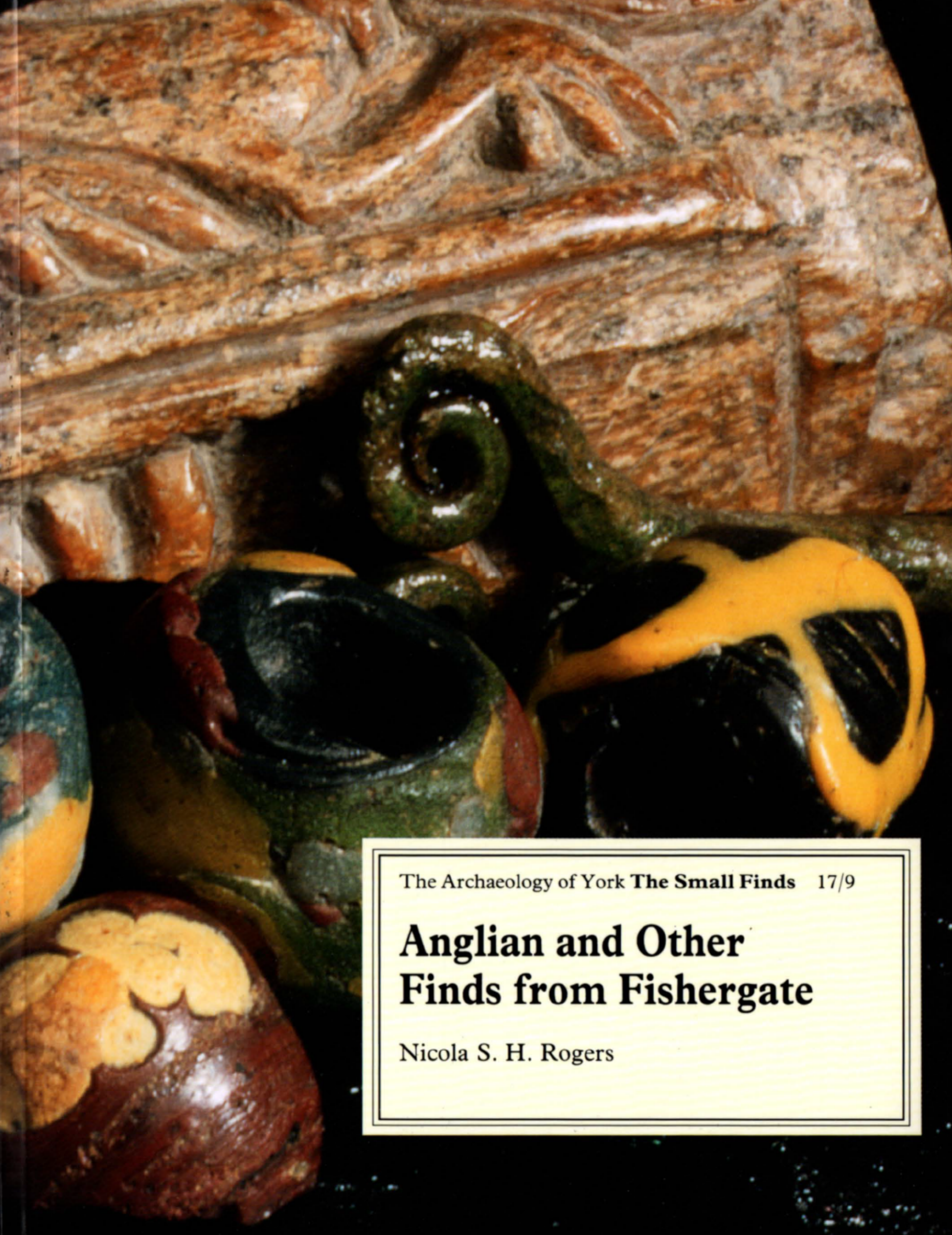

The Archaeology of York **The Small Finds** 17/9

Anglian and Other Finds from Fishergate

Nicola S. H. Rogers

The Archaeology of York
Volume 17: The Small Finds
General Editor P.V. Addyman
Managing Editor V.A. Kinsler

Published by
Council for British Archaeology
112 Kennington Road
London SE11 6RE

British Library Cataloguing-in-Publication Data.
A catalogue record for this book is
available from the British Library

ISBN 1 872414 34 6

Printed by
Henry Ling Ltd
The Dorset Press
Dorchester, Dorset

Cover: A selection of Anglian finds from the site
Cover design: Kate Leach and Glenys Boyles
Photograph: Jan Dennis

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Published for the York Archaeological Trust
by the Council for British Archaeology

1993

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Key words: Anglian, comb making, crafts, dress accessories, Eoforwic, glass, jewellery, metalworking, trade, York

Introduction

The 1985–6 excavations at 46–54 Fishergate uncovered the remains of the Priory of St Andrew, a house of the Gilbertine Order (the only order to originate in England), an 11th–12th century settlement which included a church and cemeteries, and a substantial area of Anglian occupation, the largest so far investigated in the city of York. With a riverside location, and lying slightly away from the centres of the Roman and medieval cities, it was apparent that the Anglian occupation, lasting approximately 150 years from c. AD 700–850, may have represented part of a trading settlement or *emporium*, similar to the settlements identified at Southampton (Hamwic) and Ipswich. This report is concerned with the Anglian artefacts recovered from the site, and also those from the subsequent 11th–12th century re-occupation.

The finds described in this report, together with copies of all appropriate records, will be deposited at the Yorkshire Museum, York, under the Museum and YAT accession codes 1985–6.9 (46–54 Fishergate).

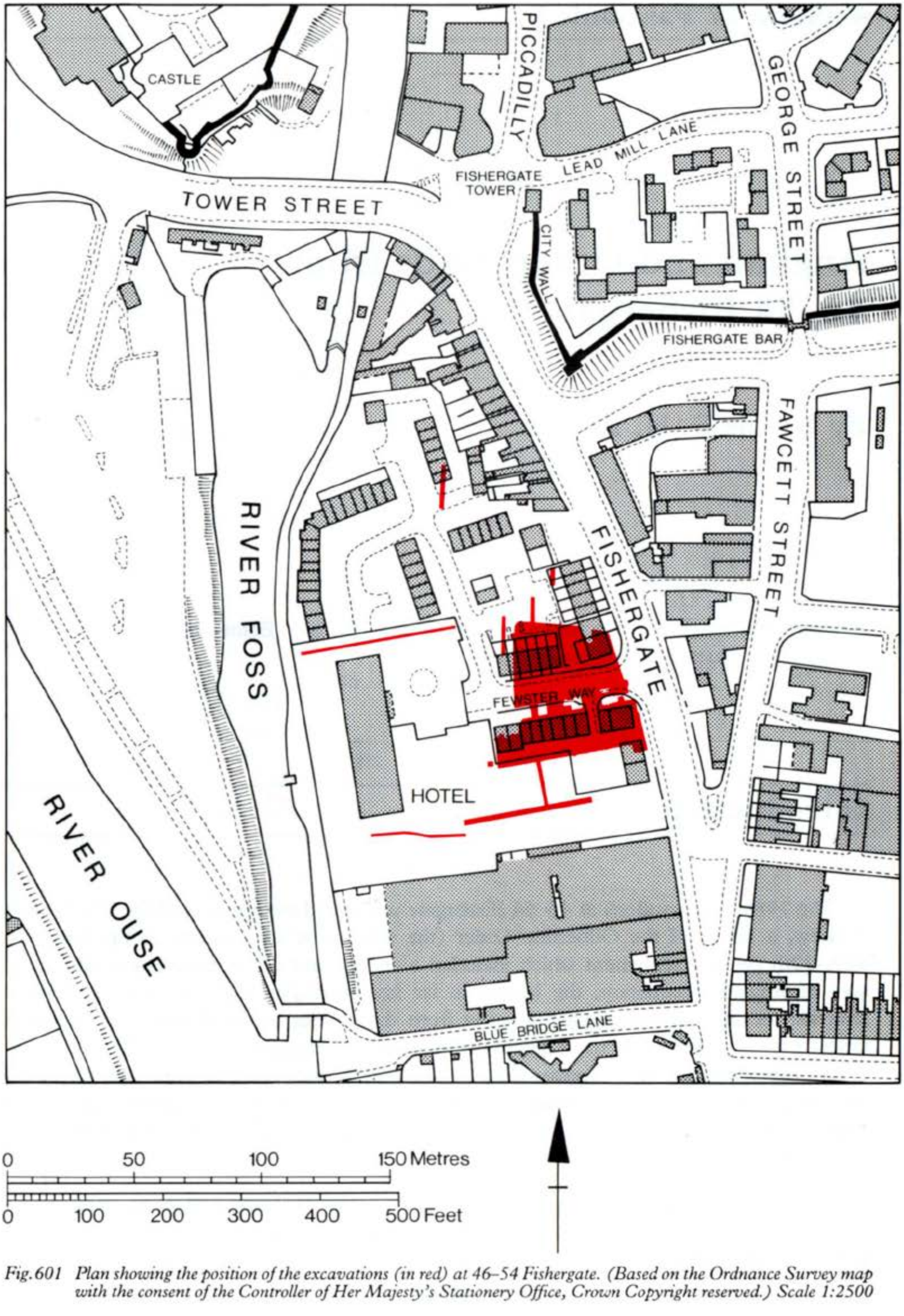


Fig.601 Plan showing the position of the excavations (in red) at 46–54 Fishergate. (Based on the Ordnance Survey map with the consent of the Controller of Her Majesty's Stationery Office, Crown Copyright reserved.) Scale 1:2500

The Archaeology of 46–54 Fishergate

By R.L. Kemp

The excavation comprised two adjacent open areas and a series of narrow trenches totalling c.2500m^2 (SE 60655115; Fig.601). It lay directly to the east of the confluence of the Rivers Ouse and Foss, west of the medieval street, Fishergate (modern Fawcett Street and George Street), which may be on the line of a Roman road from Foss Bridge, and to the south of the Walmgate medieval suburb. This is also where the east–west morainic ridge across the Vale of York meets the River Ouse, and forms a natural crossing point. The sequence of development is discussed below and summarised in Table 76.

Period 1 (Natural subsoil)

The earliest recorded deposits from the site were the natural clays with pebble and cobble inclusions typical of the glacial drift under much of York.

Period 2 (Roman)

Shallow scores in the surface of the natural subsoil and two shallow meandering ditches associated with much abraded Roman pottery probably represented ploughing and either field boundaries or drains. An even, site-wide, deposit of disturbed natural clay also contained abraded Roman sherds and was interpreted as tilth containing material from middens possibly spread as manure.

Period 3 (8th–9th century) (Figs.602–3)

The Roman surface was cut by an extensive complex of pits, ditches and post-holes dated by pottery, coins and artefacts to between the very late 7th or early 8th century and the mid 9th century (*AY* 7/2 in prep.). Over part of the site, two sets of features were stratigraphically separated from each other by an extensive horizontal deposit.

The first signs of occupation comprised a series of boundary ditches, pits and structures (Period 3a). A number of similar features could not be related stratigraphically to the main sequence and are ascribed to Period 3z; their form and contents suggest that they probably belonged to Period 3a and the two are therefore considered together. They represent a settlement unit, c.35m wide, limited to the east by a ditch and to the west by a similar ditch and a possible road parallel to the postulated line of the River Foss. Two large east–west fences/palisades divided this strip; post-built structures with associated pit groups, latrines and possible middens were identified in this area.

Table 76 Summary of archaeological development at 46–54 Fishergate

Period	Description	Characteristics
1	Natural subsoil	Till and fluvio-glacial sands, and clays with gravel
2 1st–4th century	Roman agricultural activity	Plough scores, minor ditches, mixed natural deposit containing abraded Roman pottery
3a 1st part of 8th century	Part of Anglian trading settlement	Properties delineated by ditches and palisades and containing structures, pit groups, middens
3b Later 8th century	Levelling of first settlement	Period 3a pits filled and distinctive horizontal charcoal-laden deposit spread; site possibly re-organised
3c 1st half of 9th century	Re-occupation of settlement area	Major ditch and a few pit groups (no discernible structures)
3z 8th–9th century	Features not linked to 3a–c	Pits, ditches etc. (probably belongs to Period 3a)
4a late 10th/1st half of 11th century	New settlement established	Structure in south-eastern corner and pits/post-holes to south-west. Latest pottery in fills is Stamford ware
4b Mid 11th–?mid 12th century	Cemetery and church (south-west), new buildings (south-east)	Burials and possible timber church in south-west, replacement structure to south-east
4c ?Later 11th or 12th century	Church possibly rebuilt in stone (south-west)	Construction deposits over Period 4b burials
4d 12th century	Continued use of cemetery and settlement	Burials in cemetery area and pits and post-holes over structures in the south-east
4z 11th–12th century	Features not linked to 4a–d	Pits, burials etc.
5 1142/3–1195	St Andrew's in the possession of Newburgh Priory	Historical reference only. Period not distinguished archaeologically

Table 76 (*contd*)

Period	Description	Characteristics
6a 1195–late 13th century	Gilbertine priory in original form	New monastic complex built in stone. Burials
6b Late 13th–early 14th century	First modifications to priory	Minor adjustments within church and rebuilding of cloister alley. Path/track south of nave. Burials
6c Early–mid 14th century	Substantial alterations to priory	Complete rebuilding of church and east range, substantial changes in north range. Burials
6d Late14th–15th century	Further modifications to priory	New fittings in church, alterations in east and north ranges, buttresses in cloister alley
6e 15th/16th century	Continued use and modifications to site	Adjustments to north range. Well, cess pit etc. in southern part of site
6f 16th century	Final modifications in north range	Adjustments to partitions in north range
6z 13th–16th century	Features not linked to 6a–f	Pits, burials, agricultural/horticultural deposits, hearths etc. Ditches north of priory area
7a c.1538	Demolition of church, cloisters and east range	Robbed wall foundations, heavy layer of rubble, limekiln
7b c.1540	Demolition of north range	Partially robbed wall cores
7c 2nd half of 16th century	Secular occupation of west range	Pits containing much animal bone and pottery cut through robbed walls of north range
8 c.17th–19th century	Orchards	Extensive layer of dark loam
9 c.1870–1900	Early factory	Brick foundations
10 c.1900–1984	Modern glass factory	Modern buildings, concrete floors, services, pipes etc.

The settlement was well organised and showed some evidence of having been planned. The deposits excavated contained a rich selection of personal artefacts such as dress pins and some brooches, but there was also evidence for craft activities, including antler and bone comb manufacture, some spinning and weaving, fur preparation, and iron and other metal working.

For a combination of reasons this settlement is thought to represent a small part of the trading *wic* from which *Eoforwic* or Anglian York derives the second part of its name. Firstly, there was extensive evidence for contact with areas of the continental mainland, such as the Rhineland (coins and lava querns) and northern France/Low Countries (imported pottery). Secondly, the site was located at a crossroads of communications where two rivers and an important north–south Roman road met an equally important east–west land route. Thirdly, the settlement's date, topographic position and physical character are similar to those of other *wic* sites such as Lundenwic, Hamwic and Ipswich.

The *wic* may have been established by, and designed to serve, the possible royal, administrative and ecclesiastical centre thought to have been based on the nearby area of the Roman legionary fortress. The restricted nature of the settlement's food supply, as shown by the animal bones from the site (*AY* 15/4, 277–83), is consistent with supply through such a controlling authority.

This settlement appears to come to an abrupt end, with evidence for structures being rapidly dismantled and pits systematically backfilled. None of the pits was left open long enough to act as a pit-fall trap for small mammals. In the central part of the area these features were covered by a highly distinctive charcoal-laden deposit of even thickness, recorded as a number of separate contexts (Period 3b). This deposit was unlikely to have been the result of burning in situ, and resembled more closely domestic waste and fire sweepings (*AY* 15/4). The artefactual, faunal and ceramic assemblages all closely resembled those of Period 3a. The deposit appears to represent the contents of Period 3a middens and other debris systematically spread across the dismantled and levelled settlement, with a large amount of charcoal introduced to the upper surface, perhaps for reasons connected with hygiene or health.

