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Assessment of biological remains and sediments from Roman deposits at Cumbria College of Art, Stanwix, Carlisle (site code ARC94)

by

Allan Hall, Harry Kenward, Frances Large and Raimonda Usai

Summary

A dark humic silt, exposed beneath a feature interpreted as a parade ground for the Roman fort at Stanwix, Carlisle, has been examined for its pedological characteristics and its content of biological remains. It appears to have been a soil which developed *in situ* before being buried by the parade ground make-up, its surface layers perhaps being disturbed, and even truncated, to an unknown extent.

Three samples from this 'old ground surface' were found to have a very variable content of plant and insect macrofossils but the two useful assemblages recovered from this deposit pointed to the presence of grassland, perhaps locally moist, and undoubtedly grazed. Pollen and spores were also present in these two samples and preliminary examination showed them to include tree/shrub taxa and perhaps also some evidence of heathland. A fourth sample, from a patch of 'brushwood' overlying the buried soil was found to consist mainly of remains of what was probably hay, together with some brushwood; the most likely origin of this is as horse dung, the brushwood originating either separately or as a component of stable manure.

Further investigations of these unusual deposits are recommended.

Authors' address

Environmental Archaeology Unit
University of York
Heslington
York YO1 5DD

Telephone: (01904) 433843-51
Fax: (01904) 433850

Prepared for:

Carlisle Archaeological Unit
Department of Leisure and Community Services
Carlisle City Council
Civic Centre
Carlisle CA3 8QG

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Introduction and methods

Excavations at the Art College of Cumbria at Stanwix, Carlisle, revealed a thick sandy clay dump interpreted as the parade ground for the adjacent fort. Beneath it was a black horizon present over most of the area excavated. Four samples of sediments, three from this supposed old ground surface, and a fourth from a layer of 'brushwood/vegetation' lying on top of the this surface were submitted for an assessment of the deposits for bioarchaeological analysis. In addition, some samples of undisturbed sediment were recovered from sections during excavation.

The samples of organic sediments were examined in the laboratory and a description made using a standard *pro forma*. 'Test' subsamples of 1 kg were processed using techniques described by Kenward *et al.* (1980; 1986). In all cases, samples were soaked for 1-3 days and sodium pyrophosphate was used to assist disaggregation of samples 55 and 56 when it became clear from examination of sample 54 that the humic silts (context 122) were rather difficult to disperse. Pollen and other microfossils were examined in a cursory way from samples 54 and 56 using a 'squash' (cf. Dainton 1992).

Results

The 'palaeosol'

The layer beneath the organic horizon 122, was described in the field as follows:

bBg1 Light brown sandy clay with very frequent continuous root channels, these having very frequent black coatings and black continuous or discontinuous, dense or loose infillings. Probably weak blocky structure and gradual lower boundary; over:

bBg2 Greyish brown to greyish sandy clay with rare roots and very frequent mottles (more abundant towards the lower part of the horizon). Very weak to massive structure.

Locally, this sequence was replaced by:

humic black **H** layer (122) with clear and distinct lower boundary over:

bA horizon, gradual lower boundary, over:

bE horizon (tentatively identified), over:

bBg horizon.

The analysed samples

Field descriptions of the sediments are included here together with the results of laboratory analyses of the samples.

Context 122 ('old ground surface')

Described in the field as a black, very well humified, organic horizon with a large sandy component. Generally clear and distinct to gradual and diffuse boundary to the horizon below. No roots and no plant remains visible to the naked eye. Structure apparently massive. In places, this layer appeared to fill narrow linear grooves in the underlying **bBg** horizon, interpreted by the excavator as the result of ploughing through layer 122.

Sample 54

Dark brown more or less homogeneous humic sandy silt with occasional patches of pinkish sand <20 mm across.

On disaggregation, it was clear that most of the material was fine humic matter and/or silt which passed the 300 μm-mesh sieve. The very small residue consisted of a few cm^3 of sand and undisaggregated humic sediment with a few grit clasts to 10 mm and a single stone/pot fragment to 25 mm maximum dimension.

