

Evaluation of biological remains from excavations at The Spinney, Sherburn-in-Elmet, North Yorkshire (site code: YORYM2002.448)

by

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Summary

An archaeological evaluation excavation was carried out by York Archaeological Trust at The Spinney, Sherburn-in-Elmet, during January and February 2003. Six sediment samples, 2 small charcoal samples and three boxes of hand-collected bone, recovered from deposits of ?Iron Age to early modern (18th/19th century), were submitted to PRS for an evaluation of their bioarchaeological potential.

Well- preserved plant and insect remains were abundant within most of the samples. This is somewhat unusual in the area of Sherburn-in-Elmet or indeed almost anywhere along the Magnesian Limestone ridge through southern-most North Yorkshire and easternmost West Yorkshire. Charred chaff and cereal grains were recovered from one sample of Roman date, whilst one of 14th century date produced debris which may be associated with retting. The invertebrate remains from five of the samples indicated deposition in quiet water, which was not too polluted. Terrestrial fauna varied in its representation, but generally suggested herbaceous vegetation, perhaps grassland. Synanthropic insects typical of occupation sites were rare.

A moderate-sized assemblage of animal bone was recovered from the excavated deposits, mostly from Trenches 4 and 9, with over half of the identified fragments representing several animal burials/skeletons. The range of species represented was restricted to the main domesticates, with dog and cat also identified. Bones from Trench 9 proved to be of most interest, as initial observations suggested the presence of waste associated with the skinning of horses and the disposal of horse carcasses. On the basis of the spot dates, these two activities were not contemporaneous.

This evaluation shows the potential for the preservation of biological remains within certain deposits in this area. Any further intervention which threatens the deposits should certainly be accompanied by a programme of sampling and post-excavation analysis of biological remains. Any additional analysis of the current assemblage is dependant on the provision of a tighter dating framework.

KEYWORDS: THE SPINNEY; SHERBURN-IN-ELMET; NORTH YORKSHIRE; EVALUATION; ?LATE IRON AGE TO EARLY MODERN (18TH/19TH CENTURY); CHARRED CEREAL GRAINS; PLANT REMAINS; INVERTEBRATE REMAINS; VERTEBRATE REMAINS; RETTING; ANIMAL BURIALS

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Introduction

An archaeological evaluation excavation was carried out by York Archaeological Trust at The Spinney, Sherburn-in-Elmet, North Yorkshire (NGR SE 4953 3350), during January and February 2003. A range of features and deposits, including pits and ditches, were encountered within a series of trenches across the site. Provisional dating evidence suggested that the deposits dated from ?late Iron Age through to the early modern period (18th/19th century).

Eight sediment samples (6 'GBA'/'BS' and 2 'SPOT'; sample types *sensu* Dobney *et al.* 1992) and three boxes (each box approximately 20 litres) of hand-collected bone were submitted to PRS for an evaluation of their bioarchaeological potential.

Methods

Sediment samples

The submitted 'GBA' sediment samples were inspected in the laboratory and their lithologies were recorded, using a standard *pro forma*, prior to processing, following the procedures of Kenward *et al.* (1980; 1986), for recovery of plant and invertebrate macrofossils.

The flots and washover resulting from processing were examined for plant and invertebrate macrofossils. The residues were examined for larger plant macrofossils and other biological and artefactual remains. Insect preservation was recorded using the scale of Kenward and Large (1998).

Two small samples of charcoal were examined as 'SPOT' samples to identify the wood present.

Hand-collected shell

Small numbers of snail shells were hand-collected from one context (4053). These were identified as closely as possible.

Hand-collected vertebrate remains

For the hand-collected vertebrate remains that were recorded, data were entered directly into a series of tables using a purpose-built input system and *Paradox* software. Records were made concerning the state of preservation, colour of the fragments, and the appearance of broken surfaces ('angularity'). Other information, such as fragment size, dog gnawing, burning, butchery and fresh breaks, was noted, where applicable.