Alternatively, this deposit may represent a second, distinct, period of use. No associated pits or structures were recorded, however, so any such settlement would have been radically different in character both from the Period 3a settlement and from the Period 3c occupation which followed. Continuous occupation of such fluctuating character is inherently unlikely and the hypothesis of two settlements separated by the single event of levelling is preferred (see *AY* 7/2 in prep.).

The charcoal-laden deposit was cut by a new boundary ditch associated with a number of pit groups (Period 3c). This new settlement was less intense and less extensive than that seen in Period 3a, and produced a very much smaller proportion of imported pottery. Other finds, however, do not reveal such differences, and the assemblages from Periods 3a and 3c

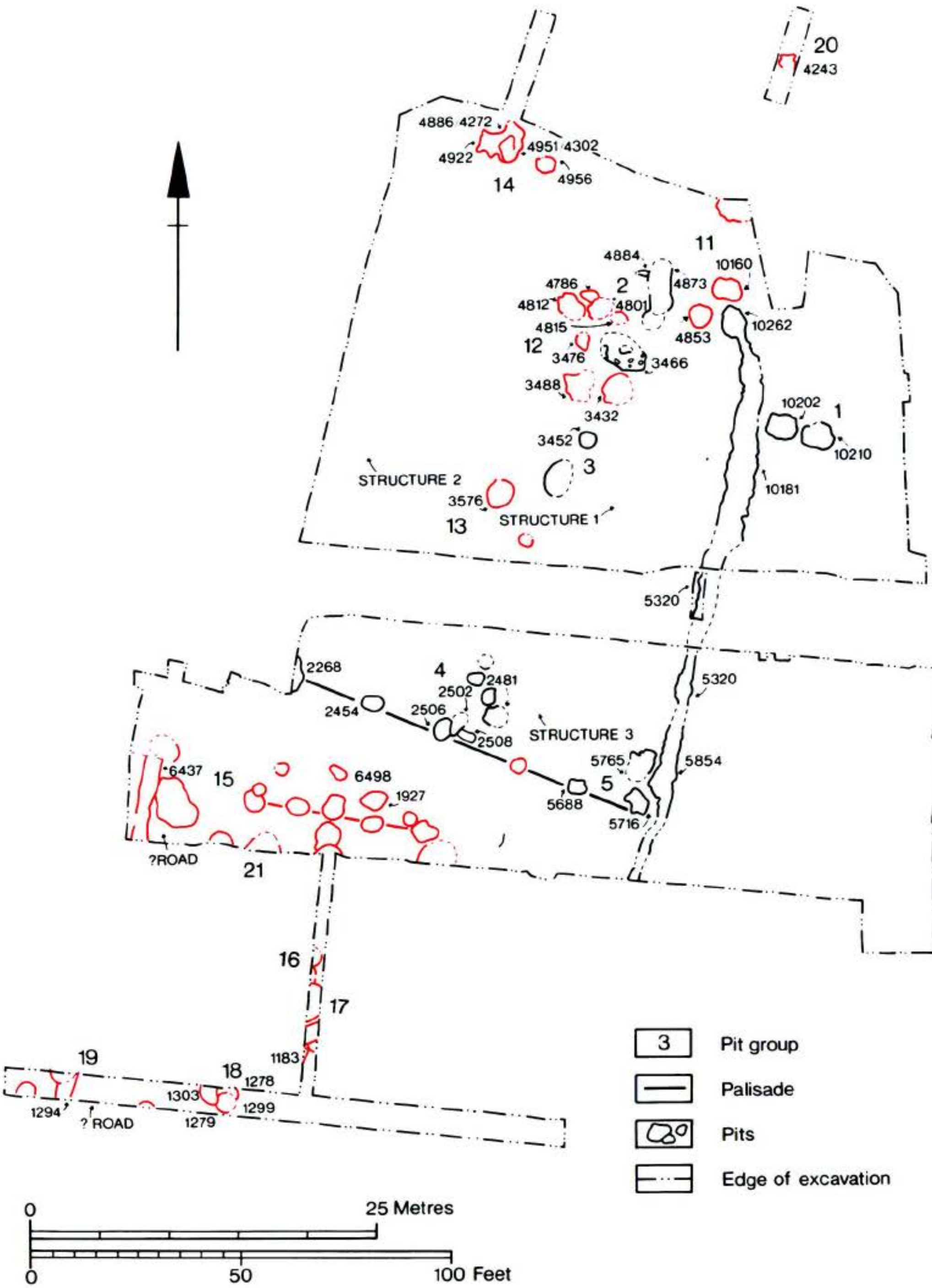


Fig. 602 Plan showing location of main excavated features from Period 3a and Period 3z (in red). Scale 1:500

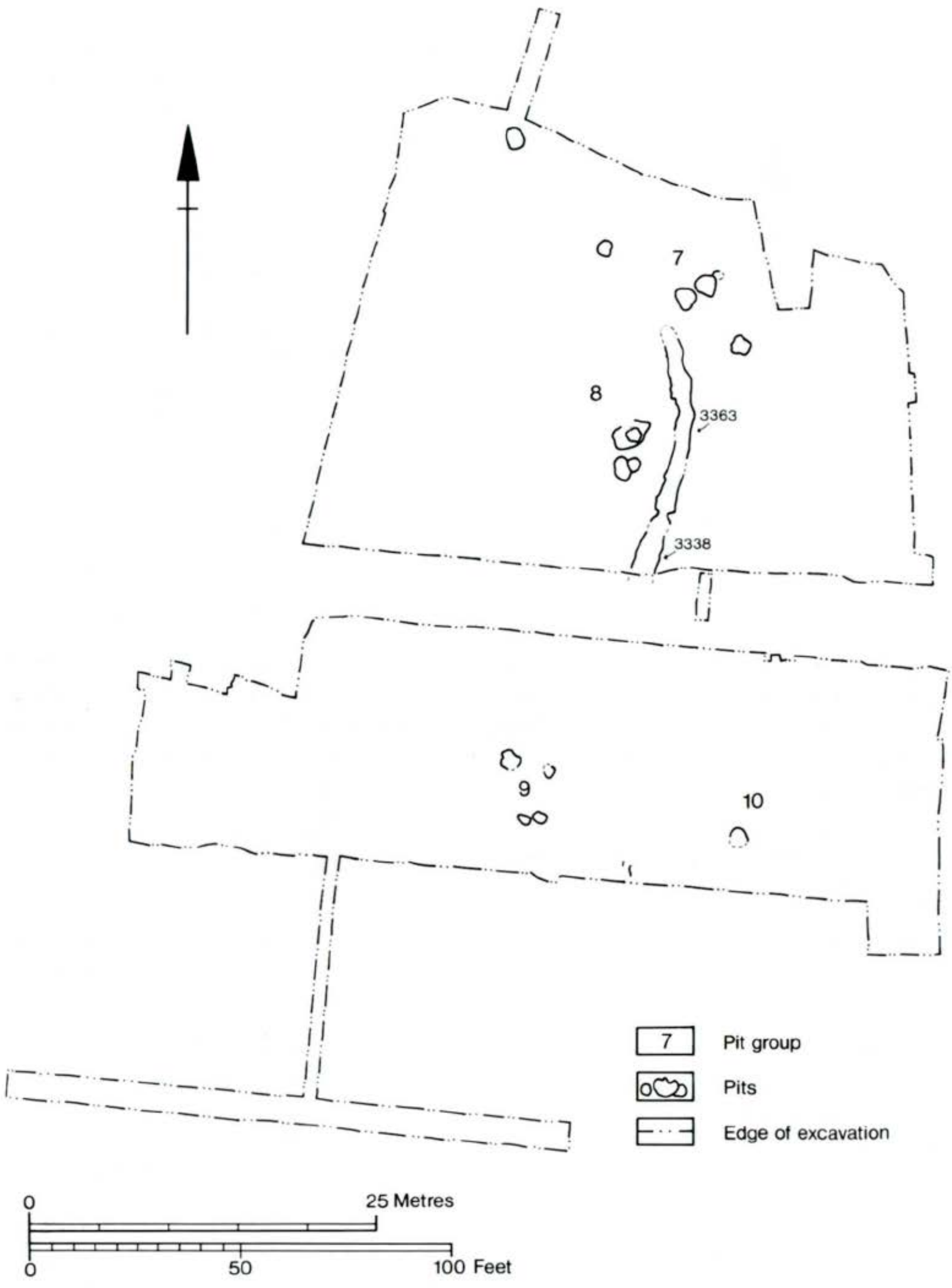


Fig. 603 Plan showing location of excavated features from Period 3c. Scale 1:500

appear similar. The faunal assemblage of Period 3c shows a slightly altered pattern of exploitation of fish with the presence of smelt which was absent in Period 3a (*AY* 15/4, 266).

A break in occupation is one interpretation of the numismatic evidence, which suggests that fewer Anglian coins were lost during the last part of the 8th century and the beginning of the 9th than in the periods before and after. This pattern is, however, repeated at other Anglo-Saxon settlements (M. Blackburn, pers. comm.).

The more limited Period 3c settlement may have continued into the later 850s but, from the evidence of both coinage and most strikingly pottery, it is unlikely to have been occupied long after the Viking capture of York in AD 866. The site remained abandoned until c. AD 1000 and produced none of the distinctive pottery assemblages of the later 9th and 10th centuries.

Periods 4 and 5 (late 10th–12th century) (Figs.604–6)

Evidence for the re-occupation of the site comprises a series of refuse pits and structures, dated by pottery to the late 10th or early 11th century (Period 4a). In the south-western corner of the site the pits were superseded by a cemetery associated with a possible timber church (Period 4b). The burials included a group of skeletons with blade injuries that may all have been buried at the same time, suggestive of the casualties of a battle. This church was possibly replaced in stone on an adjacent site, perhaps in the second half of the 11th century (Period 4c), and burials continued in the cemetery area throughout the 12th century (Period 4d).

This church is most likely to have been that dedicated to St Andrew, Fishergate, possibly the St Andrew's which was in the hands of Hugh FitzBaldric in 1086 (Domesday Book; Burton in *AY* 11/2 in prep.).

In the south-eastern part of the site a sequence of superimposed structures and pits (Periods 4a, b and d), spanning the 11th and 12th centuries, was broadly contemporary with deposits in the south-west. A series of other burials, pits and slots could not be related stratigraphically to the recognised sequences and are assigned to Period 4z.

The Period 4 features were part of a settlement that may have belonged to a continuous ribbon suburb represented by a string of early churches on either side of medieval Fishergate. This route, running south from Foss Bridge, may have had Roman origins; it declined in importance, particularly after the postulated suburb was cut in two by the erection of the Walmgate section of the city defences in the 12th or 13th century.

In 1142/3 the church of St Andrew, Fishergate, is recorded as being in the hands of Newburgh Priory (Period 5), and at the end of the 12th century it formed the basis of the donation to the Gilbertine Order for their new priory (Period 6). The archaeological

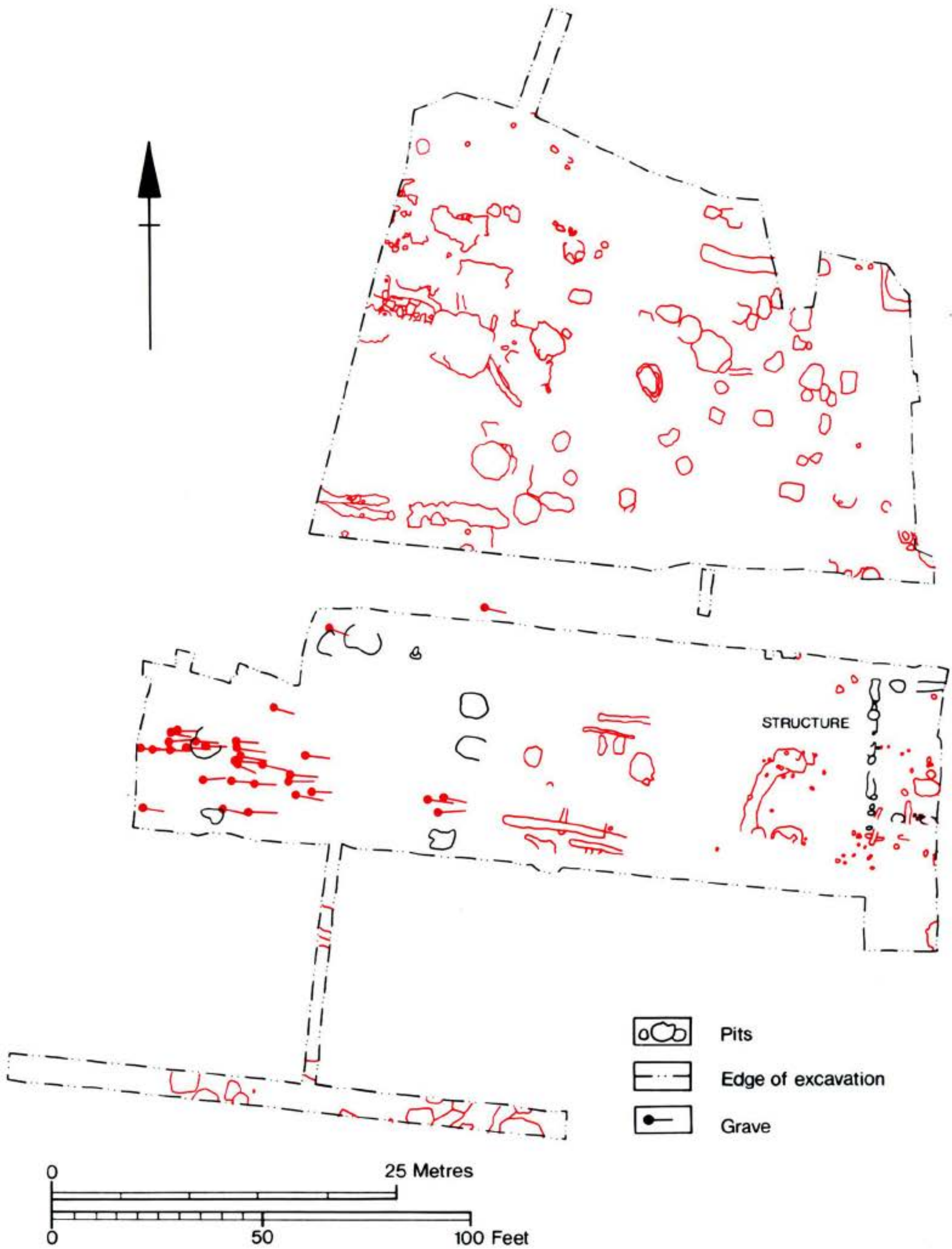


Fig.604 Plan showing location of main excavated features from Period 4a and those from Period 4z (in red). Scale 1:500

