

REHOVOT RADIOCARBON MEASUREMENTS IV¹

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INTRODUCTION

The following list consists of dates of archaeological samples, obtained by gas-proportional counting of ethane, between 1985 and the end of 1991. During this time a close cooperation has been established with the Israel Antiquities Authority, which now has an archaeologist (D.S.) participating in the operation of the lab and serving as a liaison officer with the archaeological community.

To accommodate the requests of archaeologists for higher precision, the counting time was increased to at least 3.6 k min in the large counter (0.5 liter 2100 torr, 1.5 g carbon) and 5 k min in the medium counter (0.25 liter 2100 torr, 0.75 g carbon). Organic samples are now oxidized in a high-pressure combustion unit (Phonon 400). The standard used is NBS oxalic acid II.

Dates are expressed in conventional radiocarbon years, with an overall error of $\pm 1 \sigma$. Archaeologists are also offered, and encouraged to use, calibrated ages.

The locations of sites are given in the Natural Grid Reference (NGR) and shown on the map (Fig. 1). The numbered location on the map is given with a prefix, M, next to the NGR. We acknowledge the help of G. Carmel, who prepared the map.

MARINE SAMPLES

RT-747. Maagan Michael Ship

2470 \pm 160

Wood from a sunken ship collected 1985 by E. Linder, Center for Maritime Studies, University of Haifa, from 1.8 m bsl (NGR 1410-2177, M16).

Comment (E.L.): Estimated 5th century BC.

RT-757. Atlit Harbor

800 \pm 120

Wood from posts of a crusader wharf from the north end of the bay of Atlit (NGR 1449-2350, M11). Collected 1985 by E. Galili, Israel Antiquities Authority.

Kinneret Boat Series

Boat found in winter 1986 in the mud near Genosar on the shore of the Sea of Galilee (NGR 1995-2500, M7). Samples 767A and 767B collected by A. Raban, Center for Maritime Studies,

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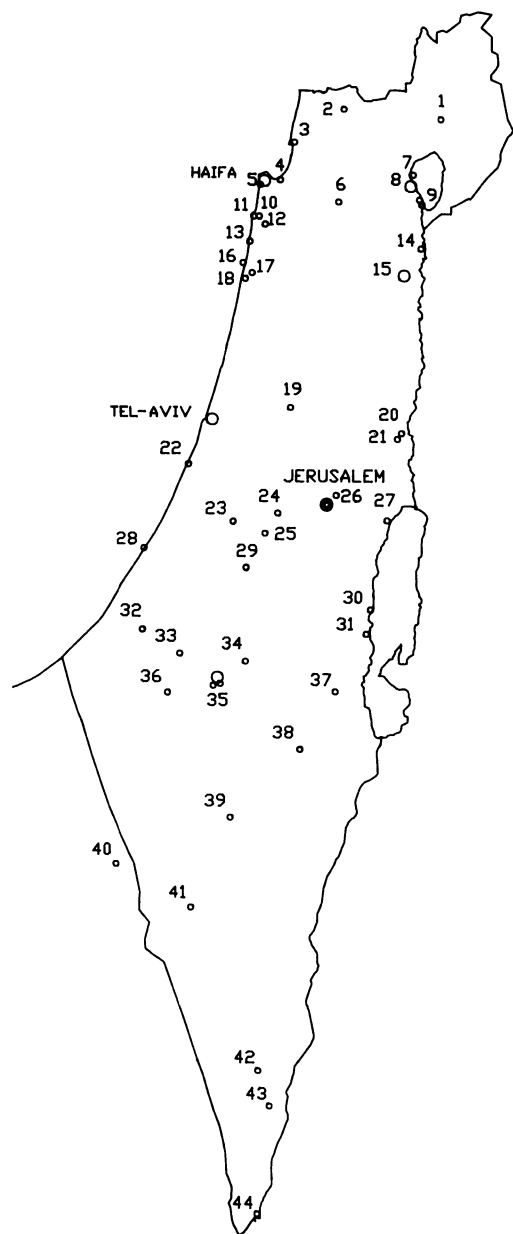


Fig. 1. Location map of archaeological sites from which the samples in this report came

1. Gesher Bnot Ya'aqov
2. Nahal Bezet/Horvat Galil
3. Acre
4. Tel Abu Hawam
5. Kefar Samir
6. Yiftah'el
7. Kinneret (boat)
8. Tiberias
9. Beth Yerah/Ohalo
10. Tel Hariz
11. Atlit Harbor
12. El Wad
13. Dor
14. Gesher
15. Beth Shaan
16. Maagan Michael
17. Beit Hananya
18. Cesarea
19. Nahal Kana
20. Gilgal
21. Netiv Hagdud
22. Palmahim
23. Tel Harasim
24. Haruv
25. Tel Yarmut
26. Nahal Zimri
27. Qumran
28. Ashqelon
29. Maresha
30. Ein Gedi
31. Nahal Mishmar
32. Nahal Metnan
33. Gilat
34. Tel Shoqet
35. Neve Noy/Beer Zfad
36. Shiqmim
37. Lahat
38. Mamshit
39. Ein Ziq
40. Kadesh Barnea
41. Nahal Oded
42. Uvda Valley
43. Ma'ale Shoharut
44. Eilat

University of Haifa. All other samples were collected by S. Wachsman, Israel Antiquities Authority. Wachsman (1990) has given a full report on all aspects of the boat.

