ANCIENT MONUMENTS LABORATORY

REPORT
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SERIES/No. ENVIRONMENTAL 55/76

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TITLE Investigations into soil samples and some comments on modern contamination at Winklebury, Hants.

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SOME COMMENTS ON MODERN CONTAMINATION AT WINKLEBURY

Early in 1976 a soil sample (No 760315) from an Iron Age hill fort at Winklebury, Hants was submitted to the Ancient Monuments Laboratory because seeds had been observed in the deposit during excavation. It had been taken about 40 cms up in the fill of an Iron Age pit, approximately 1 m below ground level. The layer sampled was a very open chalk rubble containing little finer material and overlain by a loamy deposit containing chalk fragments.

The damp sample (wt 5.2 kg) was passed through a 9 mm sieve to remove some of the chalk rubble. Water was then added to the finer material and the sample agitated gently. The flotant was collected on 300 and 425/1 sieves. It was immediately apparent that it contained an enormous quantity of weed seeds from one species. The flotant also contained a large quantity of modern roots, a few arthropod remains, some snail shells, a small amount of finely divided wood charcoal, and a few charred cereal grains. So many seeds were obtained by this method that further separation techniques were not applied to the non-floating residue, although this probably contained additional seeds.

The seeds were dried and the number recovered was estimated (by weighing) to be in the order of 30,000. They were identified by Miss P J Paradine (DOE Consultant) as Atriplex patula L. (Orache). One seed of Galium aparine L. (Cleavers), a few Lamium sp.? nutlets, and fragments of Papaver sp. (Poppy) were also present. In the dry state, the black seeds were hard and brittle, resembling charred material. However, when they were initially separated from the deposit they were flexible, which is definitely not a characteristic of charred seeds. A sample was submitted to Mr J Greig (DOE Research Fellow, University of Birmingham) who made the following comments:-

" The sample of Winklebury seeds examined had no sign of the outermost layer, the pericarp, but this absence is not surprising since it is only rarely preserved in the Chenopodiaceae. The next layer, the shiny black testa, had become dull in all cases and cracked in a few of the examples from Winklebury, and the inner layer, the endocarp, was present in all the seeds opened, and consisted of a layer of brown tissue stuck to the underside of the testa. It did not appear to be carbonised although it had turned rather dark brown in one or two examples.

The Atriplex seeds from Winklebury were compared with recent examples from the collection in the laboratory, and with subfossil Chenopodium seeds from the Roman sewer at York, one of which was apparently carbonised. One method of testing used was to examine the testa under a transmitted-light microscope with powerful illumination ----- recent Atriplex seeds transmitted a red light, while the subfossil Chenopodiaceae seeds varied considerably in their ability to transmit light except the apparently carbonised seed from York, although this last proved difficult to test, but appeared opaque. The testae of the Winklebury seeds appeared to be as translucent as the range of the York examples, but not to the same extent as the fresh material. The apparently carbonised seed from York had many fine cracks in the testa and was not in nearly such good condition as the Winklebury seeds, as well as being far more brittle.

In conclusion it can be said that the Winklebury seeds compare with subfossil examples which were preserved in rather wet conditions and somewhat damaged, on the basis of surface appearance, presence of woody endocarp layer, translucency and flexibility of testa layers with little cracking or bubbling to indicate carbonisation. The dull appearance of the testa can be attributed to poor preservation. It would be difficult to rule out slight carbonisation but that would seem unlikely."

It therefore seems that the Atriplex patula seeds were not charred, although some deterioration had occurred. This is an important point, because the Winklebury site is situated on chalk and is well drained. It is therefore most unlikely that uncharred seeds could have survived in the deposits since the Iron Age. This means that the Atriplex patula seeds are most probably of relatively modern origin.

It is generally recognised that some modern contamination occurs on most archaeological sites.[1] However, concentrations of modern seeds are generally quite low, and they are often unnoticed unless large-scale water flotation is carried out. A very high concentration of modern seeds such as this is unusual.

Subsequent information from the excavator indicated that the sampled pit was cut by a pipe trench associated with the foundations of a modern bungalow. Therefore, it might not seem surprising that modern contamination was present in these samples. However, the excavator did not consider that the sampled area had been disturbed by the modern trench. There are a number of ways in which this contamination may have arisen. Assuming that the topsoil was unusually seed-rich and virtually monospecific in content, it can be explained by the introduction of modern soil into the deposit (eg by the usual means[1] of earthworms, root holes, drying cracks, etc, or by unrecognised disturbance by the pipe trench). It is perhaps rather unlikely that the topsoil would have contained so many seeds of one species, but unfortunately, it is not possible to investigate this because the soil in this area had been removed prior to excavation. Alternatively, many of the small mammals will burrow and also create food stores underground (eg bank vole (Clethrionomys glareolus), harvest mouse (Micromys minutus), wood mouse (Apodemus sylvaticus).[2,3] Some species also utilise the burrows of other animals (eg badger and mole) and make food stores.

At least some of the small mammals utilise weed seeds as a food source; for example, one study[4] indicates that wood mice and bank voles eat small seeds such as nettle (unfortunately Atriplex sp. was not present as a potential food source in this case and therefore is not recorded as being eaten). It is quite likely that some of these species were present at Winklebury, although unfortunately there is no record of the modern small mammal population.

The common ant Lasius niger is also capable of accumulating this quantity of seeds.[5] It is apparently not recorded as carrying Atriplex sp., but it commonly takes Viola sp. seeds, which are of comparable size.

References

1. Keepax C A, 1976 Contamination of Archaeological Deposits by Biological Material of Modern Origin. AML Report No 2,000.