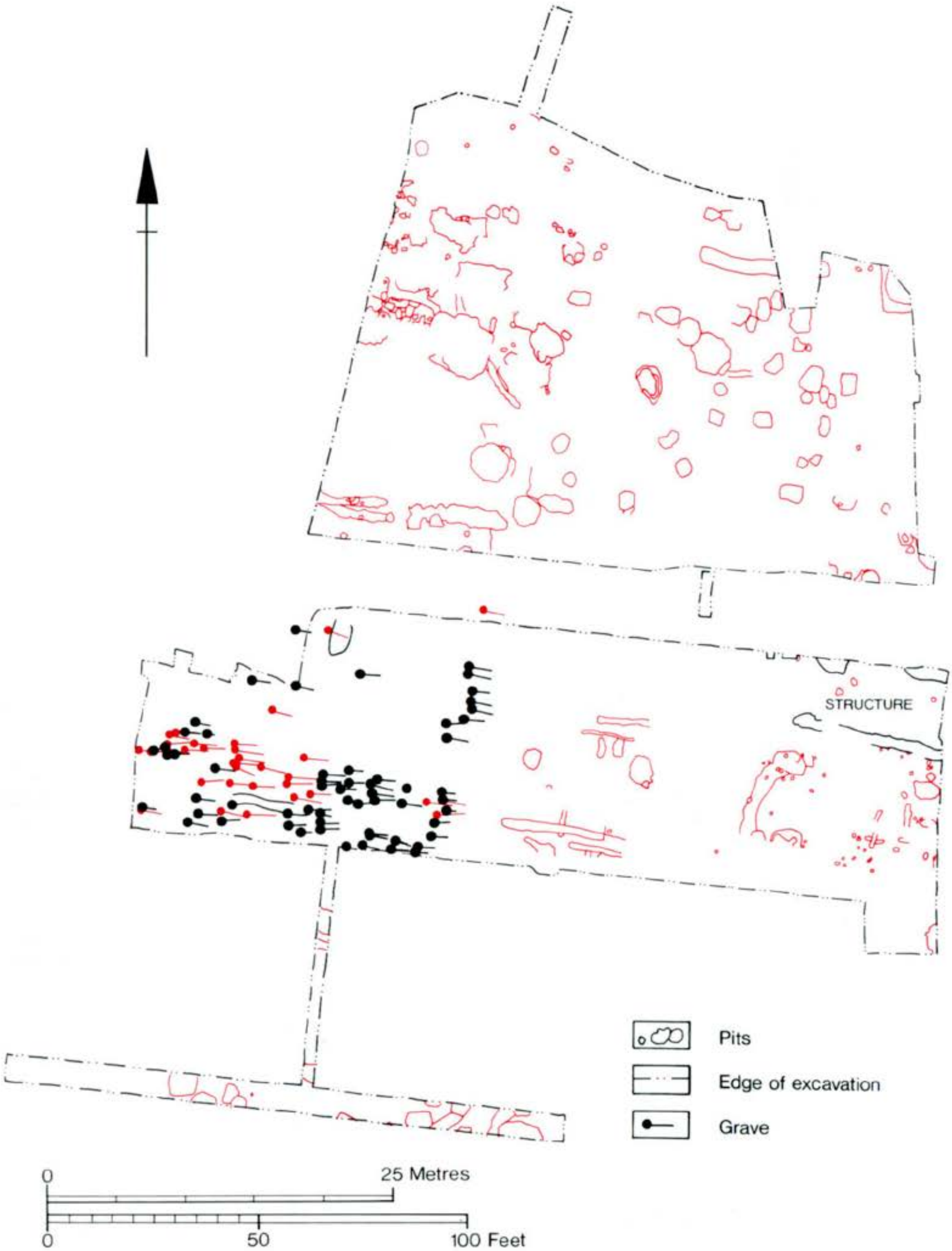


Fig. 605 Plan showing location of main excavated features from Period 4b and those from Period 4z (in red). Scale 1:500

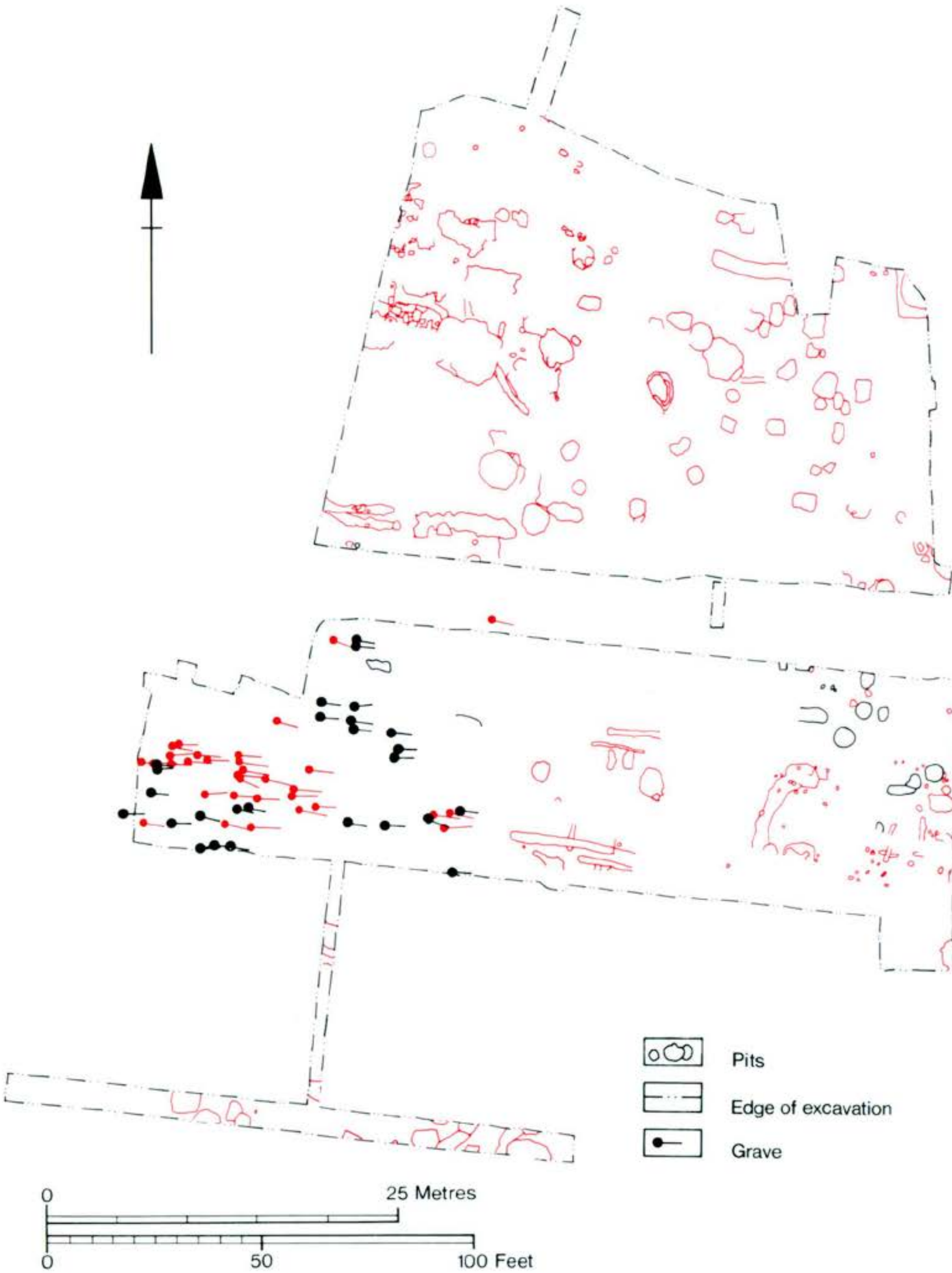


Fig.606 Plan showing location of main excavated features from Period 4d and those from Period 4z (in red). Scale 1:500

deposits which presumably belonged to Period 5 form a continuous series with those of Period 4, and it was not possible to separate them stratigraphically. All are therefore described under Period 4.

Periods 6 and 7 (1195–later 16th century)

Levels attributed to both Periods 3 and 4 were sealed beneath a single deposit of imported earth interpreted as the remains of a foundation platform for the new Priory of St Andrew of the Order of St Gilbert of Sempringham, begun in 1195 and dedicated in 1202.

Although evidence for the priory buildings, in the form of foundations, window glass, floor tiles, wall-plaster and architectural fragments, was well represented, little of the refuse of everyday life such as animal bones, organic debris, pottery and personal objects was found. Presumably such material had all been regularly disposed of, possibly into the adjacent rivers.

The original structures (Period 6a) comprised a cruciform church to the south of the cloister, with a low central tower, north and south transepts with eastern chapels, a presbytery and an aisleless nave; a chapter house with western vestibule; an eastern dormitory with latrines to the north, and a northern refectory. All were linked by a continuous alley arranged around the cloister garth. A presumed west range had been destroyed by the modern factory. Architectural fragments broadly confirmed the historical date of construction and, along with the window glass, showed some Cistercian influence.

The priory underwent certain modifications (Period 6b) including the rebuilding of the cloister arcade and minor works in the church which can tentatively be dated by coins and pottery to the late 13th or early 14th century.

In the 14th century there was an extensive programme of alterations in which the church, east range and chapter house were rebuilt, and the undercroft of the north range, previously used for storage, was converted for use as a ground-floor refectory, or as domestic apartments (Period 6c). A historical reference to the funding of certain building works at the priory in c.1335 by Henry Burghersh, Bishop of Lincoln, may provide a context for these alterations.

The priory continued to be altered and adapted in minor ways (Periods 6d–f) until its dissolution in 1538 (Period 7a). The buildings were demolished and a limekiln was built in the cloister garth using elements of the cloister arcade. This heralded the wholesale robbing of the entire complex for building materials, including the customary interest in lead from both roofs (Burton in *AY* 11/2 in prep.) and windows (Graves in *AY* 11/2 in prep.; Graves, *AY* 17 in prep.).

The north range may have been used as stables and/or a store during early demolition operations until it was itself robbed of all usable building materials (Period 7b). The final period of occupation is marked by rubbish pits, cut through the western end of the north range, which can be dated to the later 16th century; it is possible that the missing west range provided living quarters at this time (Period 7c).

Periods 8, 9, and 10 (c.17th–20th century)

The site was virtually abandoned and used as an orchard (Period 8) until it was partly occupied by an extension of the adjacent glass factory in the later 19th century (Period 9). By the 20th century the entire area of the site was under intensive industrial use (Period 10).

Introduction to the Finds

The excavations at 46–54 Fishergate produced over 9700 artefacts and pieces of manufacturing debris of stone, amber, jet, fired clay, iron and non-ferrous metal, bone, antler, shell, glass and textile. These range in date from a small group of prehistoric flints to glass objects and debris from the glass factory which stood on the site during the 19th and 20th centuries. Of the total number of finds recovered, 9500 have been catalogued and studied. The finds discussed in this fascicule comprise those associated with Roman agricultural activity, and the Anglian and 11th–12th century occupations, totalling 3350 finds, of which approximately 47% are Anglian.

The significance of this artefactual material lies primarily in the collection of Anglian objects; although individual items and some groups of Anglian material have previously been found in York (see *AY* 7/1 in prep.), the excavations provided for the first time a large and well-stratified group from a settlement. This presented the opportunity to compare Anglian York, or Eoforwic, with other middle Anglo-Saxon sites in Britain, in particular the trading settlements or *emporia* at Hamwic, Lundenwic and Ipswich. Parallels were also sought amongst the material from the continental *emporia* of Ribe in Denmark, Helgö in Sweden, Dorestad in the Netherlands, and Hedeby in Germany (see Figs.611–12).

The material from Periods 3 and 4 is discussed together, according to the functions of the artefacts, many of which are illustrated. This report is followed by a catalogue of the finds.

Methods of retrieval

One of the important aspects of the excavations at 46–54 Fishergate was the systematic recovery of artefacts and fragments of pottery and glass, as well as animal bones and environmental samples. In addition to hand collection, other recovery techniques were employed to ensure that documented samples were obtained from as many contexts as possible.

Three principal types of sample were employed. General biological analysis (GBA) samples, usually of 5–10kg, were used to examine plant and invertebrate remains. Dry-sieved (DS) samples, usually of 50–200kg, though occasionally as much as 800kg, were used primarily for the recovery of artefacts, pottery, larger bones and shellfish. The term 'dry sieving' is something of a misnomer since the samples are sprayed with water during the process of sieving through a 12mm metal mesh. Bulk-sieved samples, usually of 50–100kg, were wet sieved to 1mm and dry sorted to 2mm. These were intended for the recovery of animal bones, but some artefacts were also recovered.

Although sieving resulted in a higher recovery rate, in the case of glass, for instance, this greater bulk was largely in the form of very fragmentary pieces which were of limited diagnostic value.

A more detailed discussion of dry and bulk sieving can be found in *AY* 15/4, 221–2.

Conservation Report

By K.M. Buckingham

The conservation of the artefacts from the Fishergate excavations was carried out by staff and students at the York Archaeological Trust's Conservation Laboratory between 1987 and 1990. This report details the information revealed and the methods used in the conservation of the three main categories of material: the metals, the inorganic (non-metallic) material and the organic material. Full conservation records for every artefact treated are available in the laboratory. The numbers of objects referred to in this report include medieval finds (Rogers, *AY* 17 in prep.) as well as those discussed in this fascicule.

Metals

Iron

Over 4000 iron objects were recovered during the Fishergate excavations. These were stored in perforated polythene bags in sealed plastic boxes containing silica gel until 1988 when conservation of the ironwork began.

Soil conditions at the Fishergate site had given rise to corrosion crusts which completely obscured the objects (see below). All the iron finds were, therefore, X-radiographed using the laboratory's Hewlett Packard Faxitron machine. The radiographs revealed the outline of each object, giving an indication of what many of the pieces were. They also revealed surface details, such as non-ferrous coatings and fittings, as well as technological details such as joins, welds and repairs.

Once all the objects had been radiographed it was possible to select those requiring further investigation. This was determined by the need for specific information, such as cross-sectional shape, whether an end was complete or broken, or the extent and nature of non-ferrous coatings or mineralised organic remains. By the end of the project some 600 iron finds had been investigated in the laboratory.

The dense and voluminous nature of the corrosion products and the amount of time that would have been needed to remove them from each object totally resulted in the adoption of a policy of selective investigative cleaning. Thus, corrosion was initially removed only from areas which would elicit the maximum information about an object. A total of 280 objects were, however, totally cleaned to facilitate drawing and/or photography for publication.

Condition

The moist, aerated deposits of the Fishergate site resulted in the formation of massive, obscuring crusts of corrosion products on the ironwork. In general these crusts comprised a soft, powdery orange outer layer over a hard, dense, dark brown inner layer. Any remaining details of the objects were found beneath this dense corrosion, surviving in a black surface which contained no inclusions. This surface was presumably magnetite (Fe_3O_4), although no analysis of the corrosion products was carried out. Compared with the thick, dense crust, the magnetite layer was thin and often badly cracked, the cracks penetrating any remaining core, causing flaking and lamination. Thus, although many of the objects appeared at first sight to be quite robust, the majority were in fact fragile. A brick-red oxide, possibly haematite (Fe_2O_3), was present on a few objects (e.g. *4947*, an auger, and *4886*, a hammered strip). If iron is heated to above 200°C haematite will form, so its presence may suggest that these objects had been burnt, presumably before burial. On the majority of objects the magnetite overlay a metal core but on some the corrosion was so severe that virtually no metal survived.

Where non-ferrous coatings survived they were usually very thin and often poorly attached. In some instances, although the coating had been seen during cleaning, insufficient metal survived for it to be identified. Other non-ferrous features, however, such as copper alloy rivets or lead alloy solders, survived quite well. Analysis was carried out by the Ancient Monuments Laboratory in London by energy dispersive X-ray fluorescence (XRF) and identified copper alloy, silver and lead-tin alloy coatings. Mercury gilding was also found on a number of pieces.

Occasionally organic material associated with the iron (e.g. wooden knife handles) was preserved by the process of mineralisation, whereby metal and associated ions are deposited within the structure of the organic material. Wood (not identifiable to species), horn and antler were all preserved in this way, as was, more rarely, very decayed leather and textile. A coffin fitting, *5264*, was found to have mineralised wood on one face and mineralised textile on the other. The fibre was identified as wool from scanning electron micrographs provided by the Ancient Monuments Laboratory. The textile was examined by P. Walton Rogers and appeared to be a fine 2/1 twill (see p.1346).

Treatment

The most effective method of removing overlying corrosion was found to be the Airbrasive. By directing a thin stream of finely powdered aluminum silicate at the corrosion, the layers could gradually be removed to reveal surface details. Both the pressure and the density of the powder flow could be varied, and work was carried out under binocular microscopes using ×10 and ×20 magnification.