Fragments were identified to species or species group using the PRS modern comparative reference collection. The bones which could not be identified to species were described as the 'unidentified' fraction. Within this fraction fragments were grouped into a number of categories: large mammal (assumed to be cattle, horse or large cervid), medium-sized mammal (assumed to be caprovid, pig or small cervid), and totally unidentifiable. These groups are represented in Table 1 by the category labelled 'Unidentified'.

Results

Sediment samples

The results for the 'GBA' and 'SPOT' samples are presented in context number order by period. Archaeological information, provided by the excavator, is given in square

brackets. A brief summary of the processing method and an estimate of the remaining volume of unprocessed sediment follows (in round brackets) after the sample numbers.

ROMAN

Context 4045 [dumped material/levelling]

Sample 2/T (3 kg sieved to 300 microns with washover; approximately 4 litres of unprocessed sediment remain)

Just moist, light to mid grey-brown to mid grey, brittle to crumbly (working more or less plastic when wet), stony, silty clay. Stones (2 to 60 mm) were common and ?charcoal was present. Modern rootlets were also noted.

The small residue of about 80 cm³ was of stones (to 40 mm) and sand, with a little charcoal (to 15 mm). There was a small washover of about 50 cm³ of modern roots and some charcoal (to 10 mm in maximum dimension), with a few charred cereal grains (mainly wheat, Triticum, probably all hexaploid, i.e. spelt, T. spelta L. or bread/club wheat, T. 'aestivo-compactum') and moderate amounts of chaff. The latter proved to consist mainly of glume bases of spelt, but with a few specimens which may have been another glume wheat, emmer, T. dicoccon. Schrank. There were some poorly preserved spikelet forks which were presumably from either or both of these taxa. A single barley grain was also noted and there were a few charred grains of the grass Bromus, presumably a weed. Apart from a few other 'weed' taxa present as charred propagules, there were a very few uncharred remains: seeds of elder (Sambucus nigra L.) and duckweed (Lemna sp.). There were also a few land snails present including Vallonia ?excentrica Sterki and fragments of ?Oxychilus sp. No insect remains were observed.

Context 4063 [demolition dump] Sample 4063/SPT

A spot find of a few fragments of ?hazel ($Corylus\ avellana\ L$.) ?roundwood charcoal, rather eroded (to 20 mm).

?PRE-MEDIEVAL

Context 8004 [organic basal fill of probably premedieval ditch 8005]

Sample 14/T (1 kg sieved to 300 microns with paraffin flotation; approximately 3 litres of unprocessed sediment remain)

Moist, light to mid grey-brown to mid grey-brown, stiff (working soft), clay silt, with fine herbaceous detritus.

The small residue of about 50 cm³ of plant debris gave an assemblage entirely consistent with a ditchfill in an area of grassland with some disturbance. Seeds and fruits were rather frequent and mostly quite well preserved, though showing some flattening or other distortion. The more abundant remains were waterplantain (*Alisma*), cat's-ears (*Leontodon*), prickly sowthistle (*Sonchus asper* (L.) Hill) and St John's Wort (*Hypericum*); the range of plant taxa present was rather limited however.

The flot was of modest size and contained appreciable numbers of invertebrates, some of which were welldecayed, others in better condition (E2.5-4.5, mode 3.5, weak; F 2.5-4.0, mode 3.0 weak). Aquatics formed a significant proportion of the insect fauna, and included a pond-skater, Gerris species, not often recorded from archaeological deposits. A single fragment of a donaciine 'reed beetle' represented emergent vegetation. Terrestrial insects were quite common, with a range of plant feeders most likely to have come from herbaceous vegetation, perhaps grassland (delphacid 'froghoppers'; an elaterid; various halticine'flea beetles', including Chaetocnema concinna (Marsham); Apion sp.; and Gymnetron ?pascuorum (Gyllenhal)). Various Carabidae suggested fairly open ground. There were several dung beetles, including a Geotrupes 'dor beetle'.

MEDIEVAL

12th century

Context 9067 [organic deposit at base of ditch] Sample 21/T (1 kg sieved to 300 microns with paraffin flotation; approximately 7 litres of unprocessed sediment remain)

Moist, mid grey-brown, crumbly (working soft and slightly plastic), slightly clay silt. Small stones (6-20 mm) were present, together with fragments of ?rotted wood (black in colour).

