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Subsistence and Settlement in a Marginal Environment: Tell es-Sweyhat, 1989–1995 Preliminary Report

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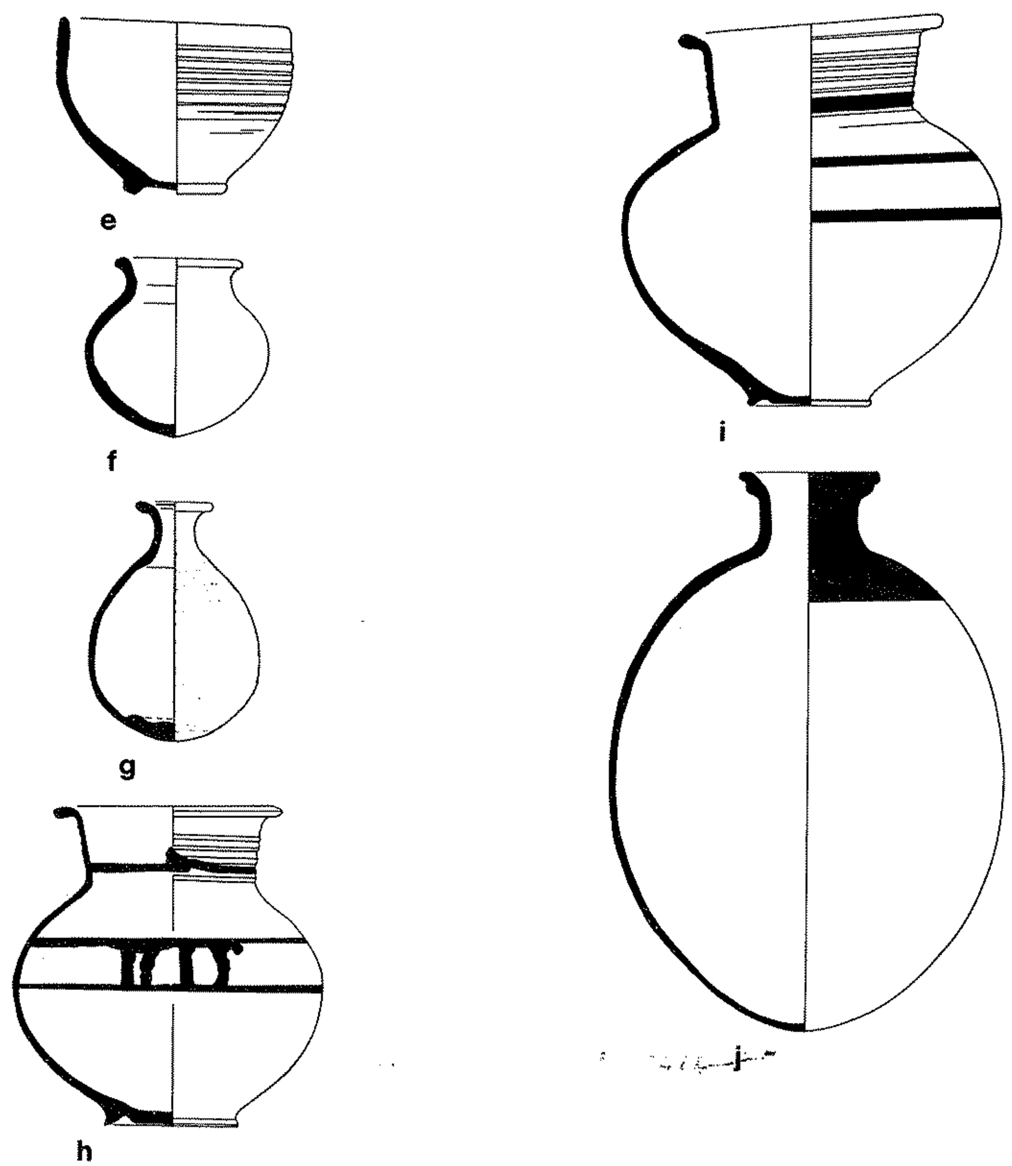

Fig. 5.7. Phase C pottery from Tell Hajji Ibrahim. e–j: metallic and band-painted wares.

6

SWEYHAT AND HAJJI IBRAHIM: SOME ARCHAEOBOTANICAL SAMPLES FROM THE 1991 AND 1993 SEASONS

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Tell-es Sweyhat is situated on a terrace at the southern edge of the rainfall agriculture zone.[28] University of Pennsylvania Museum excavations carried out in 1991 and 1993 included areas placed on the main mound (Operations 1 and 2) and in the outer town (Operations 4, 9, 12). A small (0.25 ha) mound identified as Site 3 (Wilkinson 1993) was also tested. Informally known as Hajji Ibrahim, it lies 0.9 km from the center of Sweyhat.

Excavators were asked to take flotation samples of about 8–10 liters from features (e.g., hearths, ovens, pits), clearly ashy or charcoal-rich deposits, and a selection of "control" samples from deposits within which the features were found. Flotation was carried out with a manual system based on the one described by Minnis and Leblanc (1976). The mesh size in which the heavy fraction was caught was about 1 mm; thus, tiny seeds may be underrepresented.

In the laboratory, samples were chosen for analysis according to several criteria: the director's priorities, sample richness, and the desire to obtain at least some representation for the different excavation areas and deposit types. For this report, 38 flotation samples extracted from about 289 liters of soil from Tell es-Sweyhat were selected for identification and analysis, along with 2 samples (from 20 liters of soil) from Hajji Ibrahim (Apps. 6.1, 6.9). A number of unexamined samples are stored in the MASCA Ethnobotanical Laboratory.

As reported below, the charred assemblage from Sweyhat reflects an agropastoral economy which produced barley and relied heavily on uncultivated steppe for grazing.

Archaeobotanical Research at Sweyhat and Nearby Contemporary Sites

A team from the Ashmolean Museum at Oxford, led by T. Holland, excavated at Sweyhat from 1973 to 1975. Plant remains from a burnt building in a presumed administrative quarter of the upper town were recovered. Virtually pure crop remains from storage contexts were analyzed by W. van Zeist and J.A.H. Bakker-Heeres (1985[1988]: 308–310). There were concentrations of two-row barley (*Hordeum vulgare* var. *distichum*) and grasspea (*Lathyrus sativus*), mixed with small quantities of a few other types. Also present was a jar of wild caper buds (*Capparis spinosa*).

In 1989, R.L. Zettler expanded excavations on the acropolis (Operations 1 and 2) and put in a series of trenches at different places in the outer town (Operations 3 and 4). Due to the shallowness of the deposits in the outer town, preservation was poor, and the density of both seed and charcoal remains was low. Unlike the seeds from the 1973–1975 excavations, these charred remains did not come from burned structures. Nevertheless, the goal of providing a comparison with the upper town was reached. Christine Hide, who analyzed the 1989 assemblage, concluded that the outer town charred material was, indeed, from settlement debris, and that many of the seeds came from dung fuel (Hide 1990). The recently analyzed material from the outer town is virtually indistinguishable from that examined by Hide, and her cultural interpretation stands.

The upper town samples of this report (Operation 1) probably come from the kitchen and storage areas of an as yet unexcavated central administrative area (Chapter 9). The outer town has at least one large residence (Operation 4). Operation 9 in the outer town is difficult to characterize, but it does have parts of at least three structures and includes non-industrial work areas (see Chapter 3). The upper town samples are generally much richer in charred material, but this is probably due to post-depositional processes; the Operation 1 material from later seasons was more deeply buried, and therefore less subject to disturbance. As no additional burnt buildings were examined, the pit and hearth contents and

Table 6.1. Crop and food taxa from Syrian sites near the Euphrates*

	Sweyhat	Selenkahiye	Hadidi (MB)	Jouweif (MB)	Hajji Ibrahim
Hordeum vulgare var. *distichum*	x	x	x	(x)	x
Triticum aestivum/ durum	x	x	x	x	.
Triticum dicoccum	x	x	.	.	.
Triticum monococcum	x	x	.	.	.
Cicer	.	x	x	.	.
Lathyrus	x	x	x	x	x
Lens	x	x	x	.	x
Pisum	x	x	x	.	.
Vicia ervilia	x	x	.	.	.
Carthamus tinctorius	.	x	.	.	x
Pistacia	.	x	.	.	.
Capparis	x	x	.	.	.
Ficus	x	x	.	.	.
Olea	x	x	.	.	.
Vitis	x	x	.	.	.

* Few samples were analyzed from Hadidi, Jouweif, and Hajji Ibrahim, which accounts for the comparatively low number of types at those sites. See van Zeist and Bakker-Heeres 1985[1988] for Sweyhat, Selenkahiye, and Hadidi; see Miller n.d. for Jouweif.

other charred materials from the current excavations also probably came from dung fuel.

Material from several other roughly contemporary sites is available for comparison (Table 6.1). Selenkahiye is contemporary with Sweyhat, and Hadidi, with its Middle Bronze Age deposits, is a little later (van Zeist and Bakker-Heeres 1985[1988]). Many of the samples from these sites have very high proportions and amounts of cultigens which appear to come from storage contexts. Some are nearly pure, cleaned crop samples. The archaeological context of the assemblages from these sites and deposits are therefore not comparable to those of Zettler's excavations at Sweyhat, with the exception of a few samples. These latter are described as coming from "cultural fill," and have a fair number of weed seeds and rachis bits.

Samples consisting of trashy debris from Jouweif, a Middle Bronze Age hamlet located right on the Euphrates, are similar in aspect to those of the current Sweyhat study (Miller n.d.), with only minimal differences in their respective plant assemblages. The range of wild and domesticated plants is similar, and as at Sweyhat, charcoal comes from species of the floodplain forest and steppe, and from transported wood.

The Taxa (Appendices 6.2–6.5, 6.7)

Preservation of plant macroremains at Sweyhat was primarily through charring. Of the cultigens, two-row barley (*Hordeum vulgare* var. *distichum*) predominates. However, wild and weedy seeds considerably outnumber cereals by estimated count (App. 6.2), with small-seeded legumes (Fabaceae) and grasses (Poaceae) making a big contribution to the assemblage.

Cultigens

Cereals. Cereals commonly occur in identifiable but fragmentary form, and most researchers list whole grain equivalents in their data tables. For that reason, Appendices 6.3–6.5 give counts of cereals based on the number of whole grains and an estimated number based on fragments greater than 1 mm. These rough approximations are based on the weight of barley grains in SW 2372 (about 0.72 g per 100 grains). Although there are too few wheat grains to obtain an accurate average weight, it would be about the same or a little lower than the barley. Bits of straw were also seen, but only culm nodes were counted.

Barley (*Hordeum vulgare*). In absolute quantity and frequency, barley is the most important cultigen at Sweyhat. Van Zeist and Bakker-Heeres report only two-row barley (*H. vulgare* var. *distichum*) from the site. Two-row barley is more drought resistant than the six-row type (*H. vulgare* var. *hexastichum*), and is more likely to have been grown successfully. Note, however, that in two-row barley the grains are all straight, but in six-row barley, each spikelet also has two lateral florets which develop twisted grains. A large number of the grains in the present samples appear to be slightly twisted, and there are a few obviously twisted grains. Some of the deformation could be a result of charring; therefore, even though six-row barley may have been grown, I am unwilling to assign these grains to the six-row type.

Contextually, the Sweyhat samples are most similar to "cultural fill" material mentioned by van Zeist and Bakker-Heeres (1985[1988]). The barley measurements (App. 6.6a,b) are within the range that they observed at Selenkahiye, where samples from "cultural fill" were similar to those from cleaned grain deposits. The "cultural fill" material therefore should not be construed as the tail-grain from crop-processing debris (van Zeist and Bakker-Heeres 1985[1988]: 275).

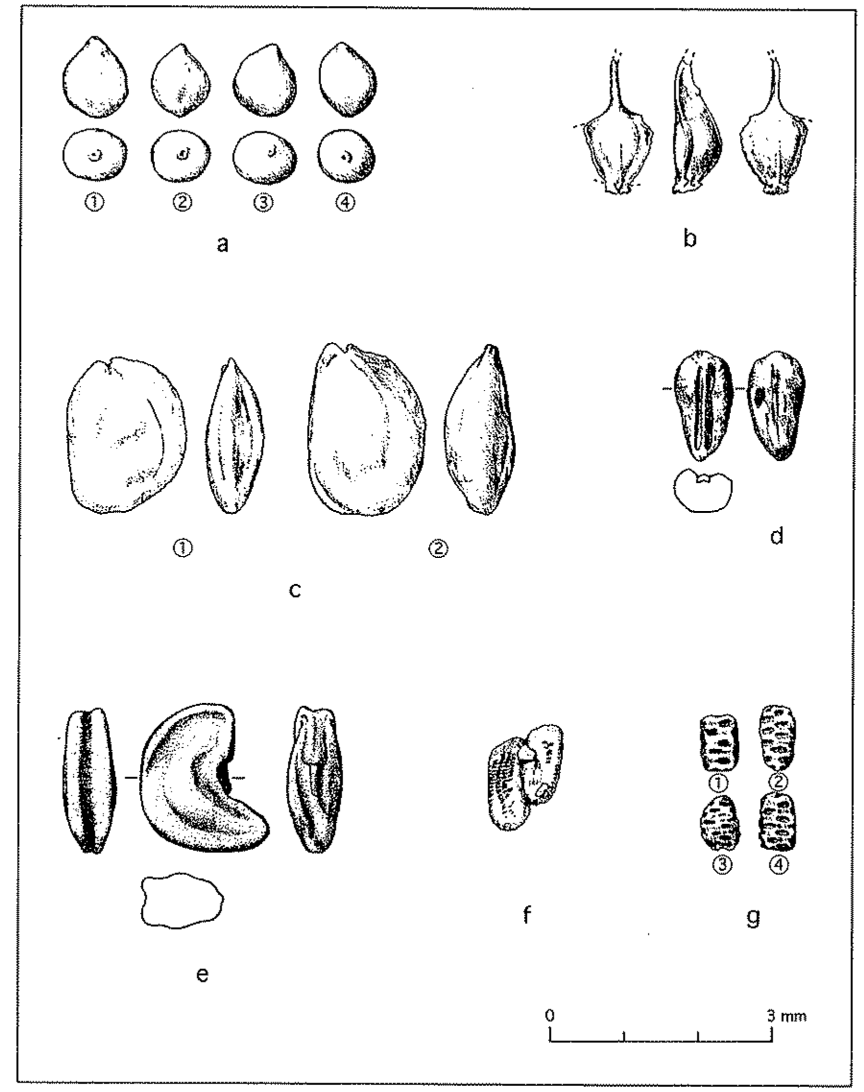

Fig. 6.1 a. *Helianthemum* (SW 2351)
b. *Ceratocephalus* (SW 93.1688)
c. cf. *Alyssum* (SW 93.1688)
d. *Crucianella* (SW 2351)
e. SW.Malvaceae-1 (SW.93.1688)
f. *Hypericum* (SW 93.0904)
g. *Verbascum* (SW 93.1688)

Wheat: bread or hard wheat (*Triticum aestivum* or *T. durum*), emmer (*T. dicoccum*), and einkorn (*T. monococcum*). The wheats represent only a small proportion of the identified cereals, whether as grain or rachis fragments. As the wheats tend to have a higher water requirement than barley, and this area is so marginal for rainfall agriculture, it is likely that the occurrence of wheat in the Sweyhat samples is from incidental field contamination. At most, wheat would have been a minor crop.

