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Assessment of biological remains from Bronze Age deposits at North Duffield, North Yorkshire

by

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Summary

Plant and invertebrate remains from a series of Bronze Age deposits from North Duffield Carrs, in the lower Derwent valley, North Yorkshire, have been examined to evaluate their palaeoecological potential.

Samples were examined from a lower clay sand deposit, a bed of peat of varying thickness, and an overlying alluvial clay. This sequence was tentatively interpreted in the field as testifying to a progression from fairly dry terrain, via wet woodland to a more fully terrestrial phase, followed by the deposition of alluvium by rising river levels.

The biota of the peats were dominated by taxa indicating wet woodland, with a variety of tree species, particularly alder. Aquatic plants were absent, and the aquatic insects recorded may have exploited small pools, perhaps of a temporary nature. Dry land insects were present in small numbers.

This well preserved material has considerable potential for palaeo-ecological reconstruction in an area posing a variety of inter-related archaeological and geographical questions. Further research at this site and in the lower Derwent valley generally is recommended.

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Introduction

Beds of peat with apparently quite considerable lateral extent were exposed near North Duffield (about SE697377) in 1993 during river control on behalf of English Nature in response to threat of land subsidence caused by deep coal mining. A large basin of up to about 2 m in depth was excavated by the contractors in order to extract clay, incidentally creating a small lake for wildfowl.

The depth and thickness of the peat layer varied across this borrow pit. It was attenuated in places and may have been absent in others, apparently reflecting variations in the ancient surface topography. Numerous tree trunks up to about 3 m in length and in some cases probably originally of 0.6 m or more in diameter were exposed in the peats during excavation of the borrow pit.

The organic horizon overlay clayey sands and was sealed by a thick deposit of clay (up to a metre or more). This succession is tentatively related to a sequence of events outlined below for the Humber basin as a whole. This is supported by the radiocarbon dates (Appendix 4) for samples of wood from the peats: four dates bracketing the period 3100 to 2600 BP (errors being ±60-70 years), i.e. in the later part of the Bronze Age in Britain.

The history of flooding and water-table changes in the Humber basin is reviewed by Van de Noort and Davis (1993, 28-9). Early post-glacial river incision was halted by sea-level rise, after which there was alluviation and the formation of peat beds from the late Neolithic, at least. Eventually, overbank alluviation occurred on a large scale—indeed, in historical times, this 'warping' was, at least locally, deliberately engineered to raise land levels. Field observation of the deposits suggested that a sequence of events of this kind had taken place at North Duffield.

In view of the suspected research potential of the site for this region, the biological remains were studied in greater detail than normal for an assessment.

Geology and geography of the lower Derwent basin

The course of the lower Derwent lies between 10 m AOD (just north of Stamford Bridge) and 5 m AOD at its confluence with the Ouse near Barmby on the Marsh. It follows fairly closely a north-south line with mostly rather modest meanders which are known to have migrated in the historical period. Surface deposits across the Derwent valley are exclusively drift, including alluvium and aeolian sands. The land surfaces mostly lie between 5 and 20 m AOD, with no more than gentle undulations which are, however, an important determinant of settlement and land exploitation. Land-use in the lower Derwent is largely a mixture of arable farming and pasture with a little forestry and some heathland.

Much of the stretch of the Derwent considered here has been recognised as a valuable natural resource and is protected in various ways, from SSSI to National Nature Reserve.

Methods

Twenty-nine samples were taken from three columns in the walls of the borrow pit (see Figure 1). Six samples from one of the sections (Section 1) were selected for processing and assessment of their biological content.

All of the sixteen samples from section 1 were described using a *pro forma*. Six samples, representing the three major

sediment types (see Figure 2), were selected for further examination. (Note that, in Figure 2, the 'peat' is described as 'silt with organic detritus'.) For each of the selected samples a 1 kg or 2 kg subsample was processed for biological remains following techniques of Kenward *et al*. (1980; 1986). 'Flots' were taken from these and the residues were separated into fractions and examined wet. Following the initial examination of the flots and residues, a second 2 kg subsample from sample 13 and an additional larger subsample (3 kg) from sample 06 were processed.

Invertebrate and plant macrofossil remains in the flots were recorded, the insect remains being picked out onto damp filter paper for identification. Insect recording was at the level of 'scan recording' as defined by Kenward (1992). Plant remains and other components were recorded very briefly from the residues.

Four samples of wood remains from sections 1 and 2 were submitted to Beta Analytic Inc., Miami, USA for dating by radiocarbon assay.

Results

Laboratory sediment descriptions are presented in Appendix 1.