The small residue of about 100 cm³ was nearly all organic debris, with just a trace of sand. The rather sparse seeds and fruits present were all rather eroded, perhaps a result of carriage by water, perhaps even some reworking. The assemblage was rather unusual in having several fruits of dandelion, *Taraxacum*: though common enough today, this plant has a rather limited late post-glacial fossil record. Other taxa present were consistent with an origin in an area of disturbed ground or cultivated land or were probably from grassland; willow buds in some quantity point to the presence of some woody vegetation too, perhaps fringing the ditch. A single fragment of hemp (*Cannabis sativa* L.) seed was the only clear evidence of human activity, though

there was a trace of charcoal (to 5 mm) which presumably arrived from domestic occupation.

The flot, which was not large, was rich in insect remains, with some Cladocera and mites. Preservation varied but on average was acceptably good (E 2.0-4.5, mode 3.0 weak; F 2.0-4.5, mode 3.0 weak). Aquatic beetles were quite common, as were water fleas (Cladocera). Terrestrial fauna (much of which could have come from the immediate edge of the water) suggested litter and herbaceous vegetation. Dung beetles were rare.

14th century

Context 9050 [backfill or build-up around the edge of a large (18 x 5 m), but shallow, cut]

Sample 19/T (2 kg sieved to 300 microns with paraffin flotation; approximately 7 litres of unprocessed sediment remain)

Moist, mid to dark grey-brown, crumbly (working soft), humic ?slightly clay silt, with fine herbaceous detritus. Stones (20-60 mm) and wood fragments were present.

The moderate-sized residue of about 275 cm³ was all, but for a few tens of cm³ of sand and Magnesian limestone gravel, organic debris. Much of the coarser debris consisted of flax (Linum usitatissimum L.) capsule fragments with some stem fragments which may also have been flax; given the rarity of flax seeds (only one or two were noted) the most likely origin is either as waste from threshing to recover seeds or, perhaps more likely, retting (in which bundles of stems would have been steeped in a body of water to facilitate the release of the fibres—certainly consistent with the nature of the feature in which this deposit formed). Other seeds and fruits present included moderate numbers of propagules of wetland and aquatic plants such as fool's watercress, Apium nodiflorum (L.) Lag. and bristle club-rush (Scirpus setaceus L.), and probably also sedges (Carex), annual or biennial weeds such as fat hen (Chenopodium album L.-actually present in rather large numbers), black bindweed (Bilderdykia convolvulus (L.) Dumort.) and sow-thistles (both prickly, S. asper (L.) Hill and common, S. oleraceus L.), and probable grassland plants such as silverweed, Potentilla anserina L.). No very strong ecological indication was revealed by the plant remains, though they were generally well preserved and overall rather abundant.

The flot consisted mainly of rootlets and was fairly small. Invertebrates were abundant but in very varied states of preservation (E 1.5-5.0, mode 3.0 distinct; F 2.0-4.0, mode 2.5 weak). In a few cases the fossils showed patchy decay, suggesting that they had rotted before becoming sealed in the deposit. Aquatics were well represented, and in this case, there were abundant

Cladocera (water fleas) and moderate numbers of Chironomidae larvae (midges). There were some dung beetles, but most of the terrestrial fauna may have had a waterside origin.

15th century

Context 9083 [backfill of pit]

Sample 22/T (2 kg sieved to 300 microns with paraffin flotation; approximately 7 litres of unprocessed sediment remain)

Moist, light yellow brown to mid grey-brown (some areas pale grey) to mid to dark grey-brown, stiff and slightly sticky (working soft and sticky), clay silt, with fine herbaceous detritus. Stones (>60 mm) and modern rootlets were present.

