

SAXON, MEDIEVAL AND POST-MEDIEVAL EXCAVATIONS AT THE LONDON SCHOOL OF ECONOMICS CENTRE BUILDING, HOUGHTON STREET, WESTMINSTER, WC2

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INTRODUCTION

This online supplement has been published in support of an article in *LAMAS Transactions* Volume 75 (2024), 188–231 (Ritchie & Hogg 2025). Standard Museum of London reference codes are used for ceramic building materials and pottery fabrics, details of which are available online (www.mola.org.uk/resource-library). Context numbers are denoted by square brackets: [1]. Open Areas, Buildings and Structures are numbered and referred to thus: OA1; B1; S1. Figure and table numbering is continued from the main article.

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GEOLOGICAL MATERIAL

Luke Barber

Introduction

The excavations at the site produced 235 pieces of stone, weighing 100,290g, recovered from 52 individual contexts. These totals include 159 pieces, weighing 1680g, recovered from one of 22 environmental samples residues. Much of this material, which was derived from the sample residues consists of very small and often intrusive, pieces. The assemblage has been fully listed on geological record sheets for the archive, with the resultant information being used to create an Excel spreadsheet as part of the digital archive. Each main stone type was allocated a code number for the archive though many of these have variations denoted by the addition of a letter to the type number that may aid future studies of provenance. The assemblage from Periods 1–3 is characterised in Table 2 (details of later and unphased material are listed in the archive).

Period 1: Middle Saxon (c.AD 730/50–850)

The Middle Saxon assemblage was recovered from a range of contexts including pits, ditches, dumps, occupation layers, post-holes and a well. Three main groupings of stone can be recognised: building material, worked objects and miscellaneous pieces. The former constitutes the majority of the assemblage and is notably dominated by Kentish Ragstone (Table 2).

Although many of the pieces are unworked, a number do have rough facing, while others, faced or not, have traces of mortar adhering. This material almost certainly represents re-used fragments of Roman building stone - a suggestion borne out by the range of similar stone types recorded at other nearby sites (Blackmore 2008b, 195). The material is widely distributed between different contexts with the largest groupings coming from layer [1174] (3/17,110g; G15, OA3), quarry pit [1344] (3/8924g; G18, OA4) and well [1496] (3/15,010g; G14, OA4). The 5b Lower Greensand type is likely to derive from a similar source but clearly came from a different geological bed than the typical Kentish Ragstone. The 3446g fragment of oolitic limestone in post-hole [1652] (G11, B1) appears to have some facing surviving, as does the block of tufa (layer [1174]). Both are types commonly used in Londinium and undoubtedly represent further robbed materials. The exact reason for the collection of this material is uncertain, but post-hole packing and the construction of hardstanding represent possible uses.

Worked stone objects are represented by a modest scatter of quern and hone fragments. The former are exclusively of German lava (19/2444g), small fragments of which are scattered widely between contexts with no obvious concentrations. The largest piece comes from a 25mm thick stone with worn face and diameter of around 380mm (well [1080], OA14), well within the usual diameter range of Middle Saxon querns (Goffin 2003a, 207), but most have at best thicknesses only surviving (20–34mm thick). Although lava quernstones were widely used in Middle Saxon London (*ibid*) a fragment from ditch [1414] (D1) has traces of mortar on its broken edge, suggesting some of the quern fragments could in fact be re-used Roman examples. This problem of establishing the extent of reuse of Roman querns has been noted before in *Lundenwic* (Blackmore 2008b, 194). The two hone fragments are of different stone types. The fine-grained grey sandstone example from post-hole [1243] (G16, B3) has some fine glauconite suggesting either a Hythe Beds (Lower Greensand) or

Table 2. Characterisation of the geological material for Periods 1 to 3 by type/period (* = type includes worked objects, + type includes shaped building materials).

Type/Period	Period 1 Middle Saxon	Period 2 medieval	Period 3 early post-medieval
No. of contexts	34	5	11
1a Grey medium-grained sast (calcareous)	2/402g	-	-
2a Reigate stone	-	-	3/2688g+
2b Upper Greensand	-	-	1/208g
3a Coal shale	-	-	3/279g
3b Coal	49/10g	96/6g	1/1g
4a German lava	19/2444g*	-	3/188g*
5a Kentish Ragstone	21/52,046g+	1/230g	10/25,054g+
5b Lower Greensand	1/3724g	2/1136g	1/648g
5c Lower Greensand chert	2/24g	-	-
6a Tufa	1/4020g+	-	-
7a Uncertain	1/1312g	-	-
8a Fine-grained grey sast	3/814g*	-	-
8b Bedded fine sast	-	2/180g	-
9a Flint pebble	1/20g	-	2/36g
9b Flint cobble	2/770g	-	-
10a Black fine-grained sast	1/94g*	-	-
11a Purbeck lmst	-	-	1/172g*
12a Oolitic lmst	1/3446g+	-	-
13a Wealden clay ironstone	1/312g	-	-
14a Slate (misc)	-	1/1g	-
Fossil	1/1g	-	-
Total	106/69,439g	102/1553g	25/29,274g

Thanet Beds source. Almost certainly this originated in north Kent. The fine-grained black example from pit [1407] (G22, OA4) is of uncertain origin, but certainly not from the Weald. Both types are not out of place with previous findings from *Lundenwic* (Goffin 2003b).

The remaining Middle Saxon stone assemblage consists of a sparse scatter of unworked pieces from Wealden and other uncertain origins. Although coal is represented by large numbers (49 pieces), all consist of tiny granules that would have easily worked their way down the soil profile. All are therefore considered to be intrusive from post-medieval activity.

Period 2: Medieval (c.1200–1375)

The majority of the assemblage from medieval contexts clearly consists of intrusive fragments of post-medieval coal. The bulk of the remainder could easily be seen as residual material from the Mid Saxon activity – most notably the Kentish Ragstone. Ironically, the only probable medieval stone appears to be residual in early post-medieval deposits.

Period 3: Early Post-Medieval (c.1475–1770)

Contexts allocated to this period produced the second largest period assemblage from the site, but there is clearly quite a high residual element to it. The three pieces of Reigate stone (robber cut [1019], G45, OA13; robber cut [1324], G45, OA13) are all from moulded or plain faced blocks that are likely to be of medieval origin (that from [1019] having part of a surviving carved roll) and the piece from a Purbeck

limestone grinding mortar is also certainly of medieval date (make-up [1556], G39, OA9). The likely date of the notable quantity of Kentish Ragstone is less certain. The vast majority was recovered from robber cut [1324] which produced a sizeable group of irregular and roughly faced blocks, often with mortar adhering to them (7/12,684g). Although they could be residual/re-used Roman/Mid Saxon pieces their association with the Reigate stone suggests they may in fact be from a medieval structure (though such a structure may well have re-used Roman materials itself).

The only stone type that can be fairly confidently ascribed to the early post-medieval period is the coal and coal shale, the latter including a notably large piece (236g) from pond [1309] (G8).

DAUB

Trista Clifford and Stephen Patton

Introduction

A very large quantity of daub, weighing a total of c.89kg, was recovered during the excavations. Many fragments from the assemblage have distinct surfaces and wattle impressions indicating the original form, and almost all of the material has been exposed to very high temperatures and has become fully ceramic. However, very little was recovered from primary contexts, with over 65% of the daub fragments by weight being from two pits that were used to dump refuse. Table 3 shows the quantification of daub fragments by period. Although the quantity of

fragments from Houghton Street is significantly large, it is very similar to Middle Saxon *Lundenwic* daub that has previously been published (eg. Smith 2012) and so does not require an in-depth discussion here. However, whilst the clay fabrics and building techniques that can be identified from this assemblage are not unique to this assemblage, of significance are the rare textile impressions on seven fragments. The analysis of these textile impressions are discussed below.

Table 3. Quantification of daub

Period	Count	Weight (g)
1	1942	83328
2	93	3356
3	58	2540
4	3	62
Total	2096	89286

Method

The assemblage was examined with the naked eye for diagnostic characteristics indicating form and character and recorded on *pro-forma* archive sheets. Each diagnostic piece of daub was recorded individually with a schematic diagram of any wattle impressions present. This record has been retained with the archive.

No sampling strategy was employed during the excavations, and therefore the total recovered amounts to 100% of the daub present within these features. During analysis a 50% sample of the excavated assemblage from the largest Period 1.3 pit fill [1512] (G57, OA14) was examined and recorded, and 100% of all other features were fully examined and recorded.

Distribution

The vast majority of the assemblage is derived from Period 1 (Middle Saxon c.AD 730/50–850) deposits, with much smaller quantities from Period 2 (medieval c.1200–1375) and Period 3 (early post-medieval c.1475–1770). The daub fragments were recovered from various phases suggesting that the later components of the assemblage were not simply residual from the Period 1 activity, but that elements of wattle and daub structures were dumped on site over a long period of time on the site. However, the very small quantity recovered from Period 4 (late post-medieval 1770–1900) deposits is almost certainly residual.

In terms of spatial distribution, nine groups contained quantities of fragmentary daub that weighed in excess of 1kg (Table 4). The largest of these quantities of fragmentary daub were recovered from OA4, and features within OA5. From single features, the most significant amounts are from burning pit [1006] (Period 1.3, G21, OA14) in Zone A (28.3kg) and quarry pit [1511] (Period 1.3, G57, OA14) in Zone B (35.2kg). Most of this material appears to be refuse dumped into the pits after the

wattle and daub structures from which it originated had been dismantled or destroyed. However, the interpretation of B3/G16 as a possible building and B4/G44 as a more certain building indicates that the fragments of daub from these features may have been recovered relatively *in situ*.

Table 4. Quantification by group of daub fragments over 1kg

Period	Land Use	Group	Count	Weight (g)
1	B3	G16 Structure?	117	2151
	D4	Ditch: final p 1.3 land division	100	2529
	OA3	G15 Silting/consolidation	41	1054
	OA4	G14 Well	30	1188
	OA14	[1080] Well	9	1214
	OA4	G18 Quarry pits	126	2803
	OA14	G57 Quarry pits	940	36244
	OA14	G19 Refuse/cesspit	100	4526
	OA14	G21 Burning pit	367	28439
2	OA8	G32 Consolidation layer	50	2401
3	B4	G44 Building	28	1803
Total			1908	84352

Fabric

Two predominant fabrics were observed: A coarse sandy fabric with grassy organic inclusions, and a finer version of this fabric which also sometimes contained calcareous inclusions. These are similar to those recorded during previous excavations in London (Goffin 1988, 115; Smith 2012, 216). Small amounts of a more densely calcareous fabric were also noted, as well as some pieces which may have originated from an estuarine or brackish clay source, having been fired to a pinkish, grey or purple hue. These latter fabrics appear synonymous with very early ‘estuarine’ brick fabrics and a number of pieces were indistinguishable from very abraded early brick.

These fragments of daub have evidently been exposed to very high temperatures, most likely direct fire, and due to the high silica content in the clay they are ceramic to the extent that the sintering is extremely pronounced and the fragments are as well fired as ceramic building material (CBM). The most likely reason for the exposure of daub to very high temperatures is the accidental destruction by fire of some buildings or structures. The exposure of daub to fire would have helped ensure its preservation during the dumping process as it would be much more resistant to weathering than ‘unfired’ material.

Daub Diagnostic Features

The most common distinguishing characteristics within the assemblage are flat, smoothed surfaces and wattle or timber impressions. Three quarters of the assemblage exhibited at least one wattle impression; fragments frequently exhibit up to three wattle

impressions and over 130 pieces have four or more with one piece exhibiting 12 impressions. Rod diameters range from c.4mm up to 39mm and the mean diameter is 14.9mm. Other structural timber impressions such as laths, posts (both square and round) and split withy impressions were evident on 27 daub fragments. A further five fragments appear to show the pointed end of staves or wattles. Several differing arrangements of rods are present including parallel impressions and intersecting upright and horizontal rods.

Discussion

The presence of daub at medieval sites is not uncommon, but the sheer quantity from the Houghton Street excavations is notable. The larger quantities previously published from Middle Saxon *Lundenwic* include 21.75kg from Maiden Lane (Cowie *et al* 1988), 26.4kg from the National Portrait Gallery (Hughes 2004a), and c.30kg from Drury Lane (Cowie & Blackmore 2012, Area N). Given that much of the material appears to have been burnt and subsequently dumped, it raises the question as to where these original structures were located. In terms of *Lundenwic* daub and how wattle and daub structures were made, this has been published in detail elsewhere (Goffin 1988; Smith 2012), including an experimental study with which the Houghton Street material is consistent (Hughes 2004b).

Hughes (*ibid*) highlights the risks involved with tightly packed wattle and daub buildings and the risk of conflagration, and it appears the vast majority of the fragmentary daub that is discussed here is most likely the result of such an incident. Kruger (2015) examined the distribution and sintering of fragmentary daub after examining a burnt wattle and daub building in Mexico. He noted that the most ceramic parts of the daub were those close to the wattle as the wood provided the fuel for the fire. The wattle impressions in the Houghton Street assemblage show that the wattle rods were fairly compacted, which potentially meant that large parts of the structures had sufficient fuel to cause considerable damage. However, Kruger (*ibid*) also estimated that only 2% of the building daub he examined would be ceramic enough to remain in the archaeological record. This suggests that even the large quantity present in this assemblage does not indicate accurately how many structures are represented.

REGISTERED FINDS

Trista Clifford

There is some residuality within the registered finds assemblage; objects are listed within their intrinsic period where it could be reliably identified. Below is a catalogue of all objects from Periods 1 and 2, with summaries of later material; however only those identified are illustrated (Fig 18).

Period 1 (c.AD 730/50–900)

Dress Accessories

Beads

The dating of individual glass beads is fraught with difficulty given the possibility of heirloom status and fairly consistent manufacturing methods used over a long period of time. The hexagonal form of bead RF <165> (Fig 18.2) is a Roman introduction (Guido 1978, 96) which continued to be included or reused within the early Saxon burial suite of beads (Brugmann 2004, 29), albeit usually in a lighter green opaque glass. The dark ground and double crossing white wave of bead 2 is more obviously a Saxon combination, and is related to Koch's series 20 beads (Brugmann 2004; Koch 1997;) which are a later 6th-century introduction.

Glass bead

RF <3> Well fill [1079] G59 OA14

Complete. Cylindrical, hexagonal section. Opaque dark green.

L(ength) 6mm W(idth) 5mm

Glass bead (Fig 18.2)

RF <165> Pit fill [1666] G22 OA4

Incomplete. Square section, probable square cylindrical bead. Opaque dark ground with opaque white double crossing wave.

Extant H(eight) 9mm Diam(eter) 7.8mm

Pins

Two copper-alloy pins were recovered, one of which could be placed within Ross's 'inverted pear' type (1991, 288 LXIX) which is the most numerous group in *Lundenwic* (Blackmore 2012, 281). Pin RF <1> (Fig 18.3) fits within his type LXIX.ii.c which has an angular profile. Pin RF <13> (Fig 18.4) is a much smaller example with a sub biconical head and smooth collar. It bears similarity in form to S304 from *Lundenwic* (Blackmore 2012, 282) in having attributes of both Ross type LXVIII, biconical head, and the inverted pear. Its size and the smooth collar are also reminiscent of the only silver pin from London (Blackmore 2012, fig 161 <S359>). Iron loop headed 'pin' RF <150> (Fig 18.4), while similar to Ross's loop headed group XVIII, may have held a different function; the date range of 6th century attributed to the group would certainly make this example a chronological outlier.

Copper-alloy pin (Fig 18.3)

RF <1> Occupation layer [1089] G89 OA7

Incomplete. Inverted pear shaped head pin with angular profile, single carinated collar and shaft which tapers in thickness to a break.

L44.2+ mm Head Diam 8.9mm Shaft Th(ickness) 3mm

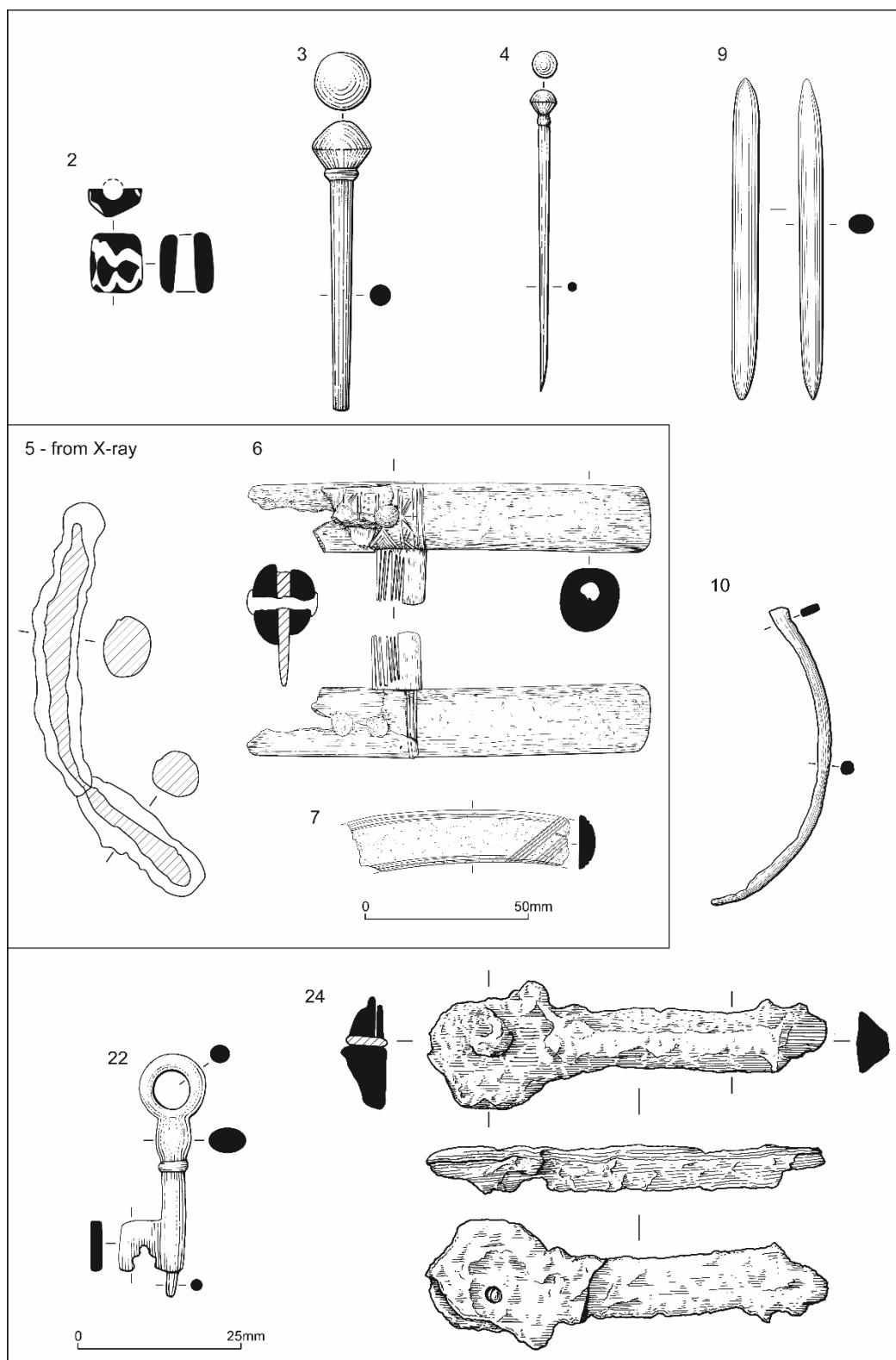


Fig 18. Illustrated registered finds for further details see catalogue

Copper-alloy pin (Fig 18.4)
RF <13> Well [1491] OA5

Complete. Sharply carinated sub-biconical head with flattened top above collar formed with two incised lines. Shaft tapers smoothly to the point.
L45.6mm Head Diam 3.8mm Shaft Diam 1.5mm

Iron ?pin (Fig 18.5)
RF <150> Pit [1100] fill [1099] OA14

Incomplete; slightly curved rod with looped head, opposite end terminated by break. Identified from x-radiograph.
L 90+mm Head W 10mm

Combs

A minimum of two combs are represented. Handled comb RF <2> (Fig 18.6) is of 'southern' construction, the handle being solid, circular sectioned and consistent in diameter along the length, with a slot retaining the tooth plates, held in place with iron rivets (Macgregor 1985, xx). Riddler (1990) records 14 bone and antler examples from London, with several more examples recorded subsequently (Keily & Blackmore 2012, 290–2). The present example appears to belong to a small group of bone combs, with sparse decoration predominantly extant on one, 'display' side (Riddler 2014) which are dated to the 8th–9th century. Riddler (*ibid*) notes that some London examples may be residual within late Saxon contexts.

A fragment of connecting plate RF <163> (Fig 18.7) derives from a single sided composite symmetrical comb, residual within a Period 2 layer. The lack of decoration at the centre of the plate is suggestive of a Middle Saxon date (Riddler 2014, 246). The decorative device is reminiscent of a comb from Brandon, Suffolk (*ibid*, no. 2040) and an example from Flixborough (Foreman 2009, 89 no.845); although the grouped lines on these are more vertical than those of the present example both share with it an absence of tooth cutting scars.

Bone handled comb (Fig 18.6)

RF <2> Well [1079] G59 OA14

Incomplete handled comb with handle and part of tooth plate held to the connecting plate with two iron rivets. Made from a cattle sized long bone, the end of the handle is decorated with a single circumferential incised line, with bands of decoration beginning only at the start of the tooth plate. This consists of finely sawn lateral pairs of lines enclosing paired zig-zag lines, and two cells of lateral dotted bands above the mid-point along the connecting plate, with incised chevrons beneath the midpoint. The other side of the comb exhibits only the two pairs of laterally incised lines. The teeth are fine, with six extant and one stub per centimetre.

Extant L 127.8mm Handle D 20mm

Antler connecting plate (Fig 18.7)

RF <163> made ground [1141] G32 OA8

Connecting plate fragment. Slightly curved in plan, and tapering in width towards the terminal; both ends broken with the suggestion of a rivet hole at both break points. The comb is decorated with two marginal incised lines along the outer edges and two sets of four oblique incised lines the one end. No tooth-cutting scars visible on the lower edge.

Extant L 68mm

Toothplate fragments

RF <164> quarry pit fill [1530] G57 OA14

Eight fragments from a bone tooth plate with evidence of burning

Textile Production

Weaving and sewing tools are sparse within the

assemblage which is dominated by loom weights (see below). The bone thread picker RF <6> (Fig 18.9) is of typical cigar shaped form ubiquitous on later Saxon sites, including *Lundenwic* (Keily & Blackmore 2012, 295). Curved possible needle fragment RF <94> (Fig 18.10) has not been paralleled; modern curved needles have specialist uses such as sewing leather, upholstery etc and it may be intrusive; the other two possible needle fragments may derive from pin(s).

Bone thread picker (Fig 18.9)

RF <6> Pit [1345] G18 OA4

Complete. Cigar shaped with pointed ends. Highly polished.

L 98.8mm W 8mm Th 6.5mm

Copper-alloy ?needle (Fig 18.10)

RF <94> Refuse pit [1403] fill [1417] OA6

Fragment; curved wire with break across flattened 'eye'

L 46mm W 3mm tapering to 1.2mm

Copper-alloy ?needle

RF <32> Ditch [1401] D1

Fragments with circular section

L 13mm and 10mm Th 2mm

Other Tools and Equipment

Iron knife

RF <151> Ditch [1041] D4

Incomplete. Mineralised. Tip missing; tang broken. Type uncertain.

Extant L 105mm W 25mm Th 13.8mm

Iron tool

RF <153> Pit [1240] fill [1241] OA14

Incomplete. Square sectioned rod with tapering thickness, from X-ray appears to be awl or punch, or possibly an auger blade.

Extant L 155mm W 21mm

Iron tool

RF <148> Ditch [1397] G62 D5

Incomplete. Tapering rod with blunt point, square section

L 68.5mm W 17mm Th 20mm

Fixtures and Fittings

Iron hook or chain element

RF <155> Pit [1666] G22 OA4

Incomplete, in two fragments. S shaped and hooked at both ends, one hook larger than the other, suggesting it was utilised in conjunction with another to form a chain.

L 170mm W 16.8mm Th 20mm

Iron fitting

RF <147> Pit [1371] G18 OA4

Incomplete. Square sectioned bar, broken at one end, the other expanded oval terminal element with rectangular slot.

L 62.5mm W 20.7mm Th 13.2mm

Iron staple

RF <152> Pit [1240] fill [1241] OA14

Incomplete; both arms broken off. Rectangular section.

L 73mm W 54.5mm Th 18.5mm

Coins

Period 1 ditch fill [1450] (D5) produced a silver *sceat* of 8th-century date. The *sceat* probably belongs to the inscribed C ARIP series (Abramson Group 26), or, less plausibly, the related K series (Abramson Group 38-41). The combination is as yet unrecorded, however the obverse bust bears similarity to the die of imitative variant 26-90 reversed, while the reverse could be that of 26-90 (or a die reversed 40-20), but is also similar to series K group 40-30. A second coin appears to be a debased silver *sceat*, with both faces illegible due to cuprous corrosion.

Silver *sceat*

RF <12> Ditch fill [1450] G5 RW1

OBV – Diademed, draped Hwiccan bust left with wreath ties behind. Legend [C-I]V in front, C[-] behind

REV – Wolf/lion looking left, coiled around forelimbs, with ?extended hind legs and tongue extending across the body, with lines and pellets forming fur

Diam 11.7mm

Silver *sceat*

RF <4> ditch fill [1175] G5 RW1

Both faces illegible; unidentified

Diam 11mm

Bone Working

Horn core

RF <83> Dump [1581] G29 OA7

Cattle sized horn core, uncertain removal method, sawn across diameter to remove the tip

Extant L 97mm

Period 2 c.1200–1375

Few objects were recovered from OA8 features of this period, and preservation is poor. Residual loom weight fragments account for a quarter of the assemblage and a bone comb fragment (RF <163>) is also residual (see above). A small casket key, and a double looped buckle fragment are of 13th- to 14th-century date. Three objects remain unidentified.

Dress Accessories

The exact form of buckle 21 is unknown however the arrangement of the strap bar is well paralleled on examples from London (Egan 1991, no. 279–311).

Copper-alloy buckle

RF <8> Dump [1378] G36 OA8

Incomplete; strap bar and part of the frame from a D shaped or oval single loop buckle; strap bar narrow

and recessed with a knop at the frame junction. Flat reverse.

L 37mm W 5mm Th 3mm

Security

Defined by Ward Perkins (1940, 144), casket keys such as RF <7> could have been used for locking any small furniture item. This type of key is common throughout the medieval period; however this example is well paralleled by a late 13th-century group from St Mary Spital (Thomas *et al* 1997, 34–5, 202–3).

Copper-alloy key (Fig 18.22)

RF <7> Dump [1378] G36 OA8

Complete; casket key with circular bow and moulded baluster and collar at the junction with the stem. The rectangular bit has a trilobe cleft on the outer edge and a pointed projection extends from the stem beyond the bit.

L 38mm Bow W 11mm Bit W 10mm Th 5mm

Tools

Iron knife

RF <154> Dump [1144] G36 OA8

Incomplete; whittle tang and part of the blade. Straight back, blade has lenticular section

L 58mm W 18.7mm Th 8mm

Fittings

Binding strips from London similar to RF <11> (Fig 18.24) are of 12th- to 15th-century date (Egan 1998, 69–75).

Copper-alloy binding (Fig 18.24)

RF <11> Occupation layer [1355] G36 OA8

Incomplete; flat reverse and D shaped section flattening towards the rounded terminal which contains a circular attachment hole and is flanked by two sets of protruding knops

L 62mm W 17mm

Other Finds

Copper-alloy object

RF <9> Dump [1378] G36 OA8

Incomplete; short length of copper alloy wire, curving in shape – D shaped section thickens where it curves, tapering to narrower, pointed ends.

L 17mm W 18mm Th 2mm

Copper-alloy object

RF <10> Occupation layer [1355] G36 OA8

Flat sheet fragment with ?original curved edge, other edges broken. Surface corroded. Possible coin flan however if so denomination unknown

L 9.8mm W 10mm

Copper-alloy object

RF <77> Dump [1378] G36 OA8

Small corroded lump of metal, X-ray undiagnostic.

L 10mm W 13mm

Period 3 c.1475–1770**Dress Accessories**

A group of 13 leather fragments (RF <109>–<122>) were recovered from pond G8 fill [1317]. Preservation was poor and the group was found to have deteriorated beyond the point that adequate recording could be carried out. Preliminary records suggest that these were small undiagnostic fragments probably derived from the same shoe; however RF <120>, the sole of a heeled shoe with extended, squared off toe and RF <121>, a narrow-waisted sole fragment with circular heel provide limited dating evidence. The style of shoes which these soles represent were current during the 1700s (Goubitz 2001, 82; Swann 1982;).

As well as shoes, five dress pins of Caple (1992) type C with globular heads were recovered. RF <15> (G39 OA9) and <16>, <17> and <19> (G50 OA10) measure c.30mm while RF <18> measures 21mm. Pins were produced and used in their thousands throughout the medieval and early post-medieval period and chronological differentiation is based on size and head manufacture. All examples here are of later post medieval date. This latter context also produced a fragment from the obverse element of a domed, circular three-piece button or mount (RF <20>).

