Palaeoecology Research Services

Technical report: Biological remains from excavations at 41-9 Walmgate, York (site code: 1999.941)

by

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

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Summary

This report discusses results of analyses of remains of plants and animals (both invertebrates and vertebrates) from deposits of mid-late 11th to late 16th century date excavated by York Archaeological Trust at 41-9 Walmgate, York.

Biological remains were abundant in some deposits, even in rather 'unpromising' layers interpreted as floor accumulations, but in general concentrations of remains were very low, and typical for deposits of medieval and early post-medieval date in this part of York. Many deposits (498 contexts) produced bone, but few produced substantial quantities of material.

The foodplants recorded were all typical for the periods represented, though only one deposit (2902) appeared to be formed largely of human faecal material in which foods actually consumed might be expected to have survived. The insect fauna from Context 2662 was strongly synanthropic, and contained three components which together are regarded as indicating stable manure; the post-Conquest date of this deposit was strongly supported by the presence of grain pests, and the spider beetle Tipnus unicolor. *One of the richer deposits with respect to plant and invertebrate macrofossils (2940) may well have been wrongly dated or have contained re-worked Anglo-Scandinavian material.*

The range of vertebrate species represented was not particularly diverse. For all phases, the main domesticates, cattle, caprovid, pig, and chicken, provided the bulk of the remains, with fish and other birds, such as goose and duck, also present. Wild species formed only a very minor component of the assemblage. A mixture of refuse was represented which showed no significant changes through time. Much of the material was primarily domestic in nature, including both kitchen and table waste. Primary and secondary butchery waste was present but did not represent large scale butchering of carcasses, nor were any assemblages identified that represented waste from craft activities such as horn working or tanning.

KEYWORDS: 41-9 WALMGATE; YORK; TECHNICAL REPORT; MID TO LATE 11TH CENTURY TO LATE 16TH CENTURY; POST-CONQUEST; MEDIEVAL; POST-MEDIEVAL; PLANT REMAINS; CHARRED PLANT REMAINS; INVERTEBRATE REMAINS; INTESTINAL PARASITIC NEMATODE EGGS; *TRICHURIS*; *ASCARIS*; VERTEBRATE REMAINS; FISH; 'STABLE MANURE'

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Introduction

This report discusses results of analyses of remains of plants and animals (both invertebrates and vertebrates) from deposits of mid-late 11th to late 16th century date excavated by York Archaeological Trust at 41-9 Walmgate, York. Some material was examined during a phase of assessment and is described by Jaques *et al.* (2001); the results of examination of some material excavated previously at this site during work for Channel 4 TV's *Time Team* programme in 1999 are presented by Johnstone *et al*. (2000).

The assessment of the material described here (and by Jaques *et al.* 2001) was carried out on a series of sediment samples ('GBA'/'BS' *sensu* Dobney *et al*. 1992) and 21 boxes (each of approximately 20 litres) of hand-collected bone. Pottery spot dating gave a range from the 10th to 19th centuries for the deposits as a whole.

Subsequently, a further subsample from one context, and subsamples from two additional contexts not reviewed in the assessment, were analysed for plant and invertebrate remains. Three further samples were sieved for the recovery of fish and other bone. This report incorporates the results of all analyses relevant to contexts of mid-late 11th to late 16th century date (Phases 4 to 9.9 inclusive) from the site.

A moderate assemblage of vertebrate remains, amounting to 21 boxes (each box approximately 25 litres) was recovered from the excavations undertaken at 41-49 Walmgate. The assessment report (Jaques *et al*. 2001) recommended the recording of all well dated vertebrate material, but financial constraints and a re-evaluation of the project's research priorities resulted in a revised research plan which principally focused upon: 1) the fish remains recovered from the samples, 2) age-at-death data provided by mandibles, and 3) biometrical data from selected cattle and caprovid skeletal elements. Additionally, material from selected contexts was examined at the request of the excavator to aid the interpretation of some of the archaeological features; the results of these investigations are presented as the Appendix. Different levels of recording were employed, from brief notes to detailed records, as appropriate to the amounts and state of preservation of the material, and the archaeological questions to be addressed. All analyses were focused on remains from Phases 4 to 9.9.

Methods

Sediment samples

The sediment samples were inspected in the laboratory and ten selected for the initial assessment. 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.

The samples selected for main phase analysis of plant and invertebrate macrofossil remains were examined to give material additional to that recovered from the assessment and to examine two additional contexts (2940 and 3240). The procedure adopted for their examination and processing was the same as that used in the assessment. In addition, further material from three other samples was

processed primarily for the recovery of fish and other bone.

Table 1 shows the material relevant to this report (i.e. only samples from contexts of mid-late 11th to late 16th century date) and its treatment.

Results from the assessment phase have been included in this report where relevant but where they add nothing to material examined later no mention is made of them.

Recording procedures

Plant remains: Plant remains and other components of the washovers and residues were recorded using direct input to a PC (via an input form and *Paradox* software). Abundance of all constituents (related to the original size of the subsample) was recorded using a four-point scale from 1 (one or a few individuals or fragments or a very small component of the matrix) to 4 (abundant remains or a major/dominant component of the matrix) for the GBA samples, and a three-point scale for the 'spot' samples.

Insect and other macroinvertebrate remains: Insects were identified by comparison with modern reference material and using the standard works. Adult beetles and bugs, other than aphids and scale insects, were normally recorded fully quantitatively and a minimum number of individuals estimated on the basis of the fragments present. Other invertebrate macrofossils were generally recorded semi-quantitatively using the scale described by Kenward *et al.* (1986) and Kenward (1992), estimates being made for extremely abundant taxa.

Insect remains recovered from the residues during recording of plant remains were in most cases included in the record, although there were hardly ever any taxa additional to those from the flots and, indeed, rarely any additional individuals. Fossils from residues tended to be larger or denser than those in the flots.

The manuscript lists of invertebrates (other than molluscs) were entered to a *Paradox* database using systems written by JC, for analysis and long-term storage. The data were interrogated using *Paradox* to produce species lists in rank order for each assemblage and a species list for the site in taxonomic order, following Kloet and Hincks (1964-77).

Eggs of intestinal parasites: Two of the samples (Sample 66, Context 2902 and Sample 15, Context 1522—provisionally dated as 15th century but subsequently rephased to Phase 10, early to mid 17th century) were examined at assessment for the eggs of intestinal parasitic nematodes and other microfossils using the 'squash' technique of Dainton (1992). Three additional samples (Sample 39, Context 1910; Sample 61, Context 2662; and Sample 67, Context 2940) were examined as part of the main post-excavation analysis.

One sample (Sample 66, Context 2902) was re-examined as part of the main analysis and measurements of complete trichurid eggs were taken. Measurements of maximum length (including polar plugs) and maximum width were taken using a calibrated eyepiece graticule at 600x magnification and subsequently converted to microns. Summary and graphical presentations of the data were prepared using *Microsoft Excel* and *PowerPoint*.

Although primarily for the detection of intestinal parasitic nematode eggs the 'squash' technique routinely reveals other microfossil remains, and where present (or markedly absent) these have also been noted.

The size range quoted for *Trichuris trichiura* (Linnaeus) follows that given by Ash and Orihel (1984). Size ranges for the eggs of trichurids of other common domestic animals are from several sources including Kassai (1998) and the WWW pages of the College of

Veterinary Medicine, University of Missouri-Columbia.

Hand-collected vertebrate remains

For the vertebrate remains, both from hand-collection and from the samples, 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 applicable, fragments were identified to species or species group, using the reference collection at Palaeoecology Research Services. Measurements were undertaken on a number of selected skeletal elements. For cattle and caprovids, these were distal tibiae, metacarpals and metatarsals. Generally, chicken coracoids, humeri and tarsometatarsi were also measured. Additional elements were measured if the bones were complete and, in the case of cattle and caprovids, an estimated withers height could be calculated. All measurements followed those outlined by von den Driesch (1976). Withers heights were estimated using calculations devised by Foch (1966) and Matolsci (1970) for cattle and Teichert (1975) for caprovids.

Caprovid tooth wear stages were recorded using those outlined by Payne (1973; 1987), and those for cattle and pig followed the scheme set out by Grant (1982). Cattle, caprovid and pig mandibles and isolated teeth were assigned to the general age categories outlined by O'Connor (1989) and Payne (1973; 1987).

Results

For a complete list of plant and invertebrate taxa recorded, see Table 2, for data concerning plant remains Table 3, and for insect remains Tables 4-6. Tables 7 and 8 and Figures 1-4 show the data for intestinal parasitic nematode eggs. Table 9 shows the fish remains recovered from the samples, and Table 10 shows the range of vertebrate species represented in the hand-collected material and the number of fragments recovered by phase. Tables 11-19 and Figures 5 and 6 show additional data for the vertebrate remains.

Sediment samples

The results are presented in context number order by phase. Archaeological information, provided by the excavator, is presented in square brackets.

PHASE 5 (12th century)

Context 2940 [multiple thin layers of ash perhaps relating to firing of kilns to north-east]
Sample 67/T2 (3 kg sieved to 300 microns with paraffin flotation; microfossil 'squash'): main phase only

Moist, mid to dark grey-brown, brittle to slightly layered, working crumbly and soft, slightly sandy silt with fine and coarse herbaceous detritus and lumps of light grey to light bluish-grey 'cheesy-brittle' (working soft and sticky) silty clay, coated with yellow-orange-brown sand. The following were noted as inclusions: rotted wood, 'straw', fish bone, leather and fly puparia.

This subsample yielded a large residue of about 1000 cm^3 of granular woody debris, largely bark and wood chips (mostly well-preserved, the chips often pale in colour and firm) in the coarser fractions (both reached 20 mm in maximum dimension). The finer material was largely plant detritus with a little (barely 100 cm^3) sand and grit. The identifiable plants remains included quite a lot of flax (*Linum usitatissimum*) seeds, and there were also traces of clubmoss (*Diphasium*) and dyer's greenweed (*Genista tinctoria*) as well as a single superbly well preserved woad (*Isatis tinctoria*) pod fragment. These dyeplants are very typical of Anglo-Scandinavian deposits in York and it is suggested that either the dating of this context requires revision or the remains are reworked from immediately underlying deposits (material of *Diphasium* was recorded from the 10th century context 2890 at this site, as well as being noted regularly together with one or more of the other characteristically Anglo-Scandinavian dyeplants in eight contexts examined during work on the largely pre-Conquest material sampled during the 'Time Team'

excavation in 1999). The presence of seeds of fig (*Ficus carica*) and achenes of corn marigold (*Chrysanthemum segetum*), perhaps pointing to a post-Conquest date, lends support to the reworking hypothesis.

In addition to these taxa there were a few charred cereals (mainly poorly preserved – shrunken and or 'dished' oats (*Avena*), barley (*Hordeum*) and ?rye (cf. *Secale*)), but also a near perfect barley grain with its enclosing lemma. A wide range of other taxa preserved by waterlogging were recorded, probably representing components in the deposits of hay, straw and wetland (perhaps peatland, both fen and bog). The peatland category included leaf fragments and fruits of bog myrtle, *Myrica gale* (here, perhaps, a dyeplant or medicinal plant, if not a flavouring for beer or some other food), as well as the moss *Scorpidium scorpioides* and some others, bog bean (*Menyanthes*), and saw-sedge (*Cladium*). Some of these may have arrived in peat, others in cut wetland vegetation, for example for flooring or roofs.

A moderately large assemblage of adult beetles and bugs was recovered from the flot (181 individuals of 84 taxa), mites were numerous, and there was a range of other invertebrates. These remains were not charred, and presumably therefore were not deposited with ash. Perhaps they were killed by ash, known to have an insecticidal effect, as they moved about on a floor surface. The fauna was ecologically mixed. Much of it may have originated within a building, including the wood-borers *Ptilinus pectinicornis* and *Anobium punctatum*. The assemblage was somewhat reminiscent of those from many Anglo-Scandinavian deposits in York, and the possibility of redeposition or incorrect dating should be explored.

The microfossil 'squash' was mostly organic detritus with a trace of inorganic material. Many fungal spores and hyphae, and phytolith fragments were present together with some pollen grains and diatoms (at least 4 types).

Context 3240 [use deposit within stokepit]
Sample 76/T2 (3 kg sieved to 300 microns with paraffin flotation): main phase only

Moist, light to mid yellowish-brown to mid to dark grey-brown, crumbly (working soft and sticky) slightly sandy clay silt to silty clay with moderate amounts of charcoal.

This subsample yielded a rather large washover of charcoal (about 300 cm^3) the remaining 200 cm^3 being grit, sand, and material which had the appearance of baked clay or daub. The charcoal, which was up to 20 mm in largest dimension, included some oak and hazel, the latter at least in part from roundwood (?wattle). Other identifiable plant remains were sparse: there were traces of uncharred weld (*Reseda luteola*) and henbane (*Hyoscyamus niger*), perhaps both weeds on or near the site, and a single small charred vetch (*Vicia*) seed and a little charred hazel nutshell.

The only invertebrates observed were an aphid, clearly a modern contaminant, and a small unidentified landsnail.

PHASE 6.1/6.2 (late 12th-13th century)

Context 3122 [burnt deposit overlying cobbled surface 3123]
Sample 71/T (0.1 kg examined as a spot sample): assessment

This sample consisted of unconsolidated black charred plant material with some lumps of grey silty sediment; a small subsample was 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 but is likely to represent cut vegetation used as, for example, roofing or litter on a floor.

PHASE 6.3 (late 13th-early 14th century)

Context 2104 [interior floor]
Sample 45/T (0.425 kg sieved to 300 microns with washover): assessment only

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 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, 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 a poppy (*Papaver argemone*) and toad rush (*Juncus bufonius*) (cf. Sample 49, Context 1969, below). 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 comprised two ?cod (cf. *Gadus morhua*) vertebrae.

PHASE 8 (mid-late 14th century)

Context 1969 [interior floor accumulations in Building S]
Sample 49/T (5 kg sieved to 300 microns with washover): assessment

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 cm^3 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*) and moderate numbers of seeds of toad rush, 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 less than 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 bones, 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.

Sample 49/T2 (4.5 kg sieved to 300 microns for recovery of fish and other bone): main phase

The general composition of the residue was as described for the assessment subsample above.

Approximately 700 fragments of both fish and mammal bone were recovered from this subsample. The assemblage was extremely fragmented, and although the largest fragment was 44 mm in greatest dimension, most fragments were less than 10 mm in size. The larger bone fragments (mainly mammal) were rather battered and some had rounded edges, but the smaller, mostly fish, bones showed better preservation. Approximately 10% of the fragments showed some degree of burning or scorching. The identified remains produced an almost identical species list to that recorded for the first subsample from this deposit, with similar proportions for each species present. Remains of herring were by far the most numerous fragments, with haddock and eel also identified. Additionally, small numbers of whiting and flatfish, and a single cyprinid fragment, were noted.

Context 2662 [use deposit within bath-shaped pit 1692, backyard area]
Sample 61/T (2 kg sieved to 300 microns with paraffin flotation): assessment

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 cm^3, of which about 200 cm^3 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 seeds, duckweed (*Lemna* sp.) thalli, and buttercup (*Ranunculus* Section *Ranunculus*) achenes, together 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). The fauna was strongly synanthropic, and contained three components which together are regarded as indicating stable manure: grain pests (*Sitophilus granarius* and *Oryzaephilus surinamensis*); 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*. 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.

Sample 61/T2 (5 kg sieved to 300 microns with paraffin flotation; microfossil 'squash' on some ?faecal concretions from the residue): main phase

The large residue of about 2 litres in volume consisted of about 400 cm^3 of sand and grit, much of rest being granular fragments of material which seems to be 'faecal concretion' (although the microfossil 'squash' contained mostly inorganic material and mineralised organic detritus with a few pollen grains but no parasite eggs) and fine organic debris, making large less than 10 mm fractions, but also some quite coarse debris: marine shell, charcoal (including a few charred roundwood fragments of hazel to 60 mm long), cinders, bone, and a little brick/tile. Notable in this sample were rather a lot of animal hairs, and some wood chips, together with plant remains suggestive of straw and hay, altogether perhaps indicating stable manure. The small amounts of food (fig, apple, blackberry) are not inconsistent with this if animals were fed food waste or recycled human faeces. On the other hand, the presence of several fragments of woven wool textile and short (<10 mm) lengths of yarn is perhaps more consistent with the suggestion that primary human faecal material was present as one component of mixed waste within the fill of this feature. The traces of leaves (spines) of gorse recorded are unlikely to have been eaten by humans, but might have been fed to animals (though the number of uses for, and therefore potential routes to the deposit of gorse are legion, cf. Lucas (1960)).

The 5.0 kg subsample, processed in order to obtain a large insect assemblage, failed to produce one: in fact only 62 adult individuals of 42 beetle and bug taxa were retrieved. Preservation was often poor, some of the remains being very friable, falling apart when handled with forceps or a paintbrush. The same ecological components noted in the assessment subsample were present, but less clearly represented. However, it appeared rather likely that most of the remains entered the deposit in stable manure (cf. Kenward and Hall 1997): house fauna, decomposers from fairly open-textured foul matter, grain pests and plant feeders likely to have been brought in hay (there were apparently freshly-emerged clover weevils, *Apion* sp.). The more abundant decomposers would have lived happily together in stable manure which was not too foul. A single water beetle and some water fleas (Cladocera) may have originated in water for stock (probably via faeces). Stable manure was probably not the only component, though: there were four human lice (*Pediculus humanus*), possibly from a house floor (which may also have been the source of some of the decomposer beetles, many of which were species as well adapted to house interiors as to animal sheds). *Tipnus unicolor*, a spider beetle typical of post-Conquest deposits but rarer in Anglo-Scandinavian ones, was quite common (six individuals), and grain pests (*Sitophilus granarius* and *Oryzaephilus* ?*surinamensis*, also characteristic of post-Conquest material, and the latter positively identified from the assessment subsample) were present in traces. There was a puparium and an adult of the sheep ked *Melophagus ovinus* (the latter perhaps released from the former during processing). These may have originated from wool-cleaning debris. There were also some feathers.