Pulses. Pulses occur in low quantities and frequency, and are found in the same trashy deposits as the other seeds. They include grasspea (*Lathyrus*), lentil (*Lens culinaris*), and pea (cf. *Pisum;* App. 6.6c). A concentration of grasspea occurs at Sweyhat in a burnt building, and there are similar large deposits of grasspea and lentil at Middle Bronze Age Hadidi (van Zeist and Bakker-Heeres 1985[1988]: 302). This demonstrates that at least at those sites, grasspea and lentil were crops in their own right. Their low quantity in the present samples from Sweyhat and those from other sites of the north Syrian Euphrates may just mean that the seeds did not become incorporated in dung fuel because they were not used for fodder.

Fruit. Fig (*Ficus carica*). A single fig seed was found in these samples. Fig is not unexpected, however, as it has a small but consistent presence at nearby Selenkahiye.

Grape (*Vitis vinifera*). Grape remains consist of one seed fragment and one peduncle (flower stalk). A few grape seeds also occur at Selenkahiye.

Wild and Weedy Plants

As most of the plants represented are unfamiliar to non-botanists, Appendix 6.2 lists the plants alphabetically by family as they appear on the seed list, with what I hope are helpful comments. The discussion below is therefore limited to matters not easily condensed into the table. Uncommon, nondescript, or poorly preserved types are just listed without further comment.

The present work adds considerably to the list of wild and weedy plants documented at Sweyhat, because the samples analyzed by van Zeist and Bakker-Heeres consisted of nearly pure crop remains and those done by Christine Hide had few seeds of any sort, which limited the variety of seed types recovered. Several types not previously attested at north Syrian Euphrates sites are also seen: *Alhagi*, *Hypericum*, and *Ceratocephalus*.

Asteraceae. In addition to several identified members of the daisy family (cf. *Artemisia*, *Centaurea*), SW.Asteraceae-3 is represented by its achene (seed; Fig. 6.2a) and capitulum (flower head; Fig. 6.2b) (SW 1565). A flower head without seeds was encountered in sample SW 93.0748.

Boraginaceae. I treat the uncharred boraginaceous nutlets (seeds) separately because their circumstances of preservation differ from the other seeds. Some are almost definitely modern, others may well be ancient. Fortunately, there are not that many of them, so conclusions based on overall seed counts still stand. (Problems might occur in trying to interpret individual deposits, however.) It is interesting that the proportion of uncharred boraginaceous seeds is substantially lower in the upper town samples of Operation 1 than in the outer town samples. If the uncharred seeds are ancient, it would mean that these heavily silicified seeds are sturdier than charred ones, and so survive in disproportionately high numbers in the shallower deposits of the outer town. If modern, it would just mean that they are more prevalent in upper soil levels. In the spring of 1995 I saw parts of the outer town covered with a boraginaceous plant that may be *Arnebia,* which might explain the high density of borages in outer town samples.

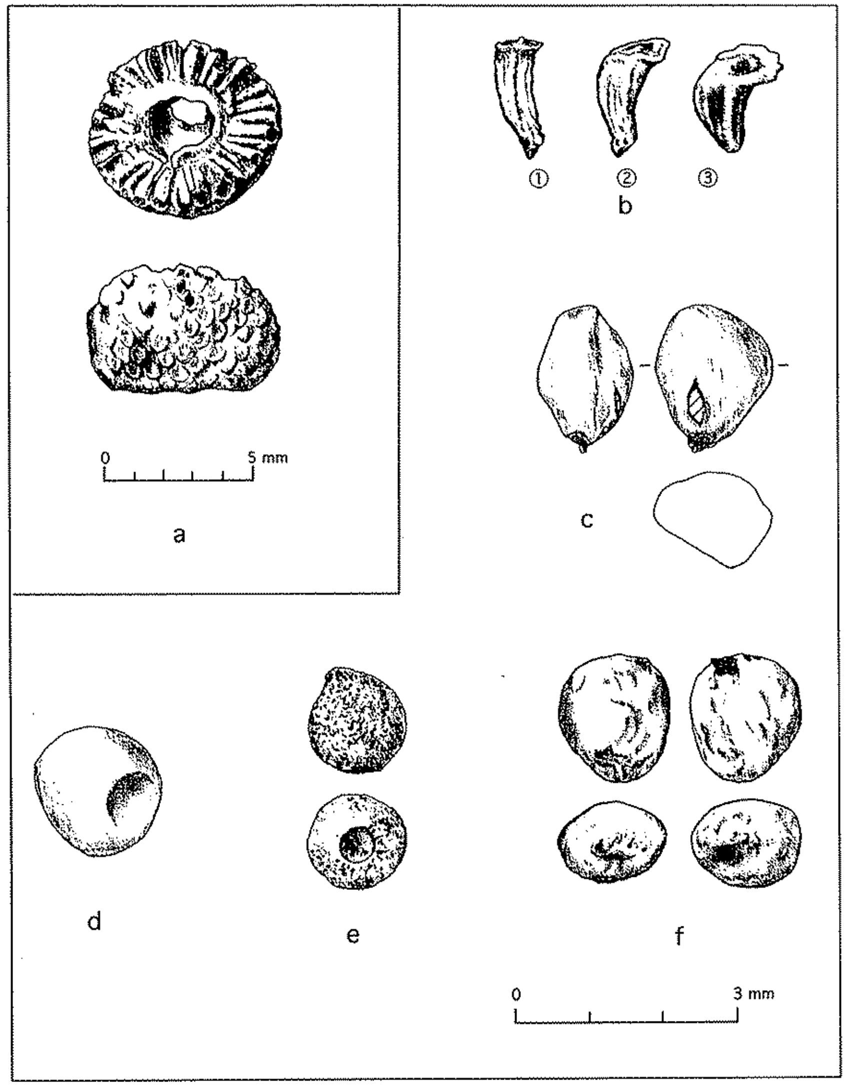

Fig. 6.2 a. SW.Asteraceae-3, capitulum (SW 1565)
b. SW.Asteraceae-3 (SW 1565)
c. SW.unknown-10 (SW 93.0748)
d. SW.Liliaceae-3 (SW 93.0904)
e. SW.Liliaceae-4 (SW 2351)
f. SW.Liliaceae-5 (SW 93.0748)

Fabaceae. Small-seeded legumes comprise the vast majority of seed remains from Sweyhat. Although their bulk is relatively low,[29] their ecological significance is great. Some could be field weeds (*Trifolium/ Melilotus*), others are almost definitely from the steppe (*Trigonella*). In addition to seeds, some cf. *Onobrychis* and cf. *Alhagi* pod fragments were seen in SW 93.0748.

Hypericaceae. Hypericum species yield essential oils and "are considered more or less medicinal" (Townsend and Guest 1980:364). They are poisonous to livestock if eaten in large quantities. Figure 6.1f illustrates two *Hypericum* seeds that have fused with charring.

Liliaceae. Several members of the lily family are tentatively distinguished, but remain unidentified (Fig. 6.2d–f). Note that SW.Liliaceae-5 may just be SW.Liliaceae-3 with the seed coat adhering.

Linaceae. Two flax-like seeds (cf. *Linum*) are only about 1 mm long, and are likely to be wild.

Poaceae. The variety of grass caryopses (seeds) is high, but compared to the legumes, they are not that important a component of the assemblage. Though some are undoubtedly steppe plants, others are likely to be agricultural weeds.

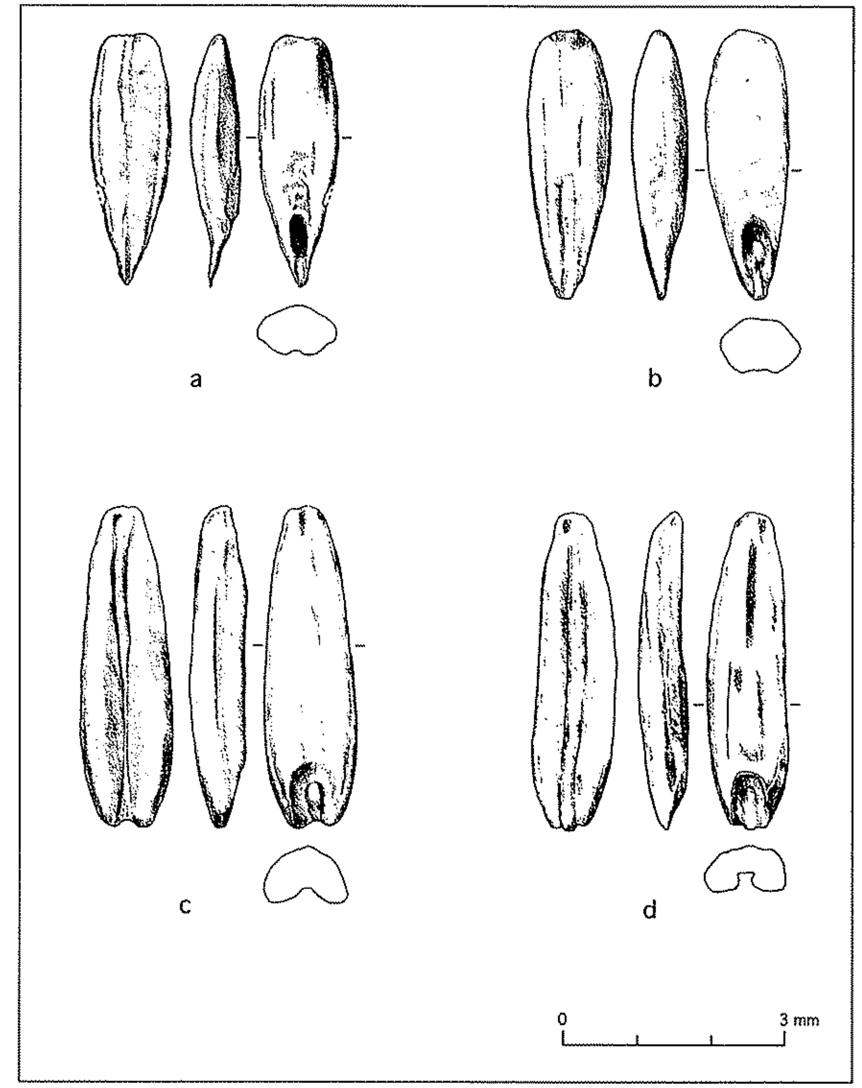

Fig. 6.3 a, b. SW.*Hordeum*-1 (SW 93.1688)
c, d. cf. *Taeniatherum* (SW 93.1688)

The most numerous grass is *Eremopyrum*. Many species grow in dry steppe or subdesert conditions, but some may also grow as field weeds (Townsend and Guest 1968:228ff.).

SW.*Hordeum*-1 is a small-seeded wild barley (Fig. 6.3a,b) that compares well with several in the comparative collection housed at MASCA (*Hordeum murinum*, *H. geniculatum*, *H. glaucum*).

Taeniatherum has been tentatively identified by comparison with fresh specimens. The seeds are relatively long (mean length 4.2 mm [3.3–4.9], L:B 4.2 [3.7–5.0]; N=11); the ventral furrow is relatively wide and deep (Fig. 6.3c,d). *Taeniatherum* is an annual grass which provides good spring forage (Townsend and Guest 1968:264ff.).

Trachynia distachya (Fig. 6.4a) refers to a type that resembles "Gramineae type C" as illustrated and described in van Zeist and Bakker-Heeres (1985[1988]: fig. 7.1, 7.2, 7.3). With regard to this type, van Zeist writes, "I arrived at the conclusion that it should be *Trachynia distachya* (L.) Link (*Brachypodium distachyon* [L.] P. Beauv.). The Selenkahiye specimens, and those of other sites I examined since then, match modern (carbonized) caryopses of this grass" (letter dated June 2, 1994).

