

*Reports from the Environmental Archaeology Unit, York 95/47, 10 pp.*

**Assessment of invertebrate remains from excavations at Dalhousie Mains, Bonnyrigg, Midlothian (site code: 1140)**

by

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**Summary**

*Eleven samples of sediment from excavations at Dalhousie Mains, Bonnyrigg, Midlothian were submitted for assessment of their content of invertebrate remains. Samples from the fills of the enclosing ditch gave assemblages of varying size and potential. Only limited interpretations could be made on the basis of this preliminary inspection, although it appeared that some of the samples from the lower fills had potential for reconstruction of aspects of conditions in the ditch and of vegetation and activity in its surroundings. On this basis, a limited programme of further work is recommended, particularly if large subsamples are available for processing (in order to recover more substantial assemblages). Integration of results from invertebrate studies with those from other analyses, especially botanical, is considered to be particularly important.*

**Keywords:** DALHOUSIE MAINS; BONNYRIGG; MIDLOTHIAN; DITCHED ENCLOSURE; INVERTEBRATE REMAINS

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30 August 1995

## Assessment of invertebrate remains from excavations at Dalhousie Mains, Bonnyrigg, Midlothian (site code: 1140)

### Introduction

The ditch of a sub-rectangular enclosure, possibly of late prehistoric date, at Dalhousie Mains, near Bonnyrigg, Midlothian, was excavated by AOC (Scotland) Ltd in 1994. Eleven samples of sediment ('GBAs' *sensu* Dobney *et al.* 1992), all from Ditch Section IV, were submitted for an assessment of their invertebrate remains.

The aims of this assessment were to determine the potential of the invertebrate remains to distinguish: (i) activities relating to the use of the enclosure; (ii) activities and conditions in the ditch itself; and (iii) natural conditions and economic activities in the environs of the site.

### Methods

All of the samples were inspected in the laboratory, allocated sample numbers and described using a standard *pro forma*. With the exception of the sample from Context 5012 (which weighed only 270 grams), a one-kilogram subsample was taken from each sample for investigation of macrofossil remains. Methodology for extraction of fossils then followed that described by Kenward *et al.* (1980; 1986).

The flots (or washovers) were then rapidly examined for their content of invertebrate remains, noting the quantity of fossils and principal taxa and ecological groups. Where appropriate, an estimate was made of the quantity of sediment required for recovery of an interpretatively useful assemblage.

### Results

The results of the investigations are presented in Tables 1 and 2. Samples from the basal ditch fill and upper ditch fill yielded, at best, only a few insect remains; none of the assemblages from them were of interpretative value and it was

considered unlikely that matters would be improved by processing larger subsamples. The lower ditch fills and the fill from Context 5007 gave assemblages of varying size but were all, subjectively, similar in character (Table 2). Some of them were judged to have potential for more precise interpretation if larger subsamples were processed.

### Discussion and statement of potential

The invertebrate remains in some of the samples from the lower ditch fills have some potential for building a reconstruction of aspects of conditions in the ditch and in the immediate surroundings. They give remarkably little evidence for the nature of materials dumped into the ditch (and, indeed, on the evidence from this assessment it would be concluded that no such dumping occurred, at least of materials containing insects).

Although some dung beetles and phytophages likely to have been associated with short vegetation were present, the numbers seen do not give sufficient evidence to suggest the surroundings to have been grazing land. Indeed, there is no clear evidence for the nature of the immediate environs of the ditch, which is surprising in view of the number of remains recovered (and the possibility raised by the topographic and excavation evidence that at least a proportion of the insect remains entered with soil creep and surface runoff).

If the archaeological questions listed above are to be pursued through analysis of the invertebrate remains it will be necessary to process much larger subsamples of selected material (see Table 2 for recommended quantities). Such analyses might also provide a clearer view of the numbers of synanthropic insects at the site. Assuming that it can be established that the deposits formed during a period of occupation (and the evidence is not yet

clear), a record of those species favoured by human activity would be of considerable interest in reconstructing human behaviour and living conditions at the site. (This information might also be of considerable value in a wider study of the relationship between site size and longevity and invasion by synanthropes.) Conversely, if other evidence concerning continued occupation of the site is equivocal, records of synanthropic insects *might* provide crucial confirmatory data.

## Recommendations

Further work is recommended on Contexts from the Lower Ditch fills and Context 5007 (Table 2). The Priority 1 sample should be recorded fully and the P2 samples at least rapid-scan recorded (*sensu* Kenward 1992). If large subsamples are available for the Contexts indicated, these should also be processed and recorded in view of their potential to enhance the rather tentative interpretation made of conditions on and around this site.

