FILECOPY.

2026

Ancient Monuments Laboratory
Report 146/87

STANSTED AIRPORT, ESSEX: EXPERIMENTAL PROCESSING OF SAMPLES OF DEPOSIT CONSISTING OF RE-WORKED CHALKY BOULDER CLAY.

Peter Murphy BSc MPhil

Ancient Monuments Laboratory Report 146/87

STANSTED AIRPORT, ESSEX: EXPERIMENTAL PROCESSING OF SAMPLES OF DEPOSIT CONSISTING OF RE-WORKED CHALKY BOULDER CLAY.

Peter Murphy BSc MPhil

Summary

Samples from sites on clayey Till are difficult to disaggregate. Acceptable rates of retrieval for carbonised plant remains are particularly hard to achieve where processing of many bulk samples in the field is necessary, for in these circumstances toxic or corrosive chemical reagents are too expensive and hazardous to be used. Experimental processing of samples from Stansted shows that pre-soaking in Calgon solution, followed by manual flotation in the field and a second treatment of any undisaggregated residue with reagents such as H_2O_2 in the laboratory before re-floating is the best method. 100% retrieval probably cannot be obtained, however, since the vigorous methods needed for disaggregation are likely to destroy a proportion of the macrofossils present.

Author's address :-

Centre of East Anglian Studies
University of East Anglia
Norwich
Norfolk NR4 7TJ

Introduction

Samples from archaeological deposits formed from Chalky Boulder Clay in Essex are commonly difficult to process since disaggregation of the soil matrix poses problems. At previous excavations on this Till sampling has been on a comparatively small scale and the samples were small enough to be processed in the laboratory. At some sites (eg. Chignall St James; Hill Hall) drying and re-wetting was found to be adequate to ensure near-complete disaggregation, but at Ivy Chimneys, Witham some soil aggregates were found to be resistant even to hydrogen peroxide treatment (Murphy, unpublished data). At the Stansted sites extensive collection of large samples was required, involving on-site processing. It was necessary to devise appropriate processing methods to obtain acceptable retrieval rates without using toxic or corrosive reagents in the field, since these might be hazardous when used outside the laboratory, besides their expense. The use of a flotation machine was not thought to be appropriate due to problems of disaggregation: manual methods were used.

Methods

Two samples from the sites at Molehill Green (MGS 86B) and the Airport Catering Services site (ACS 86) were examined. The samples were initially processed using methods possible in the field. From each sample three sub-samples were removed. They were processed in the state of air-dryness which could be achieved in the site store. One sub-sample from each sample was manually flotated using a 0.5mm. mesh without pre-soaking; a second sub-sample was manually flotated after pre-soaking for four days in water; a third was manually flotated after pre-soaking for four days in Calgon solution. The residues were then dried and weighed, after which they were soaked for two days in NaOH solution and then refloated manually. The residues from this second flotation were once more dried and weighed before sorting to extract bone fragments. The flots from both flotations were sorted separately under a binocular microscope at low power extracting carbonised plant macrofossils, which were counted and identified. Finally soil aggregates remaining in the residues were treated with water and dilute H_2O_2 to see whether complete disaggregation could be achieved.

	MGS 86B Context 112 (Sample 4)			ACS 86 Context 201 (Sample 33)		
	Not pre-soaked	Pre-soaked in water	Pre-soaked in Calgon solution	Not pre-soaked	Pre-soaked in water	Pre-soaked in Calgon solution
Original weight of sub-sample (kg)	4	4	4	3.75	4	4
Residue weight after first float (kg)	0.99	0.48	0.35	1.25	0.97	0.9
% of original weight	24.7	12.0	8.7	33.3	24.2	22.5
Residue weight after second float (kg)	0.25	0.23	0.15	0.70	0.55	0.57
% of original weight	6.2	5.7	3.7	18.7	13.7	14.2
Total no. of macro-fossils in first float	363	361	346	7	3	7
Total no. of macro-fossils in second float	53	50	22	1	2	5
% of total macro-fossils recovered in first float	87.3	87.8	94.0	Not significant		

Table 1: Results of experimental processing.