Plant macrofossil assemblages (Appendix 2) were rich and well-preserved in the richly organic deposits (but sparse in the clay sand), much of the material consisting of wood, twig and leaf fragments. The identifiable remains—including fruits and seeds, buds and bud-scales and shoot fragments of moss—were largely of woodland taxa, the most frequent remains being various parts of trees—notably fruits and female cone axes of alder. Other trees represented included oak, hazel, yew, elm, field maple birch, and holly. The moss flora was almost entirely restricted to taxa likely to have grown in shade under trees or on bark. Apart from a few remains of some marsh/fen taxa, notably marsh marigold (*Caltha palustris*) and meadow-sweet (*Filipendula ulmaria*), herbaceous taxa associated with wetland were lacking and there were no true aquatics. The bulk of the residues for the subsamples of the peat deposits consisted of wood and twig fragments and fragments of leaf, the latter almost certainly from the trees represented by bud-scales, fruits/seeds and other parts.

The insect assemblages (see Appendix 3) were diverse and showed good preservation. Fossils were moderately abundant in some layers. The dominant beetle in each of the assemblages examined was an aquatic or marshland taxon—*Hydraena* sp. in samples 10, 08 and 06b, and *Ochthebius* sp. in 06b and 3. These, together with other aquatic and damp ground/marshland species contributed a substantial proportion of the fauna. However, woodland taxa were also quite abundant, with between 10 and 20% of the individuals in each of the assemblages studied being associated with trees or woodland. Species associated with 'dry land' habitats (which, for this site, do not necessarily include woodland) were rare.

No ancient forest indicators were recorded, and no non-British taxa were observed. It is not possible to attempt identification of all remains in assessment, however, and the insect assemblages included a number of taxa which were not immediately recognised using the available reference collection, and which would require comparison with museum material.

Discussion

Depositional regime

The sands and clays in the lower part of the profiles examined (samples 13-16, 28-29, 44-5) appeared to be water-deposited and contained little biological material. That which was present appeared to form an allochthonous (transported) assemblage.

Above these deposits, a layer of well-preserved plant remains in silt and clays

appeared little disturbed, with good preservation of macrofossils, suggesting that the deposits had not been extensively reworked by water action. The low proportion of the beetle and bug assemblages contributed by true open-water aquatics such as *Hydroporus* spp., in comparison with taxa such as *Hydraena testacea*, more likely to have inhabited muddy shallows and marshland, suggests that the area was not permanently under water. This is very much in accord with the results of the botanical analyses, which showed aquatics to be absent. Whether the area was subject to overbank flooding from the Derwent, or merely had a high water-table, is not apparent from the biological analyses. A study of the mineral component of the organic deposits should elucidate this matter.

Palaeoecological context

None of the insect species identified in the assemblages were highly synanthropic, or even particularly favoured by human activity, suggesting that there was little or no human settlement in the immediate vicinity. Numbers of individual dung beetles (*Aphodius* and *Geotrupes* spp.) were also small: only 2 individuals were recovered in the samples studied (total N = 360). This contrasts with figures of 10% or more in assemblages from largely arable catchments given by Robinson (1991) and suggests that grazing-land was not a significant component of the adjacent landscape. On the other hand, the proportion of the assemblages made up of species associated with trees or found in woodlands was relatively large: between 10 and 20% of the *total* insect assemblage (including aquatics) recovered was made up of beetles and bugs from these ecological groups. Robinson (1991) suggests that around 20% of the terrestrial insect assemblage laid down in closed woodland conditions will belong to these groups.

Among the woodland taxa recovered were the bark beetles *Hylesinus crenatus* and *H. fraxini* or *orni*, all associated with *Fraxinus* trees, and herbivores such as the weevil *Phyllobius calcaratus.* Several of the species identified are saproxylic (dead wood feeders), such as the anobiids *Grynobius planus* and *Anobium* sp., the weevil *Acalles roboris* (usually associated with oak), and the cerambycid *Grammoptera* ?*ruficornis*. Saproxylic insects are particularly abundant in less disturbed woodland where less intensive management ensures the continuity of a dead-wood resource for the larvae of such species to feed on. However, none of the rare or extinct 'Old Woodland' taxa identified by Buckland (1979) from Thorne Moors, South Yorkshire, were present in the samples examined: these might be found in larger samples.

The presence in roughly contemporaneous deposits at Thorne Moors of several species which have become extinct in Britain suggests that it would be worthwhile to survey large quantities of material from North Duffield for these. A fundamental difference in the insect assemblages for the two sites would be very significant—if there is genuinely a lack of Old Woodland species at North Duffield it might be suspected that the area had completely lost its tree cover (perhaps through sustained flooding or human activity) and that the re-growth of woodland was too recent for the slow-colonising woodland specialists to invade. The preserved fauna of North Duffield may represent only the post-flooding recolonisation phase, whilst that at Thorne Moors seems to date to the time when dead trees stood in a drowned landscape.

