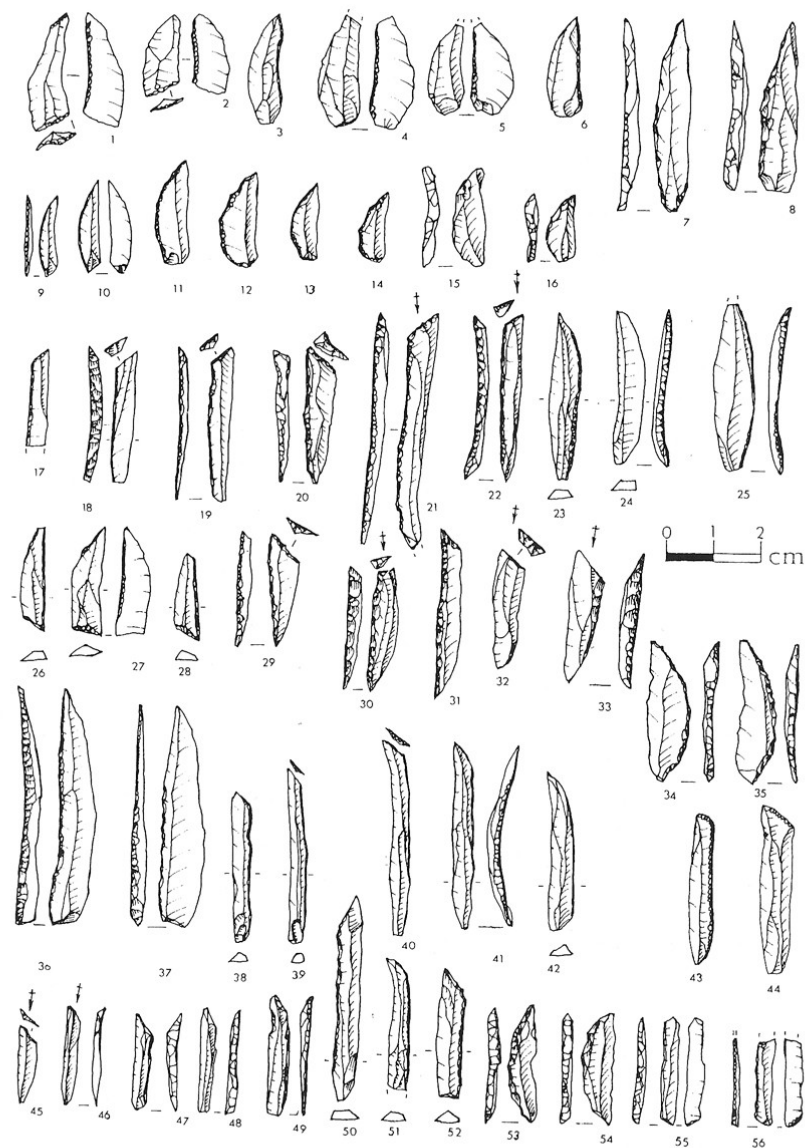


Fig. 18. Object III and the incised bone found in the grave, behind the skull of H2. Note the general resemblance in their length and diameter, as well as in the length of incisions, their width, and the regular distances between them.

Nadel et al, 2006  
*(Journal of Human  
 Evolution)*



Pl. II : 1. - Stone installation (locus 4) : one layer of unworked stones discovered after clearing the recent sands. Scale is 20 cm.  
 2. - Incised worked bone fragment found near skull of H2. 3. - Details of one series of incisions.

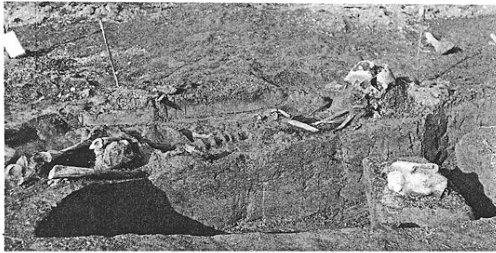


**Figure 6** Microlithic forms of various Early Epipaleolithic 'Kebaran' industries: 1–2, Jiita II/2; 3–6, Kfar Darom 28; 7–8, Fazael III B; 9–10, Kfar Darom 26; 11–14, Kfar Darom 8; 15–16, Nahal Soreq 33 G; 17–18, 26–28, Hayonim Cb; 20–21, 29, Fazael VII; 21–22, 30–31, Jiita II supérieur; 23–25, Poleg 18 MII; 32–33, Givat HaEsef; 34–35, Azariq VI; 36–42, Ein Gev I; 43–44, Kharaneh IV/B; 45–49, Fazael III A; 50–52, Nahal Hadera V/upper; 53–56, Azariq I