Overall, then, the plant and insect remains seem to point to a deposit rich in if not largely formed from stable manure and perhaps some other other waste. The insects formed a typical post-Conquest group for York.

Context 2902 [backfill of bath-shaped pit 2886 in backyard area]
Sample 66/SPT (spot sample; microfossil 'squash'): assessment and main phase

About 200 cm^3 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*) endocarp (core), corncockle (*Agrostemma githago*) 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.

For the main phase, two additional microfossil 'squash' slides were prepared and examined for the eggs of

intestinal parasitic nematodes. A total of 28 *Ascaris* eggs and 71 *Trichuris* eggs were seen. 12 of the ascarid eggs were unfertilised. Of the 71 *Trichuris* eggs, 30 were extremely well preserved, retaining both polar plugs, and were measured (35 were missing one or both polar plugs but otherwise well preserved, and six were partly obscured or were orientated on the slide in such a way as to make them unmeasurable). Most of the 'squash' was organic detritus with a little organic material, many pollen grains (of several types), a few diatoms, and a single live soil nematode.

PHASE 9.3 (early 15th century)

Context 1910 [backfill of large cesspit/industrial tank]
Sample 39/T (2 kg sieved to 300 microns with washover): assessment

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 cm^3, 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.

Sample 39/T2 (20 kg sieved to 300 microns for recovery of fish and other bone): main phase

The general composition of the residue was as described for the assessment subsample above.

This large subsample produced an assemblage of over 700 bone fragments, of which 451 were identified to species or species group. On the whole, the material was well preserved, if a little fragmented. Green staining was noted on some fragments and some bones had battered edges. Although many bones could be identified, there was also an unidentified fish component which included numerous fine spines and remnants of skeletal elements (other than vertebrae) that were too fragmented to identify further. Some mammal and bird bones were present, but fish bones, herring in particular, dominated the assemblage (Table 9). The other major component of the identified fish assemblage was Gadidae. Of the gadids, haddock was the most commonly occurring species, with cod and ?whiting also recorded. Comparison with modern reference skeletons suggested that the cod elements represented fish of approximately 60cm to over 1 metre in length, whilst the haddock remains were from much smaller fish of between 45 and 50 cm in length. Additionally small numbers of flatfish (plaice/flounder) bones and a single thornback ray dermal denticle were noted.

Several vertebrae, including herring, cod and flatfish, showed damage consistent with having passed through the digestive system, probably of a dog in view of the size of the cod vertebra. No faecal concretions were identified from this deposit and it is most likely that the damaged fragments came from dog coprolites rather than from human faecal material.

PHASE 9.8 (mid-late 16th century)

Context 1418 [floor layer/accumulation within building V]
Sample 7/T (5 kg sieved to 300 microns with paraffin flotation): assessment

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 cm^3 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*/*J. effusus*/*J. conglomeratus*), 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 subsample. Preservation of the remains was very good. The bulk of the assemblage, approximately 200 fragments, was fish bone, most of which was unidentified. Those bones which could be identified to species (or species group) included herring, eel, haddock, ?whiting, other members of the cod family (Gadidae), Pleuronectidae (flatfish), and Cyprinidae. Mammal and bird fragments were present, but were mainly too fragmented for identification. This high degree of fragmentation is most likely the result of trampling and is thus consistent with the interpretation as a floor deposit.

Sample 7/T2 (4.34 kg sieved to 300 microns for recovery of fish and other bone): main phase

The general composition of the residue was as described for the assessment subsample above.

The subsample processed for the main phase analysis produced a moderate assemblage of bone, of which at least 75% represented fish remains. Preservation was excellent, although the material was quite fragmented. The largest fragment was 39 mm in greatest dimension, but most were less than 15 mm. Material recovered from this floor deposit was somewhat different to that recovered from Context 1910. Herring was still the most frequently encountered species, but flatfish remains were almost as numerous as herring (Table 9), and gadids were considerably less in quantity. Freshwater fish also made an appearance, with the presence of several fragments identified as cyprinid. None of the cyprinid fragments could be identified to species, however. A single pharyngeal bone showed similarities with gudgeon, but its small size and fragmented nature made a confident determination impossible.

All of the fish present within the assemblage were small in size and almost exclusively represented by vertebrae. Evidence of butchery was observed on several of these fragments. A series of flatfish vertebrae (from the same individual) had all been split in half (longitudinally). Additionally, a cod caudal vertebra had been chopped longitudinally and two other gadid vertebrae (also possibly cod) had been similarly split. The latter, when compared with modern specimens of known length, were from fish that had an overall length of approximately 40 cm.

Sample 7/SPT (spot subsample): assessment

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, cf. Ammodytidae sp.).

Context 1529 [ash rake-off layer in building V, ?associated with hearth 1394]
Sample 14/T (4.5 kg sieved to 300 microns with paraffin flotation): assessment

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 cm^3 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' (probably 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.

Vertebrate remains

General comments on the hand-collected remains

Many deposits (498 contexts) produced bone, but few produced substantial quantities of material. The deposits ranged in date from the late 10th century through to the present day and represented a myriad of context types—pit fills, floors, dumps, levelling layers and post-hole fills, to name but a few.

A substantial proportion of the remains proved to be from deposits that were likely to have a high residual content. These tended to be deposits described as 'dumps' or 'levelling layers/dumps' or backfills of features whose primary function was associated with metal working. Preservation of bones from these contexts was often rather varied, with a mix of well and poorly preserved fragments. From the 14th century onwards metal working activities dominated the site and this can be seen from the presence of green coloured bones which had clearly been stained by contact with copper alloys in the ground. Overall, dog gnawing was quite abundant and evidence of butchery was noted throughout. In particular, longitudinally chopped vertebrae, representing both cattle and caprovids, were recorded, showing that carcasses were typically split in half. Once split into 'sides', transportation of carcasses was easier and this technique did not expose or damage the bulk of the meat (Rixson 2000).

Species representation

Domestic mammals dominated the hand-collected assemblage throughout the represented phases; cattle, caprovid, pig and chicken were the most commonly occurring species. Table 10 shows the range of species represented in the deposits by phase. Wild mammals were not particularly numerous, but were represented by both red and fallow deer.

Chicken and to a lesser extent, geese bones were present in most of the phases from which material was recorded. On the whole, the geese and ducks were consistent in size with domestic individuals, but several of the scanned assemblages contained remains of wild individuals, e.g. teal (Context 1604) and barnacle goose (Contexts 1657 and 1671). Other wild birds included two crane fragments from Phase 8 deposits (Contexts 1805 and 2661), a possible pheasant tarsometatarsus and a pigeon coracoid from Context 1530 (Phase 9.8), and a single fragment of jackdaw (Context 1728). One Phase 4 deposit (Context 2588) produced a rather unusual bird radius, identified as guillemot. Remains of guillemots and other auks have previously been identified from sites in York, i.e. from Anglo-Scandinavian and medieval deposits at Coppergate (Bond and O'Connor 1999) and from late medieval deposits at Hungate (Jaques *et al*. 2000) and their bones are almost always associated with food debris (Bond and O'Connor 1999).

Worthy of note is the considerable number of cat bones recovered from two mid to late 16th century deposits (Contexts 1792 and 1826). At least four individuals of varying ages (although none of them adult) were represented, including a very young kitten. Some bones clearly represented single individuals suggesting that originally whole carcasses had been disposed of in these deposits. The smaller bones, i.e. phalanges and metapodials were largely absent. This could suggest that the pelts of the animals had been deliberately removed, the lower limbs remaining attached to the skins. No skinning cuts were observed, but a good skinner may not necessarily have marked the bones (Luff and Moreno 1995). Where concentrations of juvenile cats have been found on other medieval urban sites e.g. Fishamble Street, Dublin (McCormick 1988) and Exeter (Maltby 1979), their remains have been interpreted as indirect evidence for the exploitation of their skins.

Hand-collected fish fragments were identified from twenty-two deposits from Phase 5 onwards. Most were identified as Gadidae and represented large individuals of a metre or more in length (Table 17). Two pike vertebrae were also recorded from Context 1916.

Body part representation

Where sufficient fragments were recorded, an examination of the range of skeletal elements represented for cattle suggested that primary butchery waste predominated (Table 11). Although meat-bearing elements were recorded, between 65% and 80% of cattle fragments (varying between phases) tended to be skeletal elements removed during initial carcass preparation, i.e. mandibles, metapodials and phalanges. Caprovid remains showed a slightly different picture, with a greater proportion of meat-bearing elements being recorded for most phases (Table 12). By the late 16th century, 75% of the sheep bones were refuse from food consumption, rather than waste from butchering. Medium-sized mammal (assumed to be mainly sheep) rib and shaft fragments, recorded in the 'unidentified' fraction, were also particularly numerous from Context 1910, reflecting the presence of kitchen/consumption refuse within that deposit. Large mammal remains (of rib, shaft and vertebra fragments) were quite numerous from the same deposit and also from Context 1897 (Phase 9.8). Too few pig bones were recovered to indicate any specific patterns of butchery or consumption.

A wide range of elements were present for both chicken and geese. Carcass preparation of birds would have been minimal, and most skeletal elements would be expected in household rubbish. Very little material representing kitchen waste, e.g. skulls, carpometacarpals, vertebrae and phalanges, were recovered suggesting that most of the remains were table refuse.

Investigation of individual features was not particularly illuminating and did not identify any specific patterns of disposal. As pits, and features used in association

with metal working went out of use they appeared to have been filled with a general mix of refuse, whilst levelling deposits and dumps appeared to incorporate material removed from its place of primary deposition. Variability of preservation, colour and angularity recorded for many of the assemblages also suggested that a number of sources were likely for different components of the waste.

No craft working activities were identified, unless the cat bones from Contexts 1792 and 1826 (Phase 9.8) represent the remains of waste from the activities of a furrier or a tanner. Evidence for the use of some features as garderobes or cesspits was not conclusive from the vertebrate material. Fish bones from some of the deposits (Contexts 1418 and 1910) showed the characteristic damage associated with their having been chewed and digested, but were insufficient in number to be definitive evidence of human faecal material. Details of the remains from a number of individual features (as selected by the excavator) can be found in the Appendix.

Age-at-death

Age-at-death data, supplied by dental eruption and attrition, was fairly limited in spite of all mandibles within the specified phases being recorded. Mandibles were assigned general age groups on the basis of categories outlined by O'Connor (1989) and Bond and O'Connor (1999).

Most phases for which data were obtainable showed that, generally, cattle were adults (aged between approximately five and eight years) when they were slaughtered, with a small group which were slightly older ('elderly' category) also present (Table 13). These are similar results to those from other sites in York of the same date (Bond and O'Connor 1999). The cattle represented were obviously multi-purpose beasts whose importance was not primarily for the production of meat.

One group of mandibles from a late 12th/early 13th century deposit, Context 2331 (Phase 6.1) showed a different picture, in that they all represented juvenile individuals. These cattle may indicate a deliberate husbandry practise, e.g. dairying. In such a specialist herd, calves would have been surplus to requirements and either killed very young or at an age when they would be of use for their meat, e.g. for veal. Several other juvenile individuals were represented in Phases 8, 9.2 and 9.6. Although limited, epiphyseal fusion information also indicated the presence of calves within the deposits from Phase 6 onwards.

Caprovid mandibles were almost exclusively from adult individuals (Tables 14 and 15). No clear chronological patterns were observed, however, most animals were probably culled between three and six years of age. This would suggest that sheep were primarily kept for their wool. Only a single, very young (2-6 months) individual was recorded, from Phase 6.3, and this may have been a death as a result of natural causes. Again, these results are not unlike those seen from data from Coppergate, Aldwark, and Tanner Row (Bond and O'Connor, 1999), although data from Walmgate were somewhat limited.

Most of the pig mandibles represented immature and sub-adult individuals (Table 16), though too few were recovered (by phase) to show any specific trends through time. Two neonatal individuals were recorded from Contexts 1910 and 1769 (Phases 9.3 and 9.8 respectively) and these provide some evidence for pig breeding within the city.

Biometrical data

Data were collected with a view to exploring possible size changes through time which might be used as evidence for a shift towards the production of larger carcass animals. Livestock improvement was traditionally believed to have occurred in the 18th and 19th centuries, but archaeological evidence suggests that it may have begun earlier, in the late medieval and early post-medieval period. Biometrical data for cattle were restricted to metacarpals and metatarsals and once split by phase were fairly limited in number. Plots of metatarsals using distal breadth and width measurements showed little size variation by phase. Adding data from bones from urban deposits at Lincoln (Dobney *et al.* 1996) and Blanket Row, Hull (Carrott *et al.* 2001) did not alter the picture and showed that the cattle from late medieval and early post-medieval deposits at Walmgate were of a similar size to those from other urban centres in the region (Figure 5). However, a single shoulder height of 1286 mm, estimated from the greatest length measurement of a cattle metatarsal (from mid to late 14th century deposits), showed an enormous size difference from the mean of 1107 mm calculated for cattle metatarsals from medieval deposits at Coppergate (Bond and O'Connor 1999). The mean provided by data from medieval cattle bones from Lincoln (Dobney *et al.* 1996) also showed the presence of cattle that were considerably smaller in stature (mean height 1129.8). However, the single reconstructed shoulder height from Walmgate may represent a bull and cannot be put forward as conclusive evidence for wholesale stock improvement.

Size variation of sheep was also examined, although again the biometrical dataset was fairly limited. Tibia and metapodial measurements were used to create both univariate and bivariate plots, but, as with the cattle measurements, no increase in size was noted by phase.

Contemporaneous data from Lincoln, when added to a plot illustrating tibiae measurements, showed that the sheep from Walmgate were not dissimilar to those from Lincoln at this period (Figure 6). Bones recovered from later deposits of early 16th century date at Lincoln provided evidence for much larger sheep, but there was no such evidence at Walmgate.
A small number of bones were complete and greatest length measurements from these were used to calculate estimated withers heights. These produced a range of heights (Table 18), with several large individuals present in 13/14th century deposits (Phases 6.2 and 7). Most of the heights were greater than the mean withers height (574 mm) calculated for caprovids from medieval deposits at Coppergate, but similar to the heights produced from data from other York sites (Table 19). A survey by O'Connor (1995) of data from contemporaneous sites in the region suggested that the presence of small unimproved sheep continued until the early modern period. In spite of the presence of the two large individuals, the rest of the data from Walmgate appears to support this theory.

General comments on the vertebrate remains revovered from the samples

Four of the samples produced vertebrate assemblages that were worthy of investigation. The earliest of the sampled deposits, Context 1969, was one of a series of compact floors within building S, dating from the mid to late 14th century. Artefacts associated with this context suggested the occupation of this area was of a domestic nature. Vertebrate remains recovered by hand collection and from the sample included both mammal and fish bones, which were interpreted as refuse, mainly from food consumption, but with some components indicative of primary butchery waste. Although, the hand-collected assemblage included some slightly larger fragments, over 80% of all recovered fragments were less than 50 mm in size. The small size of the bones may suggest some attempt to keep the floor fairly clean, with larger fragments removed or disposed of elsewhere. However, some of the fragmentation is probably the result of trample and use of the floor, as many of the tiny fragments were derived originally from larger bones.

One of the fills (Context 1910) within an early 15th century tank/cesspit was also sampled and, in addition to a large hand-collected vertebrate assemblage, it also yielded 487 identified fish bones. The pit or tank, once it had ceased to be of use for its original purpose, was obviously used as a repository for general refuse, including waste from the preparation and consumption of food, and from the butchering of carcasses. Indicators of faecal material, i.e. crushed and chewed fish vertebrae (indicating possible ingestion) were present, but were not abundant and may represent inclusions from dog coprolites rather than human faeces. The fish bones formed just one component in what was clearly a mix of waste from a variety of activities.

Bones from the two later (mid to late 16th century) deposits, Contexts 1418 and 1529, were only recovered from the sediment samples; no vertebrate remains were collected by hand. Both layers were described as 'ash rake-off' deposits or floor accumulations, possibly associated with a hearth. Material from these deposits was extremely fragmented (most being less than 20 mm in size) and was predominantly identified as fish. Little evidence of burning or heat damage on the bones was recorded. A high degree of fragmentation was observed and most bones were small. No large mammal remains were present, which would be expected if general refuse was being dumped in this area of the site at this period. The absence of larger fragments could suggest that these floors were swept on a regular basis, with larger fragments of bone and other rubbish removed, whilst small bones went unnoticed amongst the 'litter' laid down on the floor. Abundant rush seeds, identified from the flot, provide evidence for the presence of rushes which may have been used as a floor covering. Alternatively the bones may have become 'lost' in the ash spread and been raked into a corner or some other inaccessible part of the room where they were no longer at risk of being crushed or destroyed.

A similar range of fish species was identified in all of the assemblages, being mainly marine and with herring remains dominant. Basic fragment counts showed that, by proportion, herring were most prevalent in Contexts 1969 and 1910 (78% and 84% respectively), but that this decreased to just over 40% in the two later floor deposits. Gadidae remains formed 14% of the assemblages from Contexts 1418, 1910 and 1969, with an increase to 25% of the remains from Context 1529 (but this assemblage was rather small). Amongst the gadid species, haddock was most common, with cod present mainly in the assemblage from Context 1910. In addition, a small number of whiting and ?whiting fragments were also identified.