Household

Household objects include a fragment from a shallow lead alloy vessel (28) and the handle from a sadiron (29); these objects reflect the status of nearby households.

Lead-alloy vessel

RF <21> destruction debris [1719] G50 OA10

Part of the base and wall from a shallow sadware vessel such as a porringer or bowl. A moulded partial foot ring is extant on the outer circumference of the base and the wall is broken at the point at which it may have flared outwards to a flat rim

Extant L 55mm W 49mm Th 4mm

Iron sadiron

RF <145> pit [1335] fill [1365] OA9

Handle from a cast iron sadiron or flat iron. Solid, oval sectioned grip with flat strap sides, which curve inwards at the junction with the flatiron where they are terminated by breaks.

L 124.3mm W 31mm Section 19 x 20.5mm

Structural Fittings**Lead window came**

RF <78> Robber cut [1539] fill [1536] B4

Incomplete; two short lengths of undiagnostic twisted window came

L 15mm L 20mm

Iron structural fitting

RF <146> Pond [1317] G8

Complete; L shaped bracket or hinge pintle

L 81mm H 47.6mm Th 27mm

Bone Working Waste

It is possible that the few worked bone fragments from features of this period are residual

Bone offcut

RF <26> pit [1335] fill [1365] OA9

Sawn section from a sheep/goat sized long bone; saw marks at the same angle on both ends and circumferential score mark on one end

L 33mm

Horn offcut

RF <29> Robber cut [1539] fill [1536] B4

Flat, triangular offcut

L 39mm W 25mm Th 2mm

Antler offcut

RF <79> dump [1019] G39 OA9

Split longitudinally and sawn across both ends

Extant L 70mm

Coins and Tokens

Jettons were produced initially to facilitate accounting and could also be utilised as token small change, although by the 18th century they were used almost exclusively as gaming counters.

Copper-alloy jetton

RF <96> occupation layer [1579] G39 OA9

Anonymous issue rose/orb type. Rose with five petals and annulet crowns

Nuremburg mint

Diam 25.6mm

Copper-alloy jetton group

RF <5> occupation layer [1342] G39 OA9

Corroded group of minimum 13 jettons. Two different sizes are represented. Four are c.22mm diameter and nine are c.28–30mm. Of the former, at least one exhibits a central punch hole. The sizes correspond to medieval English jettons which were of similar size to the silver penny and groat respectively, however medieval Nuremburg and Tournai jettons were also struck in similar sizes. As these types were in circulation at the same time the group could equally well be mixed.

Copper-alloy coin

RF <80> occupation layer [1353] G39 OA9

Corroded flan, uncertain denomination. Losses at the edge indicate the flan was likely wider than is extant. Possible farthing token. X-ray undiagnostic

Diam 11mm Th 1.5mm

Other Objects

A lead ferrule or tube, RF <22>, was recorded from destruction debris [1719] G50 OA10 and B4 wall [1384] contained a circular, domed copper-alloy object filled with mortar which may be the head of a large nail or tack.

Table 5. The registered finds from Period 4 features

RF No	Context	Parent	Period	Parent Interpret	Material	Object	Description
23	1058	1055	4	cesspit	BONA	TOOTHBRUSH	narrow worked bone toothbrush handle, missing its head. staining a broken end from wire used to hold bristles. L 130mm
27	1047	1048	4	construction cut	BONA	BUTTON	bone disc with incised concentric lines and central hole. see MacGregor, pg101, fig 58, J and K. Diam 15mm. 1.5mm thick.
28	1058	1055	4	cesspit	BONA	BUTTON	bone disc with central hole. both sides have file marks from finishing. see MacGregor, pg101, fig 58, J and K. Diam 16mm, Th 1.5mm
33	1316	1316	4	dump	COPP	UNK	fragmentary, possible applique. Star shaped plate with points with circular terminals. L 30+mm
34	1058	1055	4	cesspit	COPP	COIN	halfpenny, George III Third or fourth issue Illegible, both faces corroded Diam 30.8mm Th 3mm
35	1058	1055	4	cesspit	COPP	COIN	post-medieval half penny Illegible and highly corroded. Diam 31mm Th4mm
36	1058	1055	4	cesspit	COPP	BUTTON	flat undecorated one piece Diam 24mm
37	1058	1055	4	cesspit	COPP	COIN	post medieval penny Illegible, corroded Di34mm Th5.7mm
38	1058	1055	4	cesspit	SILV	COIN	incomplete silver shilling, uncertain ruler Diam 24.5mm Th 0.7mm worn surfaces, illegible
39	1086	1085	4	consolidation layer	COPP	COIN	very corroded coin found stuck to 19th/20th C pot Diam 18.9mm
40	1058	1055	4	cesspit	COPP	ESCUTCHEON	disc with central perforation, circumferential ridge on one side. Diam 22mm
41	1058	1055	4	cesspit	COMP	WATCH	pocket or fob watch, v. poor condition. composite of copper alloy, iron, enamel, glass.
42	1058	1055	4	cesspit	COPP	UNK	corroded lump, uncertain function
43	1058	1055	4	cesspit	COPP	TACK	Diam head 12mm
81	1086	1085	4	consolidation layer	BONA	SPOON	worked bone spoon, missing part of round bowl. handle flares out from rectangular section to flat, rounded end L90mm. Diam bowl 20mm
82	1058	1055	4	cesspit	IVOR	HANDLE	ivory handle with iron tang from implement- knife? Delaminated, stained. Hexagonal section, tapers toward the blade end. L 83mm W 21
107	1326	1327	4	pit	LEAT	SHOE	3 fragments, undiagnostic upper
108	1058	1055	4	cesspit	LEAT	SHOE	shoe fragment, sole or insole
131	1326	1327	4	pit	COMP	BOOT	Boot fragment-including eyelets (12) for laces and small section of round leather lace. 2 layers, stitching at top
132	1326	1327	4	pit	LEAT	BOOT	fragment of boot sole. some stitching at sides
133	1326	1327	4	pit	COMP	BOOT	boot heel with remains of iron fittings (nails, heel plate). Comprised of 4 thick layers. more worn on one side.
134	1326	1327	4	pit	LEAT	BOOT	fragment, upper
135	1326	1327	4	pit	LEAT	BOOT	fragment, upper
136	1326	1327	4	pit	LEAT	BOOT	fragment, upper
137	1326	1327	4	pit	LEAT	BOOT	fragment, upper
138	1326	1327	4	pit	LEAT	BOOT	fragment, upper
139	1326	1327	4	pit	LEAT	BOOT	fragment, upper
140	1326	1327	4	pit	LEAT	BOOT	fragment, upper
156	1362	1363	4	construction cut	IRON	BUTTON	missing
157	1323	1000	4	robber cut	IRON	FERRULE	D23.5mm H22.8mm
158	1326	1327	4	pit	IRON	HOOK	S shaped hook with circular section L. 109mm W 57.8mm Th 10.5mm

Period 4 c.1770–1850

Two features produced almost all the registered finds from this period (Table 5). Cess pit [1055] G2 S6 contained the handle from a bone toothbrush and an ivory knife handle, as well as several late post-medieval coins and a pocket watch. Pit [1327] contained the remains of a work boot with iron heel plate.

LOOM WEIGHTS

Neehaarika Jayanth Veena

The excavation produced 92 individual fragments of loom weights representing at least 54 individual weights. Some fragments were too abraded to match them to larger fragments. None of the loom weights were complete or unfired. Most of the examples from this assemblage were found in Middle Saxon (c.AD 730/50–850), Period 1.3 (OA4 and OA5) refuse/cesspits, wells and quarry pits. Almost all of these features were used for refuse disposal at some point and this might explain the absence of any complete loom weights since all the fragments from this assemblage might have been discarded as refuse because they were unusable. The date range of both OA4 and OA5 indicates the continued use of all three forms of loom weights until this time. The largest concentration of fragments was encountered in fill [1222] of refuse/cesspit [1143] (OA14) with 14 fragments being found. The use of loom weights is explained in detail in Cowie and Blackmore (2012, 158).

Methodology

The loom weights were weighed and measured for height and thickness. The radii and diameters could not be measured since none of the weights were even close to 50% complete. Their fabrics were then identified using a x20 magnification binocular microscope, along with forms—although some weights were too abraded or broken in a way it was impossible to diagnose the form. This information along with types of firing and any decorations or marks were recorded in an Excel spreadsheet.

Fabrics

For the most part, the fabric types used to group these loom weights follow the fabrics identified by Blackmore and Cowie (2012, 218) for *Lundenwic* sites with a couple more types added. The fabric largely matches with Blackmore and Cowie's observations of being prepared from natural brickearth with inclusions of fine sand (usually), quartz, flint and, in some cases, chalk and broken shell. Similarly, there is also a presence of large granules of flint and/or pebbles in the fabric, although these appear to be more frequently found in the weights from this assemblage. The five fabrics identified are:

- 1A: Fabric 1A is composed of a fine, micaceous fabric with the presence of organic matter as

mostly voids or fine streaks. It contains moderate to abundant sand under 0.5mm with some slightly larger grains scattered. The fabric also has unevenly scattered and rare grains of quartz and/or flint although there are rare exceptions such as RF <98> (G18, OA4). Additionally, RF <161> (G18, OA4) and RF <68> (G19, OA14) have very rare chalk inclusions too. This fabric is also the most prominent in this assemblage (50.86%). All fragments from context [1222] except for RF <56> (G19, OA14) and RF <86> (G19, OA14) are made of this fabric.

- 1C: This fabric is rough to the touch with <5mm sand in abundance, scattered with finely crushed flint and/or pebbles, fairly evenly sorted. RF <46> (G18, OA4) has more flint than the rest of the fragments of this fabric. Fragments of this fabric seem to have a similar thickness with a small range of variation.
- 1B: A similar fabric to 1C but with bigger granules of flint and pebbles that are poorly sorted.
- 3: Fabric with presence of chalk or calcareous inclusions along with abundant fine sand and evenly sorted larger grains of sand. It also has moderate amount of fine flint and an occasional quartz pebble. RF <56> (G19, OA14) however, has comparatively bigger pieces of flint as well as larger grains of sand that are poorly sorted. These fragments seem to be of a similar height with fully oxidised firing except for RF <58> (G19, OA14), which has more of an irregular firing. This fabric seems to be similar to Fabric 3 described by Carew (2009, 21).
- 3A: 3A fabric is similar to the fine, micaceous texture of fabric 1A. It also has small inclusions of chalk and evenly sorted sand with an occasional quartz pebble.

Seven loom weights have inclusions of ironstone and these are either bun or intermediate form as well as two fragments that are undiagnosed. Minute iron inclusions have been previously identified in some loom weights from *Lundenwic* sites (Pritchard 1984, 65; Goffin 2003b, 216). The inclusions are found in fragments made of all fabrics except 1B.

Forms

The forms used for this assemblage follow the typology by Cowie and Blackmore (2012, 222) into annular, intermediate and bun shaped (Fig 19). Some fragments, however, were unable to be diagnosed because of the extent of abrasion. Most of the annular are also more likely to be of fabric 1A. Out of the three that are not, RF <100> (G39, OA9) is only tentatively classified under this form because of its abrasion. Annular forms also comprise the majority of the loom weights found at 35.3% of the entire assemblage. However, the other two categories are also almost as well represented in the assemblage. Half of the bun loom weights seem to be found in OA4 and OA5 and shaped loom weights are also from OA4 although the



Fig 19. RF <61> and RF <64> as examples of bun shaped loom weights

fabrics do not seem consistent. The intermediate form also comes from OA4 and OA5, mostly. The fabrics are more diverse than of the annular shape but still tend to be dominated by 1A. The thickness of the loom weights that could be measured ranged between 30mm to 52mm with the majority falling between 40–45mm, while the heights range between 35–55mm, with the majority ranging between 40–64mm. There seems to be no correlation between the forms or fabrics of the loom weights and the thickness or heights. Table 6 shows the distribution of fragments into forms and fabrics in relation to the entire assemblage.

Firing

The loom weights are also grouped on the basis of firing styles A–E as follows::

- A: Fully oxidised and even firing. These loom weights are an orange colour throughout. Some, however, also have reddish patches. Almost half of the fragments from context [1222] are fired in this style while the rest belong to style B. 20 fragments of this assemblage were fired in fully oxidised conditions.
- B: Loom weights of this type are evenly fired and oxidised with an orange colour on the exterior and interior surfaces but the core shows signs of an even, reduced firing with a greyish black hue. 21 fragments in total come under this group.
- C: A completely reduced firing. The only fragment from this assemblage that exhibits this trait is RF <59> (G14, OA4), although, this fragment is quite

small and might actually be part of a weight that was more of a type E or D.

- D: Only one side of the loom weight is fired oxidised and orange. Its lateral half is reduced and black. There are only three fragments of this kind in the entire assemblage: RF <162> (G18, OA4), RF <106> (G18, OA4) and RF <76> (G14, OA4), all of which are from the same land use OA4 and seem to be of an intermediate form. RF <162> (G18, OA4) and <RF106> (G18, OA4), also come from the same subgroup.
- E: Loom weights of this type have an irregular firing across, with random areas of oxidisation and reduction. RF <53> (G19, OA14) and RF <58> (G18, OA4) from context [1142], a fill of pit [1143], exhibit this firing. Other than these, RF <64> (G14, OA4), is the only other fragment of this firing style in this assemblage.

Eleven loom weights show signs of being burnt, with OA4 and OA5 being the source for 4 each.

Marks

Only four fragments out of the whole assemblage had any marks or decoration that are clearly identifiable. RF <92> (Fig 20) (G14, OA4), has a dip on one side of the perforation all the way to the edge. This dip is very clean in its execution and placement, indicating this mark to be intentional. The opposite side of the perforation on the fragment was too abraded to identify any marks to see if the dip was mirrored. However, the opposite side of the fragment itself showed signs of a dip but this was also too abraded to define the exact decoration.

RF <48> (Fig 20) (G19, OA4), has two stab marks on one side of the perforation. This seems to be quite a common decoration as seen in loom weights from other *Lundenwic* sites (Cowie & Blackmore 2012, 225). RF <67> (Fig 21) (G19, OA14), has a possible finger mark in the form of a triangular indent fanning out from the perforation, although this is more likely to be an accidental mark due to handling. It also has a 1.5mm shallow ring impression on the opposite surface, but this could be an accidental mark.

RF <68> (Fig 21) (G19, OA14), has a similar mark to RF <67> as well as three small groove-like impressions on one side which might be a result of friction from threads while in use.

Table 6. Distribution of the entire assemblage by form and fabric, quantified by weight

Form	Fabric					Total
	1A	1B	1C	3	3A	
Annular	22.88%	0.00%	7.62%	4.86%	0.00%	35.36%
Bun	13.15%	1.86%	6.38%	1.79%	8.48%	31.66%
Intermediate	14.83%	7.35%	5.45%	1.00%	5.35%	32.98%
Total	50.86%	9.21%	19.45%	6.65%	13.83%	100.00%



Fig 20. RF <92> and RF <48> displaying the decorations. RF <48> is also an example of an intermediate form



Fig 21. RF <67> and RF <68> displaying their marks and intends



Fig 22. RF <76> with the two rows of stab marks

RF <76> (Fig 22) (G17, S3), has two rows of stab marks stretching from one edge to the other on one side of the perforation on the bigger fragment. This might be possible comb teeth impressions since they are evenly spaced and rather shallow. The decoration is extremely similar to the one example recorded in Flixborough (Walton Rogers 2018, 108).

The only commonality between the decorated/marked fragments seems to be that they are an intermediate form, except for RF <68> which was too abraded to be diagnostic and RF <48> which was an annular loom weight.

A few other fragments such as the RF <49> (G19, OA14), have possible finger mark indents due to handling but these might also be a result of uneven abrasion and degradation.

Discussion

The loom weights were most probably broken during use due to continuous friction and accidental damage (Petty 2014), although four fragments show signs of burning while a few others have accumulations of

charcoal. None of these fragments show any other similarities or correlations. Due to the fragments of loom weights all being recovered as part of Middle Saxon refuse deposits and the absence of complete examples, it can be concluded that weaving did not take place on this particular site.

Instead, broken examples of weights were dumped on site along with other waste materials. While there is no evidence that weights were manufactured on site, this possibility should perhaps be considered as Walton Rogers (2018, 108) has suggested that the raw materials like brickearth used for manufacturing loom weights in the Middle Saxon trading centres like *Lundenwic* were sourced from the fringes of these settlements (where Houghton Street was located).

Almost all the fragments of loom weights were derived from Middle Saxon rubbish dumps. There are some exceptions: RF <68>, RF <74>, and RF <71> from G36, OA8 are from a Period 2 context, while RF <100> (G39, OA9) is from a Period 3 post-medieval context. RF <27>, RF <97> and RF <101>–<103> (G23, D5) were from fills of a ditch.

Loom weights are mostly found *in situ* such as on the sites at Flixborough, Dover, in Suffolk *etc.*, or at least some complete loom weights from other London sites. These examples massively outnumber the fragments found at this site (Petty 2014). However, this assemblage, which was derived from rubbish dumps, mirrors the findings from the London Transport Museum excavation, where fragments of weights were also recovered from rubbish deposits (Carew 2009). At 26–27 Southampton Street seven fragments of loom weights were found in rubbish pits (Hogg 2019). The intermediate form dominated the assemblage in the London Transport Museum excavation, but this might be because all undiagnostic fragments were grouped as intermediate. The annular form, however, dominated in the earlier period of the assemblage. Similarly, the slight domination of annular weights in this site might point towards an involvement in textile production from at least the Middle Saxon period under the dating followed by Cowie and Blackmore (2012).

Catalogue of Illustrated Loom Weights

RF <61> and RF <64> (Fig 19)

[1453] G14 OA4 well fill Period 1.3

Two bun shaped loom weight fragments.

RF <92> (Fig 20)

[1096] G14 OA4 well fill Period 1.3

Intermediate loom weight fragment with a dip on one side of the perforation.

RF <48> (Fig 20)

[1222] G19 OA14 refuse/cesspit fill Period 1.3

Annular loom weight fragment with two stab marks on one side.

RF <67> (Fig 21)

[1222] G19 OA14 refuse/cesspit fill Period 1.3

Intermediate loom weight fragment with triangular impression extending from one end of the perforation.

RF <68> (Fig 21)

[1222] G19 OA14 refuse/cesspit fill Period 1.3

Intermediate loom weight fragment with an indent on one side as well as three small grooves probably from use.

RF <76> (Fig 22)

[1142] G19 OA14 refuse/cesspit fill Period 1.3

Intermediate loom weight fragment with two rows of pits, probably a comb impression.

TEXTILE FINDS

Alexandra Makin

Introduction

Finds from Houghton Street included pieces of Middle Saxon (c.AD 730/50–900) daub bearing the impressions of textiles. All these pieces were recovered from pit [1006] (G21), one of two large pits that contained considerable amounts of daub. The analysis of the textile impressions was undertaken in March 2023. This report gives the technical results of the analysis and places the textile weave types in their wider mid- to late-Saxon contexts. A spreadsheet catalogue forms part of the site archive.

The Assemblage and Preservation

The evidence for the seven textiles that form the assemblage is derived from impressions made in daub (RF <166>–<172>). All consist of one piece of daub except RF <169>, which is made up of three fragments. Each piece has impressions of textile imprinted on one side, the surface that was not pushed into the wattle. They have been created by pressing fabric onto wet or damp daub with enough pressure to leave a print of their structure.

Methodology

During the assessment all the samples underwent a technical analysis and were recorded following established procedures for archaeological textiles (Walton & Eastwood 1984) and measurement (Möller-Wiering 2015). The weave structures were examined with a Dino-Lite Edge AM7915MZZT digital microscope at magnifications of 10x–40x with a raking light, and polarisation as needed. Due to the nature of the impressions, it was possible to determine the spin direction of the yarns on six of the samples [RF <166>–<171>]. However, it is not possible to say whether these directions of twist were consistent across the whole of each textile. Fibre identification was not possible.

Yarn and Weave Construction

Most fibres are short and need to be spun and twisted together to make longer usable lengths of yarn. In the early medieval period, the two main fibres were wool and bast (plant). To make a length of yarn, fibres could be spun in two directions, clockwise or anti-



Fig 23. Thread spun in an 's' direction (© Alexandra Makin)



Fig 24. Thread spun in a 'z' direction (© Alexandra Makin)

clockwise. Threads that have been spun clockwise have a spin line that lies in the same direction as the central bar of the letter 's' (Fig 23), while fibres spun anticlockwise have a spin line that corresponds with the central bar of the letter 'z' (Fig 24). Yarn that does not need spinning because it is a long useable filament, for example silk, is denoted by the letter 'I' (see Coatsworth & Owen-Crocker 2007; Walton Rogers 2007); however, this does not apply to the Houghton Street assemblage.

During the Saxon period textiles were made on the warp-weighted loom. Textiles are woven with two sets of threads, the warp threads, which hang vertically and are passive, and the weft threads, which lie horizontally and are active, passing under and over the warp threads in a set pattern. Complex or speciality fabrics can have extra, supplementary, warps and wefts but, again, this does not apply to the Houghton Street textiles. The warp threads of a 2/1 twill textile pass over two and then underneath one weft thread. This pattern is continued on each subsequent row but moved along one weft thread, forming a diagonal line. In this version of the pattern the warp yarn is dominant (Fig 25). For a 1/2 twill textile the warp thread passes over one and then underneath two weft threads. The same process of

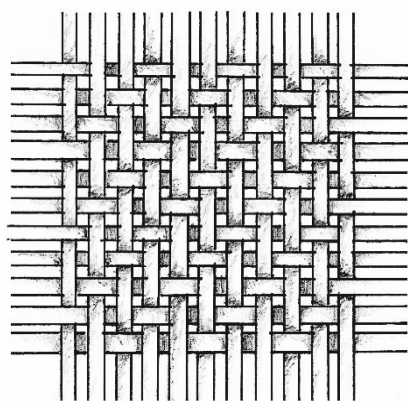


Fig 25. 2/1 Twill (© Alexandra Makin)

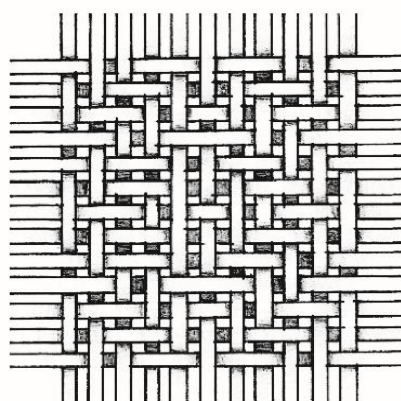


Fig 28. Diamond twill (2/2) (© Alexandra Makin)

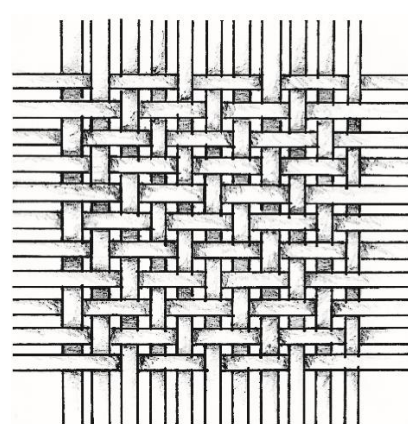


Fig 26. 1/2 Twill (© Alexandra Makin)

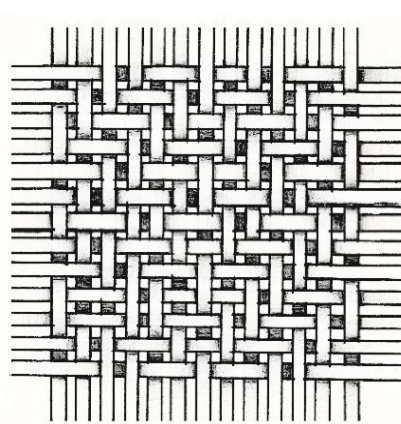


Fig 29. Broken diamond twill (© Alexandra Makin)

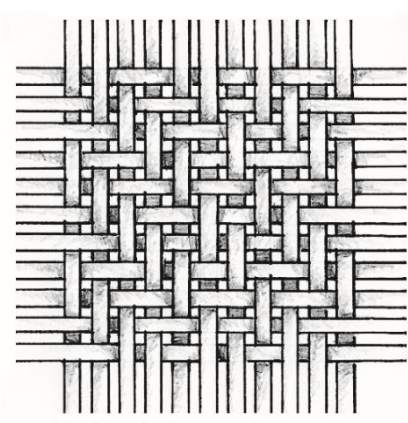


Fig 27. 2/2 Twill (© Alexandra Makin)

moving the pattern sequence along one weft thread in each subsequent row is also practiced here, again creating a diagonal line. In this version, the weft yarn is dominant (Fig 26). A 2/2 twill is visually balanced with the warp thread passing under and over two weft threads. Again, the process of moving the pattern sequence across one weft thread on subsequent rows is practiced. In this version of the twill pattern no one system is dominant (Fig 27). Diamond twills come in

two forms, one where the diamond pattern is plainly visible (Fig 28) and one where the diamond pattern is offset. The latter is called a broken diamond twill (Fig 29). In both variations the step pattern of the diagonal lines is worked so far one way before being returned back on subsequent rows, to create the point of the diamond. If the pattern is a broken diamond, the step pattern is offset (see Coatsworth & Owen-Crocker 2007; Walton Rogers 2007).

If the warp and weft systems can be identified they are always written with data corresponding to warp first, weft second. If the warp and weft cannot be identified, the systems are designated one and two. Therefore, when it is not known which system is passing over two threads in twill fabrics, the structure is written as either 2/1 or 1/2.

Descriptive Catalogue

All these pieces of daub were recovered from pit [1006] fill [1004], G21, OA14, Period 1.3 (Fig 30).

RF <166>

A textile impression varying from faint to good covers the majority of the flat surface (Fig 25). This side of the daub measures 36.73mm by 29.58mm at the widest points. The weave is a 2/2 twill. The warp and weft systems could not be identified. The thread

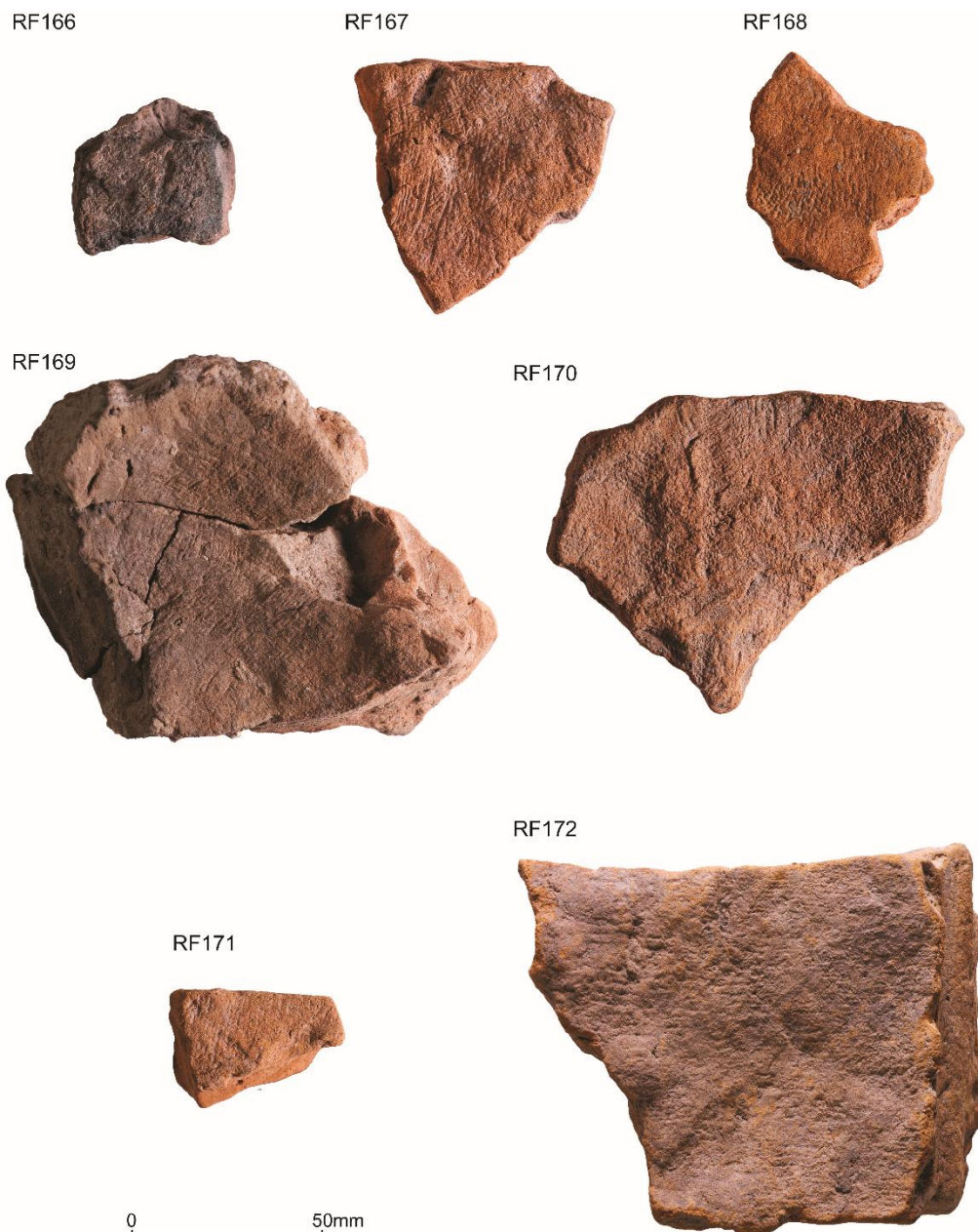


Fig 30. Daub fragments with textile impression, see catalogue for further details

count in system one is 17.5 threads per cm (7 threads over 4mm). The thread count in system two is 20–25 threads per cm (4 and 5 threads over two mm). However, the impression is worn and as a result, this count should be used with caution. There are both z-spun and s-spun threads in system one. However, a spin pattern could not be identified due to the variation in the clarity of the impression. The threads in system two are ?s-spun. The average angle of the z-spun yarn in system one is 30.51 degrees. The average angle of the s-spun threads in system one is 40.95°.

