

**Assessment of biological remains from excavations at
41-9 Walmgate, York (site code: 1999.941)**

by Deborah Jaques, Allan Hall, Harry Kenward, Stephen Rowland and John Carrott

Summary

A series of sediment samples and 21 boxes of hand-collected bone, from deposits of dating from the 10th through to the 19th centuries revealed by excavations at 41-9 Walmgate, York, were submitted for an evaluation of their bioarchaeological potential.

Plant remains were sparse in the samples, but a modest-sized assemblage from one early medieval floor was probably burnt thatch or floor litter, whilst material from a late medieval pit fill appeared to be rather strongly decayed stable manure—a conclusion supported by evidence from the well preserved insect remains present. An Anglo-Scandinavian floor deposit yielded plant and insect remains typical of the period in York, amongst which were some possible indicators of textile working, whilst a ?14th century pitfill clearly contained some (probably human) faecal material.

The excavations produced a moderate-sized assemblage of vertebrate remains, with bone from 498 contexts. Few deposits, however, produced substantial quantities of material. Overall, the vertebrate remains were reasonably well-preserved, with some rounded and battered fragments distributed throughout. Species present did not differ radically between periods and, as might be expected, the major domesticates were the most commonly occurring taxa (cattle dominated all phases). In particular, the vertebrate remains recovered from contexts dating to the transition from late medieval to early post-medieval traditions could provide valuable information about this important, and currently largely neglected, period of social and economic change.

It is recommended that the plant and insect remains from the more productive deposits are subjected to further detailed analysis to make a proper record. Any samples from well-dated deposits not examined in this assessment but which appear to have good charred or uncharred preservation should also be examined. All of the well-dated vertebrate material should be recorded in detail. In particular, age-at-death and biometrical data should be recorded for the main domesticates from relevant contexts to investigate possible late medieval/early post-medieval evidence for a shift towards intensification of agricultural practices associated with the ‘agricultural revolution’.

KEYWORDS: 41-9 WALMGATE; YORK; ASSESSMENT; 10TH TO 19TH CENTURY; ANGLO-SCANDINAVIAN; SAXO-NORMAN; MEDIEVAL; HIGH MEDIEVAL; LATE MEDIEVAL; LATE- TO POST-MEDIEVAL TRANSITION; POST-MEDIEVAL; LATE POST-MEDIEVAL; ‘AGRICULTURAL REVOLUTION’; PLANT REMAINS; CHARRED PLANT REMAINS; CEREALS; INVERTEBRATE REMAINS; INSECTS; GRAIN PESTS; VERTEBRATE REMAINS; ‘STABLE MANURE’

Authors’ address:

Palaeoecology Research Services
Environmental Archaeology Unit
Department of Biology
P. O. Box 373
University of York
York YO10 5YW
Telephone: (01904) 433846/434475/434487, Fax: (01904) 433850

Prepared for:

York Archaeological Trust
Cromwell House
11 Ogleforth
York YO1 2JG

30 April 2001

Assessment of biological remains from excavations at 41-9 Walmgate, York (site code: 1999.941)

Introduction

An archaeological excavation was carried out by York Archaeological Trust at a site at 41-9 Walmgate, York in Autumn 2000.

A series of sediment samples ('GBA'/'BS' *sensu* Dobney *et al.* 1992) and 21 boxes (each of approximately 20 litres) of hand-collected bone were recovered from the deposits. Pottery spot dating gave a range from the 10th to 19th centuries for the deposits (numbers of contexts by pottery spot date and date group for bone-bearing contexts are shown in Table 2).

All of this material was submitted to the EAU for an evaluation of its bioarchaeological potential.

Methods

Sediment samples

The sediment samples were inspected in the laboratory. Ten of the samples were selected for evaluation. The lithologies of the six 'GBA' samples 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, washovers and residues were examined for plant remains. The flots and washovers were also examined for invertebrate remains, and the residues were examined for other biological and artefactual remains.

Preservational condition of the invertebrate remains was recorded using the scheme of Kenward and Large (1998). In summary, preservation is recorded as chemical erosion (E) and fragmentation (F), in each case on a scale from 0.5 (superb) to 5.5 (extremely decayed or fragmented).

Two of the samples were examined for the eggs of intestinal parasitic nematodes and other microfossils using the 'squash' technique of Dainton (1992).

Table 1 shows a list of the processed samples and notes on their treatment.

Hand-collected vertebrate remains

For the hand-collected vertebrate remains, data were recorded electronically directly into a series of tables using a purpose-built input system and *Paradox* software. Subjective records were made of the state of preservation, colour of the fragments, and the appearance of broken surfaces ('angularity'). Additionally, semi-quantitative information was recorded for each context concerning fragment size, dog gnawing, burning, butchery and fresh breaks.

Where possible, fragments were identified to species or species group, using the reference collection at the Environmental Archaeology Unit, University of York. Fragments not identifiable 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), bird, fish, small mammal and totally unidentifiable. As well as counts of fragments, total weights were recorded for all identifiable and unidentifiable categories.

Results

Sediment samples

The results are presented in context number order. Archaeological information, provided by the excavator, is presented in square brackets. Table 5 shows the range of vertebrate species and number of fragments recovered from the samples.

Context 1418 [Interior floor layer of late-medieval to early post-medieval date]

Sample 7/T (5 kg sieved to 300 microns with paraffin flotation)

Almost dry, mid grey-brown (locally paler and darker), indurated, brittle and very finely laminated, sandy clay silt with local concentrations of fine brick/tile. Coal, ?desiccated plant matter and fish bone were present in the sample.

There was a moderate-sized residue of about 600 cm³ of sand and cinders (to 15 mm in maximum dimension), with some coal (to 10 mm), brick/tile (to 5 mm), bone (to 30 mm, including fish to 15 mm) showing green staining, as well as some undisaggregated (?somewhat concreted or indurated) matrix sediment (to 10 mm). Other components included small amounts of slag, mortar, charcoal, marine shell, and iron and copper alloy fragments (the latter no doubt responsible for the green coloration of some of the bone). A small washover of the least dense material was taken and was found to consist of 'char' (probably bituminous material exuded from coal), with some fish scale and ?modern rootlets. The tiny flot contained abundant rush (*Juncus*) seeds (these were very decayed, making identification to species difficult, but were probably mostly *J. inflexus* L./*J. effusus* L./*J. conglomeratus* L.), which represent the species perhaps most likely to be used for strewing on floors. There were also some water-plantain (*Alisma*) embryos (perhaps brought with cut vegetation from a riverside source) and some unidentifiable invertebrate remains (which had probably decayed during or immediately following deposition).