The resources required for further investigation of invertebrate remains are summarised in Table 3.

The authors strongly recommended that any further work on invertebrate remains from this material should be integrated with the analysis of plant remains in order to maximise the potential for interpretation.

## Retention and disposal

The sediment from all contexts should be retained until the project has been completed. After the main phase of analysis has been carried out, the material assigned P0 or P3 can be disposed of so far as the invertebrate remains are concerned; other samples should be retained for at least three years after publication to allow for further investigation. Flots and residues from invertebrate analysis should be retained in the longer term.

## Archive

All extracted fossils and flots are currently stored in the Environmental Archaeology Unit, University of York, along with paper and electronic records pertaining to the work described here.

## Acknowledgements

The authors are grateful to Coralie Mills of AOC (Scotland) Ltd for providing the material and archaeological information and to English Heritage for allowing HK to work on this material.

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Table 1. Sediment descriptions of GBA samples from Dalhousie Mains, Bonnyrigg.

Context number	Sample number	Sediment description
2007	1	Moist, light purplish brown to light orangish brown, crumbly (working plastic and sticky), slightly sandy clay silt with some ochre and whitish flecks and mm diameter pores.
2008	2	Moist, light/mid brown (with a greyish cast and abundant orange/brown mm scale mottles), stiff to crumbly (working plastic to sticky when wet), slightly sandy clay silt
2009	3	Moist, light brownish grey (with patches of darker sediment), plastic, silty clay
2010	4	Moist, light brownish grey, plastic, silty clay with abundant oxidation patches (on mm scale) and many pores lined with iron salts
5006	5	Moist, mid grey-brown (mottled browner and greyer), stiff (working crumbly, plastic and sticky when wet), slightly sandy clay silt with patches of iron staining and a few white flecks
5008	6	Moist, mid/dark grey-brown, crumbly (working just plastic), silt. The sediment appeared heterogeneous or mottled on the mm scale with some patches of ?decayed humic matter and abundant fine stones (2-6 mm)
5011	7	Moist, internally dark grey with a shell of pale grey-brown and purplish-brown oxidation, 'cheesy' (working plastic), humic silt. Iron staining, compressed ?reeds and root channels were also present
5012	8	Moist, mid/dark grey-brown, stiff (working crumbly to plastic), sandy clay silt
5013	9	Moist, light/mid brown to light/mid orangish brown and pinkish patches (?mineral deposition), 'cheesy' (working plastic), slightly sandy clay silt. Vivianite and ?decayed twigs were present
5016	10	Moist, light orange-brown externally and light grey (with mm mottling internally), stiff, slightly sandy silty clay with patches of rotted sandstone and vari-coloured flecks. Small stones (2 - 6 mm) and charcoal were present
5023	11	Moist, light/mid brown (internally slightly grey on cm scale), stiff (working just crumbly to just plastic and sticky when wet), slightly sandy silty clay. Stones (2 - 20 mm) and a fragment of coal were present

Table 2. Results of assessment of GBA samples from Dalhousie Mains, Bonnyrigg. Key: CN - context number; SN - sample number. In P column: +3kg - process larger subsample (in this case 3 kg; additional processing time is 3 hours unless stated); P - priority for assemblage from assessed 'test' subsample; S - sorting time; R - recording time; LP -priority for larger subsample (if different); LR, LS and LW - times for recording, sorting and washing recommended larger subsample. Times do **not** include an allowance for ancillary tasks.

CN	SN	Excavator's interpretation	Description of flot/washover	Preliminary interpretation	Notes	Priority etc.
<b>Upper ditch fills</b>						
2007	1	Possibly ploughsoil from ploughed down earthwork	Small washover. Mostly sand with some charcoal (< 5 mm), a few rootlets and a small quantity of plant detritus. Only three beetles and a worm capsule	No interpretative value		P0
2008	2	Possibly ploughsoil from ploughed down earthwork	Tiny flot. Sand and a trace of plant detritus. Single fragment of <i>Aphodius</i> sp.	No interpretative value		P0
2009	3	Possibly ploughsoil from ploughed down earthwork, but may also contain silted lenses	Small flot. Mostly rotted plant detritus and many <i>Heterodera</i> sp. cysts. Five very poorly preserved beetles	No interpretative value other than evidence for activity of soil organisms		P0