TABLE 1. Kinneret Boat Series

RT-no.	Feature	No.	Type	¹⁴ C age
-767A	Strake			1940 ± 100
-767B	Frame			2080 ± 90
-772A	Strake	6		2140 ± 100
-772B	Frame	42A		1900 ± 100
-773A	Fragment of Assembly 1			1900 ± 100
-793A	Frame	78	<i>Quercus</i>	1960 ± 130
-793B	Strake	24	<i>Cedrus</i>	2000 ± 100
-793C	Strake	62	<i>Cedrus</i>	2110 ± 110
-794D	Assembly 3 beneath boat	A657/2		2030 ± 110
-794E	Strake	A61/14		2100 ± 120
-794F	Strake	46		2060 ± 120
-794G	Tenon from strake	10		1960 ± 110

Tel Hariz series

Tel Hariz is an underwater Neolithic site 7 km south of Haifa (NGR1420-2340, M10). Collected 1986 by E. Galili, from 2.5 m bsl, 30 m from the present shoreline.

RT-779A. 7330 ± 120

Wood.

RT-779B. 6260 ± 150

Wood.

$\delta^{13}C = -25.3\text{‰}$

RT-797. Acre 2800 ± 120
 $\delta^{13}C = -26.0\text{‰}$

Charcoal from a layer of ash on a stone floor between two walls in Area P. L 8034, B 8600 (NGR 1585-2585, M3). Collected 1985 by A. Raban.

RT-801. Dor Ship 1640 ± 120

Wooden board from a sunken ship found on the beach, 25 km south of Haifa (NGR 1430-2240, M13). Collected 1986 by S. Wachsman.

RT-802. Palmahim Anchor 2080 ± 100
 $\delta^{13}C = -25.8\text{‰}$

Remains of wood coating of a lead anchor found on the beach, 15 km south of Tel Aviv (NGR 1220-1480, M22). Collected 1986 by S. Wachsman.

Cesarea series

Excavations at the site of Cesarea (NGR 1402-2136, M18). Collected by A. Raban. Raban (1989) has reported on the site and excavations.

RT-809. Rope	1630 ± 130 $\delta^{13}\text{C} = -25.4\text{‰}$
Rope from a sunken ship, in the northern bay near Straton's Tower, Area Y2, b 7004.	
RT-836A. <i>Ostrea</i>	2100 ± 120
Shells from Area S-2, L 225, at depth 1 m bsl. Collected 1986.	
RT-836C.	2010 ± 100 $\delta^{13}\text{C} = -24.8\text{‰}$
Charcoal from a ditch excavated from east to west, on dry land, Area J-3, L 327, b 8024, at depth 1.1 m under boulders. Collected 1987.	
RT-836D.	1430 ± 80
Charcoal from hole #6 under vault #1 in Area Z, b2001. Collected 1987.	$\delta^{13}\text{C} = -23.6\text{‰}$
RT-836E.	1190 ± 80
Charcoal from Area Z L 501, b 5056. Collected 1987.	$\delta^{13}\text{C} = -24.0\text{‰}$
RT-878.	1050 ± 80
Oily organic matter underlying a mosaic floor in Cesarea (L 201). Collected and submitted by A. Nissenbaum, Weizmann Institute of Science.	
RT-942A.	1100 ± 200
Rope from a sunken ship north of the port, from 2.6 m bsl. Collected 1980.	$\delta^{13}\text{C} = -25.5\text{‰}$
RT-942B.	1960 ± 50 $\delta^{13}\text{C} = -25.3\text{‰}$
Wood from a wooden envelope of a lead anchor found inside the port from 6.3 m bsl. Collected 1988 by A. Raban.	
RT-1221.	1210 ± 45
Wood from Area I-1. Collected 1989.	$\delta^{13}\text{C} = -23.9\text{‰}$

Sardinia series

Excavations near Tharros, Sardinia next to the city walls. Collected 1987 by E. Linder from Area C, 2.8 m bsl. See Linder (1987) for details.

RT-849A.	1190 ± 160
Wood.	$\delta^{13}\text{C} = -25.2\text{‰}$
RT-849B.	1870 ± 110
Wood.	$\delta^{13}\text{C} = -25.2\text{‰}$

RT-849C. 1640 ± 130

Charred wood.