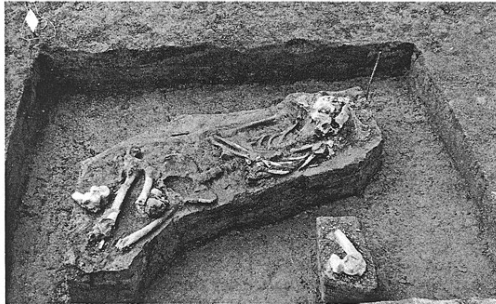
## Examples of Kebaran lithics from various sites



1



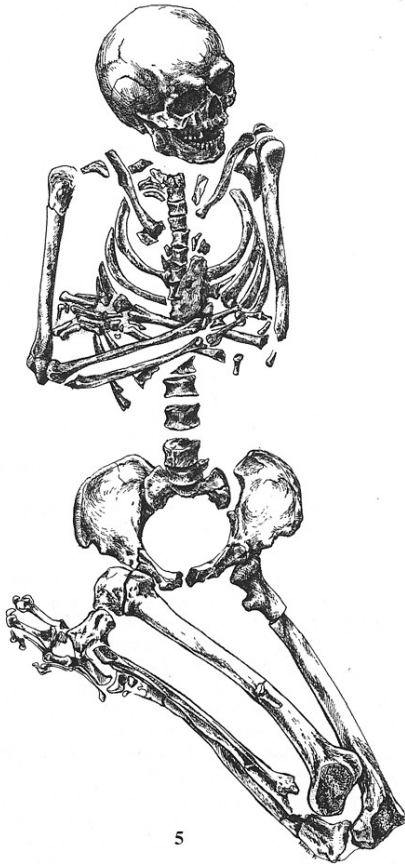
2



3



4



5



Left and right  
humeri

Pl. I : 1. - Skull and ribs of H2 during excavation. 2. - Skeleton H2 and the section under it, looking west. Note the proximity to surface and the bottom half of the section that is brighter (Lisan bedrock). 3. - H2 skeleton before removal *en bloc* to the laboratory at the Tel-Aviv University (looking west). The displaced (freshly broken) knee was probably moved by a tractor working on the beach before recognition of the site. 4. - Three stones supporting the skull and pointing it to the east. Photo of the cast of H2, after reconstruction of the skull. 5. - Line drawing of H2 skeleton after cleaning in the laboratory.

# Ohalo II Man

- Complete skeleton of man, mid-30s
- Same flexed burial position as Ein Gev female, the only other complete skeleton of the period
- Lower ribs have ossification and calcification due to chronic osteomyelitis (infection as result of trauma)
- Scapula, clavicle and humerus on right side are massive and robust and show degenerative wear
- Right and left radius and ulna were “normal” size
- He suffered from two conditions: osteomyelitis of the chest wall, and an adult onset of Erb-Duchenne brachial plexus palsy involving the upper left arm (Herhskovitz et al. *Journal of Osteoarchaeology* (1993)).



FIG. 4. *Fragment of burnt twisted fiber (specimen 1) found on the floor of locus 1 ( $\times 50$ ). This specimen is untreated.*

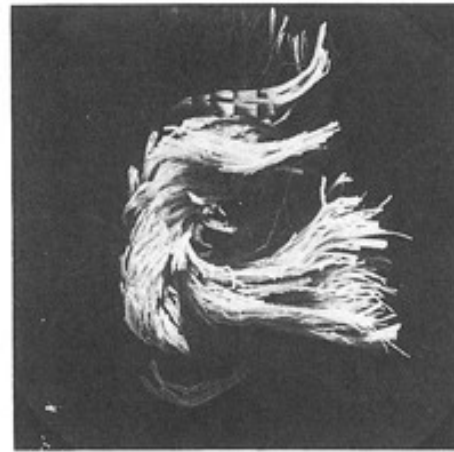


FIG. 5. *Scanning electron micrograph of fragment of burnt twisted fiber (specimen 2) found on the floor of locus 1 ( $\times 54$ ).*

Fibers most likely came from species of *Typha*, *Juncus*, *Cyperus*, *Scirpus*, *Sparganium* and *Phoenix dactylifera*

Net bags, fishing or birding nets, and rope/string are likely products