One unnamed grass, SW.Poaceae-15 (Fig. 6.7d,e), is similar to such small-seeded types as *Phleum* and *Eragrostis*. Another, SW.Poaceae-19 (Fig. 6.6e,f), looks like "Gramineae type B" from Selenkahiye (van Zeist and Bakker-Heeres 1985[1988]: fig. 7.4, 7.5, 7.6). The grasses SW.Poaceae-2, -10, -11, -12, -17, -18, -20, and -21 are also illustrated (Figs. 6.4b–d; 6.5a–d; 6.6a–d, g; 6.7c).

In addition to grass caryopses, there are a number of *Aegilops* glume fragments.

Ranunculaceae. Ceratocephalus (Fig. 6.1b) is not commonly reported from archaeological sites, though I have seen it in samples from Umm el-Marra, Syria, and Gordion, Turkey. It is native to the steppe region of southwest Asia, and grows in a variety of disturbed and undisturbed habitats.

Several other named and unnamed types are illustrated: cf. *Alyssum* (Fig. 6.1c), *Helianthemum* (Fig. 6.1a), SW.Malvaceae-1, (Fig. 6.1e), *Crucianella* (Fig. 6.1d), cf. *Verbascum* (Fig. 6.1g), SW.unknown-10 (Fig. 6.2c); plant parts SW.unknown-7 (Fig. 6.7a) and SW.unknown-12 (Fig. 6.7b).

Wood Charcoal of Trees and Shrubs

Previous work on the Sweyhat wood charcoal remains (Hide 1990) documented the presence (in order of importance) of poplar and/or willow (*Populus/Salix*), a chenopodiaceous shrub (Chenopodiaceae), and one piece each of tamarisk (*Tamarix*), ash (*Fraxinus*), and tentatively identified oak (*Quercus*).

Most of the fragments in the flotation samples are very small. I was able to identify a few more pieces, but no new types were found. The presence of oak is confirmed, and the riparian forest trees willow/poplar and tamarisk are the most important constituents of the assemblage (App. 6.7a,b). The fact that I tried to identify only fragments with at least one complete growth ring (or, in the case of the chenopodiaceous shrub, fragments big enough to handle comfortably—i.e., larger than 5 mm on a side) might tend to underrepresent shrubs.

The presence of woodland taxa (oak at Sweyhat, and oak, cedar, pine, hornbeam, and blackthorn-type at Selenkahiye and Hadidi) might be accounted for by the transport of timber and firewood downstream (van Zeist and Bakker-Heeres 1985 [1988]). It is probably no accident that Sweyhat, lying some distance from the river, yields evidence of a shrub of the steppe; trees were probably more scarce there.

Discussion and Interpretation

Agriculture

The new samples are fully consistent with the broad outlines of agricultural practice described by van Zeist and Bakker-Heeres (1985 [1988]).

1. The staple crop was barley. There is a possibility, however, that in addition to the two-row type, six-row barley was also grown.
2. Wheat was at best a minor crop, and possibly not even that.
3. Some pulses were grown as crops, though the newly reported Sweyhat samples do not provide significant additional evidence.
4. There is no particular archaeobotanical evidence for irrigation. In fact, the barley from both Selenkahiye and Sweyhat tends to be a little smaller on average than that from the better-watered northern Euphrates sites of Tepecik and Korucutepe (van Zeist and Bakker-Heeres 1985[1988]: 284), supporting this conclusion.

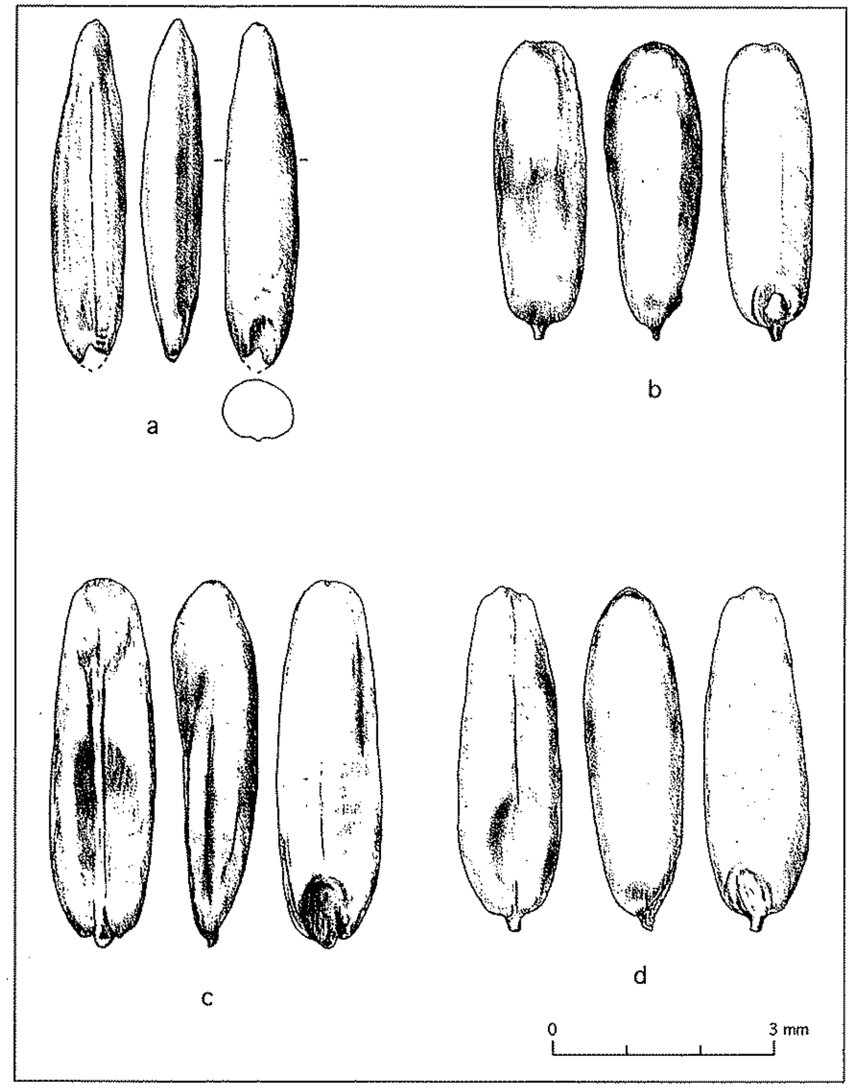

Fig. 6.4 a. *Trachynia distachya* (SW 2351)
b, c, d. SW.Poaceae-10 (SW 93.1688)

Vegetation Reconstructions Based on Analysis of Fuel Remains

A common approach to explaining archaeobotanical assemblages involves the use of ethnographic models. One model considers crop-processing a major source of charred plant remains (Hillman 1981, 1984). Another, specifically developed to explain charred assemblages in the Near East, suggests that (1) plant materials arriving in a settlement are used and deposited in a variety of ways (e.g., cess and trash deposits), (2) burning of fuel routinely occurs in the controlled setting of hearths, ovens, and fireplaces, (3) trash is less likely to be burned within the confines of the settlement, (4) charred remains scattered in the trash deposits that are most analogous to archaeological "cultural fill" are likely to be remnants of fuel, (5) many seeds persist in burnt dung. Therefore, in the absence of good archaeological

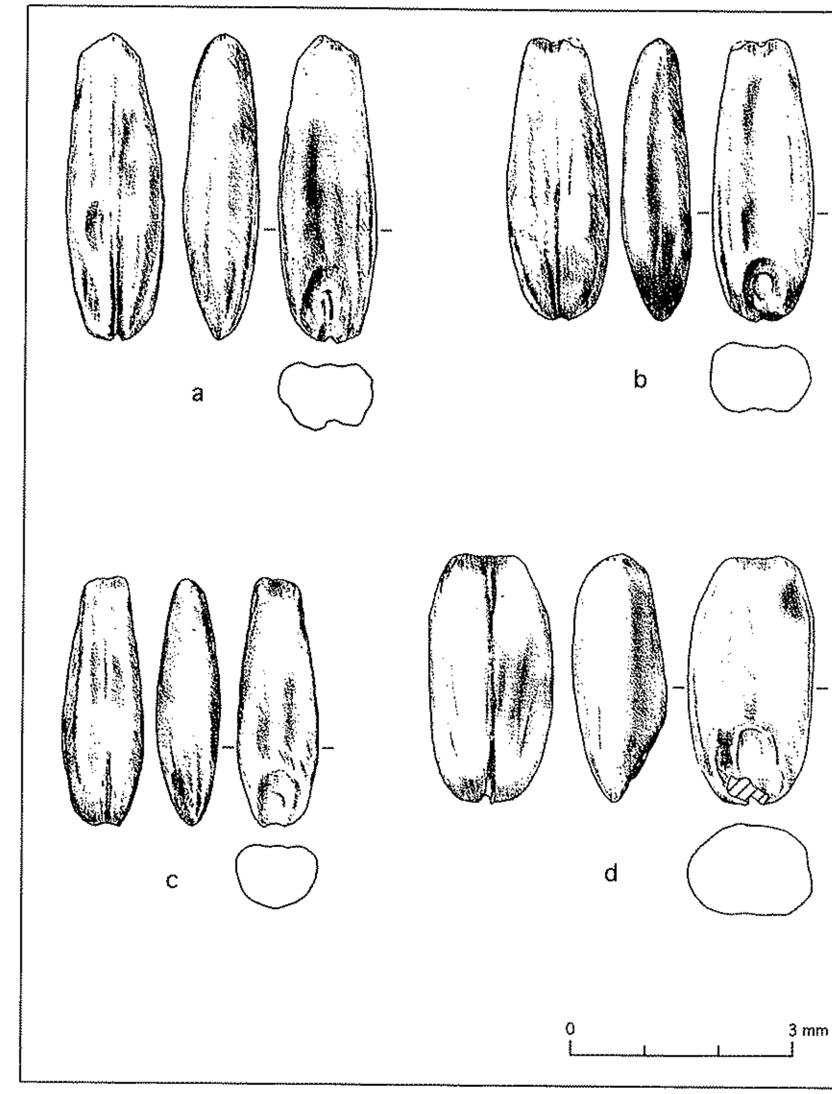

Fig. 6.5 a, b, c. SW.Poaceae-11 (SW 2351)
d. SW.Poaceae-18 (SW 2372)

contextual evidence to the contrary, charred seeds from "cultural fill" on Near Eastern sites are likely to have come from dung burning (Miller 1984a, b). Some seeds, from spiny (*Alhagi*) or unpalatable (*Peganum* and *Hypericum*) plants, may not fit this hypothesis, though even in these cases the dried forms may be eaten by animals[30]; also, dung cakes could include some stray grains from the straw used as temper during their manufacture.

For purposes of this discussion, I consider the cereals and the wild and weedy types as a group to have originated in dung fuel (Miller 1984a, b), and wood charcoal to be the incompletely burned remnants of wood fuel. Seed-to-charcoal (S:C) ratios therefore suggest the relative availability of woody vegetation; that is, high S:C ratios are associated with dung-burning, and low ones with wood-burning. The S:C ratio based on the weight in grams of material larger than 2 mm is primarily a comparison between cultigens and wood fuel, because cereals comprise most of the seed material greater than 2 mm. It would be interesting to compare such ratios in flotation samples from Sweyhat and the nearby river sites, but the only data available are from six samples from Jouweif. At Jouweif the value of S:C is 0.19, whereas in the Sweyhat Operation 1 samples it is 0.70 (excluding outlier sample SW 1301), what we would expect if wood fuel was scarcer at Sweyhat. The ratios exhibit a strongly overlapping distribution at the two sites, which suggests that even if the differences between them are real, they are minimal. The average ratio of the count of wild and weedy type seeds to the weight of wood charcoal is well under 200 at Jouweif and over 700 at Sweyhat (even excluding outlier SW 2351). With almost no overlap, these figures might reflect differences between the two sites in the sources of fodder (see section below on pastoralism and intensive farming).

Comparison with Turkish sites along the Euphrates is instructive. It is clear that as one goes north into the moister parts of the Euphrates valley, woodlands become more prominent and wood becomes an ever more popular fuel source (see Chapter 7, this volume).

A Few Unusual Deposits

Reference has been made to a few samples that are "outliers" for various characteristics. Unfortunately, it is difficult to explain these unusual samples.

Jar 3 was set in a floor of the Phase 2 occupation, its rim sheared off. The sample from the top (SW 93.0904) was ashy, but with a low density of macroscopic charred material. The bottom (93.0748) had an unusually large number of *Aegilops* glume fragments and *Eremopyrum* seeds, which might just represent hearth sweepings rather than the original contents.

SW 2351 is a trashy deposit from an abandoned room; it has a very high proportion of wild seeds relative to cereal, thanks to phenomenal numbers of small legumes, especially *Trigonella*. There is some precedent for this at sites on the steppes of southwest Asia, most notably the early agricultural site of Ali Kosh, in Iran (Helbaek 1969). At Gordion, the single most numerous type is *Trigonella*. There is good reason to believe that the seeds come from animal dung (see Miller 1996a).

Data Comparison with Selenkahiye

Van Zeist and Bakker-Heeres (1985[1988]: 286–288) compared the percentages of Mureybit and Selenkahiye's wild and weedy seed types to show how assemblage differences between those two river sites reflected vegetation changes associated with the onset of agriculture. I calculated similar figures for Sweyhat, using the 12 samples from Operation 1 that had more than 100 wild or weedy seeds.[31]

As Sweyhat is located farther from the river, the differences between it and contemporary Selenkahiye should reflect a heavier reliance on steppe resources. Indeed, the primary constituent by count of the Sweyhat seed samples is probable steppe legumes (more than 50% of the average sample), especially *Trigonella* sp., *T. astroites*, and *Astragalus*. *T. astroites*, for example, is a plant of open steppe or degraded steppe (Townsend and Guest 1974, vol. 3:102). At Selenkahiye, seeds of these plants constitute less than 10% of the average sample. Forage was not limited to steppe plants, since several of the seed types van Zeist identifies with relatively little ambiguity as stemming from agriculture are also present at Sweyhat (i.e., *Aegilops*, *Eremopyrum* and other grasses, *Trifolium/Melilotus*).