RT-855. Kefar Samir 6420 ± 200

Straw mat found near a submerged construction in Kefar Samir south of Haifa (NGR 1460-2450, M5). Collected 1987 by E. Galili. See Carmi and Segal (1990) for details.

Tel Abu Hawam series

Tel Abu Hawam is an archaeological site north of the Haifa port (NGR 1521-2450, M4). Samples are from depth 1 m, in a layer of ancient salt swamp, adjacent to the tell, containing Iron Age I remains. Collected 1988 by A. Raban (Raban & Galanti 1987).

RT-942C. 2890 ± 95

Twigs. $\delta^{13}C = -25.2\text{‰}$

RT-942D. 2940 ± 60

Piece of a wooden artifact. $\delta^{13}C = -23.4\text{‰}$

Atlit Yam series

Atlit Yam is a late Pre-Pottery Neolithic B (PPNB) submerged village off the shore of Atlit, 10 km south of Haifa (NGR 1449-2346, M11). Collected 1987 by E. Galili from 10 m bsl.

RT-944A. 7670 ± 85

Charred seeds of wheat, collected 1987.

RT-944C. 7610 ± 90

Charcoal. $\delta^{13}C = -25.7\text{‰}$

RT-1403. Atlit anchor 2320 ± 45

Wood from an anchor, found 4 m bsl off the shore of Atlit. Collected 1988 by E. Galili.

Ein Gedi Anchor series

Ropes from stone anchors, found on the shore of the Dead Sea near Ein Gedi (NGR 1880-0970, M30). Collected 1989 by G. Hadas, Israel Antiquities Authority (Nissenbaum, Carmi & Hadas 1990).

RT-954. 2180 ± 80

Rope from anchor C. $\delta^{13}C = -22.8\text{‰}$

RT-1202. 2200 ± 120

Rope from anchor A.

Tiberias series

Wood from posts next to the old walls of Tiberias (NGR2016-2422, M8). Collected 1989 by A. Raban.

RT-1291. **1360 ± 50**

RT-1292. **1360 ± 50**

CONTINENTAL SAMPLES**Uvda Valley series**

These samples are from an archaeological excavation 40 km north of Eilat (NGR1469-9295, M42). Collected by O. Yogev (RT-724A to -724F) and U. Avner (the remaining samples), Israel Antiquities Authority (Avner 1990).

RT-724A. **1290 ± 240**
 $\delta^{13}C = -10.6\text{‰}$

Uvda 7, charcoal collected 1980 from Site 7 L 907, 0.5 m below surface. Apparently, this is an Omayan intrusion into the original site.

RT-724B. **6410 ± 120**
 $\delta^{13}C = -24.5\text{‰}$

Uvda 7, charcoal collected 1980 from a hearth in Site L 69, 0.2 m below surface.

RT-724C. **4540 ± 100**

Uvda 7, charcoal collected 1980 from L 110, 0.5 m below surface. $\delta^{13}C = -13.5\text{‰}$

RT-724D. **5400 ± 110**

Uvda 4, charcoal collected 1980 from L 29, 0.5 m below surface. $\delta^{13}C = -23.3\text{‰}$

RT-724E. **2320 ± 80**

Uvda 5, charcoal collected 1980 from L 16. $\delta^{13}C = -22.4\text{‰}$

RT-724F. **4015 ± 80**

Uvda 21, charcoal collected 1980 from L 17.

RT-864A. **4310 ± 100**

Uvda 9, charcoal collected 1980 from L 912, 0.6 m below surface. $\delta^{13}C = -16.7\text{‰}$

RT-864B. **4440 ± 180**

Uvda 9, charcoal collected 1980 from L 924, 0.6 m below surface. $\delta^{13}C = -23.2\text{‰}$

RT-864C.	2740 ± 90
Uvda 9, charcoal collected 1980 from L 903, 0.3 m below surface.	$\delta^{13}C = -20.6\%$
RT-899A.	4530 ± 50
Uvda 9, charcoal collected 1984 from L 964, 0.6 m below surface.	$\delta^{13}C = -16.7\%$
RT-899B.	4520 ± 60
Uvda 9, charcoal collected 1984 from L 902, 0.4 m below surface.	$\delta^{13}C = -23.5\%$

Yiftah'el series

Yiftah'el is a Neolithic (PPNB) site in the lower Galilee in the Valley of Beth Netofa (NGR 1720-2400, M6). Collected 1983 by Y. Garfinkel, Institute of Archaeology, Hebrew University, Jerusalem (Garfinkel, Carmi & Vogel 1987).

RT-736A. Horsebean	8570 ± 130
Charred horsebean seeds from a silo in L 719, 2 m below surface.	$\delta^{13}C = -22.5\%$
RT-736B. Lentil	8890 ± 120
Charred lentil seeds from L 710, 2 m below surface.	$\delta^{13}C = -22.6\%$

Comment (Y.G.): Horsebean and lentil seeds are of special significance in the domestication process.

