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FENLAND MANAGEMENT PROJECT REPORT NO 3: CHARRED PLANT MACROFOSSILS AND MOLLUSCS FROM MORTON FEN SALTERN, LINCOLNSHIRE (MOS 93)

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Summary

Charred plant macrofossils from the site were thought largely to represent residues from fuel used during brine evaporation. The assemblages were composed of cereal processing waste including weed seeds, chaff and grains, with remains of grassland and freshwater wetland plants and halophytes. Charcoal formed only a small proportion of the flots and there was no evidence for peat-burning. It appears that other plant materials were substituted as fuel locally. Barley was the main cereal crop represented. This is unusual at a rural Roman site in East Anglia, (spelt is almost invariably the predominant cereal represented), and is probably indicative of local cultivation on saline soils, for barley is the most salt-tolerant of cereals. Notes on mollusc shells present, mainly hydrobiids, are given, but these add little to the palaeoecological data from analysis of foraminifers and ostracods.

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Introduction

30 bulk samples were collected at this site, from the fills of a salt-evaporating hearth, ditches, pits, the 'buried soil' and overlying sediments. Assessment of the flots indicated that almost all samples included a mixture of charred cereal processing waste with remains of freshwater wetland, salt marsh and grassland species, though the density of material and the range of taxa was variable. In some cases (eg the ditch fill 023 - Sample 2) the charred material was present a thin discrete layers within feature fills, probably representing single depositional events, in others it was more diffuse; but in all cases the material appeared to represent charred residues from fuel used in brine evaporation. Full analysis of all samples from the site was not thought necessary. All samples from the hearth were analysed and a representative selection of samples from other contexts have been examined.

Methods

The samples were processed by manual water flotation and wet-sieving, using 0.5mm meshes throughout. Depending on the amount of material present, the dried flots, or sub-samples of them, were fully sorted under a binocular microscope at low power. Material extracted was identified by comparison with modern reference material.

Results

Charred plant remains from the samples are listed in Table 1 and the presence of mollusc shells is noted in Table 2.

Some of the charred plant macrofossils from these samples were exceptionally well preserved: the cell structure of some _Juncus_ seed testas, for example, was clearly visible. Cereal grains, however, were commonly in a poor state of preservation, badly distorted. Notes on some critical identifications are given here.

In almost all samples, barley was the main cereal crop represented. The grains were mostly deformed, in part because some of them (eg in sample 2) had germinated before charring. However, asymmetrical lateral grains were noted. Rachis internodes of barley were abundant in several samples but few of them were intact. Those which _were_ (excluding basal internodes) had lengths >3mm. So far as could be ascertained, the barley from the site was of a hulled lax-eared variety with three fertile florets per rachis node (_Hordeum vulgare_ var. _vulgare_ fo. _tetrastichum_). This crop has also been reported in the Netherlands as an important Iron Age/Roman cereal (e.g. Brinkkemper 1991, 50). In Table 1, barley rachis internodes from the basal part of the ear (those which would not have carried fertile grains) have been separated where possible.

Culm nodes and fragments of Poaceae (grasses) were present in most samples. In some samples (e.g. 2) charred grass culm formed