2. Van den Brink, F H, 1967 A Field Guide to the Mammals of Britain and Europe. Collins: London

3. Lawrence, M J, Brown, R W, 1973 Mammals of Britain: their Tracks, Trails and Signs. Blandford: London.

4. Watts, C H S, 1968 The Foods Eaten by Wood Mice (Apodemus sylvaticus) and Bank Voles (Clethrionomys glareolus) in Wytham Woods, Berkshire. Journal of Animal Ecology 37 25-41.

5. Dr J Pontin, Royal Holloway College University of London. Personal communication.

Carole A Keepax

MC/F

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MATERIAL SOIL etc

SITE: WINKLEBURY ..... (DATE:

SHEET: 1 .....

AM No	~~X-Ray~~ ~~Photo~~	Description and Report	Ref No
760313	"Ashy loam layer sealed between clay layers of pit. ?Identity of white flecks".	The white flecks were found to be small tunnel-like structures about 0.5 to 1.0 mm in diameter. This material effervesces very strongly with dilute hydrochloric acid, indicating that it is a carbonate, probably calcium carbonate (chalk). When examined at 32X magnification, the material was found to be composed of a regular arrangement of granules resembling the cellular structure of plant roots. This seems to be different to the calcium carbonate-replaced fungal hyphae discovered during the previous excavation at Winklebury (A.M. Lab. report by Mr L Biek, 6 September 1960).	951-9900

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MATERIAL SOIL etc

SITE: WINKLEBURY ..... (DATE:

SHEET: 2

AM No	~~X-Ray~~ ~~Nox~~ ~~Photo~~ No	Description and Report	Ref No
760314	'Vegetable matter? Greenish-spongy textured with fibrous appearance. Low down in pit.'	This sample was not found to display a greenish colour when examined - it is 7.5YR 4/2 moist (brown) on the Munsell chart. There was no obvious 'fibrous' appearance, although the presence of modern roots may have given this impression. The sample is a loam containing a large amount of finely divided wood charcoal and a few snail shells. It seems that some ash may also be present. This could account for the unusual texture noted in the field.	7759901

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MATERIAL SOIL etc

SITE: ...WINKLEBURY..... (DATE:

SHEET: 3 .....

AM No	~~X-Ray No~~	~~Photo No~~	Description and Report	Ref No
760315	"Carbonised seed-eroded chalk sides."		(See separate report for full discussion of this sample). The flotant was found to contain:- 1. A large quantity of modern roots. 2. A few arthropod remains (possibly modern). 3. Some snail shells. 4. A small amount of finely divided charcoal. Most of this was too small for reliable identification, but a few fragments were tentatively identified as hazel (Corylus avellana L.) 5. Two charred wheat grains, Triticum sp. (Identified by Mr J R B Arthur). 6. An enormous quantity of small weed seeds (probably modern). Because of the contamination and the comparative lack of cereal grains, it was not considered worthwhile to sieve the residues for non-floating grains.	624-3900

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MATERIAL SOIL etc

SITE: WINKLEBURY ..... (DATE:

SHEET: 4 .....

AM No	~~XXXXXXXX~~	~~XXXXXXXX~~	Description and Report	Ref No
760316	"Carbonised grain-chalk backfill."		Sample wt. 6.8 kg. Water was added to the dry sample with gentle agitation by hand. The flotant was collected on 300 and 425 μ sieves. It was sorted at 10x magnification and was found to contain the following material:- 1. A medium amount of modern roots. 2. Some arthropod remains:- Arthropoda Millepedes (including a species with a preference for human faeces) Insecta Staphylinidae - Tachyporinae indet Elateridae - Two larval end segments - "wireworms." Acaria Soil mites It is not possible to say if the arthropods are modern - eg "wireworms" are burrowing insects. (Miss M Girling) 3. A large quantity of snail shells. 4. A large amount of finely divided wood charcoal:- Many of the fragments were too small for identification, but the following species were identified:- Ash (Fraxinus excelsior L.) Oak (Quercus sp.)	623-3901

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MATERIAL SOIL etc

SITE:....WINKLEBURY..... (DATE:

SHEET: 4 (cont'd) .....

AM No	[illegible]	[illegible]	Description and Report	Ref No
			Probably hawthorn-type (Crataegus/Pyrus/Malus/ Sorbus sp.)	
			Possible hazel or alder (Alnus glutinosa (L.))	
			5. One charred cereal grain:	
			One wheat grain, Triticum sp. (Mr J R B Arthur)	
			Because of the comparative lack of cereal grains, it was not thought worthwhile to sieve the non-floating residues for these.	

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MATERIAL SOIL etc

SITE: WINKLEBURY (DATE:

SHEET: 5

AM No	XxRxxxMx	xxxxxxxx	Description and Report	Ref No
760317	"Charcoal, burnt bone backfill."	seed, and - chalk	Sample wt. - 5.7 kg. The sample was treated as described previously. The flotant was found to contain:- 1. A large amount of modern root material. 2. Some arthropod remains, mainly millepedes. These seem to be replaced by calcium carbonate and are being reported on separately. 3. Some snail shells. 4. Some finely divided wood charcoal:- Many of the fragments were too small for identification, but the following species were found to be present:- Ash Oak Hawthorn-type 5. Two broken charred wheat grains, Triticum sp. (Identified by Mr J R B Arthur). 6. Tiny fragments of spongy bone and a few mammal vertebrae were present in the flotant. Larger fragments of burnt bone were present in the non-floating residue. Because of the comparative lack of cereal grains, it was not thought worthwhile to sieve the non-floating residue.	903-3902