Statement of Potential

Little palaeoecological work has been carried out on Bronze Age material in the central Vale of York, although deposits from around 3000 BP have been examined to the South of the Vale at Thorne Moors, largely from a palaeo-entomological viewpoint (Buckland 1979). Beetle assemblages from *c*.3240-2760 BP have been examined at St George's Field, York (Hill 1993).

The excellent preservational state of plant and insect remains at North Duffield, and apparently extensive nature of deposits on the site, gives an opportunity to study the palaeoecology of this period and area in greater depth. They will provide data on the extent and changing nature of woodland in the region in the mid-late Bronze Age, and concerning the degree of influence of man on this landscape at this period. Particularly important is the opportunity to combine studies of palaeotopography, stratigraphy, sediments, pollen, plant macrofossils and insect remains over a wider area in a closely-integrated project intended to elucidate archaeological as well as palaeo-environmental questions.

Recommendations

It is recommended that an application be made to NERC for funds to carry out a substantial investigation of the deposits at North Duffield and their biota in relation to later prehistoric hydrological and ecological changes on a regional or national scale. This would be more valuable if linked to a wider study of equivalent deposits throughout the lower Derwent valley.

Retention/disposal

All the material should be retained pending an application for research funding.

Archive

All paper and electronic archive material pertaining to the work described here is currently stored at the Environmental Archaeology Unit, University of York, along with samples of processed and unprocessed sediment, and extracted plant and invertebrate fossils.

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Appendix 1

Sediment descriptions (presented in context number order), with notes on plants in residues after flotation (where applicable)

Context 1001 (depth 90-160 cm)

Sample 01 (depth 90-100 cm): Moist, mid orange-brown to mid blue-grey (mottled on a 10-mm scale), plastic and slightly sticky, gleyed silty clay to clay silt with coarse herbaceous detritus and nutshells.

Sample 02 (depth 100-110 cm): Moist, mid orange-brown to mid blue-grey (mottled on a 10-mm scale), plastic and slightly sticky, gleyed silty clay to clay silt with coarse herbaceous and woody detritus, penetrating woody roots and modern rootlets.

Sample 03 (depth 110-120 cm): Moist, mid orange-brown to mid grey (mottled on a 10-mm scale), plastic and very sticky, gleyed clay silt with coarse woody and herbaceous detritus. Wood and twigs were common and modern rootlets present in the sample.

Residue after flotation included twig fragments, *Alnus glutinosa* fruits, catkin fragments and cone scales, *Taxus baccata* leaves, *Quercus* buds, *Rubus* seeds, *Acer campestre* and *Carex* spp. fruits. Moss fragments in the residue included *Thuidium tamariscinum*, *Neckera crispa* and *N. complanata*.

Sample 04 (depth 120-130 cm): Moist, mid grey with some mid orange-brown (mottled on a 10-mm scale), crumbly working plastic, gleyed clay silt with coarse woody and herbaceous detritus. Wood and twigs were common and modern rootlets present in the sample.

Sample 05 (depth 130-140 cm): Moist, mid grey with some mid orange-brown (mottled on a 10-mm scale), sticky, gleyed silty clay with coarse woody and herbaceous detritus. Wood and twigs were common and modern rootlets present in the sample.

Sample 06 (depth 140-150 cm): Moist, mid to dark grey with some orange-brown mottling (10-mm scale), crumbly working plastic, slightly gleyed clay silt. The sample contained abundant organic detritus including hazelnuts and wood.

Residues of subsamples a and b woody, with bark, twigs, rootwood and tree leaves. Included *Alnus* cone fragments, twigs and bud-scales, *Betula* bud-scales and catkin fragments, *Corylus avellana* nuts, *Quercus* bud-scales, *Acer campestre* fruits, *Taxus baccata* seed, *Caltha palustris* seed, and mosses *Neckera complanata* and *N. crispa.*

Sample 07 (depth 150-160 cm): Moist, mid to dark grey-brown (oxidising to mid to dark grey), crumbly working plastic, clay silt with abundant fine and coarse woody and herbaceous detritus.

Context 1002 (depth 160-200 cm)

Sample 08 (depth 160-170 cm): Moist, mid to dark brown (oxidising to dark grey-black), crumbly and cheesy-brittle working slightly plastic, fine and coarse woody and herbaceous detritus (including a whole *Corylus avellana* L. nutshell) with some silt or clay (not evenly distributed).

Residue after processing large, rich in twig fragments and with moderate numbers of roots and rootlet fragments, especially in the <2 mm fraction. Fragments identified included *Alnus* cone axes, *Taxus* leaf, and *Quercus* buds.

Sample 09 (depth 170-180 cm): Dark brown (oxidising black), crumbly working plastic, fine and coarse woody and herbaceous detritus with some sand and silt.