RF <167>

A textile impression covers the majority of the flat surface. This side of the daub measures 62.81mm by 61.58mm at the widest points. The textile imprint ranges from faint to good. The weave is a diamond twill. The warp and weft systems could not be

identified, nor could the spin direction of the threads in system one. System one has 9 threads per cm (counted as 4.5 over 5mm). System two has 12 threads per cm (counted as 6 threads over 5mm). System two is s-spun with an average angle of 45.66°.

RF <168>

A textile impression covers the majority of the flat surface. This side of the daub measures 50.29mm by 37.48mm at the widest points. A band measuring 8.56mm wide by 26.66mm long is clear. The rest of the print ranges from faint to very faint. The weave is a 2/1 or 1/2 twill. The warp and weft systems could not be determined. Both systems have 12 threads per cm (6 threads over 5mm). Of the yarns that could be clearly identified, those in system one are z-spun with an average angle of 47.88°. The threads of system two are s-spun with an average angle of 49.18°.

RF <169>

Daub now in three pieces. A textile impression covers the majority of the flat surface. This side of the daub measures a total of 103mm by 90mm at its widest points and it is concave. The textile impression shows most clearly in the middle and out towards the right, as pictured. The weave is a diamond twill. The warp and weft systems could not be identified. System one has 10 threads per cm and system two has 9 threads per cm. System one is z-spun with an average angle of 35.62°. System two is s-spun with an average angle of 42.80°.

RF <170>

A textile impression covers the whole of the flat surface. This side of the daub measures 93mm by 77.04mm at its widest points. The weave is confused with the clearest impressions appearing to correspond with a 2/2 twill. However, there are also faint impressions of a possible diamond twill, which are seen most clearly running vertically along the centre of the daub's surface (Fig 30). The warp and weft systems could not be identified. Both systems have 13 threads per cm. System one is z-spun but the angle could not be determined. System two is s-spun with an average angle of 46.31°.

RF <171>

A piece of daub with a textile impression covering the whole of the flat surface. This side of the daub measures 39.85mm by 25.73mm at its widest points. The impression is faint across the majority of the surface, with a clearer area towards the left, as pictured (Fig 30). The weave is a diamond twill. Neither the warp or weft systems could be identified. System one has c.12 threads per cm (counted c. 6 threads over 5mm). System two has 14 threads per cm (counted 7 threads over 5mm). System one is z-spun with an average angle of 50.54°. System two is s-spun with an average angle of 49.50°.

RF <172>

A piece of daub with a textile impression covering the whole of the flat surface. This side of the daub measures 96mm by 95mm at its widest points. Overall, the textile impressions, while slightly more detailed in patches, indicate the weave is a diamond twill (Fig 30). The warp and weft were not identifiable. No clear thread count and no spin direction could be determined.

Contextualisation

Three weave structures, 2/2 twill (RF <166>, RF <170>), either a 2/1 or 1/2 twill (RF <168>) and diamond twill (RF <167>, RF <169>, RF <171>, RF <172>), have been identified. The impression(s) on RF <170> is more confused with possibly two different weave types being visible, a 2/2 twill and a diamond twill.

Twill weave textiles, including diamond twills, survive from across early medieval England and are known from at least the Roman period (Bender Jørgensen 1992, 40–1; Wild, 1970, 47–50), through into the later medieval era (Crowfoot 1990, 475).

They are generally woven in wool but examples of bast fibre have also been found (Owen-Crocker 2004, 293). In 9th- and 10th-century London examples of fine four-shed twill wool textiles dominated, for example 2/2 twills, but by the 11th century these had been replaced by three-shed twills, 2/1 and 1/2 weaves. However, coarser twills, those with lower thread counts, do not follow this pattern, appearing in contexts that date throughout the period (Pritchard 1984, 67–68). Surviving examples of both four- and three-shed twills were woven with threads spun in a z or s direction in both systems or a z-spun yarn in one system, normally the warp, and an s-spun yarn in the second system, predominantly the weft (Pritchard 1984, 53, 56).

If the Houghton Street textiles were used to press daub in place, they had probably reached the end of their previous 'life cycles' and were considered rags. Comparative evidence from across the early medieval period shows that twill weave textiles were used for a variety of functions. Evidence from early Anglo-Saxon cemeteries shows that twill fabrics were used as clothing and to wrap or enhance items buried with the deceased (*eg* see Crowfoot 1992; Harrington 2007). A number of z/s twills were excavated at the early 7th-century ship burial of Sutton Hoo, including two 2/2 broken diamond twills, SH1 a probable garment or tunic and SH9, a bag or pillowcase (Crowfoot 1983, 457–59). 2/2 and 2/1 twills of wool and bast dating to between c.AD 850 and c.975, were found at 16–22 Coppergate in York. Textile 1263, a 2/2 wool twill, is thought to have been a wall-hanging or curtain. Diamond twill 1268 was found in association with a skeleton, on the right side of the skull, but there is no indication as to what clothing or wrapping it was originally part of (Walton 1989). Similar examples have also been excavated at Lloyds Bank, 6–8 Pavement and other sites in York (see Hedges 1982). Later examples include a mid- to late 10th-century 2/2 diagonal twill textile from a possible gown or tunic excavated in Lower Brook Street in Winchester (Crowfoot 1990, 475, 484).

A number of wool and bast twill textiles have been found in Viking Age Scotland (Bender Jørgensen 1992; Gabra-Sanders 1998; Hayeur Smith 2020, 48–53). These include examples of presumably rags being used in the manufacturing process of brooches. The clay moulds were lined with textiles and as the hot metal cooled inside the mould, they took an impression of the textile linings (*eg* see Gabra-Sanders 1999, 67). Similar twills used for clothing come from 10th-century Dublin (Pritchard 2014) and Birka in Sweden, although it has been suggested that the technique for weaving 2/1 twills was not widely known in Scandinavia at this time (Andersson 1999, 41). However, z/s wool 2/2 and 2/1 twills were the main textile types across the North Atlantic islands during the Viking period (Hayeur Smith 2020). A wide variety of z/s wool twill weaves have also come from Frisia (Brandenburg 2016; also see Bender Jørgensen 1991). Therefore, while the original functions of the textiles that made the impressions on the pieces of daub from Houghton Street are unknown, it is apparent that the weave types fall into the general pattern of z/s twills manufactured in England and

North-Western Europe during the early medieval period.

ANIMAL BONES

Hayley Forsyth-Magee

Introduction

Excavations at Houghton Street produced a large assemblage of 10,856 faunal remains, the majority of which are dated to Period 1.3 (c.AD 730/50–850). The site is located on the eastern outskirts of *Lundenwic*. The faunal remains recovered from the four phases of Middle Saxon occupation (Periods 1.1–1.4) represent an opportunity to analyse the animal husbandry regime of the *Lundenwic* hinterland. The medieval (c.1200–1375) Period 2 and early post-medieval (c.1475–1770) Period 3 produced moderate quantities of bone, with the late post-medieval (1770–1850) Period 4 producing the smallest quantity of faunal remains.

Methodology

The assemblage has been recorded directly into an Excel spreadsheet in accordance with the zoning system outlined by Serjeantson (1996). Species identifications were made using Archaeology South-East's in-house comparative reference collection as well as consulting relevant reference methods including Schmid (1972). Where possible bone fragments were identified to species and the skeletal element, part and proportion, represented. Specimens that could not be confidently identified to taxa, including long-bone, rib and vertebrae fragments (with the exception of axis, atlas and sacrum), have been recorded according to their size and categorised as 'Large' (cow/deer/horse sized), 'Medium' (sheep/pig/dog sized) or 'Small' (cat/rabbit sized) mammal. The total number of unidentifiable fragments from each context has been noted, although not included further. Each hand-collected and bulk-sampled context containing faunal bone has been quantified and weighed.

The Number of Identified Specimens (NISP) was calculated for all taxa. The Minimum Number of Individuals (MNI) was calculated from the most common element according to the Minimum Number of Elements (MNE) by taking sides into consideration with reference to the part and proportion of the bone present. Due to bone fragmentation, only the most frequently occurring parts of elements have been counted (*ie* acetabulum and glenoid process). Recently broken bones have been rejoined and recorded as single fragments. Categories for bone preservation were noted as 'Good', 'Moderate' or 'Poor' depending on the degree of taphonomic damage to the bone.

In order to distinguish between the bones and teeth of sheep and goats a number of identification criteria were used including those outlined by Boessneck (1969), Boessneck *et al* (1964), Halstead *et al* (2002), Hillson (1995), Kratochvil (1969), Payne (1969; 1985), Prummel and Frisch (1986) and

Schmid (1972). Sheep have been positively identified; although evidence of goat has not been observed, a small goat population may have been present. Deer have been identified where possible, with reference to Lister (1996). The identification criteria of rabbit and hare specimens have been undertaken with reference to Callou (1997). The identification of domestic fowl has been undertaken with reference to the criteria outlined by Tomek and Bocheński (2009), with the identification of additional bird bones referencing Cohen and Serjeantson (1996). Small mammal remains have been separated into rodent and anuran categories with reference to Lawrence and Brown (1974), Andrews (1990), Corbett and Harris (1991) and Bailon (1999). No attempt to distinguish these faunal remains further were undertaken. Fish bones have been recorded separately below.

The state of epiphyseal and metaphyseal long bone fusion was recorded as 'fused', 'unfused' and 'fusing' (fusion line visible) categories, whilst for bird bones the terms 'subadult' and 'adult' were used. Mammal bones were also categorised as juvenile or neonatal based upon fusion, porosity and general size. The methods used for ageing cannot give precise ages, but do provide an approximation which can be used to interpret animal husbandry practices. Specific ages were not assigned to bone fusion data, due to differences in maturation between modern and ancient fusion rates. Instead, fusion data were grouped following O'Connor (1989) using 'early', 'intermediate', 'late' and 'final' stages of fusion, to allow relative ages to be assessed.

The mandibular tooth eruption and wear stage of cattle, sheep/goat and pigs was recorded using Grant (1982) and converted to definitive age ranges with reference to Hambleton (1999). Tooth eruption and wear data was only recorded for mandibles with two or more teeth *in situ*. Equid mandibular tooth eruption and wear was recorded following Levine (1982). Mammal bone measurements have been taken in accordance with Von Den Driesch (1976) and measurements of bird bones were taken in accordance with Cohen and Serjeantson (1996). Withers heights reference Von Den Driesch and Boessneck (1974) for cattle (Fock, 1966), caprines (Teichert (1975), pig Teichert (1969) and horse (Kiesewalter 1888), whilst dog follows Harcourt (1974). Only metapodia have been used for calculating withers height estimates; additional long bone metrics are available in the archive.

Table 7. The total number of fragments, NISP (Number of Identifiable Specimens) count

Period	No. Frags.	NISP
1.1	362	243
1.2	2084	1233
1.3	15278	7130
1.4	1336	441
2	2413	948
3	833	800
4	84	61
Total	22390	10856

All specimens were studied for the presence of gnawing (differentiating between carnivores and rodents). Burning and butchery marks were noted on the part and proportion of each bone affected. The degree of burning (charred to calcined) was assessed and brief descriptions of any butchery marks were made, which included the type (*ie.* chop, cut mark, sawing) and position on the bone. Pathologies were categorised by type, noting the position and a description of the area affected, aetiologies have been discussed where possible. Evidence of absent or reduced hypoconulids, a dental non-metric trait, were recorded in a small number of cattle third molars within this assemblage. Further details concerning the assemblage are available in the site archive.

Assemblage

A total of 10,856 identifiable faunal remains were recorded, of which 6,625 bones were recovered by hand collection and another 4,231 examples were retrieved from bulk samples. The majority of the assemblage was recovered from Period 1.3 (n=7130) (*c.*AD 730/50–850) (Table 7); the greatest quantities of faunal remains were recovered from the pits and other features within OA14 and OA4. Wells associated with OA5, and ditches (D1) and RW1, also produced noteworthy quantities of animal bones (Table 8). Moderate quantities of bone were recovered from OA3 G15 and G26 (external dumping in Period 1.2), similar to the assemblage from Period 1.4, recovered from OA7 G29 (layers of dumping, levelling and occupation). Period 1.1 produced the smallest quantity of bone, deriving mostly from postholes (B1 G11; B2 G12; B3 G16) associated with possible

buildings.

Period 2 produced a moderate collection of faunal material (n=948) with the majority recovered from made ground and dump features associated with OA8 G32 (n=296) and G36 (n=447). The Period 3 assemblage produced a similar quantity of bones to Period 2 (n=800), recovered primarily from occupation layers, dumping and features from OA9 G39 (n=341). Period 4, produced the smallest collection of faunal bones (n=61) derived from pits and robber cut features associated with the School Building B8 G1 (n=34).

The three main domesticates – cattle (12%), ovicaprid (12%) and pig (8%) – dominate the entire assemblage, along with large (29%) and medium (34%) mammal bone fragments, the majority of which were recovered from the Middle Saxon deposits (Period 1.1–1.4) (Table 9). The other domesticates – horse (<1%), dog (<1%) and cat (<1%) – are present, although in much smaller quantities. Wild mammalian taxa including deer (<1%), hare (<1%), rabbit (<1%) and rodent (<1%) are inconsistently present whilst domestic fowl (0.5%) and probable domestic goose (<1%) were present in low numbers throughout the assemblage. Indeterminate bird species (1%) and anurans (1%) were present in similar quantities.

The majority of the bones are in a moderate state of preservation with some signs of surface erosion and weathering evident. It is possible that bones exhibiting taphonomic erosion were left exposed to the elements before being buried, or re-deposited, as gravel concretions covered a number of specimens. Bones in a moderate condition of preservation may have been buried soon after deposition.

Table 8. NISP (Number of Identifiable Specimens) by feature and period

Feature	Period						
	1.1	1.2	1.3	1.4	2	3	4
Consolidation layer						1	
Construction cut						26	34
Destruction debris						16	
Ditch			1630				
Dump		183		283	306	168	
Dump layer		286					
Gully			191		3		
Levelling deposit	14			78			
Made ground					228	2	
Occupation layer		764	33	80	370	171	
Pit	10		2803		41	214	2
Pit, cess							16
Pit, quarry			487				
Pit, refuse			179				
Pond						2	
Posthole	193		24				
Redeposited natural	24						9
Robber cut						195	
Stakehole	2						
Wall						5	
Well			1783				
Total	243	1233	7130	441	948	800	61

Table 9. NISP (Number of Identifiable Specimens) by taxa and period

Taxa	Period							Total
	1.1	1.2	1.3	1.4	2	3	4	
Cattle	30	157	800	72	121	161	9	1350
Sheep/goat	19	102	636	64	74	70	5	970
Sheep	3	12	205	20	27	55	7	329
Pig	26	114	568	41	96	34	3	882
Horse		4	4			1		9
Dog	1	3	9			14		27
Cat		1	3			1		5
Large mammal	62	440	2027	84	254	260	15	3142
Medium mammal	98	347	2530	134	351	171	19	3650
Small mammal		24	73	20	7	2	1	127
Deer		2	2	1				5
Deer?	2		2			1		5
Hare			1					1
Lagomorph		1				1		2
Rodent			6					6
Bird		16	91	2	8	9	1	126
Chicken	1	2	41	1	4	11	1	61
Goose	1	4	25	2	1	3		36
Anuran		4	107		5	6		122
Total	243	1233	7130	441	948	800	61	10856

Period 1: Middle Saxon (c.AD 730/50-850)

The Middle Saxon assemblage (Periods 1.1–1.4) produced the largest collection of identified faunal remains, consisting of 9,047 specimens recovered from 153 contexts. The majority of the assemblage was hand collected (n=5,372), with the remainder (n=3,675) retrieved from bulk samples. The taxa identified includes the three main domesticates of ovicaprid (12%), cattle (12%) and pig (8%), other domesticates include horse (<1%), dog (<1%) and cat (<1%). Wild taxa are also present in low numbers and include deer (<1%), hare (<1%), rabbit (<1%), rodent (<1%) and anuran (1%). However, birds are present in slightly greater quantities, including domestic fowl (0.4%), probable domestic goose (0.3%) and indeterminate species (1%). Large quantities of fish were also present (n=2,588) (see below Forsyth-Magee *Fish Bone*).

Period 1 shows a clear trend in exploitation through its sub-periods (1.1–1.4), with the earliest evidence of activity beginning pre-AD 750 (sub-period 1.1 n=243), increasing during AD 750–70 (sub-period 1.2 n=1233). Period 1.3 culminated in the greatest quantity of faunal remains (n=7130) with the most diverse range of taxa, highlighting a peak phase of intense exploitation. This peak in activity was followed by decline and then disuse towards the end of the period (Period 1.4 n=441). This publication text has grouped all of the sub-periods under the main heading of Period 1 for ease of reference.

Cattle

Cattle contribute to 12% of the faunal assemblage from Period 1, producing an MNI count of at least 33 animals in total. The assemblage is represented by all parts of the carcass, containing both meat and non-

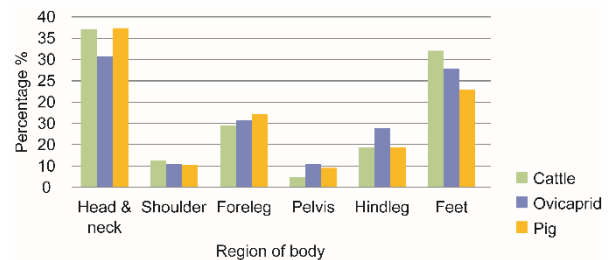


Fig 31. Period 1 bone elements present

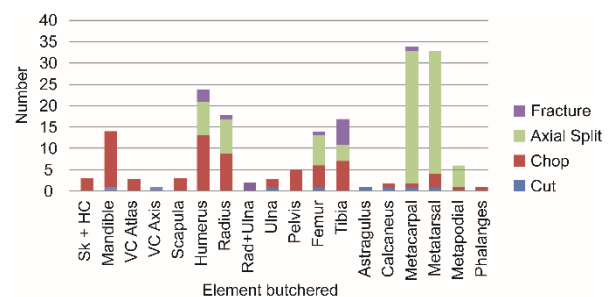


Fig 32. Period 1 cattle butchery

meat bearing bones, indicating that whole animals were processed on site (Fig 31). The majority derived from Period 1.3, though element representation remained consistent across all the sub-periods. Due to the limited datasets from Periods 1.1, 1.2 and 1.4, quantities have been amalgamated to form Period 1.

Butchery marks were observed in 17% of the cattle assemblage predominantly affecting the metapodial elements (Fig 32). The majority of the assemblage had no visible butchery, however, many of the bones were fractured and fragmented. In this instance due to the absence of the diagnostic part of the bone, these

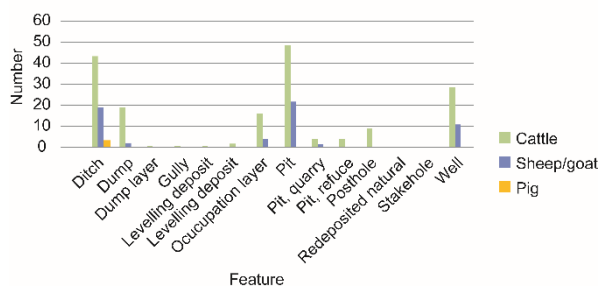


Fig 33. Period 1 butchered taxa by feature

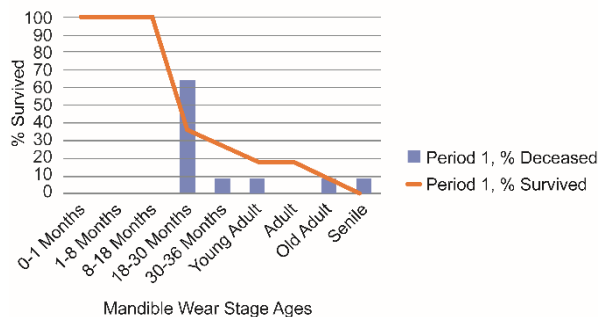


Fig 34. Period 1 cattle mortality curve

remains have not been recorded as deliberately butchered. Butchery marks that have been identified include fine knife blade cuts (1%), chops by cleaver or axe (7%), as well as axial splitting (9%) and deliberate fracturing (1%).

Of the butchered cattle bones, the majority have been split axially (53%), predominantly affecting the metapodia, followed by chop marks (41%), deliberately fractured bones (7%) and fine knife blade cuts (5%). The majority of the butchery marks were made using a cleaver or axe to dismember and portion carcasses, as well as splitting bones for marrow extraction. Knife marks were utilised in the dismemberment and disarticulation of joints including the removal of toes from feet, tongue meat and decapitation. Evidence of horn-core removal affected just four specimens and suggests that this resource may have been exploited on occasion for craft working. The majority of the butchered taxa from Period 1.3 were recovered from pit fills (OA14, OA4), ditch fills (D1, RW1) and well fills (OA5) (Fig 33). Given the sheer quantity, and the general size and morphology of cattle remains it is no surprise that they dominate these particular features.

Analysis of mandible wear stage data indicates that the majority of young animals were culled between the ages of 18–30 months (Fig 34), representing approximately 64% of the assemblage. Less than 20% of the assemblage survived into young adulthood, with a small quantity of old adult and senile animals present. The epiphyseal fusion data supports the ageing profile derived from the dentition data and suggests that 94% of the Period 1 cattle population survived for approximately 18 months, with just over half (54%) surviving for two to three and a half years, whilst 62% survived for between the ages of three and a half to four years.

As only 6% of animals were slaughtered between 0–18 months, both the epiphyseal fusion and dentition wear suggest there is no evidence for the culling of young calves, which is indicative of a dairy herd. It is possible that the porous bones of neonate and infant cattle did not survive within the assemblage, however, the presence of a number of fish, bird and small mammal bones suggests that survivability and recovery bias was not an issue. The majority of cattle were culled between the ages of 18–30 months and represent an autumn kill-off, similar to the Anglo-Saxon West Stow cattle assemblage (Crabtree 1989). There is no evidence of a kill-off between the ages of three and a half to four years, which is the age cattle were slaughtered for prime beef production (*ibid*, 69–75) and may suggest that livestock was transported on-hoof into *Lundenwic* (Rielly *et al* 2012, 146–52). The culling peak of pre-adult cattle indicates a taste for good quality meat (*ibid*, 146–9) which may preclude the absence of adult cattle from the assemblage. This indicates that the cattle herd was not exploited as a specialised resource, but represents more of a mixed economy including meat and secondary products (Holmes 2014, 67). The presence of joint disease and associated trauma in a number of fused long bones and extremities suggests that some animals were exploited for traction. Of the 31 pelvic bone fragments present, only one could be tentatively identified as female. A small number of fully fused metapodia (n=12) produced withers height estimations (Table 10); these are in keeping with cattle from *Lundenwic* sites (Rielly 2012a, 138). Metrical data for additional elements are present within the site archive.

Due to the small quantity of canid gnawed post-cranial elements recovered, less than 1% of the cattle assemblage, it is likely that bones were discarded and buried almost immediately. There appears to be no obvious pattern of discard, with bones found in a number of refuse/cesspit fills [1099] (pit [1100], OA14) [1417] (OA6 G22), quarry pit fill [1395] (OA4 G18) and fill of well [1491] (OA5). Burning at low temperatures (charring) was noted in a small quantity (n=6) of fragmented cattle bones from the fills of burning [1004], refuse/cesspit [1143] and storage pits [1269] (OA14), the fill of a ditch [1175] (RW1), quarry [1376] and refuse [1666] pits (OA4). The localised nature of the charring and the elements affected suggests refuse burning, possibly indirectly related to cooking practices.

Table 10. Period 1 cattle withers height estimations.
MC=Metacarpal, MT=Metatarsal

Bone	No.	Max wt	Min wt	Mean	Sd
MC	4	1.226	1.134	1.161	0.043
MT	8	1.128	1.253	1.183	0.043

Ovicaprid

Ovicaprids (sheep/goat) are present in a slightly greater NISP quantity (Table 8) than cattle (12%), although given the size differences; the meat yield from cattle is still greater. Only a small proportion of

sheep have been identified, and no direct evidence for goat has been recorded. MNI counts indicate that at least 55 animals are represented. All parts of the carcass were present indicating that whole animals were likely processed on site (Fig 35). Similarly to cattle, the sub-period datasets for sheep/goat have been combined as Period 1. Most of the sheep/goat assemblage derived from Period 1.3.

Butchery marks were observed in just 6% of the ovicaprid assemblage, predominantly affecting the metapodial elements, as well as the tibia (Fig 35). Compared to that of cattle only a small number of bones were fractured and fragmented, this is likely due to the much smaller bone size of ovicaprids. Butchery marks consist of fine knife blade cuts (1%), chops by cleaver or axe (4%), as well as axial splitting (<0.5%) and deliberate fracturing (0.5%).

Of the butchered ovicaprid bones, the majority have been chopped (75%), predominantly affecting the metapodia, followed by fine knife blade cuts (15%), deliberately fractured bones (8%) and axial splitting (2%). Ovicaprids were butchered in a similar manner to cattle: cleavers and axe were used to dismember and portion carcasses, as well as split bones for marrow extraction. Knives and fine blades were used in the dismemberment and disarticulation of joints, including the removal of toes from feet, tongue meat and decapitation. Horn-core removal was noted in just three of the 36 skull and horncore specimens, suggesting that this resource was exploited for craft working on occasion. Deposition of butchered sheep/goat remains is similar to that of cattle in terms of feature type and land-use classification (pit fills OA14, OA4, well fill OA5, ditch fills RW1, D1). Analysis of mandible wear stage data (Fig 36) indicates a peak cull between the ages of three to four years, representing approximately 43% of the assemblage. At least 90% of the assemblage

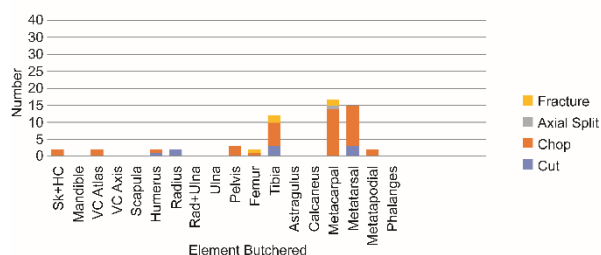


Fig 35. Period 1 Ovicaprid butchery

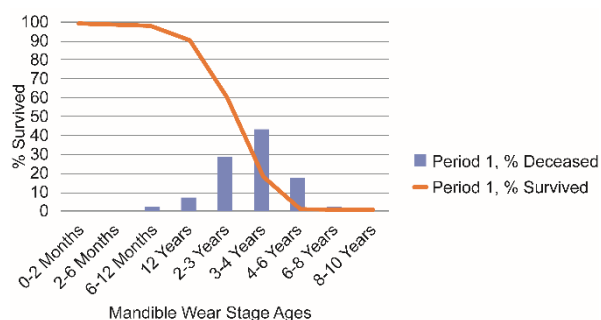


Fig 36. Period 1 Ovicaprid mortality curve

survived until the age of two years suggesting that there was little to no interest in consuming lamb. At two to three years of age, 30% of the assemblage was culled and from the age of four to eight years, the number of ovicaprids culled reduces significantly. The epiphyseal fusion data supports the ageing profile derived from the dentition data and suggests that 92% of the Period 1 ovicaprid population survived for approximately 18 months, with just over half (61%) surviving for two to three and a half years, whilst 34% survived until the age of three and a half and four years.

Both the epiphyseal fusion and dentition wear suggests there is no evidence for the consumption of lamb in any substantial quantity. The presence of fish, bird and microfauna indicate that the preservation and recovery of fragile bones is possible, suggesting that porous neonatal and juvenile bones should also have survived if they were present. The majority of ovicaprids were culled between the ages of two and four years, which is indicative of prime meat production and possibly wool (Hamilton-Dyer 2005, 148; Holmes 2014, 70–3). A small quantity of ovicaprids were also exploited for secondary purposes (such as breeding and possibly milk as well as wool production), culled between the ages of four and six years once no longer of use. The presence of castrates and rams were recorded within the assemblage from metrical analysis of fully fused metacarpals using a slenderness index (Fig 37). Although the dataset was small (n=8) it could suggest that the flock contained castrates, which may have been exploited for wool, with few rams and ewes kept as breeding stock (Holmes 2014, 70–3). Of the 72 pelvic bone fragments present, four were identified as definite female and 16 were tentatively identified as female. One tentative male pelvis was also recorded. The presence of ked puparia (see Allison *Insects*), an insect associated with fleece and wool processing, and a number of finds associated with textile manufacture supports the theory that the flock was exploited for wool, as well as meat (and the secondary products of breeding, manure and possibly milk).

