

Supporting Information

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SI Text

Archaeological and Geological Layers. The preservation of the macrobotanical remains of GBY is excellent throughout the stratigraphic sequence because of the waterlogged nature of the sediments. The studied sedimentological package, 34-m thick, was divided into archaeological layers, which include archaeological materials (stone artifacts and faunal remains with evidence of carcass exploitation) and geological layers, which are devoid of stone artifacts and mammal remains. From a sedimentological perspective, the geological layers are characterized by black muds, gray muds, coquinas, and rarely, paleosols. The sediments of the archaeological layers include gravels (with redeposited artifacts and mammal bones), coquinas, sands, and rarely, paleosols (12, 19, 53). In the study area (excavated between 1989 and 1997), the richest archaeological layers are bedded in mainly coquinas and more specifically, storm beach layers represented by layer II-6. In addition, archaeological layers are sometimes located at the contact between two different sedimentary units (53). The entire sedimentological package of GBY attests to a lake and lake margin environmental setting and is analogous to the recent Lake Hula, which was drained in the early 1950s (54). The cyclic pattern of the sediments (19, 53) indicates that the deposition of the two mud types (black and gray) took place when the water stand of paleo-Lake Hula was high, and therefore, hominin occupation could not have taken place at such times in the study area. Only when regressive phases of the lakes occurred, a phenomenon assigned to global climatic changes (12, 38), was the landscape

suitable for occupation (in close proximity to the water edge). Clearly, some of the lake margin zones were not occupied even when sedimentologically they could have hosted hominin groups. The oscillating paleo-Lake Hula provided a particular wet habitat niche that enabled the growth of edible water plants, both submerged and terrestrial (18, 55).

Extinct Species. The antiquity of the seed remains that we studied poses yet another difficulty, because they may include extinct species. For example, the regionally extinct water lily *Euryale ferox*, one of the plants found at GBY, grows today only in Southeast Asia, but its fossil remains have been discovered in Europe. Preliminary identification of its seeds was carried out after drawing of similar seeds from quaternary sediments in Russia (49). Identification of such findings requires us to use data sources of greater variety and from distant geographical areas.

The identification of waterlogged plant macrofossils is often complicated, because the outer layer of the coat usually softens in a humid environment and rots or separates from the seed. Thus, it was often necessary to remove the outer layer of the seed coat in the reference collection to enable comparisons.

Seasonality. In autumn, acorns, olives, raspberries, and the fruits of Christ's thorn jujube are abundant; the latter also ripen during May. In summer, fruits of fig (*Ficus carica*), Syrian pear (*Pyrus syriaca*), bear's plum (*Prunus ursina*), wild almond (*Amygdalus korschinskii*) in the rare nontoxic individuals, and wild grape vine (*Vitis sylvestris*) are available.

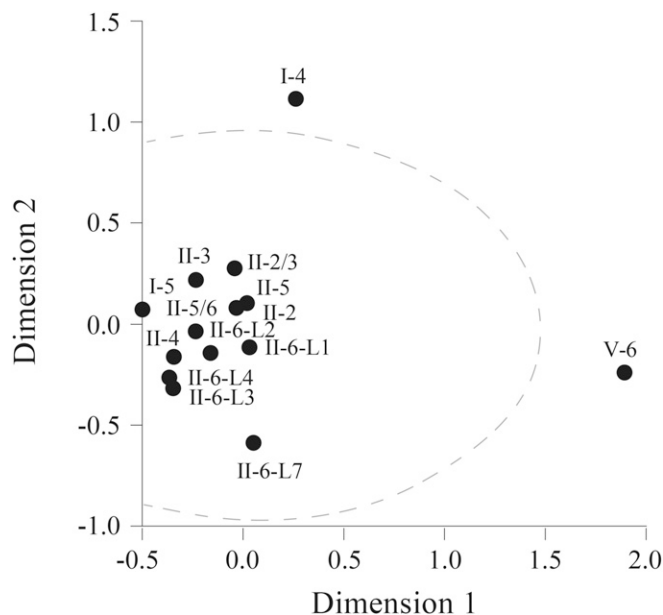


Fig. S1. MDS (PROXCAL) plot of 14 archaeological layers based on the Chebychev distance calculated from the proportion of 36 plant species remains. Dispersion accounted for (i.e., variance explained) = 0.99, and the stress (i.e., the degree of correspondence between the distances among points calculated by the MDS map and the input matrix) = 0.0098. The dashed line denotes the 95% confidence ellipse.