Netiv Hagdud series

These samples are from a Pre-Pottery Neolithic A (PPNA) site in the Jordan Valley, 12 km north of Jericho (NGR 1920-1540, M21). Collected 1984 by O. Bar-Yosef and A. Gopher, University of Tel Aviv. All samples are charcoal.

RT-762A.	9680 ± 140
	$\delta^{13}C = -23.2\%$
RT-762B.	9600 ± 170
	$\delta^{13}C = -23.2\%$
RT-762C.	9970 ± 150
RT-762D.	9400 ± 180
	$\delta^{13}C = -24.9\%$
RT-762F.	9780 ± 150
	9980 ± 150
RT-777. Gilgal I	$\delta^{13}C = -22.9\%$

Gilgal I is a PPNA site in the Jordan Valley, 17 km north of Jericho (NGR1920-1540, M20).

Collected 1985 by T. Noy, Israel Museum, Jerusalem. The sample is charred barley seeds from a silo inside a house, 11.9 m below surface.

Ma'ale Shaharut series

Ma'ale Shaharut tombs are in a rockshelter in Wadi Shaharut in the Arava Valley, east of Uvda valley (NGR1499-9238, M43). Samples are wood, probably acacia, attributed to Middle Bronze I (MBI) and Early Bronze I (EBI). Collected 1986/7 by U. Avner.

RT-771A. B5 **2430 ± 130**

Sample from Tomb IV, 0.8 m below surface. $\delta^{13}C = -22.6\text{‰}$

RT-771B. B4 **3580 ± 130**

Sample from Tomb IV, 0.8 m below surface. $\delta^{13}C = -24.0\text{‰}$

RT-899C. **3700 ± 55**

Sample from Tomb IV, 0.6 m below surface. $\delta^{13}C = -23.0\text{‰}$

RT-899D. **3100 ± 60**

Sample from Tomb III, 0.6 m below surface. $\delta^{13}C = -22.1\text{‰}$

Lahat series

Lahat cave is in the Judean Desert, 40 km southeast of Beer Sheva (NGR1710-0680, M37). In 1986, I. Gilead, Ben Gurion University, Beer Sheva, conducted salvage excavations after the site was robbed. Chalcolithic and Roman remains were found on the bedrock.

RT-782A. Twigs, Layer C **4050 ± 120**

$\delta^{13}C = -21.2\text{‰}$

RT-782B. Charcoal, Layer B **3800 ± 100**

$\delta^{13}C = -23.4\text{‰}$

RT-783. Neve Noy **1330 ± 100**

$\delta^{13}C = -11.1\text{‰}$

Charcoal from a suburb of Beer Sheva, on the south bank of wadi Beer Sheva (NGR 1300-0710, M35). Collected 1986 by I. Gilead. Sample is from the remains of a furnace 1.5 m below surface. Byzantine sherds were found in the fill.

Gesher series

Gesher is a Neolithic (PPNA) site in the Jordan Valley, 15 km south of the outflow of the Sea of Galilee (NGR 2030-2230, M14). Collected 1986 by Y. Garfinkel.

RT-814A. **10,590 ± 140**

Charcoal collected 1986 from 4 m below surface in Area A. $\delta^{13}C = -25.2\text{‰}$

RT-814B.	10,390 ± 220
Charcoal collected 1986 from 4 m below surface in Area A.	$\delta^{13}C = -25.0\text{‰}$
RT-868A.	9820 ± 140
Charcoal collected 1986 from 4 m below surface in Area A.	$\delta^{13}C = -25\text{‰}$
RT-868B.	9790 ± 140
Charcoal collected 1986 from 4 m below surface in Area A.	$\delta^{13}C = -24.3\text{‰}$
RT-843. Ashqelon	2080 ± 80
Wood from the bottom of a Roman well in Tel Ashqelon (NGR 1071-1171, M28). Collected 1987 by Y. Nir, Israel Geological Service. The wood, identified as sycamore, was used as a foundation for the walls of the well, which was built from dressed kurkar stones. The well is in the kurkar precipice southeast edge of the tell.	$\delta^{13}C = -29.6\text{‰}$
RT-856. Maagan Michael	995 ± 120
Charcoal from mortar used in a dam near a water mill (NGR 1420-2170, M16). Collected 1987 by Y. Peleg, Israel Antiquities Authority.	$\delta^{13}C = -24.8\text{‰}$
<i>Comment</i> (Y.P.): The dam is a Byzantine construction (Peleg 1986).	
RT-857. Beit Hananya	1700 ± 85
Charcoal from mortar around ceramic pipes in an aqueduct near Cesarea (NGR 1430-2150, M17). Collected 1987 by Y. Peleg.	$\delta^{13}C = -23.5\text{‰}$
<i>Comment</i> (Y.P.): The structure was a Byzantine construction.	
Shiqmim series	
Charcoal from a Chalcolithic village near Beer Sheva (NGR1147-0675, M36). Collected 1987 and 1989 by T. E. Levy, Hebrew Union College, Jerusalem.	
RT-859B.	5460 ± 140
Eastern deep trench field Sample 14.	$\delta^{13}C = -24.0\text{‰}$
RT-859C.	5080 ± 180
L210/B0317 from Square K/11.	$\delta^{13}C = -24.0\text{‰}$
RT-859D.	5370 ± 180
L216/B0323 from a lower village.	$\delta^{13}C = -24.0\text{‰}$