A small number of female horn cores recovered from quarry pit fill [1373] OA4 G18 (n=3) and refuse pit fill [1417] OA6 G22 (n=1) exhibited signs of 'thumb print' depressions, which have tentatively been associated to old age, dental and joint disease possibly associated with malnutrition and milking stress (Albarella 1995, 699–704). This could suggest that some ewes may have been exploited for milk. Well established dental disease and long bones with signs of joint disease also indicate the presence of older animals within the flock. A small number of fully fused metapodia (n=17) produced withers height estimations (Table 11), which are in keeping with the animals from *Lundenwic* sites (Reilly 2012a, 138). Metrical data for additional elements are present within the site archive.

A small quantity (n=10) of predominantly post-cranial ovicaprid bones exhibited signs of canid gnawing. Good preservation and lack of weathering suggests bones were discarded and disposed of soon after slaughter into the fills of ditches (RW1, D1, D4), pits (OA4, OA6, OA14) and a well [1494] (OA5 G14).

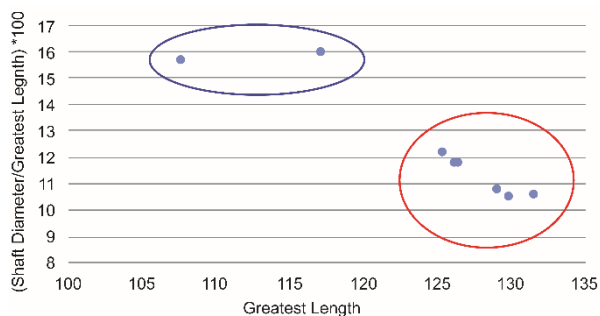


Fig 37. Period 1 Ovicaprid metacarpal slenderness Index. Castrates within red circle, rams within blue circle

Table 11. Period 1 ovicaprid withers height estimations. MC=Metacarpal, MT=Metatarsal

Bone	No.	Max wt	Min wt	Mean	Sd
MC	8	63.665	52.059	60.075	3.864
MT	9	66.477	57.493	61.044	2.728

Burning at high (calcined) and low (charred) temperatures affected just 13 specimens consisting of cranial and postcranial elements. These remains were predominantly discarded into pits associated with burning, refuse/cesspits (OA14) quarry pits (OA4) and ditches (RW1, D1), likely the result of refuse disposal.

Pigs

Pigs are the least abundant domesticate and contribute only 8% of the assemblage from Period 1, producing an MNI count of at least 24 animals. The assemblage is represented by all parts of the carcass, containing both meat and non-meat bearing bones, indicating that whole animals were processed on site (Fig 31). Deposition trends similar to those of cattle and sheep/goats remained consistent with pigs, with bones discarded into the fills of pits (OA14, OA4), wells (OA5) and ditches (D1, RW1)

Butchery marks were observed in just 1% of the pig assemblage (n=6) predominantly affecting the humerus (n=4). Identified marks include chops by cleaver or axe (83%) affecting just five pig bones (humerii n=3, skull n=1 pelvis n=1), and a single scoop mark (17%) indicative of meat removal from the bone (humerus n=1). Analysis of mandible wear stage data (Fig 38) indicates that the majority of young animals were culled between the ages of 14–21 months, representing approximately 52% of the assemblage, whilst less than 10% of the assemblage survived into adulthood. The epiphyseal fusion data supports the ageing profile derived from the dentition data and suggests that 80% of the Period 1 pig population survived for approximately 18 months. Less than half (31%) survived for two to three and a half years, whilst only 3% survived between the ages of three a half to four years.

A small number (8%) of pigs were slaughtered between 0–18 months; this estimation is slightly

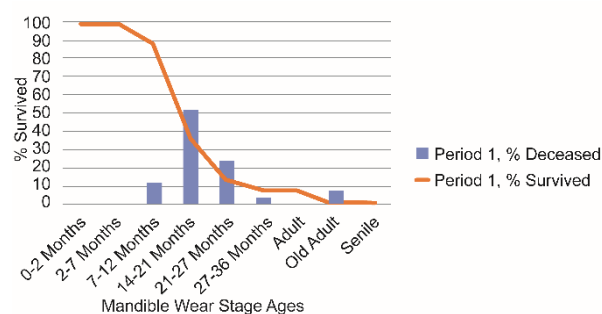


Fig 38. Period 1 pig mortality curve

Table 12. Period 1 pig withers height estimations. MC=Metacarpal, MT=Metatarsal

Bone	No.	Max wt	Min wt	Mean	Sd
MC 3	3	75.061	73.796	74.442	0.632
MC 4	2	75.131	68.318	71.724	4.817
MT 3	1	69.657			

higher at 12% according to the dental wear data. This is not surprising given that dental enamel often survives well in the buried environment compared to that of porous juvenile bones. The majority of the pigs were culled for their meat between the ages of 14–27 months, with a peak at 14–21 months. Pigs reach osteological maturity at the age of approximately 36 months, the presence of pigs older than wear stage F (n=3) suggests that some animals were exploited for breeding stock (Holmes 2014, 73). A small number of fully fused metapodia (n=6) produced withers height estimations (Table 12). Metrical data for additional elements are present within the site archive.

Of note is the lack of canid gnawing within the pig assemblage, suggesting canids did not have access to these remains, for reasons unknown. Burning at low and high temperatures was noted in a small quantity of fragmented pig bones (n=7) affecting cranial and post-cranial elements. These mostly derived from pit fills associated with refuse, refuse/cesspits and quarrying (OA4, OA14), likely the result of refuse burning. Evidence of joint disease was noted in a single fifth metatarsal from the fill [1222] of refuse/cesspit [1143] OA14.

Other Domesticates: Horses; Dogs; Cats; Chickens & Geese

Horses, dogs and cats were all exploited, with horses being used for transport and traction, dogs for hunting and herding and cats for pest control. Horse remains represent less than 1% of the total faunal assemblage and consist exclusively of post-cranial elements (Period 1.2 OA3; Period 1.3 RW1, D1, D3, OA6). Epiphyseal fusion indicates that the majority of animals are adult; with one under the age of 42 months (Silver 1969). A withers height estimation calculated from a single metacarpal from the fill of refuse pit [1417] OA4 (1.47m, 14.2HH) classified this animal as average height (Vitt 1952; May 1985). No

evidence for butchery processing or the consumption of horse meat was present, though absence of evidence does not mean it did not occur. Dog remains represent <1% of the assemblage, consisting primarily of adult animals. Cranial and post-cranial elements were recovered from the fills of ditches (D4, RW1), posthole (OA2), dump layers (OA3), pits (OA4) and wells (OA5) from Periods 1.1–1.3. The lack of observable knife cut marks, along with the presence of a metapodial bone suggests these animals may not have been exploited for their fur.

Cat remains also showed no evidence for skinning. Cats (<1%) consisted of post-cranial elements of adult animals recovered from ditch fill [1548] (RW1) and dump fill [1612] (OA3).

Chickens and geese did not feature highly in the Anglo-Saxon diet (Holmes 2014, 42; 2017, 30). Small quantities of both chicken and goose are present in all sub-periods (<0.5%), similar to the assemblages from the National Gallery Basement, Jubilee Hall, the Lyceum Theatre (Holmes 2014, 157–72) and other *Lundenwic* sites (Reilly 2012a, 132). These birds were presumably exploited for their meat, eggs and feathers. Cockerels may have also been used for sport; chickens are represented by post-cranial adult bones recovered predominantly from pit fills (OA14, OA4) and well features (OA5) assigned to Period 1.3. Smaller quantities of chicken bones were recovered from features across the site (B3, D4, OA3, OA6, OA7, RW1).

At least three cockerels were identified based on the presence of cockspurs (1.1 n=1, 1.3 n=2). Evidence of butchery marks consistent with dismemberment and portioning, likely for consumption, was noted in a tarsometatarsus from the fill of quarry pit [1360] (OA4). A tibiotarsus from pit fill [1005] (OA14) had been exposed to high temperature burning (calcined), though not directly related to cooking practices. A further tibiotarsus from pit fill [1371] (OA4) exhibited signs of possible trauma related pathology.

Geese (domestic/wild) (n=32) are similarly represented by post-cranial adult elements, with the majority retrieved from pit fills (OA14, OA4) gully and ditches (RW1) and well features (OA5). A single goose scapula from pit quarry fill [1371] OA4 exhibited butchery marks consistent with carcass dismemberment and portioning for consumption.

Wild Taxa (Fish not Included)

Wild taxa were present in small quantities, representing <5% of the assemblage (Table 9). The presence of deer in small quantities in all of the sub-periods (Periods 1.1–1.4) suggests that these animals were exploited occasionally for their meat and secondary products, although not in any great quantity to supplement the Saxon diet (Holmes 2014, 43). Bones of hare (Period 1.3) and lagomorph (possible rabbit?; (Period 1.2) were recovered from a refuse pit fill [1620] and dump layer [1174] associated with OA4 and OA3 respectively. The presence of rabbit in the Anglo-Saxon period is relatively rare, although not unheard of, with a specimen also recovered from a pit in Saxon Southampton thought

to be an import of a preserved meat joint (Sykes & Curl 2010, 121). Anurans, rodents and small mammals were recovered primarily from pit quarry, ditch, pit and well fills, as well as gully, dump and occupation layers across Periods 1.2–1.4 and gives an insight into the surrounding habitat/environment. These remains are likely the result of pit-fall traps or predation (O'Connor 2000, 126; Hambleton 2008, 22). Recovery bias with regards to feature deposition likely explains the absence of these taxa from Period 1.1.

Period 1 Discussion

The Middle Saxon (c.AD 730/50–850; Period 1) faunal assemblage from Houghton Street provides an insight into animal husbandry practices taking place in the hinterland of *Lundenwic*. Although Houghton Street lies on the eastern periphery of the *Lundenwic*, its faunal assemblage is not easily classified by site type. Large numbers of cattle and pig bones (Period 1.3) are usually indicative of urban assemblages, similar to Maiden Lane, James Street, Jubilee Hall, Lyceum Theatre and the Peabody site (Holmes 2014, 157–72). Rural assemblages such as Althorpe Grove, the National Gallery Basement, National Portrait Gallery and the Treasury in Whitehall (*ibid*, 157–72) are typified by the presence of large quantities of ovicaprid remains.

The NISP (Number of Individual Specimens) counts of the three main domesticates from Houghton Street (combined sub-periods) are jointly dominated by ovicaprids (n=1,061) and cattle (n=1,059), with pigs following in abundance (n=749). As cattle bones are larger in size and more robust than ovicaprids it is possible that butchery processing has affected the NISP count, inflating the number of cattle present. Analysis of the MNI (Minimum Number of Individual) counts indicate that ovicaprids dominate the assemblage, with at least 55 animals, followed by cattle (n= 33) and pig (n=24). Butchery of the main domesticate species (cattle, ovicaprid and pig) appear to be systematic and indicate that primary butchery occurred on site. The reduced number of bones present from prime-meat areas could suggest that dressed meat-joints and prime cuts were transported elsewhere. This may explain the absence of lambs within the assemblage.

Taxa exploitation remained consistent in terms of species representation. The earliest phase of Saxon activity (Period 1.1) recovered faunal remains from a number of pre 750 structures (B1–B3) as well as an open area of silting (OA2). A period of abandonment followed (Period 1.2), with faunal material deposited in layers of dumping and occupation (OA3). Activity culminated in Period 1.3) producing the greatest quantity of faunal remains, leading to a clear decline in the Anglo-Saxon use of the landscape with a period of dumping and disuse (OA7) (Period 1.4).

The majority of the faunal assemblage derived from Period 1.3, predominantly concentrated within pits (OA14 and OA4), wells (OA5) and ditches (RW1 and D1). The inclusion of the majority of butchered taxa within these features suggests they were utilised for general refuse and food waste disposal. There are

no obvious patterns of distribution between the taxa present and the features/land-use areas in which they have been deposited. This may not entirely reflect areas of zoning activity specifically, but rather that these features are more numerous compared to others.

Ovicaprids, which included rams, ewes and castrates, were exploited for prime meat and wool, between the ages of two to four years (Hamilton-Dyer 2005, 148; Holmes 2014, 70–3). Whilst older animals (four to six years) were utilised for their secondary products including breeding, possibly milk and meat once they were deemed no longer productive. This cull pattern is indicative of a mixed economy and is comparable to many Anglo-Saxon assemblages (Holmes 2014, 70–3; 2017, 49–50).

Cattle were mostly exploited for their good-quality meat and culled as pre-adults, whilst older animals were exploited for their secondary products of traction, breeding, manure, hide and horn. The absence of prime-beef cattle may be explained by the culling of the pre-adult stock or these animals could have been transported on the hoof elsewhere.

Pigs were primarily culled for their meat with a small number of older animals kept as breeding stock. The numbers of pigs represented by the MNI count ($n=24$), is not reflected amongst the butchery waste and may indicate that dressed meat/joints were transported elsewhere (Maltby 1981, 13).

Horses, used as transport and traction, dogs, used for stock herding, hunting and guarding, and cats for pest control, were utilised as ‘working’ animals, whilst chickens and geese would have provided meat, feathers and eggs.

The limited presence of wild taxa suggests that these resources were not overly exploited and the Anglo-Saxon diet was not supplemented by deer, small mammals including lagomorphs, rodents, or anurans. The faunal remains from this period are predominantly the result of domestic refuse disposal, with a small quantity of craft/bone working debris also noted within the assemblage.

Period 2: Medieval (AD 1200–1375)

The medieval assemblage (Period 2) produced the second most abundant collection of faunal remains from the excavations at Houghton Street, consisting of 948 identified faunal remains recovered from 11 contexts. This assemblage predominantly derives from dumps, occupation layers and made ground from OA8, with smaller quantities of bone also recovered from pit and gully fills in OA8 (Table 8). Identified taxa (Table 9) includes the three main domesticates, dominated by cattle (13%), closely followed by ovicaprids (11%) and pigs (10%). Other domesticates include chickens (<0.5%) and geese (<0.5%).

Wild taxa are represented by small mammals (<1%), indeterminate birds (<1%) and anurans (0.5%). Moderate quantities of large and medium mammal bones are also present.

Cattle

The cattle assemblage is moderate in size, contributing to 13% of the faunal assemblage, producing an MNI count of at least three animals (Table 9). The majority of the cattle remains were recovered from OA8 deposits (Table 8) and consist predominantly (89%) of non-meat bearing bones. This indicates that primary carcass processing occurred onsite, with the majority of dressed meat joints moved elsewhere. Analysis of the limited epiphyseal fusion data suggests that 100% of the cattle assemblage survived for approximately 18 months, with just over half (60%) surviving for two to three and half years, whilst no kill-off data was available for three and half to four years. Only two mandibles produced wear stage values of 8–18 months and 30–36 months respectively. The limited ageing profile data suggests that the cattle assemblage was not solely exploited as a dairy herd, although it is likely that some milking occurred based on the mandible wear stages present. The majority of the cattle were culled once they reached prime beef production ages based upon middle fusing (24–42 months = 40% culled). This suggests that cattle were exploited as part of a mixed economy, including beef and secondary products such as traction, milk, manure, hide and horn.

Butchery marks predominantly consisting of chops, were observed in 11% of the cattle assemblage, mostly affecting the metapodials ($n=9$) as well as other meat and non-meat bearing post-cranial elements. The butchered bones were recovered from OA8 deposits. These butchery marks are consistent predominantly with marrow extraction, as well as some carcass dismemberment and portioning.

Ovicaprids

Ovicaprids produced just 11% of the faunal remains from Period 2 (Table 9), with an MNI count of at least five animals recovered predominantly from OA8 deposits (Table 8). Analysis of the epiphyseal fusion data indicates that the majority (96%) of the ovicaprid assemblage survived for approximately 18 months, this trend continued with 92% surviving for two to three and half years, whilst over half (60%) reached three and a half to four years. Analysis of the limited mandible wear stage data ($n=4$) suggests that ovicaprids were culled as part of a non-specialised mixed economy of meat and secondary products, with animals culled between the ages of 6 months–4 years of age (6–12 months $n=2$, one to two years $n=1$, 3–4y $n=1$). The assemblage is represented predominantly by non-meat bearing bones and teeth (67%), indicating that the animals were probably processed within the vicinity of the site.

Butchery marks affect just one post-cranial element recovered from dump fill OA8, consistent with carcass dismemberment and portioning. A single fully fused ovicaprid metacarpal produced a withers height estimation of 61cm from OA8 and at least one possible female ovicaprid has been identified.

Pigs

Pigs are the least abundant of the three main domesticates (Table 9), representing 10% of the faunal remains and producing an MNI count of at least four individuals. Non-meat bearing bones and loose dentition dominate the assemblage, predominantly recovered from OA8 deposits (Table 8). Butchery marks were noted in two post-cranial elements from OA8 consistent with carcass dismemberment and portioning. The limited epiphyseal fusion and tooth wear data available indicates that adult and juvenile animals are present, culled after reaching prime-meat age. The fusion data suggests that 78% of pigs survived for approximately 18 months, with less than half (36%) surviving for two to three and a half years and 23% survived between the ages of three and half to four years. As only one mandible provided wear stage data (14–21 months), the ageing information could not be corroborated. Males and females are present within the assemblage based upon the morphology of the pig canines. A small number of fully fused metacarpals (n=3) produced withers height estimations (Table 13). Metrical data for additional elements are present within the site archive.

Table 13. Period 2 Pig withers height estimations.
MC=Metacarpal

Bone	No.	Max wt	Min wt	Mean	Sd
MC 3	1	69.058			
MC 4	2	74.878	72.783	73.831	1.481

Other Domesticates: Chickens; Geese and Birds

Chickens (n=4) are represented by post-cranial adult bones recovered from occupation and dump layers from OA8. Evidence of at least one cockerel was noted based on the presence of a cockspur. A single goose post-cranial bone was recovered from OA8. Indeterminate bird bones (n=8) consisting of post-cranial elements have been recovered from dumps, occupation layers and made ground features associated with OA8. These birds were likely exploited for their meat, eggs or feathers and possibly sport in the form of cockfighting.

Wild Taxa: Small Mammals and Anurans

There is a dearth of wild taxa in Period 2, with only small mammals and anurans present (Table 9). Bones were recovered from occupation layers, dumps and made ground associated with OA8 and are likely the result of pit-fall traps (O'Connor 2000, 126).

Discussion

The medieval period faunal assemblage from Houghton Street provides an insight into the animal husbandry practices of the time. The faunal assemblage is significantly smaller in size compared to that of Period 1, in particular the main domesticates

of cattle, ovicaprid and pig. Small quantities of chickens and geese would have been exploited for their meat, eggs and possibly feathers. Primary butchery and carcass processing occurred in the area, with animals exploited as part of a mixed economy. The faunal remains from this period are the result of butchery waste and domestic refuse disposal.

Period 3: Early Post-Medieval (c.1475–1770)

The early post-medieval assemblage produced a moderate quantity of faunal remains consisting of 800 fragments recovered from 39 contexts from Periods 3.1–3.4. The majority of the remains have been retrieved from features associated with robber cuts OA13 and occupation layers and dumps OA9, as well as pit fills and pond sediments G8 (Table 8). Identified taxa (Table 9) include the three main domesticates, dominated by cattle (20%), followed by ovicaprids (16%) and pig (4%). Other domesticates include horse (<1%), dog (2%), cat (<1%), chickens (1%) and geese (0.5%). Wild taxa are represented by deer? (<1%), small mammal (<1%), rabbit (<1%), bird (1%) and anuran (0.5%). Moderate quantities of large and medium mammal bones are also present.

Cattle

The cattle assemblage is moderate in size, contributing to 20% of the faunal assemblage from Period 3, producing an MNI count of at least eight animals, recovered predominantly from features associated with occupation layers and dumps from OA9 (Table 8). The majority of the assemblage is represented by non-meat bearing bones, indicating that the animals were probably processed within the vicinity of the site. Analysis of the epiphyseal fusion data indicates that the majority (96%) of the cattle assemblage survived for approximately 18 months, with just over half (59%) surviving for two to three and a half years, whilst just under half (46%) reached three and half to four years. Only two mandibles produced wear stage values of 8–18 months and 18–30 months respectively. The limited ageing profile data suggests there is no clear evidence for the preference of young calves, which is indicative of a dairy herd. The majority of the cattle were culled once they reached prime beef production ages based upon middle fusing (24–42 months = 41% culled) and late fusing (42–48 months = 54% culled) bones. This data indicates that beef production was the primary focus, although a mixed economy is more likely based on the presence of joint disease, which suggests cattle may also have been exploited for traction/ploughing (Holmes 2017, 48, 109). Butchery marks predominantly consisting of chops, were observed in 29% of the cattle assemblage, mostly affecting the metapodials (n=19) as well as other meat and non-meat bearing post-cranial elements. The majority of the butchered bones were recovered from OA9 dumped deposits and the robber cuts from OA13. Smaller quantities of bone were retrieved from pond G8, B4, OA10 and B6. These butchery marks are consistent with marrow extraction, as well as carcass dismemberment and portioning. A single fully fused

metatarsal produced a withers height estimation of 1.17m. Two post-cranial elements from robber cuts OA13 and dump OA9 had been gnawed by canids, suggesting some bones were accessible for a time before being disposed of, whilst burning (charring) was noted in a single post-cranial element from robber cuts OA13.

Ovicaprids

Ovicaprids contribute to 16% of the faunal remains from Period 3 (Table 9), producing an MNI count of at least 10 animals recovered predominantly from features associated with dumping and pits from OA9, as well as OA13 robber cuts and pits from pond G8 (Table 8). Analysis of the epiphyseal fusion data indicates that the majority (95%) of the ovicaprid assemblage survived for approximately 18 months, with half (50%) surviving for two to three and half years, whilst just under half (43%) reached three and half to four years. Analysis of the mandible wear stage data (n=6) indicates that ovicaprids were culled as part of a non-specialised mixed economy of meat and secondary products, with animals culled between the ages of two to eight years of age (two to three years n=1; three to four years n=2; four to six years n=1, 6–8y n=2). The assemblage is represented by meat and non-meat bearing bones, indicating that the animals were probably processed within the vicinity of the site. Butchery marks affect just 17% of the ovicaprid assemblage (n=21) consisting of meat-bearing post-cranial elements, the majority of which were recovered from OA13, pond G8 and OA9 and are indicative of carcass dressing including dismemberment, portioning and marrow extraction. A single fully fused ovicaprid metatarsal produced a withers height estimation of 57.6cm from pond G8.

Pigs

Pigs are the least abundant of the main domestic species present from Period 3 (Table 9), representing just 4% of the faunal remains and producing an MNI count of at least three individuals. The elements present indicate that meat bearing bones dominate the assemblage and were predominantly recovered from OA9 deposits. Butchery marks were noted in four cranial and post-cranial elements all from OA9 (dump and occupation layer) consistent with carcass dismemberment, portioning and possible marrow extraction. Epiphyseal fusion and tooth wear data indicates that only juvenile animals are present, culled after reaching prime-meat age. Canid gnawing was noted in one element from dump OA9.

Other Domesticates: Horses; Dogs; Cats; Chickens and Geese

Horses (<1%) were exploited for transport and traction, a single bone was recovered from the OA13 robber cuts. No evidence for butchery processing or the consumption of horse meat was present. Dogs (2%) would have been exploited as hunting and herding animals, the presence of pathology in the form of joint disease and a healed fracture may

suggest some dogs were cared for. Adult and juvenile cranial and post-cranial remains were recovered from features associated with OA13, OA9, OA10 and pond G8. The presence of metapodials and lack of knife cuts suggests that these animals were not exploited for fur. Three bones produced withers height estimations of 46.5cm, 47.8cm and 48.2cm, in keeping with other Anglo-Saxon dog assemblages (Harcourt 1974, 151–75). Cats were represented by just one post-cranial bone (<1%) from robber cut OA13. No evidence of skinning for fur removal was noted. Chickens (n=11) are represented by post-cranial adult bones recovered predominantly from features associated with OA13 robber cuts and OA9 pit fills. Evidence of at least one cockerel was noted based on the presence of a cockspur. Geese (n=3) are present in small quantities represented by post-cranial adult elements, retrieved from features associated with occupation layer and dump layers associated with OA9 as well as pond G8. A goose tibiotarsus from pond G8 exhibited butchery marks consistent with carcass dismemberment and portioning for consumption. Indeterminate bird bones (n=9) consisting of post-cranial elements have been recovered from pit features associated with OA9. These birds were likely exploited for their meat, eggs or feathers and possibly sport in the form of cockfighting.

Wild Taxa: Deer?; Small Mammals; Rabbits and Anurans

Wild taxa were present in small quantities (Table 9), contributing to <1% of the faunal assemblage from this period. Single specimens of possible deer and rabbit were recovered from occupation layer OA9 and robber cut OA13 respectively, suggesting that these animals were exploited on occasion. Anurans and small mammals were recovered primarily from cellar masonry B5, pit OA9 and construction cuts B4.

Discussion

The early post-medieval (Period 3) faunal assemblage from Houghton Street provides an insight into the animal husbandry practices of the time, indicating a continuation in the utilisation of the local landscape. The faunal assemblage is significantly smaller in size when compared to that of Period 1, in particular the main domesticates of cattle, ovicaprid and pig. Small quantities of chickens and geese would have been exploited for their meat, eggs and possibly feathers. The faunal remains from this period are the result of butchery waste and domestic refuse disposal.

Period 4: Late Post-Medieval (1770–1900)

The late post-medieval assemblage (Period 4) produced the smallest quantity of identifiable faunal remains consisting of 61 fragments from six contexts from both sub-periods (4.1, 4.2) (Table 7). The majority of the remains were retrieved from construction cut fills associated with cesspit S6 and B8 (St Clement Danes Grammar School) (Table 8). Smaller quantities of faunal remains were retrieved from robber cuts for Period 3 building B7 and pits

(OA11). Identified taxa (Table 9) include the three main domesticates; cattle (15%), sheep (11%), ovicaprid (8%) and pig (5%), as well as domestic fowl (2%). Moderate quantities of large and medium mammal bones are present and wild taxa are represented by bird (2%) and small mammal (2%) bones.

Cattle

The cattle assemblage is small in size, contributing to 15% of the faunal assemblage from Period 4, producing an MNI count of at least two animals, recovered predominantly from features associated with cesspit S6 and construction cuts B8 (Table 8). The assemblage is represented by meat and non-meat bearing bones, indicating that the animals were probably processed within the vicinity of the site. Epiphyseal fusion and tooth wear data indicates that most disarticulated bones are osteologically mature, with a small number of juvenile remains also present. Butchery marks, consisting of chops, were observed in 56% of the cattle assemblage recovered from cesspit S6, OA11 and robber cuts for B7, affecting cranial and post-cranial elements (n=5) and indicative of carcass portioning and marrow extraction.

Ovicaprids

Ovicaprids dominate the assemblage contributing to 20% of the faunal remains from Period 4 (Table 9), producing an MNI count of at least two animals recovered predominantly from features associated with the cesspit (S6) and construction cuts (B8) (Table 8). The assemblage is represented by meat and non-meat bearing bones, indicating that these animals were probably processed within the vicinity of the site. Butchery marks affect just 33% of the ovicaprid assemblage (n=3) and are indicative of carcass dressing including portioning and marrow extraction, recovered from S6 and B8. The presence of canid gnawing in a butchered ovicaprid pelvis fragment from cesspit (S6) suggests that bones were accessible for a time before final deposition. Ageing data indicates that the majority of the animals were osteologically mature. Epiphyseal long bone fusions suggests that some animals (n=2) were culled before reaching adulthood at approximately 6–10 months and 30–42 months respectively, whilst analysis of the mandible wear stage data (n=2) indicates that two ovicaprids were culled at three to four years and six to eight years, suggesting that they were exploited for secondary products, rather than culled primarily for meat.

Pigs

Pigs are the least abundant of the main domestic species present from Period 4 (Table 9), representing just 5% of the faunal remains and producing an MNI count of at least one individual. Analysis of the elements present indicate that meat bearing bones (n=2) dominate the assemblage (n=3). Epiphyseal fusion data indicates that only juvenile animals are present, culled after reaching prime-meat age. These

bones were retrieved from features associated with cesspit S6, robber cuts B7 and construction cuts B8.

Other Domesticates: Chickens

A single subadult chicken radius fragment was recovered from the robber cut backfill of B7.

Wild Taxa: Birds and Small Mammals

Wild taxa were present in small quantities (Table 9), contributing to 4% of the faunal assemblage from this period. A single bird ulna fragment and small mammal tibia fragment were recovered from a construction cut backfill of B8.

Discussion

The late post-medieval (Period 4) faunal assemblage from Houghton Street is limited in size and is the smallest collection of faunal remains from the entire assemblage. The faunal remains from this period are the result of butchery waste and domestic refuse disposal.

FISH BONES

Hayley Forsyth-Magee

Introduction

The excavations at Houghton Street produced a large assemblage of 2,588 fish remains. The majority of the assemblage derives from Period 1 Middle Saxon (AD c.730/750–850) sub-periods 1.2–1.4, with remains recovered predominantly from pit (OA14, OA4) and well (OA5, OA14) features. Smaller quantities of fish remains were also recovered from Period 2 medieval (c.1200–1375), Period 3 early post-medieval (c.1475–1770) and Period 4 late post-medieval (1770–1850). This assemblage provides a chance to analyse the diet and fish husbandry regimes of the inhabitants of *Lundenwic*.