Remains of flatfish were chiefly recorded from the two 16th century floor deposits, but were quite scarce. Most could not be identified to species, but several vertebrae were tentatively identified as lemon sole. Small quantities of eel vertebrae, usually ubiquitous from medieval and post-medieval urban deposits in York, were identified from three of the deposits (Contexts 1418, 1529 and 1969), but, somewhat surprisingly, not from Context 1910. The presence within this deposit of numerous small herring vertebrae suggests that preservational factors were not responsible for this absence. Freshwater fish were rare, with 13 of the 14 fragments being recovered from Context 1418.

The significance of each species in economic terms is difficult to ascertain from simple counts. Differences in the number of identifiable elements for each species and differential preservation of certain bones are just two factors which can create an over- or under-representation of individual species. Clearly, the picture presented by the later floor samples may show a bias in favour of smaller fish because of specific disposal practises, e.g. the possible removal (in antiquity) of the larger bone fragments. The recovered remains, despite being so well preserved, probably do not reflect the original material deposited because of human activities related to waste disposal.

Most of the fish bones represented fairly small individuals. Comparison of gadid vertebrae with modern reference specimens of known length suggested that the haddock and whiting bones and the cod vertebrae from Contexts 1418 and 1529 were from individuals of between 30 and 50 cm in length. Only fish remains from Context 1910 suggested the presence of large cod of approximately a metre or more in length. Fragments recovered by hand-collection (Table 10), although not numerous, also provide evidence for the larger Gadidae, including ling.

The fish remains appear to be kitchen or table refuse rather than waste from fish processing on a commercial scale. Skeletal elements present suggest that, for herring, the whole of the fish was represented, although the more robust vertebrae formed the bulk of the remains. Vertebrae, both abdominal and caudal, were also the main bones recovered for cod, haddock and whiting, but skeletal elements representing the head (such as the articular, dentary, premaxilla and posttemporal) and appendicular region (cleithrum and supracleithrum) were identified and many of the larger damaged fragments in the unidentified fraction were probably gadid. An absence of cranial fragments is generally used as an indicator of stored rather than fresh fish (as the head of the fish is removed prior to salting or drying). Whilst the remains representing the smaller gadids (haddock, whiting and small cod) appeared to include a range of elements, those representing ling and cod over 1 metre in length were mainly vertebrae. Evidence for butchery on the latter was also noted. These remains could possibly suggest the presence of stored/stockfish within the assemblage.

Discussion

Biological remains were abundant in some deposits, even in rather 'unpromising' layers interpreted as floor accumulations, but in general concentrations of remains were very low, and typical for deposits of medieval and early post-medieval date in this part of York. One of the richer deposits with respect to plant and invertebrate macrofossils (2940) may well have been wrongly dated or have contained re-worked Anglo-Scandinavian material (well-preserved fossils of pre-Conquest date were recorded from many contexts at this site, cf. Johnstone *et al.* 2000). Redeposition of delicate (*sensu* Kenward and Hall 2000) 'waterlogged' remains in the way discussed by Dobney *et al.* (1997) is something which has to be accepted as a real possibility, as it may not always be as easily recognised as it is in cases where – as here – dyeplants or characteristic insect assemblages are noted.

For the most part, the plant and invertebrate remains reflected deposition of litter and waste of various kinds, the two combining as stable manure in one or perhaps two cases. Plant litter perhaps used as roofing or flooring was also recorded (e.g. charred remains in contexts 3122 – material which may have been reed; and 2104 – cereal straw and saw-sedge). Exploitation of peatland or other wetland environments was also evident (in the presence of taxa such as saw-sedge, bog myrtle and some of the mosses), though these remains may sometimes have arrived in peat itself rather than in cut vegetation.

The foodplants recorded were all typical for the periods represented, though only one deposit (2902) appeared to be formed largely of human faecal material in which foods actually consumed might be expected to have survived. Measurements of the complete *Trichuris* eggs seen in the 'squash' subsamples from this context were taken in an attempt to identify the source of the faecal component within the deposit. Identification of trichurids to species from their eggs is problematic in that the size ranges for different species often overlap significantly (Figure1). In the case of the remains from this deposit the problem is to distinguish between *Trichuris trichiura* (Linnaeus), the whipworm of humans, and *T. suis* (Schrank), of pigs; a particularly difficult task given that the usual size range for *T. trichiura* is a wholly contained subset of that for *T. suis*. Table 7

shows the trichurid egg measurements for the sample and Figure 1 shows the measurements with commonly quoted size ranges for *T. trichiura* and other trichurids of some common domesticated animals given as boxed overlays. Figure 2 shows the measurement data on shorter scale axes including error bars.

Several of the data points fall wholly outside the ranges (allowing for error) for either *T. trichiura* or *T. suis* these may represent aberrant eggs, or could reflect 'in-ground' changes in egg morphology (all of the overlay boxes for egg size ranges are based on limited sets of published 'modern' data). No real study of changes in egg morphology caused by varying ground conditions and states of preservation has been undertaken and comparison with modern data, though valid, must, of necessity, be cautious. However, most of the measurements fall within the range for modern *T. trichiura* and almost all within the range for *T. suis*.

Mean values for polar plug to polar plug maximum length and maximum width for each sample were calculated and are presented, along with other summary descriptive statistics for the eggs, as Table 8. Frequency and running mean plots (Fig. 3 and Fig. 4, respectively) for the data show no indications of a bimodal distribution (which would be expected if two species were present). That individual data points for the measurements fall outside the size ranges given for both modern *T. trichiura* and *T. suis* is perhaps most likely to be through taphonomic processes but objective investigation of the effects of, for example, different soil chemistries on egg morphology has yet to be undertaken.

Similarly, the eggs of the ascarids *Ascaris lumbricoides* (Linnaeus) and *A. suum* (Goeze), the maw worms of humans and pigs respectively (though some parasitologists believe that there is just one species of *Ascaris* that infests both humans and pigs), are almost identical. The *Ascaris* eggs seen in these samples could indicate the presence of either human or pig faeces, or both.

Taylor (1955) has remarked that a high ratio of *Ascaris* to *Trichuris* eggs may indicate pig rather than human faeces. The ratio seen here of approximately 2:3 (*Ascaris*:*Trichuris*) is inconclusive, however.

In summary, the deposit (2902) showed a significant faecal content, as indicated by the presence of the eggs of intestinal parasitic nematodes and the remains of foodplants. It has not been possible to determine definitively the source of the faecal content but, on balance, it seems most likely that the deposit contained human faeces, but may also have included a component of pig faeces.

The range of vertebrate species represented at Walmgate was not particularly diverse. For all phases, the main domesticates, cattle, caprovid, pig and chicken, provided the bulk of the remains, with fish and other birds, such as goose and duck also present. Limited dental eruption and attrition data suggested that both cattle and caprovids were slaughtered once they had reached maturity and, this appeared to be the case for all phases. One exception was a group of mandibles from Context 2331 (Phase 6.1) which all represented juvenile individuals. The presence of juvenile cattle bones, although a common feature in later post-medieval deposits, is, at this early date (i.e. late 12th to early 13th century) not typical for York. Only one other (published) site in the city, the Bedern (the site of the medieval College of the Vicars Choral of York Minister), has produced a similar assemblage, from deposits of mid 13th to late 14th century. Here, there were also a number of elderly individuals represented and it was suggested that the assemblage showed a characteristic age profile thought to be associated with dairying. Bond and O'Connor (1999) concluded that the Vicar's College was obtaining beef from specialist dairy herds, a source not available to other inhabitants of the city. With this interpretation in mind, the remains from Walmgate could represent waste

from the butchering of carcasses destined for a very select market.

Data from the pig remains was scant, but suggested a kill-off pattern for pigs whereby they were slaughtered at the optimum time for meat production.

Wild species formed only a very minor component of the assemblage, but proved to be of some interest. The presence of the guillemot radius from Context 2588 (Phase 4) is unusual, but remains of these birds have been found amongst food refuse in medieval deposits elsewhere in York (O'Connor 1989; Jaques *et al*. 2001) and also from sites in Beverley (Scott 1991; 1992). They are unlikely to have resided within the city as they spend a large proportion of their time at sea and Bond and O'Connor (1999) have suggested that these remains may represent evidence for coastal trading. They also put forward the hypothesis that these birds, because of their 'pelagic lifestyle' may have been seen locally as an acceptable substitute for fish for eating on Friday or were perhaps associated with an ecclesiastical diet.

Interestingly, a number of species sometimes thought to indicate high status occupation were identified from Phase 8 deposits. Several fragments of crane and fallow deer were recovered from Contexts 1805, 2661 and 2625. During the later medieval period, the hunting and consumption of crane was considered to be an important symbol of wealth and status (Dobney and Jaques in press), whilst venison was usually only available either through hunting or through gifts provided by patronage (Neave 1991). Additionally, fish bones identified as ling and cod and representing large individuals of over a metre in length, were recovered from Context 2661. Some of the vertebrae had been chopped, which may indicate that these fragments were from stored/stock fish, i.e. fish that had been dried, salted or smoked or a combination of these (Locker 2001). Whilst large gadids were becoming increasingly available during this period, and the importation of stock fish was more commonplace, they still represented a resource that was not necessarily available to all (Woolgar 1999). Some of the deposits from other phases at Walmgate produced numerous fish remains but few fragments representing the larger gadids were recovered.

The size of medieval and early post-medieval cattle and caprovids from Walmgate was consistent with animals from other sites in the city. No conclusive evidence was found for a significant increase in the size of these species during this period. The shift towards larger breeds of sheep that has been recognised at Lincoln (Dobney *et al.* 1996) and further south at, for example, Norwich (Albarella *et al*. 1997; Weinstock 2002) does not appear to be evident from archaeological material from York (Bond and O'Connor 1999), Beverley (Scott 1991; Dobney *et al*. 1994) or Hull (Carrott *et al.* 2001). It is the emphasis on wool rather than meat at this period in this region that perhaps delayed the introduction or development of improved breeds, as these larger animals were mainly utilised for meat production (Dobney unpublished).

Vertebrate remains recovered from deposits at Walmgate represented rather a mixture of refuse which showed no significant changes through time. Much of the material, particularly in the later phases, was primarily domestic in nature including both kitchen and table waste. Primary and secondary butchery waste, largely from cattle, was common, but did not represent large scale butchering of carcasses, nor were any assemblages identified that represented refuse from craft activities such as horn working or tanning. The juvenile cat remains from Phase 9.8 may be derived from the processing of skins but the lack of skinning marks and the small numbers of individuals represented renders this interpretation somewhat tentative.

Some of the bones had clearly been disposed of elsewhere before being incorporated into the deposits and some of the butchery refuse probably did not originate from activities

undertaken at the site. Disposal of rubbish, particularly the noxious and smelly kind that results from the slaughtering and butchering of animals, was obviously something of a problem in York in the medieval period. Ordinances issued in York from the middle of the 14th century onwards forbade the butchers from dumping their offal and refuse where ever they felt like it. Areas of the river where dumping of such rubbish was permitted were outlined by the city authorities when they endeavoured to tackle the problems of 'roaming pigs, garbage, all engendering great corruption and horrible pernicious air' (quoted in The Company of Butchers of York 1975). It follows, therefore, that disused pits and tanks would be used as receptacles for such waste if they were conveniently placed.

The fish bones from Walmgate suggest that the inhabitants in the medieval and early post-medieval period enjoyed a diet supplemented mainly by marine fish, in particular herring and Gadidae. They were sufficiently affluent to purchase imported large fish (sometimes in excess of a metre in overall length), such as ling, but relied more on the cheaper products, such as herring, haddock, whiting and small cod. This is not unlike assemblages from other sites in York (Bond and O'Connor 1999). Surprisingly though, eel remains were not abundant. Their scarcity may be a reflection of varying disposal methods for different fish remains/waste or may represent a decrease in demand for locally available freshwater and estuarine species as a result of the increasing importance of cod and other offshore marine species in the medieval and early post-medieval period. This trend, also noted by a number of researchers (Barrett *et al.* 1999; Enghoff 2000; Locker 2001), partly explains the almost complete absence of freshwater fish in the assemblage, despite the site's proximity to the river. Additionally, the increasing pollution of the river by the dumping of foul and noxious refuse from the slaughtering and butchering of animals, and from other activities such as tanning, may have discouraged the use of the local riverine resources.

Comparisons with other sites in the region show similarities with the fish assemblages from 14/15th century deposits at the Magistrates Court site in Hull (Hall *et al.* 2000). Both sites are dominated by herring remains, with gadid bones forming an additional important component. Hand-collected remains also show the presence of larger fish which may represent imported dried or salted stockfish. Herring appear to show a decrease in significance in the later medieval period and this can perhaps also be seen at Walmgate. In contrast, no dominant species were apparent from deposits at Blanket Row, Hull (Carrott *et al.* 2001) and both small flatfish and eel played a more significant role in the diet. The remains also included rockling and other fish that could be locally caught in shallow waters. Assemblages from Blanket Row clearly represented low status urban households with access to smaller less expensive fish, whilst the remains recovered from both the Magistrates Court site and Walmgate suggest a greater degree of affluence.

Archive

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

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Table 1. 41-9 Walmgate, York: list of processed sediment samples with notes on their treatment (Phases 4 to 9.9).

Context	Sample	Notes
1418	7	5 kg sieved to 300 microns with paraffin flotation and small subsample examined as a spot sample; an additional 4.34 kg processed for bone recovery for main post-excavation phase
1529	14	4.5 kg sieved to 300 microns with paraffin flotation; all of this sample was processed at the assessment stage
1910	39	2 kg sieved to 300 microns with paraffin flotation; an additional 20 kg processed for bone recovery and microfossil 'squash' for main post-excavation phase
1969	49	5 kg sieved to 300 microns with washover; an additional 4.5 kg processed for bone recovery for main post-excavation phase
2104	45	0.425 kg sieved to 300 microns with washover
2662	61	2 kg sieved to 300 microns with paraffin flotation; additional 5 kg processed in same way and microfossil 'squash' on some ?faecal concretions from the residue for main post-excavation phase
2902	66	Examined as a spot sample including microfossil 'squash'; measurements of trichurid eggs taken for the main post-excavation phase
2940	67	3 kg sieved to 300 microns with paraffin flotation and microfossil 'squash'; no assessment, subsample processed for the main post-excavation phase only
3122	71	0.1 kg examined as a spot sample
3240	76	3 kg sieved to 300 microns with paraffin flotation; no assessment, subsample processed for the main post-excavation phase only

Table 2. 41-9 Walmgate, York: Complete list of plant and invertebrate animal remains recorded from deposits from Phases 4 to 9.9.

Taxonomic order and nomenclature follow Tutin et al. *(1964-80) for vascular plants, Smith (1978) for mosses, and Kloet and Hincks (1964-77) for insects. Tentative records for insects are not included if secure ones were also made. Plant material not specifically noted as being preserved by charring or mineral replacement can be assumed to be uncharred and unmineralised (i.e. 'waterlogged', but sometimes denoted simply as 'uncharred'). For invertebrates (all preserved by anoxic waterlogging), * = not used in calculating assemblage statistics (Table 5); ecode—ecological code used in generating main statistics; Sp(p).—species not previously listed; Sp(p). indet.—may be a species already listed.*

MOSSES (all leaf/leaves and/or shoot fragments)
Antitrichia curtipendula (Hedw.) Brid.
Neckera complanata (Hedw.) Hüb.
Drepanocladus cf. *aduncus* (Hedw.) Warnst.
Scorpidium scorpioides (Hedw.) Limpr.
Calliergon cf. *giganteum* (Schimp.) Kindb.
C. cuspidatum (Hedw.) Kindb.
Homalothecium sericeum/*lutescens*
Hypnum cf. *cupressiforme* Hedw.