RT-859E.	5390 ± 180
L211/B0329 from a lower village.	
RT-1317.	5330 ± 50
L3294/Z750, underground subroom (SR) I near a basalt bowl.	
RT-1318.	5240 ± 65
L3262/Z617, a tunnel fill leading into SRI, near surface.	
RT-1319.	5450 ± 60
L3313/Z874, cultural fill in underground room SR9, Subphase bII.	
RT-1321.	5570 ± 65
L3327/Z902, from the floor of underground room SR9, Subphase bII.	
RT-1322.	5190 ± 75
L3304/Z839, from a sterile layer in underground room SR8, Subphase aII.	
RT-1326.	5420 ± 50
L3312/Z833, from the floor of underground room SR7, Phase II.	
RT-1328.	5520 ± 60
L3281/Z695, from underground room SRII, Phase IIb.	
RT-1329.	4260 ± 80
L3290/Z728, from a hearth on the floor of SRIII.	$\delta^{13}C = -22.3\text{‰}$
RT-1330.	5300 ± 60
L3293/Z744, from a pit in underground room SR6/7, Subphase c, dII.	
RT-1332.	4700 ± 80
L3292/Z747, aeolian fill in underground room SR6, Subphase bII.	
RT-1334.	5590 ± 60
L3335/Z913, from fill in underground room SR10, Subphase CIII.	$\delta^{13}C = -23.9\text{‰}$
RT-1335.	5370 ± 65
L434/B7308, from between the walls of possible Altar 2.	
RT-1339.	4940 ± 70
L3055/Z201, from a Phase bII burial pit.	

RT-1341. **5370 ± 40**
 L3256/Z569, from Phase I(2) court. $\delta^{13}\text{C} = -24\text{‰}$

Gilat series

Charcoal from a Chalcolithic village 13 km northwest of Beer Sheva (NGR 1170-0830, M33).
 Collected 1987 by T. E. Levy, Hebrew Union College, Jerusalem.

RT-860A. **5440 ± 180**
 L128/B5180, from the base of a stone-lined silo in Stratum III. $\delta^{13}\text{C} = -24.3\text{‰}$

RT-860B. **4800 ± 135**
 $\delta^{13}\text{C} = -24.3\text{‰}$
 L92/B595, from a rubbish pit in Stratum II, with penetrated stand and a predynastic-style granite head.

Nahal Kana series

Charcoal samples from an active karstic burial cave at elevation 210 m asl in Samariya, 25 km northeast of Tel Aviv (NGR1550-1680, M19). The first two samples (A, B) and the last two samples (D, E) are Chalcolithic, and were associated with gold artifacts. The remaining sample (C) is from another room in the cave, with Pottery Neolithic (PN) remains. Collected by A. Gopher, University of Tel Aviv.

RT-861A. **5150 ± 190**
 L 104 B 1172B 1100, collected 1986.

RT-861B. **6010 ± 150**
 L 142 B 1549, collected 1987.

RT-861C. **5240 ± 180**
 $\delta^{13}\text{C} = -25.4\text{‰}$
 L 143, L 130 B 1534, B 1555, collected 1987.

RT-861D. **6980 ± 190**
 $\delta^{13}\text{C} = -26\text{‰}$
 L 409, collected 1987.

RT-861E. **5440 ± 100**
 $\delta^{13}\text{C} = -23.4\text{‰}$
 L 125, B 1245, collected 1987.

RT-862C. Beer Zfad (Bir Safadi) **5220 ± 105**
 Charcoal from L 160 in a system, L-144, of a subterranean room of Phase 3 on the bank of Wadi Beer-Sheva, Beer Sheva (NGR 1280-0700, M35). Collected 1982 during a salvage excavation by I. Eldar, Israel Antiquities Authority. The site was excavated previously by J. Perrot in the 1950s (Eldar & Baumgarten 1985).

Tel Shoqet series

Charred organic matter from a bell-shaped hole under the floor of a Chalcolithic house near Tel Shoqet junction, 15 km northeast of Beer Sheva (NGR 1407-0795, M34). Collected 1987 by Y. Guvrin, The Negev Museum, Beer Sheva.