Methodology

Fish remains were predominantly recovered from environmental samples; only five bones were retrieved by hand collection. Bulk samples were processed using a combination of floating and wet and dry sieving. Wet samples were sieved and sorted to 250 microns and dry residues were sieved and sorted to 2mm. A selection of sample residues were retained due to the inclusion of fish bones. A total of 234 samples were processed, of which 67 contained fish bones. The assemblage has been recorded onto an Excel spreadsheet. Wherever possible the fragments have been identified to family group or species and the skeletal element represented, utilising the authors modern comparative reference collection along with reference to Cannon (1987), Wheeler (1978) and Wheeler and Jones (2009). All fragments were counted with the major skeletal elements recorded to taxonomic level where possible. Elements that could

Table 14. Fish bones NISP (Number of Identifiable Specimens) by feature and period

Feature	Period						
	1.2	1.3	1.4	2	3	4	
Construction cut							1
Ditch		74					
Dump	4		1	17			
Dump layer	3						
Gully		44					
Levelling deposit/dump			85				
Made ground				17			
Occupation layer	29	2	21	66	1		
Pit		1109			1		
Pit, Quarry		243					
Pit, Refuse		24					
Robber cut							1
Wall					46		
Well		799					
Total	36	2295	107	100	48	2	

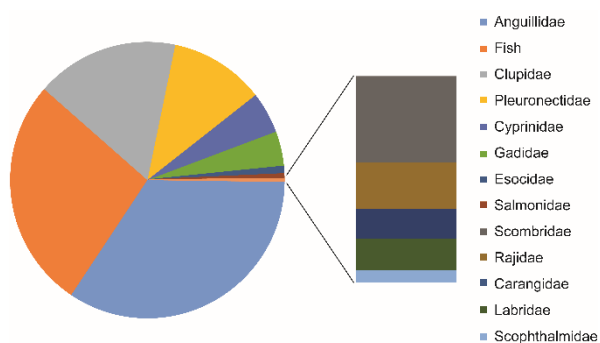


Fig 39. Percentage of fish families present in the assemblage

not be confidently identified to species have been classified to family level, with undiagnostic fragments recorded as indeterminate 'Fish'. The bones have been examined for taphonomic alterations (butchery, burning, crushing, acid etching) and pathology. Measurements have been recorded where possible and follow Morales and Rosenlund (1979). The fish bones were also compared with modern specimens of known size.

Assemblage

A total of 2,588 fish remains have been recovered, of which 1,880 (73%) have been identified to family or species level (excluding indeterminate fish). The bulk of the assemblage was retrieved from environmental samples ($n=2,583$), with only five bones recovered by hand-collection. The majority of the bones are in a good state of preservation, although few complete and measurable bones were recovered. Vertebrae were the most commonly occurring element ($n=1909$), with very few cranial bones recovered. Fish

cranial bones are generally much more fragile than robust vertebral elements and are often affected by taphonomic processes within the buried environment (Nicholson 1992; Wheeler & Jones 2009). The hand-collected assemblage included robust bones; cranial elements consisting of a pharyngeal ($n=1$) identified to plaice (*Pleuronectes platessa*), and parasphenoid fragments ($n=3$) identified to cod (*Gadus morhua*), Gadidae (cod family) and indeterminate fish. Post-cranial elements included an anal pterygiophore identified as plaice. A small quantity of Gadid and Pleuronectidae vertebrae were also recovered through hand collection.

The majority of the assemblage was recovered from the Period 1 Middle Saxon deposits ($n=2,438$) (Table 14), with the greatest quantities of fish bones predominantly recovered from Period 1.3 well ($n=799$, OA5, OA14) and pit ($n=1109$, OA14, OA4, OA6) features. Smaller quantities of fish bones were also recovered from the fills of Period 1.3 ditches (D1, D4, D5, RW1), Period 1.4 levelling deposits (OA7), Period 1.3 gully (RW1) and Period 1.2 occupation layers (OA3; 1.3 OA5; 1.4 OA7) across the site.

The medieval deposits (Period 2), produced a small collection of fish ($n=100$) recovered from occupation layers ($n=66$), made ground ($n=17$) and dumps ($n=17$) associated with OA8. The early post-medieval deposits (Period 3) produced an even smaller quantity of fish remains ($n=48$) from wall B5 ($n=46$), occupation layer OA9 ($n=1$) and a possible pond G8 ($n=1$) feature. Late post-medieval deposits (Period 4) contained just two bones recovered from robber cuts for Period 3 building B7 and the construction cut of the school building B8.

A range of marine, migratory and freshwater fish have been identified from the Houghton Street assemblage (Table 15 & Fig 39). The species of fish most commonly represented was eel (*Anguilla anguilla* 34%), followed by Clupidae species (17%) (herring family) in particular twaite shad (*Alosa fallax* 10%) and right-eye flounder species of Pleuronectidae (11%) consisting mostly of plaice (*Pleuronectes platessa*) and flounder (*Platichthys flesus*) (9%). Cyprinids make up 5% of the assemblage, followed by Gadidae taxa (4%). Smaller quantities of pike (*Esox lucius*), salmonids (*Salmo trutta*), mackerel (*Scomber scombrus*), thornback ray (*Raja clavata*), scad (*Trachurus trachurus*), ballan wrasse (*Labrus bergylla*) and possible turbot (*Psetta maxima*) were also present.

A moderate quantity of fish bones underwent taphonomic alterations and a smaller quantity showed evidence of butchery marks (Table 16). The majority of these alterations occurred in fish remains from Period 1, only two of the affected bones were recovered from Period 2.

Period 1: Middle Saxon (c.AD 730/50–850)

The Middle Saxon assemblage (Periods 1.2–1.4) produced the largest collection of identified fish remains (Table 15) consisting of 2,438 specimens derived from 61 contexts. The majority of the assemblage was recovered from environmental sampling ($n=2,436$), only two bones were recovered by hand collection. Fish remains were predominantly

Table 15. Fish Species NISP (Number of Identifiable Specimens) by Period

Taxa	Period						Total
	1.2	1.3	1.4	2	3	4	
<i>Raja clavata</i> (thornback ray)		2		1			3
<i>Anguilla anguilla</i> (eel)	8	823	15	20	8		874
<i>Clupea harengus</i> (herring)	5	109	3	15	4		136
<i>Alosa fallax</i> (twait shad)	8	234	13	13	2		268
<i>Clupeidae</i> (herring family)	1	36		2			39
<i>Cyprinidae</i> (carp family)		105	3	5			113
<i>Barbus barbus</i> (barbel)		4					4
<i>Leuciscus leuciscus/cephalus</i> (dace/chub)			1				1
<i>Rutilus rutilus</i> (roach)		12					12
<i>Salmonidae</i> (salmon family)		5					5
<i>Salmo salar</i> (Atlantic salmon)		7					7
<i>Esox lucius</i> (Northern pike)	1	20	1				22
<i>Gadidae</i> (cod family)	1	57	7	1		1	67
<i>Gadus morhua</i> (cod)		16					16
<i>Melanogrammus aeglefinus</i> (haddock)		4	2	1			7
<i>Merlangius merlangus</i> (whiting)		2	6	1			9
<i>Merlangius merlangus?</i> (cf. whiting)		1					1
<i>Trachurus trachurus</i> (scad)		2					2
<i>Labrus bergylla</i> (ballan wrasse)	1			1			2
<i>Scomber scombrus</i> (Atlantic mackerel)			4				4
<i>Psetta maxima?</i> (turbot)		1					1
<i>Pleuronectidae</i> (righteye flounder family: plaice/flounder/dab/lemon sole)	3	198	24	13	4		241
<i>Pleuronectidae</i> (plaice/flounder)		19					19
<i>Pleuronectes platessa</i> (plaice)		21				1	23
<i>Limanda limanda</i> (dab)		2					2
Indeterminate Fish	8	615	28	27	30		708
Total	36	2295	107	100	48	2	2588

Table 16. Butchery and taphonomic alterations

Taxa	Butchered	Crushed	Burning	Calcined
<i>Anguilla anguilla</i>	1	265		2
<i>Clupeidae</i>		1	1	
<i>Clupea harengus</i>		6		7
<i>Alosa fallax</i>			2	
<i>Gadidae</i>		1		2
<i>Gadus morhua</i>	1			
<i>Melanogrammus aeglefinus</i>		1		
<i>Merlangius merlangus</i>			1	
<i>Trachurus trachurus</i>		2		
<i>Pleuronectidae</i>		2		
Fish	3	4	1	2
Total	5	282	5	13

derived from Period 1.3 pit (OA14, OA4, OA6) and well (OA5, OA14) features.

Eel (*Anguilla anguilla*), a migratory species, dominates the assemblage considerably by 35%, similar to the assemblages from Maiden Lane (Locker 1988, 149–50), National Gallery Basement and the

Peabody site (Locker 1989, 148), as well as Parker Street (Forsyth-Magee 2021) and the *Lundenwic* sites F, J, N and R (Rielly *et al* 2012, 142–3). Cranial and post-cranial elements are present, with the majority of eel bones represented by vertebral centra (n=826), recovered primarily from refuse/cesspits associated with OA14. A small number of complete cranial bones were present, with measurements suggesting total lengths spanning 180–470mm (referencing Libois *et al* 1987). These figures are similar to the eel assemblage from The Peabody site and the National Gallery Basement (Locker 1989, 149), these measurements are within the range for male, or possibly small female eels (Wheeler 1978, 62). A number of vertebral elements (n=264) exhibited signs of crushing (Table 16) as a result of mastication. The retrieval of the majority of these elements from refuse/cesspit fills [1140] and [1542] (n=257) (OA14) indicates that they were probably consumed and passed through the gut (Butler & Schroeder 1998; Jones 1984; Nicholson 1993; Wheeler & Jones 2009).

The size of eel vertebrae suggests that these fish were caught locally. Yellow eels (young eels) were often caught in large numbers as they travelled upstream, or as maturing adults (silver eels) as they migrated back to the sea during the months of November to January (Wheeler 1979, 140–2; Wheeler & Jones 2009, 164). None of the eel bones were small

enough to be elvers. The River Thames is close to Houghton Street (Fig 1), making it the most likely source of eel exploitation. These fish would have been caught in traps such as eel-bucks and weirs, examples of which have been documented in the River Thames (Cowie & Blackmore 2008, 115–24), or speared (Reynolds 2015, 184). A single butchery mark affecting a cleithrum from the fill of refuse/cesspit [1541] (OA14) indicates that eels were processed and consumed on site.

Taxa from the Clupidae (herring) family (17%) are the next most abundant species from this assemblage and include twaite shad (10%) as well as herring (5%) (Table 15). The majority of these remains were recovered from wells (OA5, OA14) and pits (OA4, OA14, OA6). Twaite shad, a migratory fish, could have been caught in the Thames during breeding season (Locker 1989, 149). These fish greatly outnumber herring and are found in other Saxon assemblages in varying quantities (Reynolds 2015, 96). At Houghton Street, the majority of twaite shad bones consist of vertebral centra (n=250), with only three cranial elements present, whilst herring are represented solely by vertebrae. The majority of the cranial elements from these two species are very fragile and often do not survive well in the buried environment.

Herring, also a migratory marine fish, were present in much smaller numbers than eel which may be explained by local dietary preferences and fishing methods. This is mirrored in a number of other London sites including the National Gallery Basement (Locker 1979), the Royal Opera House (Rielly 2003), Jubilee Hall (Locker 1988) and *Lundenwic* sites F, J, N and R (Rielly 2012b). Herring are a seasonal resource, migrating annually to spawn and are often found in the Channel during winter months (Kowaleski 2010, 119–20). Herring shoals would have been caught in the Thames estuary (Serjeantson & Woolgar 2006, 116–17) and in-shore waters (Wheeler 1978, 66–7; 1979, 171–2) using hook and line, as well as from the North Sea, using nets (Locker 1989, 149). A small number (n=7) of herring vertebrae had been crushed as the result of mastication (Table 16), these elements were recovered from the fills of refuse/cesspit [1143], pit [1044] (OA14), a ditch [1175] (RW1) and a well [1079] (OA14).

Flatfish are represented by right-eyed species (11%) of Pleuronectidae consisting of plaice, flounder and dab (Table 16). The majority of these elements are represented by vertebral centra (n=238), as well as cranial elements (n=29), recovered predominantly from Period 1.3 pits (OA4, OA6, OA14) and wells (OA5, OA14). Flatfishes could have been caught using lines and nets (Locker 1988, 149) or weirs (Reynolds 2015, 117–57) from the Thames estuary and surrounding shorelines. The flatfish vertebrae at Houghton Street are small in size, indicating the presence of juvenile specimens. A single specimen of turbot was tentatively identified, a left-eyed flatfish species, this fish may have been caught from the estuary and shallow inshore waters (Wheeler 1978, 344). Unlike other Saxon fish assemblages from the London area (Locker 1988; 1989, Rielly 2003; 2012) the numbers of flatfish at

Houghton Street are present in greater abundance than those of the Cyprinidae family, possibly indicating a dietary preference as well as a variation in fishing methods.

Cyprinids represent just 5% of the fish remains from Houghton Street, recovered mostly from sub-period 1.3 and consisting predominantly of vertebral centra. This is a large freshwater family with morphologically similar bones and in most cases only the pharyngeal bones can be identified to species. Roach (n=12) and dace/chub (n=1) pharyngeal tooth plates have been positively identified, as well as a small quantity of barbel serrated spines (n=4). The majority of these fish bones were recovered from wells (OA5, OA14) and pits (OA4, OA6, OA14). Smaller quantities were present in ditch (D1), gully (RW1) and levelling deposit/dump fills (OA7). Pike (1%) were identified within the assemblage (n=22), represented by small vertebrae which suggests juvenile/young (jacks) fish may have been caught using rod and line (Locker 1988, 149). The quantity and size of these fish bones indicate that pike were not frequently exploited as a food resource. Salmonids (0.5%), a migratory riverine fish were identified by vertebral centra. Salmonid remains are affected by preservation levels more so than other species (Wheeler & Jones 2009, 62) and may be under-represented within the assemblage.

Gadids are present in small quantities, representing only 4% of the assemblage and consist of cod family, cod, whiting and haddock (Table 16). Of the gadids present the cod family and cod taxa include cranial as well as post-cranial elements, a number of which are from specimens approximately 1m in length. The low numbers of cranial bones compared to that of post-cranial bones could suggest that some cod were preserved as salt or stock fish (Hagen 1995, 157; Holterman 2016; Rielly *et al* 2012, 142–3; Serjeantson & Woolgar 2006, 107–16). Cod, until the 13th century, was fished locally from the North Sea (Barrett *et al* 2011; Orton *et al* 2014), after which it was imported from further afield. Haddock live close to the seabed and would have been caught using lines, whilst whiting are common in shallow inshore waters and would have been caught using lines or nets. These fish could have been caught locally in the North Sea close to the Thames estuary and transported upriver by boat (Locker 1988, 149). Butchery and taphonomic alterations were present in a small quantity of remains; a chop mark was noted in a single cod caudal vertebra recovered from well fill [1096] OA14 and suggests that some fish processing occurred onsite. Crushing by mastication was also noted in single specimens of haddock and Gadidae vertebra from levelling deposit [1356] OA7 and pit [1395] OA4 respectively. Burning was recorded in two calcined Gadidae vertebrae [1373] and one charred whiting vertebra [1385] from quarry pits OA4. Gadidae species were the least abundant of the major species (eel, Clupeids, Cyprinids and flatfish) from the majority of the *Lundenwic* sites (Rielly *et al* 2012, 142–3) with the exception of the fish assemblages from Bull Wharf (Rielly 2000) and the Royal Opera House (Rielly 2003). Gadidae are also less prevalent at Maiden Lane and Jubilee Hall (Locker 1989, 149–50), compared with the Late Saxon assemblage from

Pudding Lane and medieval finds from Trig Lane in the City of London (Locker 1986). The quantity of Gadidae remains typically increases in late Saxon and medieval assemblages (Locker 1988; Serjeantson & Woolgar 2006, 110–14), although this was not observed within the Houghton Street assemblage. These patterns of fish husbandry can likely be attributed to local preference and population pressures (Locker 2018, 36–43; Rielly *et al* 2012, 142–3; Serjeantson & Woolgar 2006, 107–16). Other marine fish identified within the assemblage include mackerel, thornback ray, scad and ballan wrasse (Table 16), the quantities of which are small.

Discussion

The fish remains recovered from Houghton Street represent that of domestic food waste (kitchen and table waste). The taxa present are comparable to the main species of eel, Clupeids, Cyprinids, flatfish and Gadidae recovered from other Middle and Late Saxon sites in England (Holmes 2014, 183–96; Locker 2018, 34–42). The species present in the assemblage reflect local fishing in the River Thames, with a preference for freshwater and migratory fish over marine species. The dominance of eel freshwater catches is comparable with the sites of *Lundenwic* (Rielly *et al* 2012, 142–3), Maiden Lane (Locker 1988, 149–50), the National Gallery Basement (Locker 1989, 148–150), The Peabody site (Locker 1989, 148–50) and Parker Street (Forsyth-Magee 2021). This suggests that the consumption of eel was the result of the exploitation of an abundant local resource that was available throughout the year (Wheeler & Jones 2009, 164).

There is some possible evidence for deep-water fishing with the presence of larger cod within the assemblage, although large marine fish were not present in abundance, suggesting that anglers favoured the exploitation of local coastal, inshore and estuarine waters. However, no large-scale commercial processing of fish was evident, which indicates fish were caught more for local subsistence. The lack of fish remains recovered from Period 1.1 (pre-AD 730/50) is likely due to recovery bias, given that very few microfaunal remains were represented within the animal bone assemblage. The intensification of fish remains in Period 1.3 is also reflected within the animal bone assemblage, indicating that animal husbandry practices and exploitation of wild resources peaked at this time.

Period 2: Medieval (c.1200–1375)

The medieval assemblage (Period 2) produced a significantly smaller quantity of fish remains compared to Period 1, consisting of 100 specimens recovered entirely from six bulk-sampled contexts. Eel (*Anguilla anguilla*) dominates the assemblage by 20%. Followed by taxa from the Clupidae (herring) family with herring (*Clupea harengus*) and twaite shad (*Alosa fallax*) contributing to 15% and 13% of the assemblage respectively, and Clupids at 2%. Right-eye flatfishes consisting predominantly of plaice (*Pleuronectes platessa*) and flounder (*Platichthys flesus*)

contributed to 13% of the assemblage from Period 2. Cyprinidae, freshwater species, produced 5% of the assemblage, whilst Gadidae (cod family), a marine family including haddock (*Melanogrammus aeglefinus*) and whiting (*Merlangius merlangus*), contributed just 3%. Less frequent taxa included thornback ray (*Raja clavata*) and ballan wrasse (*Labrus bergylla*) (Table 15). Fish remains were predominantly recovered from occupation layers from OA8 (n=66), followed by dumps (n=17) and made ground (n=17) features, also associated with OA8. The majority of the assemblage consists of post-cranial elements, with vertebra dominating (n=75).

The main species present are comparable to the popular fish species of eel and herring recovered from other medieval sites in England (Holmes 2017; Serjeantson & Woolgar 2006). However, unlike the majority of these sites, which favour herring as well as cod family species, eels dominate the assemblage at Houghton Street, which is more in keeping with the Period 1 assemblage. Medieval fish assemblages are more often than not dominated by herring and cod due to their extensive natural distributions, abundance and suitability for preservation (Barrett 2016, 5). Compared with the majority of fish assemblages from this period, the quantity of Gadidae remains are much smaller in number (Table 15) (Barrett & Orton 2016; Holmes 2017, 289–91; Serjeantson & Woolgar 2006, 107–14).

The presence of eel cranial and post-cranial elements suggests that these migratory fish were consumed as fresh, whole specimens. Eels would have been caught during their seaward migration, the main season of which fell between November to January (Wheeler 1979, 62). These fish were likely caught locally using traps such as eel-bucks and weirs, from the river Thames (Locker 1988, 149; 1995, 111–13). Single specimens of eel caudal and precaudal vertebra had been crushed and calcined (Table 16), suggesting that eels were consumed on site (Butler & Schroeder 1998; Jones 1984; Nicholson 1993; Wheeler & Jones 2009, 74). However, there is no direct evidence for consumption and no acid erosion to indicate digestion or retrieval from cesspits.

Clupidae species including herring and twaite shad are represented by vertebral elements only, as cranial elements are extremely fragile and often do not survive the buried environment. Herring, a marine species, are a seasonal resource, migrating annually to spawn and are often found in the Channel during winter months (Kowaleski 2010, 119–20). Shoals of herring would have been caught in the Thames estuary (Serjeantson & Woolgar 2006, 116) and inshore waters (Wheeler 1978, 66; 1979, 171–2), before they began to be exploited more intensively by fisheries in the North Sea (Kowaleski 2016). Twaite shad is a close relation of herring, although this fish does not share the same popularity as its relation in the medieval period. It is not particularly valued as a food, being rather dry and full of bones (Wheeler 1979, 65–6), despite this 13% of the medieval assemblage has been identified as Shad (twaite).

Plaice and flounder are represented by a small quantity of caudal vertebrae recovered from occupation layers, made ground and dump features associated with OA8. The flatfish at Houghton Street

are small to medium in size, which suggests they were caught in the Thames estuary and fished for using lines (Locker 1988, 149) or fish weir traps (Cowie & Blackmore 2008, 115–24; Rielly *et al* 2012, 142–3). Flatfish had an enhanced cash value (Serjeantson and Woolgar 2006, 117), indicating that certain inhabitants may have consumed a high-status diet. Cyprinids, a freshwater family, were represented by a very small quantity of vertebrae and a fragmented pharyngeal tooth plate, recovered from occupation layers (OA8) and made ground (OA8), respectively. The lack of freshwater fish at Houghton Street is somewhat common (Locker 2018, 36–41; Serjeantson & Woolgar 2006, 123–6).

Gadids, consisting of cod, haddock and whiting are represented by caudal vertebrae, recovered from occupation layers and dump features associated with OA8. Cod and haddock usually contribute to the bulk of medieval fish assemblages, their size producing a greater meat yield than smaller species such as herring (Serjeantson & Woolgar 2006, 117), however, this is not typical of the Houghton Street assemblage. The small size of the gadidae vertebrae make it unlikely that these remains are the waste from imported salt fish or stockfish (Hagen 1995, 157; Nicholson 2006, 367; Rielly *et al* 2012, 142–3; Serjeantson & Woolgar 2006, 105, 115). The lack of skull fragments suggests that the majority of the fish were decapitated fresh (Wheeler & Jones 2009, 68–9), before being disposed of, although some specimens may have been preserved by salting or drying (Holmes, 2014, 50; Rielly, 2007, 331–35; Rielly *et al* 2012, 142–3), allowing fish catches to be transported further inland without spoiling. Isotopic signatures from cod bones recovered from urban London sites from the 13th–14th centuries indicate that fish were being caught from further afield; suggesting the demand for cod may have outstripped local supply (Orton *et al* 2014). There is however no evidence for large-scale commercial processing of fish within this assemblage, which indicates fish were caught and consumed more for local subsistence. Imported stockfish from Scandinavia and Scotland start to become more common during the 13th to 14th centuries, especially in London (Orton *et al* 2014). Isotope analysis revealed evidence of the stockfish trade came from as far as Newfoundland in the cargo onboard the 1545 wreck of the Mary Rose (Hutchinson *et al* 2015). Single specimens of thornback ray and ballan wrasse were also present within the assemblage and could have been caught from estuary and inshore waters.

Period 3: Early Post-Medieval (c.1475–1770)

The early post-medieval assemblage (Period 3) produced a small assemblage of identified fish remains, consisting of 48 specimens recovered from three contexts (Tables 14, 15). The majority of the fish remains were retrieved from environmental sampling, with one bone recovered by hand collection. The taxa identified includes eel (*Anguilla anguilla*) (17%), herring (*Clupea harengus*) (8%), Pleuronectidae species (plaice/flounder) (8%) and twaite shad (*Alosa fallax*) (4%). Indeterminate fish

(62%) dominated the majority of the assemblage, consisting of spines, rays, scales and cranial fragments. The majority of the fish remains were recovered from a masonry cellared building located on Houghton Street B5 (n=46) and likely represent domestic refuse comprised of kitchen/table waste. A single plaice/flounder (*Pleuronectidae*) caudal vertebra was recovered from an occupation layer within OA9, and an indeterminate hand-collected fish cranial fragment was recovered from a possible pond G8.

Eels continue in their popularity from the medieval period as a dietary staple (Holmes 2017, 38). The presence of cranial and post-cranial eel bones suggests that these fish were consumed as whole, fresh specimens, probably caught locally from the Thames. Young eels were often caught in large numbers, using traps such as eel-bucks, in the River Thames (Cowie & Blackmore 2008, 115–24) as they travelled upstream, or as maturing adults as they migrated back to the sea during the November–January months (Wheeler 1979, 62; Wheeler & Jones, 2009, 164).

Herring, a marine species of fish, are represented by post-cranial elements and consist only of vertebrae. Herring cranial elements consist of fragile bones, the absence of which does not necessarily mean that only preserved specimens were consumed at Houghton Street. Compared to the medieval (Period 2) assemblage, herring numbers declined significantly (Holmes 2017, 39). Amongst other factors herring were regarded as an inferior species to stored white-fleshed fish by the elite classes in the later 16th century (Locker 2016, 100–1). Eels, as well as white-fish, are more favoured at this time (Serjeantson & Woolgar 2006, 107). As herring are a seasonal resource most of these fish would have been consumed as preserved fish (salted, pickled and/or smoked), increasing the longevity of the fish without spoiling the flesh, making a seasonal resource available year-round (Locker 2016, 100; Serjeantson & Woolgar 2006, 116–17; Wheeler & Jones 2009, 159–60). Until the adoption of the Protestant doctrine during the English Reformation (1547–53) people were not supposed to eat meat or poultry on Fridays or during Lent, but instead they were permitted to eat fish. The ending of this religious dietary prohibition combined with a change in dietary preferences, saw herrings become cheap and as a result they were consumed by the poor (Locker 2016, 100–1), whilst London's growing population saw an increase in the quantities of red (salted, ungutted and smoked) and white (gutted, salted and stored in salt or brine) herrings by the 18th century, often imported (*ibid*, 103–4). Fresh fish became more popular by the 19th century and the use of trawlers and ice/refrigeration enabled larger catches to be fished and stored to meet the demands of the growing population (*ibid*, 104–6). Herring was still one of the most popular fish species at this time (Barrett & Orton 2016) and the methods of preserving them produced milder cures to keep up with changing tastes (Locker 2016, 104). Twaite shad, an anadromous species and member of the herring family, was recovered in small quantities (n=2) from B5. Similarly to herring, only post-cranial vertebral elements were present. This fish could have been caught from the tidal reaches of the Thames as it migrated upriver for breeding.

Flatfish (probably plaice/flounder) were present in small quantities similar to that of herring (n=4) and consist of cranial and post-cranial elements, suggesting that whole fish were caught and consumed in the vicinity. Plaice/flounder are often found in and around the estuaries and inshore coastlines and would have been caught using lines and nets. White-fleshed fish species regarded as 'low grade' such as plaice/flounder were often sold cheaply as 'fryers' with bread in the 19th century as the demand for fresh fish increased (Locker 2016, 105).

There is a distinct lack of Gadidae species, likely affected by a range of social and economic factors (Barrett & Orton 2016; Locker 2000, 270–82; 2016, 104–6). Indeterminate fish bones include cranial fragments (n=3) recovered from pond G8 and B5, spine/rib/ray fragments (n=24) and scales (n=3), also from features associated with B5.

Period 4: Late Post-Medieval (1770–1900)

The late post-medieval period produced just two hand-collected fish remains consisting of a possible large Gadid (cod family) parasphenoid fragment and a moderately sized plaice (*Pleuronectes platessa*) pharyngeal, recovered from construction cut B8 and robber cut for B7, respectively (Tables 14, 15). The presence of cranial remains suggests that these fish were caught locally as fresh specimens and likely represent discarded domestic refuse, possibly the result of scavenged waste. Large cod would have been caught from deep waters using substantial seaworthy boats (Serjeantson & Woolgar 2006, 107). The presence of the parasphenoid suggests that this particular fish arrived fresh and whole, rather than being preserved as dried and salted cod, the popularity of which began to decline during this period (Locker 2016). Plaice are migratory fish and medium-sized specimens would have been caught in and around the inshore coastline using lines and nets.

PLANT REMAINS

Mariangela Vitolo

Introduction and Methodology

A two stage post-excavation assessment of environmental samples from Houghton Street was carried out first on a preliminary selection of 75 contexts and a further selection of 30 contexts. The majority of sampled contexts did not produce botanical remains and in the features where these were present their density was low.

Following assessment, samples from eight Middle Saxon deposits (Period 1) were identified as being worthy of plant macrofossils analysis. The recommended samples originated from a range of features, mostly pits, either refuse or quarry pits, but also from a well and a ditch. The majority produced only charred plant remains although a possible cesspit [1143] (OA14) also yielded remains preserved through mineral-replacement, whilst anoxic conditions are likely to have occurred in some features, such as well [1080] (OA14) (Table 17).