VASCULAR PLANTS

Diphasium sp(p).	clubmoss	shoot fragment(s)
Salix sp(p).	willow	bud(s), twig epidermis fragment(s)
Populus sp(p).	poplar/aspen	bud(s) and/or bud-scale(s)
Myrica gale L.	bog myrtle/sweet gale	fruit(s), leaf fragment(s)
cf. *Betula* sp(p).	?birch	charcoal fragment(s)
Alnus glutinosa (L.) Gaertner	alder	bud(s) and/or bud-scale(s)
Corylus avellana L.	hazel	charcoal fragment(s), charred and uncharred nut(s) and/or nutshell fragment(s)
Quercus sp(p).	oak	bud(s) and/or bud-scale(s), charcoal fragment(s), twig fragment(s), and wood chip(s)
Ficus carica L.	fig	seed(s)
Humulus lupulus L.	hop	achene(s)
Urtica urens L.	annual nettle	achene(s)
Polygonum aviculare agg.	knotgrass	fruit(s)
P. hydropiper L.	water-pepper	fruit(s)
P. persicaria L.	persicaria/red shank	fruit(s)
P. lapathifolium L.	pale persicaria	fruit(s)
Bilderdykia convolvulus (L.) Dumort.	black bindweed	fruit fragment(s)
Rumex acetosella agg.	sheep's sorrel	fruit(s)
Rumex sp(p).	docks	charred and uncharred fruit(s)
Chenopodium album L.	fat hen	seed(s)
Atriplex sp(p).	oraches	seed(s)
Stellaria media (L.) Vill.	chickweed	seed(s)
Spergula arvensis L.	corn spurrey	seed(s)
Agrostemma githago L.	corncockle	charred and uncharred seed(s), seed fragment(s)
Silene cf. *alba* (Miller) Krause in Sturm	?white campion	seed(s)
Caltha palustris L.	marsh marigold	seed(s)
Ranunculus Section *Ranunculus*	meadow/creeping/bulbous buttercup	achene(s)
R. arvensis L.	corn crowfoot	achene(s)
R. flammula L.	lesser spearwort	achene(s)
Thalictrum flavum L.	common meadow rue	achene(s)
Papaver rhoeas L./*P. dubium* L.	field/long-headed poppy	seed(s)
Papaver argemone L.	long prickly-headed poppy	seed(s)

Isatis tinctoria L.	woad	pod fragment(s)
Brassica rapa L.	'turnip'	seed(s)
Brassica sp(p).	cabbages, etc.	seed(s)
Brassica sp./*Sinapis arvensis*	brassica/charlock	pod segment(s) and/or fragment(s); seed(s)
Raphanus raphanistrum L.	wild radish	pod segments and/or fragment(s)
Reseda luteola L.	weld/dyer's rocket	seed(s)
Rubus fruticosus agg.	blackberry/bramble	seed(s)
Potentilla cf. *erecta* (L.) Raüschel	?tormentil	achene(s)
Aphanes arvensis L.	parsley-piert	achene(s)
A. microcarpa (Boiss. & Reuter) Rothm.	slender parsley-piert	achene(s)
Malus sylvestris Miller	crab apple	endocarp
Prunus sp(p).	sloe/plum/cherry, etc.	thorn(s)
Leguminosae	pea family	flower(s) and/or petal(s), pod(s) and/or pod fragment(s)
Genista tinctoria L.	dyer's greenweed	stem fragment(s), twig epidermis fragment(s)
Ulex sp(p).	gorses	leaf/leaves (spines)
cf. *Vicia* sp(p).	?vetches, etc.	charred seed(s)
Pisum cf. *sativum* L.	?garden/field pea	waterlogged hilum/a
Linum usitatissimum L.	cultivated flax	capsule fragment(s), mineralised and waterlogged seed(s)
Viola sp(p).	violets/pansies, etc.	capsule segment(s) and seed(s)
Scandix pecten-veneris L.	shepherd's needle	mericarp(s)
Oenanthe sp(p).	water-dropworts	mericarp(s)
Aethusa cynapium L.	fool's parsley	mericarp(s)
Anethum graveolens L.	dill	mericarp(s)
Apium graveolens L.	wild celery	mericarp(s)
Heracleum sphondylium L.	hogweed	mericarp(s)
Daucus carota L.	wild carrot	mericarp(s)
Menyanthes trifoliata L.	bogbean	seed(s)
Galium aparine L.	goosegrass, cleavers	epicarp (fruit skin)
Galium sp(p).	bedstraws, etc.	fruit(s)
Galeopsis Subgenus *Ladanum*	hemp-nettles	nutlet(s)
G. Subgenus *Galeopsis*	hemp-nettles	nutlet(s)
Prunella vulgaris L.	selfheal	nutlet(s)
Hyoscyamus niger L.	henbane	seed(s)
Pedicularis palustris L.	marsh lousewort	seed(s)
Rhinanthus sp(p).	yellow rattles	seed(s)
Plantago major L.	greater plantain	seed(s)
Sambucus nigra L.	elder	seed(s) and seed fragment(s)
Valerianella dentata (L.) Pollich	narrow-fruited cornsalad	fruit(s)
Knautia arvensis (L.) Coulter	field scabious	fruit(s) and fruit fragment(s)
Compositae	daisy family	involucre(s)/fragment(s)
Bidens sp(p).	bur-marigolds	achene(s)
Anthemis cotula L.	stinking mayweed	achene(s)
Chrysanthemum segetum L.	corn marigold	achene(s) and achene fragment(s)
Arctium sp(p).	burdocks	achene(s)
Carduus/*Cirsium* sp(p).	thistles	achene(s)
Centaurea cf. *cyanus* L.	?cornflower	achene(s)
Centaurea sp(p).	knapweeds, etc.	achene fragment(s), involucral bract(s), and involucre(s)/fragment(s)
Leontodon sp(p).	hawkbits	achene(s)
Sonchus asper (L.) Hill	prickly sow-thistle	achene(s)
S. oleraceus L.	sow-thistle	achene(s)
Lapsana communis L.	nipplewort	achene(s)
Baldellia ranunculoides (L.) Parl.	lesser water-plantain	carpel(s)

Alisma sp(p).	water-plantains	carpel(s) and/or seed(s)
Juncus inflexus L./*J. effusus* L./ *J. conglomeratus* L.	hard/soft/compact rush	seed(s)
J. bufonius L.	toad rush	seed(s)
Juncus sp(p).	rushes	seed(s)
Luzula sp(p).	woodrushes	seed(s)
Gramineae	grasses	waterlogged caryopsis/es and culm fragment(s), charred culm fragment(s), charred culm node(s)
Cerealia indet.	cereals	waterlogged chaff
Triticum '*aestivo-compactum*'	bread/club wheat	charred caryopsis/es
Triticum sp(p).	wheats	charred free-threshing rachis fragment(s)
Triticum/*Secale*	wheat/rye	waterlogged periderm ('bran') fragment(s)
Secale cereale L.	rye	charred caryopsis/es, lemma margins and rachis fragment(s)
cf. *S. cereale*	?rye	charred caryopsis/es
Hordeum sp(p).	barley	charred caryopsis/es
Avena sp(p).	oats	charred caryopsis/es and chaff, waterlogged caryopsis/es
cf. *Avena* sp(p).		part-charred chaff
Alopecurus sp(p).	foxtails	waterlogged caryopsis/es
Danthonia decumbens (L.) DC. in Lam. & DC.	heath grass	caryopsis/es
Lemna sp(p).	duckweeds	frond(s)
Eleocharis palustris sl	common spike-rush	nutlet(s)
Cladium mariscus (L.) Pohl	great sedge/saw-sedge	charred leaf fragment(s), uncharred nutlet(s)
cf. *C. mariscus*		charred stem fragment(s)
Carex sp(p).	sedges	nutlet(s)
NEMATODA		
*?*Heterodera* sp. (cyst)	u	
**Ascaris* ?*suum*	u	
**Ascaris* ?*lumbricoides*	u	
**Trichuris* ?*suis*	u	
**Trichuris* ?*trichiura*	u	
ANNELIDA: OLIGOCHAETA		
**Oligochaeta* sp. (egg capsule)	u	
CRUSTACEA		
CLADOCERA		
**Daphnia* sp. (ephippium)	oa-w	
**Cladocera* spp. L (ephippium)	oa-w	
BRACHYURA		
*?*Cancer pagurus* L.	u	
INSECTA		
DERMAPTERA		
**Dermaptera* sp.	u	
MALLOPHAGA		
*?*Damalinia* sp.	u	

ANOPLURA (SIPHUNCULATA)		
**Pediculus humanus* Linnaeus	ss	
HEMIPTERA		
Heterogaster urticae (Fabricius)	oa-p	
Lyctocoris campestris (Fabricius)	rd-st	
Cercopidae sp.	oa-p	
Aphrodes sp.	oa-p	
Delphacidae sp.	oa-p	
*Auchenorhyncha sp. (nymph)	oa-p	
*Coccoidea sp.	u	
DIPTERA		
*Syrphidae sp. (larva)	u	
**Melophagus ovinus* (Linnaeus) (puparium)	u	
**Melophagus ovinus* (adult)	u	
*Diptera sp. (adult)	u	
*Diptera sp. (puparium)	u	
*Diptera sp. (pupa)	u	
SIPHONAPTERA		
*Siphonaptera sp.		u
COLEOPTERA		
Carabus sp.	oa	
Bembidion (*Philochthus*) sp.	oa	
Agonum sp.	oa	
Agabus bipustulatus (Linnaeus)	oa-w	
Agabus or *Ilybius* sp.	oa-w	
Helophorus aquaticus or *grandis*	oa-w	
Helophorus sp.	oa-w	
Cercyon analis (Paykull)	rt-sf	
Cercyon atricapillus (Marsham)	rf-st	
Cercyon haemorrhoidalis (Fabricius)	rf-sf	
Megasternum obscurum (Marsham)		rt
Acritus nigricornis (Hoffmann)	rt-st	
Ochthebius sp.	oa-w	
Ptenidium spp.	rt	
Acrotrichis sp.	rt	
Ptiliidae sp.	u	
Silpha atrata Linnaeus	u	
Phyllodrepa ?*floralis* (Paykull)	rt-sf	
Omalium ?*rivulare* (Paykull)	rt-sf	
Omalium sp.	rt	
Xylodromus concinnus (Marsham)	rt-st	
Omaliinae sp.	rt	
Coprophilus striatulus (Fabricius)	rt-st	
Carpelimus bilineatus Stephens	rt-sf	
Carpelimus fuliginosus (Gravenhorst)	st	
Carpelimus sp.	u	
Platystethus arenarius (Fourcroy)	rf	
Platystethus cornutus group	oa-d	
Platystethus nitens (Sahlberg)	oa-d	
Anotylus complanatus (Erichson)	rt-sf	
Anotylus nitidulus (Gravenhorst)	rt	
Anotylus rugosus (Fabricius)	rt	
Oxytelus sculptus Gravenhorst	rt-st	
Stenus sp.	u	
Astenus sp.	rt	

Leptacinus ?*pusillus* (Stephens)	rt-st	
Leptacinus sp.	rt-st	
Gyrohypnus angustatus Stephens	rt-st	
Gyrohypnus fracticornis (Muller)	rt-st	
Neobisnius sp.	u	
Philonthus spp.	u	
Quedius sp.	u	
Staphylininae spp.	u	
Cordalia obscura (Gravenhorst)	rt-sf	
Falagria sp.	rt-sf	
?*Crataraea suturalis* (Mannerheim)		rt-st
Aleochara sp.	u	
Aleocharinae spp.	u	
Pselaphidae spp.	u	
Aphodius prodromus (Brahm)	ob-rf	
Aphodius spp.	ob-rf	
Clambus pubescens Redtenbacher	rt-sf	
Elateridae sp.	ob	
?*Dermestes* sp.	rt-sf	
Anobium punctatum (Degeer)	l-sf	
Ptilinus pectinicornis (Linnaeus)	l-sf	
Tipnus unicolor (Piller & Mitterpacher)	rt-ss	
Ptinus fur (Linnaeus)	rd-sf	
Lyctus linearis (Goeze)	l-sf	
Kateretes sp.	oa-p-d	
Meligethes sp.	oa-p	
Monotoma sp.	rt-sf	
Oryzaephilus surinamensis (Linnaeus)	g-ss	
Cryptophagus spp.	rd-sf	
Atomaria sp.	rd	
Mycetaea hirta (Marsham)		rd-ss
Lathridius minutus group	rd-st	
Corticaria spp.	rt-sf	
Cortinicara gibbosa (Herbst)	rt	
Aglenus brunneus (Gyllenhal)	rt-ss	
Blaps sp.	rt-ss	
Tenebrio obscurus Fabricius	rt-ss	
Anthicus formicarius (Goeze)	rt-st	
Chrysolina sp.	oa-p	
Chrysomelinae sp.	oa-p	
Phyllotreta nemorum group	oa-p	
Longitarsus sp.	oa-p	
Chaetocnema concinna (Marsham)	oa-p	
Apion sp.	oa-p	
Sitophilus granarius (Linnaeus)	g-ss	
Ceutorhynchus sp.	oa-p	
?*Mecinus* sp.	oa-p	
Curculionidae sp. A	oa	
Curculionidae sp. B	oa	
*Coleoptera sp. (larva)	u	
HYMENOPTERA		
*Proctotrupoidea sp.	u	
*Hymenoptera sp.	u	
*Chalcidoidea sp.	u	
ARACHNIDA		
*Pseudoscorpiones sp.	u	
*Acarina sp.	u	

MOLLUSCA	
Ostrea edulis L.	u
*Mollusca sp. indet	u

Table 3. 41-9 Walmgate, York: Complete lists of plant remains and other components of samples recorded during examination of plant material from samples from Phases 4 to 9.9. Samples are presented in context and sample order and within each list components are listed by decreasing abundance, using a semi-quantitative four-point scale (see text for explanation).

Abbreviations: af—achene fragments; b/bs—buds, buds/bud-scales; br—bracts; caps—capsules; ch—charred; c/n—culm-nodes; 'embs'—'embryos'; endo—endocarp ('core'); ff—fruit fragments; fgts—fragments; fls—flowers; f/t—free-threshing; inc—including; inv—involucre; lf—leaf; lvs—leaves; min—mineral-replaced; n/u—nutlets with utricles, or free utricles present; pet—petals; segs—segments; sf—seed fragments; spec—specimen; tef—twig epidermis fragments; tw—twig; v—very; w/l—waterlogged (i.e. uncharred); for twig fragments, measurements are length x diameter in mm.

Context 1418, Sample 7/SPT		
cinders	3	to 15 mm
'char'	2	
bone fgts	2	to 30 mm
brick/tile	2	to 5 mm
coal	2	to 10 mm
fish bone	2	to 15 mm
Juncus cf. inflexus/effusus/ conglomeratus	2	
unwashed sediment	2	to 10 mm
Alisma sp(p).	1	'embs' only
Juncus sp(p).	1	
Sonchus oleraceus	1	modern
charcoal	1	to 5 mm
cockle shell fgts	1	to 5 mm
Cu/alloy fgts	1	to 15 mm
eggshell fgts	1	to 3 mm
?Fe object(s)	1	to 10 mm
fish bone	1	to 10 mm
fish scale	1	to 5 mm
glassy slag	1	to 5 mm
insects	1	v decayed
metallic slag	1	to 5 mm
mortar	1	to 10 mm
mussel shell 'fibres'	1	
mussel shell fgts	1	to 5 mm
otoliths	1	
part-burnt coal	1	to 10 mm
root/rootlet fgts (?modern)	1	
sand	3	

Context 1529, Sample 14/T		
brick/tile	3	to 35 mm
cinders	3	to 20 mm
sand	3	
charcoal	2	to 10 mm
coal	2	to 20 mm
fish bone	2	to 25 mm
Corylus (charcoal)	1	to 10 mm
Quercus (charcoal)	1	to 10 mm
'char'	1	
?baked clay/daub	1	to 10 mm
?Fe object(s)	1	to 40 mm
bird bone	1	to 50 mm
bone fgts	1	to 40 mm
burnt bone fgts	1	to 5 mm
Cu/alloy fgts	1	to 10 mm
earthworm egg caps	1	
eggshell fgts	1	to 3 mm
fish scale	1	to 3 mm
glassy slag	1	to 3 mm
gravel	1	to 15 mm
mortar	1	to 10 mm
mussel shell fgts	1	to 5 mm
percid scale	1	
pottery	1	to 2 mm
root/rootlet fgts (modern)	1	
teeth	1	
thornback ray bucklers	1	

Context 1910, Sample 39/T		
cinders	4	to 30 mm
'char'	2	
coal	2	to 30 mm
fish bone	2	to 15 mm
sand	2	
?baked clay/daub	1	to 10 mm
bird bone	1	to 170 mm
brick/tile	1	to 20 mm
burnt bone fgts	1	to 15 mm
charcoal	1	to 15 mm
cockle shell fgts	1	to 5 mm
Cu/alloy fgts	1	
eggshell fgts	1	to 5 mm
fine plant detritus	1	
fish scale	1	to 4 mm
glassy slag	1	to 5 mm
gravel	1	to 15 mm
mammal bone	1	to 150 mm
mortar	1	to 10 mm
mussel shell 'fibres'	1	
mussel shell fgts	1	to 10 mm
oyster shell fgts	1	to 30 mm
part-burnt coal	1	to 15 mm
root/rootlet fgts (modern)	1	

Context 1969, Sample 49/T		
sand	3	
bone fgts	2	to 80 mm
brick/tile	2	to 80 mm
fish bone	2	to 20 mm

Juncus bufonius	2	
burnt bone fgts	1	to 10 mm
Cenococcum (sclerotia)	1	
Leguminosae (fls/pet)	1	v decayed
Papaver cf. argemone	1	v decayed
charcoal	1	to 20 mm
cinders	1	to 15 mm
coal	1	to 10 mm
concretions	1	to 10 mm
crab shell fgts	1	to 5 mm
Cu/alloy fgts	1	
fish scale	1	to 5 mm
gravel	1	to 25 mm
decayed		
mortar	1	to 25 mm
oyster shell fgts	1	to 60 mm
decayed		
pottery	1	to 40 mm
root/rootlet fgts (modern)	1	
snails	1	
woody root fgts (modern)	1	

Context 2104, Sample 45/T

Juncus bufonius	2	v decayed
Papaver rhoeas/dubium	2	v decayed
Secale cereale (rachis fgts)	2	
Agrostemma githago (ch)	1	
Cladium mariscus (ch lf fgts)	1	
Corylus avellana (ch)	1	to 5 mm
Gramineae/Cerealia (ch c/n)	1	
Gramineae/Cerealia (ch culm fgts)	1	
Juncus inflexus/effusus/ conglomeratus	1	v decayed
Papaver argemone	1	very bone
Rumex sp(p). (ch)	1	
Sambucus nigra	1	inc fgts Secale
cereale	1	
Secale cereale (lemma fgts)	1	
Triticum aestivo-compactum	1	
Triticum sp(p). (f/t rachis fgts)	1	
bone fgts	1	to 60 mm
brick/tile	1	to 5 mm
burnt bone fgts	1	to 10 mm
charcoal	1	to 10 mm
charred herbaceous detritus	1	
coal	1	to 15 mm
eggshell fgts	1	to 10 mm
fish bone	1	to 20 mm
gravel	1	to 10 mm
mussel shell 'fibres'	1	
decayed		
part-burnt coal	1	to 15 mm
pottery	1	to 10 mm
root/rootlet fgts	1	
sand	1	