Where necessary, objects were re-assembled or consolidated using methyl methacrylate adhesives and consolidants (Paraloid B78 and B48N). They were then given physical protection in appropriate packaging and stored in sealed boxes containing silica gel to lower the relative humidity to below 15%. Passive methods of stabilisation were chosen in preference to chemical because of the lack of long-term success achieved by chemical methods in the past and because it was not possible to stabilise chemically objects which had been only partly cleaned. Forty objects were given some chemical protection, however, in the form of a 20% solution of tannic acid which was painted onto their surfaces. The objects were then placed in a desiccating environment for 24 hours before being lacquered with the acrylic lacquer, Incralac. This was to treat small areas of bright metal which had been revealed on the objects, either through the lamination of surface flakes or because of the thinness of the magnetite layer, and which might have acted as anodic sites for rapid corrosion during the finds research stage. The treatment was carried out during 1988 and 1989 and the objects were re-examined in 1990. At that time approximately half the objects treated with tannic acid were beginning to show signs of corrosion in the form of small patches of bright orange powder in pits and crevices. Tannic acid has not therefore proved to be a long-term solution to the problem of unstable archaeological ironwork recovered from excavations in York.

Slag

Over 1700 pieces had been identified as slag at the time of excavation. After examination in the laboratory, 10% of these were X-radiographed. The radiographs revealed some 20 objects including an iron buckle (*5045*), two fragments of iron scrap riveted together and with copper alloy plating (*4860*), and an awl (*4952*).

Copper alloy

A wide range of copper alloy objects, both Anglian and medieval, was examined in the laboratory; these included needles, pins, lace tags, strap-ends, bowls, tweezers, thimbles, coins and fragments of scrap metal, as well as unidentified pieces. Unlike the ironwork, all of which was radiographed, only coins were radiographed as a matter of course. Other objects were radiographed only if their outline was unclear or if specific information was required.

As with the ironwork, the aim of investigation was to reveal as much information as possible about the technology employed in the production of the object. Pin heads were examined, for example, to determine how they had been attached to the shank; the head of *5383* had been soldered on using a lead-tin alloy. Tool marks were often revealed; pin *5354*, for example, has very clear file marks around its decorated head. Many of the objects were found to be decorated; by casting, by incising the decoration into the surface of the object, or by the addition of a surface coating. A large number of objects with surface coatings were sent to the Ancient Monuments Laboratory for analysis; the coatings were found to be gold, silver, tin or tin-lead alloys (see p.1231, Table 82). A number of objects were also found to be decorated with enamels. Although these were usually in a very poor state of preservation, the enamel on mount *5325* was surprisingly intact, although very fragile. On initial examination, all details of this mount were obscured by thick, hard concretions of sand and green-black corrosion products. It was radiographed prior to cleaning; this revealed an animal figure and incised decoration in a field below it, but gave no indication of the presence of enamel. After cleaning, the mount was found to have a central animal figure surrounded by yellow (coloured by lead antimonate), blue (coloured by cobalt and possibly copper) and purplish blue to blue-green (coloured by iron) glass. There is also an area of incised decoration consisting of lines and rings, the rings randomly stamped, often over each other.

Organic remains were found on a number of objects. Copper salts are toxic to the micro-organisms usually responsible for the decay of organic material so such material often survives when in contact with copper, albeit in a rather fragile or mineralised state. The most common organic material associated with the Fishergate copper alloys was leather which was found between the plates of several buckles, within strap-ends and in a number of lace tags.

Condition

The corrosion of copper alloy after burial is often initially slow due to the presence of protective oxide layers developed during use. However, in the damp, aerated soils of the Fishergate site corrosion was inevitable. Unlike the corrosion of iron (see p.1218), copper alloy corrosion usually begins internally, along the grain boundaries of the metal, and rarely results in voluminous crusts. Where corrosion occurs slowly and evenly, compact patinas form in which the detail of the original surface of the object survives. Although some of the Fishergate copper alloys had obviously corroded quite rapidly, giving rise to bulkier crusts and subsequent loss of information, the majority exhibited quite smooth green or green-brown patinas. However, the presence of chloride ions in the Fishergate soils caused corrosion below the layer of patina. Chloride ions stimulate corrosion by penetrating the protective oxide layer and forming a white, waxy layer of copper (I) chloride ($CuCl$, known as nantokite) against the metal. In the presence of water and oxygen the nantokite reacts to form copper (II) chloride (paratacamite $Cu_2.3Cu(OH)_2$), so releasing chlorides for further reactions. This reaction is often speeded up during excavation and gives rise to the powdery light green corrosion referred to as 'bronze disease'. Thus, although the surface detail survived well on many of the copper alloy objects from Fishergate, the patinas were often disrupted and poorly affixed, with powdery and unstable corrosion products beneath.

Treatment

The copper alloys were first cleaned using a selection of small hand tools under the binocular microscope. The presence of active 'bronze disease' on so many of them made chemical stabilisation necessary. The objects were degreased with acetone and then immersed in a 3% solution of Benzotriazole in industrial methylated spirit, under vacuum. This has so far prevented further corrosion. The objects were then lacquered with Incralac diluted in toluene. Wherever necessary they were consolidated or mended with Paraloid B72. The copper alloy items are now stored in sealed plastic boxes with silica gel to reduce humidity to below 35%.

Silver

Eight of the 36 silver objects found at Fishergate were treated in the laboratory. These comprised four coins, a finger-ring, a fitting, a garment hook and a pin. Several unidentified fragments were also treated.

Most of the objects were in a fragile condition with little or no extant metal core and thick halide corrosion crusts ranging in colour from purple to grey. However, at least some surface detail was revealed on most of the objects, surviving in a black, somewhat powdery, sulphide layer beneath the corrosion crusts.

The objects were manually cleaned under binocular microscopes, the halide crusts separating from the 'original' surface reasonably readily in most cases. Incralac was used to lacquer the objects.

Lead

Over 300 lead objects were examined in the laboratory and approximately 160 whose form or function had not been obvious immediately after excavation were selected for conservation. These included a pendant in the shape of an axe-head (*5486*) and a paten and chalice (sf5712) (Rogers, *AY* 17 in prep).

Some objects were in good condition with only a thin film of soil over a coherent grey to white carbonate surface; others were brittle and fragmented with much thicker crusts of soil and granular corrosion products. The objects were mechanically cleaned under the microscope, and details which had not been apparent before were revealed. The paten and chalice, for example, were found to have concentric lines around them suggesting that they had been raised from a sheet on a lathe.

Corroded lead objects are often more brittle than they appear, so once cleaned the objects were given physical protection in individually fitted packaging. Acid-free materials were used because of the danger of rapid corrosion if lead becomes contaminated by organic acids.

Organic material

Osseous material

Over 700 bone and antler objects were recovered during excavation. They were stored damp until they could be examined in the laboratory. In general the objects were found to be in excellent condition and required little more than the removal of surface dirt. They were allowed to air dry under controlled conditions and no problems with splitting were encountered. Paraloid B72 was used to reconstruct the few objects which required it.

Non-metallic, inorganic material

Glass

A number of glass objects, such as vessel fragments and beads, were treated. Some were in excellent condition, requiring only cleaning, examination for associated material such as threads in bead holes, and packaging. Others had deteriorated and become crazed and flaky. Those in poor condition were consolidated and, whenever possible, reconstructed with Paraloid B72.

The conservation of the considerable amount of window glass which was recovered from the Fishergate site is detailed in Graves, *AY* 17 in prep.

Conclusion

The detailed investigation of the large number of artefacts from the Fishergate excavations treated in the Conservation Laboratory revealed much information which would otherwise not have been recovered. Obscured by dirt and corrosion, technological details such as hammered ends, filed edges, welds and joins, surface coatings and decoration would have gone unnoticed and would eventually have been lost forever through the uncontrolled forces of corrosion.

The Finds

Evidence of several industrial and craft activities was recovered from the site, comprising metalworking, woodworking, bone and antler comb making, leatherworking, and textile preparation and manufacture.

Metalworking

There was evidence for ironworking and non-ferrous metalworking during both the Anglian and the 11th–12th century occupations of the site at 46–54 Fishergate. Most of the evidence for ironworking takes the form of slag, but offcuts of iron plate and strips and several tools were also recovered.

Ironworking

Ironworking residues

The ironworking residues were studied by Dr J.G. McDonnell and Dr M. Heyworth. The following report has been supplied by **Dr J.G. McDonnell**:

Introduction

The excavations at Fishergate revealed deposits dating from the Roman period to the present day. Ironworking slags were recovered from all periods, but particular periods produced substantial quantities of slag, indicative of ironworking on or close to the site. This report describes the types of slag recovered and discusses their distribution. (A second report detailing the slag analyses is available in the site archive.)

Slag classification

The slags were visually examined and the classification is solely based on morphology. In general the slags are divided into two broad groups. First are the diagnostic slags which can be attributed to a particular industrial process; these comprise the ironworking slags, i.e. smelting or smithing slags. The second group, the non-diagnostic slags, could have been generated in a number of different ways but reveal no diagnostic characteristic that can identify the specific process involved. In many cases the non-diagnostic residues, e.g. hearth or furnace lining, may be ascribed to a particular process through archaeological association.

The residue classifications are defined below:

(a) Ferrous diagnostic slags and residues

Smelting Slag (SMLT): silicate slag generated by the smelting process, i.e. the extraction of the metal from the ore. This occurs in characteristic forms; tap slag was the predominant type in the Fishergate material.

Table 77 Range and mean dimensions of hearth bottoms

Dimension	Range	Mean	Standard Deviation
Weight (g)	116–1250	460	265
Major diameter (mm)	65–180	100	20
Minor diameter (mm)	50–150	80	20
Depth (mm)	20–65	40	10

Smithing Slag (SSL): randomly shaped pieces of silicate slag generated by the smithing process.

Hearth Bottom (HB): a plano-convex accumulation of silicate slag formed in the smithing hearth. The range and mean dimensions of 46 individually recorded hearth bottoms are given in Table 77; there is a typical spread of hearth bottom sizes. Table 78 shows the number of hearth bottoms and the mean weight grouped by period; there are no significant variations in the size of the hearth bottoms in Periods 3, 4 and 6.

Cinder (CIN): high-silica content smithing slag, often formed at the reaction zone between the smithing slag and the hearth lining.

(b) Non-diagnostic slags and residues

Hearth Lining (HL): the clay lining of an industrial hearth, furnace or kiln that has a vitrified or slag-attacked face.

Cinder (CIN): high-silica content slag that can either be formed as described above or by high-temperature reaction between silica and ferruginous material. It can be ascribed to either the non-diagnostic or the diagnostic slags depending on the iron content and its morphology.

Fuel Ash Slag (FAS): A very high-silica slag (usually 90% silica) formed under high-temperature oxidising conditions by the reaction of siliceous material and fuel ash. It is a non-diagnostic slag which can be formed in any hearth or fire.

Other material which comprises fragments of fuel, ferruginous stones (including possible 'ores') etc.

Table 78 Details of hearth bottoms by period

Period	Number of HBs	Mean weight (g)
2	1	577
3	13	440
4	13	545
6	17	410
7	1	690
8	1	366

Table 79 Period distribution of diagnostic and non-diagnostic slags (measured in grams)

Period	SSL/HB	SMLT	CIN	HL	Other
2	1182	–	64	55	4
3	53094	1079	5772	3191	622
4	43202	838	5024	2062	1844
6	38287	243	4790	1739	662
7	1148	–	301	52	28
8	1899	37	27	–	8
9	556	77	–	–	–
10	298	–	7	18	31
Unstrat.	2995	216	645	217	80
Total	142661	2490	16630	7334	3279

The distribution of the slag by period

Table 79 gives the distribution of the slag by period. Only a small quantity of slag identified as smelting slag was present, and that was in the characteristic tap slag form. It is possible that some of this was smithing slag that had been accidentally liquefied to give the characteristic ropey morphology of smelting tap slag. Experience indicates, however, that the majority is iron smelting slag. There is not enough to suggest that there was smelting either on the site or close to it. The largest quantity in one context was 740g (context 5422, Period 4z).

Table 80 Distribution of diagnostic and non-diagnostic slags by subperiod in Periods 3, 4 and 6 (measured in grams)

Subperiod	SSL/HB	SMLT	CIN	HL
3a	10762	422	1701	977
3b	15593	256	1160	647
3c	12908	12	1407	488
3z	13831	389	1504	1079
4a	831	–	64	97
4b	7667	59	568	153
4c	390	–	5	–
4d	940	7	324	5
4z	33374	772	4063	1807
6a	22343	77	2967	676
6b	2419	–	455	41
6a/b	8370	161	505	898
6c	2904	5	370	96
6b/c	–	–	56	–
6d	143	–	80	17
6e	924	–	60	–
6z	1184	–	297	11
Total	137862	2160	15586	6992

Table 79 also shows that there were large depositions of smithing debris in Periods 3, 4 and 6, the main periods of occupation. There are correspondingly increased deposits of 'other material', cinder and hearth lining. The smithing debris in Period 2 is at background level, and the quantities in Periods 7–10 probably represent residual material from earlier periods. It is, however, interesting to note the relative paucity of smithing slag during the reconstruction phases of the priory (Periods 6b–f).

Table 80 gives the distribution by subperiod, and shows that there are three main periods of deposition. The first took place throughout Period 3, the Anglian occupation. The spatial distribution is uneven; the larger deposits are found in the northern part of the site, the earliest of these (Period 3a) occurring on both sides of the main eastern boundary ditch. There is smithing debris from all subperiods of Period 3 in the area between the Period 3a Structures 1 and 2, where there are pit groups in both Period 3a and 3c. The largest quantities of slag were found across the site in the charcoal-laden deposits of Period 3b, and it is possible that much of this material derives from Period 3a activities. There are also substantial deposits of slag in Period 3c in the area to the north of the Period 3a structures.

Significant deposition took place in Period 4 (especially in 4z contexts), during the 11th–12th century occupation. The large slag deposits occurred across most of the site, with the exception of the central western area. Finally, a considerable amount of slag was recovered from deposits which represent deliberate make-up to provide a level platform for the construction of the priory buildings in Period 6a. Some of this material may have been imported from elsewhere on the site or from adjacent areas outside the site boundary (*AY* 16/6, 622–3). Slag was also recovered from the cemetery area, notably from Period 6a or 6b contexts; some of it may have been upcast from earlier deposits during the digging of graves.

The pattern of slag deposition suggests that it was generated during both the Anglian (Period 3) and the 11th–12th century occupation (Period 4). Table 80 shows that the larger deposits of slag are associated with large deposits of hearth lining. This would support the interpretation that smithing took place in the locality during these periods.

Further evidence for nearby smithing is provided by the presence of hammer scale in Periods 3a–z, 4z and 6a (see Table 81). This fine material derives from welding and is unlikely to survive extensive redeposition (p.475, *AY* 17/6). The earliest occurrence of hammer scale was in Period 2, the Roman ploughsoil; in Period 3a it was found in deposits

Table 81 Number of sieved samples containing spheroidal (S) and flake (F) hammer scale

Period	No. of Samples	S	F	S+F
2	1	1	–	–
3a	1	1	–	–
3b	2	1	–	1
3c	4	4	–	–
3z	15	14	1	–
4a	1	1	–	–
4z	15	8	1	6
6a	4	3	–	1
6b	1	1	–	–

to the east of the eastern boundary ditch, and in Period 3b it occurred in the residues of sieved samples from the charcoal-rich layer. This was noted particularly in the southern part of the site around the northern palisade boundary, and deposits attributed to Period 3z in these areas produced further evidence. Hammer scale was found across much of the site in Period 4, the exception being (as with the distribution of the slag deposits) the central western area. It also occurred in the raft of levelling deposits (Period 6a) below the priory buildings. No quantification of the hammer scale was undertaken, but it was noted that spheroidal hammer scale was at least as common as flake hammer scale. This is contrary to observations from other sites in which flake hammer scale usually dominates.