Pastoralism and Intensive Farming

A survey of botanical remains from sites located along the Euphrates (Kurban Höyük, Hacınebi, and Sweyhat) suggests that, all things being equal, wheat and barley cultivation follows rainfall. In particular, as rainfall declines, the prevalence of barley increases. Furthermore, if most of the seeds come from dung fuel, the wild seed to cultivated cereal ratio is an indicator of what the herds and flocks ate (Chapter 7, this volume).

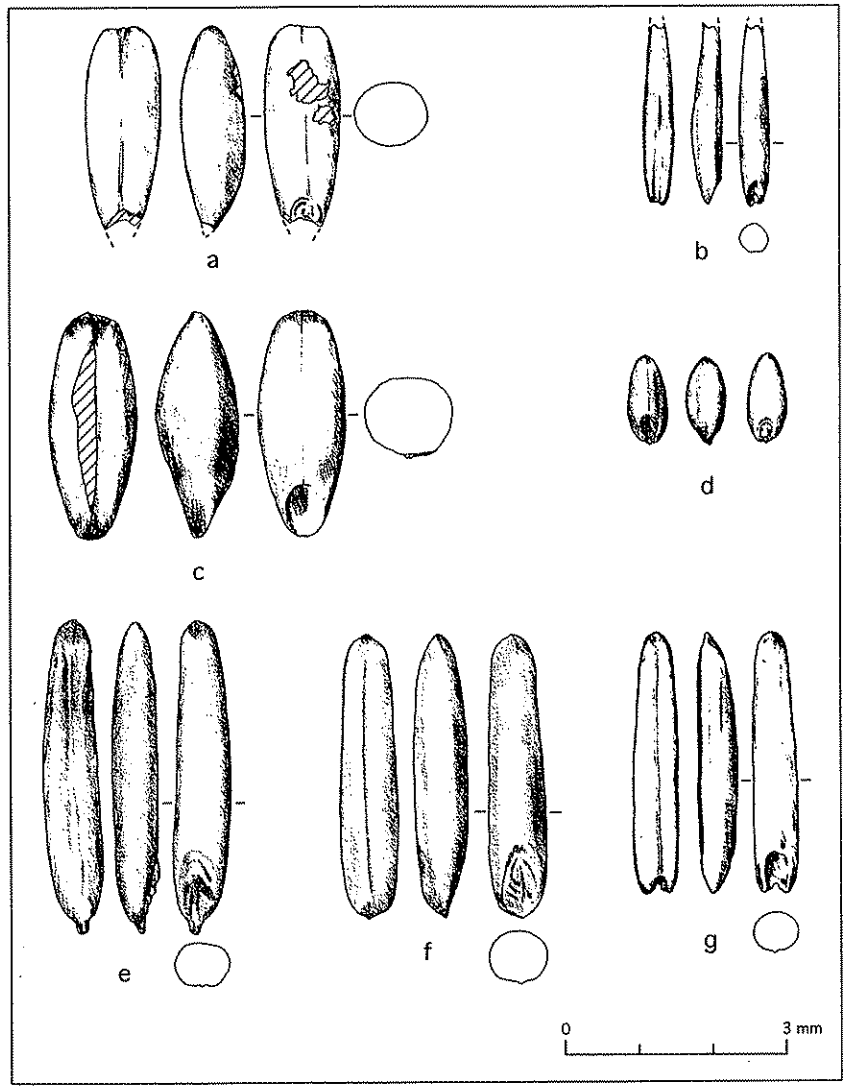

Fig. 6.6 a, c. SW.Poaceae-2 (SW 2026, SW 93.0748)
b. SW.Poaceae-12 (SW 2351)
d. SW.Poaceae-17 (SW 2351)
e, f. SW.Poaceae-19 (SW 2351)
g. SW.Poaceae-20 (SW 2026)

Quantifying seed remains is problematic. In many samples, the category of wild and weedy seeds barely tips the scales, so seed counts are most appropriate. On the other hand, weight is a more accurate measure of *quantity* of the extant cereal remains, due to the high number of identifiable fragments. I have calculated the ratio of wild and weedy seeds as one of number to weight; Appendix 6.8 lists cereals by weight.

Given the relatively high value of this ratio at Sweyhat compared to those of the upstream sites that are out of the steppe zone, it would seem that the animals were eating non-cultivated food. In particular, the small-

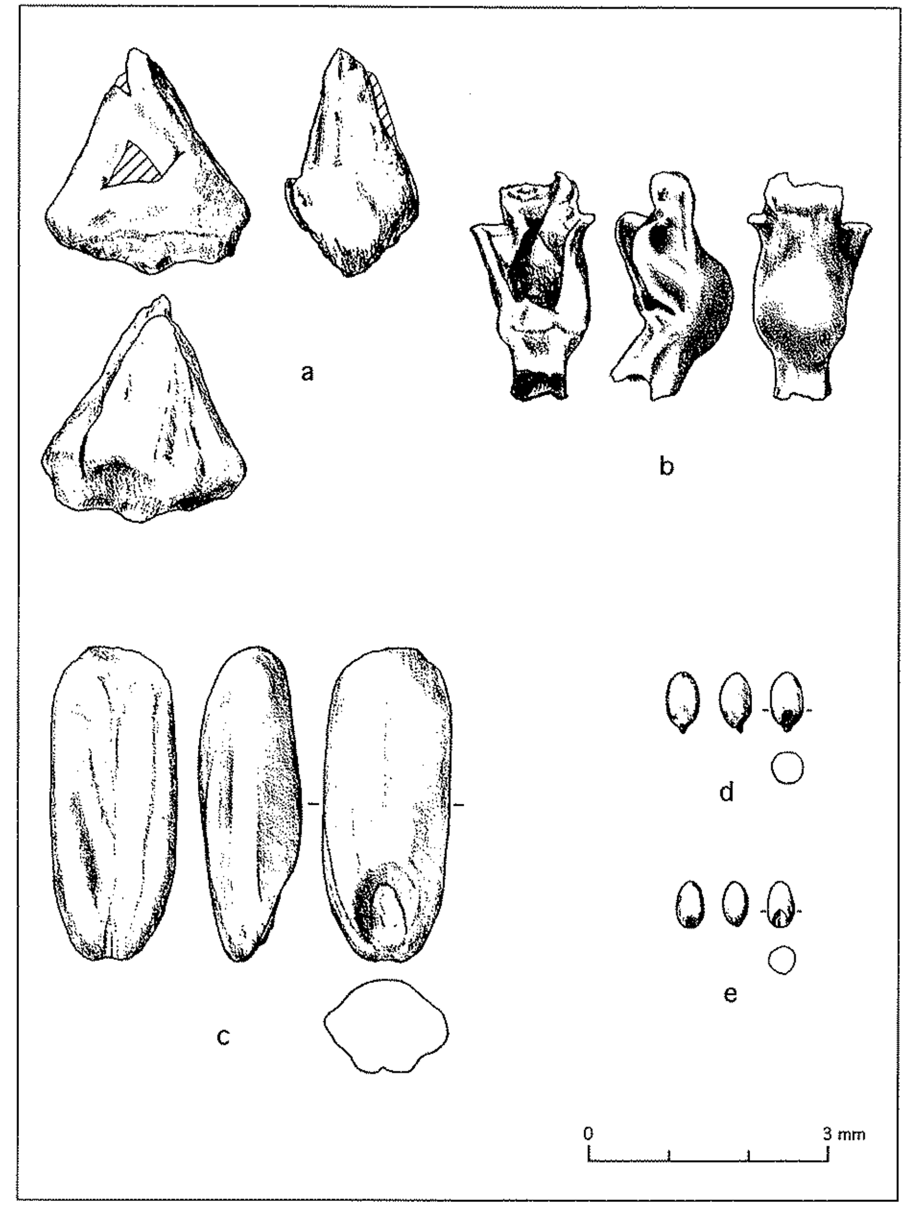

Fig. 6.7 a. SW.unknown-7 (SW 1316)
b. SW.unknown-12 (SW 2026)
c. SW.Poaceae-21 (SW 93.0748)
d, e. SW.Poaceae-15 (SW 93.1688)

seeded legumes appearing in high quantities are most probably steppe plants.

Wilkinson (1982) found evidence for a ring of intensive manuring around Sweyhat dating to the florescence of the urban center. The archaeobotanical evidence from the same period strongly suggests the economy had a major pastoral component. These two results need not be contradictory. One can easily imagine a situation in which the land most suitable for agriculture (perhaps the narrow floodplain east of the Euphrates, along with the band of cultivated land around the settlement) was devoted to crops that would be used to feed people living in the city. Flocks could then be sent to graze out on the steppe, where they would cause no damage to the crops. Such specialization of agricultural labor at the end of the third millennium B.C. is well-attested at Ebla (Archi 1984, 1990a).

Hajji Ibrahim (Site 3)

Two samples were examined from this small early third millennium site: oven contents (SW 93.1680), and the material outside the oven (SW 93.1688). Both samples had substantial quantities of charred material (App. 6.5). If anything, the area outside the oven had a higher density of charred remains than the oven itself. In sample SW 93.1688, the ratio of wild and weedy seed to cereal (count/ weight in grams) is similar to that of the Sweyhat samples, but there is almost no wood charcoal. Unlike samples I have seen from Sweyhat itself, there is a very large quantity of straw fragments.[32] The remarkable amount of straw remains might suggest the seed remains are from field weeds rather than steppe plants. Note further that the major identified grass represented is *Eremopyrum*, which, as mentioned above, is likely to be a field weed. Grasses are an extremely important part of the assemblage of wild and weedy plants (85% of charred seeds), more so than in any other sample reported among agricultural sites of the Syrian Euphrates.[33] Also in contrast to the Sweyhat remains, the small-seeded legume content of the area outside the oven is quite low. I do not have a definitive explanation for these peculiarities, but possibilities to consider include:

1. The remains represent crop-processing debris rather than dung fuel
2. The remains represent straw fuel rather than dung fuel
3. There is some microhabitat near Hajji Ibrahim (either

cultivated or not) that favored grasses over legumes

3a. The microhabitat is cultivated land, which was the source of most animal fodder; the grasses are field weeds rather than steppe plants, indicating animals were not sent out to the steppe to graze

4. In the early third millennium, grasses were more common on the steppe than later
5. There is a seasonal difference (unlikely; the grasses and legumes tend to ripen at about the same time)
6. Chance preservation or small sample size
7. Some combination of the above

Possibilities (1) and (2) are both consistent with Hajji Ibrahim being a grain storage site (see Chapter 5). Crop-processing debris could account for SW 93.1688, given the remarkable lack of wood charcoal. As Hillman suggests (1981), a pure deposit of the sieved by-products of crop-processing should be of fairly uniform size, depending on the mesh used. In this sample, the charred remains consist of a variety of sizes (i.e., 1.70 g of the seed material, primarily barley, and 0.35 g of the straw are greater than 2 mm), although most of the charred remains fall through a 2 mm mesh (2.68 g of seed and 2.79 g of straw between 1 mm and 2 mm). Nevertheless, the sample makes a visual impression of uniform size, so an interpretation of crop-processing debris sieved through a slightly larger than 2 mm mesh cannot be excluded. The archaeological context is also consistent with this interpretation: M. Danti reports that the oven appears to be in a large, open space.

Alternatively, the high density of straw could point to a straw-fueled fire. This is not far-fetched. For example, to make bread, women at Malyan, Iran, fueled fires with straw, dried sesame stalks, or other herbaceous material, though all other fires were made with dung, wood, or kerosene (Miller 1982:90–91; see also Sweet 1974:133). If Hajji Ibrahim was a grain depot and processing station, the most readily available fuel would have been from primary crop-processing debris, i.e., straw.

Consider, too, the implications of option (3a). Hajji Ibrahim lies well within the late third/second millennium intensive manuring zone reported by Wilkinson (1982) at Sweyhat. At that time, the specialized pastoral economy involved pasturing animals off site, on the steppe. The earlier Sweyhat settlement, the one contemporary with Hajji Ibrahim, was small and its territory was not heavily manured. Perhaps the Hajji Ibrahim evidence shows a situation, as seen in late fourth millennium Kurban Höyük, of a less specialized agricultural economy, where domestic subsistence production required smaller numbers of animals, and devoted agricultural land to (human) food production (see Chapter 7). Alternatively, the agricultural emphasis of the Hajji Ibrahim assemblage may reflect the site's proposed role as a grain depot for pastoralists (see Chapter 5). That is, it represents a seasonally and functionally restricted range of activities. Clearly, more work at Hajji Ibrahim holds great promise for resolving this problem.

Acknowledgments

Thanks are due to Clare Jones and Nancy Mahoney, who sorted some of the Sweyhat samples, and to Tony Wilkinson for permission to discuss the Jouweif material.

Notes

28. Tell-es Sweyhat is a large (35 ha) late third/early second millennium B.C. site about 3 km from the Euphrates River in northwestern Syria.

29. The over 10,000 *Trigonella* seeds in SW 2351 fit easily into a 5 ml vial.

30. When I pointed to some *Alhagi* and *Peganum* growing near my flotation tank, a retired farmer (Ekrem Bekler) from Yassihöyük, Turkey, assured me that the animals would eat those plants if they were dried.