The moderate-sized residue of about 350 cm³ consisted mainly of organic debris with some sand and Magnesian gravel (about 10% by volume). The coarser organic material was wood, bark and twig fragments (all to about 20 mm) and woody roots; seeds and fruits were sparse and rather worn. The more abundant taxa suggested either that the pit contained water or received sediment from a pond or ditch in an area off disturbed grassland: fool's watercress, toad rush (Juncus bufonius L.), watercress (Nasturtium officinale R. Br. in Aiton), buttercups (Ranunculus Section Ranunculus), celeryleaved crowfoot (R. sceleratus L.) and stinging nettle (*Urtica dioica* L.), with a variety of other taxa present in smaller amounts but representative of the same kinds of habitats. Apart from one very small eroded fragment of hazel nutshell and a trace of charcoal (to 5 mm) there was no evidence for possible occupation material amongst the plant remains.

The invertebrate remains in the smallish flot were chemically fairly well preserved, though sometimes fragmented (E 2.0-3.5, mode 2.5 weak; F 1.5-4.0, mode 2.5 weak). Modest numbers of insects were present, with a good proportion of aquatics (in this case including several chironomid midge larvae). Terrestrial forms suggested only herbaceous vegetation; there was a single dung beetle. There was a single pronotum of the grain weevil *Sitophilus granarius*, a species which is wholly dependent on stored cereal grains in Britain. Unfortunately this is the only fossil from the site which contains a characteristic silty infilling, and there must be a possibility that it is redeposited or a contaminant.

UNDATED

Context 6010 Sample 6010/SPT A spot find of a few fragments of ?Salix/Populus (willow/poplar/aspen) ?roundwood charcoal, rather eroded, to 10 mm.

Context 9047 [organic ditch fill]

Sample 18/T (2 kg sieved to 300 microns with paraffin flotation; approximately 6 litres of unprocessed sediment remain)

Moist, mid grey-brown (with orange 'cast' in places from decayed organics) to mid grey, soft and slightly sticky to crumbly (working soft and somewhat plastic), slightly clay silt, with fine and coarse woody and herbaceous detritus.

The moderate-sized residue of about 275 cm³ was mostly woody and herbaceous detritus, the twigs often rather 'silted' with some flattening. There was also a trace of sand. Identifiable plant remains were generally well preserved, e.g. some carrot (*Daucus carota* L.) fruits bearing spines.

Overall the assemblage was consistent with deposition in a water-filled ditch, with oogonia of Characeae (a group of freshwater algae), sedges, meadowsweet (Filipendula ulmaria (L.) Maxim.) and woody taxa such as Rubus and Rosa all recorded. There were rather large numbers of small Labiatae nutlets which ought perhaps to be identified more closely; apart from Mentha (mints), small fruits belonging to this family are rather rare in the fossil record and the present material may represent something like marjoram (Origanum) or thyme (Thymus).

The flot was fairly small, but rather rich in invertebrate remains, especially beetles. Preservation varied from rather good to a little poor (E 2.0-3.5, mode 2.5 weak; F 2.0-4.0, mode 2.5 weak). Mites (Acari) were abundant. The aquatics were much as in the other samples, though with the addition of several Hydraena testacea Curtis (found in still or sluggish water) and a second Hydraena species. There were hints of a betterdeveloped waterside fauna than in the other samples. Terrestrial fauna might largely have originated adjacent to water, giving no clear indication of vegetation type. There were several kinds of Aphodius dung beetles as well as a Geotrupes and other species found in dung (though certainly not confined to it, e.g. Megasternum obscurum (Marsham), Anotylus rugosus (Fabricius) and Tachinus sp.), suggesting livestock nearby.

Hand-collected shell

The snail remains recovered from Context 4053 (12th century backfill of pit) had been severely fragmented post-collection. All of the remains appeared to be of, what had initially been a few well-preserved

individuals, of the freshwater planorbid *Planorbis* planorbis (L.)—a species of hard, 'weedy' waters, mostly found in ditches and small ponds.

Hand-collected vertebrate remains

Three boxes (each box approximately 20 litres) of hand-collected vertebrate remains were recovered from 48 deposits, ranging in date from the Roman period through to 19th century. However, whilst spot dates were supplied for some of the deposits, no dating information was available for 22 of the contexts. Most of the bones were recovered from Trenches 4 and 9, with smaller assemblages from Trenches 6, 7 and 8. A total of 1465 fragments were recorded, of which 653 represented the remains of three complete skeletons —a sheep, a dog and a cow—all recovered from Trench 9. Excluding those representing complete or part skeletons, 15 measurable fragments and 2 mandibles with teeth in situ were recorded.