Conclusions

There were two main periods of primary slag deposition. These comprise Periods 3 (the Anglian occupation) and 4 (the 11th–12th century occupation), when there was substantial deposition. The slag recovered from Period 6 contexts was largely residual (secondary deposition). The different slag types present at Fishergate show that iron smithing was carried out in the locality during both Periods 3 and 4. Although it has not been possible to identify specific iron smithing areas, the presence of hammer scale indicates smithing on or close to the area excavated. A small quantity of smelting slag was also identified, but it is unlikely that iron smelting took place on site. Its presence may be the result of smelting elsewhere in the Fishergate area, or the slag may have been imported to the site as ballast.

Strips, plates and unfinished objects

As noted above, analyses of the slag indicate that iron smithing was carried out on or near the site in both Periods 3 and 4. This evidence is supplemented by offcuts, fragments and possibly unfinished objects which also derive from both periods. The strips and plates have been identified using the criteria suggested by Ottaway (pp.493, 501, *AY* 17/6). Objects defined as strips have a ratio of maximum width to maximum thickness of less than 4:1; plates usually have a maximum thickness of 6mm and a ratio of maximum width to maximum thickness of more than 4:1.

Strips (Fig.607)

There are 77 objects which may be described as strips, 42 recovered from Period 3 contexts (*4846–79*) and 35 from Period 4 (*4880–909*). The majority of the strips are rectangular or subrectangular in shape, although a few, such as *4862* and *4869*, taper towards one end. Most have a rectangular or square section, although *4853* has a trapezoidal section.

The dimensions of the strips vary considerably. The two longest are over 170mm in length (*4891, 4896*); *4896* may be an unfinished tool, having a roughly shaped tang at one end and a point at the other. Similarly, *4892* has a tang-like projection at one end of a rectangular strip and may represent an unfinished or discarded knife. Two other strips exceed 100mm in length. One of these, *4899*, is spirally twisted along almost its entire length and may represent the raw material for, or an offcut from, the manufacture of a figure-8 shape hasp (Goodall 1980a, 118) or a chest handle, such as those found at 16–22

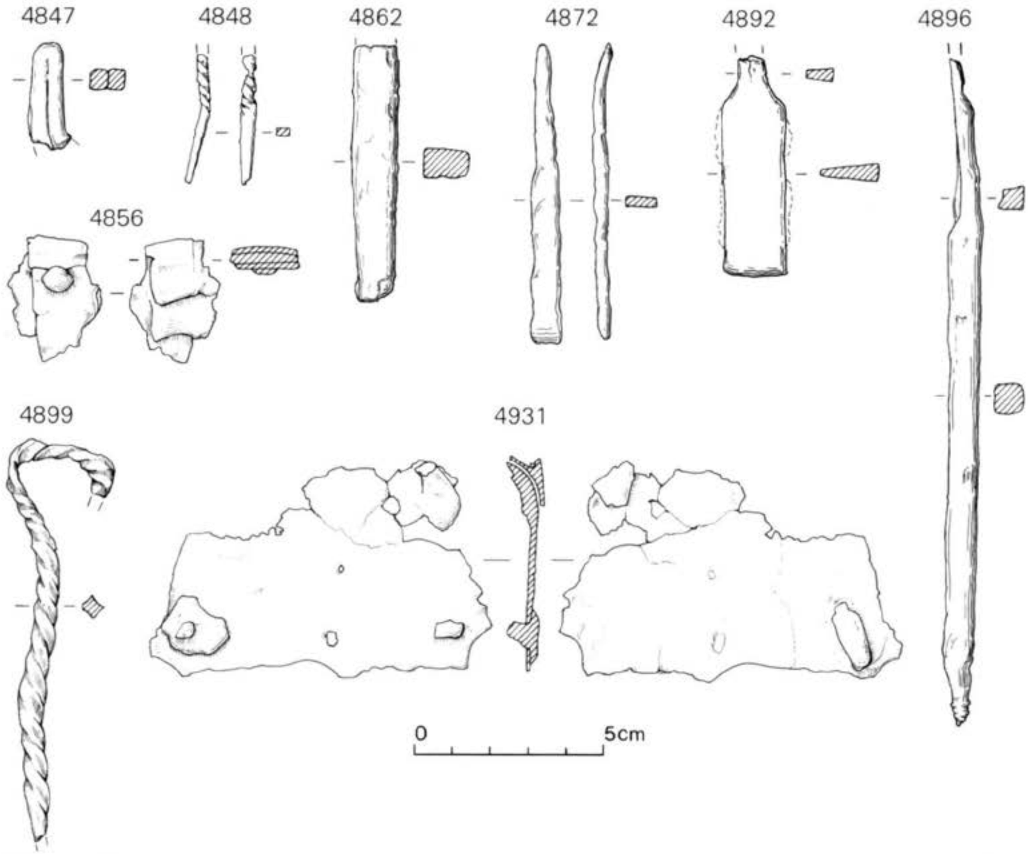


*Fig. 607 Ironworking debris: iron strips (*4847–8, 4856, 4862, 4872, 4892, 4896, 4899*) and plate fragment (*4931*). Scale 1:2*

Coppergate (e.g. *3499*, *AY* 17/6). *4848* and *4890* are also spirally twisted. The smaller strips range in length from approximately 21mm (*4850*) to approximately 91mm (*4883*), but, as the majority must be offcuts, these dimensions are unlikely to be of significance. It may be noted that the widths also vary considerably, from 2·7mm (*4887*) to 27mm (*4865*), and the thicknesses from 1·9mm (*4873*) to 10·7mm (*4886*).

Although many of the strips appear to be fragments, the ends survive on some. These are often cut square (*4871*) or at an oblique angle (*4870*), and indicate the use of a hammer and chisel by the smith to cut the ends. Others, including *4897–8*, have had one end partially cut through and then twisted in order to break them. Signs of hammering are visible along the lengths of several of the strips, such as *4883, 4886* and *4903*, and on the ends of others, including *4851* and *4898*. The welding together of strips can be seen in several examples such as *4847*, *4866* and *4877*, which all appear to have been folded during this process. Two other strips bear marks which indicate that the smith used a clamp or other tool to hold the strip (*4863, 4887*). From a Period 3z pit, *4874* is formed of three copper-plated strips folded and welded together; this item may have been destined for recycling. *4904* may be an unfinished object; it has been perforated at one end, but the other end appears incompletely finished off. *4854*, which has been hammered and shaped at one end, may also be unfinished.

Plates (Fig.607)

There are 24 fragments of plate which may be offcuts or scraps discarded during the manufacture of objects. Period 3 contexts produced eight (*4910–12, 4914–15, 4918–19*) while Period 4 contexts produced 16 (*4920–1, 4924–6, 4932–3*). These pieces vary in shape, some having straight edges (*4914, 4919*), some having curved edges (*4915, 4925*), and some, including *4921*, with all edges broken. These fragments may represent part- or fully-made objects, offcuts or scrap for recycling.

A number of plate fragments appear to be parts of objects, also possibly intended for recycling (*4913, 4916–17, 4922–3, 4927–31*). Most are irregularly shaped but retain fragments of rivets, are perforated, or bear traces of plating. Two fragments have traces of mineralised leather on them (*4913* and *4931*), although it is uncertain whether these relate to their original use or are the result of deposition next to leather.

Non-ferrous plating

Non-ferrous plating was found on a range of iron objects, including keys, nails, belt fittings and binding strips. The plating or coating may simply have been for decoration; alternatively, it may have provided a surface resistant to corrosion, acted as a base for soldering or as a solder itself (pp.486–7, *AY* 17/6). Plating was found on objects from both Periods 3 and 4, and the metals used were primarily tin, tin-lead or copper (for details see Table 82). Although plating with brass was carried out by the Romans, tin plating is thought only to have originated in the 8th century (p.613, *AY* 17/6). The Anglian objects from 46–54 Fishergate which reveal evidence of tin plating must thus represent some of the earliest-known examples of its use.

The use of tin-lead alloys was noted on both iron and copper alloy pins of the Anglian period (see pp.1361–7). Two iron pins had pure lead heads (*5054, 5061*), while one had a tin-lead head (*5056*) and others had heads with tin (*5055, 5063*) or tin-lead (*5062*) coatings. In all cases, it is likely that these heads were intended to be decorative. On one headless copper alloy pin, *5383*, traces of a lead-tin solder were found at the upper end of the shank, indicating the original presence of a separate head, now lost. Other objects which had tin or tin-lead coatings include binding strips *5184* and *5186* (see p.1413), nails *5108* and *5274* (see pp.1409, 1437), and the spur goad *5246*. A key (*5240*, see p.1423) also has traces of tin coating. This feature was noted on a number of items at 16–22 Coppergate (pp.486–7, *AY* 17/6), and may reflect the use of the techniques of dipping and wiping to apply the plating (ibid., pp.487, 490). Copper alloy plating was less frequently found on the objects analysed, but was seen on a key (*5235*) and two strips of uncertain function (*4856* and *4860*). Silver plating was found on strap-end buckle *5312* (see p.1348).

Table 82 Results of the analysis of plating or composition of iron and non-ferrous artefacts

Cat. No.	Object	Material	Analysis of plating/composition
4856	Strip	Iron	Copper plating, small trace of tin
4860	Strip	Iron	Copper plating with tin, small trace of lead
4874	Strips	Iron	Copper plating, traces of lead and tin
4916	Plate	Iron	Copper plating
4929	Plate	Iron	Low-tin bronze plating
5050	Belt fitting	Iron	Tin plating
5054	Pin	Iron	Lead head
5055	Pin	Iron	Lead head, trace of tin
5056	Pin	Iron	Tin-lead head
5058	Pin	Iron	Lead-tin solder
5059	Pin	Iron	Lead-tin coating
5060	Pin	Iron	Lead head
5061	Pin	Iron	Pure lead head
5062	Pin	Iron	Tin-lead coating on head
5063	Pin	Iron	Head of lead with traces of tin
5089	Pin	Iron	Lead-tin coating
5098	Finger-ring	Iron	Copper (trace zinc) brazing; brass plating
5102	Nail	Iron	Tin coating on head
5104	Nail	Iron	Tin plating on inside and outside of head
5107	Nail	Iron	Copper plating
5108	Nail	Iron	Tin-lead coating
5184	Binding strip	Iron	Tin-lead coating
5186	Binding strip	Iron	Tin coating
5217	Wall hook	Iron	Possible copper plating
5230	Collar	Iron	Copper plating
5233	Padlock	Iron	Copper plating, traces of tin and lead
5235	Key	Iron	Copper plating, traces of lead and tin
5240	Key	Iron	Tin coating
5246	Spur goad	Iron	Tin coating
5276	Coffin nail	Iron	Tin plating on head and shank
5311	Buckle	Copper alloy	Silver inlay on leaded bronze
5312	Buckle	Copper alloy	Leaded gunmetal, traces of silver coating
5319	Strap-end	Copper alloy	Tin in surface coating
5325	Mount	Copper alloy	Brass (small lead); lead antimonate, cobalt and ?copper, iron (glass)
5332	Brooch knob	Copper alloy	Leaded bronze; brass brazing (traces of lead and tin)
5337	Pin	Copper alloy	High-tin bronze plating
5373	Pin	Copper alloy	Lead-tin solder at head
5383	Pin	Copper alloy	?Lead-tin solder at head
5386	Pin	Copper alloy	Lead-tin solder at head
5437	Wire	Gold	Gold with a few % copper
5438	Wire	Gold	Gold with a few % copper
5439	Sheet	Gold	Pure gold

All the objects were analysed using X-ray fluorescence at the Ancient Monuments Laboratory; for the analytical methods used see pp.724–5, *AY* 17/6.

Non-ferrous metalworking

Evidence for the working on site of non-ferrous metals, including gold, silver, and copper and lead alloys, is provided by crucible fragments, an ingot mould, fragments of gold and silver, and copper alloy and lead alloy manufacturing waste.

Crucibles (Fig.608)

Thirty-seven crucible fragments and a number of deeply vitrified sherds of unknown metallurgical function were examined, and the metal-rich deposits on them analysed qualitatively by X-ray fluorescence (XRF). **Dr Justine Bayley** of English Heritage provides the following report:

> The crucibles are mainly small in size, handmade and of a variety of fabrics, most of which are quite refractory. In most cases both inner and outer surfaces have a thin glassy covering, often highly coloured, and occasionally the vitrification penetrates more deeply into the crucible fabric. These vitrified surfaces were analysed by XRF to detect the presence of any non-ferrous metals. In a few cases (marked EOL/EIL in Table 83), an

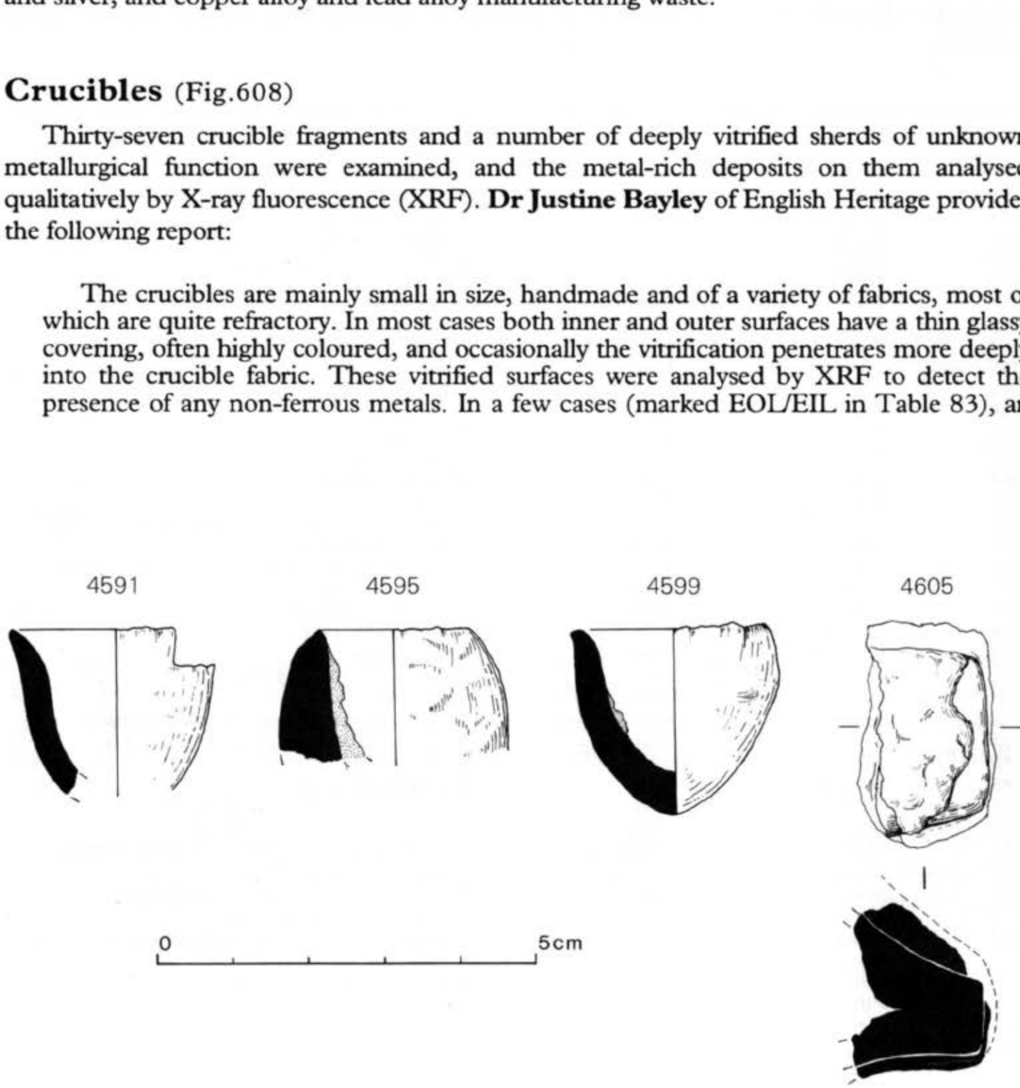


Fig.608 Non-ferrous metalworking: crucible fragments 4591, 4595, 4599, 4605. *Scale 1:1*

extra layer of less refractory clay had been added to the outside or inside of the crucibles; this is a common feature of Roman and later crucibles (Bayley 1988, 197–8).