Table S1. Common edible plants of wet habitats of the Upper Jordan Valley

Species	Abundance (17)	Edible part	Processing	GBY
USOs				
<i>Alisma plantago-aquatica</i> (18)	Common	Rhizome	Raw (dried), roasted	G
<i>Alisma lanceolatum</i> (56)	Common	Rhizome	Raw (dried), roasted	S
<i>Arundo donax</i> (18)	Common	Rhizome	Cooked, baked, roasted	—
<i>Butomus umbellatus</i> (18)	Common	Rhizome	Cooked, roasted	S
<i>Calystegia sepium</i> (18)	Common	Rhizome	Cooked	—
<i>Cyperus rotundus</i> (18)	Common	Rhizome	Raw, roasted	G
<i>Lycopus europaeus</i> (18)	Common	Rhizome	Raw, cooked	S
<i>Lythrum salicaria</i> (18)	Common	Root	Raw	—
<i>Nuphar lutea</i> (18)	Very common	Rhizome	Cooked, baked	S
<i>Phragmites australis</i> (18)	Common	Rhizome	Raw, cooked, roasted	—
<i>Potamogeton pectinatus</i> (18)	Common	Rhizome	Raw	S
<i>Scirpus maritimus</i> (18, 57)	Common	Rhizome	Raw, cooked, roasted	G
<i>Typha domingensis</i> (18)	Common	Young rhizome	Cooked, roasted	G
Fruits				
<i>F. carica</i> (18)	Common	Fruit	Raw	S
<i>Rubus sanguineus</i> (18)	Common	Fruit	Raw, cooked	S
Seeds				
<i>Catabrosa aquatica</i> (18)	Common	Seed	Baked?	—
<i>Foeniculum vulgare</i> (18)	Common	Seed	Raw, cooked	S
<i>Melilotus albus</i> (18)	Common	Seed	Cooked	—
<i>Nuphar lutea</i> (18)	Very common	Seed	Raw, cooked, baked	S
<i>Plantago lanceolata</i> (18)	Common	Seed	Baked	—
<i>Sorghum halepense</i> (18)	Very common	Grain	Raw, cooked, baked	—
<i>Salix alba</i> (18)	Common	Inner bark	Raw	G
Vegetables				
<i>Adiantum capillus-veneris</i> (18)	Very common	Leaf	Raw	—
<i>Apium nodiflorum</i> (18)	Common	Leaf	Raw	—
<i>Calystegia sepium</i> (18)	Common	Shoot	Raw	—
<i>Ceratophyllum demersum</i> (18)	Common	Leaf	Raw?	S
<i>Echinochloa crus-galli</i> (18)	Very common	Young stem	Raw, cooked	—
<i>Foeniculum vulgare</i> (18)	Common	Young stem, leaf, fruit	Raw, cooked	S
<i>Helminthotheca echioides</i> (18)	Common	Young leaf	Raw	—
<i>Lemna minor</i> (18)	Common	Leaf	Raw	—
<i>Lepidium latifolium</i> (18)	Common	Young leaf	Raw, cooked	—
<i>Lythrum salicaria</i> (18)	Common	Young leafy shoots	Raw	—
<i>Melilotus albus</i> (18)	Common	Young stem, leaf, pod	Raw	—
<i>Mentha aquatica</i> (18)	Common	Leaf	Raw, cooked	—
<i>Mentha pulegium</i> (18)	Common	Leaf	Raw, cooked	—
<i>Nasturtium officinale</i> (18)	Common	Leaf	Raw, cooked	S
<i>Nuphar lutea</i> (18)	Very common	Leaf, petiole	Cooked	S
<i>Persicaria lapathifolia</i> (18)	Common	Young leaf	Raw, cooked	S
<i>Phragmites australis</i> (18)	Common	Young shoot	Cooked, roasted	—
<i>Plantago lanceolata</i> (18)	Common	Young leaf	Raw, cooked	—
<i>Potamogeton pectinatus</i> (18)	Common	Leaf, stem	Raw?	S
<i>Salix alba</i> (18)	Common	Leaf, young shoot	Raw, baked	G
<i>Scirpus holoschoenus</i> (58)	Common	Basal parts of stems	Raw	S
<i>Sparganium erectum</i> (59)	Common	Stem base	Raw, cooked	S
<i>Trifolium repens</i> (18)	Common	Young leaf	Raw	G
<i>Typha domingensis</i> (18)	Common	Shoot	Cooked, roasted	G
<i>Verbena officinalis</i> (18)	Common	Leaf	Cooked	S
<i>Veronica anagallis-aquatica</i> (18)	Common	Leaf	Raw, cooked	—