31. Following van Zeist and Bakker-Heeres, I include the Boraginaceae in calculating the percentages. The results are similar even if SW 2351 (the one with over 10,000 *Trigonella*) is omitted.

32. At Sweyhat, the average ratio of "miscellaneous" (primarily straw and rachis fragments) charred material to wood charcoal is 0.11 (ranging from 0 to 0.91); in sample SW 93.1688 from Hajji Ibrahim it is 1.35.

33. Figures for samples relatively rich in grasses include two Roman samples at Hadidi (under 30%), and some barley samples from Šelenkahiye (up to 60%).

AUTHOR'S NOTE

As this publication went to press, the author realized that the seed type designated "*Verbascum*" or "cf. *Verbascum*" is more likely to be *Scrophularia*. Available seed illustrations did not show a clear distinction between the two genera. Direct comparison with modern seeds, however, showed that *Scrophularia* has clear and deep indentations, whereas the surface of *Verbascum* is more undulating.—*N.F.M.*

APPENDIX 6.1

CATALOG OF SAMPLES ANALYZED

SW #	Op.	Loc.	Lot	Prov. type	Phase	Millennium*	Notes
Sweyhat							
615	1	1	9	ash layer	6	L3/E2	
626	1	3	1	mixed ashy layer	6	L3/E2	
627	1	3	1	mixed ashy layer	6	L3/E2	
1001	1	5	3	mixed	6	L3/E2	
1049	1	1	26	ash layer	6	L3/E2	
1301	1	1	26	ash layer	6	L3/E2	
1316	1	1	30	fireplace?	6	L3/E2	
1560	1	9	2	trash	5	L3	
1565	1	9	2	trash	5	L3	
2026	1	13	2	room	4	L3	"kitchen building"
2157	1	15	1	ashy	5	L3	assoc. w/ loc. 9
2260	1	16	8	room	4	L3	"kitchen building"
2261	1	16	9	room	4	L3	"kitchen building"
2351	1	9	14	trash	5	L3	
2372	1	15	6	trash	4	L3	
93.0478	1	15	22	pit (ash-filled)	4	L3	"kitchen building"
93.0748	1	27	3	Jar 3	2	M3?	
93.0904	1	27	2	ash (bottom Jar 3)	2	M3?	
93.1608	1	30	16	charcoal	1	E3	willow/poplar
786	4	3	4	room		L3	
1147	4	14	6	room		L3	above floor
1148	4	14	6	room		L3	above floor
1624	4	18	4	oven		L3	cut into loc. 18.03
1625	4	18	4	oven		L3	cut into loc. 18.03
1629	4	18	4	oven		L3	cut into loc. 18.03
1639	4	18	3	lime plaster floor		L3	
1645	4	23	2	oven		L3	precedes loc. 18
1847	4	31	3	bread oven		L3	outside area
2460	4	22	5	vessel contents		L3	sw corner of room
2515	4	7	1	vessel contents		L3	
2537	4	21	3	hearth		L3	assoc w/ SW 2538
2538	4	21	3	control sample		L3	assoc w/ SW 2537
2541	4	36	2	pit		L3	below floor, loc. 6
2542	4	36	2	control sample		L3	assoc w/ SW 2541, 2547
2547	4	36	5	pit		L3	below floor, loc. 6
988	9	4	2	fill		L3	
2143	9	4	2	vessel contents		L3	on virgin soil
2116	9	5	3	storage jar contents		L3	
2144	9	4	2	fill		L3	
Hajji Ibrahim							
93.1680	1/2	12	2	oven contents		E3	
93.1688	1/2	11	7	outside the oven		E3	

* Millennium: L3 = late 3rd, M3 = mid 3rd, E3 = early 3rd

APPENDIX 6.2

SWEYHAT WILD AND WEEDY TYPES

Taxon	Life form†	Comments+
Aizoaceae		
*Aizoon**	?	
Apiaceae		carrot family (Umbelliferae), ≥ 2 types
Bupleurum	h	freq. dry, open land
Torilis-type	ah	open land
Asteraceae		daisy family (Compositae), ≥ 3 types (Fig. 6.2a,b)
cf. *Artemisia**	h, s	wormwood; freq. steppe
Centaurea	h	
Boraginaceae		borage family
*Arnebia decumbens**	h	gravelly uncultiv. land
*Arnebia linearifolia**	h	stony slopes
Heliotropium	h	
Lithospermum tenuiflorum	ph	
Brassicaceae		mustard family
cf. *Alyssum*	h	likely steppe plant (Fig.6.1c)
Lepidium	h	edible herb/forage
Neslia	ah	disturbed ground
cf. *Ochthodium*	ah	disturbed ground
Caryophyllaceae		pink family
Gypsophila	h	
Silene	h	
Chenopodiaceae		goosefoot family
cf. *Atriplex*	h, s	
cf. *Salsola*	h, s	saltwort; freq. salty soils
Cistaceae		
*Helianthemum**	s, h	usu. open ground (Fig. 6.1a)
Cyperaceae	h	sedge family; usu. moist ground; sev. types
Euphorbiaceae		spurge family
cf. *Euphorbia*	h	milky sap; unpalatable
Fabaceae		pea family (Leguminosae); usu. good forage
cf. *Alhagi*	s	camel thorn; sharp spines
Astragalus	h, s	
cf. *Hippocrepis*	ah	steppe, open slopes
Medicago	h	
*Medicago radiata**	h	steppe
cf. *Onobrychis**	ph, s	steppe, slopes
Prosopis	s	*shauk* (Arabic)
Trifolium/Melilotus	h	clover/melilot
Trigonella	ah	usu. steppe, slopes
*T. astroites-type**	ah	steppe and other habitats
Hypericaceae		
Hypericum	ph, s	not good for livestock (Fig. 6.1f)
Lamiaceae		mint family (Labiatae)
*Ajuga**	h	uncultivated land
*Teucrium**	ph	freq. rocky ground
cf. *Ziziphora**	h	
Liliaceae		lily family, some with edible bulbs, ≥ 2 types (Figs. 6.2d–f)
Linaceae		flax family
cf. *Linum*	h	a small-seeded wild flax
Malvaceae		mallow family (Fig. 6.1e)
cf. *Malva*	h	disturbed ground
Papaveraceae		poppy family
Fumaria	ah	
Glaucium	h	

APPENDIX 6.2 (CONT'D)

SWEYHAT WILD AND WEEDY TYPES

Taxon	Life form†	Comments+
Plantaginaceae		plantain family
cf. *Plantago*	h	
Poaceae	h	grass family (Gramineae), usu. good forage, ≥10 indeterminate types (Figs. 6.4b-d; 6.5a-d; 6.6a-g; 6.7c-e)
Aegilops	h	
Avena	h	oat, probably wild
Bromus sterilis-type*	h	prob. weedy
Eremopyrum	ah	steppe, uncultiv. land
SW.Hordeum-1	h	wild barley, a small-seeded type (Fig. 6.3a,b)
Hordeum cf. *spontaneum**	h	wild barley, a large-seeded type
Phalaris	h	
Secale cf. *cereale*	h	rye, cultigen; here, prob. weed
cf. *Setaria*	h	disturbed ground
cf. *Taeniatherum*	ah	prob. steppe, slopes (Fig. 6.3c,d)
Trachynia distachya	ah	steppe or fields (Fig. 4a)
Polygonaceae		knotweed family
Polygonum	h	knotweed; freq. damp, disturbed ground
Rumex	h	dock; freq. damp, disturbed ground
Primulaceae		primrose family
Androsace	h	
Ranunculaceae		buttercup family
Adonis	h	
Ceratocephalus	ah	open places (Fig. 6.1b)
cf. *Ranunculus*	h	buttercup
Rubiaceae		
cf. *Crucianella**	h	(Fig. 6.1d)
Galium	h	usu. uncultivated land
Scrophulariaceae		
cf. *Verbascum*	h	(Fig. 6.1g)
Veronica persica-type	h	disturbed land
Solanaceae		nightshade family
cf. *Hyoscyamus*	h	henbane
Thymelaeaceae		
*Thymelaea**	h, s	prob. steppe, dry slopes
Valerianaceae		
Valerianella	ah	
V. cf. *coronata**	ah	open and disturbed land
Zygophyllaceae		
Peganum harmala	ph	wild rue; unpalatable to animals

† Life form: h = herbaceous, s = shrubby; p = perennial, a = annual
+ Misc. notes culled from *Flora of Iraq* (Townsend and Guest 1966–85), *Flora of Turkey* (Davis 1965-88), or personal observation; for additional information, see relevant plant discussions by van Zeist and Bakker-Heeres 1985(1988).
* Identification based primarily on illustrations in van Zeist and Bakker-Heeres 1982(1985), 1984(1986), 1985(1988); comparative material not available.

APPENDIX 6.3

PLANT REMAINS FROM OPERATION 1

Operation	1	1	1	1	1	1	1	1	1
Locus	1	1	1	1	3	3	5	9	9
Lot	9	26	26	30	1	1	3	2	2
SW #	615	1301	1049	1316	626	627	1001	1560	1565
soil vol (l)	10	8	8	8	8	8	8	8	8
flot. vol (cc)	2.5	5	5	15	10	10	16	25	25
charcoal (>2 mm; g)	0.05	0.01	0.08	0.65	0.17	0.05	1.10	0.53	0.61
seed (>2 mm; g)	0.09	0.10	0.04	0.41	0.06	0.14	0.25	0.55	0.97
misc (>2 mm; g)	.	.	.	+	0.01	+	0.01	0.02	0.56
density (g/l)	0.01	0.01	0.02	0.13	0.03	0.02	0.17	0.14	0.27
seed/charcoal (g/g)	1.80	10.00	0.50	0.63	0.35	2.80	0.23	1.04	1.59
wild & weedy, charred (#)	35	30	41	315	40	37	328	689	1523
w&w/charcoal (#/g)	700	3000	513	485	235	740	298	1300	2497
w&w/cereal (#/g)	1167	200	1025	606	364	308	1312	1094	1904
w&w, uncharred	61	88	106	91	66	45	14	0	195
w&w, % charred	36	25	28	78	38	45	96	100	89
CULTIGENS									
Hordeum	3	9	5	47	7	8	26	49	78
Triticum aestivum/durum	.	.	.	.	1	6	.	2	6
Triticum dicoccum	.	.	.	.	.	.	.	.	1
Triticum monococcum	.	.	.	.	.	.	.	.	.
Triticum sp.	.	1	.	.	.	.	1	.	.
Cereal indet.	1	10	1	28	7	4	13	33	17
Lathyrus	.	.	.	.	.	1	.	.	.
Lens culinaris	.	+	.	.	.	.	.	1	.
Lens/Pisum	.	.	.	.	.	+	.	.	.
Pisum/Vicia	.	+	.	.	.	.	.	.	.
cf. Pisum	.	.	.	.	.	.	.	.	.
large legumes	.	.	.	.	.	.	.	.	+
Vitis	.	.	.	.	.	.	.	.	.
Ficus	.	.	.	.	.	.	.	.	.
WILD AND WEEDY									
Aizoon	.	.	.	.	.	.	.	.	.
Bupleurum	.	.	.	.	.	.	1	.	.
Torilis-type	.	.	.	.	.	.	.	.	.
Apiaceae	.	.	.	.	1	.	.	.	.
cf. Artemisia	.	.	.	.	.	1	.	1	.
Centaurea	.	.	.	1	.	.	.	.	1
SW.Asteraceae-1	.	.	.	.	.	.	2	.	.
SW.Asteraceae-3	.	.	.	2	.	.	.	33	60
Heliotropium	.	.	.	5	.	.	3	1	1
cf. Alyssum	.	.	.	.	.	.	.	.	1
Lepidium	.	.	.	.	.	.	.	.	.
Brassicaceae indet.	.	.	.	.	.	.	1	.	2
Gypsophila	.	.	2	.	.	1	.	6	.
Silene	.	1	1	7	.	3	8	9	22
Caryophyllaceae indet.	.	.	.	1	.	.	.	1	1
cf. Atriplex	.	1	.	.	.	.	.	.	.