	Not pre-soaked		Pre-soaked in water		Pre-soaked in Calgon solution	
	1st flot	2nd flot	1st flot	2nd flot	1st flot	2nd flot
Triticum sp. ca (a)	225	16	215	32	209	16
Triticum sp. rn (b)	8	1	6	1	10	-
Triticum sp. ri.fr	1	1	1	1	5	-
Hordeum sp. ca	3	-	1	-	-	-
Avena sp. ca (c)	14	-	10	-	13	1
Cereal indet. ca	42	11	60	4	42	2
Ranunculus acris/repens/bulbosus	1	-	1	-	-	-
Brassica sp.	-	-	1	-	-	-
Atriplex patula/hastata	2	-	-	-	1	-
Chenopodiaceae indet.	1	-	1	-	2	1
Medicago lupulina-type	1	-	2	-	-	-
Vicia/Lathyrus sp(p)	3s+10co	3s+1co	4s+5co	2s+2co	5s+5co	-
Leguminosae indet. (d)	3s+2co	-	2s+2co	-	2s+3co	-
Rumex sp.	5+2cf	-	5+2cf	2	4	1
Euphrasia/Odontites sp.	1	-	-	-	-	-
Anthemis cotula L	28	17	30	4	34	-
Lapsana communis L	-	-	1	-	1	-
Carex sp.	-	-	1+1cf	-	-	-

Bromus mollis/secalinus	5	1	6	-	5	1cf
Gramineae indet.	4	1	1	-	1	-
Indet. seeds etc.	2	1	2	2	4	-
Indet. bud	-	-	1	-	-	-

Table 2: Plant macrofossils from MGS 86B, Context 112, Sample 4.

Taxa are represented by fruits or seeds except where indicated.

Abbreviations: ca - caryopses; co - cotyledons; fr - fragments; ri - rachis internodes; rn - rachis nodes; s - seeds.

Notes: (a) Short-grained forms. (b) Identifiable nodes are from hexaploid species. (c) Some germinated.

(d) Large seeds cf. *Vicia* or *Pisum*.

		Not pre-soaked		Pre-soaked in water		Pre-soaked in Calgon solution	
		1st flot	2nd flot	1st flot	2nd flot	1st flot	2nd flot
Triticum cf. spelta L.	spb	1	-	-	-	-	-
Triticum sp.	spb	-	-	-	-	-	1
Triticum sp.	gb	-	-	2	-	2	-
Triticum sp.	ri	-	-	-	-	1	1
Cereal indet.	ca	1	-	-	1fr	1	1
Montia fontana subsp. chondrosperma		-	-	-	1	-	1fr
Vicia/Lathyrus sp.		1co	-	-	-	-	-
Rumex sp.		1	-	-	-	1+1cf	1
cf. Galium aparine L.		1fr	-	-	-	-	-
Bromus mollis/secalinus		-	-	-	-	1	-
Gramineae indet.		1	-	-	-	-	-
Indet.		1	1	1	-	-	-

Table 3: Plant macrofossils from ACS 86, Context 201, Sample 33.

Taxa are represented by fruits or seeds except where indicated.

Abbreviations: ca - caryopses; co - cotyledons; fr - fragments; gb - glume bases; ri - rachis internodes; sp - spikelet bases.

Results (Tables 1-3)

Pre-soaking in Calgon clearly helps disaggregation. After the first flotation in 'field' conditions the residue from the sub-sample which had been pre-soaked in Calgon was less for both contexts. Complete disaggregation is, however, not possible by this means: a second treatment in the laboratory with a more powerful reagent is necessary. A second treatment with dilute NaOH almost completely disaggregated the matrix of MGS 86B 112, but was much less successful with that from ACS 86 201: the final residue from this sample contained (besides fragments of chalk, flint, limestone, derived fossils, fired clay, bone and mollusc shells) many small hard clay aggregates. Even within the area of the Stansted project there are clearly variations in the lithology of the Till. Treatment of these remaining clay aggregates with dilute H_2O_2 disaggregated most, though not all, of them.

Conclusions

It is probably not possible to retrieve 100% of carbonised plant macrofossils from these samples: any method vigorous enough to disaggregate the clay matrix of the samples may be likely to cause some destruction of macrofossils. However, the most successful method is to pre-soak in Calgon, manually flotate the samples in the field and re-treat the residues in the laboratory. By this means a representative, though not complete, collection of material can be obtained, and if the same methods are used for all samples, reliable intra-site comparisons can be made. This two stage processing will inevitably limit the number of samples which can be processed in the time available. There is no evidence to suggest that different processing methods affect sample composition (see Table 2).