The table presents 48 edible vegetal organs that originated from 37 species that currently inhabit wet ecosystems in the Upper Jordan Valley. The list includes wet habitat species that are common in the Upper Jordan Valley today. Fifteen of these species are common to the present day Upper Jordan Valley and GBY. Seven other species have either related species or members of the same genus that were identified in the GBY assemblages. The common food types in the wet habitat are green vegetables (26 items) followed by USOs (13), seeds (7), and fruits (2). Of these vegetal items, 32 (67%) can reportedly be consumed raw (23 green vegetables, 8 USOs, 2 fruits, and 4 seeds), whereas the other 12 items (4 green vegetables, 6 USOs, and 2 seeds) are consumed after processing by fire (roasting or cooking). G, the same genus was identified at GBY; S, the same species is present at GBY.

Table S3. List of non-edible plant taxa found at GBY

Dry Habitat	Wet Habitat
<i>Adonis</i> sp.	<i>Aldrovanda vesiculosa</i>
<i>Ajuga</i> cf. <i>chamaepites</i>	<i>Ceratophyllum</i> cf. <i>submersum</i>
cf. <i>Anagallis</i>	<i>Cladium mariscus</i>
<i>Amaranthus</i> sp.	<i>Cyperus</i> cf. <i>articulatus</i>
<i>Anthemis</i> sect. <i>Maruta</i>	<i>Glinus lotoides</i>
<i>Anthemis</i> cf. <i>pseudocotula</i>	<i>Heliotropium supinum</i>
<i>Bifora testiculata</i>	<i>Hypericum</i> cf. <i>hircinum</i>
<i>Bupleurum lancifolium</i>	<i>Najas foveolata</i>
<i>Chrozophora</i> sp.	<i>Najas minor</i>
cf. <i>Crepis</i>	<i>Potamogeton acutifolius/trichoides</i>
<i>Erodium gruinum</i>	<i>Potamogeton coloratus/polygonifolius</i>
<i>Euphorbia aulacosperma</i>	<i>Ranunculus sceleratus</i>
<i>Euphorbia chamaesyce/maculata</i>	<i>Ranunculus</i> subgen. <i>Batrachium</i>
<i>Euphorbia helioscopia</i>	<i>Stratiotes intermedius</i>
<i>Euphorbia valerianifolia</i> type	<i>Verbena officinalis</i>
<i>Fumaria</i> sp.	<i>Verbena supina</i>
<i>Heliotropium</i> cf. <i>europaeum</i>	<i>Vitex</i> sp.
<i>Hymenocarpus circinnatus</i>	<i>Zannichellia palustris</i>
<i>Hypericum</i> cf. <i>triquetrfolium</i>	
<i>Mercurialis annua</i>	
<i>Ochthodium aegyptiacum</i>	
<i>Picris</i> cf. <i>altissima</i>	
<i>Ranunculus arvensis</i>	
<i>Ranunculus</i> cf. <i>marginatus</i>	
<i>Ricinus communis</i>	
<i>Solanum villosum</i>	
<i>Stipa bromoides</i>	
<i>Styrax officinalis</i>	
<i>Thymelaea passerina</i>	
<i>Valerianella</i> cf. <i>muricata</i>	

Table S4. Edible species found at GBY and their present frequency in the Hula Valley: edible organs, total amount found at the site by frequency of appearance, seasonality, and edible parts