Dry flots were analysed in their entirety, but the residue from sample <64>, which produced a large number of mineralised matter, was sub-sampled. Flots were passed through graded sieves and then sorted under a stereozoom microscope at 7-45x magnifications. Macrobotanical remains were identified through comparison with published reference atlases (Cappers *et al* 2006; Jacomet 2006) and a modern botanical reference collection. Nomenclature used follows Stace (1997) for the wild plants and the cereals traditional classification as outlined in Zohary and Hopf (2000, 28 table 3, 65 table 5). Most weed ecology information is sourced from Stace (1997) and Grime *et al* (1988). Macrobotanical taxa are listed in Tables 17 and 18.

Results

Charred and Waterlogged Plant Remains

Free-threshing wheat (*Triticum aestivum/turgidum/durum*) and hulled barley (*Hordeum* sp) were the most commonly occurring cereals on site. Chaff of either genus were not preserved and therefore it was not possible to identify them down to species level. Two twisted caryopses from [1374] (G18, OA4) indicate the presence of six-row barley (*Hordeum vulgare*), although the co-presence of two-rowed barley cannot be ruled out. Rye (*Secale cereale*) grains were much less common and it is not clear whether rye was grown on its own or perhaps as a maslin.

Remains of edible wild plants included elder (*Sambucus nigra*), bramble/raspberry (*Rubus sect Glandulosus*) and hazel (*Corylus avellana*). As these species were recovered in small amounts there is no evidence of their systematic collection for consumption or of their cultivation.

Arable weeds included wild grasses such as brome (*Bromus* sp), meadow grasses/cat's tails (*Poa/Phleum* sp), small indeterminate legumes (Fabaceae), clover/medick (*Trifolium/Medicago* sp), bedstraws (*Galium* sp), goosefoot (*Chenopodium* sp.), red shank/amphibious/pale persicaria (*Persicaria maculosa/amphibia/lapathifolia*), common chickweed (*Stellaria media*), stinking chamomile (*Anthemis cotula*).

A number of uncharred seeds from well [1080] (OA14) could be modern contaminants that infiltrated the deposit through root action or could be contemporary with the deposit and have preserved in anoxic conditions. The periods of waterlogging that allowed for such conditions could have been permanent or intermittent. These remains included remains of edible fruits such as fig (*Ficus carica*), bramble/raspberry and elder as well as stinging nettle (*Urtica dioica*) and knotgrass family (Polygonaceae) (Table 17).

Mineralised Plant Remains

Sample <64>, from a feature interpreted as a refuse or cesspit, yielded a large amount of mineralised seeds and insect remains. In addition to the biological material that probably mineralised after passing through the human digestive tract, various type of

rubbish seems to have been thrown into the feature, such as charcoal, fish bone, ceramic building materials and slag.

The botanical assemblage was dominated by whole or fragmented apple/pear (*Malus/Pyrus* sp) pips as well as indeterminate large legumes (*Vicia/Lathyrus/Pisum* sp), only a few of which were tentatively identified as garden pea (*Pisum sativum*) and common vetch (*Vicia sativa*), whilst the others had lost their *hilum* and *testa*. Flax (*Linum usitatissimum*), bramble/raspberry and elder seeds were less common. Cereal caryopses were frequent and included rye, free-threshing wheat and a possible oat (cf *Avena* sp). Crop weeds, such as knotgrass (*Polygonum aviculare*), knotgrasses/docks (*Polygonum/Rumex* sp), black bindweed (*Fallopia convolvulus*), fat-hen (*Chenopodium album*) and brome (*Bromus* sp) were also frequent. Apart from seeds, fragments of fruit skins also occurred. The remainder of the residue largely contained amorphous mineralised material which so far remains unidentified. Much of this is likely to consist in fragments of the botanical material identified in the assemblage or mineralised 'concretions'.

Discussion

The bulk soil samples from Houghton Street have produced a small assemblage of charred, mineralised and possibly waterlogged plant remains. The combination of different modes of preservation at the site has allowed for a wide array of remains to be preserved and giving an all-round insight into the diet and economy of the residents of the site during the Middle Saxon period. Cereals such as free-threshing wheat, barley including six-rowed, and rye were probably the most important economic crops. The single possible oat could have derived either from a weed or a crop. Cultivated pulses, including peas and vetches, complemented the cereal based diet alongside fruits and nuts. Vegetable gardens or orchards are likely to have been present, containing trees and shrubs carrying apple or pear, fig, elder, bramble and hazelnut. Flax could have been grown either for its oily seeds, which can be consumed whole added to bread or ground into flour, or for use as textile. It is likely that both uses were in place. Some of the wild seeds, for example fat-hen, black bindweed and brome, could also have been consumed as that is a known practice in the Anglo-Saxon period (Hagen 1995, 26). However, the Houghton Street assemblage does not indicate cultivation or intentional collection of such plants for the purpose of human consumption.

Both the charred and mineralised assemblages consist of seeds of crops and their associated weeds, but no cereal chaff was found. The absence of chaff is partly due to only free-threshing cereals being present. The chaff of free-threshing cereals can be under-represented because it is removed during the early stages of crop processing which were carried out away from settlements. In addition, after the cleaning of the crops chaff can be used for fuel or animal feed, thus disappearing from the archaeological record.

The majority of the recovered weed seeds are in a fairly large size range. The smaller seeds would have been filtered out through systems of sieving early on in the cereal processing, but unless they were tolerated contaminants, there would have been no other way of eliminating large seeds than through hand-sorting them from the crop seeds. The assemblages appeared to not have undergone this stage yet, which perhaps was carried out piecemeal, on a day-to-day basis, as and when required.

The range of weed taxa is fairly restricted and broadly similar in the charred and mineralised assemblages. These weeds are generally indicative of open grassland or disturbed ground and in general are not indicative of determinable soil conditions, bar a few exceptions. Some heavy clay soils are likely to have been under cultivation as the presence of a single seed of stinking chamomile from quarry pit [1395] indicates. The presence of only one seed of this species is linked to the generally small number of small headed seeds in the assemblage. The mixture of nitrophilous taxa (fat-hen) as well as others species indicative of low nutrients in the soil (clover/medick, black bindweed) could indicate a mixed origin of rich and poor for the cereal crops. Whilst barley for example is tolerant of different soil conditions, free-threshing wheat requires more labour and resources input. Other crops, such as flax or the cultivated pulses could have been used in a system of crop rotation along with the cereals, as legumes are known to restore nutrients in impoverished soils.

The archaeobotanical assemblage from Houghton Street is comparable to others recorded elsewhere in Saxon London. The range of economic plants, including cereal crops to legumes and fruits and nuts, is similar to those at The National Portrait Gallery (Carruthers 2004) and at 28–31 St James Street (Hunter 2004). The sparsity of cereal remains and the relatively clean nature of the crop assemblage, devoid of chaff and low in weed seeds, are also typical of other *Lundenwic* contexts. Such characteristics have led researchers to hypothesise that crops were brought into the site from elsewhere rather than being grown locally (eg Rackham 1994; Carruthers 2004). If the purchased crops originated from mixed sources, then this could offer a further explanation as to why weed taxa indicative of differing soil types are present in the Houghton Street assemblage.

CHARCOAL

Stacey Adams

Introduction

Following an assessment of the charcoal fragments recovered from 32 samples a total of 16 were selected for full analysis. The samples – ranging from 20 to 40 litres in volume – were all derived from Middle Saxon deposits and medieval dump layers. The Middle Saxon charcoal was derived from silting/consolidation layers, quarry pits, burning and refuse pits, the enclosure ditch and a well. The aim of the analysis is to investigate spent fuel deposition across the site, plus fuel acquisition and use.

Table 17. Charred and waterlogged Middle Saxon plant remains

		Sample no.	1	18	107	108	119	123	140
		Feature no.	1006	1080	1374	1382	1393	1395	1399
		Context fill no.	1004	1079	1376	1382	1392	1407	1401
		Landuse	OA5	OA14	OA4	OA4	OA4	OA4	ENC1
		Feature type	pit	well	pit, quarry	pit, quarry	pit, quarry	pit, quarry	ditch
		Flot volume (ml)	<10	30	45	45	70	50	90
		Flot weight (g)	2	6	17	9	22	14	32
Taxonomic ID	Common name								
Cereals									
<i>Triticum aestivum/turgidum/durum</i>	free-threshing wheat		21	28	5	25	8	9	10
<i>Triticum</i> sp	Indeterminate wheat				2				
<i>Hordeum</i> sp	hulled barley		8		3	10	4	5	5
<i>Hordeum vulgare</i>	six-row barley					2			
<i>Triticum/Hordeum</i> sp	wheat/barley		25					2	8
<i>Secale cereale</i> L	rye			2		1	2		
<i>Triticum/Secale</i> sp	wheat/rye			1					
Cerealina indet	indeterminate cereal caryopses			16	5	5	7	9	7
Chaff									
Indet stem frags (cf Poaceae)	possible grass stem fragments					1			
Edible plants and trees of economic value									
<i>Corylus avellana</i> L	hazel nutshell fragments		25	1	2		1		
Rosaceae	rose family indeterminate fruit		1						
<i>Rubus idaeus/fruticosus</i> agg.	raspberry/bramble				1				
Wild grasses, arable weeds and waste ground									
Poaceae	Large caryopses		2					2	
<i>Bromus</i> sp	brome		2			1			
<i>Poa/Phleum</i> sp	meadow grasses		12	1					
Fabaceae	indeterminate legumes small round				1			1	3
<i>Trifolium/Medicago</i> sp	clover/medick			1					
<i>Persicaria maculosa/amphibia/lapathifolia</i> type	red shank/ amphibious/ pale persicaria							1	
<i>Polygonum/Rumex</i> sp	knotweeds/dock		2						2
<i>Polygonum</i> sp	knotweeds				1				
<i>Chenopodium album</i> L	fat hen				2			3	
<i>Stellaria media</i> (L) Vill	common chickweed		1						
<i>Galium</i> sp	bedstraws/cleavers								15
Asteraceae	Compositae/daisy family		2						
<i>Anthemis cotula</i> L	stinking chamomile							1	
<i>Daucus carota</i> L	wild carrot							2	
<i>Euphrasia/Odontites</i> sp	eyebrights/bartsia		8						
Small Cyperaceae	sedges lenticular		1						
Uncharred									
<i>Ficus carica</i> L	fig			5					
<i>Rubus fruticosus</i> agg.	bramble			3					
<i>Sambucus nigra</i> L	elder			1					
<i>Urtica dioica</i> L	stinging nettle			1					
Polygonaceae	knotgrass family			3					

Table 18. Mineralised plant remains from a Middle Saxon pit [1143] OA14.
 Numbers represent actual counts; volume in parenthesis indicates sorted volume.
 Key: ** = 10–50; *** = 50–100

	Sample no.	64
	Feature no.	[1143]
	Context fill no.	[1222]
	Feature type	refuse/cesspit
	4–2mm residue volume	700 (350)ml
	<2mm residue volume	1150 (50)ml
	Flot volume (ml)	18
	Flot weight (g)	7
Taxonomic ID	Common names	
Cereals		
<i>Secale cereale</i>	rye	10
cf <i>Secale cereale</i>	rye	4
<i>Triticum</i> sp free-threshing	wheat	6
<i>Triticum/Secale</i> sp	wheat/rye	10
cf <i>Avena</i> sp	oat	1
Cerealialia	indeterminate cereal	9
Wild & other crops		
<i>Chenopodium album</i> L.	fat-hen	5
<i>Chenopodium</i> sp	goosefoot	3
<i>Fallopia convolvulus</i> (L.) Á Löve	black bindweed	5
<i>Polygonum aviculare</i> L.	knotgrass	1
<i>Polygonum/Rumex</i> sp	knotgrass/dock	8
<i>Bromus</i> sp	brome	6
<i>Poa/Phleum</i> sp	meadow grass/cat's tails	1
<i>Rubus fruticosus</i> agg	bramble/raspberry	18
<i>Sambucus nigra</i> L.	elder	4
<i>Galium</i> sp	bedstraw	1
<i>Malus/Pyrus</i> sp	apple/pear	85
<i>Potentilla</i> sp	cinquefoil	1
Rosaceae	rose family	22
<i>Vicia/Lathyrus/Pisum</i> sp	large legume >4mm whole	53
<i>Vicia/Lathyrus/Pisum</i> sp	large legume fragments	***
cf <i>Pisum sativum</i> L.	common pea	2
cf <i>Vicia sativa</i> L.	common vetch	2
<i>Vicia/Lathyrus</i> sp	2-4mm legume	7
<i>Linum usitatissimum</i> L.	flax	7
Apiaceae	carrot family	1
<i>Apium</i> sp	marshwort	2
cf <i>Marrubium vulgare</i> L.	white horehound	1
<i>Plantago lanceolata</i> L.	ribwort plantain	1
Asteraceae	small, no achene	1
<i>Carduus/Cirsium</i> sp	thistle	1
Other/Indeterminate		
Insect shell (whole)		20
Insect (head)		1
Insect shells (fragments)		4
Fruit skin fragments		**

Methodology

Charcoal was selected for analysis from a representative number of samples that contained frequent charcoal (>50 fragments). Whenever possible, one hundred charcoal fragments were submitted for identification as per the minimum number of fragments principle for temperate regions proposed by Asouti & Austin (2005). Identification followed standardised procedures (Gale & Cutler 2000; Hather 2000) under an incident light microscope at magnifications up to 500x. Taxonomic identifications were assigned by comparing suites of anatomical characteristics visible with those documented in reference atlases (Hather 2000; Schweingruber 1990; Schoch *et al* 2004).

Distortion of the anatomical features, such as radial cracks, vitrification and post-depositional sediment, were recorded and the ring curvature of each fragment was assessed to determine the presence of twigs and roundwood. Quantification and taxonomic identifications of charcoal are recorded in Table 19. Classification and nomenclature follow Stace (1997) for the following taxa/groups:

- Fagaceae. *Fagus sylvatica* L, beech; *Quercus* sp L, oak
- Betulaceae. *Betula* sp L birch; *Alnus* sp L, alder; *Carpinus betulus* L, hornbeam; *Corylus avellana* L, hazel
- Salicaceae. *Populus/Salix*, poplar/ willow
- Grossulariaceae. *Ribes* sp L, gooseberry
- Rosaceae. *Rosa* sp L, rose; *Prunus* spp, plum-type
- Maloideae, which includes *Crataegus* sp, hawthorn; *Malus* sp, apple; *Pyrus* sp, pear; *Sorbus* spp, whitebeam. These taxa are anatomically similar; one or more taxa may be represented in the charcoal
- Leguminosae, wood from taxa within the extensive legume family
- Aquifoliaceae. *Ilex aquifolium* L, holly
- Aceraceae. *Acer campestre* L, field maple
- Oleaceae. *Fraxinus excelsior* L, ash
- Adoxaceae. *Sambucus* sp L elder

Results

Preservation of the charcoal ranged from poor to moderate with 8% of the assemblage deemed indeterminate due to acute thermal degradation of the fragments. Vitrification was low within the assemblage although it was slightly more prevalent in medieval gravel layer [1141] (G32, OA8). Vitrification is a feature often attributed to high temperatures and prolonged burning times (Gale & Cutler 2000; Prior & Alvin 1983), although recent experiments claim that it is not induced by such factors and that the cause is still unknown (McParland *et al* 2010). Radial cracks appear as 'blown-up' ray cells causing cracks of missing or exploded tissue. They are associated with the presence of moisture in the wood and thus possibly reflect the burning of live wood (Fiorentino & D'Oronzo 2010). Post-depositional sediment is attributed to fluctuations in the water-table during

burial.

Period 1: Middle Saxon (c.AD 730/50–850)

Little distinction exists between the taxa represented in the charcoal deposits from across the Houghton Street site. The charcoal identified was largely derived from large branches or trunk wood from a limited range of taxa within each deposit. Roundwood, from small branches or twigs, represented 13% of the assemblage and was not limited to certain taxa. Oak (*Quercus* sp) was dominant, totalling 41% of the assemblage. Charcoal of plum-type (*Prunus* sp) formed 13% of the assemblage whilst the apple sub-family (Maloideae) equated to 11%. Ash (*Fraxinus excelsior*) and hazel (*Corylus avellana*) were less prominent forming 7 and 6% of the total charcoal (Table 19). Beech (*Fagus sylvatica*) and ash are indicative of calcareous soils whilst birch (*Betula* sp) and alder (*Alnus* sp) would have grown on acidic soils. Hornbeam (*Carpinus betulus*) grows well on clay. The exploitation of shrubby woodland is indicated by the presence of oak, hazel, plum-type, holly (*Ilex aquifolium*) and elder (*Sambucus* sp). The presence of alder and poplar/willow (*Populus/Salix*) represent riverine environments, whilst wood derived from open, possibly heath-like environs is indicated by birch, field maple (*Acer campestre*) and ash. Several fragments of rose (*Rosa* sp) and gooseberry (*Ribes* sp) charcoal were also recorded.

Period 2: Medieval (c.1200–1375)

The medieval charcoal assemblage was less diverse than that derived from the earlier Saxon phase of activity, although it is only represented by the analysis of two samples (Table 20). Similarly, there is little discrepancy between the taxa within the contexts. Oak was slightly more dominant than other taxa, totalling 32% of the assemblage. Plum-type charcoal and that of the apple sub-family formed 21% of the charcoal whilst 10% was identified as field maple. Shrubby woodland is again represented by oak and plum-type charcoal as are riverine environs with poplar/willow. As in the earlier samples calcareous and clay soils are indicated by beech and hornbeam.

Discussion

The wide ecological ranges represented by the charcoal taxa indicates that a variety of environs were exploited to provide fuel wood to the Houghton Street site from the Middle Saxon (Period 1) through to the medieval occupation (Period 2). The presence of large woodland trees, such as oak and beech, suggests that fuel was sourced from outside central London. While there was extensive deforestation of the Middlesex area during the medieval period (Rackham 2006, 103), William Fitz Stephen writing in 1170–83 wrote that to the north of the City of London there was 'a great forest with wooded glades' (Epping Forest) (Stenton 1990, 50). It is likely that the fuel would have also been derived from the Chilterns and Weald areas which were still densely wooded (Galloway *et al* 1996). The chalky soils of the Chilterns

Table 19. Charcoal identifications from Middle Saxon samples at Houghton Street

		Period																							
Group		21		15		19		1		18		29		23		14									
Sample no.		1		17		48		120		173		64		164		167		113		94		141		151	
Context		1004		1044		1174		1394		1542		1222		1513		1530		1385		1356		1415		1481	
Parent context		1006		1087		1174		1394		1543		1143		1511		1532		1374		1356		1414		1496	
Context/deposit type		pit		pit		dump layer		occupation layer		pit		pit		pit		pit		quarry pit		dump layer		ditch		pit	
Sample volume (L.)		40		35		40		40		20		40		40		40		40		40		40		40	
Preservation		+++		+++		+		++		+		++		++		++		+++		++		+		++	
Taxonomic ID	Common name																								
<i>Fagus sylvatica</i> L.	beech	2																							
<i>Quercus/Fraxinus</i>	oak/ash	3																							
<i>Quercus/Castanea</i>	oak/chestnut	1																							
<i>Quercus</i> sp L.	oak	78 rw:4	15 rw:2	38	22	44 rw:10	37 rw:11	51	67 rw:7	24	70 rw:18	15 rw:8	32												
cf <i>Quercus</i> sp L.	cf oak	1																							
Betulaceae	birch family	2																							
<i>Betula</i> sp L.	birch	1																							
<i>Alnus</i> sp Mill	alder	2																							
<i>Carpinus betulus</i> L.	hornbeam	1																							
<i>Corylus/Alnus</i>	hazel/alder	4																							
<i>Corylus avellana</i> L.	hazel	14 rw:13	2	4	2	8 rw:3	1	5 rw:2	36 rw:10	2 rw:2	4 rw:8	8													
<i>Populus/Salix</i>	poplar/willow	6																							
<i>Ribes</i> sp L.	gooseberry	3																							
<i>Rosa</i> sp L.	rose	2																							
<i>Prunus</i> spp L.	plum-type	22	56 rw:8	4 rw:2	20	8	6 rw:2	25 rw:1	7	4 rw:2	8														
cf <i>Prunus</i> spp L.	cf plum-type	1																							
Maloideae	apple sub-family	8																							
Leguminosae	legume family	10																							
<i>Ilex aquifolium</i> L.	holly	13 rw:4																							
<i>Acer campestre</i> L.	field maple	3 rw:1																							
<i>Fraxinus excelsior</i> L.	ash	9 rw:3	2	13	8	12 rw:7	6	12 rw:1	2 rw:2	1 rw:1	12														
cf <i>Fraxinus excelsior</i> L.	cf ash	13 rw:3																							
<i>Sambucus</i> sp L.	elder	1 rw:1																							
Indet.	indeterminate	2																							
	root wood	9																							
	bark fragment	13																							
	vitrified	7	5	3	3	1	1	4	1	2	1														
	radial cracks	6																							
	post-depositional sediment	3	9	3	8	3	9	8	6	2	70	1													
	distorted	7																							
	knotwood	11																							
	insect hole	3																							

Table 20. Charcoal identifications from medieval samples at Houghton Street

Period		2	
Group		32	36
Sample no.		34	41
Context		1141	1144
Parent context		1141	1144
Context/deposit type		gravel layer	dump layer
Sample volume (L)		40	30
Preservation		(++)	(++)
Taxonomic ID	Common name		
<i>Fagus sylvatica</i> L.	beech	5	
<i>Quercus</i> sp L	oak	39	24 rw:1
cf <i>Quercus</i> sp L	cf oak		1
<i>Carpinus betulus</i> L.	hornbeam	3	
<i>Populus/ Salix</i>	poplar/willow	5	1
<i>Prunus</i> sp L	plum-type	15	6 rw:2
Maloideae	apple sub-family	13	7 rw:2
<i>Acer campestre</i> L.	field maple	16	4
Indet	indeterminate	4	6
	root wood		1
	vitrified	13	5
	radial cracks	17	
	post-depositional sediment	12	1
	distorted		5

are represented by beech and ash whilst the clay-loving taxon of hornbeam would have been available locally on the London Clay soils.

The uniformity of the charcoal assemblage across the Houghton Street site indicates that there was no relationship between wood taxa and the intended fuel use. This trend appears to continue from the Saxon into the medieval activity. The recovery of domestic refuse such as animal bones, mollusc shells, pottery sherds and ceramic building materials found alongside the charcoal suggests that the fuel waste was derived from domestic occupation rather than industrial activity. The paucity of roundwood indicates that fuel was not brought to site as bundles of branches but rather as coppiced branches or trunk wood.

Contemporary comparative sites in central London with full charcoal analysis are few and far between. The majority of research into firewood acquisition in Saxon and medieval London is based on historical records rather than direct anthracological data. The Saxon material can be compared to the poorly preserved assemblage at Parker House to the north in Camden (Vitolo 2017) where it appears similar large woodland trees were exploited as fuel wood.

INSECT REMAINS

Enid Allison

Introduction

The seven samples from the excavations at Houghton Street selected for the examination of insect remains

consisted of the waterlogged fills of various Middle Saxon (Period 1, c.AD 730/50–850) refuse/cesspits, quarry pits and a well. Three samples produced substantial assemblages of insects remains, primarily beetles, and their analysis has provided information on waste disposal, human living conditions and craft activities.

Methodology

Insect Extraction and Recording

The samples had volumes of 3.5–10 litres; individual volumes are given in Table 21 and an appendix available as part of the site archive. Processing broadly followed the methods of Kenward *et al* (1980). Each sample was boiled briefly with washing soda (sodium carbonate) and washed onto 0.3mm mesh, then subjected to paraffin flotation to extract insect remains. The resulting flots were placed in jars of industrial methylated spirits (IMS).

Two samples were selected for detailed analysis. For this, beetle (Coleoptera) and bug (Hemiptera) sclerites were removed from the paraffin flots onto moist filter paper for identification using modern comparative material and by reference to standard published works. Minimum numbers of adult beetles and bugs were estimated from the major sclerites. Other insect groups were recorded semi-quantitatively on a four-point scale: + 1–3 individuals; ++ 4–10 individuals; +++ 11–50 individuals; ++++ >50 individuals. The remaining samples were scanned in IMS in a petri dish. Nomenclature for Coleoptera follows Duff (2018), and lists compiled by Bantock and Botting (2018) for Hemiptera. Other invertebrates in all the samples were simply noted as present, common or abundant. Extracted insect material is currently stored in vials of IMS.

Ecological codes shown in square brackets are: d – damp ground/waterside, h – house/building, l – wood/timber, oa – outdoor taxa not usually found within buildings or in accumulations of decomposing matter, ob – probable outdoor taxa, p – plant-associated, sf – facultative synanthropes, ss – strong synanthropes, st – typical synanthropes, u – uncoded, w – aquatic. Abundance of insects other than adult beetles and bugs has been estimated as: + 1–3 individuals, ++ 4–10, +++ 11–50, ++++ >50. Other invertebrates have been recorded as occasional (O), moderately frequent (M) or common (C).

Interpretative Methods

To aid interpretation, beetles and bugs were assigned to broad ecological groups based on Kenward *et al* (1986), Kenward (1997) and Smith *et al* (2020) (see Table 21 for codes used). The main sources of ecological information were Cox (2007), Duff (2018), Hansen (1987), Hodkinson and White (1979), Lindroth (1986), Lott (2009), Lott and Anderson (2011), Luff (2007), Morris (1997; 2012), and Southwood and Leston (1959). Other sources are mentioned where relevant. Some taxa are included in more than one group, while

others are uncoded, either because they occur in a wide variety of habitats and situations, or because it was not possible to identify the available sclerites closely enough. Synanthropic beetle taxa, *ie* those favoured by artificial habitats associated with human occupation and activity, were divided into three categories following Kenward (1997) and Smith *et al* (2020). ‘Strong’ synanthropes are essentially dependent on human activity for survival in the region being considered in a particular analysis and are rarely found in natural habitats; ‘typical’ synanthropes are especially favoured by artificial habitats but can survive in natural situations; and ‘facultative’ synanthropes are common in natural situations but clearly favoured by man-made habitats.

The abundance of aquatic taxa has been calculated as a percentage of the whole assemblage. Aquatics have been subtracted from the totals to calculate percentages for terrestrial insects. Proportions for particular ecological groups quoted in the text below and presented in Table 22 are based on the number of individuals in the terrestrial fauna, unless otherwise indicated. All percentages have been rounded to the nearest whole number. The values for particular groups represent a minimum value as various generalist or uncoded taxa may have exploited similar habitats. It should be noted that the significance of the proportions varies according to group: proportions of decomposers are typically high relative to other taxa on an urban site and an MNI value of 20% for them is regarded as low, whereas 20% is a high to extremely high value for the various groups among the outdoor insects.

The diversity (species richness) of the analysed assemblages, and the decomposer component within each assemblage, was measured using the index of diversity (alpha) of Fisher *et al* (1943). Values of alpha (α) and the associated standard error (SE) were calculated using a purpose-written Pascal program originally created at the University of York in 1992 by Harry Kenward, and subsequently adapted to run on a personal computer by John Carrott.

The Insect Assemblages

Assemblages from individual samples are described below by area, followed by a discussion of the results. Lists of insects and other invertebrate taxa for the two assemblages that were analysed in detail are presented in Table 21, and the main statistics for these in Table 22. Lists of taxa noted in the scanned samples are provided in an appendix available as part of the site archive.

Abbreviations used are as follows:

α – the index of diversity (alpha) for the whole assemblage
 RT – total decomposers
 α RT – diversity (alpha) of the decomposer component
 SE – standard error of alpha.

Fills of Well [1080]

Insect assemblages recovered from two samples from well [1080] (OA14) indicated the disposal of a variety of

occupation waste. Records of bean seed weevils (*Bruchus cf rufimanus*) in the primary fill (context [1124], sample <25>) were highly suggestive of human faeces. *Bruchus* were frequently ingested with infested pulses in the past and they are characteristic of cess deposits (*eg* Smith 2013). In waterlogged contexts they often provide the main evidence for the consumption of pulses which do not preserve well unless they are charred or mineralised (*eg* Allison & Hall 2001; Carruthers & Allison 2015). An alternative possibility might be the discard of spoiled pulses, but a faecal origin is most likely. A distinctive ‘house fauna’ indicating the disposal of floor litter or sweepings was also recorded. This group of beetles is predominantly associated with mouldering organic litter within buildings where various kinds of organic materials were used either structurally (such as floor litter, bedding or roofing material) or stored (for example, hay or straw: Carrott & Kenward 2001; Hall & Kenward 1990; Kenward & Hall 1995). House faunas are not confined to human dwellings but would have developed in various kinds of buildings fulfilling the similar criteria, including barns, stables and workshops.

A substantial assemblage of 487 beetles and bugs of 138 taxa from the secondary fill of the well was analysed in detail (context [1098], sample <23>). Diversity was quite high for an occupation site suggesting mixed origins (α = 64, SE = 5). Decomposers were the dominant ecological group (RT 71%; α RT = 21, SE = 2), many of the taxa being synanthropic to some degree. A significant element within the assemblage was an ‘oxyteline association’ consisting of *Carpelimus*, *Platystethus* and *Anotylus* species, and *Neobisnius ?villosulus* (Carrott & Kenward 2001), ten species accounting for 43% of the terrestrial fauna. This association is regularly recorded on occupation sites, particularly in pits and other deep features where the various species would have exploited damp muddy habitats. *Anotylus rugosus* and *Carpelimus bilineatus* or *erichsoni* were notably abundant (94 and 65 individuals respectively).