In both the small 'flot' from paraffin flotation and the residue, plant macrofossils were present in small numbers and preservation was generally rather poor. The largest numbers of remains were fruits of grasses and seeds of rushes. The former included cf. *Danthonia decumbens* and *Alopecurus* sp., but at least two or three other types were present. The *Juncus* seeds were predominantly toad-rush, *J. bufonius*, with a few *J. conglomeratus/effusus/ inflexus*. Also present were a few seeds of probable weed and/or grassland species, *Heterodera* (nematode) cysts, *Cenococcum* (soil-fungus) sclerotia and a few root fragments. Charcoal to 5 mm was present in very small amounts and there were a few charred twig fragments to 3 mm diameter by 15 mm maximum length. Insect remains were present in fairly small numbers and included some common dung beetles, a few plant feeders and some decomposer species most likely to be found together in natural litter.

Pollen observed in a 'squash' was moderately common and quite well preserved; the chief types noted were alder (*Alnus*) and some other trees/shrubs, with a few herbaceous types.

Overall, the biological remains confirm that this is, indeed, a buried soil surface, the grass and rush remains presumably indicating turf, perhaps with impeded drainage. The tree pollen may have originated some distance from the soil, although the possibility that it came from patches of brushwood (cf. sample 12) cannot be ruled out. The insects offer a strong hint that this was grazing land.

Sample 55

Dark brown (?slightly humic) sandy silt with occasional pinkish flecks and a few stones to 5 mm.

There was only a very small residue from this subsample, consisting mainly of sand with a little gravel to 15 mm and rare pellets of undisaggregated silt. A trace of charcoal to 5 mm was recorded, along with traces of rootlets, a sedge nutlet and a few poorly preserved arthropod fragments. The organic content of this part of context 122 had clearly either been low at deposition or else had become much reduced through decay post-depositionally.

Sample 56

Black to dark brown, more or less homogeneous, humic silt with occasional pinkish sand patches to 5 mm.

The small residue consisted largely of undisaggregated amorphous organic material and sand with a few stones to 10 mm. The >1 mm fractions, in particular, were quite rich in 'seeds', however, whose preservation was generally good. Some of the material appeared quite strongly compressed, notably some ?hazel buds, which were quite frequent, and some small twig fragments. The rest of the assemblage consisted predominantly of plants certainly or probably of grassland habitats, especially buttercups (*Ranunculus* Sect. *Ranunculus*), ragged robin (*Lychnis flos-cuculi*), sedges (*Carex* spp.), yellow-rattle (*Rhinanthus* sp(p).), sheep's sorrel (*Rumex acetosella* agg.), purging flax (*Linum catharticum*), small legume flowers and some grasses, including heath-grass (*Danthonia decumbens*, represented by free caryopses and whole spikelets containing caryopses). Toad-rush (*Juncus bufonius*), indicative of trampled wet places, was also quite frequent and perhaps an indicator of impeded drainage, at least locally. The single moss identified, *Calliergon cuspidatum*, probably also grew in moist grassland, but some of the taxa (*L. catharticum*, *R. acetosella*) are perhaps more consistent with well-drained soils.

The small group of insect remains included dung beetles, plant feeders associated with herbaceous vegetation, and some species typically found together in herbaceous litter.

Pollen from a 'squash' was sparse but quite well preserved; it included birch and Ericales which may suggest vegetation on leached soils, in contrast to the spectrum observed for sample 54.

The plant macrofossil and insect evidence again suggests the presence of grazing land, perhaps wet in places; impeded drainage may have been responsible for the good state of preservation of so much organic material. The ?hazel buds and small twig fragments suggest the presence of another kind of vegetation, or the incorporation of a different component (?brushwood) into the soil.

Context 96

Sample 12 (brushwood/vegetation lying on OGS)

Dark brown (oxidising darker), compressed structured peat with flattened twigs to 25 mm maximum diameter and about 350 mm length, and patches of straw-like material with some humic silt and occasionally grit/gravel to 10 mm. On disaggregation, a small sand component became obvious.

The 1 kg subsample yielded a very large residue and paraffin flotation was extremely difficult because of the large component of herbaceous plant detritus.