Species	Edible organ	Remnant in GBY	Finds in GBY (n organs/n layers)	Presence in the Hula Valley	Main season of exploitation
Nuts					
<i>E. ferox</i>	Seed* (21)	Seed	641/21	Ex	End of summer (21)
<i>Pistacia atlantica</i>	Nutlet* (18)	Nutlet	1/1	HF	Autumn (18)
<i>Quercus calliprinoslithaburensis</i>	Nut* (60)	Acorn, cupule	88/17	F	Autumn–winter (18)
<i>Trapa natans</i>	Nut* (18)	Nut (calyx)	872/38	F	Autumn (18)
Species producing USOs					
<i>Alisma lanceolatum</i>	Rhizome [†] (18)	Seed	120/16	F	Summer (18)
<i>Butomus umbellatus</i>	Rhizome [†] (60)	Seed	43/12	F	Summer (18)
<i>Damasonium alisma</i>	Rhizome (18)	Seed	16/8	LF	Summer (18)
<i>Lycopus europaeus</i>	Rhizome* (18)	Mericarp	776/22	F	Summer (18)
<i>Myriophyllum spicatum</i>	Rhizome* (18)	Nutlet	130/14	LF	Summer (18)
<i>Nuphar lutea</i>	Rhizome [†] (18)	Seed	880/22	F	Throughout the year [‡]
<i>Nymphaea alba</i>	Rhizome [†] (18)	Seed	192/13	F	Throughout the year [‡]
<i>Potamogeton crispus</i>	Rhizome (18)	Nutlet	20/3	—	Summer (18)
<i>Potamogeton pectinatus</i>	Rhizome (18)	Nutlet	5/4	—	Summer (18)
<i>Sagittaria sagittifolia</i>	Rhizome [†] (18)	Seed	116/19	Ex	Summer–autumn (18)
<i>Scirpus lacustris</i>	Rhizome* (18)	Nutlet	2243/18	F	Summer (18)
<i>Silybum marianum</i>	Root* (18)	Achene	42/13	HF	Winter–spring (18)
<i>Sparganium erectum</i>	Rhizome [†] (59)	Nutlet	3/2	F	Summer [‡]
<i>Typha cf domingensis</i>	Rhizome (60)	Nutlet	75/14	F	Throughout the year (18)
Fruits					
<i>Capparis cf spinosa</i>	Young fruit (60)	Seed	49/16	HF	Spring–summer (58)
<i>F. carica</i>	Fruit (18)	Seed	79/12	F	End of summer (61)
<i>Olea europaea</i>	Fruit (18)	Stone	388/14	F	Autumn (60)
<i>Rubus cf sanguineus</i>	Fruit (60)	Nutlet	313/25	F	Summer–autumn (18)
<i>Sambucus sp.</i>	Fruit (18)	Seed	2/1	—	End of summer–autumn (58)
<i>V. sylvestris</i>	Fruit (18)	Pip	395/41	LF	End of summer–autumn (18)
<i>Ziziphus spina-christi</i>	Fruit (60)	Stone	10/8	HF	Autumn/spring (62)
Seeds					
<i>Aegilops cf geniculata</i>	Grain* (18)	Grain	2/2	F	Spring–beginning of summer (18)
<i>Avena sp.</i>	Grain* (18)	Grain	2/2	HF	Spring–beginning of summer (18)
<i>Carthamus sp.</i>	Seed [†]	Achene	7/5	F	Summer [‡]
<i>Chenopodium sp.</i>	Seed [†] (60)	Seed	69/13	F	Summer (18)
<i>Hordeum spontaneum</i>	Grain* (18)	Grain	1/1	F	Spring–summer (18)
<i>Malva sp.</i>	Seed* (60)	Mericarp	3/2	F	Winter–spring (18)
<i>Nuphar lutea</i>	Seed* (18)	Seed	880/22	F	Summer (18)
<i>Onobrychis sp.</i>	Seed [†] (60)	Pod	21/11	F	Spring–summer [‡]
<i>Silybum marianum</i>	Seed [†] (60)	Achene	42/13	HF	Spring–beginning of summer (18)
Species producing organs eaten as vegetables					
<i>Alcea sp.</i>	Stem, bud (60)	Seed	21/12	F	Spring (18)
<i>Allium cf neapolitanum</i>	Bulb* (18)	Seed	1/1	F	Winter–spring (18)
<i>Beta vulgaris</i>	Leaf* (60)	Nutlet	29/9	F	Winter–spring (18)
<i>Ceratophyllum demersum</i>	Leaf (18)	Nutlet	318/30	F	Spring–summer (18)
<i>Chenopodium sp.</i>	Leaf* (18)	Seed	69/13	F	Spring–summer (18)
<i>Chrysanthemum coronarium</i>	Stem, inflorescence bud* (60)	Achene	2/2	F	Spring (18)
<i>Foeniculum vulgare</i>	Leaf, stem (60)	Achene	50/13	HF	Spring–summer (18)
<i>Hippuris vulgaris</i>	Leaf* (18)	Nutlet	40/4	Ex	Summer–autumn (51, 63)
<i>Lomelosia cf prolifera</i>	Stem, head (60)	Calyx	190/34	F	Spring (18)
<i>Malva sp.</i>	Leaf,* stem [†] (60)	Mericarp	3/2	F	Winter–spring (18)
<i>Medicago coronata</i>	Leaf, stem (18)	Pod	6/4	F	Winter–spring (18)
<i>Medicago sp. a</i>	Leaf, stem (18)	Pod	45/12	F	Winter–spring (18)
<i>Medicago sp. b</i>	Leaf, stem (18)	Pod	18/6	F	Winter–spring (18)
<i>Medicago sp. c</i>	Leaf, stem (18)	Pod	9/4	F	Winter–spring (18)
<i>Medicago sp. d</i>	Leaf, stem (18)	Pod	2/2	F	Winter–spring (18)
<i>Medicago sp.</i>	Leaf, stem (18)	Pod	79/23	F	Winter–spring (18)
<i>Montia minor</i>	Leaf, stem (58)	Seed	5/5	Ex	Spring (58)
<i>Najas delilei</i>	Leaf, stem (18)	Nutlet	454/10	LF	Spring–summer (18)
<i>Nasturtium/Roripa</i>	Leaf, stem (60)	Seed	1/1	F/LF	Spring–autumn (18)

Table S4. Cont.