RT-863A. **4620 ± 170**

L 17 B 86. $\delta^{13}C = -21.8\text{‰}$

RT-863B. **5490 ± 140**

L 17 B 96. $\delta^{13}C = -21.0\text{‰}$

RT-879. Ein Gedi **210 ± 120**

Wood branch (jujube) found in a wall of a water mill near Ein Gedi spring (NGR 1986-0971, M30). Collected 1987 by G. Hadas.

Nahal Metnan series

Nahal Metnan is an Early Arabic site in the Western Negev Highlands (NGR1034-0095, M32). Collected by M. Haiman, Israel Antiquities Authority; submitted 1987 (Haiman 1990).

RT-884. **1455 ± 95**

L103 B1022.

RT-934. **1515 ± 55**

$\delta^{13}C = -23.6\text{‰}$

Ein Ziq series

Charcoal from Ein Ziq, near Sede Boqer, 50 km south of Beer Sheva (NGR 1355-0225, M39). Collected 1987 by O. Bar-Yosef.

RT-885A. **3960 ± 90**

L 53 B282. $\delta^{13}C = -22.5\text{‰}$

RT-885B. **4760 ± 80**

L 79 B422.

RT-897. Nahal Oded **1290 ± 40**
 $\delta^{13}C = -21.8\text{‰}$

Charcoal from a Byzantine/Early Arabic site in the southern Negev (NGR 1217-9907, M41). Collected by S. Rosen, Ben Gurion University, Beer Sheva; submitted 1988 (Rosen & Avni 1989).

Kadesh Barnea series

Charred cereal seeds from an Iron-Age fortress in Kadesh Barnea, north Sinai (NGR0960-0050,

M40). Collected 1978 by R. Cohen, Israel Antiquities Authority.

RT-898.	2600 ± 45
Sample from Square D6, L523, B994.	$\delta^{13}C = -21.2\text{‰}$
RT-933.	3080 ± 45
Sample from the upper fortress.	$\delta^{13}C = -21.9\text{‰}$

Qumran series

Samples from Cave 24 in the Qumran site, Dead Sea shore (NGR1935, 1294, M27). Collected 1988 by Y. Garfinkel.

RT-907A.	9720 ± 100
Charcoal from a fire.	$\delta^{13}C = -11.6\text{‰}$
RT-907B.	9010 ± 150
Piece of wood.	$\delta^{13}C = -25.3\text{‰}$
RT-907C.	8540 ± 90
Charcoal from a fire.	$\delta^{13}C = -15.3\text{‰}$
RT-907D.	6450 ± 65
Charcoal from a fire.	
RT-907E.	1800 ± 95
Goat dung.	$\delta^{13}C = -21.4\text{‰}$

Comment (Y.G.): Archaeological finds in the cave range from Neolithic to Roman periods.

RT-924B. Hartuv	4645 ± 55
	$\delta^{13}C = -24.2\text{‰}$
Charcoal from L 162 from this EBI site, 20 km southwest of Jerusalem (NGR 1500-1300, M24). Submitted 1988 by O. Bar-Yosef.	

RT-925A. Tel Yarmut	4920 ± 90
	$\delta^{13}C = -24.2\text{‰}$
Charcoal from a sealed construction from this EBIII site, 20 km west of Jerusalem (NGR 1240-1470, M25). Submitted 1989 by O. Bar-Yosef.	

Eilat IV series

Samples are from Tomb IV in a field of tumuli in Eilat (NGR 1435-8855, M44). Collected July 1988 by U. Avner.

RT-926A.	6340 ± 60
Charcoal from Hearth 4 next to the tomb, from 20 cm below surface.	$\delta^{13}C = -23.6‰$
RT-926B.	5400 ± 100
Charcoal from Hearth 1 next to the tomb.	$\delta^{13}C = -23.6‰$
RT-989.	6470 ± 60
Charcoal from the base of the tomb, at 80 cm depth, B16.	
RT-1210.	5710 ± 75
Pieces of wood from 20 cm below surface next to the tomb.	$\delta^{13}C = -20.2‰$

Eilat V series

Samples are from Tomb V in a field of tumuli in Eilat (NGR 1435-8855, M44). Collected July 1988 by U. Avner.

RT-1211.	5640 ± 60
Charcoal from Hearth 16, 20 cm below surface.	$\delta^{13}C = -24.4‰$
RT-1212.	5930 ± 80
Charcoal from Hearth 18, 20 cm below surface.	$\delta^{13}C = -23.8‰$
RT-1213.	5490 ± 60
Charcoal from Hearth 19, 20 cm below surface.	$\delta^{13}C = -22.7‰$
RT-1214.	5980 ± 130
Charcoal from Hearth 22, 20 cm below surface.	
RT-1215.	6400 ± 210
Charcoal from Hearth 27, 15 cm below surface.	
RT-1216.	6060 ± 65
Charcoal from Hearth 28, 15 cm below surface.	