APPENDIX 6.3 (CONT'D)

PLANT REMAINS FROM OPERATION 1

Operation	1	1	1	1	1	1	1	1	1
Locus	1	1	1	1	3	3	5	9	9
Lot	9	26	26	30	1	1	3	2	2
SW #	615	1301	1049	1316	626	627	1001	1560	1565
cf. Salsola	.	.	.	2	.	.	.	1	.
Helianthemum	.	.	.	.	.	.	.	2	1
Cyperaceae	.	.	.	.	.	.	.	1	.
cf. Alhagi	.	.	.	.	.	.	.	.	.
Astragalus	3	3	3	73	4	2	44	46	204
cf. Hippocrepis	.	.	.	.	.	.	.	.	.
Medicago	.	.	.	.	.	1	.	.	35
Medicago radiata	.	.	.	.	.	.	.	.	2
cf. Onobrychis?	.	.	.	.	.	.	.	.	.
Prosopis (estimate)	1	.	.	.	.	.	2	.	2
Trifolium/Melilotus	.	4	.	10	10	12	36	11	15
Trigonella	13	.	3	50	12	2	29	165	277
Trigonella astroites-type	.	1	3	45	1	2	22	148	332
Fabaceae indet.	10	2	18	79	4	3	132	203	466
Hypericum	.	.	.	.	.	.	.	.	.
Ajuga	.	.	.	.	.	.	.	.	.
Teucrium	.	.	.	.	3	.	1	2	1
Lamiaceae	.	.	.	.	.	.	.	1	.
SW.Liliaceae-1	.	.	.	.	.	.	.	.	.
SW.Liliaceae-2	.	2	.	.	.	.	.	.	.
SW.Liliaceae-3	.	3	.	.	1	.	.	.	.
SW.Liliaceae-4	.	.	.	.	.	.	.	.	.
SW.Liliaceae-5	.	.	.	.	.	.	.	.	.
cf. Linum	.	.	.	2	.	.	.	.	.
cf. Malva	.	.	.	2	.	1	.	8	2
Malvaceae indet.	.	.	.	.	.	.	9	.	2
Fumaria	.	.	.	.	.	.	.	.	.
Glaucium	.	.	.	2	.	.	.	1	4
cf. Plantago	.	.	.	.	.	.	.	1	.
Aegilops	1	.	1	1	.	1	1	.	5
Avena	.	.	.	.	.	.	.	.	.
Bromus sterilis-type	.	3	.	.	.	.	.	.	.
Eremopyron	1	7	1	9	1	1	21	9	54
SW.Hordeum-1	.	.	1	.	.	.	.	.	.
Hordeum cf. spontaneum	.	.	.	.	1	.	.	.	.
Hordeum	.	.	.	.	.	.	.	.	1
Phalaris	1	.	3	.	.	.	.	.	.
Secale cf. cereale	.	.	.	.	.	.	.	.	.
cf. Setaria	.	.	.	.	.	.	.	.	.
Trachynia distachya	.	.	.	2	.	.	3	10	1
SW.Poaceae-2	.	.	.	.	.	.	.	.	.
SW.Poaceae-3	.	.	.	.	.	.	.	.	.
SW.Poaceae-4	.	.	.	.	.	.	.	.	.
SW.Poaceae-5	.	.	.	.	.	.	.	.	.
SW.Poaceae-6	.	.	.	.	.	.	.	.	.
SW.Poaceae-7	.	.	.	.	.	.	.	.	.
SW.Poaceae-10	.	.	.	.	.	.	.	.	.
SW.Poaceae-11	.	.	.	.	.	.	.	.	.
SW.Poaceae-12	1	.	.	2	.	.	2	15	5
SW.Poaceae-15	.	.	.	.	.	.	.	1	.
SW.Poaceae-17	.	.	.	1	.	.	.	1	.

APPENDIX 6.3 (CONT'D)

PLANT REMAINS FROM OPERATION 1

Operation	1	1	1	1	1	1	1	1	1
Locus	1	1	1	1	3	3	5	9	9
Lot	9	26	26	30	1	1	3	2	2
SW #	615	1301	1049	1316	626	627	1001	1560	1565
SW.Poaceae-18	.	.	.	.	1	.	.	.	.
SW.Poaceae-19	1	.	.	.	.	.	1	1	.
SW.Poaceae-21	.	.	.	.	.	.	.	.	.
Poaceae indet.	2	2	2	11	.	2	4	3	3
Polygonum	1	.	.	.	.	.	.	.	.
Rumex	.	.	.	.	.	.	.	.	.
Androsace	.	.	.	1	.	.	.	.	2
Adonis	.	.	.	.	.	.	.	.	1
Ceratocephalus	.	.	.	.	.	.	.	.	.
cf. Crucianella	.	.	.	.	.	.	.	.	1
Galium	.	.	.	.	.	.	.	.	.
cf. Verbascum	.	.	.	.	.	.	.	.	.
Veronica persica-type	.	.	.	.	.	.	.	.	.
cf. Hyoscyamus	.	.	.	.	.	.	.	.	.
Thymelaea	.	.	.	2	.	.	1	.	7
Valerianella	.	.	.	1	.	.	1	1	2
cf. coronata	.	.	.	.	.	.	.	.	.
Peganum harmala	.	.	.	.	1	.	2	2	1
SW.unknown-7	.	.	.	.	.	.	.	.	.
SW.unknown-10	.	.	.	.	.	.	.	.	.
unknown misc.	.	1	3	4	.	5	2	5	9
PLANT PARTS									
Hordeum internode	.	.	.	37	3	5	31	.	28
H. 'spontaneum' int.	.	.	.	.	.	.	.	.	.
Triticum aestivum/ durum int.	.	.	.	.	.	.	1	.	.
cf. Triticum int.	.	.	.	.	.	.	.	.	.
T. mono/dicoccum sf	.	.	1	.	.	.	1	.	.
SW.Asteraceae-3 head with ca. 100 seeds	.	.	.	.	.	.	.	.	1
Asteraceae head	.	.	.	.	.	.	.	.	.
Brassicaceae silique frg.	.	.	.	.	.	.	.	.	.
cf. Alhagi pod frgs.	.	.	.	.	.	.	.	.	.
Onobrychis pod frg.	.	.	.	.	.	.	.	.	1
grass culm nodes	.	.	.	6	1	.	11	.	73
Aegilops glume base	.	.	.	.	.	.	1	.	.
Aegilops glumes	.	.	.	.	.	.	.	.	.
Ranunculus pericarp frgs.?	.	.	.	.	.	.	.	.	.
SW.unknown-12	.	.	.	.	.	.	.	.	.
UNCHARRED SEEDS									
Arnebia decumbens	22	4	5	.	4	1	1	.	10
A. linearifolia	.	.	.	.	.	6	.	.	.
Arnebia/Lithospermum	36	84	96	37	61	34	3	.	148
Heliotropium	1	.	.	.	.	.	.	.	.
Lithospermum tenuiflorum	2	.	5	54	1	4	7	.	35
Lithospermum sp.	.	.	.	.	.	.	3	.	2
Glaucium (white)	.	.	.	.	.	.	.	.	.

APPENDIX 6.3 (CONT'D)

PLANT REMAINS FROM OPERATION 1

Operation	1	1	1	1	1	1	1	1	1
Locus	9	13	15	15	15	16	16	27	27
Lot	14	2	1	6	22	8	9	3	2
SW #	2351	2026	2157	2372	93.0478	2260	2261	93.0748	93.0904
soil vol (l)	8	10	1.75	8	1.25	10	0.5	10	10
flot. vol (cc)	30	50	20	100	25	5	<5	30	25
charcoal (>2 mm; g)	0.03	3.96	1.68	11.78	1.62	0.08	0.06	0.73	0.40
seed (>2 mm; g)	0.01	1.05	0.32	2.24	0.55	0.02	0.01	0.71	0.12
misc (>2 mm; g)	.	0.07	0.02	0.28	.	0.04	.	0.28	0.01
density (g/l)	0.01	0.51	1.15	1.79	1.74	0.01	0.14	0.17	0.05
seed/charcoal (g/g)	0.33	0.27	0.19	0.19	0.34	0.25	0.17	0.97	0.30
wild & weedy, charred (#)	13553	1093	995	4478	47	50	6	275	19
w&w/charcoal (#/g)	451767	276	592	380	29	625	100	377	48
w&w/cereal (#/g)	71332	950	3827	1882	392	833	n/c	372	56
w&w, uncharred	176	165	38	149	2	14	0	23	75
w&w, % charred	99	87	96	97	96	78	100	92	20
CULTIGENS									
Hordeum	14	124	19	200	7	5	1	26	13
Triticum aestivum/ durum	.	1	3	5	.	.	.	.	.
Triticum dicoccum	.	.	.	2	.	.	.	.	.
Triticum monococcum	.	.	.	1	.	.	.	.	.
Triticum sp.	.	.	.	.	.	.	.	.	.
Cereal indet.	18	34	13	120	10	3	.	76	35
Lathyrus	.	.	1	.	.	.	.	.	.
Lens culinaris	.	1	.	.	.	.	.	.	2
Lens/Pisum	.	.	.	.	.	.	.	.	2
Pisum/Vicia	.	.	.	.	.	.	.	.	.
cf. Pisum	.	1	1	.	79	.	.	37	.
large legumes	.	+	.	.	.	.	.	5	.
Vitis	.	.	.	.	.	.	.	+	.
Ficus	.	.	.	.	1	.	.	.	.
WILD AND WEEDY									
Aizoon	3	.	.	.	.	.	.	.	.
Bupleurum	4	.	.	2	.	.	.	.	.
Torilis-type	1	.	.	.	.	.	.	.	.
Apiaceae	1	.	2	.	1	.	.	.	1
cf. Artemisia	.	.	.	1	.	.	.	.	.
Centaurea	24	.	.	8	.	.	.	.	.
SW.Asteraceae-1	.	.	.	2	.	.	.	.	.
SW.Asteraceae-3	11	.	3	5	.	.	.	.	.
Heliotropium	2	2	1	5	.	.	.	.	.
cf. Alyssum	.	.	.	.	1	.	1	.	.
Lepidium	1	.	.	.	.	.	.	.	.
Brassicaceae indet.	3	.	5	6	.	.	.	1	.
Gypsophila	6	.	2	3	.	.	.	2	.
Silene	19	26	1	37	.	2	1	4	.
Caryophyllaceae indet.	2	.	.	.	.	.	.	.	.
cf. Atriplex	.	.	1	.	.	.	.	.	.

APPENDIX 6.3 (CONT'D)

PLANT REMAINS FROM OPERATION 1

Operation	1	1	1	1	1	1	1	1	1
Locus	9	13	15	15	15	16	16	27	27
Lot	14	2	1	6	22	8	9	3	2
SW #	2351	2026	2157	2372	93.0478	2260	2261	93.0748	93.0904
cf. Salsola	3	.	.	1	.	.	.	1	.
Helianthemum	271	7	18	64	.	.	.	.	.
Cyperaceae	1	.	.	1	.	.	.	.	.
cf. Alhagi	22	1	4	1	.	.	.	.	.
Astragalus	836	88	40	545	.	2	.	10	.
cf. Hippocrepis	.	.	.	5	.	.	.	.	.
Medicago	.	.	.	4	.	.	.	5	.
Medicago radiata	2	.	1	.	.	.	.	.	.
cf. Onobrychis?	.	.	.	1	.	.	.	.	.
Prosopis (estimate)	1	.	.	10	.	.	.	1	.
Trifolium/Melilotus	94	60	18	55	.	6	.	.	.
Trigonella	10752	439	407	1734	.	9	1	1	.
Trigonella									
astroites-type	.	233	286	726	.	3	.	.	.
Fabaceae misc.	1089	72	108	774	.	11	.	12	1
Hypericum	.	.	.	.	.	.	.	.	2
Ajuga	.	1	.	.	.	.	.	1	.
Teucrium	5	.	.	4	.	.	.	.	.
Lamiaceae	.	.	.	.	.	.	.	.	.
SW.Liliaceae-1	.	.	.	.	.	.	.	2	.
SW.Liliaceae-2	.	.	.	.	.	.	.	.	.
SW.Liliaceae-3	3	.	.	6	4	.	.	3	3
SW.Liliaceae-4	.	.	.	.	.	.	.	2	.
SW.Liliaceae-5	2	.	.	.	.	.	.	.	.
cf. Linum	.	.	.	.	.	.	.	.	.
cf. Malva	.	.	8	17	2	.	.	2	.
Malvaceae indet.	18	3	1	6	.	.	.	.	.
Fumaria	.	.	.	.	26	1	.	.	2
Glaucium	2	.	.	7	.	.	.	.	.
cf. Plantago	.	.	.	.	.	.	.	.	.
Aegilops	5	7	6	12	.	1	1	37	1
Avena	.	.	1	1	.		.	.	.
Bromus sterilis-type	.	.	1	1	.	.	.	1	.
Eremopyron	77	53	28	42	.	8	.	110	5
SW.Hordeum-1	2	.	.	3	1	.	.	.	.
Hordeum cf. spontaneum	.	1	.	2	.	.	.	.	.
Hordeum	.	.	.	.	.	1	.	.	.
Phalaris	.	.	1	1	.	.	.	.	.
Secale cf. cereale	.	.	2	.	.	.	.	.	.
cf. Setaria	.	.	.	1	.	.	.	.	.
Trachynia distachya	4	.	.	4	.	.	.	1	.
SW.Poaceae-2	3	3	.	.	.	.	.	5	.
SW.Poaceae-3	.	2	.	4	.	.	.	.	.
SW.Poaceae-4	.	2	.	.	.	.	.	.	.
SW.Poaceae-5	.	2	.		.	.	.	.	.
SW.Poaceae-6	.	4	.		.	.	.	.	.
SW.Poaceae-7	.	1	.	.	.	.	.	.	.
SW.Poaceae-10	.	10	.	3	.	.	.	.	.
SW.Poaceae-11	18	1	2	3	.	.	.	9	.
SW.Poaceae-12	3	5	.	9	.	.	.	.	.
SW.Poaceae-15	.	.	.	.	.	.	.	.	.
SW.Poaceae-17	21	.	1	.	.	.	.	.	.
SW.Poaceae-18	.	.	.	3	.	.	.	.	.