A vertebrate assemblage amounting to 278 fragments was recovered from this sample. Preservation of the remains was very good. The bulk of the assemblage (approximately 200 fragments) were fish bones, most of which were unidentified. Those which could be identified to species (or species group) included herring, eel, haddock, ?whiting, other members of the cod family (*Gadidae*), *Pleuronectidae* (flat fish) and *Cyprinidae*. Mammal and bird fragments were present, but were mainly too fragmented for identification.

Sample 7/SPT: A spot sample of sediment bearing areas of glossy ?plant material within rather dense, compacted, layered sandy silt ?floor sediment, seen during examination of the unprocessed sample in the laboratory, proved to be concentrations of small fish bone (including three tail vertebrae of a ?sand eel (*Ammodytidae*)).

Context 1467 [Levelling deposit of clay—15th century]

Sample 9/T (0.465 kg)

The whole of this very small sample was processed as a 'test' sample. It consisted of a stiff, somewhat orangish-brown clay, with some patches of black charred fine plant detritus, perhaps cereal chaff. The sample needed a long period of soaking to disaggregate the very tenacious clay. The washover of about 10-20 cm³ of fine organic debris was then examined from the very small residue: it comprised modest amounts of unidentifiable charred cereal chaff, perhaps from oats, *Avena* (since there were also traces of charred oat grains). The only other plant remains were traces of taxa likely to have been cornfield weeds. There were also very small amounts of charcoal (to 10 mm) and coal (to 5 mm).

Context 1522 [Backfill of brick lined pit. 15th century]

Sample 15/P (Microfossil 'squash')

The microfossil 'squash' was mostly inorganic, with a trace of organic detritus. A few fungal hyphae and a single 'live' soil nematode were noted, but no eggs of intestinal parasitic nematodes or other identifiable microfossils were seen.

Context 1529 [Floor accumulations/rake-off. ?Post-medieval]

Sample 14/T (4.5 kg sieved to 300 microns with paraffin flotation)

Dry, varicoloured (light to mid grey-brown to black to white to light grey-brown), crumbly and layered (including a thin white layer of ?lime—certainly calcareous material as shown by its reaction to dilute hydrochloric acid), slightly sandy silt (locally slightly clay). Brick/tile and coal were present in the sample.

The large residue of about 1000 cm³ consisted of brick/tile (to 35 mm), cinders (to 20 mm) and sand, with some charcoal (10 mm, including oak, *Quercus*, and hazel (*Corylus*), coal (20 mm) and fish bone (25 mm); there were also traces of mortar, marine shell, eggshell, iron and copper alloy objects, and slag. The small flot contained some 'char' (from coal) and fragments of modern roots.

No identifiable invertebrate remains were observed. They had probably decayed during or immediately following deposition.

The residue yielded 85 vertebrate fragments identified to species or species group, together with numerous unidentified fish, mammal and bird remains (approximately 300 in total). The preservation of the bone was good, with colour mostly brown or fawn. Fish remains predominated and included herring, eel, thornback ray, haddock, ?cod, ?three- or five-bearded rockling, plaice and lemon sole. Many of these fragments were vertebrae, but other elements were also represented.

Context 1910 [Exterior backfill of large pit—15th century]

Sample 39/T (2 kg sieved to 300 microns with washover)

Moist, mid to dark brown, crumbly (working thixotropic), slightly clay sand (but matrix largely of ?ash). Charcoal was abundant and brick/tile, coal, cinder, mammal and ?fish bone were all present in the sample.

There was an extremely large washover and residue of about 1200 cm³, the former mostly of cinders (to 30 mm), charcoal and char, the latter of cinders and sand with some coal (to 30 mm) and bone (to 170 mm, including fish, up to 15 mm, some of it green-stained). Traces of ?baked clay/daub, brick/tile, marine shell, copper alloy objects or slag, eggshell, mortar and non-cuprous slag were also noted. Uncharred plant material was limited to traces of modern rootlets and some fine unidentifiable plant detritus.

Vertebrate remains from this assemblage amounted to 257 fragments, all of which were well preserved, although a little battered in appearance. A range of fish was identified, mostly from vertebrae, with other elements mostly being too fragmented for identification. Some of the unidentified fish fragments also showed evidence of butchery. Species present included herring, haddock, ?cod, gadid and plaice. Cattle, pig and goose remains were also present.

Context 1969 [Interior floor accumulations—14th century]

Sample 49/T (5 kg sieved to 300 microns with washover)

Moist, dark grey-brown (locally somewhat lighter), crumbly (working more or less plastic and sticky), sandy clay ?ashy silt, with fine varicoloured laminations visible within unbroken lumps. Brick/tile, mammal bone and oyster shell were present in the sample.

There was a large residue of about 1000 cm³ of sand with some bone and brick/tile (both to 80 mm, and including rather a lot of fish bone to 20 mm), and traces of charcoal, cinders, coal, marine shell (including crab). The green-staining seen on some of the bone could be linked to the presence of copper alloy material, and there was also a coppery/rusty metallic staining on some bone and on some oyster shells. Traces of bone-rich concretion perhaps reflect the presence of faecal concretion, perhaps dog coprolite. The tiny flot yielded some unidentified snail fragments along with traces of very decayed seeds of poppy

(*Papaver ?argemone* L.) and moderate numbers of seeds of toad rush (*Juncus bufonius* L.), the former perhaps from straw, the latter likely to have arrived on muddy feet.

Identified vertebrate remains recovered from this sample amounted to 130 fragments, with a further 450 assigned to the 'unidentified' category. Preservation of the vertebrate assemblage was mainly good, although some of the larger mammal fragments had eroded surfaces. Some small calcined fragments were also present. More than 50% of the assemblage was <30 mm in size, with larger fragments (to 80 mm) restricted to the mammal remains.