As with the primary fill, *Bruchus cf rufimanus* is suggestive of the disposal of human faeces or spoiled pulses, and a house fauna (*Xylodromus concinnus*, white-marked spider beetle (*Ptinus fur*), *Cryptophagus*, *Atomaria* and *Lathridius minutus* group; 6% of the terrestrial fauna) indicated the disposal of litter from within buildings. Sheep ked (*Melophagus ovinus*) puparia were common and would have been associated with the house fauna (discussed further below).

Beetles associated with wood and timber were quite well represented (5%). Woodworm beetle (*Anobium punctatum*) and powder post beetle (*Lyctus linearis*) may have formed part of the house fauna but both species are also likely to have been common members of the background fauna of an area where wooden buildings and structures were common. Larvae of powder post beetle most commonly bore in oak sap wood. *Hylesinus varius*, a bark beetle (Scolytinae) primarily found in ash (*Fraxinus*), is frequently associated with house faunas (Carrott & Kenward 2001), probably emerging from ash logs used as firewood. Another bark beetle *Scolytus rugulosus*, represented by four individuals, that typically attacks woody Rosaceae might also relate to the house fauna rather than to trees or shrubs growing close to the

Table 21. Insects and other invertebrates recorded from the samples

	Context no.	1098	1386
	Sample no.	<23>	<114>
Taxonomic ID	Sample volume	10L	3.5L
ANNELIDA			
Oligochaeta sp (earthworm) egg capsules		M	O
CRUSTACEA			
<i>Daphnia</i> sp Ehippia		O	-
INSECTA			
DERMAPTERA (earwigs)			
<i>Labia minor</i> L [rt]		+	-
Dermaptera sp [u]		+	+
HEMIPTERA: HETEROPTERA (true bugs)			
Coreidae (shield bugs)			
<i>Coreus marginatus</i> (Linnaeus) [oa-p]		-	1
Pentatomoidea sp (shield bugs)		-	1
Anthocoridae (minute pirate bugs)			
<i>Lyctocoris campestris</i> (Fabricius) [rd-sfh]		-	1
Anthocoridae sp [u]		1	1
Lygaeidae (ground bugs)			
<i>Heterogaster urticae</i> (Fabricius) [oa-p]		1	-
Lygaeidae spp [oa-p]		2	-
HEMIPTERA: HOMOPTERA			
Auchenorrhyncha spp [oa-p]		3	-
Psylloidea (jumping plant lice)			
<i>Craspedolepta nervosa</i> (Förster) nymph [oa-p]		-	+
COLEOPTERA (beetles)			
Dytiscidae (diving beetles)			
<i>Agabus</i> or <i>Ilybius</i> spp [oa-w]		1	-
Carabidae (ground beetles)			
<i>Nebria brevicollis</i> (Fabricius) [oa]		1	-
<i>Nebria</i> cf <i>brevicollis</i> (Fabricius) [oa]		-	1
<i>Loricera pilicornis</i> (Fabricius) [oa]		1	-
<i>Clivina fossor</i> (L) [oa]		4	1
<i>Trechus obtusus</i> or <i>quadristriatus</i> [oa]		1	-
<i>Bembidion</i> (<i>Metallina</i>) <i>lampsos</i> or <i>properans</i> [oa]		-	1
<i>Bembidion</i> (<i>Philochthus</i>) <i>lunulatum</i> (Geoffroy in Four.) [oa-d]		3	-
<i>Bembidion</i> (<i>Philochthus</i>) sp [oa]		-	1
<i>Bembidion</i> (<i>Phyla</i>) <i>obtusum</i> Audinet-Serville [oa]		1	-
<i>Bembidion</i> spp [oa]		3	-
<i>Tachys bistratus</i> (Duftschmid) [oa-d]		-	1
<i>Tachys</i> cf <i>bistratus</i> (Duftschmid) [oa-d]		1	-
<i>Pterostichus vernalis</i> (Panzer) [oa-d]		1	-
<i>Pterostichus melanarius</i> (Illiger) [ob]		3	1
<i>Pterostichus anthracinus</i> (Panzer) [oa-d]		-	1
<i>Pterostichus</i> (<i>Pseudomaseus</i>) sp [oa-d]		1	-
<i>Amara</i> spp [oa]		3	2
<i>Oodes helopioides</i> (Fabricius) [oa-d]		-	1
<i>Agonum</i> sp [oa]		-	1

Helophoridae (grooved water scavengers)		
<i>Helophorus grandis</i> Illiger [oa-w]	2	3
<i>Helophorus</i> spp [oa-w]	3	4
Hydrophilidae		
<i>Hydrobius fuscipes</i> (Linnaeus) [oa-w]	1	-
Hydrophilinae spp [oa-w]	1	-
<i>Cercyon haemorrhoidalis</i> (Fabricius) [rf-sf]	4	5
<i>Cercyon nigriceps</i> (Marsham) [rf-st]	-	3
<i>Cercyon nigriceps</i> or <i>pygmaeus</i> [rf-st]	2	-
<i>Cercyon unipunctatus</i> (Linnaeus) [rf-st]	1	-
<i>Cercyon analis</i> (Paykull) [rt-st]	14	8
<i>Cryptopleurum minutum</i> (Fabricius) [rfst]	-	2
<i>Megasternum concinnum</i> (Marsham) [rt-sf]	5	2
Histeridae (clown beetles)		
<i>Acritus nigricornis</i> (Hoffman) [rt-st]	5	3
Histerinae sp [rt]	1	-
Histeridae sp(p) [u]	1	1
Hydraenidae		
<i>Ochthebius bicolon</i> Germar [oa-w]	1	-
<i>Ochthebius dilatatus</i> Stephens [oa-w]	-	1
<i>Ochthebius minimus</i> (Fabricius) [oa-w]	-	2
<i>Ochthebius</i> cf <i>minimus</i> [(Fabricius) oa-w]	1	-
Ptiliidae (featherwing beetles)		
<i>Ptenidium</i> sp [rt]	3	3
<i>Acrotrichis</i> sp [rt]	2	1
Leiodidae		
Cholevinae sp [u]	2	-
Silphidae (sexton beetles)		
Silphidae sp [u]	1	-
Staphylinidae (rove beetles)		
<i>Omalium</i> spp [rt]	4	5
<i>Xylodromus concinnus</i> (Marsham) [rt-st-h]	1	4
<i>Xylodromus depressus</i> (Gravenhorst) [rt-st]	2	3
<i>Lesteva</i> ? <i>longoelytrata</i> (Goeze) [oa-d]	1	-
<i>Lesteva</i> sp [oa-d]	2	-
Omalinae sp [u]	1	-
<i>Megarthus</i> sp [rt]	1	-
Pselaphinae sp [u]	1	-
<i>Tachyporus</i> sp [u]	-	1
<i>Tachinus</i> sp [u]	-	1
<i>Aleochara</i> sp [rt]	3	-
<i>Crataraea suturalis</i> (Mannerheim) [rt-st-h]	1	2
<i>Cypha</i> sp [u]	1	1
<i>Drusilla canaliculata</i> (Fabricius) [rt]	1	-
<i>Cordalia obscura</i> (Gravenhorst) [rt-sf]	5	2
<i>Falagria caesa</i> or <i>sulcatula</i> [rt-sf]	4	3
Aleochariinae spp [u]	23	15
<i>Coprophilus striatulus</i> (Fabricius) [rt-st]	2	1
<i>Carpelimus bilineatus</i> or <i>erichsonii</i> [rt-sf]	65	6
<i>Carpelimus</i> spp [u]	7	1
<i>Platystethus cornutus</i> group [oa-d]	6	20
<i>Platystethus nitens</i> (Sahlberg) [oa-d]	11	11
<i>Platystethus arenarius</i> (Geoffroy in Fourcroy) [rf]	2	6
<i>Anotylus complanatus</i> (Erichson) [rt-sf]	1	-
<i>Anotylus nitidulus</i> (Gravenhorst) [rt-d]	9	10
<i>Anotylus rugosus</i> (Fabricius) [rt-sf]	94	5
<i>Anotylus sculpturatus</i> group [rt-sf]	-	1
<i>Anotylus tetracaratus</i> (Block) [rt-sf]	3	3

<i>Oxytelus sculptus</i> Gravenhorst [rt-st]	16	5	Corylophidae		
Scydmaeninae sp(p). [u]	1	1	<i>Orthoperus</i> sp [rt-sf]	3	-
<i>Stenus</i> spp [u]	4	11	Corylophidae sp [rt]	3	-
<i>Lathrobium</i> spp [u]	2	1	Latridiidae (minute brown scavenger beetles)		
<i>Lithocharis ochracea</i> (Gravenhorst) [rt-st]	-	1	<i>Latridius minutus</i> group [rd-st-h]	17	21
<i>Rugilus</i> sp [rt]	1	-	<i>Enicmus</i> sp [rd-sf]	2	-
Paederinae spp [u]	3	1	<i>Corticaria</i> ? <i>punctulata</i> Marsham [rt-sf]	1	-
<i>Leptacinus batychnus</i> (Gyllenhal) [rt-st]	2	-	<i>Corticaria</i> spp [rt-sf]	15	12
<i>Leptacinus intermedius</i> or <i>pusillus</i> [rt-st]	-	3	Corticariinae spp [rt]	2	-
<i>Gyrophypnus angustatus</i> Stephens [rt-st]	-	1	Mycetophagidae (hairy fungus beetles)		
<i>Gyrophypnus fracticornis</i> (Müller) [rt-st]	5	2	<i>Typhaea stercorea</i> (Linnaeus) [rd-ss-h]	-	1
<i>Gyrophypnus</i> sp indet. [rt]	1	-	Tenebrionidae (darkling beetles)		
<i>Xantholinus gallicus/linearis/longiventris</i> [rt-sf]	-	1	<i>Tenebrio obscurus</i> Fabricius [rt-ss-h]	-	1
<i>Creophilus maxillosus</i> (Linnaeus) [rt]	1	-	Salpingidae		
<i>Neobisnius</i> ? <i>villosulus</i> (Stephens) [rt-sf]	7	2	<i>Aglenus brunneus</i> (Gyllenhal) [rt-ss-h]	-	2
Staphylininae spp [u]	6	2	Anthicidae (ant-like flower beetles)		
Geotrupidae (dor beetles)			<i>Omonadus</i> sp [rt-st]	-	1
Geotrupinae sp [oa-rf]	1	-	Cerambycidae (longhorn beetles)		
Trogidae (hide beetles)			<i>Gracilia minuta</i> (Fabricius) [l-sf]	6	6
<i>Trox scaber</i> (Linnaeus) [rt-sf]	1	2	Cerambycidae sp [l]	-	1
Scarabaeidae (dung beetles and chafers)			Chrysomelidae (seed and leaf beetles)		
<i>Aphodius fimetarius</i> (Linnaeus) [ob-rf]	2	2	<i>Bruchus</i> ? <i>rufimanus</i> Boheman [sf]	2	2
<i>Calamosternus granarius</i> (Linnaeus) [ob-rf-sf]	-	6	<i>Chaetocnema concinna</i> or <i>picipes</i> [oa-p]	-	1
<i>Melinopterus prodromus</i> or <i>sphacelatus</i> [ob-rf]	2	5	<i>Longitarsus</i> spp [oa-p]	-	2
<i>Nimbus contaminatus</i> (Herbst) [oa-rf]	1	-	<i>Phyllotreta nemorum</i> group [oa-p]	-	1
<i>Oxyomus sylvestris</i> (Scopoli) [rt-sf]	1	4	Apionidae		
Aphodiinae sp [ob-rf]	1	-	Apionidae spp [oa-p]	3	-
<i>Onthophagus</i> sp [oa-rf]	1	-	Curculionidae (weevils)		
Scarabaeidae sp indet. [oa-p]	-	1	? <i>Mecinus pascuorum</i> (Gyllenhal) [oa-p]	-	2
Clambidae (fringe-winged beetles)			Ceutorhynchinae spp and sp indet. [oa-p]	2	1
<i>Clambus</i> sp [rt-sf]	2	-	Cossoninae sp [l]	-	1
Scirtidae (marsh beetles)			<i>Sitona</i> sp [oa-p]	1	1
<i>Contacyphon</i> sp [oa-d]	3	-	<i>Hypera</i> sp [oa-p]	-	1
Elateridae (click beetles)			<i>Hylesinus varius</i> (Fabricius) [l]	1	-
Elateridae spp [ob]	1	-	<i>Scolytus rugulosus</i> (Müller) [l]	4	-
Dermestidae (larder beetles)			<i>Scolytus</i> sp indet. [l]	-	1
<i>Dermestes</i> cf <i>lardarius</i> Linnaeus [rd-st-h]	-	2	Scolytinae sp(p). [l]	2	-
Bostrichidae (powderpost beetles)			Curculionidae sp [oa-p]	-	1
<i>Lyctus linearis</i> (Goeze) [l-st-h]	1	1	Coleoptera spp and sp indet. [u]	-	2
Ptinidae (spider and woodworm beetles)					
<i>Ptinus fur</i> (Linnaeus) [rd-sf-h]	4	5	DIPTERA (flies)		
<i>Anobium punctatum</i> (De Geer) [l-sf]	8	4	<i>Melophagus ovinus</i> (Linnaeus) puparia	++	+++
<i>Ptilinus pectinicornis</i> (Linnaeus) [l-sf]	-	2	Diptera spp adults	-	++
Monotomidae			Diptera spp pupal fragments and puparia	++++	+++
<i>Rhizophagus parallellocollis</i> Gyllenhal [rt-sf]	1	-			
<i>Monotoma spinicollis</i> Aubé [rt-sf]	1	1	HYMENOPTERA (bees, wasps and ants)		
<i>Monotoma</i> sp [rt-st]	1	3	Formicidae spp	-	-
Cryptophagidae (silken fungus beetles)			Hymenoptera Parasitica spp	+++	++
<i>Cryptophagus</i> spp [rd-sf-h]	4	4			
<i>Atomaria</i> sp(p). [rd-sf-h]	3	3	SIPHONAPTERA (fleas)		
<i>Ephistemus globulus</i> (Paykull) [rd-sf]	2	1	<i>Pulex irritans</i> Linnaeus [ss] (human flea)	-	+
Nitidulidae (sap and pollen beetles)			Siphonaptera sp indet. body segments	-	+
<i>Omosita colon</i> (Linnaeus) [rt-sf]	-	14			
<i>Omosita discoidea</i> (Fabricius) [rt-sf]	-	3	ARACHNIDA		
<i>Omosita colon</i> or <i>discoidea</i> [rt-sf]	1	-	Acarina spp (mites)	M	C
Nitidulidae sp indet. [u]	-	1	Araneae sp (spiders)	-	O
Coccinellidae (ladybirds)					
<i>Coccidula</i> sp (Herbst) [oa]	-	1			
			Total adult beetles and bugs	487	311

Table 22. Main statistics for the analysed insect assemblages.
Ecological codes shown in square brackets are explained in

Area Feature	A Well [1080]	C Quarry pit [1374]
Context no.	1098	1386
Sample	<23>	<114>
Total beetle and bug individuals	487	311
Total beetle and bug taxa	138	119
Diversity (α)	64	70
Standard error of α	5	6
AQUATICS % of whole assemblage	2%	3%
TERRESTRIAL FAUNA		
Decomposer component:		
% Dry decomposers [rd]	7%	13%
% Foul decomposers [rf]	4%	10%
% Eurytopic decomposers [rt]	60%	40%
% Total decomposers [RT = rd+rf+rt]	71%	62%
Total decomposers individuals	337	187
Total decomposer taxa	60	53
Diversity of decomposers (α RT)	21	25
SE of α RT	2	3
Outdoor and probable outdoor component		
% Damp ground/waterside [d]	8%	15%
% Plant-associated [p]	3%	4%
% Outdoor taxa [oa + ob]	14%	23%
Other groups		
% grain pests [g]	0%	0%
% Wood-associated [l]	5%	5%
% House fauna [h]	6%	15%
% Scarabaeoid dung beetles	2%	4%
% Oxyteline association	43%	22%
SYNANTHROPES		
% Strong synanthropes [ss]	0%	1%
% Typical synanthropes [st]	15%	21%
% Facultative synanthropes [sf]	52%	31%
% Total synanthropes [sf+st+ss]	66%	53%

well. Charcoal analysis indicates that both ash and members of the Rosaceae family (*Prunus*-type and Maloideae) were used as fuel wood (see Adams: Charcoal). At least six individuals of *Gracilia minuta*, a small longhorn beetle (Cerambycidae) that bores in fine twigs, are too common to suggest accidental arrival in the well. The species is well known from wickerwork (Duffy 1953, 195; Hickin 1975, 241) and the most likely origin for these specimens is in wicker or basketwork within a building. Another potential origin that might be considered is if wicker-like twiggy material was used to line the well. There was no evidence for a lining in this deposit but it has been suggested that waterlogged

wood and organic material in the primary fill might possibly be the remains of some form of a lining (Ritchie 2017, 16).

Decomposer beetles specifically associated with foul matter, including several scarabaeoid dung beetles (Geotrupinae, Aphodiinae spp, *Onthophagus*), accounted for 4% of the assemblage, but the proportion is not high enough to suggest that the material derived from buildings in this deposit consisted of stable waste containing animal dung.

Outdoor insects, *ie* taxa that would not usually live and breed either within buildings or in accumulations of decomposing organic material, were quite common for an occupation site (14% of the terrestrial fauna). Some, such as *Contacyphon*, could potentially have been imported onto the site with wetland vegetation used as floor litter, but most are probably indicative of habitats close to the well. Various ground beetles (Carabidae) suggest rather open conditions with damp ground locally: for example, *Bembidion lunulatum* occurs on bare, damp soils near water, *Clivina fossor* usually in open areas on soft damp ground, and *Tachys cf bistriatus* in litter on damp sand or clay. Several *Amara* species, on the other hand, suggest relatively dry, open, sun-exposed areas. Nettle ground bug (*Heterogaster urticae*) is found on nettles in warm, sunny locations.

Six aquatic taxa accounted for 2% of the whole assemblage and they included *Helophorus* spp and *Hydrobius fuscipes*, which are opportunistic invaders of many forms of standing water, *Ochthebius cf minimus* and *O bicolon*. The last of these is typically found in mud by running water. While it is possible that these beetles were attracted to standing water in the well, given the evidence for the disposal of various forms of occupation waste, it is at least as likely that some of these arrived in wastewater.

Fill of Refuse Pit/Cesspit [1143]

A very small insect assemblage from an intermediate fill of pit [1143] (OA14) (context [1222], sample <64>) contained taxa indicating that litter from within buildings had contributed to the deposit. Fragments of ked (*Melophagus ovinus*) puparia are likely to have arrived in the pit with the building litter. The presence of cereal bran in the paraffin flot suggested that the fill may also have included faeces.

Fill of Refuse Pit/Cesspit [1543]

The only invertebrate material recovered from the primary fill of pit [1543] (OA14) (context [1562], sample <179>) were occasional fragments of earthworm egg capsules and indeterminate beetle cuticle. It is likely that conditions in this feature were largely unsuitable for insect preservation.

Fill of Quarry Pit [1344]

Two samples were examined from quarry pit [1344] (G18, OA4). A single poorly preserved elytron of a corylophid beetle and indeterminate scraps of insect cuticle were the only insect remains recovered from the

basal silting deposit (context [1381], sample <110>). Decomposers characteristic of occupation waste were noted in a small assemblage from the primary fill (context [1369], sample <97>), with the seed weevil *Bruchus cf. rufimanus* suggesting a faecal component.

Fill of Quarry Pit [1374]

An assemblage of 311 beetles and bugs of 119 taxa was recovered from a 4-litre sample from the primary fill of quarry pit [1374] (G18, OA4) (context [1386], sample <114>), the high diversity indicating mixed origins and probably to some extent deposition in the open ($\alpha = 70$, SE = 6). Decomposers were the dominant ecological group (RT 62%; α RT = 25, SE = 3), many of which were synanthropes. There were hints of a faecal component from the presence of *Bruchus cf. rufimanus*, and clear indications of the disposal of litter from buildings. A substantial and diverse house fauna (15% of terrestrial insects) consisted of *Xylodromus concinnus*, *Cratarea suturalis*, bacon beetle (*Dermestes cf. lardarius*), white-marked spider beetle (*Ptinus fur*), *Cryptophagus* spp, *Atomaria*, *Latridius minutus* group, *Typhaea stercorea*, *Tenebrio obscurus*, *Aglenus brunneus* and *Lyctocoris campestris*. Associated with this were human flea (*Pulex irritans*), ked puparia and sheep lice (*Bovicola ovis*), of which the ked puparia were notably common. Beetles associated with wood and timber accounted for 5% of the terrestrial fauna and at least some of these may have been associated with the house fauna. *Gracilia minuta*, which is especially typical of wicker and basketwork, was common.

A group of beetles that typically occur on relatively dry, somewhat foul matter of animal origin may have a connection to activities carried out within buildings. *Omosita colon* and *O depressus* are chiefly found on dry carrion, old dry bones and similar material such as old skins (Joy 1932, 535) and were notably common (minimum 17 individuals). *Monotoma* spp and *Trox scaber* will also occur on similar material. Incidences where *T. scaber* has been found in association with the tanning process, tanning waste and leather-working have been summarised by Hall and Kenward (2011).

Outdoor insects were well represented (23% of the terrestrial fauna). Ground beetles (Carabidae) are particularly likely to represent conditions in the immediate surroundings of the quarry pit. Taxa from damp ground were somewhat better represented than in the sample from well [1080] (OA14) (15% of terrestrial insects). *Amara* species occur on relatively dry, open, sun-exposed ground but a wider range of species are indicative of soft, damp ground, and *Pterostichus anthracinus* and *Oodes helopioides* are typical of well-vegetated humus-rich soils near fresh water. Weedy vegetation and disturbed ground were indicated by *Coreus marginatus*, associated with docks (*Rumex*) in the larval stages, *Chaetocnema concinna* or *C. picipes* found on Polygonaceae including docks and knotweed (*Polygonum*), and *Phyllotreta nemorum* group which occurs on various wild and cultivated Brassicaceae. Another group of beetles suggestive of grassland vegetation (?*Mecinus pascuorum* found on ribwort plantain (*Plantago lanceolata*), a *Craspedolepta nervosa* nymph found on yarrow (*Achillea millefolium*), *Sitona*,

Hypera, *Longitarsus* spp) might relate either to the use of cut vegetation as floor litter or as animal fodder in buildings, or to the local environment. Beetles specifically associated with foul organic matter such as dung were quite well represented (10% of the terrestrial fauna) but the proportion is probably not high enough to indicate that stable waste containing animal dung was a major element in this deposit, although a limited amount is certainly a possibility along with other forms of waste.

Discussion and Conclusions

There was convincing evidence from five of the samples for the disposal of a variety of occupation waste including human faeces and mouldering organic litter from within buildings, most likely from floors. This was evident even in two samples that produced only small amounts of insect material. Two further samples produced very few or no identifiable insect remains, and it is likely that conditions in the features that they represent were unsuitable for insect preservation.

It seems likely from the composition of the fully analysed assemblages that the discarded floor litter came chiefly from domestic buildings or workshops, rather than structures where animals were kept. The relative abundance of beetles specifically associated with foul organic matter and dung in quarry pit [1374] (G18, OA4), together with a smaller group of insects associated with grassland vegetation, might provide a hint for the disposal of stable waste, but this was unclear since the deposit probably also contained human faeces which would have been attractive to the same group of foul decomposers.

Beetles associated with wood were quite common. These included three species that commonly attack structural timbers, namely common woodworm beetle (*Anobium punctatum*), fan-bearing wood-borer (*Ptilinus pectinicornis*), and powder-post beetle (*Lyctus linearis*). These were probably mainly associated with the faunas from buildings, but rotten timbers might also have been dumped along with other refuse, and all three species are likely to have formed part of the 'background fauna' of an area where old timber buildings and structures were common. Bark beetles (Scolytinae) associated with ash and woody Rosaceae could have been imported into buildings in firewood, while *Gracilia minuta*, a small longhorn beetle (Cerambycidae) that was common in both the analysed samples most likely originated in wicker or basketwork within buildings.

Four samples produced puparia of sheep keds (*Melophagus ovinus*). They were particularly common in the fill of quarry pit [1374] where occasional sheep lice (*Bovicola ovis*) were also recorded. Keds are ectoparasitic flies found exclusively on sheep, spending their whole lives in the fleece, and their puparia are firmly glued to the wool fibres by a secretion produced by the adult females. In archaeological deposits, the occurrence of keds and sheep lice, appears to be particularly associated with floors of buildings where wool was cleaned and processed, and with discarded floor litter (eg Kenward & Hall 1995, 775–7). The most effective way of removing the puparia from wool would be by teasing (a process that loosens and spreads out wool fibres

removing dirt and other unwanted matter prior to carding and spinning), an activity that would often have taken place within workshops or domestic buildings. In addition to the evidence for wool-cleaning, a substantial group of beetles that are predominantly associated with dry but somewhat foul organic matter, such as dry carrion, old bones and skins, was recorded from quarry pit [1374] (G18, OA4). Given the abundant evidence for the discard of mouldy floor litter and wool cleaning, it seems likely that these beetles may also be connected with crafts being carried out in the buildings, perhaps 'dirty' activities such as leather, hide or horn working.

Beetles associated with outdoor habitats were well-represented in the fully analysed samples. Some of these could have been introduced into the features with discarded litter, having been originally imported with cut vegetation from either wetland or grassland. Others, and particularly various ground beetles (Carabidae), provide an indication of well-vegetated marshland in the near vicinity of quarry pit [1374] (G18, OA4). Various insects associated with docks and weedy vegetation suggested disturbed ground close to the quarry pit. Ground close to well [1080] (OA14) may have been soft, damp and rather bare. Although most of the evidence was damp ground, relatively dry, sun-exposed ground was also indicated close to both features.