One complete crucible, *4599*, is widest just below the rim and tapers to a fairly pointed base. Many of the other fragments are probably from other vessels of this general form; the variation in wall thickness suggests a range of sizes, though in no case, where the diameter could be estimated, was it over 50mm. A number of sherds, identified in Table 83 as 'cf Type A', are of a similar fabric to the Type A crucibles from the site at 16–22 Coppergate (p.760, *AY* 17/7). Their form is also comparable, being thin-walled and straight-sided with a rounded base. There are also a few sherds which appear to come from rather cruder thumb pot crucibles, possibly similar to those found at Southampton (Addyman and Hill 1969, 66, fig.25). One crucible, *4611*, is flat-bottomed and, from its form and fabric, is likely to be medieval or later in date.

There is a single fragment, *4605*, which must be from a completely different form of crucible. It is a rectangular knob, vitrified on its outer surface, which must have served as a handle on a crucible. It has apparently been added to the outside of a vessel, as no trace of an original inner surface survives. Crucibles with knobbed lids are known on Irish sites of this period (e.g. Youngs 1989, 184, pl.169), but the appearance of this piece suggests that it came from the side of a crucible; possible parallels are the early 9th century knobbed crucibles from Ribe in Jutland (Brinch Madsen 1984, 105ff.). The Fishergate knob had an area on one side where added clay had broken away. A possible interpretation is that it was fixed near the rim of the crucible and the extra clay which is now lost was part of a lid; this may perhaps suggest a shape similar to the crucibles from Helgö in Sweden (Lamm 1980, 100). The only knobbed crucibles from English sites are a Roman brass making crucible from Colchester, Essex (Bayley 1984, 42–3), and a vessel of similar shape from Ribchester, Lancashire.

There is no difference between the crucibles from various periods, so it is possible that most of them are of Anglian date, and are thus residual when found in later contexts. If there had been metalworking in Period 4, some Stamford ware crucibles would have been expected, as they are common on other sites in the city at this time, e.g. 16–22 Coppergate (p.754, *AY* 17/7).

The analytical results for the metal-rich deposits on the crucibles are similar in different periods, reinforcing the interpretation that most of them represent a single phase of metalworking. The symbols in Table 83 denote the presence of copper (Cu), tin (Sn), zinc (Zn), lead (Pb) and silver (Ag). The symbols are listed in order of the XRF signal strength, which is not, however, directly related to the relative abundance of that element in the alloy being melted; in particular, zinc and lead tend to be over-represented, and tin and silver under-represented. Where the symbols are given within brackets, only very low levels of those elements were detected. The interpretation of the analytical results suggests that most, if not all, of the copper alloys contained tin as a major alloying element, and some probably also contained zinc and/or lead in more than trace amounts. The alloys are therefore best described as bronzes (copper-tin alloys), while some may have been gunmetals (copper-tin-lead alloys). In a few cases silver was detected, though never on its own. These crucibles were probably used to melt silver which contained more than a minor amount of other metals; it was significantly debased.

In addition to the crucibles, there is a group of deeply vitrified and bloated ceramics which are characterised by low or undetectable levels of metals (listed in Table 84) (*4612–20*). Some pieces have a regular, fine-surfaced inner face; others have possible textile or thread impressions. The outer surface is universally vitrified, suggesting that the

Table 83 Metalworking crucibles (approx. dimensions in mm)

Cat. No.	Sherd	Elements detected	Diam. (ext.)	Wall	Comments
Period 3a					
4577	rim	Zn Pb Cu	30	5	
Period 3b					
4578	body/base	Cu Pb Sn (Zn)	–	9	
4579	base	Zn Cu Pb Ag	25	3	? cf Type A
4580	body	Cu Zn Pb Sn	40	6	
4581	body	Zn Cu	35	4	
4582	body	Pb Cu (Sn)	–	4–5	
4583	base?	Zn Cu Pb Sn	35	4–7	
Period 3c					
4584	body?	Zn (Cu)	45	3–8	? crucible
4584	base?	Zn Cu Pb Sn	40	3–4	
4585	body	Cu Zn Pb Sn	35	5	
4586	body	Cu Zn Sn Pb	30–35	5	
Period 3z					
4587	base	Cu Sn (Pb Zn)	–	5–8+	
4588	body	Cu Sn (Zn)	30	5	
4589	body	Zn Cu (Pb) Sn	35	2–3	cf Type A
4590	body	Zn Cu Pb Sn	40	3–4	
4591	rim	Cu Zn Pb Sn	30	3–4	cf Type A
4591	body	Zn Pb Cu Sn	35–40	3	
4591	body	Zn Cu Pb Sn	–	5	EOL (2 layers)
Period 4a					
4592	rim	Zn Cu Pb Sn	35	6	? same vessel as *4594*
4593	rim?	Cu Zn Pb Sn	40	6	
4594	rim	Zn Cu Pb Sn	35	5	see *4592*
Period 4b					
4595	rim	Cu Zn Pb Sn	45	6	4mm EIL
Period 4d					
4596	rim	Cu Zn Pb Sn	40?	2–3	cf Type A
Period 4z					
4599	whole	Cu Zn Pb Ag Sn	25	4?	1.5–3ml usable/brimful
4600	body	Zn Cu Pb Sn	25–30	5–6	
4601	rim	Cu Zn Sn Pb	45	5–7	
4602	rim?	Pb Cu Zn	–	3–6	
4602	rim	Pb Cu (Zn)	–		
4602	body	Pb Zn Cu	–	6–7	EOL
4603	rim/lip	Pb Cu Zn Ag ?Sn	30?	6	? for refining
4603	base?	(Pb Cu Ag)	25	3	cf Type A
4604	rim	Cu Pb (Zn) Ag	40	5–8	EOL ? lidded
4605	knob	Cu	–	–	EOL
Periods 6/7					
4606	rim	Cu Zn Pb Sn	45?	5–6	
4607	body	Cu Pb Zn Sn	–	8–12	
4609	rim	Zn	–	4	? kiln waster
Unstratified					
4611	base	Pb (Zn Cu)	50	2–3	flat-bottomed

Table 84 Vitrified mould-type material

Period	Cat. No.	Elements detected	Description
3c	*4612*	(Pb)	2 fragments, 1 with original inner surface surviving
3z	*4613*	nd	? textile impression on smooth face
3z	*4614*	Pb (Zn Cu)	17 fragments, 3 with smooth inner surfaces
4z	*4615*	Zn (Cu Pb)	package 40 × 25 × 25mm; metal fragment trapped in convoluted inner surface
4z	*4616*	Zn Cu Pb	red-orange vitrified inner surface
4z	*4617*	nd	irregular markings on inner surface
4z	*4618*	nd	7 small fragments, 2 with inner surfaces surviving
4z	*4619*	nd	uneven inner surface
6c	*4620*	(Zn Pb Cu)	irregular markings on inner surface

Key: nd = no metals detectable

objects of which these pieces were part had been heated strongly. One piece (*4616*) also has a red (copper-coloured) vitrified inner surface. These finds would seem to have some association with metalworking, but their exact function is not known.

Several fragments of crucibles used to melt high-lead glass were also found (see Table 85); similar vessels have been found on the site at 16–22 Coppergate (*AY* 16/5, 471–2).

In addition to the mould-type material noted in Table 84, other fragments of this material were recovered from the following contexts:

Period 3a: 3415, 4880, 10180
Period 3b: 7070
Period 3c: 4847
Period 3z: 3463, 4848, 4869
Period 4z: 3407, 4242
Period 6a: 3352, 5375
Period 6z: 4259

Table 85 Crucibles with traces of high-lead glass

Period	Cat. No.	Elements detected	Description
4z	*4597*	Pb (Cu)	base of oxidised fabric
4z	*4598*	Pb Cu	base
6a/b	*4608*	Pb	rim with high-lead glass/glaze
6z	*4610*	Pb (Cu Zn)	body sherd

Ingot mould (Fig.609)

The sandstone mould *4423* was found in a Period 3z pit.

Dr G.D. Gaunt comments on the stone type. It should be noted that none of the stone items discussed in this fascicule was thin-sectioned.

> This is a rather nondescript sandstone, typical of many sandstones in the Coal Measures and of some sandstones in the Middle Jurassic of north-eastern Yorkshire. It may derive from either of these sources.

The mould is a roughly shaped block, with an elongated oval-shaped slot of U-shaped section on one face. The slot is rather shallow, and may be unfinished (J. Bayley, pers. comm.). No residue was found in the slot; although such residues are rarely recovered (Bayley 1988, 201) it seems probable that this mould was discarded during manufacture and was never actually used for casting ingots.

There are few stone ingot moulds which can be dated to the Anglian or middle Saxon period (Bayley 1982, 493; 1991, 125–7); *4423* is therefore of interest as it is stratified in a

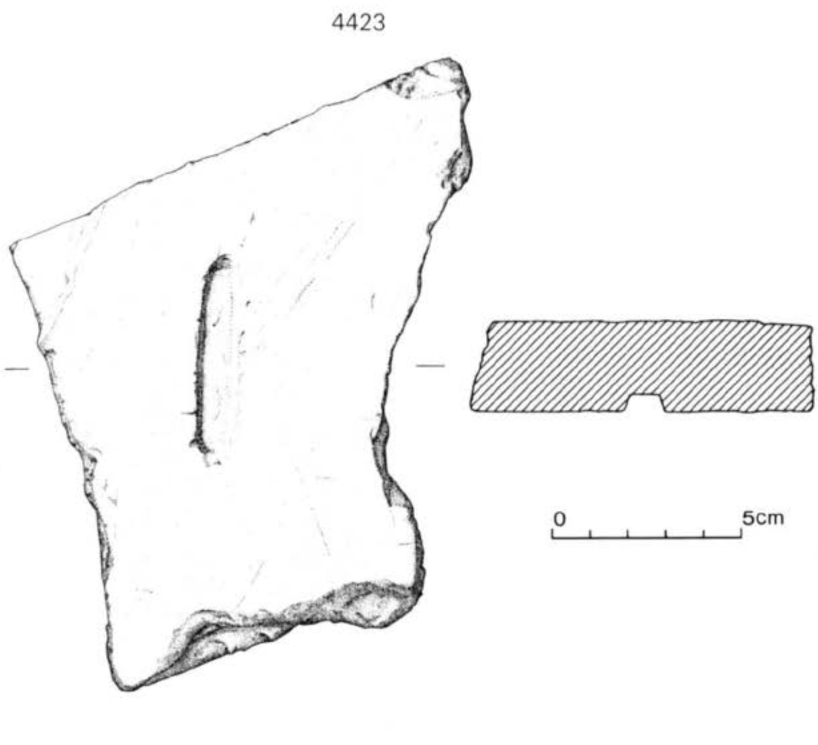


Fig.609 Non-ferrous metalworking: stone ingot mould 4423. *Scale 1:2*

context dated to c. AD 700–850. Anglo-Scandinavian and late Saxon examples are better known. Many of those found at Flaxengate, Lincoln, are similar to *4423* in having only one slot on each mould (Bayley 1982, 491), while others found at 16–22 Coppergate (Roesdahl et al. 1981, YMW7–10; Figs.330–2, *AY* 17/7), and 26–42 Lower Bridge Street, Chester (Rutter 1985, 64), have up to five slots. Most of the moulds from Coppergate had been used for the casting of either copper alloys or silver. No traces were recovered from the Chester mould, but it may have been used for the casting of precious rather than base metals (ibid.). Ingots of silver which must have been cast in moulds similar to *4423* are well known from the Viking period (Roesdahl et al. 1981, E18, E25). As noted on p.1233, analysis of the crucibles from Fishergate shows that both copper alloy and, to a lesser extent, debased silver were being melted, but it is impossible to be certain which type of metal might have been cast in this mould, had it been finished.

Gold and silver working debris (Fig.610)

Two lengths of gold wire, *5437–8*, and an offcut of gold sheet, *5439*, were recovered from Period 3a and 3b contexts. *5437* is a long piece of wire, which appears to have been partially twisted and later untwisted; like *5438*, it has had its ends pinched off. Silverworking is indicated by *5434*, which comprises fragments of silver wire and tiny irregularly shaped silver pieces; these were found in the Period 3b charcoal-rich deposit. Offcuts of precious metals were usually recycled, so the survival of these items is unexpected. Although the small fragments of gold and silver probably represent casual losses, the failure to recover and recycle such a long length of wire as *5437* (243mm) appears rather wasteful.

Copper alloy working debris (Fig.610)

Although two fragments of copper slag (*5279–80*) were found, along with a small piece of melted copper alloy (*5281*), it is unlikely that smelting was undertaken on site, and the pieces may have been unintentionally imported. Fragments of wire (*5282–7*), pieces of rod (*5288–92*), and sheet offcuts (*5293–8*) were also recovered. Three of the rods, *5289–91*, seem to have been in the process of being wrought when they were discarded or lost, all having been partially hammered. Of the sheet offcuts, only *5297* provides any evidence of the use of the sheet, each offcut having had two discs of similar size and part of a third stamped out along one edge. Unfortunately, it has not been possible to relate these discs to any objects found on the site. In addition to these pieces, there are also fragments of sheet (*5299–309*) which may have been destined for recycling.

Evidence for copper alloy working on site has been found in both Period 3 and 4 contexts, but it is possible that this working was largely, if not exclusively, carried out during the Anglian period. The fabrics of the crucibles point to their use in the Anglian rather than the later period (see p.1233) and the waste recovered in Period 4 may also be residual from Period 3. All the gold and silver fragments were recovered from Period 3 contexts.

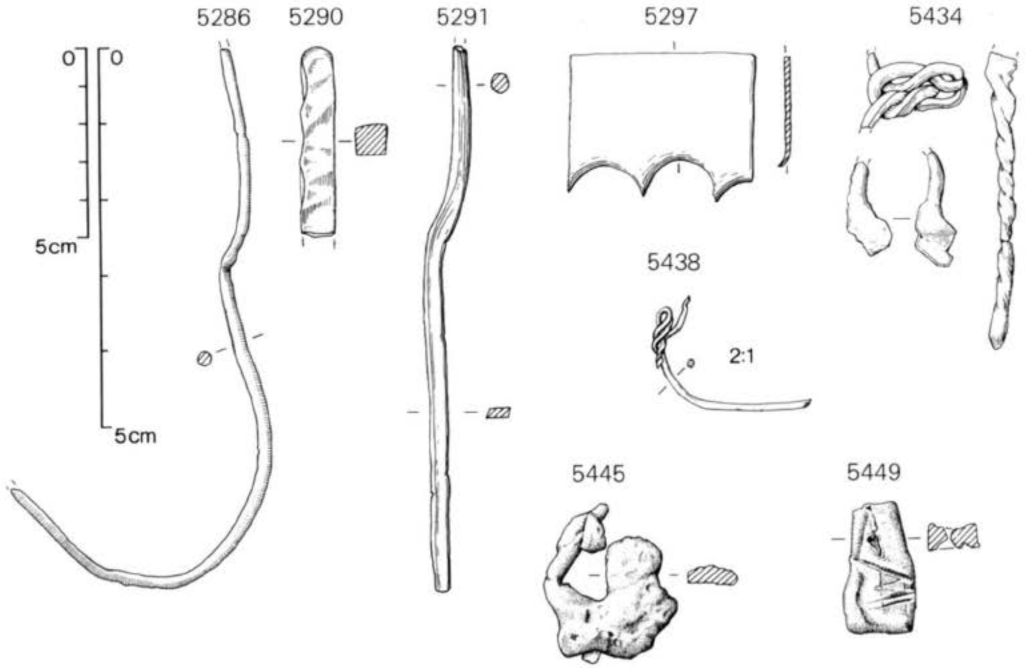


Fig.610 Non-ferrous metalworking debris: copper alloy wire (5286), rod (5290–1) and sheet offcuts (5297); silver fragments (5434); gold wire fragment (5438); lead alloy run-off (5445) and bar (5449). Scale 1:1, gold wire 2:1, lead alloy 1:2

Lead and lead alloy working debris (Fig.610)

Run-offs or spillages of lead alloy *(5441–7)* resulting from the melting or casting of metal, bar fragments *(5448–9)* and sheet offcuts *(5450–68)* were all recovered, indicating that this material was worked on the site. Sheet and strip fragments *(5469–76)*, including a perforated strip which had been folded up and compressed *(5476)*, may have been intended for recycling. Lead alloy objects found on the site include weights for fishing nets (see p.1320).