Mammals were represented by the major domesticates (cattle, caprovid and pig), whilst fish remains included herring, haddock, whiting, and several pleuronectid fragments. Vertebrae were the most commonly identified fish bone, but the unidentified component contained another 200 (approximately) bones, some representing fragments of other skeletal elements, ribs and finrays. Unidentified mammal fragments were also numerous.

Context 2104 [Interior floor. 11th/12th century]

Sample 45/T (0.425 kg)

The whole sample was washed to 300 microns and treated as a 'test' subsample. It consisted of black, crumbly ?ash and charcoal with some lumps of greyish silt and some fish bone. It yielded a small residue mainly of undisaggregated silt with bone and some clasts of matted, compressed, charred herbaceous plant material (some of it grass or cereal straw), free charred herbaceous fragments, and some well preserved charred cereal grains. The last-named were bread/club wheat (*Triticum 'aestivo-compactum'*) and rye (*Secale cereale* L.) and there were also some slender rachis (ear-stalk) fragments which were apparently mostly rye, but which also included traces of free-threshing wheat. Amongst the charred herbaceous detritus were traces of leaf of the saw sedge, *Cladium mariscus* (L.) Pohl, and this, together with the cereal remains, especially the slender rye rachis, perhaps points to this material coming from thatch or floor litter. The washover from this sample yielded moderate numbers of uncharred seeds of *Papaver argemone* and *Juncus bufonius* (cf. Sample 49, Context 1969). There were a few other identifiable charred plant remains consistent with the presence of straw and others of no particular interpretative significance.

This sample produced 40 rounded and rather battered looking fragments of bone, of which only two were identified. A large proportion of the assemblage consisted of small (<15 mm in size), unidentified fish remains. The identified component included two ?cod (cf. *Gadus morhua* L.) vertebrae.

Context 2662 [Basal fill of timber lined pit 1692 in backyard area—circa 14th century]

Sample 61/T (2 kg sieved to 300 microns with paraffin flotation)

Moist, very dark grey-brown, crumbly or compressed/fissile (in different areas), sandy silt and clods of somewhat felted woody and herbaceous organic detritus with hints of ?mineralisation within the layered organic component. Fragments of large mammal bone were present in the sample.

This subsample yielded a moderate-sized to large residue of about 525 cm³, of which about 200 cm³ was mineral sediment (mainly sand), the rest forming a washover of charred and uncharred organic debris, including some large (to 30 mm) charcoal fragments. In general, the coarser plant detritus had the appearance of grassy or strawy litter, borne out by the rather large number of taxa which may have originated in hay or other cut vegetation. Preservation was often rather poor and the concentration of seeds within the matrix of herbaceous debris rather low. The more abundant identifiable taxa were fig (*Ficus carica* L.) seeds, duckweed (*Lemna* sp.) thalli, and buttercup (*Ranunculus* Section *Ranunculus*) with other probable foodplants, cereal weeds, and grassland plants. There may well have been some reworked and very decayed faecal concretions.

The flot was small and contained modest numbers of insect remains (other invertebrates were rare). Their chemical preservation was mostly fairly poor (E 2.5-4.5, mode 3.5, weak) and fragmentation was

moderate (F 1.5-3.0, mode 2.5, weak). The fauna was strongly synanthropic, and contained three components which together are regarded as indicating stable manure: grain pests (*Sitophilus granarius* (Linnaeus) and *Oryzaephilus surinamensis* (Linnaeus)); the weevils *Apion* (some freshly emerged) and *Gymnetron*, probably introduced in hay, and small numbers of various decomposers regarded as typical of stable manure. A single ?*Damalinia* sp., a member of a genus of lice found on domestic animals, was noted. The post-Conquest date of the deposit was strongly supported by the presence of the grain pests, and of *Tipnus unicolor* (Piller and Mitterpacher). The contrast between the poor preservation of the plant remains and the rather better state of the insect remains is notable; perhaps the material decayed strongly during deposition, leaving the insects which partook in decay or entered at a late stage.

This deposit seems to have included stable manure, but perhaps also human food waste or faeces.

This material would repay further investigation, both to amplify interpretation and to provide data for synthesis from a poorly-represented period. For the insects, an additional 4-5 kg subsample should be processed, and the data combined with those from the present subsample.

Context 2890 [Floor. 10th/11th century]

Sample 65/T (2 kg sieved to 300 microns with paraffin flotation)

Moist, very dark brown to black, compressed and felted, slightly silty herbaceous detritus with some wood fragments.

The very large residue of about 800 cm³, of which all but about 100 cm³ was woody and herbaceous debris, had a rather flaky/granular texture; the mineral component consisted mainly of sherds of what appeared to be a single pot. Amongst the coarser organic remains were moderate numbers of well preserved wood chips (to 10 mm), and abundant wood fragments (to 35 mm). There were also some well preserved hazelnut shell fragments, often large (though never whole). Other plant remains suggested the presence of a 'strawy' or hay component, perhaps even litter from woodland sources and grassland/heathland turves. There were also abundant seeds of flax/linseed (*Linum usitatissimum* L.) and moderate numbers of seeds of celery (*Apium graveolens* L.), perhaps both used for food. One taxon consistent with the dating of this deposit to the Anglo-Scandinavian period was the clubmoss, *Diphysium complanatum* (L.) Rothm.

Insect remains were rather abundant in the large flot, but other invertebrates not common. Their chemical preservation was mostly good, although a component of more highly decayed fossils was present (E 2.0-4.0, mode 2.5, distinct). This more decayed component could not be related to a particular habitat type and so did not give clues as to taphonomic pathways to the deposit. Many sclerites were highly fragmented (F 1.5-5.0, mode 3.5, weak), though whether this had occurred in the ground or during processing can only be guessed. Most remains were identifiable despite their fragmentary nature.