Sample 10 (depth 180-190 cm): Dark brown (oxidising black), stiff working crumbly then plastic, fine and coarse woody and herbaceous detritus with some sand grains.

Residue quite large, consisting mainly of wood and twigs. Included *Alnus* fragments, *Corylus* nutshell fragments, *Ilex* and *Be*tula fruits, and seeds of *Rubus* sp. and herbaceous plants including *Filipendula ulmaria*, *Ranunculus* section

Ranunculus, *Stachys* and *Mentha* spp. The residue also contained fragments of caddis larval cases.

Sample 11 (depth 190-200 cm): Dark brown (oxidising black), crumbly and cheesy-brittle, fine and coarse woody and herbaceous detritus with some silt.

Context 1003 (depth 200-205 cm)

Sample 12 (depth 200-205 cm): Mid buff, cheesy-brittle, slightly silty sand with black fine and coarse woody and herbaceous detritus from adjacent layer.

Context 1004 (depth 205-245+ cm)

Sample 13 (depth 205-215 cm): Light buff, soft slightly silty or clay sand with a little fine and coarse herbaceous detritus including penetrating roots.

Residue of subsamples a and b relatively small, consisting of twigs (including *Alnus*), roots and rootlets, and *Rubus* fruits in sand. Apparently a clastic deposit.

Sample 14 (depth 215-225 cm): Light to mid blue-grey (oxidising to mid yellow-brown), clay sand to sandy clay with fine herbaceous detritus.

Sample 15 (depth 225-235 cm): Light to mid blue-grey (oxidising to mid yellow-brown), stiff plastic, strongly gleyed clay sand.

Residue after processing small, largely sand, with some roots and coal fragments.

Sample 16 (depth 235-245 cm): Light to mid blue-grey (oxidising to mid yellow-brown), stiff plastic, clay sand.

Appendix 2: *Plant remains from North Duffield flots. Key: * = present ** = abundant*

Taxon	Sample					
	03	**06a**	**06b**	**08**	**10**	**13a + b**
Alnus glutinosa (L.) Gaertner	*	*	**	*	*	
Acer campestre L.	*					
Betula spp. (tree birches)	*	*	*			
Caltha palustris L.	*	*	*			
Carex sp.	*				*	
Corylus avellana L.	*				*	
Eurhynchium striatum (Hedw.) Schimp.	*	*	*			
Eurhynchium cf. *praelongum* (Hedw.) Br. Eur.					*	
Eurhynchium sp.				*	*	
Filipendula ulmaria (L.) Maxim.	*	*	*	*		
Fissidens taxifolius Hedw.			*			
Homalothecium sericeum or *H. lutescens*		*				
Hylocomium brevirostre (Brid.) Br. Eur.	*		*			
Hypnum cf. *cupressiforme* Hedw.		*	*			
Ilex aquifolium L.				*		
Mnium hornum Hedw.			*			
Neckera complanata (Hedw.) Hüb.	*	*	*			
Neckera crispa Hedw.	*	*	*	*		
Oxalis acetosella L.	*		*		*	
Quercus sp.		*				
Ranunculus Section *Ranunculus*	*				*	
Rosa or *Rubus* sp.		*				
Rubus idaeus or *fruticosus*						**
Rubus idaeus L.					*	
Stachys sp.					*	
Taxus baccata L.		*	*			
Thamnobryum alopecurum (Hedw.) Nieuwl.	*	*	*			
Ulmus sp.			*			
Ulota sp.		*				
Viola sp.		*				

Appendix 3

Statistics concerning assemblages of adult Coleoptera and Hemiptera from North Duffield. S—number of taxa; N—minimum number of individuals; α—index of diversity, alpha, of Fisher et al. *(1943); d—dominance index of Berger and Parker (1970).*

Sample	**Depth (cm)**	**Weight (kg)**	**S**	**N**	**α**	**d**	**Dominant species**	**% N associated with trees and woodland**
03	110-120	1	43	53	105	0.113	*Ochthebius* sp.	15.1
06a	140-150	1	57	82	82	0.097	*Ochthebius* sp.	12.2
06b	140-150	3	73	113	89	0.062	*Hydraena* sp.	16.8
08	160-170	1	41	57	65	0.105	*Hydraena* sp. and *H. testacea* Curtis	10.5
10	180-190	1	55	93	56	0.172	*Hydraena* sp.	10.7
13a	205-215	2	0	0	0	0	-	-
13b	205-215	2	0	0	0	0	-	-
15	225-235	2	0	0	0	0	-	-

Appendix 4

Radiocarbon dates for samples from North Duffield

Laboratory No.	Sample No.	14C age (years BP)±1 standard deviation
Beta-71169	08	2760±60
Beta-71170	11	3100±70
Beta-71171	26	2600±60
Beta 71172	31	2800±70