Sample number	2	3	6	10	11	13	21	22	23	24	26	30
Context number	23	41	117	205	209	215	318	356	355	317	216	362
Context type	Ditch	Ditch	Ditch	Ditch	Ditch	Ditch	Hearth	Hearth	Hearth	Hearth	Ditch	Pit
Cereals												
Hordeum sp (grains)	22	38	146	5	34	22					3	
Hordeum sp (underdeveloped florets)			5									
Hordeum sp (rachis nodes)	3	77	67	247	6	2					2	
Hordeum sp (basal rachis nodes)		3	30	17								
Hordeum sp (awn fragments)				x								
Triticum aestivum-type (grains)		5									5	
Triticum aestivum (rachis nodes)		6										
Triticum dicoccum (glume bases)		3										1
Triticum dicoccum (spikelet forks)		1	2									1
Triticum spelta (glume bases)		6		1				3			1	1
Triticum spelta (spikelet forks)												
Triticum spelta (rachis internodes)		1									1	
Triticum sp (elongate grains)	1	10		1							3	
Triticum sp (glume bases)		6	1	1	1	1		2				2
Triticum sp (spikelet bases)		1										
Triticum sp (rachis nodes)				1	1							
Unidentified cereal (grains)	9	22	43	9	15	2					5	
Unidentified cereal (rachis nodes)						1						
Herbs (grassland/weeds)												
Apiaceae indet		1		3							1	
Atriplex spp	4	31	103	87							7	
Avena sp (awn fragments)		x				x						
Avena sp (floret bases)		1										
Avena sp (grain)		5	11			1						
Avena/Bromus	2	1	5	4		1						1
Bromus mollis/secalinus		3	1	64	3	4					8	
Chenopodiaceae indet		23	41	28	7			4			4	1
Chenopodium album L		8		2								
Chenopodium cf rubrum/glaucum		4										
Chenopodium ficifolium Sm		19		1					1		1	
Cirsium/Carduus											1	
Euphrasia/Odontites											1	
Fallopia convolvulus (L)					1						1	
Galium sp		1										
Galium aparine L		10										
Lapsana communis-type			1									
Medicago-type		3	1	3	2							
Mentha sp				1								
Plantago lanceolata L												2
Plantago major L		4	5	3	2						3	
Plantago sp		1		2			2	16		3		
Poaceae indet	4	50	25	91	9	11	2	39	1	3	24	2
Poaceae indet (floret)					1							
Polygonaceae indet		1					1					
Polygonum aviculare agg		3	4	8	1							
Prunella vulgaris L						1						
Ranunculus sp					1							
Rumex sp		3										
Stellaria media-type				1								
Trifolium sp(p)	3	17	20	99	5	2					3	1
Tripleurospermum maritimum (L) Koch		3										
Vicia/Lathyrus spp		42	2	2								
Halophytes and other coastal plants												
Apium graveolens L								1				
Glaux maritima L					3							
Juncus cf gerardii Loisel (seed aggregate)					x							
Plantago maritima (capsule lids)		2		2							2	
Primulaceae cf G. maritima				1								
Scirpus maritimus L		7									15	1
Suaeda maritima (L) Dumort		1		1							4	
Aquatics and plants of wet soils												
Carex spp			1	3	1							
Cyperaceae indet		2		1		1						
Iris pseudacorus-type (fruit fragments)											x	
Juncus sp(p) (capsules)		3	8	1		5					2	
Lycopus europaeus L					2							
Scirpus sp		2		1				1			4	
Vegetative plant material												
Buds				6	1							
Cyperaceae (stem fragments)											x	
Monocot (stem fragments)		x	x	x		x					x	
Poaceae (culm bases)			25									
Poaceae (culm fragments)	xxx	xx	xxx	x	xx	x		x			xx	xx
Poaceae (culm nodes)	16	21	100	3	8						10	2
Rhizome fragment					x							
Unidentified seeds etc.	3	12	6	28	5	1		2	1		12	1
Sample volume (litres)	0.75	7	7	6	7	5	3.5	2	3	4	7	0.75
% flot sorted.	100	100	12.5	50	25	50	100	100	100	100	50	100

→ amount of flot in ml.

Table 1: Charred plant macrofossils from site MOS 93. Taxa are represented by fruits or seeds except where indicated. See text for notes.

Sample number	3	6	10	11	26
Context number	41	117	205	209	216
Context type	Ditch	Ditch	Ditch	Ditch	Ditch
Terrestrial/marsh molluscs					
Succinea sp					x
Carychium sp					x
Vallonia excentrica	x				
Vertigo sp		x			
Pupilla muscorum	x				
Brackish/estuarine molluscs					
Hydrobia ulvae	x *		x *		x *
Hydrobia ventrosa	x *				xx*
Hydrobia sp				x *	

Table 2: Mollusc shells from flots sorted at MOS 93. * indicates some shells discoloured by burning.

the bulk of the flot. The nodes were very variable in size (1-6mm in diamter) and must represent a range of grass species and, perhaps, cereals. In general, they were large, and commonly showed adventitious buds above the node. A few well-preserved examples showed short hairs in the position of the ligule. They were thought to be mainly of Phragmites australis (common reed), though poor preservation limited the certainty of identification in many cases.

Other vegetative plant material included buds (probably from Phragmites nodes), culm bases with buttress roots, monocotyledonous stems with triangular cross-sections (Cyperaceae) rhizome fragments and indeterminate monocot stem fragments, some of which were from the basal parts of inflores cences.

Juncus spp (rushes) were represented mainly by immature capsules and capsules with mature seeds which had fused into a tarry mass during charring. In sample 26, the capsule bracts had burnt away, leaving an aggregate of well-preserved seeds. They were large seeds with laterally elongate cells in longitudinal rows and with longitudinal cell walls thickened more than transverse walls. In the present context J. gerardii is the most plausible identification.

The Scirpus nutlets were variably preserved, though many showed the outer glossy layer of distinct sub-circular cells characteristic of S. maritima. Others had lost this layer and were not specifically identifiable.