The fauna was mixed in nature, including some synanthropes associated with human occupation and a range of forms from outdoor habitats, a proportion of which were probably introduced in materials of some kind. There were at least three sheep keds (*Melophagus ovinus* (Linnaeus), represented both by the adults and the puparia from which they were doubtless released during processing, and several ?*Damalinia* sp., in all probability the sheep louse, *D. ovis* (Schrank). These remains were almost certainly deposited during wool-cleaning. Human fleas (*Pulex irritans* Linnaeus) and a single ?human louse (*Pediculus humanus* Linnaeus) suggest domestic occupation, consistent with dyeing and wool cleaning. A range of large beetles was represented by well-preserved though fragmentary remains (e.g. *Carabus nemoralis* Müller and *Silpha atrata* Linnaeus); these may have strayed into the building and been trampled into the floor surface.

The insects do not clarify the dating of the deposit in a positive way, though no grain pests were present and *Tipnus unicolor* was not recorded; these beetles are almost always present in post-Conquest deposits

but absent from Anglo-Scandinavian ones. Thus, negative evidence places the layer before the Conquest, consistent with the presence of the clubmoss.

This seems likely to be an Anglo-Scandinavian domestic floor deposit.

The insect remains from Sample 65/T require further investigation, both by recording the fossils from the present subsample in detail and by processing a further subsample, perhaps of 3-5 kg. This would give a clearer view of conditions within the building, the range of activities, and the likely source of the outdoor forms. It would also enable the presence of further dyeplants to be tested.

The vertebrate material recovered from this sample was well-preserved and most fragments were less than 25 mm in size. A number of fragments were calcined. In total, 90 fragments were recovered, the bulk of which were unidentified mammal and fish remains. Herring, eel, and smelt vertebrae were identified.

Context 2902 [Backfill of pit 2886 in backyard area—probably 14th century]

Sample 66/SPT

About 200 cm³ of this material—a dark brown, compacted, perhaps slightly fissile, organic detritus, perhaps peat, apparently somewhat concreted within lumps—was broken up in water. Lumps were soft externally, then flaky, and internally very indurated: they were evidently faecal concretions, a diagnosis borne out by their large content of wheat/rye bran, with some apple (*Malus sylvestris* Miller) endocarp (core), corncockle (*Agrostemma githago* L.) seed fragments and the presence of eggs of the intestinal parasites whipworm (*Trichuris*) and maw-worm (*Ascaris*) in a smear from a little undisaggregated material prepared on a microscope slide.

Context 3122 [Burnt deposit overlying cobbled surface—circa 13th century]

Sample 71/T (0.1 kg)

This sample consisted of unconsolidated black charred plant material with some lumps of grey silty sediment; a small subsample taken to check the content of biological remains, using gentle water disaggregation. It was found that the coarser charred material consisted of grass/cereal culm (stem) fragments, probably cereal straw or reed (*Phragmites australis* (Cav.) Trin. ex Steudel). It could not be identified further.

Hand-collected vertebrate remains

Hand-collected vertebrate material, amounting to 21 boxes (each box approximately 20 litres) was recovered from 498 contexts, of which 92 were undated at the time this report was prepared. A wide range of context types, including floors, pitfills, dumps and build-up deposits, were represented. Dates provided by the pottery suggested that the earliest deposits were Anglo-Scandinavian, whilst most of the deposits were formed in the medieval period. Additionally some post-medieval and early modern deposits were encountered. Most bone-bearing contexts were of 13th to 15th century date and the bulk of the overall vertebrate assemblage was recovered from these.

For the assessment, material was selected on the basis of the size of the assemblage and to represent the various time periods covered by the deposits. Vertebrate remains from 47 deposits, representing a range of context types, were chosen. In total, 2573 fragments (weighing 48.3 kg) were recorded for this assessment, of which 833 (weighing 24.8 kg) were identified to species.

Pottery spot dates provided 28 different date categories by which the material could be grouped. For ease of comprehension, these were amalgamated into seven broader time periods: Anglo-Scandinavian; Saxo-Norman; high medieval; late medieval; late- to post-medieval; early post-medieval; and late post-medieval (See Table 2). Contexts of broad or modern date and those that were undated were excluded. Table 2

shows the total number of bone-bearing contexts by spot date and date group, whilst Table 3 shows the total number of contexts and fragments recorded for the assessment by date group and includes the number of measurable bones and the number of mandibles with teeth *in situ*.

Anglo-Scandinavian

A total of 186 fragments (of which 45 were identified to species) was recorded from this period (Table 4), representing 5 contexts (approximately one box of bone). Anglo-Scandinavian deposits produced 13 measurable bones and 2 mandibles with teeth *in situ*.

Preservation of the material from this period was good, with colour mainly recorded as dark brown. Fresh breakage and dog gnawing was observed in all contexts, but few bones were affected. Evidence of butchery was rarely extensive, with the exception of Context 2940, where butchered fragments represented 20-50% of the assemblage.

Of the major domesticates, cattle remains predominated, followed by caprovid and pig. Caprovid remains included a large goat metacarpal. Additionally, single fragments of cat and goose were identified. Preliminary observations of skeletal element representation for cattle suggested that meat-bearing elements, such as scapulae, humeri, radii, ulnae and femora) were prevalent. The unidentified component included large mammal (assumed to be mainly cattle) rib and shaft fragments, which also indicated the presence of domestic refuse. Insufficient caprovid and pig fragments were recovered for any clear patterns to be identified from them.

Saxo-Norman

The vertebrate assemblage from this period, amounting to 82 identified and 141 unidentified fragments, represented three contexts (approximately 0.75 boxes of bone). Sixteen measurable bones and six mandibles with teeth *in situ* were recorded.

As with material from the previous period, preservation was good, although a few rounded and battered fragments were noted scattered throughout the assemblage. Colour of the fragments was largely recorded as brown, with a green discolouration (typical of copper alloy staining) of some of the bones from Contexts 1826 and 2331. A single human bone was identified from Context 2907, suggesting the presence of residual or reworked material.

A similar range of species to those identified for the Anglo-Scandinavian period was recorded. Common domesticates were present, with cattle remains making up the largest proportion of the identified material (Table 4). Five mandibles from juvenile cattle and a number of juvenile cattle skull and femur fragments were identified from this period. The range of skeletal elements for cattle suggested that a larger component of butchery waste was present than was noted for the earlier period. Mandibles, isolated teeth and phalanges were the most commonly occurring elements.