Beth Yerah series

Beth Yerah is an EB site on the western beach of the Sea of Galilee (NGR2040-2350, M9). Collected 1985 by O. Yogev, to define the transition from EBI to EBII at the site.

RT-927A.	4540 ± 90
Charcoal from stone Hearth L185 B794.	$\delta^{13}C = -22.9‰$

RT-927B.	4650 ± 80
Charcoal from brick tabun L604 B1378.	$\delta^{13}\text{C} = -24.1\text{‰}$
RT-927D.	4650 ± 115
Charcoal from the floor of room L 615 B1404.	$\delta^{13}\text{C} = -23.9\text{‰}$
RT-927E.	4510 ± 90
Charcoal from brick construction L644 B1538.	$\delta^{13}\text{C} = -23.2\text{‰}$

Gesher Bnot Ya'aqov series

This is a prehistoric site on the Jordan River (NGR 2090 2680, M1). Collected by N. Goren-Inbar, Institute of Archaeology, Hebrew University, Jerusalem (Goren-Inbar 1991).

RT-932.	38,500 ± 17
A piece of partly exposed wood (<i>Fraxinus syriaca</i>) from 10 cm below surface.	$\delta^{13}\text{C} = -27.7\text{‰}$
RT-961.	34,700 ± 90
A piece of wood (<i>Pistacia atlantica</i>) from a layer of Bnot Ya'aqov formation.	$\delta^{13}\text{C} = -25.2\text{‰}$

Ohalo II series

Charred wood and seeds from a prehistoric excavation on the southwestern shore of the Sea of Galilee (NGR2039-2362, M9). Collected 1989 by D. Nadel, Prehistoric Museum, Haifa.

RT-1244.	18,360 ± 230
Sample C89a.	$\delta^{13}\text{C} = -21.5\text{‰}$
RT-1246.	15,550 ± 13
Sample AB87.	$\delta^{13}\text{C} = -20.9\text{‰}$
RT-1248.	19,800 ± 360
Sample B89c.	
RT-1250.	19,250 ± 400
Sample B89b.	$\delta^{13}\text{C} = -24.4\text{‰}$
RT-1251.	19,000 ± 190
Sample B85b.	$\delta^{13}\text{C} = -22.2\text{‰}$
RT-1252.	18,900 ± 400
Sample B89b.	

RT-1297.	17,500 ± 200
Sample E866.	$\delta^{13}C = -22.7\text{‰}$
RT-1342.	18,600 ± 220
Sample B86d.	$\delta^{13}C = -19.5\text{‰}$
RT-1343.	19,500 ± 170
C85c.	

Comment (D.N.): Ohalo is an early Kebaran site.

Beth Shaan series

Excavations of the theater at Beth Shaan East (NGR 1973-2122, M15). Collected 1990 by D. Segal.

RT-1310.	1440 ± 60
Charcoal collected next to furnace Area L 3271.	$\delta^{13}C = -24.5\text{‰}$
RT-1311.	1470 ± 75
Charcoal collected from Furnace L 50618 B.	$\delta^{13}C = -24.6\text{‰}$
RT-1406.	310 ± 50
	$\delta^{13}C = -21.9\text{‰}$
Charcoal collected between Wall 1 and the underlying stylobate in Area G, B 64643.	

El-Wad series

Charcoal from a prehistoric early Natufian cave in Mount Carmel, 20 km south of Haifa (NGR 1480-2310, M12). Collected 1989 by M. Evron, University of Haifa.

RT-1367.	10,680 ± 190
Sampled from Square G38/b, Room III, depth 17 cm.	$\delta^{13}C = -11.0\text{‰}$
RT-1368.	12,950 ± 200
Sampled from Square E41/C+d, Room III, depth 46 cm.	$\delta^{13}C = -25.3\text{‰}$

Maresha series

Samples are from a Hellenistic site in Maresha (NGR1400-1110, M29), excavated by A. Kloner. Collected 1990 by D. Segal.

RT-1384.	2370 ± 45
Charcoal from the southern wall in the western section, Area 100.	$\delta^{13}C = -22.5\text{‰}$

- RT-1385.** **2280 ± 80**
Charcoal from the fill in an excavated rectangular basin, Area 30 L34. $\delta^{13}C = -22.7\text{‰}$
- RT-1386.** **2270 ± 90**
Charcoal from a shallow layer, 2 cm thick, in the central hall of System 75, L2035. $\delta^{13}C = -22.7\text{‰}$
- RT-1387.** **2100 ± 40**
Organic matter from an olive-oil press collecting system, from Area 44. $\delta^{13}C = -23.4\text{‰}$

Upper Galilee Prehistory series

Samples are from two PPNB sites in the Upper Galilee (NGR 1732-2731, M2), collected by A. Gopher.