Although not identified closely, the bulk of the herbaceous detritus was probably from grasses. Given the other taxa present—which included cow parsley (*Heracleum sphondylium*), *Rhinanthus*, *Danthonia*, *Ranunculus* Section *Ranunculus*, small legume flowers, and sedges, this material was probably hay rather than straw. There was at least one probable cornfield weed, *Bilderdykia convolvulus*, which might represent a straw component, but since there were also fragments of uncharred cereal caryopsis, including wheat/rye (*Triticum/Secale*) and barley (*Hordeum*), it could have come from animal feed. This organic material therefore probably included some horse dung and this was certainly the impression gained from observations of the raw material in the hand.

The twigs examined proved to be oak (*Quercus*) and oak bud-scales were also present in the subsample examined, along with leaf abscission pads from an (unidentified) tree.

A squash for pollen and other microfossils was not made for this sample since it seemed clear from inspection of the raw sediment that it was a mixture of different materials.

Modest numbers of insect remains were present. Although no taxa were abundant, there was a range of species which formed a distinctive and often-observed community; these were *Typhaea stercorea*, *Anthicus floralis* or *formicarius*, *Cryptolestes* sp., *Sitophilus granarius*, *Lathridius minutus* group and *Cryptophagus* sp. This grouping may tentatively be interpreted as indicating stable manure. Other insects included some dung beetles and a variety of species from natural or semi-natural habitats.

This deposit appears to have consisted predominantly of herbaceous plant material from hay with a component of brushwood; the most likely origin is from dumped stable manure, although there are a number of other possibilities. The area may have been used for penning horses, which were fed hay (and cereals) *in situ*, or the organic debris may represent dung from horses working at the site—perhaps during the construction of the parade ground. The brushwood component may, as suggested by the excavator, have been used to consolidate wet ground, but it could also have arrived with dumped stable manure since a variety of different kinds of plant material appear to have been used as litter in stables in the past.

'Parade ground'

The overlying deposit, interpreted as the parade ground for the fort, was described in the field as disturbed redeposited material of reddish colour with abundant rounded and subangular stones (more frequent at the top of

the layer) and a substantial sandy component. The lower part of this layer often included fragments and parts, physically mixed, of the black humic horizon (context 122) below.

Discussion

Sediments

The uppermost layer discussed here (i.e. the Roman parade ground) contains a significant sandy fraction.The buried black layer (122) itself is often in continuity with the mineral soil (**bBg1**) below, though in some cases the lower boundary is sharp and apparently truncates the **bBg1** horizon. This, however, may be a local phenomenon resulting from later disturbance. There is no local evidence of *in situ* **L** (litter) or **F** (fermented) layers. The intense decomposition of the *in situ* organic material is not accompanied by readily visible *in situ* plant remains.

In the **bBg1** horizon, the root channels are moderately thin (around 1-2 mm); they are often spread throughout the whole of the horizon. Thicker roots (or their channels) or any other *in situ* plant remains were not observed in the field nor were they been recorded during the excavation. Dense/loose, continuous/discontinuous infillings, apparently of amorphous organic material, often occupied the root channels and showed a morphology of illuviation (downward movement of fine particles) along the profile.

The presence of a quantity of sand and pebbles with adjacent planes and fractures, and macro voids, in the 'parade ground' deposit indicates a degree of permeability of this layer for water, which could flow down through it to the buried soils below. Water movement downslope, subparallel to the buried layers, might also have occurred, and these underlying horizons probably became waterlogged. The gley features observed in the basal **bBg** horizons are in agreement with intense and prolonged waterlogging.

The organic layer 122 and the deposits beneath it have the appearance of a buried soil profile with no visible discontinuities of parent material. Further observations might allow the detection of the degree of organisation of the fine fraction and its spatial organisation in relation to the coarser fraction (these characteristics, in this case, would be directly related to the degree/intensity of development of the soil profile).

No macroscopic evidence of physical disturbance resulting from biological activity was readily visible to the naked eye during the site visit; probably microscopic observations would help to establish the degree of disturbance. Such bioturbation would be expected where there had been a cover of vegetation before burial. Disturbance by human activity is likely to have occurred, possible processes being stripping for turf; trampling; and mixing of the original top soil into the parade ground make-up.