Context 2662, Sample 61/T2

(includes records for items recorded during assessment, but not subsequently re-recorded)

?faecal concretions	3	to 30 mm
fine plant detritus	3	
wood fgts	3	v decayed, to 10 mm
animal hairs	2	
brick/tile	2	to 40 mm
charcoal	2	to 50 mm
Ficus carica	2	
gravel	2	to 30 mm
grit	2	
herbaceous detritus	2	
sand	2	
unwashed sediment	2	to 10 mm
wool textile fgts	2	to 5 mm
Agrostemma githago	1	inc fgts
Alnus glutinosa (b/bs)	1	
Alopecurus sp(p).	1	
Arctium sp(p).	1	
Atriplex sp(p).	1	
Avena sp(p). (w/l)	1	
Bidens sp(p).	1	
Brassica rapa	1	
Brassica sp(p).	1	
Brassica sp./Sinapis arvensis	1	inc fgts
Caltha palustris	1	
Carex sp(p).	1	
Centaurea sp(p). (af)	1	
Centaurea sp(p). (inv fgts)	1	
Chenopodium album	1	
Chrysanthemum segetum (af)	1	
Compositae (inv fgts)	1	
Corylus avellana	1	
Corylus avellana (ch roundwood)	1	to 60 x 15 mm
Danthonia decumbens	1	
Eleocharis palustris sl	1	v decayed
Galeopsis Subgenus Galeopsis	1	
Galium aparine (epicarp)	1	
Gramineae	1	
Gramineae/Cerealia (ch culm fgts)	1	
Gramineae/Cerealia (culm fgts)	1	
Hypnum cf. cupressiforme	1	
Juncus bufonius	1	
Knautia arvensis (ff)	1	
Lapsana communis	1	
Leguminosae (fls/pet)	1	
Lemna sp(p). (fronds)	1	
Linum usitatissimum (min)	1	
Luzula sp(p).	1	
Malus sylvestris (endo)	1	

Melophagus ovinus (sheep ked)	1		sclereids (from bark)	1	
Papaver argemone	1		?slag	1	to 10 mm
Pisum cf. sativum (hila)	1		twig fgts	1	to 20 mm
Plantago major	1		wood chips	1	v decayed, to 10 mm
Polygonum aviculare agg.	1				
Polygonum lapathifolium	1		wood fgts	1	to 30 mm
Polygonum persicaria	1		wood fgts (min)	1	to 10 mm
Populus sp(p). (b/bs)	1				
Potentilla cf. erecta	1				
Prunella vulgaris	1		**Context 2902, Sample 66/SPT**		
Prunus sp(p). (thorns)	1		faecal concretions	3	
Quercus sp(p). (b/bs)	1		Agrostemma githago (sf)	2	
Ranunculus arvensis	1		Triticum/Secale ('bran' fgts)	2	
Ranunculus flammula	1		Aethusa cynapium	1	fgt(s) only
Ranunculus Section Ranunculus	1		Ascaris (eggs)	1	
Raphanus raphanistrum			Brassica rapa	1	
(pod segs/fgts)	1		Centaurea cf. cyanus	1	
Reseda luteola	1		Centaurea sp(p). (af)	1	
Rhinanthus sp(p).	1		Malus sylvestris (endo)	1	
Rubus fruticosus agg.	1		Trichuris (eggs)	1	
Rumex acetosella agg.	1				
Rumex sp(p).	1				
Salix sp(p). (tef)	1		**Context 2940, Sample 67/T2**		
Sambucus nigra	1		Anthemis cotula	3	
Scandix pecten-veneris	1		bark fgts	3	to 30 mm
Silene cf. alba	1		fine plant detritus	3	
Sonchus asper	1		wood chips	3	to 30 mm
Stellaria media	1		wood fgts	3	to 20 mm
Thalictrum flavum	1		Atriplex sp(p).	2	
Ulex sp(p). (lf/lvs)	1		Avena sp(p).	2	
Viola sp(p). (caps segs)	1		Carex sp(p).	2	n/u
bark fgts	1	to 60 mm	Chenopodium album	2	
beetles	1		Eleocharis palustris sl	2	
bivalve periostracum	1	to 5 mm	Juncus bufonius	2	
bone fgts	1	to 70 mm	bark fgts (ch)	2	to 40 mm
?burnt soil/daub	1	to 20 mm	charcoal	2	to 30 mm
caddis larva cases	1		leather fgts	2	to 25 mm
cinders	1	to 50 mm	Linum usitatissimum	2	inc fgts
coal	1	to 5 mm	Scorpidium scorpioides	2	
cockle shell fgts	1	to 10 mm	Aethusa cynapium	1	
earthworm egg caps	1		Agrostemma githago (sf)	1	
eggshell fgts	1	to 10 mm	Anethum graveolens	1	
eggshell membrane fgts	1	to 30 mm	Antitrichia curtipendula	1	
fish bone	1	to 25 mm	Aphanes arvensis	1	
fly puparia	1		Aphanes microcarpa	1	
iron-rich concretions	1	to 30 mm	Apium graveolens	1	
leather fgts	1	v dec, to 10 mm	Avena sp(p). (chaff)	1	
			Avena sp(p). (w/l)	1	
marine mollusc shell	1	to 20 mm	cf. Avena sp(p). (part-ch chaff)	1	
mortar	1	to 30 mm	Baldellia ranunculoides	1	
mussel shell fgts	1	to 30 mm	Bilderdykia convolvulus (ff)	1	
oyster shell fgts	1	to 100 mm	Brassica rapa	1	
?pottery	1	to 20 mm	Brassica sp(p).	1	
root/rootlet fgts	1		Brassica sp./Sinapis arvensis	1	
roundwood fgts (ch)	1	to 50 x 10 mm	Brassica sp./Sinapis arvensis		

(pod fgts)	1		Spergula arvensis	1	
Calliergon cf. giganteum	1		Urtica urens	1	
Calliergon cuspidatum	1		Valerianella dentata	1	
Carduus/Cirsium sp(p).	1		Viola sp(p).	1	
Centaurea sp(p). (inv br)	1		Viola sp(p). (caps segs)	1	
Cerealia indet. (w/l chaff)	1		'ash beads'	1	
Chrysanthemum segetum	1		'coils'	1	
cf. Cinclidium stygium	1		?cynipid galls	1	
Cladium mariscus	1		?daub	1	to 10 mm
cf. Cladium mariscus (ch stem fgts)	1		burnt bone fgts	1	to 15 mm
Corylus avellana	1		bark lichen lirellae	1	
Corylus avellana (ch)	1		beetles	1	
Daucus carota	1		bone fgts	1	to 40 mm
Diphasium sp(p).	1		earthworm egg caps	1	
Drepanocladus cf. aduncus	1		fish bone	1	to 10 mm
Ficus carica	1		fly puparia	1	
Galeopsis Subgenus Galeopsis	1		gravel	1	to 35 mm
Galeopsis Subgenus Ladanum	1		grit	1	
Galium sp(p).	1		mites	1	
Genista tinctoria (st fgts)	1		mussel shell fgts	1	to 10 mm
Genista tinctoria (tef)	1		pottery	1	to 10 mm
Gramineae	1		sand	1	
Heracleum sphondylium	1		twig fgts	1	to 20 x 10 mm
Homalothecium sericeum/lutescens	1				
Hordeum sp(p).	1				
Humulus lupulus	1		**Context 3122, Sample 71/T**		
Isatis tinctoria (pod fgts)	1	single spec	Gramineae/Cerealia (ch culm fgts)	3	
Knautia arvensis	1		Gramineae/Cerealia (ch c/n)	1	
Lapsana communis	1		mammal tooth	1	
Leguminosae (pods/fgts)	1	to 5 mm			
Leontodon sp(p).	1				
Linum usitatissimum (caps fgts)	1		**Context 3240, Sample 76/T2**		
Menyanthes trifoliata	1		?baked clay/daub	3	to 30 mm
Myrica gale	1		charcoal	3	to 20 mm
Myrica gale (lf fgts)	1		mortar	2	to 5 mm
Neckera complanata	1		sand	2	
Oenanthe sp(p).	1		cf. Betula (charcoal)	1	to 15 mm
Pedicularis palustris	1		Corylus avellana (ch)	1	
Polygonum aviculare agg.	1		Corylus avellana (charcoal)	1	to 20 mm
Polygonum hydropiper	1		Hyoscyamus niger	1	v decayed
Polygonum lapathifolium	1		Quercus (charcoal)	1	to 20 mm
Prunella vulgaris	1		Reseda luteola	1	
Quercus (wood chips)	1	to 20 mm	Sambucus nigra (sf)	1	
Quercus sp(p). (b/bs)	1		cf. Vicia sp(p).	1	
Quercus sp(p). (tw fgts)	1	to 10 mm	bark fgts (ch)	1	to 20 mm
Ranunculus flammula	1		bone fgts	1	to 5 mm
Ranunculus Section Ranunculus	1		burnt fish bone	1	to 2 mm
Raphanus raphanistrum (pod segs/fgts)	1		eggshell fgts	1	to 5 mm
			fish bone	1	to 2 mm
Rumex acetosella agg.	1		fish scale	1	to 2 mm
Rumex sp(p).	1		gravel	1	to 20 mm
Salix sp(p). (b)	1		root/rootlet fgts (?modern)	1	
Sambucus nigra	1				
cf. Secale cereale	1				
Sonchus asper	1				

Table 4. 41-9 Walmgate, York: Insects and other macro-invertebrates—species lists by context and sample. Taxa are listed in descending order of abundance.

Key: n - minimum number of individuals; q - quantification (s - semi-quantitative 'several', m - semi-quantitative 'many', both sensu *Kenward* et al. *(1986), e - estimate); ec - ecological codes (see Table 6 for explanation); * - not used in calculation of statistics in Table 5.*

Context: 2662 Sample: 61/T2 ReM: D
Weight: 5.00 E: 4.00 F: 3.00

Notes: Entered 9/8/02. Several dishes of flot. Recorded in flot and on filter paper. Remains very friable in many cases, often pale. E 3.5-5.0, mode 4.0 weak; F 2.0-5.0, mode 3.0 weak. AH tube from residue contained puparia and traces of beetles (no additional taxa). *Apion* fresh, elytron not expanded.

	n	q	ec
Lathridius minutus group	11	-	rd-st
Tipnus unicolor	6	-	rt-ss
Oxytelus sculptus	3	-	rt-st
Cercyon ?analis	2	-	rt-sf
Cercyon atricapillus	2	-	rf-st
Phyllodrepa ?floralis	2	-	rt-sf
Xylodromus concinnus	2	-	rt-st
Anotylus complanatus	2	-	rt-sf
Apion sp.	2	-	oa-p
Bembidion (Philochthus) sp.	1	-	oa
Agabus bipustulatus	1	-	oa-w
Cercyon haemorrhoidalis	1	-	rf-sf
Acrotrichis sp.	1	-	rt
Silpha atrata	1	-	u
Omalium sp.	1	-	rt
Anotylus rugosus	1	-	rt
Philonthus sp. A	1	-	u
Philonthus sp. B	1	-	u
Philonthus sp. C	1	-	u
Staphylininae sp. A	1	-	u
Staphylininae sp. B	1	-	u
Aleocharinae sp. A	1	-	u
Aleocharinae sp. B	1	-	u
Aphodius sp. A	1	-	ob-rf
Aphodius sp. B	1	-	ob-rf
Elateridae sp.	1	-	ob
?Dermestes sp.	1	-	rt-sf
Anobium punctatum	1	-	l-sf
Ptinus ?fur	1	-	rd-sf
Monotoma sp.	1	-	rt-sf
Oryzaephilus ?surinamensis	1	-	g-ss
Cryptophagus sp. A	1	-	rd-sf
Cryptophagus sp. B	1	-	rd-sf
Cryptophagus sp. C	1	-	rd-sf
Mycetaea hirta	1	-	rd-ss
Aglenus brunneus	1	-	rt-ss
Tenebrio obscurus	1	-	rt-ss
Chrysolina sp.	1	-	oa-p
Chrysomelinae sp.	1	-	oa-p
Longitarsus sp.	1	-	oa-p
Sitophilus granarius	1	-	g-ss
?Mecinus sp.	1	-	oa-p
*Acarina sp.	15	m	u
*Coccoidea sp.	6	s	u
*Diptera sp. (puparium)	6	s	u
*Aves sp. (feather)	6	s	u
*Pediculus humanus	4	-	ss
*?Heterodera sp. (cyst)	1	-	u
*Oligochaeta sp. (egg capsule)	1	-	u
*Daphnia sp. (ephippium)	1	-	oa-w
*Cladocera sp. S (ephippium)	1	-	oa-w
*Diptera sp. (adult)	1	-	u
*Diptera sp. (pupa)	1	-	u
*Melophagus ovinus (adult)	1	-	u
*Melophagus ovinus (puparium)	1	-	u
*Coleoptera sp. (larva)	1	-	u
*Pseudoscorpiones sp.	1	-	u

Context: 2940 Sample: 67/T2 ReM: D
Weight: 3.00 E: 2.50 F: 2.50

Notes: Entered HK 9/8/02. Several dish flot. Recorded in flot and on filter paper. E 2.5-3.5, mode 2.5 weak; F 1.5-4.0, mode 2.5 weak. Preservation made identifications difficult in many cases.

	n	q	ec
Anotylus nitidulus	9	-	rt
Xylodromus concinnus	8	-	rt-st
Corticaria sp. C	7	-	rt-sf
Cercyon analis	6	-	rt-sf
Carpelimus bilineatus	6	-	rt-sf
Ptilinus pectinicornis	6	-	l-sf
Atomaria sp.	6	-	rd
Stenus sp.	5	-	u
Anobium punctatum	5	-	l-sf
Lathridius minutus group	5	-	rd-st
Platystethus arenarius	4	-	rf
Platystethus cornutus group	4	-	oa-d
Cryptophagus sp. B	4	-	rd-sf
Corticaria sp. A	4	-	rt-sf
Corticaria sp. B	4	-	rt-sf
Neobisnius sp.	3	-	u

Aleocharinae sp. D	3	-	u
Ptinus fur	3	-	rd-sf
Corticaria sp. D	3	-	rt-sf
Megasternum obscurum	2	-	rt
Ochthebius sp.	2	-	oa-w
Carpelimus fuliginosus	2	-	st
Platystethus nitens	2	-	oa-d
Anotylus complanatus	2	-	rt-sf
Anotylus rugosus	2	-	rt
Oxytelus sculptus	2	-	rt-st
Leptacinus ?pusillus	2	-	rt-st
Gyrohypnus angustatus	2	-	rt-st
Quedius sp.	2	-	u
Falagria sp.	2	-	rt-sf
?Crataraea suturalis	2	-	rt-st
Aleocharinae sp. B	2	-	u
Aleocharinae sp. E	2	-	u
Aphodius prodromus	2	-	ob-rf
Clambus pubescens	2	-	rt-sf
Kateretes sp.	2	-	oa-p-d
Mycetaea hirta	2	-	rd-ss
Aglenus brunneus	2	-	rt-ss
Anthicus formicarius	2	-	rt-st
Ceutorhynchus sp.	2	-	oa-p
Heterogaster urticae	1	-	oa-p
Lyctocoris campestris	1	-	rd-st
Cercopidae sp.	1	-	oa-p
Aphrodes sp.	1	-	oa-p
Delphacidae sp.	1	-	oa-p
Carabus sp.	1	-	oa
Agonum sp.	1	-	oa
Agabus or Ilybius sp.	1	-	oa-w
Helophorus aquaticus or grandis	1	-	oa-w
Helophorus aquaticus or grandis	1	-	oa-w
Helophorus sp.	1	-	oa-w
Cercyon atricapillus	1	-	rf-st
Acritus nigricornis	1	-	rt-st
Ptenidium sp. A	1	-	rt
Ptenidium sp. B	1	-	rt
Acrotrichis sp.	1	-	rt
Ptiliidae sp.	1	-	u
Omalium ?rivulare	1	-	rt-sf
Omalium sp.	1	-	rt
Omaliinae sp.	1	-	rt
Coprophilus striatulus	1	-	rt-st
Carpelimus sp.	1	-	u
Astenus sp.	1	-	rt
Leptacinus sp.	1	-	rt-st
Gyrohypnus fracticornis	1	-	rt-st
Staphylininae sp. A	1	-	u
Staphylininae sp. B	1	-	u
Cordalia obscura	1	-	rt-sf
Aleochara sp.	1	-	u
Aleocharinae sp. A	1	-	u
Aleocharinae sp. C	1	-	u
Pselaphidae sp. A	1	-	u
Pselaphidae sp. B	1	-	u
Aphodius sp.	1	-	ob-rf
Lyctus linearis	1	-	l-sf
Meligethes sp.	1	-	oa-p
Monotoma sp.	1	-	rt-sf
Cryptophagus sp. A	1	-	rd-sf
Cortinicara gibbosa	1	-	rt
Blaps sp.	1	-	rt-ss
Phyllotreta nemorum group	1	-	oa-p
Chaetocnema concinna	1	-	oa-p
Apion sp.	1	-	oa-p
Curculionidae sp. A	1	-	oa
Curculionidae sp. B	1	-	oa
*Acarina sp.	500	e	u
*Proctotrupoidea sp.	50	e	u
*Diptera sp. (puparium)	15	m	u
*Coleoptera sp. (larva)	4	-	u
*Coccoidea sp.	3	-	u
*Auchenorhyncha sp. (nymph)	2	-	oa-p
*Melophagus ovinus (adult)	2	-	u
*Syrphidae sp. (larva)	2	-	u
*Cereal grain (charred)	1	-	u
*Dermaptera sp.	1	-	u
*Oligochaeta sp. (egg capsule)	1	-	u
*Cladocera sp. L (ephippium)	1	-	oa-w
*?Damalinia sp.	1	-	u
*Diptera sp. (adult)	1	-	u
*Melophagus ovinus (puparium)	1	-	u
*Siphonaptera sp.	1	-	u
*Chalcidoidea sp.	1	-	u
*Hymenoptera sp.	1	-	u

Context: 3240 Sample: 76/T2 ReM: S
Weight: 3.00 E: 0.00 F: 0.00

Notes: Entered 9/8/02 HK. Half dish of flot: effectively barren. Only remains were a modern aphid and a small unidentified landsnail.

	n	q	ec
*null	0	-	u

Table 5. 41-9 Walmgate, York: Main statistics for the assemblages of adult Coleoptera and Hemiptera (excluding Aphidoidea and Coccidoidea). For explanation of codes see Table 6.