BIBLIOGRAPHY

- Abramson, T, 2016 *Sceattas, an Illustrated Guide*, London
- Albarella, U, 1995 'Depressions on sheep horncores' *J Archaeol Sci* 22, 699–704
- Allison, E P, & Hall, A R, 2001 'The plant and invertebrate remains' in M Hicks & A Hicks *St Gregory's Priory, Northgate, Canterbury: Excavations 1988–89 The Archaeology of Canterbury* (New Series) 2, 334–8
- Andersson, E, 1999 *The Common Thread: Textile Production During the Late Iron Age–Viking Age*, Lund
- Andrews, P, 1990 *Owls, Caves and Fossils*, Chicago
- Asouti, E, & Austin, P, 2005 'Reconstructing woodland vegetation and its exploitation by past societies, based on the analysis and interpretation of archaeological wood charcoal remains' *Environ Archaeol* 10.1, 1–18
- Bailon, S, 1999 'Différenciation ostéologique des Anoures (Amphibia, Anura) de France' *Fiches D'Ostéologie Animale Pour L'Archéologie, Série C: Varia*, Valbonne, 1–38
- Bantock, T, & Botting, J, 2018 *British Bugs: An Online Identification Guide to UK Hemiptera*, <https://www.britishbugs.org.uk/systematic.html> (accessed January 2025)
- Barrett, J H, Orton, D, Johnstone, C, Harland, J, Van Neer, W, Erynck, A, Roberts, C, Locker, A, Amundsen, C, Enghoff, I B, Hamilton-Dyer, S, Heinrich, D, Hufthammer, A K, Jones, A K G, Jonsson, L, Makowiecki, D, Pope, P, O'Connell, T C, De Roo, T, & Richards, M, 2011 'Interpreting the expansion of sea fishing in medieval Europe using stable isotope analysis of archaeological cod bones' *J Archaeol Sci* 38.7, 1516–24
- Barrett, J, 2016 'Studying medieval sea fishing and fish trade: how and why' in Barrett & Orton, 1–10
- Barrett, J, & Orton, D, 2016 *Cod and Herring: The Archaeology and History of Medieval Sea Fishing*, London
- Bender Jørgensen, L, 1991 'The textiles of the Saxons, Anglo-Saxons and Franks' *Studien zur Sachsen Forschung* 7, 11–23
- Bender Jørgensen, L, 1992 *North European Textiles until AD 1000*, Aarhus
- Blackmore, L, 2008 'The accessioned finds' in Cowie & Blackmore, 193–5
- Blackmore, L, 2012 'The non-ferrous metalworking' in Cowie & Blackmore, 161–2
- Boessneck, J, Muller, H H, & Teichart, M, 1964 'Osteologische unterscheidungsmerkmale zwischen Schaf (*Ovis aries* Linne) und Ziege (*Capra hircus* Linne)' *Kuhn-Archiv* 78, 5–129
- Boessneck, J, 1969 'Osteological differences between sheep (*Ovis aries* Linne) and goat (*Capra hircus* Linne)' in D R, Brothwell and E S Higgs (eds) *Science in Archaeology: A Comprehensive Survey of Progress and Research*, London, 331–58
- Brandenburgh, C R, 2016 *Clothes Make the Man: Early Medieval Textiles From the Netherlands*, Leiden
- Brugmann, B, 2004 *Glass Beads From Anglo-Saxon Graves: A Study of the Provenance and Chronology of Glass Beads From Early Anglo-Saxon Graves, Based on Visual Examination*, Oxford
- Butler, V L, & Schroeder, R A, 1998 'Do digestive processes leave diagnostic traces on fish bones?' *J Archaeol Sci* 25.10, 957–71
- Callou, C, 1997 'Diagnose différentielle des principaux éléments squelettiques du lapin (genre *Oryctolagus*) et du lièvre (genre *Lepus*) en Europe Occidentale' *Fiches d'Ostéologie Animale pour L'Archéologie. Série B: Mammifères* 8, Editions APDCA, Juan-les-Pins, 1–24
- Cannon, D Y, 1987 *Marine Fish Osteology: A Manual for Archaeologists* Department of Archaeology Publication 18, Simon Fraser University, Burnaby, Canada
- Caple, C, 1992 'The detection and definition of an industry: the English medieval and post medieval pin industry' *Archaeol J* 148.1, 241–55
- Cappers, R T J, Bekker, R M, & Jans, J E A, 2006 *Digital Seed Atlas of the Netherlands* Groningen Archaeological Series 4, Elde NL
- Carew, T, 2009 *London Transport Museum, Covent Garden. Archaeological Archive Report, Volume 1* (site code LTM03) unpub AOC Archaeology report
- Carrott, J, & Kenward, H, 2001 'Species associations among insect remains from urban archaeological deposits and their significance in reconstructing the past human environment' *J Archaeol Sci* 28, 887–905
- Carruthers, W, 2004 'Plant remains' in Leary, 112–15
- Carruthers, W, & Allison, E, 2015 *Plant and Insect Remains From Medieval Features at 70 Stour Street, Canterbury, Kent (Site code SCC(70).EX13)* unpub Canterbury Archaeological Trust Report 2015/79
- Coatsworth, E, & Owen-Crocker, G R, 2007 *Medieval Textiles of the British Isles AD 450–1100: An Annotated Bibliography* British Archaeological Reports (British Series) 445, Oxford

- Cohen, A, & Serjeantson, D, 1996 *A Manual for the Identification of Bird Bones From Archaeological Sites*, London
- Corbett, G B, & Harris S, 1991 *The Handbook of British Mammals*, Oxford
- Cowie, R, & Blackmore, L, 2008 *Early and Middle Rural Settlement in the London Region* MoLAS Monograph 41, London
- Cowie, R, & Blackmore, L, 2012 *Lundenwic: Excavations in Middle Saxon London, 1987–2000* MOLA Monograph 63, London
- Cox, M L, 2007 *Atlas of the Seed and Leaf Beetles of Britain and Ireland*, Newbury,
- Crabtree, P, 1989 *West Stow: Early Anglo-Saxon Animal Husbandry* East Anglian Archaeology 47, Norfolk
- Crowfoot, E, 1983 ‘The textiles’ in A Care Evans (ed) *The Sutton Hoo Ship-Burial, Volume 3*, London, 409–79
- Crowfoot, E, 1990 ‘Textiles’ in M Biddle (ed) *Object and Economy in Medieval Winchester* Winchester Studies 7ii, Oxford, 467–87
- Crowfoot, E. 1992 ‘Table of Anglo-Saxon textiles’ in L Bender Jørgensen *North European Textiles until AD 1000*, Aarhus, 153–8
- Duff, A, (ed) 2018 *Checklist of Beetles of the British Isles* (3rd edition), Iver
- Duffy, E A J, 1953 *A Monograph of the Immature Stages of British and Imported Timber Beetles (Cerambycidae)*, London
- Egan G, 1998 *The Medieval Household: Daily Living c. 1150–c.1450* Medieval Finds from Excavations in London 6, London
- Fiorentino, G, & D’Oronzo, C, 2010 ‘An archaeobotanical and experimental approach to identifying successive fire events in hearth structures in the sanctuary of Apollo in Hierapolis (Turkey)’ in I Théry-Parisot, L Chabal & S Costamagno (eds) ‘Taphonomie des Résidus Organiques Brûlés et des Structures de Combustion en Milieu Archéologique’ *Paléthnologie* 2, 59–68
- Fisher, R A, Corbet, A S, & Williams, C B, 1943 ‘The relation between the number of species and the number of individuals in a random sample of an animal population’ *J Animal Ecology* 12, 42–58
- Fock, J, 1966 *Metrische Untersuchungen an Metapodien Einiger Europäischer Rinderrassen* unpub PhD thesis, University of Munich
- Foreman, M, 2009 ‘Combs’ in D H Evans & C Loveluck (eds) *Life and Economy at Early Medieval Flixborough, c. AD 600–1000: The Artefact Evidence. Excavations at Flixborough Volume 2*, Oxford, 82–102
- Forsyth-Magee, H, 2021 ‘The fish bones’ in I Hogg ‘Activity on the edge of Lundenwic: excavations at Parker House, in the London Borough of Camden’ *Trans London Middlesex Archaeol Soc* 72, 215–16
- Gabra-Sanders, T, 1998 ‘Review of Viking-Age textiles and fibres from Scotland: an interim report’ in L Bender Jørgensen & C Rinaldo (eds) *Textiles in European Archaeology. Reports from the 6th NESAT Symposium, 7–11 May 1996 in Borås, Göteborg* University Department of Archaeology, 177–85
- Gabra-Sanders, T, 1999 ‘The textiles’ in O Owen & M Dalland (eds) *Scar: A Viking Boat Burial on Sanday, Orkney*, East Linton, 67
- Gale, R, & Cutler, D, 2000 *Plants in Archaeology*, Otley
- Galloway, J A, Keene, D, & Murphy, M, 1996 ‘Fuelling the City: production and distribution of firewood and fuel in London’s region, 1290–1400’ *Economic Hist Rev* 49.3, 447–72
- Goffin, R, 1988 ‘The Saxon daub’ in R Cowie & R L Whytehead with L Blackmore ‘Two Middle Saxon occupation sites: excavations at Jubilee Hall and 21–22 Maiden Lane’ *Trans London Middlesex Archaeol Soc* 39, 114–19
- Goffin, R, 2003a ‘The quernstones’ in Malcolm & Bowsher, 204–9
- Goffin, R, 2003b ‘The stone objects’ in Malcolm & Bowsher, 197–203
- Goffin, R, 2003c ‘The loom weights’ in Malcolm & Bowsher, 216–22
- Goubitz, O, 2001 *Stepping Through Time: Archaeological Footwear From Prehistoric Times Until 1800*, Stichting Promotie Archaeologie, Zwolle
- Grant, A, 1982 ‘The use of tooth wear as a guide to the age of domestic ungulates’ in B Wilson, C Grigson & S Payne (eds) *Ageing and Sexing Animals from Archaeological Sites* British Archaeological Reports (British Series) 109, Oxford, 91–108
- Grime, J P, Hodgson, J F, & Hunt, R, 1988 *Comparative Plant Ecology: A Functional Approach to Common British Species*, London
- Guido, M, 1978 *The Glass Beads of the Prehistoric and Roman Period in Britain and Ireland* Society of Antiquaries Research Report 35, London
- Hagen, A, 1995 *A Second Handbook of Anglo-Saxon Food & Drink: Production & Distribution*, Thetford
- Hall, A R, & Kenward, H K, 1990 *Environmental Evidence From the Colonia: General Accident and Rougier Street* Archaeology of York 14, Council for British Archaeology, London, 289–434
- Hall, A, & Kenward, H, 2011 ‘Plant and invertebrate indicators of leather production: from fresh skin to leather offcuts’ in R Thomson & Q Mould (eds) *Leather Tanneries: The Archaeological Evidence*, London, 9–32
- Halstead, P, Collins, P, & Isaakidou, V, 2002 ‘Sorting sheep from goats: morphological distinctions between the mandibles and mandibular teeth of adult Ovis and Capra’ *J Archaeol Sci* 29, 545–53
- Hambleton, E, 1999 *Animal Husbandry Regimes in Iron Age Britain: A Comparative Study of Faunal Assemblages From Iron Age Sites* British Archaeological Reports (British Series) 282, Oxford
- Hambleton, E, 2008 *Review of Middle Bronze Age–Late Iron Age Faunal Assemblages from Southern Britain* English Heritage Archaeological Science Research Report 71, Swindon
- Hamilton-Dyer, S, 2005 ‘Animal bones’ in V Birbeck with R J C Smith, P Andrews & N Stoodley *The Origins of Mid-Saxon Southampton: Excavations at the Friends Provident St Mary’s Stadium 1998–2000*, Wessex Archaeology, Salisbury, 140–54
- Hansen, M, 1987 *The Hydrophiloidea (Coleoptera) of Fennoscandia and Denmark* Fauna Entomologica Scandinavica 18, Leiden and Copenhagen
- Harcourt, R A, 1974 ‘The dog in prehistoric and early historic Britain’ *J Archaeol Sci* 1, 151–75
- Harrington, S, 2007 ‘Soft furnished burial: an assessment of the role of textiles in Early Anglo-

- Saxon inhumations, with particular reference to East Kent' *Anglo-Saxon Stud Archaeol History* 14, 110–16
- Hather, J G, 2000 *The Identification of Northern European Woods: A Guide for Archaeologists and Conservators*, London
- Hayeur Smith, M, 2020 *The Valkyries' Loom: The Archaeology of Cloth Production and Female Power in the North Atlantic*, Gainesville FL
- Hedges, J, 1982 'Textiles' in A MacGregor (ed) *Anglo-Scandinavian Finds from Lloyds Bank, Pavement, and Other Sites* Archaeology of York: the small finds 17.3, Council for British Archaeology, London, 102–36
- Hickin, N E, 1975 *The Insect Factor in Wood Decay: An Account of Wood-Boring Insects With Particular Reference to Timber Indoors* (3rd edition revised by R Edwards), London
- Hillson, S, 1995 *Mammal Bones and Teeth: An Introductory Guide to Methods of Identification*, London
- Hodkinson, I D, & White, I M, 1979 *Homoptera: Psylloidea* Handbooks for the Identification of British Insects 2 (part 5a), Royal Entomological Society, London
- Hogg, I, 2019 'Excavations at 26–27 Southampton Street: a snapshot of the decline of *Lundenwic*' *London Archaeol* 15.7, 211–14
- Holmes, M, 2014 *Animals in Saxon & Scandinavian England*, Leiden
- Holmes, M, 2017 *Southern England: A Review of Animal Remains From Saxon, Medieval and Post-Medieval Archaeological Sites* Historic England Research Report Series 08/2017
- Holterman, B, 2016 'How to recognise stockfish from its bones' available online at *Fish and Ships: weblog about pre-modern international trade in the North Atlantic*, the German Maritime Museum (Deutsches Schiffahrtsmuseum) in Bremerhaven, <https://fishandships.dsm.museum/?p=379> (accessed January 2025)
- Hughes, R, 2004a 'The fired daub' in Leary 97–8
- Hughes, R, 2004b 'Wattle and daub: a technical and experimental study based on materials from the National Portrait Gallery' in Leary, 115–35
- Hunter, K, 2004 'Plant remains' in Leary, 35–8
- Hutchinson, W F, Culling, M, Orton, D C, Hanfling, B, Lawson-Handley, L, Hamilton-Dyer, S, Richards, M P, & Barrett, J H, 2015 'The globalization of naval provisioning: ancient DNA and stable isotope analyses of stored cod from the wreck of the Mary Rose, AD 1545' *Royal Soc Open Sci* 2.9, <https://doi/10.1098/rsos.150199> (accessed January 2025)
- Jacomet, S, 2006 *Identification of Cereal Remains From Archaeological Sites* (2nd edition), Archaeobotany laboratory, IPAS, Basel University, online open access resource (accessed January 2025)
- Joy, N H, 1932 *A Practical Handbook of British Beetles*, London
- Jones, A K G, 1984 'Some effects of the mammalian digestive system on fish bones' in N Desse-Benet (ed) *Second Fish Osteoarchaeology Meeting* Centre de Recherches Archeologiques Notes et Monographies Techniques 16, Centre National de la Recherche Scientifique, Paris, 61–5
- Jones, A K G, 1986 'Fish bone survival in the digestive tract of pig, dog and man: some experiments' in D C Brinkhuizen & A T Clason (eds) *Fish and Archaeology* British Archaeological Reports (International Series) 294, Oxford, 53–63
- Keily, J, & Blackmore, L, 2012 'The worked bone and antler objects' in Cowie & Blackmore, 289–95
- Kenward, H, 1997 'Synanthropic decomposer insects and the size, remoteness and longevity of archaeological occupation sites: applying concepts from biogeography to past 'islands' of human occupation' in A C Ashworth, P C Buckland & J T Sadler (eds) *Studies in Quaternary Entomology: An Inordinate Fondness for Insects* Quaternary Proceedings 5, 135–52
- Kenward, H K, & Hall, A R, 1995 *Biological Evidence From 16–22 Coppergate* Archaeology of York 14.7, Council for British Archaeology, York, 435–797
- Kenward, H K, Hall, A R, & Jones, A K G, 1980 'A tested set of techniques for the extraction of plant and animal macrofossils from waterlogged archaeological deposits' *Science Archaeol* 22, 3–15
- Kenward, H K, Hall, A R, & Jones, A K G, 1986 *Environmental Evidence From a Roman Well and Anglian Pits in the Legionary Fortress* Archaeology of York 14.5, Council for British Archaeology, London, 241–88
- Kiesewalter, L, 1888 *Skelettmessungen an Pferden als Beitrag zur theoretischen Grundlage der Beurteilungslehre des Pferdes* unpub Leipzig Phil dissertation
- Koch, U, 1997 'Polychrome perlen in Württemberg/Nordbaden' in U von Freeden & A Wiczorak (eds) *Perlen: Archäologie, Techniken, Analysen; Akten des Internationalen Perlensymposiums in Mannheim vom 11 bis 14 November 1994* (Kolloquien zur Vor- und Frühgeschichte), Bonn, 143–8
- Kowaleski, M, 2010 'The seasonality of fishing in medieval Britain' in S G Bruce (ed) *Ecologies and Economies in Medieval and Early Modern Europe: Studies in Environmental History for Richard C. Hoffmann*, Leiden, 117–47
- Kowaleski, M, 2016 'The early documentary evidence for the commercialisation of the sea fisheries in medieval Britain' in Barrett & Orton, 23–41
- Kratochvil, Z, 1969 'Species criteria on the distal section of the tibia in *Ovis ammon* F. aries L. and *Capra aegagrus* F. hircus L.' *Acta Veterinaria* 38, 483–90
- Kruger, R, 2015 'A burning question or, some half-baked ideas: patterns of sintered daub creation and dispersal in a modern wattle and daub structure and their implications for archaeological interpretation' *J Archaeol Method Theory* 22.3, 883–912
- Lawrence, M J, & Brown, R W, 1974 *Mammals of Britain: Their Tracks, Trails and Signs*, London
- Leary, J, with Brown, G, Rackham, J, Pickard, C, & Hughes, R, 2004 *Tatberht's Lundenwic. Archaeological Excavations in Middle Saxon London Pre-Construct* Archaeology Monograph 2, London
- Levine, M, 1982 'The use of crown height measurements and eruption-wear sequences to age horse teeth' in B Wilson, C Grigson & S Payne (eds) *Ageing and Sexing Animals From Archaeological Sites* British Archaeological Reports (British Series) 109, Oxford, 91–108
- Libois, R M, Hallet-Liboi, C, & Rosoux, R, 1987 *Éléments Pour l'Identification des Restes Craniens des Poissons Dulçaquicoles de Belgique et du Nord de la France*, Fiches

- d'Osteologie Animale pour l'Archeologie Series A, Poissons 3, Centre de Recherches Archeologiques du CNRS, Juan les Pins
- Lindroth, C H, 1986 *The Carabidae (Coleoptera) of Fennoscandia and Denmark* Fauna Entomologica Scandinavica 15.2, Leiden, Brill
- Lister, A M, 1996 'The morphological distinction between bones and teeth of fallow deer (*Dama dama*) and red deer (*Cervus elaphus*)' *Int J Osteoarchaeol* 6, 119–143
- Locker, A, 1986 *Pudding Lane, City of London: The Fishbone, Department of Urban Archaeology (site code PDN81)*, unpub Museum of London archive report
- Locker, A, 1988 'The fish bones' in R Cowie & R L Whytehead with L Blackmore 'Two Middle Saxon occupation sites: excavations at Jubilee Hall and 21–22 Maiden Lane' *Trans London Middlesex Archaeol Soc* 39, 149–50
- Locker, A, 1989 'The fish bones' in R L Whytehead & R Cowie with L Blackmore 'Excavations at the Peabody Site, Chandos Place, and the National Gallery' *Trans London Middlesex Archaeol Soc* 40, 148–50
- Locker, A, 1995 'The fish bones' in P Mills 'Excavations at the dorter undercroft, Westminster Abbey' *Trans London Middlesex Archaeol Soc* 46, 111–13
- Locker, A, 2000 *The Role of Stored Fish in England 900–1750 AD; The Evidence From Historical and Archaeological Data* unpub PhD thesis Southampton University
- Locker, A, 2016 'The decline in the consumption of stored cod and herring in post-medieval and early industrialised England: a change in food culture' in Barrett & Orton, 99–107
- Locker, A, 2018 *Freshwater Fish in England*, London
- Lott, D A, 2009 *The Staphylinidae (Rove Beetles) of Britain and Ireland Part 5: Scaphidiinae, Piestinae, Oxytelinae* Handbooks for the Identification of British Insects 12 (5), Royal Entomological Society, St Albans
- Lott, D A, & Anderson, R, 2011 *The Staphylinidae (Rove Beetles) of Britain and Ireland Parts 7 & 8: Oxyporinae, Steninae, Euaesthetinae, Pseudopsinae, Paederinae, Staphylininae* Handbooks for the Identification of British Insects 12 (7), Royal Entomological Society, St Albans
- Luff, M L, 2007 *The Carabidae (Ground Beetles) of Britain and Ireland* Handbooks for the Identification of British Insects 4 (2) (2nd edition), Royal Entomological Society/Field Studies Council, Shrewsbury
- MacGregor, A, 1985 *Bone, Antler Ivory and Horn: The Technology of Skeletal Materials Since the Roman Period*, London
- Maltby, M, 1981 'Iron Age, Romano-British and Anglo-Saxon animal husbandry: a review of the faunal evidence' in M Jones & G Dimbleby (eds) *The Environment of Man: The Iron Age to the Anglo-Saxon Period* British Archaeological Reports (British Series) 87, Oxford, 155–204
- Malcolm, G, Bowsher, D, with Cowie, R, 2003 *Middle Saxon London: Excavations at the Royal Opera House 1989–99* MoLAS Monograph 15, London
- May, E, 1985 'Widerristhöhe und Langenknochenmaße bei Pferden – ein immer noch aktuelles Problem' *Mammalian Biology/Früher Zeitschrift für Säugetierkunde* 50, 368–82
- McParland, L C, Collinson, M E, Scott, A C, Campbell G, & Veal, R, 2010 'Is vitrification in charcoal a result of high temperature burning of wood?' *J Archaeol Sci* 37, 2679–87
- Möller-Wiering, S, 2015 'External examination of spinning and weaving samples' in E Andersson Strand & M L Nosch (eds) *Tools, Textiles and Contexts. Investigating Textile Production in the Aegean and Eastern Mediterranean Bronze Age*, Oxford & Philadelphia, 101–18
- Morales, A, & Rosenlund, K, 1979 *Fish Bone Measurements: An Attempt to Standardize the Measuring of Fish Bones From Archaeological Sites*, Copenhagen
- Morris, M G, 1997 *Broad-Nosed Weevils, Coleoptera: Curculionidae (Entiminae)* Handbooks for the Identification of British Insects 5 (17a), Royal Entomological Society, London
- Morris, M G, 2012 *True Weevils (Part 3) (Coleoptera: Curculioninae, Baridinae, Orobolinae)*, Handbooks for the Identification of British Insects 5 (17d), Royal Entomological Society/Field Studies Council, Shrewsbury
- Nicholson, R, 1992 'Bone survival: the effects of sedimentary abrasion and trampling on fresh and cooked bone' *Int J Osteoarchaeol* 2, 79–90
- Nicholson, R, 1993 'An investigation into the effects on fish bone of passage through the human gut: some experiments and comparisons with archaeological material' *Circea* 10.1, 38–51
- Nicholson, R A, 2006 'Fish remains' in K Parfitt, B Corke & J Cotter *Townwall Street, Dover: Excavations 1996* Archaeology of Canterbury (New Series) 3, 353–69
- Nicholson, R A, 2009 *Southampton French Quarter SOU 1382 Specialist Report Download E2 (Fish Bones)*, Oxford Archaeology Library, <https://eprints.oxfordarchaeology.com/58/> (accessed January 2025)
- O'Connor, T, 1989, *Bones from Anglo-Scandinavian Levels at 16–22 Coppergate*, Archaeology of York 15:33, Council for British Archaeology & York Archaeological Trust, London
- O'Connor, T, 2000 *The Archaeology of Animal Bones*, Stroud
- Orton, D, Morris, J, Locker, A, & Barrett, J, 2014 'Fish for the city: meta-analysis of the archaeological cod remains and the growth of London's northern trade' *Antiquity* 88 (issue 340), 516–30
- Owen-Crocker, G R, 2004 *Dress in Anglo-Saxon England: Revised and Enlarged Edition*, Woodbridge.
- Payne, S, 1969 'A metrical distinction between sheep and goat metacarpals' in P Ucko & G Dimbleby (eds) *The Domestication and Exploitation of Plants and Animals*, London, 295–305
- Payne, S 1985 'Morphological distinctions between mandibular teeth of young sheep, Ovis, and goats, Capra' *J Archaeol Sci* 12, 139–47
- Petty, C, 2014 *Warp Weighted Looms: Then and Now. Anglo-Saxon and Viking Archaeological Evidence and Modern Practitioners* unpub Masters Thesis, University of Manchester

- Prior, J, & Alvin, K L, 1983 'Structural changes on charring wood of *Dichrostachys* and *Salix* from Southern Africa' *Int Assoc Wood Anatomists* 4, 197–206
- Pritchard, F A, 1984 'Late Saxon textiles from the City of London' *Medieval Archaeol* 28,1, 46–76
- Pritchard, F, 2014 'Textiles from Dublin' in N Coleman & N Løkken (eds) *Vikingatidens Kvinnor*, Oslo, 225–40
- Prummel, W, & Frisch, H J, 1986 'A guide for the distinction of species, sex and body side in bones of sheep and goat' *J Archaeol Sci* 13, 567–77
- Rackham, J, 1994 'Economy and environment in Saxon London' in J Rackham (ed) *Environment and Economy in Anglo-Saxon England: A Review of Recent Work on the Environmental Archaeology of Rural and Urban Anglo-Saxon Settlements in England* Council for British Archaeology Research Report 89, York, 126–35
- Rackham, O, 2006 *Woodlands*, London
- Reynolds, R V, 2015 *Food for the Soul: The Dynamics of Fishing and Fish Consumption in Anglo-Saxon England; c. AD 410–1066* unpub PhD thesis University of Nottingham
- Riddler, I D, 1990 'Saxon handled combs from London' *Trans London Middlesex Archaeol Soc* 41, 9–20
- Riddler, I, 2014 'Toilet implements: combs' in A Tester, S Anderson, I Riddler & R Carr *Staunth Meadow, Brandon, Suffolk: A High Status Middle Saxon Settlement on the Fen Edge* East Anglian Archaeology 151, Bury St Edmunds, 246–56
- Rielly, K, 2000 *Bull Wharf (BUF90) and Upper Thames Street (UPT90): Archive Report of the Animal Bones* unpub MoLAS report
- Rielly, K, 2003 'The animal and fish bone' in Malcolm & Bowsher, 315–24
- Rielly, K, 2007 'The meat diet' in D Bowsher, T Dyson., N Holder & I Howell *The London Guildhall: An Archaeological History of a Neighbourhood From Early Medieval to Modern Times* MoLAS Monograph 36 (part 2), London, 331–5
- Rielly, K, 2012 'The animal and fish bone' in Cowie & Blackmore, 302–4
- Rielly, K, 2012 'Animal husbandry' in Cowie & Blackmore, 132–9
- Rielly, K, Pipe, A, & Davis, A, 2012 'Hunting, gathering and fishing' in Cowie & Blackmore, 141–55
- Ritchie, S, 2017 *A Post-Excavation Assessment and Updated Project Design Report, Centre Buildings Redevelopment London School of Economics and Political Science Houghton Street, City of Westminster, London, WC2A 2AE* Archaeology South-East unpub report 2017001
- Ritchie, S, & Hogg, I, 2025 'Saxon, medieval and post-medieval excavations at the London School of Economics Centre Building, Houghton Street, Westminster, WC2' *Trans London Middlesex Archaeol Soc* 75, 188–231
- Ross, S, 1991 *Dress Pins From Anglo-Saxon England: Their Production and Typo-Chronological Development* unpub DPhil thesis, University of Oxford
- Schmid, E, 1972 *Atlas of Animal Bones for Prehistorians, Archaeologists and Quaternary Geologists*, Amsterdam
- Schoch, W, Heller, I, Schweingruber, F H, & Kienast, F, 2004 *Wood Anatomy of Central European Species*, www.woodanatomy.ch. (accessed January 2025)
- Schweingruber, F H, 1990 *Macroscopic Wood Anatomy* (3rd edition), Swiss Federal Institute for Forest, Snow and Landscape Research, Birmensdorf
- Serjeantson, D, 1996 'The animal bones' in S Needham & T Spence *Runnymede Bridge Research Excavations, Volume 2: Refuse and Disposal at Area 16 East, Runnymede* London, 194–223
- Serjeantson, D, & Woolgar, C M, 2006 'Fish consumption' in C M Woolgar & D Serjeantson (eds) *Food and Drink in Medieval England*, Oxford, 102–30
- Silver, I A, 1969 'The ageing of domestic animals' in D Brothwell & E Higgs (eds) *Science in Archaeology: A Comprehensive Survey of Progress and Research*, London, 250–68
- Smith, D N, 2013 'Defining an indicator package to allow identification of 'cesspits' in the archaeological record' *J Archaeol Sci* 40, 526–43
- Smith, T P, 2012 'The daub' in Cowie & Blackmore, 216–17
- Stace, C, 1997 *New Flora of the British Isles* (2nd edition), Cambridge
- Stenton, F M, 1990 *Norman London* (originally published in 1934 as Historical Association leaflets 93 and 94), reprinted in 1990 by Italica Press, New York
- Swann, J 1984 *Shoes*, London
- Smith, D, Hill, G, Kenward, H, & Allison, E, 2020 'Development of synanthropic beetle faunas over the last 9000 years in the British Isles' *J Archaeol Sci* 115, published online: <https://doi.org/10.1016/j.jas.2020.105075> (accessed January 2025)
- Southwood, T R E, & Leston, D, 1959 *Land and Water Bugs of the British Isles*, London
- Sykes, N, & Curl, J, 2010 'The rabbit' in T O'Connor & N Sykes (eds) *Extinctions and Invasions: A Social History of British Fauna*, Oxford, 16–126
- Thomas, C, Sloane, B, & Phillpotts, C, 1997 *Excavations at the Priory and Hospital of St. Mary Spital, London* MoLAS Monograph 1, London
- Teichert M, 1969 'Osteometrische untersuchungen zur berechnung der Widerristhöhe bei vor- und fruhgeschichtlichen schweinen' *Kühn-Archiv*, 83, 237–92
- Teichert, M, 1975 'Osteometrische untersuchungen zur berechnung der Widerristhöhe bei schafen' in A T Clason (ed) *Archaeozoological Studies*, Amsterdam, 51–61
- Tomek T, & Bocheński, Z M, 2009 *A Key for the Identification of Domestic Bird Bones in Europe: Galliformes and Columbiformes*, Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences, Kraków, 111
- Vitolo, M, 2017 'Charcoal' in I Hogg *Parker House, Parker Street, London Borough of Camden. Post-Excavation Assessment Report and Updated Project Design* unpub ASE Report 2017479, available online from the Archaeology Data Service Library (accessed January 2025)
- Vitt, V O, 1952 'The horses of the kurgans of Pazyryk' *J Soviet Archaeol*, 16, 163–206
- Von Den Driesch, A, 1976 *A Guide to the Measurement of Animal Bones from Archaeological Sites*, Peabody Museum Bulletin, Harvard University
- Von Den Driesch, A, & Boessneck, J, 1974 'Kritische

- anmerkungen zue widerristhöhenberechnung aus langenmassen vor- und frühgeschichtlicher tierknochen' *Säugetierkundliche Mitteilungen* 22, 325–48
- Walton, P, 1989 *Textiles, Cordage and Raw Fibre From 16–22 Coppergate* Archaeology of York 17/5, Council for British Archaeology, London
- Walton Rogers, P, 2007 *Cloth and Clothing in Early Anglo-Saxon England AD 450–700* Council for British Archaeology Research Report 145, York
- Walton Rogers, P, 2018 'From farm to town: the changing pattern of textile production in Anglo-Saxon England' *Fasciculi Archaeologiae Historicae Fasc XXXII*, 103–15
- Walton, P, & Eastwood, G, 1984 *A Brief Guide to the Cataloguing of Archaeological Textiles*, London
- Ward Perkins, J B, 1940 *The London Museum Medieval Catalogue* (reprinted 1993), London
- Wheeler, A, 1978 *Key to the Fishes of Northern Europe*, London
- Wheeler, A, 1979 *Fish and Fisheries of the Tidal Thames*, London
- Wheeler, A, & Jones, A K G, 2009 *Fishes*. Cambridge Manuals in Archaeology, Cambridge
- Wild, J P, 1970 *Textile Manufacture in the Northern Roman Provinces*, Cambridge
- Zohary, D, & Hopf, M, 2000 *Domestication of Plants in the Old World*, Oxford