Birds were represented by geese and chickens, the remains of the latter being more numerous than caprovids and pigs. Context 1826 produced the remains of a number of juvenile and sub-adult cat bones, representing at least three individuals. Both front and back limbs were noted. One deposit, Context 1792, with a later spot date (14th/15th Century) but also from the same pit, produced a similar accumulation of juvenile cat bones, which complemented those recovered from Context 1826. These deposits probably include the remains of part skeletons of the same cats, which suggests that some of the material may be reworked or residual.

High medieval

A total of 257 fragments, representing six contexts (approximately 0.75 boxes of bone), was examined. Seventy-four fragments were identified to species, of which twenty were measurable and one was a mandible with teeth *in situ*.

Much of the assemblage recorded for this period was reasonably well-preserved, although three deposits (Contexts 2108, 2155 and 2932) yielded moderate quantities of bone fragments that were battered in appearance. Additionally, eroded and damaged surfaces were noted on material from Context 2155. Bones from Context 2932 were extensively gnawed, whilst burnt and scorched fragments were noted from Contexts 2620 and 2876. The preservation and angularity of the fragments suggests that some of the material may represent reworked material. Evidence of butchery included split cattle long bones (tibiae in particular) and medium-sized mammal vertebrae (assumed to be mainly caprovid) that had been chopped longitudinally. The latter are typically noted in medieval deposits and indicate the splitting of carcasses into sides.

Mammal species present (Table 4) included the major domesticates (cattle, caprovid and pig), with a small number of chicken and geese remains. Context 2620 produced goose fragments consistent in size with the barnacle geese reference specimens in the EAU. These bones, therefore, are likely to represent wild birds. Skeletal element representation for this period suggested that, for cattle, a mixture of primary butchery and domestic refuse was present in the deposits, with roughly equivalent numbers of non-meat and meat bearing elements. Although rare, caprovid remains showed a similar picture, whilst for pigs, isolated teeth were prevalent.

Late medieval

Material (amounting to 1.75 boxes) from 17 deposits contributed to the vertebrate assemblage from this period. In total 584 fragments, of which 213 were identified to species, were recorded in detail. Most of the vertebrate remains were recovered from backyard or exterior dump deposits and pit fills. Preservation of the material was mainly good, although some fragments, particularly from the pitfills, did have a rather battered appearance. Material from Context 1404 showed much variability of both preservation and angularity (nature of the broken surfaces). The colour of the fragments was typically brown, although bones from Context 2340 were stained a very intense green. Concretions were noted on the material recovered from Contexts 1897, 2601 and 2625. None of the assemblages from individual deposits was particularly fragmented, although some fresh breakage damage was noted. Dog gnawing was present, but was not extensive. Evidence of butchery was recorded on 20-50% of the fragments recovered from Contexts 1897 and 2340, whilst 10-20% of fragments from Contexts 1404, 2322 and 2343 were butchered. Split cattle longbones and longitudinally chopped vertebrae were the most commonly occurring kinds.

As might be expected, cattle remains predominated, the other major domesticates (caprovid and pig) providing the bulk of the rest of the assemblage. Goose and chicken remains were also quite numerous, whilst a single crane (*Grus* sp.) fragment was recorded from Context 2661. Wild mammals were represented by two cervid fragments, one identified as a red deer tibia and the other as a fallow deer metatarsal. Hand-collected fish remains were uncommon and, where identification was possible, represented members of the gadid family, such as ling and haddock.

Cattle were represented by a range of elements and, whilst non-meat-bearing elements such as metapodials, phalanges and isolated teeth were prevalent, a large component of meat-bearing elements (e.g. pelvises and femora) was also present. Skeletal element representation for caprovids showed a similar mix of bones, with radii and tibiae (meat-bearing), and mandibles and metapodials (non-meat-bearing) being most frequent. Although not particularly numerous, pig remains were chiefly composed of meat-bearing elements.

Fifty measurable fragments and ten mandibles with teeth *in situ*, of use for providing biometrical and age-at-death data, were recorded.

Late- to post-medieval transition

Three boxes of bone, amounting to 1019 fragments from thirteen deposits, were recorded from this period for the assessment. Back yard dumps and a number of pit fills produced the bulk of the assemblage, with the largest accumulation of material, over a third of the bones (380 fragments) recorded being from a single pitfill, Context 1910.

Vertebrate remains from this period showed good preservation, only a few bones, mainly from dump and levelling deposits (Contexts 1804, 1901, 2302 and 2406), being slightly battered in appearance or having rounded edges. Although most fragments were brown, some contexts (Contexts 1792, 1910 and 1995) yielded fragments which had been stained green to differing degrees. Variation of colour was otherwise apparent only within material from Context 1901. Little dog gnawing was evident, except on the material from Context 2406, of which 10-20% of the bones were chewed. Cattle bones from this deposit were also extensively butchered, this group including split tibiae, chopped mandibles, metapodials and vertebrae. Material from Contexts 1910 and 2339 also included heavily butchered cattle pelvis fragments.

The species present represented the usual range of domestic animals, with cattle remains predominating. Chicken was the next most abundant species (73 fragments), whilst caprovid and pig remains were less common. The assemblage from Context 1522 was made up almost entirely of chicken remains, representing at least 3 individuals, including juveniles. Context 1910 also produced a number of both chicken and goose fragments.

An increase in the number of fragments representing juvenile and immature cattle (when compared with the earlier material from this site) was recorded. This is a trend that has been recorded at other sites (Albarella and Davis 1996; Dobney *et al* 1996), but usually associated with slightly later post-medieval deposits.

A preliminary examination of the composition of the recorded assemblages suggested that a mixture of waste was represented. For cattle, mandibles, isolated teeth, metapodials and phalanges, indicative of primary butchery waste, were the most frequently encountered elements. However, as noted for the previous period, a large proportion of meat-bearing bones (representing domestic refuse), particularly amongst the caprovid remains, was present. Skeletal element representation for chicken and geese showed that most of the body was present. This suggests the presence of domestic refuse, as carcass preparation of birds would have been minimal, and most skeletal elements would be expected in household rubbish.