Context	2662	2940	Whole site
Sample	61	67	
Ext	/T2	/T2	
ConalphaN			
S	42	84	107
N	65	181	246
ALPHA	51	61	72
SEALPHA	12	8	8
SOB	10	22	31
PSOB	24	26	29
NOB	11	30	41
PNOB	17	17	17
ALPHAOB	0	38	57
SEALPHAOB	0	15	20
SW	1	4	5
PSW	2	5	5
NW	1	5	6
PNW	2	3	2
ALPHAW	0	0	0
SEALPHAW	0	0	0
SD	0	3	3
PSD	0	4	3
ND	0	8	8
PND	0	4	3
ALPHAD	0	0	0
SEALPHAD	0	0	0
SP	5	10	14
PSP	12	12	13
NP	6	12	18
PNP	9	7	7
ALPHAP	0	0	0
SEALPHAP	0	0	0
SM	0	0	0
PSM	0	0	0
NM	0	0	0
PNM	0	0	0
ALPHAM	0	0	0
SEALPHAM	0	0	0
SL	1	3	3
PSL	2	4	3
NL	1	12	13
PNL	2	7	5
ALPHAL	0	0	0
SEALPHAL	0	0	0
SRT	23	45	64
PSRT	55	54	60
NRT	45	114	159
PNRT	69	63	65
ALPHART	19	28	40
SEALPHART	5	4	5
SRD	6	7	13
PSRD	14	8	12
NRD	16	22	38
PNRD	25	12	15
ALPHARD	0	4	7
SEALPHARD	0	1	2
SRF	4	4	8
PSRF	10	5	7
NRF	5	8	13
PNRF	8	4	5
ALPHARF	0	0	0
SEALPHARF	0	0	0
SSA	21	35	45
PSSA	50	42	42
NSA	43	95	138
PNSA	66	52	56
ALPHASA	16	20	23
SEALPHASA	4	3	3
SSF	11	18	24
PSSF	26	21	22
NSF	14	59	73
PNSF	22	33	30
ALPHASF	0	9	13
SEALPHASF	0	2	2
SST	4	14	14
PSST	10	17	13
NST	18	31	49
PNST	28	17	20
ALPHAST	0	10	7
SEALPHAST	0	3	2
SSS	6	3	7
PSSS	14	4	7
NSS	11	5	16
PNSS	17	3	7
ALPHASS	0	0	0
SEALPHASS	0	0	0
SG	2	0	2
PSG	5	0	2
NG	2	0	2
PNG	3	0	1
ALPHAG	0	0	0
SEALPHAG	0	0	0

Table 6. Abbreviations for ecological codes and statistics used for interpretation of insect remains in text and tables. Lower case codes in parentheses are those assigned to taxa and used to calculate the group values (the codes in capitals). See Table 4 for codes assigned to taxa from the present site. Alpha - the index of diversity alpha (Fisher et al. *1943); Indivs - individuals (based on MNI); No - number.*

No taxa	S
Estimated number of indivs (MNI)	N
Index of diversity (α)	alpha
Standard error of alpha	SE alpha
No 'certain' outdoor taxa (oa)	SOA
Percentage of 'certain' outdoor taxa	PSOA
No 'certain' outdoor indivs	NOA
Percentage of 'certain' outdoor indivs	PNOA
No OA and probable outdoor taxa (oa+ob)	SOB
Percentage of OB taxa	PSOB
No OB indivs	NOB
Percentage OB indivs	PNOB
Index of diversity of the OB component	alphaOB
Standard error	SEalphaOB
No aquatic taxa (w)	SW
Percentage of aquatic taxa	PSW
No aquatic indivs	NW
Percentage of W indivs	PNW
Index of diversity of the W component	alphaW
Standard error	SEalphaW
No damp ground/waterside taxa (d)	SD
Percentage D taxa	PSD
No damp D indivs	ND
Percentage of D indivs	PND
Index of diversity of the D component	alphaD
Standard error	SEalphaD
No strongly plant-associated taxa (p)	SP
Percentage of P taxa	PSP
No strongly P indivs	NP
Percentage of P indivs	PNP
Index of diversity of the P component	alphaP
Standard error	SEalphaP
No heathland/moorland taxa (m)	SM
Percentage of M taxa	PSM
No M indivs	NM
Percentage of M indivs	PNM
Index of diversity of the M component	alphaM
Standard error	SEalphaM
No wood-associated taxa (l)	SL
Percentage of L taxa	PSL
No L indivs	NL
Percentage of L indivs	PNL
Index of diversity of the L component	alphaL
Standard error	SEalphaL
No indivs of grain pests (g)	NG
Percentage of indivs of grain pests	PNG
No decomposer taxa (rt + rd + rf)	SRT
Percentage of RT taxa	PSRT
No RT indivs	NRT
Percentage of RT indivs	PNRT
Index of diversity of RT component	alpha RT
Standard error	SEalphaRT
No 'dry' decomposer taxa (rd)	SRD
Percentage of RD taxa	PSRD
No RD indivs	NRD
Percentage of RD indivs	PNRD
Index of diversity of the RD component	alphaRD
Standard error	SEalphaRD
No 'foul' decomposer taxa (rf)	SRF
Percentage of RF taxa	PSRF
No RF indivs	NRF
Percentage of RF indivs	PNRF
Index of diversity of the RF component	alphaRF
Standard error	SEalphaRF
No synanthropic taxa (sf+st+ss)	SSA
Percentage of synanthropic taxa	PSSA
No synanthropic indivs	NSA
Percentage of SA indivs	PNSA
Index of diversity of SA component	ALPHASA
Standard error	SEALPHASA
No facultatively synanthropic taxa (sf)	SSF
Percentage of SF taxa	PSSF
No SF indivs	NSF
Percentage of SF indivs	PNSF
Index of diversity of SF component	ALPHASF
Standard error	SEALPHASF
No typical synanthropic taxa (st)	SST
Percentage of ST taxa	PSST
No ST indivs	NST
Percentage of ST indivs	PNST
Index of diversity of ST component	ALPHAST
Standard error	SEALPHAST
No strongly synanthropic taxa (ss)	SSS
Percentage of SS taxa	PSSS
No SS indivs	NSS
Percentage of SS indivs	PNSS
Index of diversity of SS component	ALPHASS
Standard error	SEALPHASS
No uncoded taxa (u)	SU
Percentage of uncoded indivs	PNU

Table 7. 41-9 Walmgate, York: Measurements for trichurid eggs from Context 2902, Sample 66 in microns. ***Key****: p-p = polar plug to polar plug maximum length; w = maximum width.*

p-p	w
55.29	26.00
54.00	24.71
54.00	24.07
55.29	25.36
55.29	26.00
54.64	24.07
54.00	24.71
54.00	27.29
51.43	24.71
54.64	26.64
51.43	24.71
52.07	25.36
56.57	24.71
54.64	24.71
54.64	22.79
54.64	24.71
51.43	23.43
58.50	25.36
56.57	23.43
55.29	22.79
57.21	24.71
55.29	26.64
57.86	23.43
57.86	24.71
55.93	21.50
55.29	24.71
58.50	24.71
54.00	24.71
56.57	22.79
54.00	23.43

Table 8. 41-9 Walmgate, York: Descriptive statistics for polar plug to polar plug maximum length (l) and maximum width (w) measurements for Context 2902, Sample 66.

maximum length (microns)		*maximum width (microns)*	
Mean	55.03	Mean	24.56
Standard Error	0.35	Standard Error	0.23
Median	54.96	Median	24.71
Mode	55.29	Mode	24.71
Standard Deviation	1.93	Standard Deviation	1.27
Sample Variance	3.72	Sample Variance	1.62
Kurtosis	-0.13	Kurtosis	0.35
Skewness	-0.11	Skewness	-0.11
Range	7.07	Range	5.79
Minimum	51.43	Minimum	21.50
Maximum	58.50	Maximum	27.29
Sum	1650.86	Sum	736.93
Count	30.00	Count	30.00

Fig 1. 41-9 Walmgate, York: Plotted trichurid egg measurements with overlay of size ranges for eggs of trichurids of several common domesticated animals and Trichuris trichiura*. Larger circles represent multiple coincident measurements. Maximum length includes polar plugs.*

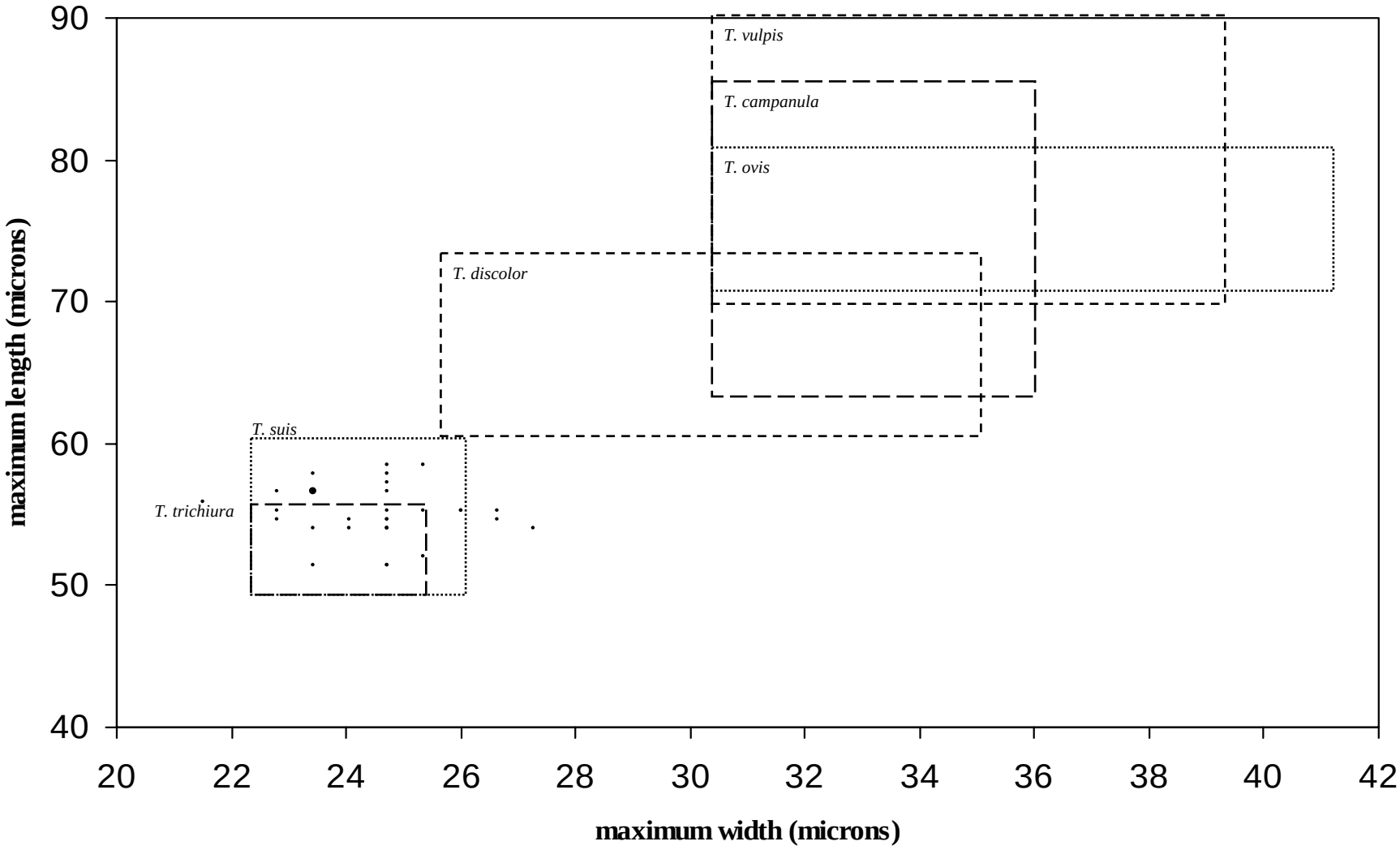


Fig 2: 41-9 Walmgate, York: Plotted trichurid egg measurements with overlay of size ranges for eggs of Trichuris trichiura *and* T. suis. *Error bars are +/- 0.25 of a graticule division or 0.625 of a micron representing the resolution of the measurements. Larger circles represent multiple coincident measurements. Maximum length includes polar plugs.*

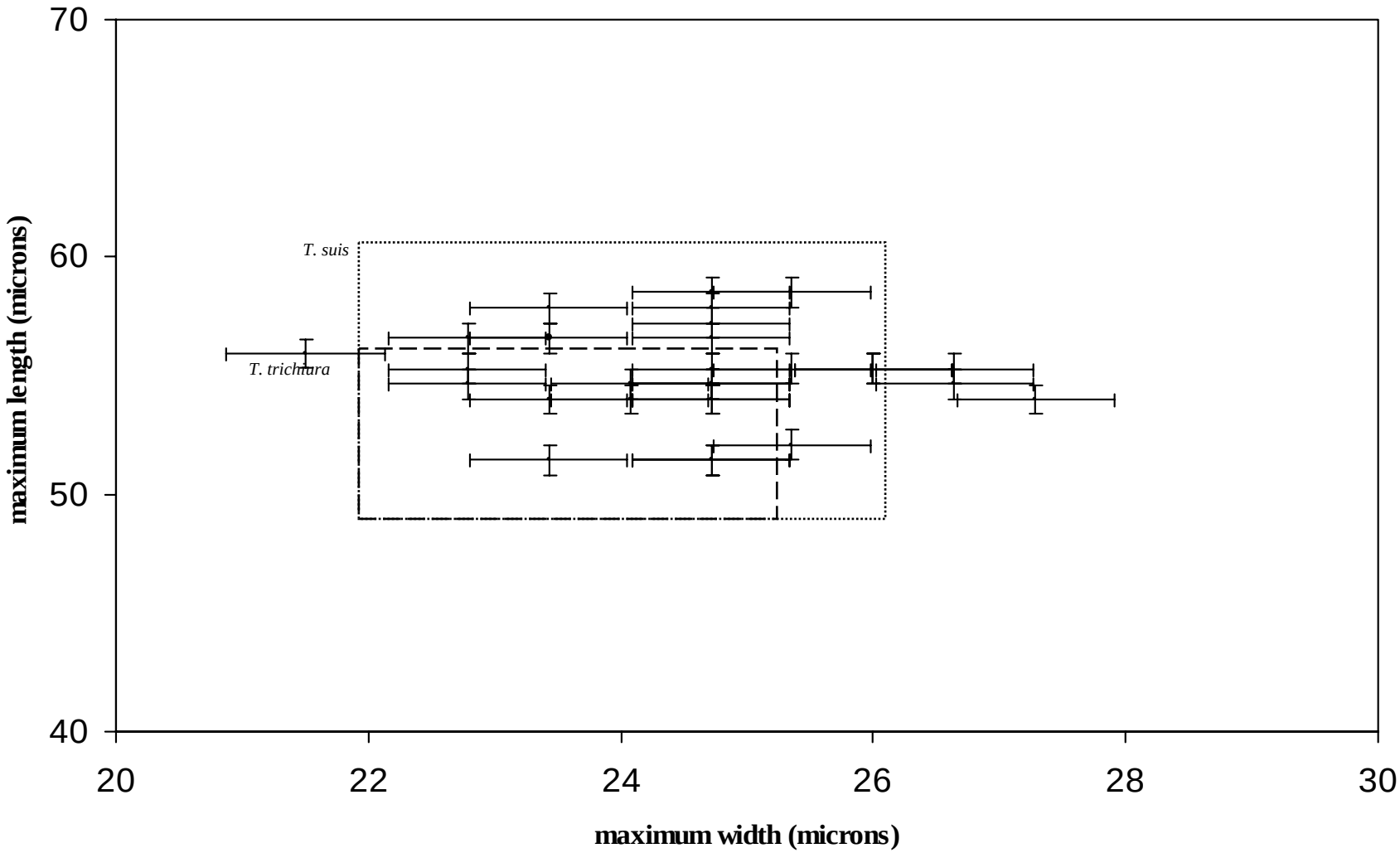
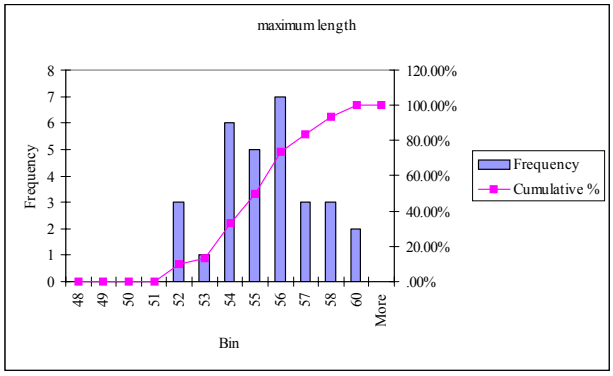


Fig 3. 41-9 Walmgate, York: Histograms of the distributions of polar plug to polar plug maximum length and maximum width measurements (in microns).