Material from the different trenches varied in preservation; remains from Trench 9 showed, on the whole, the best preservation. Fragments recovered from Trench 4 showed rather varied preservation, with bones from seven of the eighteen bone producing deposits being recorded as 'poor'. In particular, Contexts 4063 and 4068 produced assemblages from which even the teeth were eroded (teeth generally survive better where conditions are unfavourable for the preservation of bone). Material from Trench 8 was also rather poorly preserved, with most fragments being eroded and battered in appearance. With regards to colour, fragments from Trench 9 deposits were mainly dark brown in colour, whilst those from other trenches tended to be fawn or brown. In most cases, the colour was homogeneous throughout the material from single contexts. Fragmentation, mostly the result of fresh breakage during excavation and post-excavation processes, was quite extensive, affecting up to 50% of fragments from twelve of the contexts. Most of these deposits were from Trench 4, whilst the bones from the Trench 9 skeletons, despite their appearance of being well preserved, were in fact rather brittle and this was probably why they had fragmented on excavation. The main domesticates, cattle and caprovids, were the most commonly occurring species, with horse remains also being prevalent, particularly from Trench 9. However, the bulk of the horse bones (94 fragments)

The main domesticates, cattle and caprovids, were the most commonly occurring species, with horse remains also being prevalent, particularly from Trench 9. However, the bulk of the horse bones (94 fragments) were recovered from Contexts 9070 and 9076 and were mainly freshly broken skull and mandible fragments and teeth; the material from each of these contexts probably representing single individuals. Eleven horse bones, representing a minimum of three individuals, were also recovered from Context 9002. Faint knife marks, indicative of skinning, were observed on several of the horse tibiae from this deposit. Evidence for the disarticulation of horse carcasses, for disposal or for

consumption was suggested by chop marks on a horse radius and a horse mandible fragment from the same trench (Context 9083).

Trench 9 also produced two articulated animal skeletons from Contexts 9055 and 9059, a sheep and a young cow. Fusion data suggested that the cow was aged between 18 months and two years when it died, whilst the sheep was fully adult and was probably older than four years of age. Another skeleton, that of a dog, was identified from Context 9072. This animal was approximately 10 months old at the time of its death. No cause of death for any of these animals was apparent from the bones.

In addition to the part and complete skeletons from Trench 9, dog remains from Trench 4 (Context 4046) possible represented the fore leg and vertebrae of a single individual, whilst a possible animal burial, the part skeleton of a calf, was recovered from Context 6052. Fragments from the latter were very fragile and rather poorly preserved, but included several bones associated with the lower hind leg (metatarsal, calcaneum and phalanges) of the animal, together with some vertebra fragments and a deciduous maxillary premolar. A horse canine, which was very pale in colour and had a rather modern appearance, was also present within this deposit.

Discussion and statement of potential

Well-preserved assemblages of plant and insect remains are extremely rare in the area of Sherburn-in-Elmet or indeed almost anywhere along the Magnesian Limestone ridge through southern-most North Yorkshire and easternmost West Yorkshire, *pace* a few deposits encountered along the route of the A1-M1 extension, cf. reports in Roberts *et al.* (2001).

The invertebrate remains from five of the samples indicated deposition in quiet water, which was not too polluted. *Helophorus*, *Ochthebius* and *Limnebius* species, *Hydrobius fuscipes* (Linnaeus), various hydrophilines, and some hydroporines, were usually present, sometimes with *Haliplus* sp., *Agabus bipustulatus* (Linnaeus) and *Colymbetes fuscus* (Linnaeus), and from Context 9047 a *Dystiscus* species. In each case, there were small numbers of waterside beetles, but indicators of emergent and damp-ground or waterside vegetation were rare. Terrestrial

fauna varied in its representation, but generally suggested herbaceous vegetation, perhaps grassland. Dung beetles were present in modest numbers, sufficient to hint at nearby grazing livestock but not to suggest that they had access to the deposit as it formed. Synanthropic insects typical of occupation sites were rare, represented mainly by single individuals of *Lathridius minutus* group. Although a single pronotum of *Sitophilus granarius* (Linnaeus) was recovered from Context 9083, it may have been a contaminant.