Cat remains were fairly numerous, representing at least two individuals, including a juvenile skull and mandibles. However, these remains appear to be related (i.e. part of the same skeletons) to those recovered from Context 1826 (Saxo-Norman), a fill from the same pit, suggesting some degree of reworking or redeposition of the deposits. Other species present included horse, red deer, duck, pigeon, and a few fish bones. The fish were mostly unidentified, but haddock and flat fish remains were noted from Context 1910.

In total, from the recorded assemblage there were 93 measurable fragments and seventeen mandibles with teeth *in situ*.

Early post-medieval

Material from only three deposits was recorded, amounting to 205 fragments (approximately half a box), of which eight were measurable and three were mandibles with teeth *in situ*.

Much of the material was well-preserved, although the colour of the fragments was rather variable within individual contexts. Fragments from Contexts 1530 and 1455 were, on the whole, brown or beige in colour, with some green staining evident (Context 1530), whilst material from Context 1273 was very variable and included burnt and scorched bones. Context 1455 also included bones with a somewhat 'greasy', semi-translucent appearance. Fragmentation and dog gnawing were minimal. Butchery marks were evident on 20-50% of the bones recovered from Contexts 1273 and 1530.

A range of species was identified, dominated by the major domesticates—cattle, caprovids and pigs. The remains of chickens, geese and single fragments of duck (*Anas* sp.), ?pheasant (cf. *Phasianus colchicus* L.) and jackdaw (*Corvus monedula* L.) were also recovered. Skeletal element representation for the three main species showed the presence of household/kitchen refuse in these deposits, with a smaller component of butchery waste also present.

Late post-medieval

Vertebrate remains (approximately a quarter of a box), recovered from a single deposit of 17th century date, were assessed. Ninety-nine fragments were recorded, of which nineteen were identified to species.

Preservation of the remains was good, with colour of the fragments recorded as brown. Dog gnawing was negligible and no burnt fragments were noted. The assemblage was dominated by cattle and large mammal (assumed to be mainly cattle) remains which included heavily chopped scapula and pelvis fragments. Caprovid and pig bones were also present but there were insufficient fragments for meaningful interpretation.

Discussion and statement of potential

Plant remains in these samples were sparse and (where uncharred) usually poorly preserved, as might be expected in deposits of this kind and date. Exceptionally, there was an assemblage of charred material which was highly suggestive of roofing or flooring material (from Context 2104), whilst the sample from Context 2662 proved to contain uncharred plant and insect remains likely to represent stable manure. An Anglo-Scandinavian floor deposit (Context 2890) gave an assemblage of plant and insect remains very typical of the period, with some evidence for processing of perhaps both plant and animal fibre for textiles. The context of this floor was, however, essentially domestic.

Data from analysis of plant and invertebrate remains from this site would be of value in the context of synthesis, adding to the information brought together by Hall and Kenward (2000), for example. Particular aspects to which the present site is relevant include land-use zonation, keeping of stock, textile working and roofing.

The excavations produced a moderate-sized assemblage of vertebrate remains, with bone from 498 contexts. Few deposits, however, produced substantial quantities of material. The assessed material represented approximately a third of the entire hand-collected assemblage and covered a chronological period from Anglo-Scandinavian period through to the 17th Century. Most of the recorded bones were recovered from pit fills and dump deposits, although some floor and accumulation deposits were represented.

Overall, the vertebrate remains were reasonably well-preserved, with some rounded and battered fragments distributed throughout. A small number of individual contexts showed evidence of reworked or residual material, but mostly the bones seemed to have been quite quickly incorporated into the deposits. Evidence of the metal-working activities being undertaken on site could be seen from the green coloured bones which had clearly been stained by contact with copper alloys in the ground.

Species present did not differ radically between periods. As might be expected, the major domesticates were the most commonly occurring taxa, with cattle dominating all phases. Chicken and geese remains were also present in most of the period assemblages. Cat bones appeared to be fairly numerous from the Saxo-Norman and the late medieval/post-medieval periods, but these fragments were recovered from the same feature and may represent part skeletons within reworked deposits.

A preliminary examination of body part representation for the major domestic species was undertaken. No large dumps of commercial refuse appeared to be present. Cattle remains from the recorded Anglo-Scandinavian assemblage were dominated by meat-bearing elements, whilst from the Saxo-Norman period onwards, cattle fragments included more primary butchery waste. However, numbers of meat-bearing elements, most likely to represent domestic refuse, were also noted. Where sufficient fragments were recorded, caprovid remains showed a similar picture but, in general, a larger proportion of the bones represented waste from food consumption. The presence of chicken and goose bones, particularly in the deposits of late- to post-medieval date, also highlights the domestic content. Slight differences between periods were apparent and, therefore, a more detailed examination of body part representation, looking at material from individual contexts or features, might provide a clearer picture of specific activities being undertaken in this area at different periods.

Another aspect of the vertebrate assemblage, which is worthy of further consideration, is the potentially important data which could be provided by the material recovered from late medieval/post-medieval deposits. As highlighted in previous reports (Jaques *et al.* 2000; Johnstone *et al.* 1999), the transition from late medieval to early post-medieval traditions has been identified by English Heritage (1991, 37) as a specific research priority. Until fairly recently, the study of vertebrate material from this important period of social and economic change has been largely neglected. Biometrical data from this assemblage will produce information regarding changes in height and general body conformation and, therefore, could provide insight into early stock improvement associated with the so-called 'agricultural revolution'. Associated changes in husbandry practices during this period can be seen in the increase in number of juvenile cattle remains (noted in numerous late medieval and post-medieval assemblages). This phenomenon has been linked to the rise in importance of dairying, with a consequent surplus of calves for veal. Evidence from medieval deposits at The Bedern, York (Bond and O'Connor 1999), however, could indicate an even earlier shift towards intensive dairying and prime beef production in the region. Several high status late medieval establishments have also provided similar evidence (Dobney unpublished). Further recording and analysis of the material from Walmgate will add to the dataset from these and other sites and help further clarify the complex changes during this important period.