Biological samples

The material described here can be divided into two groups: (a) the samples from the upper horizons of the buried soil and (b) the organic debris deposited patchily on its surface and sealed by the parade ground. Although further, systematic, investigation of the samples will be necessary before firm conclusions can be drawn, it may be tentatively suggested that, at the time context 122 was developing, the area was, at least initially, rather damp grazing land, perhaps with areas of scrub nearby. The accumulation of large quantities of amorphous organic matter in this upper soil horizon indicates a long period of stability in which decay took place steadily. Differences in the organic content of the three samples examined from layer 122, however, indicate that the deposit was by no means as homogeneous as it appeared in the field. The most plausible preliminary interpretation is that the grazing land soil had developed over an irregular surface left by the last episode of ploughing, the organic horizon filling the

plough-grooves as it formed (rather than organic matter having been introduced into these grooves by 'ploughing through', which seems improbable in view of the nature of the organic layer). There is no evidence from this layer for incorporation of debris from human occupation or stabling, though of course some herbivore dung is likely to have been introduced from stock grazing on the land.

The second stage of organic deposition is represented by the patches of plant material which appear to consist of brushwood and hay with some cereal grains and a characteristic insect fauna, probably representing horse dung. The means by which this was introduced have been discussed above (sample 12, context 96).

The concentration of insect remains in the sediment analysed here is rather low. However, analysis of larger subsamples (or combining of results from a series of samples) should provide adequate material for objective interpretation.

Statement of potential

Further analysis of the sediments should establish the history of development of the soil profiles (related to length of time of stability and to the intensity of biological activity and weathering). Methods should include further macromorphological observations, micromorphological analysis on selected samples for each horizon, and measurements of texture.

The biological material shows clearly that further investigation will amply repay the effort. The sampling of the buried soil undertaken during excavation across a large area will permit an assessment of the spatial variations in the biota to be established as well as providing firmer data than those recorded in this brief analysis. It should be possible to refine the description of the vegetation supported by the palaeosol, and to clarify the implications of the patches of organic debris lying on it.

Recommendations

Descriptions of the gross nature of the sediments and of the soil profile should be made. Examination of thin sections traversing the boundary between the organic horizon (122) and the horizons above and below will be particularly significant for establishing more precisely the nature of the disturbance of the top-soil. Thin sections representing the A, B and E horizons will help to define the extent and type of soil development.

All the biological samples available should be inspected and a selection made to allow for the evident variation in organic content and spatial distribution to be investigated through more detailed analysis and recording of plant and insect macrofossils.

Pollen from a series of samples should be analysed (using conventional techniques) to establish the local, and probably also regional, pollen rain and identify any further vegetation types not represented by the macrofossil remains, and to investigate spatial variations. It may also be worth examining replicate subsamples from single samples to check for the degree of mixing of pollen into the sediment. Phytoliths should be investigated by a simple survey technique to establish the presence of grass remains in those parts of the deposit where macrofossils preserved by anoxic waterlogging have decayed completely.

The scale and precise design of further work should be established in consultation with the excavator. Some of the material is difficult to process for extraction of biological remains, and several thin sections will be required; allowance should be made for this in time/cost estimations.

Retention/disposal

All samples should be retained under good (cool, dark) storage conditions until decisions about future work can be made.

Archive

All material relating to the work reported here is currently stored at the EAU, University of York.

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References

Dainton, M. (1992). A quick, semi-quantitative method for recording nematode gut parasite eggs from archaeological deposits. *Circaea* **9**, 58-63.

Kenward, H. K., Engleman, C., Robertson, A., and Large, F. (1986). Rapid scanning of urban archaeological deposits for insect remains. *Circaea* **3** (for 1985), 163-72.

Kenward, H. K., Hall, A. R. and Jones, A. K. G. (1980). A tested set of techniques for the extraction of plant and animal macrofossils from waterlogged archaeological deposits. *Science and Archaeology* **22**, 3-15.