- RT-1394. Nahal Bezet I** **8330 ± 100**
 $\delta^{13}C = -25.6\text{‰}$
Charcoal from the floor of circular construction #1, Square K-9, collected 1987.
- RT-1395. Nahal Bezet I** **7400 ± 65**
Charcoal from a hearth in Square K-7, collected 1987. $\delta^{13}C = -25.0\text{‰}$
- RT-1397. Horvat Galil** **9340 ± 70**
Charcoal from Square G-11d, collected 1989. $\delta^{13}C = -25.6\text{‰}$
- RT-1396. Horvat Galil** **8950 ± 100**
Charcoal from a posthole in construction #1, collected 1989.

- RT-1400. Tel Harasim** **2740 ± 70**
 $\delta^{13}C = -25.2\text{‰}$
Charcoal from Layer V, Area A-3 (NGR 1340-1280, M23). Collected 1990 by D. Inbar.

Nahal Mishmar series

Samples from the Chalcolithic treasure cave in Nahal Mishmar in the Judean Desert, west of the Dead Sea (NGR 1810-0880, M31). Collected 1961 P. Bar Adon and stored for 30 years before dating (Bar Adon 1980).

- RT-1407. Mat** **4990 ± 70**
 $\delta^{13}C = -9.2\text{‰}$
The style of this mat is similar to that in which the treasure was packed, from Cave I, Alcove A B-11/2.
- RT-1409.** **5355 ± 55**
Piece of wood, possibly from a loom. $\delta^{13}C = -26.0\text{‰}$

RT-1410.

2385 ± 55

Charcoal found in the cave.

RT-1415. Mamshit

1670 ± 45

 $\delta^{13}C = -22.8\%$

Piece of cypress from storage of wood planks excavated in Mamshit, in the Negev (NGR 1560-0480, M38). Submitted by N. Lifshitz, University of Tel Aviv.

RT-1416. Nahal Zimri

3490 ± 90

 $\delta^{13}C = -22.8\%$

Charcoal from a site in northern Jerusalem, near wadi Zimri, 683 m asl (NGR 1734-1365, M26). Collected by I. Meitlis, Israel Antiquities Authority, from a room in a public building in a MBII village, Layer 2 L364 B3492.

REFERENCES

- Avner, U. 1990 Ancient agricultural settlement and religion in the Uvda Valley in southern Israel. *Biblical Archaeologist* 53: 125–141.
- Bar Adon, P. 1980 The Cave of the Treasure, Jerusalem. *Israel Exploration Society* 180–195.
- Carmi, I. and Segal, D. 1990 ¹⁴C dates of samples from an underwater site in Kefar Samir, Mitekufat Haevan. *Journal of the Israel Prehistory Society* 23: 152.
- Eldar, I. and Baumgarten, Y. 1985 Neve Noy Chalcolithic site of the Beer-Sheva culture. *Biblical Archaeology* 48: 134–139.
- Garfinkel, Y. and Nadel, D. 1989 The Sultanian flint assemblage from Gesher and its implications for recognizing Early Neolithic entities in the Levant. *Paléorient* 15/2: 139–151.
- Garfinkel, Y., Carmi, I. and Vogel, J. C. 1987 Dating of horsebean and Lentil seeds from the Pre-Pottery Neolithic B village of Yiftah'el. *Israel Exploration Journal* 37: 40–42.
- Goren-Inbar, N. 1991 The Acheulian site of Gesher Benot Ya'akov – an Asian or an African Entity? In Akazawa, T., ed., *The Evolution and Dispersal of Modern Humans in Asia*. The University of Tokyo Symposium, 14–17 November 1990.
- Haiman, M. 1990 An agricultural settlement in Ramat Barnea in the seventh-eighth centuries CE. *Atiqot* 10: 111–124 (in Hebrew with an English summary).
- Linder, E. 1987 The maritime installation of Tharros (Sardinia). A recent discovery. *Rivista di Studi Fenici* XV: 47–55.
- Nissenbaum, A., Carmi, I. and Hadas, G. 1990 Dating of ancient anchors from the Dead Sea. *Naturwissenschaften* 77: 228–229.
- Peleg, J. 1986 Das Stauwerk fuer untere Wasserleitung nach Caesarea. *Mitteilungen des Leichtweiss Institut* 89.
- Raban, A. 1989 The harbours of Caesarea Maritime. Results of the Caesarea Maritime: Results of the Caesarea Ancient Harbour Excavation Project, 1980–1985, Vol. 1: The site and the excavations. *BAR International Series* 491: 518
- Raban, A. and Galanti, I. 1987 Tel Abu Hawam, 1985. *Israel Exploration Journal* 37: 179–181.
- Rosen, S. A. and Avni, G. 1989 Har Oded, 1988. *Israel Exploration Journal* 39: 117–120.
- Wachsman, S. 1990 The excavation of an ancient boat (Lake Kinneret). *Atiqot* 19: 1–138.