The sample residues produced a moderate-sized assemblage of fish bones indicating that both marine and freshwater resources were utilised. Preservation of this material was good, it thus has potential for further investigations of human activity. Fish remains from other sites in York of medieval date (O'Connor 1991; Bond and O'Connor 1999) have shown the beginnings of large scale exploitation of deep water marine fisheries, representing a shift in emphasis from locally available freshwater, estuarine and inshore marine species (Dobney unpublished). Systematically recovered fish assemblages of medieval and post-medieval date are rare and there is a lack of understanding of the exploitation of past fish stocks and the trade/supply relationships between the coastal fisheries and the urban settlements.

Recommendations

It is recommended that a proper record (using further unprocessed material) is made of the plant remains in samples from Contexts 2104, 2662 and 2890, and of insect remains from the two latter contexts. Any samples from well-dated deposits not examined in this assessment but which appear to have good charred or uncharred preservation should also be examined.

It is evident that at least some of the deposits at this site have a high potential to investigate living conditions and human activity through much of the middle ages (in the broad sense) and every attempt should be made to sample and analyse suitable material if it is threatened by development.

The vertebrate assemblage shows some potential for providing useful zooarchaeological and archaeological information. It is recommended that all well-dated material should be recorded in detail. In particular, age-at-death and biometrical data should be recorded for the main domesticates from relevant contexts to further investigate possible late medieval/early post-medieval evidence for a shift towards intensification of agricultural practices involving urban meat supply and dairying and for early livestock improvement associated with the 'agricultural revolution'.

A diverse assemblage of fish was recovered from Contexts 1418, 1529, 1910 and 1969 and there is little doubt that processing more sediment from the same deposits would produce a moderately large assemblage. Equally, other samples not examined quite probably contain well-preserved fish remains and, therefore, any remaining samples should be investigated for the recovery of fish bones. The material recovered should then be recorded selectively (depending upon size of assemblage, range of species encountered and dating framework) following an agreed zooarchaeological protocol.

Retention and disposal

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

Archive

All material is 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 Neil Macnab of York Archaeological Trust for providing the material and the archaeological information, and to English Heritage for allowing AH and HK to contribute to this report.

References

- Albarella, U. and Davis, S. J. M. (1996). Mammals and birds from Launceston Castle, Cornwall: decline in status and the rise of agriculture. *Circaea, The Journal of the Association for Environmental Archaeology* **12**(1), 1-156.
- Bond, J. M. and O'Connor, T. P. (1999). Bones from medieval deposits at 16-22 Coppergate and other sites in York. *The Archaeology of York* **15** (5), 299-429 + Plates XVI-XIX. York: Council for British Archaeology.
- Dainton, M. (1992). A quick semi-quantitative method for recording nematode gut parasite eggs from archaeological deposits. *Circaea* **9**, 58-63.
- Dobney, K. (unpublished draft). Northern regional review of environmental archaeology: vertebrates.
- 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.
- Dobney, K., Jaques, D. and Irving, B. (1996). Of butchers and breeds. Report on vertebrate remains from various sites in the City of Lincoln. *Lincoln Archaeological Studies* **5**, vi + 215 pp.
- English Heritage. (1991). *Exploring our past*. London: HBMC.
- Hall, A. R. and Kenward, H. K. (2000). Setting people in their environment: plant and animal remains from Anglo-Scandinavian York. *Reports from the Environmental Archaeology Unit, York* **2000/42**, 44 pp. + 39 pp. tables and figures.
- Jaques, D., Carrott, J., Hall, A., Kenward, H., and Rowland, S. (2000). Evaluation of biological remains from excavations in the Hungate area, York (site codes YORYM2000.1-14). *Reports from the Environmental Archaeology Unit, York* **2000/29**, 22 pp.
- Johnstone, C., Large, F., Jaques, D., Worthy, D., Hall, A., Carrott, J. and Kenward, H. (1999). Assessment of biological remains from Blanket Row, Hull (sitecode: BWH98). *Reports from the Environmental Archaeology Unit, York* **99/1**, 35 pp.
- Kenward, H. K., Engleman, C., Robertson, A. and Large, F. (1986). Rapid scanning of urban archaeological deposits for insect remains. *Circaea* **3**, 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.
- Kenward, H. and Large, F. (1998). Recording the preservational condition of archaeological insect fossils. *Environmental Archaeology* **2**, 49-60.
- O'Connor, T. P. (1991). Bones from 46-54 Fishergate. *The Archaeology of York* **15** (4), 209-98 + Plates XII-XV. London: Council for British Archaeology.

Table 1. 41-9 Walmgate, York: list of processed sediment samples with notes on their treatment.

Context	Sample	Notes
1418	7	5 kg sieved to 300 microns with paraffin flotation and small subsample examined as a spot sample
1467	9	0.465 kg processed as 'test' sample
1522	15	Microfossil 'squash'
1529	14	4.5 kg sieved to 300 microns with paraffin flotation
1910	39	2 kg sieved to 300 microns with paraffin flotation
1969	49	5 kg sieved to 300 microns with washover
2662	61	2 kg sieved to 300 microns with paraffin flotation
2890	65	2 kg sieved to 300 microns with paraffin flotation
2902	66	Examined as a spot sample including microfossil 'squash'
3122	71	0.1 kg examined as a spot sample

Table 2. 41-9 Walmgate, York: number of bone-bearing contexts by date group and pottery spot date. **Key:** no. contexts = number of contexts producing bone.