The lead alloy working waste derives from both Periods 3 and 4. Although the amount of lead alloy working debris recovered was considerably larger than that from silver and copper alloy working, it is unlikely that this reflects the comparative levels of use of these materials. Precious metal and copper alloy were considered too valuable to allow any scrap or fragments to go to waste, and these were recycled whenever possible (Tweddle 1990, 33). Lead, however, seems to have been much more abundant in supply, and thus much less was re-used (Roesdahl et al. 1981, YMW2).

Comparative material

Over 90 English excavations have now produced evidence of non-ferrous metalworking in the Anglo-Saxon and Anglo-Scandinavian period, about half being concentrated in just six urban centres — York, Lincoln, London, Northampton, Thetford and Winchester (see Fig.611). Most of these finds date from the late 9th century to the mid 11th century (Bayley 1991). Crucibles are the most commonly found evidence for metalworking. Crucibles from Hartlepool, Cleveland, have been dated to as early as c.700, and Anglian crucibles were recovered from Wharram Percy in Yorkshire. Fragments of more than 50 crucibles dating to the 8th and early 9th centuries have come from Hamwic. Many late Anglo-Saxon and Anglo-Scandinavian sites have produced much larger assemblages of crucibles. Other finds associated with non-ferrous metalworking include ingot moulds and bar ingots; moulds for casting small objects; parting vessels and cupels used in metal refining; and scrap metal. A more complete list of finds from middle and late Saxon sites can be found in Bayley 1991, 125–7.

Metalworking tools

Eight tools were recovered which may be associated with metalworking, comprising four punches, three chisels, and a file fragment.

Punches (Fig.613)

Two punches (*4934–5*) are without tangs, and would have been struck on the head, as indicated by the pronounced burring on the heads of both. *4935* comes from a Period 3z pit, and may have been used to make holes in hot iron. *4934*, which is the smaller of the two, was recovered from the charcoal-rich deposit of Period 3b. A punch of similar size, recovered from Anglo-Scandinavian levels at 16–22 Coppergate, was found to have traces of copper alloy attached to it (*2219*, *AY* 17/6), and it seems probable that *4934* was also used in non-ferrous metalworking.

Two other punches, *4936–7*, both from Period 4z pits, appear to be tanged. The tang on *4936* has been broken off, but the remains of shoulders are visible, a feature also found on the more complete *4937* and previously noted on other tanged punches found in York (e.g. *2229*, *AY* 17/6). Wooden handles, into which the tangs were set, would be held in place by the shoulders (p.517, *AY* 17/6). The shafts of the punches are both of square section, and of approximately equal lengths, but that of *4937* tapers gradually to a point at its tip, while *4936* only tapers close to its flattened tip. Both punches could have been used to make holes in iron, but it is possible that they were used in bone or leather working (p.517, *AY* 17/6), or to sink nail heads in woodworking (Goodall 1980a, 15). Although several examples of this type of punch have now been recovered from excavations in York, tanged punches have not otherwise been recognised in Britain. It is possible that this may partly be due to their identification in the past as awls. They are also uncommon on contemporary sites on the Continent, although there is an example from Hedeby, a late 8th to early 10th century

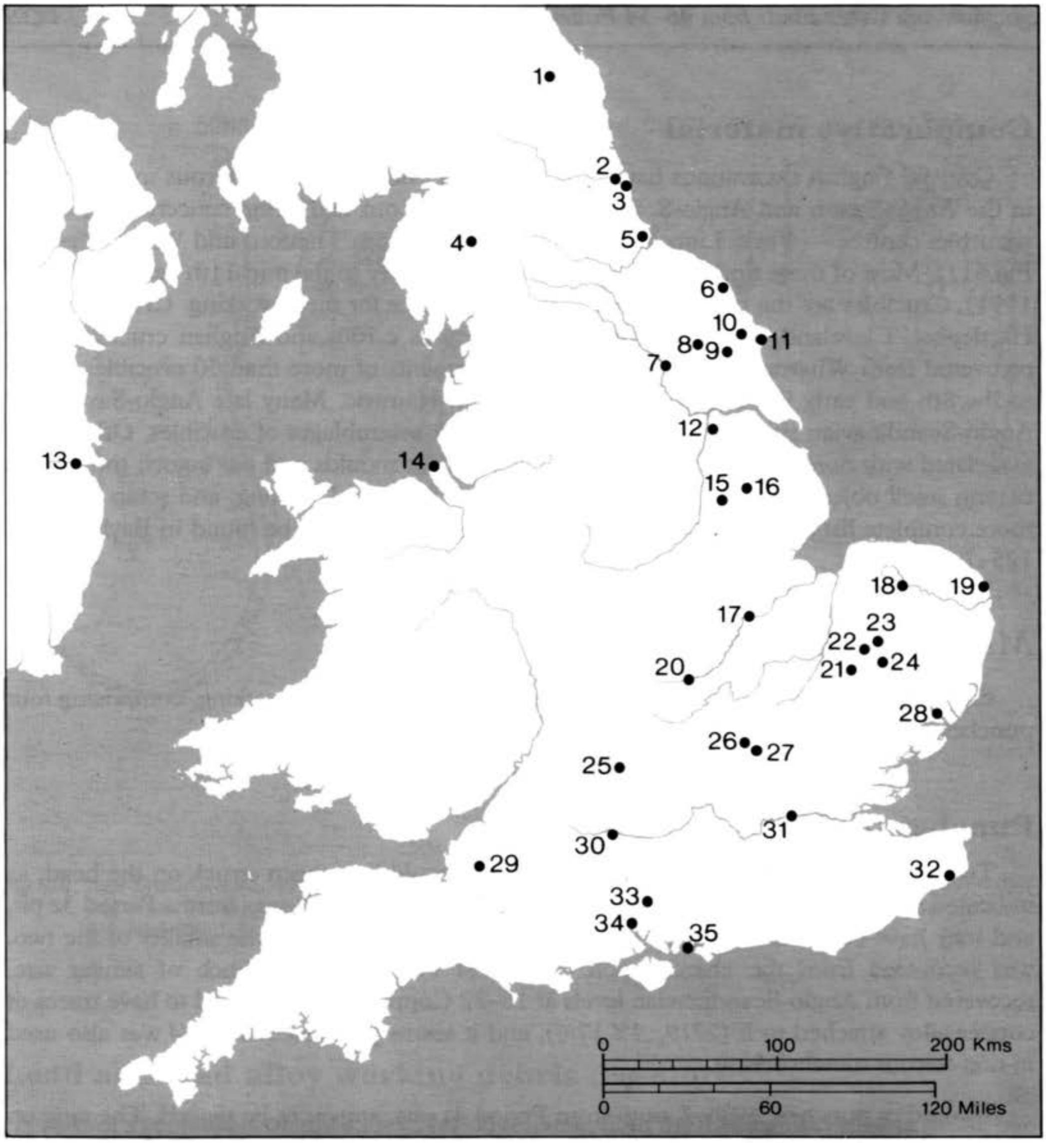


Fig. 611 Map of Britain and Ireland showing the main sites referred to in the text

Burwell (21)
Caistor-by-Norwich (19)
Cheddar (29)
Dacre (4)
Dover (32)
Dublin (13)
Dunstable (27)
Flixborough (12)
Garton Slack (9)
Goltho (16)
Hartlepool (5)
Holywell (22)
Ipswich (28)
Jarrow (2)
Leighton Buzzard (26)
Lincoln (15)
London (Lundenwic) (31)
Maxey (17)
Meols (14)
Monkwearmouth (3)
Northampton (20)
Portchester (35)
Ramsbury (30)
Sewerby (11)
Shakenoak (25)
Southampton (Hamwic) (34)
Spong Hill, North Elmham (18)
Thetford (23)
Thwing (10)
Wharram Percy (8)
Whitby (6)
West Stow (24)
Winchester (33)
Yeavering (1)
York (7)

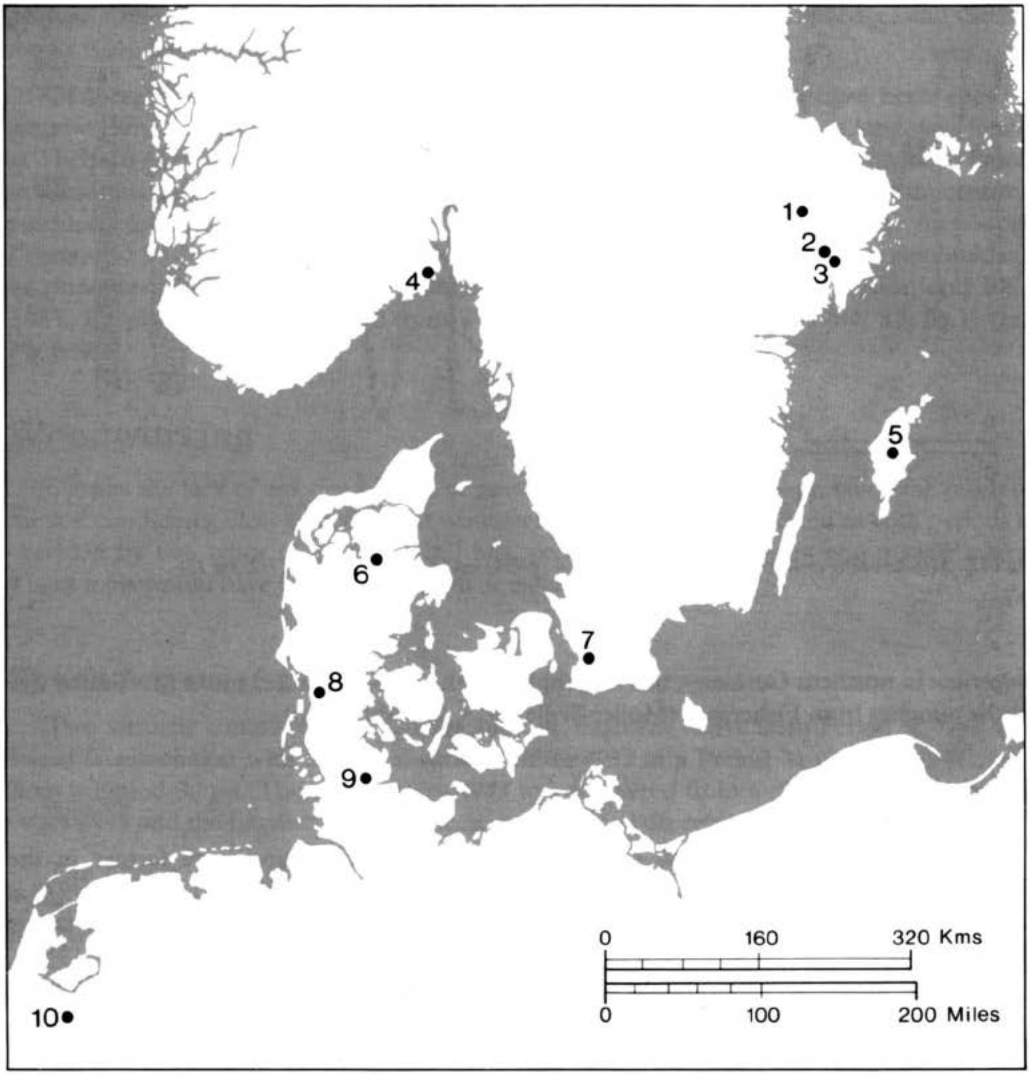


Fig. 612 Map of northern Europe showing the main sites referred to in the text

Birka (2)	*Lund (7)*
Dorestad (10)	*Mästermyr (5)*
Hedeby (9)	*Ribe (8)*
Helgö (3)	*Tjele (6)*
Kaupang (4)	*Valsgärde (1)*

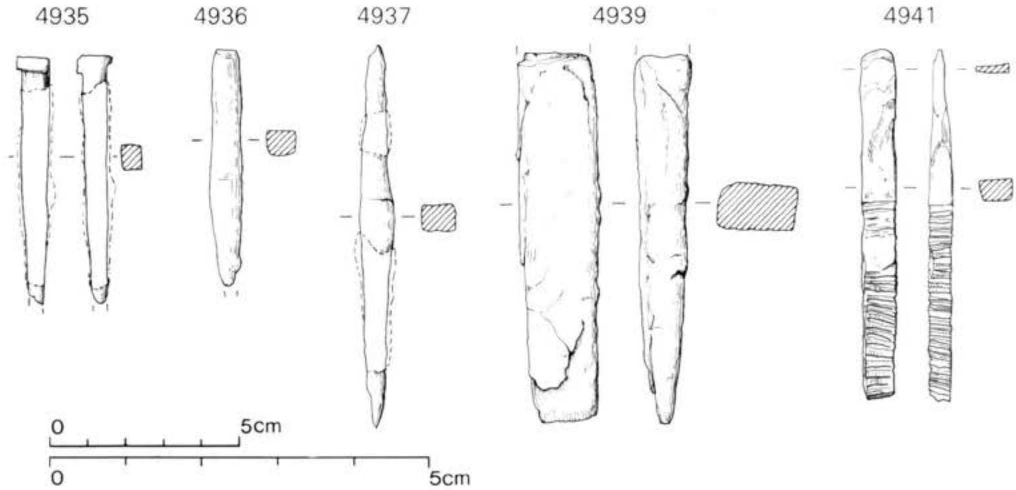


Fig.613 Metalworking tools: punches (4935–7), chisel (4939) and file (4941). Scale 1:2; file 1:1

emporium in northern Germany; this is complete with wooden handle, and is of a similar size to the punches from Fishergate (Müller-Wille 1973, 26, Abb.2, 10).

Chisels (Fig.613)

Two of the chisels (*4938–9*) were found in Period 3a contexts, the former in the boundary ditch, the latter in a pit; a third (*4940*) derives from a Period 4b context. *4939* is incomplete, its upper end having been broken off. Rectangular in shape, it gradually tapers to a rounded tip; this indicates that it may have been used to cut hot iron (Goodall 1980a, 14). Similar chisels have been found at the late 8th to late 10th century cemetery at Birka in Sweden (Arbman 1940, Taf.185, 13) and, in this country, in 10th/11th century levels at Thetford (I.H. Goodall 1984, 77, fig.116, 6). *4938* and *4940* are smaller and may be compared with the only chisel found at 16–22 Coppergate, which was considered too small for cutting iron but suitable for use on non-ferrous metals or wood (*2245, AY* 17/6).

File (Fig.613)

4941 is a file fragment, found in the fill of a Period 4z ditch. Of rectangular section, it tapers to one end, which may have acted as a tang; the other end has been broken. There are transverse serrations along most of one edge, and oblique serrations on part of one face, all very worn, but possibly the remains of the file teeth. The serrations are equally spaced, and fine, with six to seven per 10mm; this suggests that the file may have been used to provide a finish to objects of copper alloy, including the removal of rough edges and casting marks (Goodall 1980a, 18).