Some recent intrusive uncharred plant material was present in all samples. In general, this was readily distinguished and discounted. However, some seeds of Chenopodiaceae were more problematic. Doubtful specimens have been excluded from Table 1.

Discussion

The samples from the fills of the hearth (21-24) produced very little charred material: probably the structure was cleaned out between each firing and the charred residues discarded in nearby pits and ditches. These produced most of the plant material from the site. The sparse material present in the hearth samples was, however, similar in composition to those from secondary contexts.

The charred assemblages were clearly mixed. Cereal processing waste was an important component in some samples (e.g. 3, 6 and 10), in which barley chaff was common. Other samples (e.g. 2, 11 and 13) included grains but little chaff, probably as a result of differential preservation during charring. Although some of the barley grains had germinated before being charred, it is improbable that the material relates to malting: an essential prerequisite for malting is a good supply of fresh water, but foraminiferal evidence (M. Godwin, in prep) has established that the site was located in an intertidal environment, as would be expected at a saltern. Sprouting of residual grains in processing waste was presumably just accidental.

Barley was the predominant crop in all the larger samples analysed and in other samples assessed from the site (Murphy, unpublished). Wheats (emmer, spelt and bread wheat) were fairly consistently represented by grains and chaff, but were never common. This is most unusual at Roman sites in East Anglia: spelt is almost always the main crop represented. It seems probable that the predominance of barley at this coastal site was related to its salt-tolerance compared to wheat (Baykal 1979). At late prehistoric to early medieval coastal sites in the Netherlands and Germany, barley and oats (the latter does not seem to have been an important crop in Roman Britain) are invariably the main cereals (Behre and Jacomet 1991, 91). Experimental work in the Netherlands has shown that 'four-row' barley, the crop represented here, is the only cereal capable of producing acceptable yields in highly saline environments (Bottema et al 1980; Koerber-Grohne 1967; Van Zeist et al 1977). For this reason, it is thought that the barley waste used as fuel at the Morton Fen saltern came from arable areas subject to saline influence close to the site.

Further evidence for locally saline environments came from the charred remains of salt-marsh plants (Glaux maritima, Juncus cf gerardii, Plantago maritima, Suaeda maritima) and of Scirpus maritimus, the sea club-rush, which commonly grows on the margins of tidal creeks. Phragmites (reed) culm fragments were also common in many samples. This species is common in brackish marshes. Freshwater wetland plants (eg Carex spp, Lycopus europaeus and probably Iris pseudacorus) were present but less common.

The remaining terrestrial plants identified included weeds, which probably arrived at the site with cereal processing waste, and grassland species. By far the commonest weeds present were in the Chenopodiaceae - a plant family with a predominantly but not exclusively maritime distribution. Fruits of grasses (Poaceae) occurred in all samples, often with seeds of small leguminous grassland plants such as Trifolium spp (clovers) and Plantago major (rat's tail plantain). Other grassland herbs occurred at lower frequencies.

It is thought that all the charred material from the site, derived from nearby cereal production, coastal vegetation and grassland, had been imported for use as fuel. The absence of Cladium mariscus (sedge) nutlets in these samples contrasted markedly with samples from Roman saltern debris under the Roman road at London Lode Farm, Nordelph, Norfolk (Murphy, in prep), where Cladium was the commonest species. It is thought that, at Nordelph, the sedge nutlets were residues from the burning of sedge peat as a fuel; indeed peat-cuttings of Roman date are known from aerial photographs in the vicinity of that site. There is no evidence at all from Morton Fen for the burning of sedge peat. Moreover, the flots included remarkably little charcoal, perhaps indicating that wood was in short supply locally.
It seems possible that the mixed and diverse assemblages of charred plant remains from Morton Fen resulted from the use of alternatives to peat and wood as fuel.

Molluscs

Small numbers of shells were extracted from the flots sorted for charred plant macrofossils (see above and Table 2) and other shells were noted in flots and residues from other samples. Besides the taxa noted in Table 2, there were occasional scraps of _Mytilus edulis_ (mussel) and _Littorina_ sp (winkle) shell, with the freshwater _Planorbis planorbis_ (in sample 4, Ct. 42), and _Armiger crista_ and _Anisus_ sp (in sample 27, Ct. 397). The terrestrial snail _Vertigo angustior_ occurred in sample 15, Ct. 216. Brackish-water hydrobiids consistently predominated in these sparse assemblages.

Some shells of _Hydrobia ulvae_ and _H. ventrosa_ showed signs of discoloration by burning. Presumably they were accidentally imported to the site with plants such as _Scirpus maritimus_, intended for use as fuel.

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