APPENDIX 6.3 (CONT'D)

PLANT REMAINS FROM OPERATION 1

Operation	1	1	1	1	1	1	1	1	1
Locus	9	13	15	15	15	16	16	27	27
Lot	14	2	1	6	22	8	9	3	2
SW #	2351	2026	2157	2372	93.0478	2260	2261	93.0748	93.0904
SW.Poaceae-19	9	.	1	9	.	1	.	3	.
SW.Poaceae-21	.	.	.	.	.	.	.	1	.
Poaceae misc.	44	17	17	34	2	2	2	32	3
Polygonum	.	.	.	.	.	.	.	.	.
Rumex	.	.	.	1	.	.	.	.	.
Androsace	50	4	7	13	.	.	.	2	.
Adonis	1	.	.	8	9	1	.	.	.
Ceratocephalus	4	1	.	4	.	.	.	.	.
cf. Crucianella	2	1	.	4	.	1	.	1	.
Galium	.	1	.	.	.	.	.	.	.
cf. Verbascum	2	.	.	.	.	.	.	.	.
Veronica persica-type	2	.	.	.	.	.	.	.	.
cf. Hyoscyamus	.	.	.	.	.	.	.	1	.
Thymelaea	4	2	1	3	.	.	.	.	.
Valerianella	.	2	.	1	.	.	.	.	.
Valerianella									
cf. coronata	.	.	.	.	.	1	.	.	.
Peganum harmala	94	2	19	19	.	.	.	1	.
SW.unknown-7	.	.	.	.	.	.	.	2	.
SW.unknown-10	.	.	.	.	.	.	.	2	.
unknown misc.	30	34	2	263	1	.	.	22	1
PLANT PARTS									
Hordeum internode	203	123	21	164	1	16	.	16	.
H. 'spontaneum' int.	.	.	.	2	.	.	.	.	.
Triticum aestivum/									
durum int.	.	.	.	.	.	.	.	.	.
cf. Triticum int.	.	1	.	.	.	.	.	.	.
T. mono/dicoccum sf	3	1	.	10	.	1	.	.	.
SW.Asteraceae-3									
head with seeds	.	.	.	.	.	.	.	.	.
Asteraceae head	.	.	.	.	.	.	.	1	.
Brassicaceae silique frg.	.	.	3	.	.	.	.	.	.
cf. Alhagi pod frgs	.	.	.	.	.	.	.	2	.
Onobrychis pericarp frg.	.	.	.	.	.	.	.	2	.
grass culm nodes	11	17	4	152	2	5	.	23	1
Aegilops glume base	2	11	2	8	.	.	.	33	5
Aegilops glumes	.	.	.	.	.	.	.	429	11
Ranunculus pericarp frgs.?	.	.	.	.	.	.	.	2	1
SW.unknown-12	.	5	.	.	.	.	.	.	.
UNCHARRED SEEDS									
Arnebia decumbens	.	29	.	10	.	1	.	.	.
A. linearifolia	.	2	.	1	.	.	.	.	1
Arnebia/Lithospermum	138	66	36	97	2	9	.	18	62
Heliotropium	.	.	.	.	.	.	.	.	.
Lithospermum tenuiflorum	37	16	2	33	.	4	.	5	12
Lithospermum sp.	.	52	.	7	.	.	.	.	.
Glaucium (white)	1	.	.	1	.	.	.	.	.

Abbreviations: w&w = wild and weedy types; n/c = not calculable; int. = internode; sf = spikelet fork; + = present in unmeasurable quantity

APPENDIX 6.4

PLANT REMAINS FROM OPERATIONS 4 AND 9

Operation	4	4	4	4	4	4	4	4	4	4
Locus	3	7	14	17	18	18	18	18	21	21
Lot	4	1	6	6	3	4	4	4	3	3
SW #	786	2515	1148	1147	1639	1624	1629	1625	2537	2538
soil vol (l)	8	1	8	8	10	8	8	8	10	10
flot. vol (cc)	<5	<1	<5	<5	<5	<5	<5	<5	<5	<5
charcoal (>2mm; g)	.	.	0.01	.	.	.	.	+	.	.
seed (>2mm; g)	0.02	.	+	0.01	+	0.02	.	+	+	0.01
misc (>2 mm; g)	+	+	.	+	+	+	.	+	+	.
density (g/l)	+	+	+	+	+	+	+	+	+	+
seed/charcoal (g/g)	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c
wild & weedy, charred (#)	72	.	1	2	.	11	.	3	2	2
w&w/charcoal (#/g)	n/c	n/c	100	n/c	n/c	n/c	n/c	n/c	n/c	n/c
w&w/cereal (#/g)	n/c	n/c	100	1	n/c	n/c	n/c	n/c	n/c	n/c
w&w, uncharred	6	1	3	4	5	9	12	10	37	19
w&w, % charred	92	0	25	33	0	55	0	23	5	10
CULTIGENS										
Hordeum	.	.	1	4	.	1	.	.	.	.
Cereal indet.	1	.	1	1	.	1	.	.	.	.
Lathyrus	1	.	.	.	.	.	.	.	.	.
Pisum/Vicia	.	.	.	.	.	1	.	.	.	.
cf. Pisum	.	.	.	.	.	.	.	.	.	.
large legumes	.	.	.	2	+	.	.	.	.	.
WILD AND WEEDY										
Gypsophila	1	.	.	.	.	.	.	.	.	.
Silene	2	.	.	.	.	.	.	.	.	.
cf. Euphorbia	.	.	.	.	.	.	.	.	.	1
Astragalus	.	.	.	1	.	.	.	1	.	.
Medicago	1	.	.	.	.	.	.	.	.	.
Trifolium/Melilotus	57	.	.	.	.	1	.	.	.	.
Trigonella	8	.	.	1	.	6	.	.	2	.
Trigonella astroites-type	.	.	.	.	.	.	.	.	.	.
SW.Liliaceae-3	1	.	.	.	.	.	.	.	.	.
Aegilops	.	.	.	.	.	.	.	.	.	.
Eremopyron	.	.	1	.	.	.	.	1	.	.
SW.Poaceae-12	.	.	.	.	.	2	.	.	.	.
SW.Poaceae-17	.	.	.	.	.	.	.	.	.	.
Poaceae misc.	.	.	.	.	.	1	.	1	.	.
Adonis	1	.	.	.	.	.	.	.	.	.
Thymelaea	.	.	.	.	.	.	.	.	.	1
unknown misc.	1	.	.	.	.	1	.	.	.	.
PLANT PARTS										
Triticum monococcum/ dicoccum sf	1	1	.	.	.	.	.	.	.	.
Vitis peduncle	.	.	.	.	.	.	.	.	1	.
UNCHARRED SEEDS										
cf. Apiaceae	.	.	2	.	.	.	.	.	.	.
Arnebia decumbens	4	.	.	.	.	2	4	.	4	3

APPENDIX 6.4 (CONT'D)

PLANT REMAINS FROM OPERATIONS 4 AND 9

Operation	4	4	4	4	4	4	4	4	4	4
Locus	3	7	14	17	18	18	18	18	21	21
Lot	4	1	6	6	3	4	4	4	3	3
SW #	786	2515	1148	1147	1639	1624	1629	1625	2537	2538
A. linearifolia	.	.	.	1	.	1	.	1	.	.
Arnebia/Lithospermum	1	.	.	.	.	2	1	4	8	3
Heliotropium	.	.	.	1	.	.	.	.	7	2
Lithospermum sp.	.	.	.	.	.	.	1	.	.	.
L. tenuiflorum	1	1	.	1	5	4	6	5	17	6
Boraginaceae	.	.	.	.	.	.	.	.	.	.
cf. Brassica	.	.	.	.	.	.	.	.	.	.
Brassicaceae indet.	.	.	.	.	.	.	.	.	.	.
Gypsophila	.	.	.	.	.	.	.	.	.	2
Silene	.	.	1	1	.	.	.	.	.	2
cf. Ochthodium	.	.	.	.	.	.	.	.	.	.
Euphorbia	.	.	.	.	.	.	.	.	1	1

Operation	4	4	4	4	4	4	9	9	9	9
Locus	22	23	31	36	36	36	4	4	4	5
Lot	5	2	3	2	2	5	1	2	2	3
SW #	2460	1645	1847	2541	2542	2547	988	2143	2144	2116
soil vol (l)	10	8	10	8	4	10	4	10	2	10
flot. vol (cc)	<5	5	<5	5	<5	5	<5	<5	<5	5
charcoal (>2mm;g)	.	.	.	.	.	.	.	.	.	+
seed (>2mm;g)	.	0.02	0.03	0.01	.	.	.	+	0.02	+
misc (>2;g)	.	.	0.06	+	0.02	.	.	.	0.04	+
density (g/l)	0.00	+	0.01	+	+	0.00	0.00	+	0.03	+
seed/charcoal (g/g)	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c
wild & weedy, charred (#)	1	5	181	.	1	.	3	.	.	2
w&w/charcoal (#/g)	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c
w&w/cereal (#/g)	n/c	n/c	n/c	0	n/c	n/c	n/c	n/c	n/c	67
w&w, uncharred	42	50	36	19	7	10	29	10	8	35
w&w, % charred	2	9	83	0	13	0	9	0	0	5
CULTIGENS										
Hordeum)	.	.	.	.	.	.	.	.	.	1
Cereal indet.	.	13	.	3	.	.	.	.	.	3
Lathyrus	.	.	.	.	.	.	.	.	.	.
Pisum/Vicia	.	.	5	1	.	.	.	.	.	+
cf. Pisum	.	.	.	.	.	.	.	.	.	.
large legumes	.	.	.	.	.	.	.	.	.	.
WILD AND WEEDY										
Gypsophila	.	.	.	.	.	.	.	.	.	.
Silene	.	.	4	.	.	.	1	.	.	.
cf. Euphorbia	.	.	.	.	.	.	.	.	.	.
Astragalus	.	.	.	.	.	.	.	.	.	.
Medicago	.	.	.	.	.	.	.	.	.	.
Trifolium/Melilotus	1	.	.	.	.	.	.	.	.	.

APPENDIX 6.4 (CONT'D)

PLANT REMAINS FROM OPERATIONS 4 AND 9

Operation	4	4	4	4	4	4	9	9	9	9
Locus	22	23	31	36	36	36	4	4	4	5
Lot	5	2	3	2	2	5	1	2	2	3
SW #	2460	1645	1847	2541	2542	2547	988	2143	2144	2116
Trigonella	.	2	145	.	.	.	1	.	.	.
Trigonella astroites-type	.	.	30	.	.	.	.	.	.	.
SW.Liliaceae-3	.	.	.	.	.	.	.	.	.	.
Aegilops	.	1	.	.	.	.	.	.	.	1
Eremopyron	.	.	.	.	.	.	.	.	.	.
SW.Poaceae-12	.	.	.	.	.	.	.	.	.	.
SW.Poaceae-17	.	.	1	.	.	.	.	.	.	.
Poaceae misc.	.	1	1	.	.	.	.	.	.	.
Adonis	.	.	.	.	.	.	1	.	.	.
Thymelaea	.	.	.	.	.	.	.	.	.	1
unknown misc.	.	1	.	.	1	.	.	.	.	.
PLANT PARTS										
Triticum monococcum/ dicoccum sf	.	.	.	.	.	.	.	.	.	.
Vitis peduncle	.	.	.	.	.	.	.	.	.	.
UNCHARRED SEEDS										
cf. Apiaceae	.	.	.	.	.	.	.	.	.	.
Arnebia decumbens	6	.	1	2	.	3	3	.	.	9
A. linearifolia	.	.	2	.	.	1	.	.	2	2
Arnebia/Lithospermum	11	42	21	1	.	.	19	5	.	3
Heliotropium	1	.	.	.	.	.	.	.	.	2
Lithospermum sp.	.	.	.	.	.	.	.	.	.	.
L. tenuiflorum	24	8	12	16	6	5	7	5	6	15
Boraginaceae	.	.	.	.	.	.	.	.	.	1
cf. Brassica	.	.	.	.	.	.	.	.	.	1
Brassicaceae indet.	.	.	.	.	.	.	.	.	.	1
Gypsophila	.	.	.	.	.	1	.	.	.	.
Silene	.	.	.	.	.	.	.	.	.	.
cf. Ochthodium	.	.	.	.	.	.	.	.	.	1
Euphorbia	.	.	.	.	1	.	.	.	.	.

w&w = wild and weedy; n/c = not calculable; sf = spikelet fork; + = present in unmeasurable quantity

APPENDIX 6.5

PLANT REMAINS FROM HAJJI IBRAHIM

Operation	1/2	1/2
Locus	11	12
Lot	7	2
SW #	93.1688	93.1680
soil vol (l)	10	10
flot. vol (cc)	50	ca. 12
charcoal (>2mm; g)	0.26	0.06
seed (>2mm; g)	1.70	0.31
misc (>2mm; g)	0.35	0.06
density (g/l)	0.23	0.04
seed/charcoal (g/g)	6.54	5.17
wild & weedy, charred (#)	3424	314
w&w/charcoal (#/g)	13169	5233
w&w/cereal (#/g)	1600	551
w&w, uncharred (#)	692	15
w&w, % charred	83	95
CULTIGEN		
Hordeum	249	28
Triticum sp.	1	.
Cereal indet.	76	50
Lathyrus	1	.
Lens culinaris	1	.
Pisum/Vicia	.	1
WILD AND WEEDY		
Aizoon	1	.
Carthamus cf. tinctorius†	1	.
Centaurea	5	1
SW.Asteraceae-1	.	3
SW.Asteraceae-3	82	6
Heliotropium	6	1
cf. Alyssum	102	3
Neslia	1	3
Brassicaceae indet.	5	.
Gypsophila	2	1
Silene	.	1
Atriplex	22	.
Euphorbia	.	1
Astragalus	16	4
Trifolium/Melilotus	4	3
Trigonella	12	10
Fabaceae indet.	7	.
cf. Ziziphora	1	1
SW.Liliaceae-3	10	.
SW.Liliaceae-5	1	.
Liliaceae indet.	.	1
Malva	144	17
SW.Malvaceae-1	13	2
Aegilops	22	6