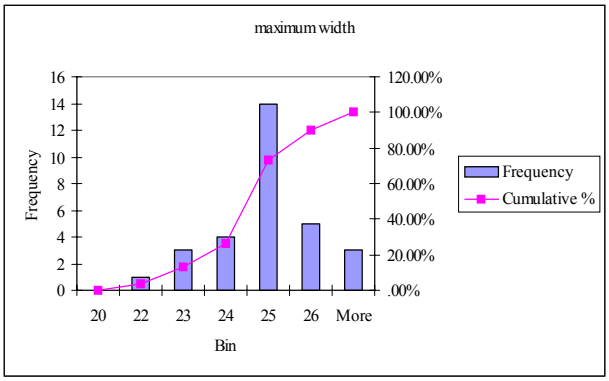


Fig 4. 41-9 Walmgate, York: Running means for polar plug to polar plug maximum length (p-p) and maximum width measurements (w).

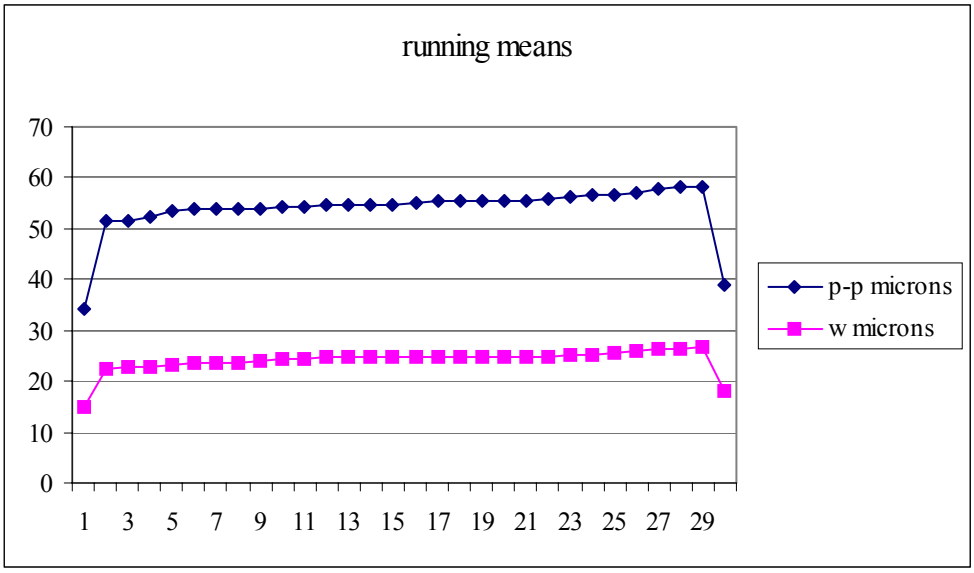


Table 9. Identified fish remains recovered from the samples from 41-49 Walmgate, York.

Species		**1418**	**1529**	**1969**	**1910**	**Total**
Raja sp.	ray	-	1	-	-	1
Raja clavata L.	thornback ray	2	1	-	1	4
Anguilla anguilla (L.).	eel	17	11	9	-	37
Clupea harengus L.	herring	43	27	166	409	645
Cyprinidae	cyprinid	10	-	1	-	11
cf. *Gobio gobio* (L.)	?gudgeon	3	-	-	-	3
Gadidae	gadid	6	2	2	9	19
Gadus morhua L.	cod	1	-	-	14	15
cf. *Gadus morhua* L.	?cod	1	5	-	5	11
Melanogrammus aeglefinus (L.)	haddock	3	6	18	37	64
cf. *Melanogrammus aeglefinus* (L.)	?haddock	1	1	3	-	5
Merlangius merlangus (L.)	whiting	-	-	7	-	7
cf. *Merlangius merlangus* (L.)	?whiting	3		1	3	7
?Ciliata mustela (L.)	?five bearded rockling	-	2	-	-	2
Pleuronectidae	flatfish	13	1	2	7	23
?Pleuronectidae	?flatfish	-	-	-	1	1
cf. *Limanda limanda* (L.)	?dab	-	2	-	-	2
cf. *Pleuronectes platessa* L./*Platichthys flesus* L.	?plaice/flounder	-	-	3	-	3
Pleuronectes platessa (L.)	plaice	1	1	-	-	2
cf. *Pleuronectes platessa* (L.)	?plaice	-	-	-	1	1
Microstomus kitt (Walbaum)	lemon sole	-	3	-	-	3
Total		**104**	**63**	**212**	**487**	**866**

Table 10. Hand-collected vertebrate remains recorded from deposits from Phases 4-9.9 at 41-49 Walmgate, York.

Species		**4**	**5**	**6.1**	**6.2**	**6.3**	**7**	**8**	**9.1**	**9.2**	**9.3**	**9.4**	**9.5**	**9.6**	**9.8**	**9.9**	**Total**
Canis f. domestic	dog	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	2
Felis f. domestic	cat	-	-	-	-	-	-	4	-	-	-	-	3	-	33	-	40
Equus f. domestic	horse	-	-	-	-	-	-	1	-	-	-	-		-	-	-	1
Sus f. domestic	pig	1	22	4	-	-	1	18	3	6	9	-	1	3	12	3	83
Cervus elaphus L.	red deer	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	2
Dama dama (L.)	fallow deer	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	2
Bos f. domestic	cow	1	38	18	10	-	3	41	10	28	55	6	11	19	52	1	293
Caprovid	sheep/goat	1	16	5	10	2	3	32	7	15	11	4	8	6	31	4	155
Anser sp.	goose	-	-	6	1	4	-	3	-	-	12	2	4	-	3	-	35
Anas sp.	duck	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	3
cf. *Anas* sp.	?duck	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Gallus f. domestic	fowl	-	3	11	1	1	-	11	1	7	26	26	2	2	13	2	106
cf. *Phasianus colchius* L.	?pheasant	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
G*rus* sp.	crane	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	2
Uria aalge (Pontoppidan)	guillemot	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Columbidae	Columbidae	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Corvus monedula L.	jackdaw	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Esox lucius L.	pike	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Gadidae	cod family	-	-	-	-	-	1	1	-	-	2	-	-	1	2	1	8
Gadus morhua L.	cod	-	-	1	-	-	1	1	-	-	1	-	-	-	4	-	8
cf. *Gadus morhua* L.	?cod	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	2
Melanogrammus aeglefinus (L.)	haddock	-	-	1	-	-	-	1	-	1	1	-	-	-	1	-	5
Molva molva (L.)	ling	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	3
Homo sapiens	human	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Unidentified		6	249	84	49	8	16	228	23	108	325	31	48	42	206	37	1460
Total		**10**	**330**	**130**	**71**	**15**	**26**	**351**	**44**	**167**	**442**	**69**	**77**	**75**	**362**	**49**	**2218**

Table 11. Cattle: skeletal element representation by phase from deposits at 41-49 Walmgate, York.

Element	**5**	**6.1**	**6.2**	**7**	**8**	**9.1**	**9.2**	**9.3**	**9.4**	**9.5**	**9.6**	**9.8**	**9.9**
horncore	1	-	-	-	1	-	-	-	-	-	-	1	-
mandible	5	7	-	-	7	-	5	9	-	--	1	2	-
teeth	2	2	2	-	6	2	2	7	1	3	2	6	-
scapula	4	-	-	1	1	-	-	1	-	-	1	2	1
humerus	2	-	-	-	-	-	-	1	-	-	-	4	-
radius	2	-	1	-	3	1	1	3	2	1	-	4	-
ulna	2	1	1	-	-	-	1	-	1	-	-	1	-
pelvis	1	1	-	-	4	1	2	4	-	-	1	1	-
femur	3	-	-	-	1	1	1	2	-	2	3	1	-
tibia	1	-	-	1	2	1	1	1	-	-	1	3	-
calcaneum	2	-	1	-	1	1	3	-	-	-	-	2	-
astragalus	3	-	1	-	1	1	-	-	-	1	2	1	-
metacarpal	1	-	-	-	4	-	1	1	-	-	2	-	-
metatarsal	3	2	1	-	3	-	4	3	1	1	2	9	-
metapodial	-	-	2	-	-	1	1	2	-	-	-	1	-
phalanges	5	2	-	1	4	1	4	15	-	3	3	12	-

Table 12. Caprovid: skeletal element representation by phase from deposits at 41-49 Walmgate, York.

Elements	**5**	**6.1**	**6.2**	**6.3**	**7**	**8**	**9.1**	**9.2**	**9.3**	**9.4**	**9.5**	**9.6**	**9.8**	**9.9**
horncore	-	-	-	-	-	-	-	-	-	1	-	-	-	-
mandible	4	-	-	-	-	4	-	1	-	-	1	1	3	-
teeth	-	-	-	-	-	1		2	4	-	-	-	-	-
scapula	-	-	2	-	-	2		2	1	-	-	-	3	-
humerus	-	-	-	-	-	3	2	1	1	-	-	1	1	-
radius	2	2	2	-		1	1	1	1	1	1	2	7	-
ulna	-	-	-	-	2	2	-	-	1	1	2	-	-	-
pelvis	1	-	-	-	-	7	-	2	2	-	-	-	3	2
femur	-	1	-	-	-	1	-	-	-	-	-	-	2	1
tibia	4	-	1	1	-	1	2	3	-	-	1	-	5	1
calcaneum	-	-	-	-	-	-	-	-	-	-	-	-	-	-
astragalus	-	-	-	-	-	1	-	-	-	-	-	-	-	-
metacarpal	1	-	1	-	1	6	-	1	1	-	1	1	1	-
metatarsal	4	1	3	1	-	1	-	2	-	-	2	1	3	-
metapodial	-	-	-	-	-	2	-	-	-	-	-	-	-	-
phalanges	-	-	-	-	-	2	-	-	-	-	-	-	-	-

Table 13. Tooth wear for cattle mandibles and loose teeth using wear stages as outlined by Grant (1982) and age categories (where applicable) after O'Connor (1989). Key: ERP = erupting; CPT = visible in crypt.

Phase	Context	dp4	P4	M1	M2	M3	Age category
6.1	2331	C	-	CPT	-	-	Juvenile
6.1	2331	D	ERP	-	-	-	Juvenile
6.1	2331	B	-	-	-	-	Juvenile
6.1	2331	C	-	-	-	-	Juvenile
6.1	2331	-	D	K	-	-	
6.1	2331	-	-	-	-	F	Adult3
6.1	4084	-	-	-	-	J	Elderly
7	2936	-	-	-	-	G	Adult3
8	2851	C	-	-	-	-	Juvenile
8	2406	-	-	L	K	-	Adult
8	2406	-	-		K	K	Elderly
8	2406	-	-	L	K	-	Adult
8	2115	-	-	M	L	-	Adult
9.2	2302	B	-	-	-	-	Juvenile
9.3	1910	-	C	-	-	-	
9.3	1910	-	-	N	M	M	Elderly
9.3	1910	-	-	-	G	E	Adult3
9.3	1910	-	-	-	G	F	Adult3
9.6	2340	-	-	ERP	-		Juvenile
9.6	1813	-	-	-	-	G	Adult3
Loose teeth							
5	3065	J	-	-	-	-	
8	2406	-	-	-	-	H	Adult 3
9.2	2138	-	-	-	-	K	Elderly
9.8	1897	-	-	-	-	L	Elderly
9.8	1858	-	G	-	-	-	
9.9	1619	-	-	-	-	G	Adult 3

Table 14. Tooth wear for caprovid mandibles using wear stages as outlined by Payne (1973; 1987) and age categories after O'Connor (1989). Key: ERP = erupting.

Phase	Context	dp4	P4	M1	M2	M3	Age category
5	3004	-	8A	9A	9A	-	
5	2108	-	-	9A	7A	-	
6.1	4084	-	12S	12A	9A	11G	Adult3
6.1	4084	-	12S	12A	9A	11G	Adult3
6.3	3037	13L	-	ERP	-	-	Juvenile
6.3	1895	-	-	9A	5A	-	
6.3	3185	-	-	9A	5A	-	
7	3118	-	-	-	-	5A	Adult2
7	2659	-	-	9A	9A	5A	Adult2
8	2738	-	-	-	9A	11G	Adult3
8	2738	-	-	-	12A	11G	Adult3
9.2	2609	-	-	10A	9A	6G	Adult3
9.4	1426	-	-	-	10A	7G	Adult3
9.6	2340	-	-	9A	8A	5A	Adult2
9.8	1530	-	15A	15A	13A	12G	Adult3
9.8	1530	-	9A	12A	9A	11G	Adult3
9.9	1694	-	-	-	-	11G	Adult3

Table 15. Age categories for caprovid mandibles after Payne (1987).

		Phase								
Category	**Age**	6.1	6.3	7	8	9.2	9.4	9.6	9.8	9.9
A	0-2 mths	0	0	0	0	0	0	0	0	0
B	2-6 mths	0	1	0	0	0	0	0	0	0
C	6-12 mths	0	0	0	0	0	0	0	0	0
D	1-2 yrs	0	0	0	0	0	0	0	0	0
E	2-3 yrs	0	0	2	0	0	0	1	0	0
F	3-4 yrs	0	0	0	0	1	1	0	0	0
G	4-6 yrs	2	0	0	1	0	0	0	1	1
H	6-8 yrs	0	0	0	1	0	0	0	0	0
I	8-10 yrs	0	0	0	0	0	0	0	1	0

Table 16. Tooth wear for pigs using wear stages as outlined by Grant (1982) and age categories after O'Connor (1989). Key: ½ = half erupted; BKN = broken; CPT = visible in crypt.

Phase	**Context**	**dp4**	**P4**	**M1**	**M2**	**M3**	**Age category**
4	3025	-	C	H	BKN	-	
5	3170	M	-	D	½	-	Immature2
6.1	2938	-	E	H	D	B	Adult2
6.3	3190	-	B	G	D	CPT	Subadult1
8	2828	-	-	-	E	A	Subadult2
8	2115	-	B	H	C	-	
9.2	2302	-	-	G	A	-	Immature2
9.3	1910	A	-	-	-	-	Neonatal
9.8	1769	½	-	-	-	-	Neonatal
9.9	1680	-	C	G	BKN	-	

Table 17. Hand-collected fish remains from deposits at 41-49 Walmgate, York. Key: Frags = total number of fragments.

Phase	Context	Species	Frags	Notes
5	2155	?cod	1	anterior abdominal vert - large individual over a metre
6.1	2331	cod	1	largish individual - approaching 1 metre in length
6.1	3005	haddock	1	
7	2086	cod	1	large individual represented - over 1 metre
7	3208	gadid	1	large individual represented
8	2042	cod	1	split
8	2042	gadid	1	anterior vert from quite large gadid
8	2661	?cod	1	large individual represented
8	2661	ling	1	large individual - over 1 metre in length
8	2661	ling	1	large individual - over 1 metre in length. Chopped transversely
8	2625	haddock	1	
9.2	1698	haddock	1	anterior abdominal vert - fish approx 50-60 cm length
9.3	1560	haddock	1	anterior abdominal vert
9.3	1657	cod	1	rather battered
9.3	1701	gadid	2	anterior abdominal vert - 1 chopped longitudinally
9.6	1523	gadid	1	gadid caudal vert - smallish
9.8	1381	gadid	1	
9.8	1530	haddock	1	
9.8	1558	cod	1	individual over 40 cm but well under 1 metre
9.8	1558	gadid	1	large and extremely well preserved otolith
9.8	1604	cod	1	large individual 1 metre length
9.8	1700	cod	1	abdominal vert - rather battered - large over 1m individual
9.8	1916	?pike	2	2 large vert
9.9	1303	ling	1	anterior abdominal vert - fish of approx 1 metre - very well preserved
9.9	1694	gadid	1	large fish - rather battered

Table 18. Estimated withers heights (in mm) for caprovids from deposits at 41-49 Walmgate, York.

Phase	**Withers height (mm)**	**mean**
phase 6.2 (13thC)	612.32	
phase 6.2 (13thC)	572.72	
phase 7(early to mid 14thC)	645.70	605.06
phase 8 (mid to late 14thC)	589.51	
phase 9.8 (mid to late 16thC)	549.09	
phase 9.9 (late 16thC)	586.46	567.78

Table 19. Extrapolated mean withers heights (in mm) for caprovid material from medieval and early post-medieval levels at Walmgate, York and contemporaneous sites (data from O'Connor 1995).