Date group	spot date	no. contexts
Anglo-Scandinavian	10 th	19
Anglo-Scandinavian	10 th /11 th	2
Saxo-Norman	11 th	23
Saxo-Norman	11 th /12 th	11
High medieval	12 th	39
High medieval	12 th /13 th	2
High medieval	late 12 th /13 th	1
High medieval	12 th ?	1
Late medieval	13 th	63
Late medieval	13 th /14 th	4
Late medieval	late 13 th /14 th	1
Late medieval	14 th	92
Late medieval/post-medieval	14 th /15 th	33
Late medieval/post-medieval	late 14 th /15 th	2
Late medieval/post-medieval	15 th	48
Early post-medieval	16 th	23
Early post-medieval	16 th /17 th	2
Late post-medieval	17 th	5
Late post-medieval	17 th /18 th	1
Late post-medieval	17 th /19 th	1
Late post-medieval	18 th	10
Late post-medieval	18 th /19 th	8

Table 3. 41-9 Walmgate, York: total number of hand-collected fragments recorded for assessment purposes by date group, including the number of mandibles with teeth in situ, measurable fragments and contexts represented. **Key:** no. frags = number of recorded fragments; no. mand = number of mandibles with teeth in situ; no. meas = number of measurable fragments; no. contexts = number of contexts represented.

Date group	no. frags	no. mand	no. meas	no. contexts
Anglo-Scandinavian	186	2	13	5
Saxo-Norman	223	6	16	3
High medieval	257	1	20	6
Late medieval	584	10	50	17
Late medieval/ post-medieval	1019	17	93	13
Early post-medieval	205	3	8	3
Late post-medieval	99	1	0	1

Table 4. 41-9 Walmgate, York: hand-collected vertebrate remains.

Species		A/S	S/N	HM	LM	LM/PM	EPM	LPM	Total
<i>Canis f. domestic</i>	dog	-	-	-	-	2	-	-	2
<i>Felis f. domestic</i>	cat	1	19	-	4	17	-	-	41
<i>Equus f. domestic</i>	horse	-	-	-	-	1	-	-	1
<i>Sus f. domestic</i>	pig	6	7	16	25	31	11	4	100
<i>Cervus elaphus</i> L.	red deer	-	-	-	1	1	-	-	2
<i>Dama dama</i> (L.)	fallow deer	-	-	-	1	-	-	-	1
<i>Bos f. domestic</i>	cattle	24	26	32	95	128	24	12	341
Caprovid	sheep/goat	13	8	19	59	57	23	3	182
<i>Homo sapiens</i>	human	-	1	-	-	-	-	-	1
<i>Anser</i> sp.	goose	1	7	4	11	16	3	-	42
<i>Anas</i> sp.	duck	-	-	-	-	3	1	-	4
<i>Gallus f. domestic</i>	chicken	-	13	3	16	73	7	-	112
cf. <i>Phasianus colchicus</i> L.	?pheasant	-	-	-	-	-	1	-	1
<i>Grus</i> sp.	crane	-	-	-	1	-	-	-	1
Columbidae	pigeon family	-	-	-	-	1	-	-	1
<i>Corvus monedula</i> L.	jackdaw	-	-	-	-	-	1	-	1
<i>Gadus morhua</i> L.	cod	-	1	-	-	-	-	-	1
<i>Sub-total</i>		45	82	74	213	330	71	19	833
Unidentified fish	fish	2	-	1	10	15	-	-	28
Unidentified	unidentified	139	141	182	361	674	134	80	1711
<i>Sub-total</i>		141	141	183	371	689	134	80	1739
Total		186	223	257	584	1019	205	99	2573

Table 5. 41-9 Walmgate, York: vertebrate remains recovered from the GBA samples.

Species	Context	1418	1529	1910	1969	2104	2890	Total
<i>Sus f. domestic</i>	pig	-	-	1	4	-	1	6
<i>Bos f. domestic</i>	cow	-	1	2	1	-	-	4
Caprovid	sh/g	-	-	1	4	-	-	5
<i>Anser sp.</i>	goose	-	-	2	-	-	-	2
<i>Gallus f. domestic</i>	fowl	-	-	-	1	-	-	1
Rajidae	ray family	-	1	-	-	-	-	1
cf. <i>Raja clavata</i> L.	?thornback ray	1	-	-	-	-	-	1
<i>Raja clavata</i> L.	thornback	-	1	-	-	-	-	1
<i>Anguilla anguilla</i> (L.)	eel	10	11	-	2	-	1	24
<i>Clupea harengus</i> L.	herring	14	27	37	82	-	8	168
Cyprinidae	carp family	4	-	-	-	-	-	4
<i>Gobio gobio</i> (L.)	gudgeon	3	-	-	-	-	-	3
<i>Osmerus eperlanus</i> (L.)	smelt	-	-	-	-	-	6	6
Gadidae	gadid	2	2	-	-	2	1	7
cf. <i>Gadus morhua</i> L.	?cod	-	5	7	-	-	-	12
cf. <i>Melanogrammus aeglefinus</i> (L.)	?haddock	-	1	-	2	-	-	3
<i>Melanogrammus aeglefinus</i> (L.)	haddock	3	6	1	7	-	-	17
cf. <i>Merlangius merlangus</i> L.	?whiting	2	-	-	-	-	-	2
<i>Merlangius merlangus</i> (L.)	whiting	-	-	-	4	-	-	4
cf. <i>Ciliata mustela</i> (L.)	?5 bearded rockling	-	2	-	-	-	-	2
?Syngnathidae	?pipe fish family	1	-	-	-	-	-	1
?Pleuronectid/Cyprinid	?pleuronectid/ cyprinid	1	-	-	-	-	-	1
?Pleuronectid	?pleuronectid	-	-	-	1	-	-	1
Pleuronectid	pleuronectid	1	1	-	-	-	-	2
cf. <i>Limanda limanda</i> (L.)	?dab	-	2	-	-	-	-	2
cf. <i>Pleuronectes platessa</i> L./ <i>Platichthys flesus</i> (L.)	?plaice/flounder	-	-	1	1	-	-	2
cf. <i>Pleuronectes platessa</i> L.	?plaice	-	-	1	-	-	-	1
<i>Pleuronectes platessa</i> L.	plaice	1	1	-	-	-	-	2
<i>Microstomus kitt</i> (Walbaum)	lemon sole	-	3	-	-	-	-	3
Amphibian		-	-	-	2	-	-	2
Large mammal		6	6	-	10	1	-	23
Medium mammal		-	5	-	7	-	-	12
Unidentified bird		9	10	4	2	-	7	32
Unidentified fish		150	200	150	200	35	16	751
Unidentified mammal		70	100	50	250	2	50	522
Total		278	385	257	580	40	90	1630