Operation	1/2	1/2
Locus	11	12
Lot	7	2
SW #	93.1688	93.1680
Avena	4	.
Bromus sterilis-type	15	.
Eremopyron	1664	93
SW.Hordeum-1	49	.
cf. Taeniatherum	26	.
Trachynia distachya	56	2
SW.Poaceae-1	.	12
SW.Poaceae-2	48	.
SW.Poaceae-10	35	.
SW.Poaceae-11	.	3
SW.Poaceae-12	1	5
SW.Poaceae-13	.	1
SW.Poaceae-15	18	.
SW.Poaceae-16	1	.
SW.Poaceae-19	10	1
Poaceae misc.	979	115
Adonis	1	.
Ceratocephalus	12	3
Crucianella	2	.
cf. Verbascum	24	1
Valerianella	1	.
Peganum harmala	14	.
unknown misc	7	11
PLANT PARTS		
Hordeum internode	.	25
Triticum mono/dicoccum sf	.	8
Straw culm node	many	9
Brassicaceae, silique frg.	.	3
Atriplex, whole fruit	*15	.
Malva pericarp fragments	several	.
Aegilops glume base	.	4
grass internode, indet.	23	.
SW.unknown-12	.	3
unknown	21	.
UNCHARRED SEEDS		
Arnebia decumbens	.	3
A. linearifolia	.	1
Arnebia/Lithospermum	692	.
Lithospermum cf. arvense	.	8
L. tenuiflorum	.	3
Adonis	.	+

† Carthamus cf. tinctorius could be cultivated
* seeds in Atriplex fruit included in seed total
+ present in unmeasurable quantity

APPENDIX 6.6A–C

6.6A. BARLEY MEASUREMENTS FROM SW 2372

N=32	L (mm)	B (mm)	T (mm)	L/B	T/B
minimum	3.8	1.7	1.3	1.68	0.61
mean	5.3	2.6	2.0	2.09	0.77
maximum	6.1	3.2	2.5	2.45	0.96

6.6B. BARLEY MEASUREMENTS FROM HAJJI IBRAHIM, SW 93.1688

N=23	L (mm)	B (mm)	T (mm)	L/B	T/B
minimum	4.2	1.8	1.1	1.71	0.62
mean	5.5	2.5	1.9	2.22	0.75
maximum	6.7	3.5	2.8	2.80	0.89

6.6C. PEA MEASUREMENTS FROM SW 2372

N=22	D	T	D/T
minimum	2.2	1.9	0.96
mean	2.8	2.4	1.15
maximum	3.4	3.3	1.30

APPENDIX 6.7A, B

6.7A. SWEYHAT CHARCOAL FROM OPERATION 1 (COUNT)

Locus	1	3	5	13	15	15	15	27	
Lot	30	1	3	2	1	6	22	3	
SW #	1316	0626	1001	2026	2157	2372	93.0478	93.0748	Total
Populus/Salix	1	1	2	4	2	.	1	1	12
Tamarix	.	.	.	2	.	4	1	.	7
cf. Tamarix	.	.	2	.	1	.	.	.	3
Quercus	.	.	.	.	.	.	4	.	4
Chenopodiaceae	.	.	.	.	.	1	.	1	2
Fraxinus	1	.	.	.	.	.	.	.	1
cf. Fraxinus	.	.	.	.	.	1	.	.	1
cf. Monocot	.	.	.	.	.	.	.	+	+
unknown	.	.	.	.	1	2	.	1	4

6.7B. SWEYHAT CHARCOAL FROM OPERATION 1 (WEIGHT, G)

Locus	1	3	5	13	15	15	15	27	
Lot	31	1	3	2	1	6	22	3	
SW #	1316	0626	1001	2026	2157	2372	93.0478	93.0748	Total
Populus/Salix	0.01	0.08	0.03	0.22	0.10	.	0.01	0.04	0.49
Tamarix	.	.	.	0.39	.	0.83	0.01	.	1.23
cf. Tamarix	.	.	0.11	.	0.05	.	.	.	0.16
Quercus	.	.	.	.	.	.	0.17	.	0.17
Chenopodiaceae	.	.	.	.	.	0.22	.	0.02	0.24
Fraxinus	0.01	.	.	.	.	.	.	.	0.01
cf. Fraxinus	.	.	.	.	.	0.07	.	.	0.07
cf. Monocot	.	.	.	.	.	.	.	0.03	0.03
unknown	.	.	.	.	0.04	0.88	.	0.03	0.95

APPENDIX 6.8

WEIGHT OF CEREAL GRAINS (G)

Op.	Locus	Lot	SW #	Hordeum	Triticum aestivum/durum	T. dicoccum	T. monococcum	Triticum sp.	Cereal indet.
Sweyhat									
1	1	9	615	0.02	.	.	.	.	0.01
1	1	26	1301	0.07	.	.	.	0.01	0.07
1	1	26	1049	0.03	.	.	.	.	0.01
1	1	30	1316	0.32	.	.	.	.	0.20
1	3	1	626	0.05	0.01	.	.	.	0.05
1	3	1	627	0.07	0.02	.	.	.	0.03
1	5	3	1001	0.16	.	.	.	+	0.09
1	9	2	1560	0.37	0.02	.	.	.	0.24
1	9	2	1565	0.64	0.04	+	.	.	0.12
1	9	14	2351	0.06	.	.	.	.	0.13
1	13	2	2026	0.90	0.01	.	.	.	0.24
1	15	1	2157	0.15	0.02	.	.	.	0.09
1	15	6	2372	1.44	0.03	0.03	0.01	.	0.87
1	15	22	93.0478	0.05	.	.	.	.	0.07
1	16	8	2260	0.04	.	.	.	.	0.02
1	16	9	2231	+	.	.	.	.	.
1	27	3	93.0748	0.19	.	.	.	.	0.55
1	27	2	93.0904	1.09	.	.	.	.	0.25
4	3	4	786	.	.	.	.	.	+
4	7	1	2515	.	.	.	.	.	.
4	14	6	1148	+	.	.	.	.	0.01
4	17	6	1147	0.04	.	.	.	.	+
4	18	3	1639	.	.	.	.	.	.
4	18	4	1624	+	.	.	.	.	+
4	18	4	1629	.	.	.	.	.	.
4	18	4	1625	.	.	.	.	.	.
4	21	3	2537	.	.	.	.	.	.
4	21	3	2538	.	.	.	.	.	.
4	22	5	2460	.	.	.	.	.	.
4	23	2	1645	.	.	.	.	.	0.09
4	31	3	1847	.	.	.	.	.	.
4	36	2	2541	.	.	.	.	.	0.02
4	36	2	2542	.	.	.	.	.	.
4	36	5	2547	.	.	.	.	.	.
9	4	1	988	.	.	.	.	.	.
9	4	2	2143	.	.	.	.	.	.
9	4	2	2144	.	.	.	.	.	.
9	5	3	2116	0.01	.	.	.	.	0.02
Hajji Ibrahim									
1/2	11	7	93.1688	1.59	.	.	.	+	0.55
1/2	12	2	93.1680	0.21	.	.	.	.	0.36

APPENDIX 6.9

SWEYHAT LABORATORY PROCEDURES

1. Fill in SW data sheet provenience information (see next page)

2. If sample is larger than about 1 film cannister full, weigh entire sample and record volume (cc). Use sample splitter to obtain about one film cannister of material, and weigh the material to be sorted and record volume (cc). (For each halving, put in separate containers so that it will be possible later to do additional fractions of approximately equal size).

3. For portion to be identified, sift into 4.75 mm, 2 mm, 1 mm, and 0.5 mm sieves.

4. Totally sort charred material larger than 2 mm into wood, seed and seed fragments, straw and stem fragments. Also separate other materials, like bone/shell.
   a. weigh charcoal and record
   b. weigh seeds and seed fragments as a group and record
   c. weigh rachis, straw, and other charred fragments as a group and record
   d. put bone/shell, unidentified carbonized material in separate containers with labels (SW # and substance; for bone and shell put full provenience)
   e. identify the large seeds; record (see below).

5. For the material between 1 and 2 mm, separate whole seeds, identifiable seed fragments (mainly cereal), and rachis internodes; record.

6. For material between 0.5 and 1 mm remove only whole seeds and rachis internodes, and record. Scan the material smaller than 0.5 mm (which usually has very little identifiable material), and extract whole seeds and identifiable rachis internodes, and record.

Recording:

1. Taxa that are frequently found in identifiable fragments include many economically important ones such as cereals (wheat, barley, indeterminate cereal), pulses (grass pea, bitter vetch, lentil et al.), grape, nutshell, etc. They should be recorded by count and weight (of whole ones and of fragments) for material larger than 2 mm and between 1 and 2 mm.

2. For wild and weedy seeds smaller than 2 mm, only counts are necessary. Many taxa may be identified by some unique anatomical feature; a "minimum number of individuals" based on fragmentary remains should be indicated (e.g., 3 whole seeds and 2 distinctive parts can be noted as "3 + 2 MNI").

3. Plant parts should be recorded separately (e.g., rachis internodes, straw, fruit skins, etc.).

4. Obviously modern seeds and not so obviously modern seeds should be recorded as such.

SWEYHAT FLOTATION 199

Tag no.	Op.	Locus	Lot	Other Prov.	Type	Date	Excavator's comment:

Vol.	Vol. (cc)	Charcoal,>2mm		Seed > 2mm		Misc>2		1>seed>2mm		Coll Dt	Flt Dt	sort	id	T
		Lt	Hv	Lt	Hv	Lt	Hv	Lt	Hv	/ /	/ /	/ /	/ /	

GRAIN / NUT	>2	<2	<1
ct			
wt whl			
wt frg			
ct			
wt whl			
wt frg			
ct			
wt whl			
wt frg			
ct			
wt whl			
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wt whl			
wt frg			
ct			
wt whl			
wt frg			

SEEDS (charred)	>2	<2	<1

HEAVY FRACTION CHECK LIST

_____ Bone _____ Botanical
_____ Shell
_____ Metal
_____ Ceramic
_____ Other:

LIGHT FRACTION MISC.

	removed	tossed
_____ Snail shell	____	____
_____ Bone		
_____ Other		
_____ Rootlets	____	____

MISC. PLANT PARTS	>2	<2	<1

SEEDS (uncharred, modern?)	>2	<2	<1

GRAIN etc.

NUTSHELL & GRAPE

LEGUME etc.

COMMENTS

7

FARMING AND HERDING ALONG THE EUPHRATES: ENVIRONMENTAL CONSTRAINT AND CULTURAL CHOICE (FOURTH TO SECOND MILLENNIA B.C.)

Naomi F. Miller

Determining the degree to which environmental conditions constrained agriculture and pastoral production in ancient times is no easy task. To approach this topic with archaeological materials, it helps to be able to compare sites from the same time period in different but adjacent environmental zones, or different time periods of one site. The present chapter examines some of these issues as they relate to the agropastoral economy at a few sites along a 200 km stretch of the Euphrates River in northwestern Syria and southeastern Turkey: Tell es-Sweyhat, Hacınebi Tepe, Kurban Höyük, and Hassek Höyük (Fig. 7.1). These sites date between the late fourth and early second millennia B.C., though the time periods are not equally represented. The longest archaeobotanical sequence comes from Kurban Höyük. The assemblages of plant remains from the other sites each represent a single time period: late fourth millennium for Hacınebi and Hassek, and late third/early second millennium for Sweyhat. The last of these is the only one that can be considered a city.

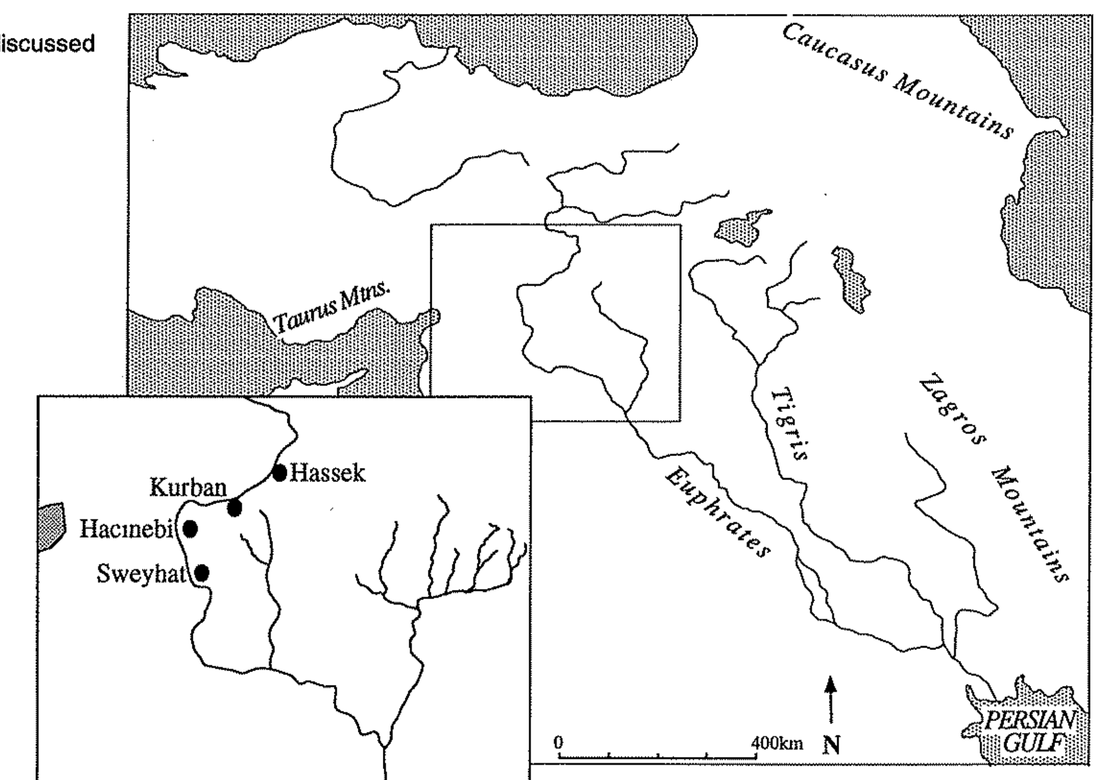

Fig. 7.1. Sites discussed in the text.