The hand-collected shell amounted to the remains of only a few freshwater snails, recovered from Context 4053 (a 12th century backfill of a pit). Given the nature of this deposit it seems most likely that these remains were introduced during the infilling of this feature.

A moderate-sized assemblage of animal bone was recovered from the excavated deposits, mostly from Trenches 4 and 9, with over half of the identified fragments representing several animal burials/skeletons within the latter trench. Overall, the range of species represented was restricted to the main domesticates, with dog and cat also identified. With the exception of the animal skeletons, for which cause of death was unknown, the remains represented a mixture of waste, including butchery and domestic refuse. Bones from Trench 9 proved to be of most interest, as initial observations suggested the presence of waste associated with the skinning of horses and the disposal of horse carcasses. On the basis of the spot dates, these two activities were not contemporaneous. Material from the other trenches was less numerous and suggests that these areas have less potential for the preservation of bone. Overall, few measurable fragments or mandibles with teeth in situ were recovered of use for providing biometrical and age-at-death data, were recorded.

Recommendations

stored

Biological remains from this site, particularly those from Trench 9, show potential for the interpretetation of some of the excavated archaeological features, but, as is highlighted below, further analysis is dependant on the provision of a tighter chronological framework.

If the Roman deposit with charred chaff can be dated more closely it is recommended that a larger subsample is processed and the charred remains recorded more thoroughly. Likewise, material from the 14th century ?retting pit should certainly be subjected to a proper archaeobotanical investigation, including checking the identity of the ?flax stem fragments.

Providing dating is sufficiently reliable, all of the insect assemblages and the vertebrate remains deserve further consideration; the former to obtain information concerning local land use and to determine whether there is evidence for scatter or waste from buildings, the latter for a more detailed investigation of the activities being undertaken at the site. For the insect remains, further sediment should be processed with some care in order to recover assemblages of sufficient size and in good condition.

The snail remains were too few to warrant further investigation.

This evaluation shows the potential for the preservation of biological remains within certain deposits in this area, and this should be borne in mind if further excavation is undertaken.

Retention and disposal

All of the current material should be retained for the present.

Palaeoecology Research Services (Unit 8, Dabble Duck Industrial Estate, Shildon, County Durham), along with paper and electronic records pertaining to the work described here.

material is currently

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References

Dobney, K., Hall, A. R., Kenward, H. K. and Milles, A. (1992). A working classification of sample types for environmental archaeology. *Circaea, the Journal of the Association for Environmental Archaeology* **9** (for 1991), 24-6.

Kenward, H. and Large, F. (1998). Recording the preservational condition of archaeological insect fossils. *Environmental Archaeology* **2**, 49-60.

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.

Kenward, H. K., Engleman, C., Robertson, A. and Large, F. (1986). Rapid scanning of urban archaeological deposits for insect remains. *Circaea* **3**, 163–172.

Roberts I, Burgess A and Berg D. (eds). 2001. A new link to the past: the archaeological landscape of the M1-A1 link road. *Yorkshire Archaeology* 7. Leeds: West Yorkshire Archaeology Service on behalf of West Yorkshire Joint Services.

Archive

Table 1. Hand-collected vertebrate remains (including complete and part skeletons) from excavations at the Spinney, Sherburn-in-Elmet, North Yorkshire. Key. Med = medieval; post-med = post-medieval; nd = not dated.

Species		?IA/RB	Roman	med	post-med	18/19thC	nd	Total
Canis f. domestic	dog	-	-	12	156	2	-	170
Felis f. domestic	cat	-	-	-	-	1	2	3
Equus f. domestic	horse	-	3	63	2	11	48	127
Sus f. domestic	pig	-	3	3	1	-	3	10
Bos f. domestic	cow	5	5	32	3	4	412	461
Caprovid	sheep/goat	-	3	11	1	2	268	285
Unidentified		22	16	96	41	10	224	409
Total		27	30	217	204	30	957	1465

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