CN	SN	Excavator's interpretation	Description of flot/washover	Preliminary interpretation	Notes	Priority etc.
2010	4	Possibly ploughsoil from ploughed down earthwork	Small washover. Mainly sand with some plant detritus, a little charcoal (to 1 cm) and several <i>Heterodera</i> sp. cysts. Several very poorly preserved individuals of a weevil	No interpretative value other than suggesting soil organism activity		P0
<b>Fill of 5007 (secondary linear cut feature)</b>						
5006	5	Possibly ploughsoil from ploughed down earthwork or perhaps waterborne silt	Moderate-sized flot. Much plant detritus and many seeds. Large quantity of <i>Daphnia</i> sp. ephippia and insect immatures. Mixture of outdoor, aquatic and (very few) terrestrial decomposer species. Probably background fauna. Fragmentation quite high but preservation moderately good	Temporary aquatic conditions are indicated but not certain if open water. There <i>may</i> have been some dumping but it apparently did not include large quantities of organic matter	A large subsample (at least 5 kg) would be necessary to clarify this interpretation and improve the description of the local ecology	P2 R2  LP1-2 +>5kg LS4 LR6

CN	SN	Excavator's interpretation	Description of flot/washover	Preliminary interpretation	Notes	Priority etc.
<b>Lower ditch fills</b>						
5008	6	Possibly dumped material with organic inclusions, or natural accumulation of silt and plant debris in standing water	Small flot. Mostly fine plant detritus with some seeds. Moderate-sized insect assemblage of outdoor, aquatic and some decomposer species. Mainly background fauna	Could be plant debris dumped in the open but nothing suggests that this was an artificial accumulation. Most likely background fauna accumulating in a damp place. No evidence for strong human influence in the surroundings	Borderline for further analysis: 5 kg would probably give only a little extra information	P2 R1.5 +>5kg LR2.5

CN	SN	Excavator's interpretation	Description of flot/washover	Preliminary interpretation	Notes	Priority etc.
5011	7	Possibly containing dumps of occupation material or miscellaneous organic inclusions in waterlogged silts	Medium-sized flot. Much plant detritus, some seeds, and a few <i>Heterodera</i> sp. cysts. Many, well-preserved insects but with low numbers of individuals of each taxon (i.e. high diversity). Dominated by outdoor species	Aquatic deposition. Immediate environs may have been arable or kept relatively clear of vegetation (there would be more dung species if cattle were present). Presence of some 'weeds' indicated. Conspicuous rarity of synanthropic insects	Larger subsample would probably improve resolution of interpretation	P1 R7.0  +3kg LS4.0 LR12.0
5012	8	Possibly dumps of organic material	Small flot, mostly plant debris, many seeds. A few insects, similar in character to the assemblages from Contexts 5008 and 5006	Possibly a random extract from assemblages of the type found in Contexts 5008 and 5006	5 kg would only produce a group of borderline interpretative value at best	P2 R0.5



CN	SN	Excavator's interpretation	Description of flot/washover	Preliminary interpretation	Notes	Priority etc.
5013	9	Possibly dumped occupation material within silted standing water	Small flot. Mostly plant detritus, including moss, and many seeds. Moderate-sized insect assemblage dominated by aquatics, with a few decomposers	Possibly from a natural aquatic deposit with a small input from dung/grazing in surroundings. ?Terrestrialisation. Nothing (from insects) to suggest dumped material	Further subsample could not really improve the interpretation	P1-2 R2.0
5016	10	Possibly a mixture of silts (?earthwork erosion) and occupation dumps in wet conditions	Tiny flot containing a few seeds and a little plant debris. Trace of invertebrate remains, including two <i>Daphnia</i> sp. ephippia	Of no real interpretative value		P3 R0.5
<b>Basal ditch fill</b>						
5023	11	Possibly glacial till quarried from the ditch and redeposited during earthwork construction or by early settlement and weathering	Small washover; mainly charcoal (to 7 mm) and some sand with a trace of plant detritus (including moss stem), and a seed. No invertebrates were recovered	No invertebrates		P0 R0

Table 3. Dalhousie Mains, Bonnyrigg. Resources required for recommended further work. Costs are quoted separately. RA - Research Assistant; RF - Research Fellow; Tech - Technician.

Task	Resource	Time (hours)	Cost (£)
Record P1 and P1-2 assemblages from test subsamples	RA	10	
	RF	2	
Record P2 and P3 assemblages from test subsamples	RA	6	
	RF	1	
Process and sort larger subsamples for LP1 and LP1-2 groups	Tech	13	
Process and sort larger subsamples for LP2 group	Tech	9	
Record P1 and P1-2 assemblages from large subsamples	RA	14	
	RF	3	
Record P2 assemblages from test subsamples	RA	10	
	RF	2	
	RA	8	
Data analysis			
Report writing	RA	12	
	RF	4	
Administrative tasks	RA	2	
	RF	1	
Consumables	-	-	