Species	Edible organ	Remnant in GBY	Finds in GBY (n organs/n layers)	Presence in the Hula Valley	Main season of exploitation
<i>Nymphaea alba</i>	Fruit (58)	Seed	192/13	F	Summer (58)
<i>Nymphoides peltata</i>	Leaf, stem (18)	Seed	72/17	Ex	Summer (18)
<i>Persicaria lapathifolia</i>	Leaf (18)	Nutlet	47/5	F	Spring–summer (18)
<i>Potamogeton crispus</i>	Leaf [†] (18)	Nutlet	20/3	—	Summer (18)
<i>Potamogeton distinctus</i>	Leaf (18),	Nutlet	116/16	Ex	Summer (18)
<i>Potamogeton pectinatus</i>	Leaf, stem (18)	Nutlet	5/4	—	Summer (18)
<i>Raphanus cf raphanistrum</i>	Young leaf stem and inflorescence (58, 64)	Silique	55/15	LF	Winter–spring (18)
<i>Scirpus holoschoenus</i>	Basal parts of stems (58)	Nutlet	27/11	F	Spring (58)
<i>Scirpus lacustris</i>	Young shoot,* base of stem* (65)	Nutlet	2,243/18	F	Spring–summer (18)
<i>Silybum marianum</i>	Leaf,* young stem* (18)	Achene	42/13	HF	Winter–spring (18)
<i>Sinapis arvensis</i>	Leaf, stem (18)	Seed	2/1	F	Spring (18)
<i>Sparganium erectum</i>	Stem ^{††} (58)	Nutlet	3/2	F	Winter–summer [‡]
<i>Typha cf domingensis</i>	Shoot* (18)	Nutlet	75/14	F	Throughout the year [‡]
<i>V. sylvestris</i>	Leaf [†] (18)	Pip	395/41	LF	Spring–summer (18)

Ex, extinct in the Hula Valley; F, frequent; HF, high frequency; LF, low frequency (after 17).

*Better when cooked.

[†]Must be cooked.

[‡]Lev-Yadun S, Melamed Y authors' field experience.

Table S5. Frequency of edible organ types and seasonality in the archaeological layers arranged from youngest to oldest (left to right, respectively)

Type of plant food	V-4	V-5	V-6	I-4	I-5	II-2	II-2/3	II-3	II-4	II-5	II-5/6	II-6 L1	II-6 L2	II-6 L3	II-6 L4	II-6 L4b	II-6 L5	II-6 L7	IV-24/25	Total
Autumn	—	2	9	5	3	6	3	3	5	7	4	5	4	5	4	1	—	9	1	11
Winter	2	1	11	2	2	4	3	2	4	8	3	11	4	6	4	3	—	9	—	17
Spring	3	2	20	7	5	9	7	8	8	14	6	19	7	9	7	5	—	18	2	32
Summer (+ end of summer)	1	4	27	9	2	11	5	6	6	12	4	9	4	5	4	3	1	23	2	32
Fruit	—	1	2	4	2	5	3	2	4	6	3	4	2	3	2	1	—	4	1	6
Nut	—	—	3	2	1	3	2	3	3	3	3	3	3	3	3	—	1	2	—	3
Seed	1	1	4	3	—	1	1	2	1	3	—	3	2	1	2	1	—	2	—	5
USO	1	1	12	1	—	3	1	1	1	2	—	2	1	1	1	1	—	9	—	13
Vegetable	1	1	17	4	4	5	4	6	5	10	4	13	4	7	4	3	—	16	2	26
No. of taxa	1	2	29	12	6	14	8	11	11	20	10	21	9	12	9	3	1	25	2	43
No. of plant foods	3	4	38	14	7	17	11	14	14	24	11	25	12	15	12	6	1	33	3	53

Dataset S1. GBY edible species and types of organ remains arranged by stratigraphic order from youngest (left) to oldest (right)

Dataset S1

A, archaeological horizon; G, geological layer.