Site	**Date**	**Withers height (mean)**
Coppergate	12-13thC	574
Walmgate	13-14thC	605
Hall Garth, Beverley	14-L15thC	580
Bedern Foundry, York	L15thC	576
Bedern SW, York	L15-E16thC	583
Lincoln	PM1(E 16thC)	626
1-5 Aldwark, York	E16thC	560
Walmgate	16thC	568
Blanket Row, Hull	16thC	556
Doncaster	16thC	574
Hall Garth, Beverley	16-17thC	574

Figure 5. Cattle metatarsals from 41-49 Walmgate, York in comparison with contemporary sites (data for Blanket Row, Hull and Lincoln after Carrott et al. 2001 and Dobney et al. *1996 respectively). Key: Bd = Distal breadth; Dim = depth of internal trochlea, medial condyle; HMED = high medieval; LMED = late medieval.*

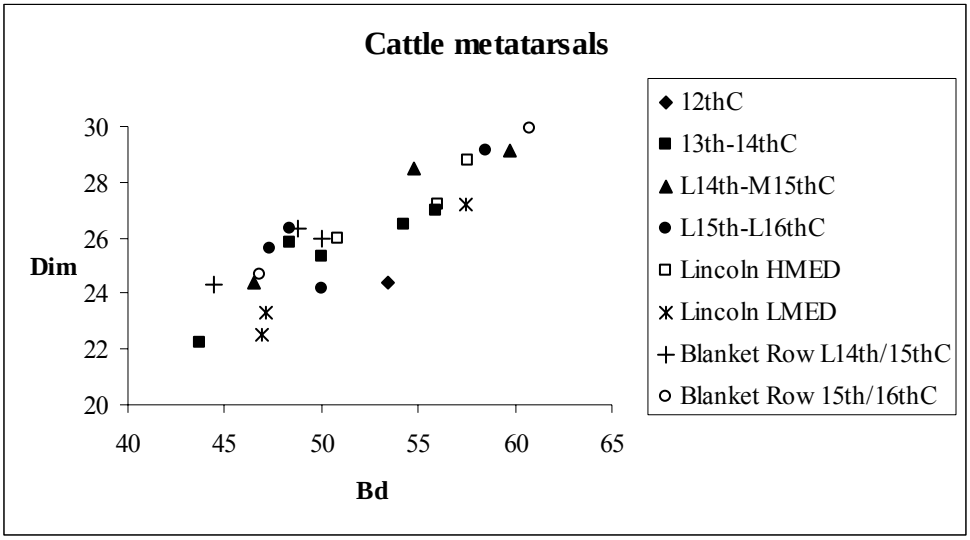
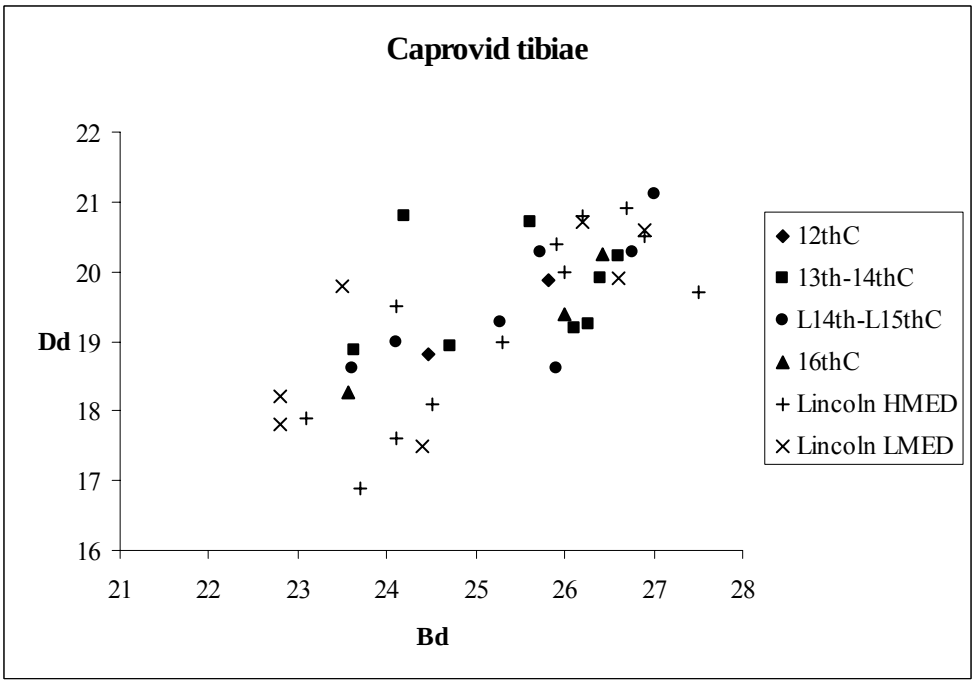


Figure 6. Caprovid tibiae from 41-49 Walmgate, York in comparison with Lincoln (data for Lincoln after Dobney et al. *1996). Key: Bd = distal breadth; Dd = distal depth; HMED = high medieval; LMED = late medieval.*



Appendix: *Notes on the vertebrate remains from specific contexts targeted by the excavator.*

Phase 4 – mid to late 11th century
[*Pit backfill 2588 of pit 2589 – pit function?*]

Only a very small assemblage of bone (10 fragments) was recovered from this deposit, most of which represented the remains of cattle, caprovid and pig. These fragments are likely to represent domestic refuse. One fragment, a bird radius, did prove to be rather unusual. It was identified as guillemot. Guillemots and other members of the auk family have previously been identified from sites in York, i.e. from Anglo-Scandinavian and medieval deposits at Coppergate (Bond and O'Connor 1999) and from late medieval deposits at Hungate (Jaques *et al.* 2000). They are unlikely to have been resident in York and their bones are almost always associated with food debris. Bond and O'Connor have suggested (1999) that these remains may represent evidence for coastal trading. These seabirds possibly represent a resource utilised on a seasonal basis. They spend most of the year at sea but form breeding colonies on the cliffs in the summer and obviously during this time are easier to capture.

Phase 5 – 12th century
[*Ash lenses – looks like floor accumulation – could it be kiln waste build-up from dumping of ashy by-products of kiln close by 2940, 3004, 3183, 3166, 3123, 3122*]

Of the six deposits highlighted for examination, only two produced vertebrate remains. Context 2940 contained 35 fragments which were dominated by cattle and large mammal fragments, whilst 23 fragments were recovered from Context 3004. Material from the latter was very variably preserved and had a rather mixed appearance. Some fragments were battered in appearance, whilst other bones had very rounded edges. It is likely that some of the material from Context 3004 had been redeposited or was residual. A mix of refuse was represented, which included waste from primary and secondary carcass preparation and also food refuse.

Phase 6.1 – late 12th to early 13th century
[*Backfill 2938 of pit 2939 – pit function?*]

Only a single pig mandible was recovered from Context 2938.

Phase 6.3 – late 13th to early 14th century
[*Sunken area – Context 2559 – function? – work area? – filled with Contexts 2601, 2104, 2105, 2578, 2580, 2581 and 1962*]

No large assemblages of bones were recovered from the sunken feature. Context 2601 consisited mainly of bird remains, including goose wing elements. Other bones present were mostly large and medium-sized mammal rib fragments. This material was clearly domestic refuse representing the remains of meals.

Material recovered from Contexts 2578 and 1962 was less well preserved than that from Context 2601 and somewhat battered in appearance. Both deposits included skeletal elements which could represent butchery waste.

The assemblages from these deposits are too small to shed much light on the function of this feature.

[*Pit backfill 3037 of gully/pit? 3038 – function?*]

Vertebrate remains from this pit fill were well preserved and not particularly fragmented. Only nine fragments of bone were recovered; too few to give any indication of the function of the pit.

Phase 7 – early to mid 14th century
[*Floor 2681 within building Q*]

Only three fragments of bone were recovered from this floor deposit. This floor may have been kept clear of debris or its use was not domestic in nature.

Phase 8 – mid to late 14th century
[*Floor 1969 within building S*]

See text discussing samples in main body of report.

[*Pit backfill 2625 of pit 2626 – function of the pit? Generalised rubbish – casting?*]

This deposit produced a small assemblage of bones amounting to 20 fragments. Preservation was good, although some bones were a little battered in appearance. Although rather limited by its small size, this assemblage included refuse representing both primary and secondary butchery waste, with large sized mammal shaft and rib fragments also present. A fallow deer metatarsal and a haddock cleithrum were identified within this assemblage. The deer remains could hint at high status occupation in the vicinity. The dog gnawing noted on a number of the bones from this deposit suggested that some of the bones were initially disposed of elsewhere, where they were accessible to scavengers. The variability of preservation and the mix of refuse represented suggests the re-use of an existing feature.

[*Pit backfill 2661 of pit 1692 – function of the pit? - cess pit?*]

Material (23 fragments) from this deposit was again a mix of refuse from various activities. The crane tibiotarsus hints at rubbish from high status occupation. Both the crane and the fallow deer from Context 2625 are suggestive of hunting, an activity associated with the nobility or some sort of ecclesiastical patronage. Fish bone present in the assemblage included cod and ling (estimated length of over 1 metre). Such large fish were not available to all. The remains of fish and chicken provide the domestic component of the waste, along with large and mediun-sized mammal rib fragments. Several of the large-sized mammal vertebrae had been chopped longitudinally. No clear indicators of cess or faecal material were apparent from the vertebrate remains.

[*Pit backfill 2738 of pit 2739 – generalised rubbish pit function?*]

This deposit produced 41 bone fragments of somewhat variable preservation. Some fragments were eroded and quite friable. Main domesticates (cattle, caprovid and pig) were represented, mainly by elements suggesting butchery refuse; for caprovids this included mandibles and metapodials, whilst for cattle cranial fragments. The domestic component of the refuse was represented by goose remains. The pit was obviously a convenient place for dumping refuse.

[*Pit backfills 2306, 2316, 2317 and 2319 of pit 2318 – Context 2319 has evidence of a slag lining or concretion on pit surface – suggesting tap pit/casting pit – any evidence on bone – or is it just generalised rubbish?*]

No bone was recovered from 2319 and only 24 fragments were recorded from the other deposits listed.

The vast majority of the material from these deposits represented primary butchery waste being mainly cattle metapodials and cranial fragments, together with large mammal vertebra and rib fragments. The single fragment from Context 2316 was stained green as a result of contact with copper alloys in the ground.

[*Pit backfill 2674 of pit 2675 – pit function? cesspit?*]

Only eight fragments of well preserved bone were recovered from this fill. The assemblage was too small to aid with the interpretation of the function of this pit.

Phase 9.2 – late 14th to early 15th century
[*Backfill 2302 fills pit 2435 – is this a generalised rubbish pit or a casting pit?*]

Small quantity of bone recovered from this deposit totalling 15 fragments. Major domesticates represented. Cattle fragments from juvenile individuals, mandibles present.

Phase 9.3 – early 15th century
[*Information on backfill 1910 and backfill 2277*]

Context 1910: This deposit produced one of the largest bone assemblages from the whole site. The handcollected material amounted to 374 fragments, of which 95 were identified to species. Cattle remains were the most numerous, and although some meat bearing elements were recorded, most of identifiable fragments were mandibles, isolated teeth and metapodials. Other mammals present included caprovids and pig. Chicken and goose remains were also fairly numerous and these, along with the many fish bone fragments recovered from the samples, are likely to represent kitchen or table waste. The unidentified fraction included many large mammal sized rib, cranium, vertebra and shaft fragments and bird shaft fragments. Some of the fish remains may have originated in human faeces or dog coprolites, but the bulk of the assemblage was a mix of refuse disposed of in a convenient tank/pit after the pit ceased to function as a garderobe.

Context 2277: Preservation of the vertebrate material from this deposit was variable and evidence of dog gnawing was extensive. The material appears to have lain elsewhere before being used to back fill the disused post-hole, together with debris associated with metal working. An assortment of bones, including caprovid and pig shaft fragments and medium-sized mammal rib and bird shaft fragments were present. Both butchery waste and domestic refuse were identified within the assemblage.

[*Floor deposit 1657*]

Twenty-nine well preserved fragments of bone were recovered from floor deposit, Context 1697. Caprovid and cattle were represented by skeletal elements (isolated teeth, mandible fragments and phalanges) that suggested the presence of waste associated with primary carcass processing. Other fragments, including the remains of chicken, goose and cod were more indicative of household refuse. The goose scapula was of a size consistent with a wild individual and possibly represented a barnacle goose.

[*backfill 2082 of casting? Pit 2113*]

Context 2082 contained few fragments of bone (10). All were small and fragmented, some of which had been damaged in antiquity, but most had been recently broken during excavation.

Phase 9.5 – mid to late 15th century
[*Fill, Context 2322 of* l*arge Pit 2489 – Casting pit? or generalised rubbish pit within building Y?*]

Seventy-seven fragments of bone were recovered from the fill (2322) of pit 2489. The assemblage showed quite a high degree of fragmentation and was mostly comprised of pieces of large mammal shaft fragments. These, in all probability, had been split and broken up for the removal marrow fat. Species identified included cattle, caprovid, chicken, goose and cat. These bones represent both butchery and domestic waste.

Phase 9.6 – late 15th to early 16th century
[*Floors 1416 and 1523 within building V*]

These two floor deposits only produced 23 fragments between them. The floors had obviously been kept quite clean. The fragments (21) recovered from Context 1523 were all quite small, with approximately 20% being less than 50 mm in dimension. Pig remains included a mandible with a small female canine.

[*Backfill 2340 of original large furnace construction cut 2458 within the rear room of Building U*]

This deposit produced a small assemblage of bone, some of which had been stained a very intense green. Many of the cattle bones recovered had been heavily butchered, the pelves and femora in particular. One vertebra had been chopped longitudinally, suggesting that the carcasses were split into 'sides' of beef. This assemblage probably represents waste from secondary carcass preparation, i.e. chopping the carcasses into joints.

[*Floors 2295, 2310 may yield useful info on what the metal-workers are eating close to the large furnace in the rear room of Building U*]

Only two fragments of bone were recovered from Context 2295, a burnt chicken leg bone and a caprovid rib fragment. Both are likely to represent food waste.

Some unusual pits in the front room of Building U in this phase – need clarification of function – are they generalised rubbish pits – or is it backfilling of metal-working – casting pits? Pit/Bosh 1854 filled with 1812 and 1724; Pit 1982 is filled with 1963; *tap pit 1779 is filled with 1775; Pit 1981 is filled with 1944; Pit 2016 is filled with 2002; Pit 2033 is filled with 2032.*

This collection of pit fills produced very little bone and no useful information regarding the function of these features was forthcoming. If the pits were being used for rubbish then it must have been for the disposal of waste from metal working or other commercial activities. Domestic refuse does not appear to have been dumped here.

Phase 9.8 – mid to late 16th century

[*1418 and 1419 are very similar floor accumulations above one another within building V*]

For Context 1418, see text in main body of report. Context 1419 only produced two fragments, whilst the sample from Context 1418 produced numerous fragments of fish.

[*1792, 1671, 1826, 1835 and 1845 all the backfills of a robber cut (1778) which appears to have robbed out a large furnace in the rear room of Building U. 1995, 1991, 1983 and 1978 are the packing for the robbed out furnace*]

Contexts 1792, 1826 and 1845, backfills of the robber cut (1778) produced 132 fragments of mainly well preserved bone. Material from Context 1845 was slightly more variable, with some bones that were rather battered and greasy in appearance. This deposit also included a small proportion of burnt fragments. Worthy of note is the considerable number of cat bones recovered from these deposits. At least four individuals of varying ages were represented, including a very young kitten. Some bones clearly represented single individuals suggesting that originally the whole carcass had been disposed of. The smaller bones, i.e. phalanges and metapodials were absent. This could suggest that the pelts of the animals had been deliberately removed, the lower limbs remaining attached to the skins.. However, no skinning marks were observed. Other refuse, representing food debris and butchery waste was also present. The leveling deposit on the top, Context 1671, contained quite well preserved bones, of varying colour. This assemblage appeared to be of mixed origin, but included mainly domestic refuse, suggested by the presence of chicken, goose and rabbit remains and large and medium-sized rib and vertebra fragments. Part of a cat skull and a few vertebrae were also identified.

The packing deposits, Contexts 1978, 1991 and 1995 contained considerably fewer fragments. Bones present within these deposits were extremely well preserved and many were stained green. Cattle fragments predominated and skeletal element representation suggested most bones were primary butchery waste.

[*1945 – is the backfill of pit 2121 – is it possible to tell if this pit functioned as a tap pit for tapping slag off a furnace (ie charring of bone, intense heat in evidence on the bone assemblage) – or is the bone just generalised rubbish?*]

Only five fragments of bone were present within Context 1945, all of which were well preserved and showed no evidence of any damage resulting from exposure to intense heat.

[*Backfills 1858 and 1897 are the fills of a large rectangular pit 1951 within building Y – function of the pit is unknown.*]

Bones from Contexts 1858 and 1897 were only moderately well preserved. Concretions were noted on some of the bones and evidence of dog gnawing was quite common (10-20% of all bones from the deposits). Skeletal elements present for both cattle and caprovids mostly represented primary butchery refuse, with a greater proportion of meat-bearing elements for caprovids. The unidentified fraction was dominated by large and medium-sized rib and shaft fragments, many of the latter had been split longitudinally, probably for the extraction of marrow. These fills, therefore, appear to be made up of general refuse, the high degree of dog gnawing suggesting that some of the bones had possibly been discarded where they could be easily scavenged and then, sometime later, been collected up and deposited in the pit.

Phase 9.9 – late 16th century

[*Contexts 1318 and 1340 are the backfill and lining of a tile lined pit 1326 – unusual small shallow feature in a fairly built-up backyard – any suggestions as to function/use would be helpful*]

No vertebrate remains were recovered from Context 1340. The small assemblage of bones recovered from Context 1318 can shed little light on the original use of pit 1326. Although well preserved, the colour and appearance of the bones was rather variable. Several metapodials and a phalanx, all identified as rabbit, had a 'greasy' feel to them (as did one of the chicken bones), and these could be modern in origin.