Of three files found at 16–22 Coppergate, two were thought to have been used in metalworking (*2246–7*, *AY* 17/6). A large example, approximately 230mm long, was found at Thetford (I.H. Goodall 1984, 77, fig.116, 10), but files have more commonly been found in Scandinavia. The ironworking site at Helgö, in operation during the 8th century, produced five files, of which three were thought to have been used on fine metalwork (Tomtlund 1978, 16, table 2); others have been found in the late 10th century shipbuilder's or carpenter's kit recovered from Mästermyr, Gotland, in Sweden (Arwidsson and Berg 1983, 12, pls.7, 22), and a hoard from Tjele, Denmark (Munksgaard 1984, 85, fig.1) (see Fig.612).

Woodworking

Despite the lack of wooden objects or structures found on the site, probably the result of the soil conditions, clear evidence that woodworking was being carried out in both periods is provided by two types of auger or drill bits, comprising spoon augers and a twist auger. These tools would have been used to drill or enlarge holes in wood.

Spoon augers (Fig.614)

Two virtually complete spoon augers and one fragment derive from Period 3; *4942* was found in association with the metalworking chisel *4939* in a Period 3a pit, and *4944* came from a Period 3z pit. The fragmentary *4943* was recovered from a 3b pit. Both the largely intact *4945* and the fragment *4946* came from the Period 4b cemetery build-up.

The almost complete spoon augers *4942* and *4944–5* vary considerably in size. At 229mm in length, *4944* is almost twice as long as the others. They share the same shape, however, with a flat lanceolate tang at one end, tapering shafts of subsquare section, and a scooped or spoon-shaped blade at the other end. The blade of *4945* is partially broken, but the blades are intact on *4942* and *4944*, and both show signs of wear. The slight twist to one side suggests that *4942* was probably used in a clockwise direction, while the greater wear on one edge of the blade of *4944* indicates that it may have been turned anti-clockwise.

The fragment *4943* appears to be the upper part of a spoon auger, with substantial traces of the wooden handle remaining on the tang. The shaft is of subcircular section and has been broken transversely at the lower end. Also incomplete, *4946* has had its tip broken away, but has the lanceolate tang typical of these tools.

The form of spoon augers or bits has remained almost unchanged from the Roman period (Manning 1985, 25–7) to recent times. Few examples are recovered complete with handle, but these would probably have been of wood and aligned transversely, as on a 13th century example from Mileham, Norfolk (Wilson 1976, 258). Although a spoon auger was found at the late 7th to 9th century *emporium* of Dorestad (Van Es and Verwers 1980,

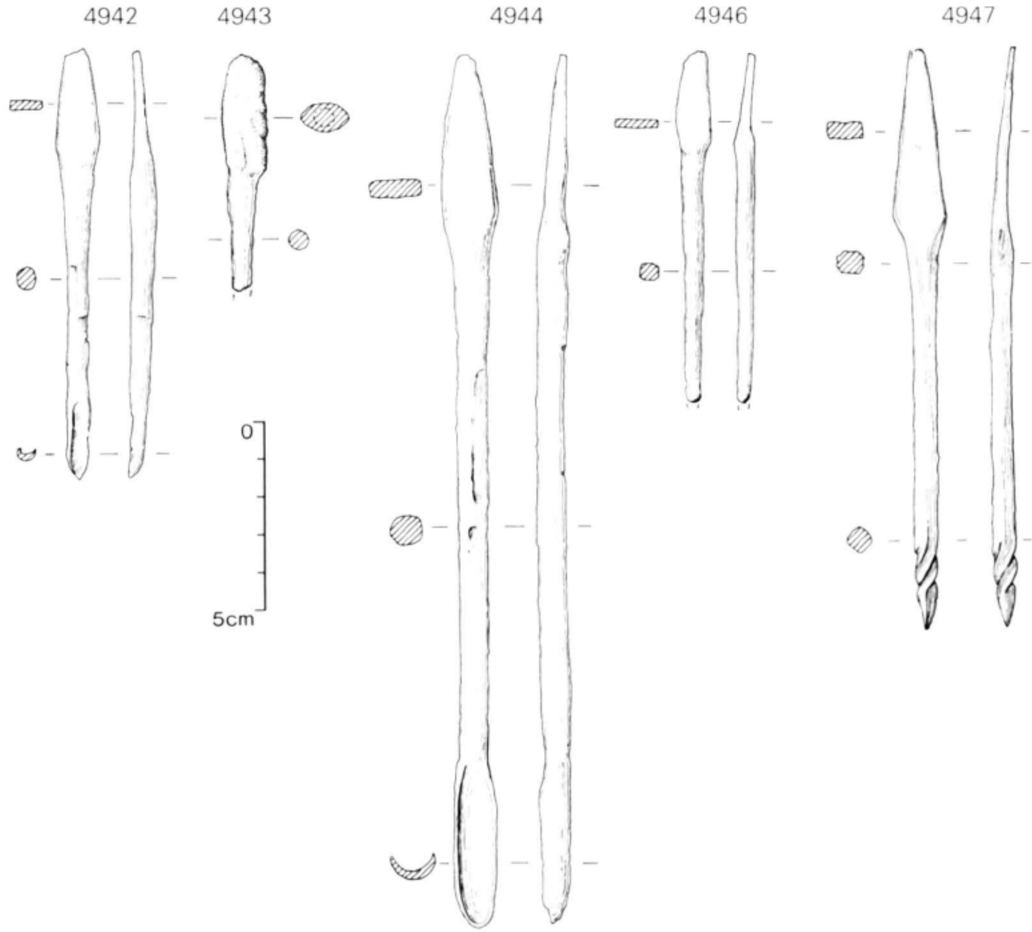


Fig. 614 Woodworking tools: spoon augers (4942, 4944), auger fragments (4943, 4946) and twist auger (4947). Scale 1:2

fig.128), these tools have more commonly been recovered from 10th and 11th century contexts. Two late Anglo-Saxon sites at Westley Waterless, Cambridgeshire, and Hurbuck, Co. Durham (Wilson 1968, 146, fig.2), and 11th century levels at Goltho (Goodall 1987, 178, fig.156, 3–4) all produced spoon augers over 320mm in length; four smaller spoon augers, more like the smaller examples from Fishergate, were recovered from 10th/11th century levels at Thetford (I.H. Goodall 1984, fig.117, 14–17). Several examples have also been found on other sites in York, including Parliament Street (*712*, *AY* 17/4), 21–33 Aldwark (MacGregor 1978, 44, fig.26, 8), and 16–22 Coppergate, where bits varying in length from 200 to 327mm were found (*2260–6, 2268*, *AY* 17/6). The Viking chest found at

Mästermyr included six spoon augers of varying sizes (Arwidsson and Berg 1983, 13, pl.28), and indicates the woodworker's requirement for a number of tools to produce a range of hole sizes.

Twist auger (Fig.614)

The sixth auger from Fishergate is of a type which has rarely been found previously on sites in Britain or Europe. *4947* is a complete example of a twist auger which was retrieved from a Period 4z ditch. Apart from its tip, it is very similar in shape to the spoon augers, with a long flat tapering tang, and a shaft of square section. At the tip there is a double twist into a point, the clockwise direction of the twist indicating how the auger would have been turned. It would have been used in conjunction with a spoon auger, the twist auger starting off the hole which would then be fully drilled by the second bit. Apart from a possible tip fragment from Viking Age levels on 16–22 Coppergate (*2267*, *AY* 17/6), there seem to be no other contemporary examples of twist augers in Britain. In Sweden, a small twist auger found at Helgö was thought to be 9th century or earlier (Werner 1981, 53, fig.45); Lund produced some 11th century examples (Bergman and Billberg 1976, pl.154). Viking Age Norway has also produced several of these tools, but they are considerably less common than the spoon augers (Petersen 1951, 519, fig.124). A collection of carpentry tools from northern Russia, dating from the 10th to the 13th century, included four twist augers of varying sizes (Kolchin 1953, 120, phc.87, 1–4).

Antler and bone working (Figs.615–16)

A total of 1728 offcuts of antler, bone and horn were recovered and recorded. The majority of the offcuts (73·8%) derive from Period 3 contexts and result from the

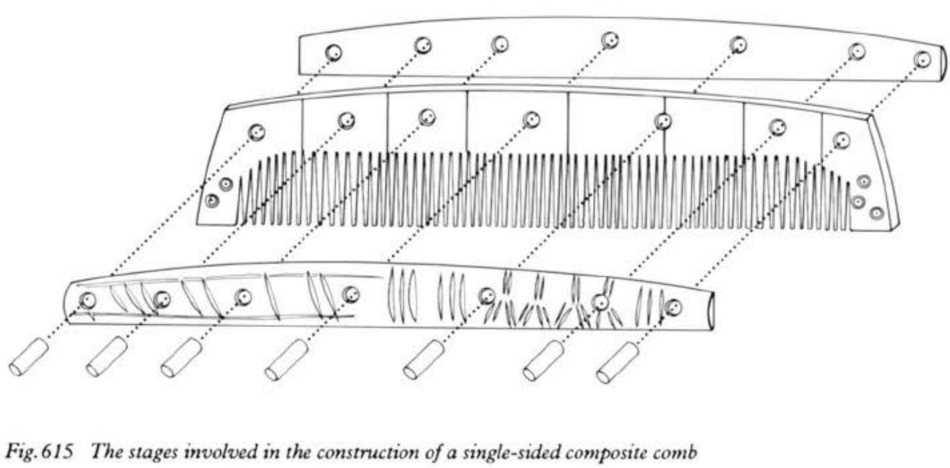
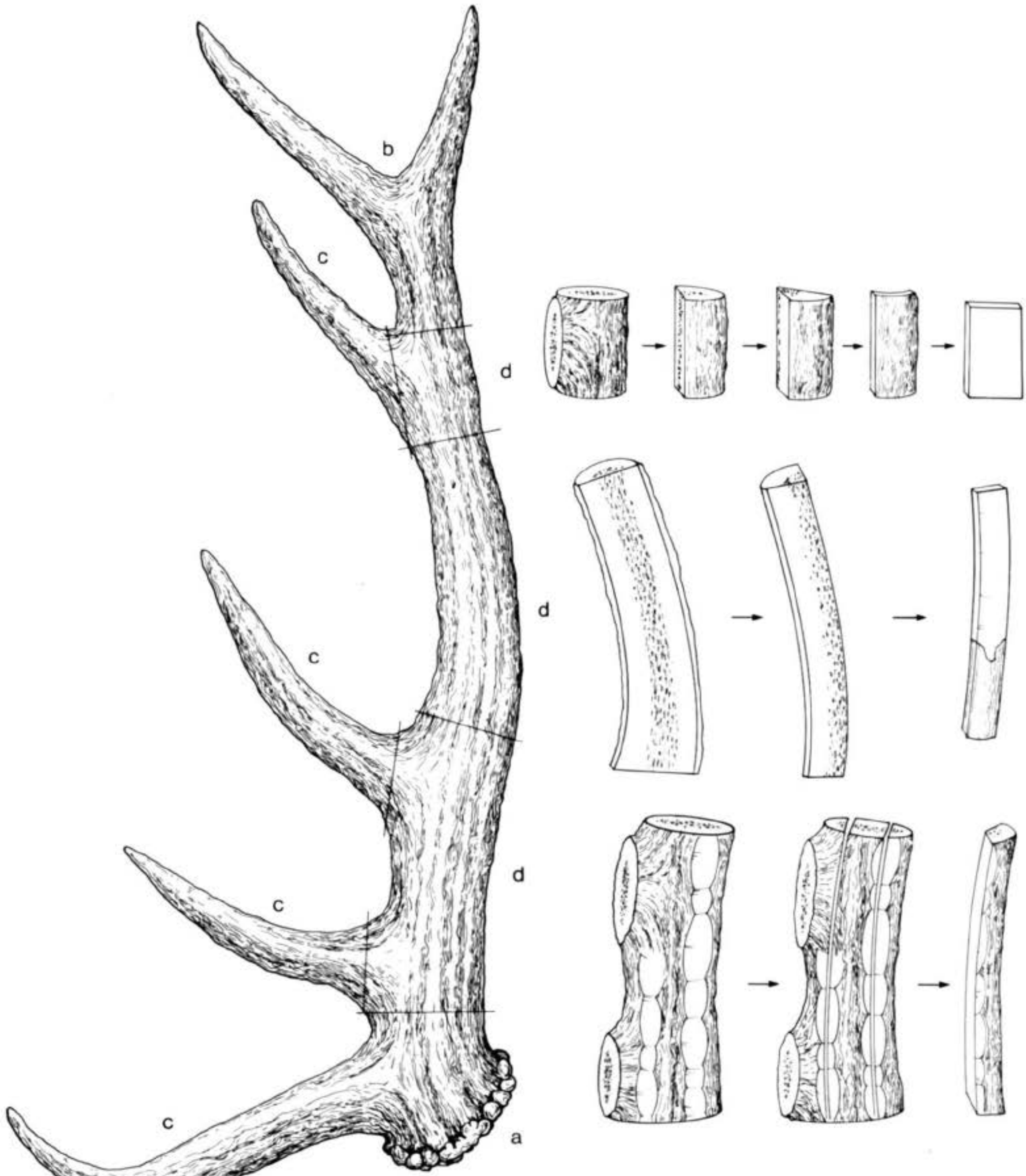


Fig.615 The stages involved in the construction of a single-sided composite comb


b
c
d
d
c
d
c
c
a

manufacture of composite combs on the site during the Anglian period; the remainder are almost certainly residual. Many Anglian combs and comb fragments were also found on the site (see p.1388–1404). Other objects of antler and bone occur, including pins, skates and miscellaneous items; these may also have been made on site. Approximately 79% of the offcuts are of antler; the remainder are of bone.

All the combs produced on the site were composite, made up of a number of plates which were cut and riveted together, the method of construction almost exclusively employed in the manufacture of combs during the Anglian and Viking periods (Fig.615).

The different stages of the manufacturing process have often been described (e.g. Ambrosiani 1981; Christophersen 1980); a useful summary of all these accounts is to be found in MacGregor (1985). The debris recovered from Fishergate provides evidence of all these stages, from the cutting up of the raw material of antler and bone, to the shaping of the blank tooth and connecting plates, and the trimming of the assembled comb.

Antler working

The antlers would have been provided primarily by red and roe deer, both of which were naturally distributed over a large part of the British Isles from the Roman period through to the Norman Conquest (MacGregor 1985, 34). Fallow deer may also have been present, but

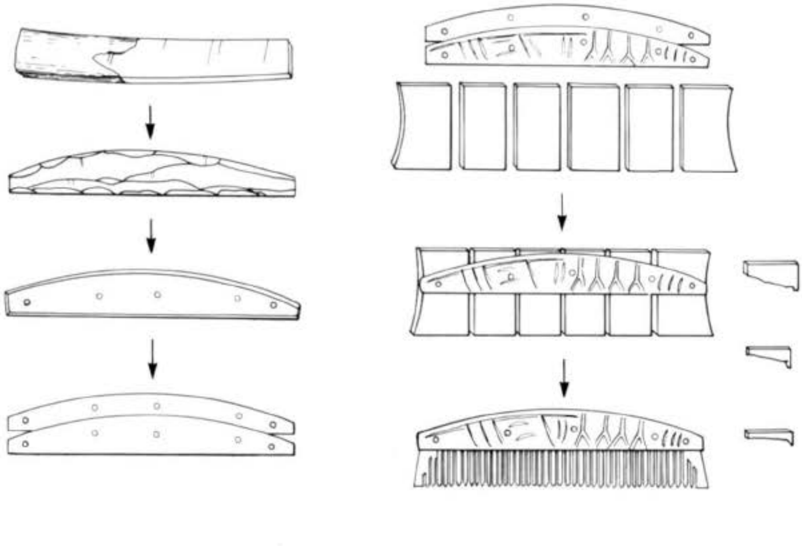


Fig.616 (left and above) Schematic representation of methods of cutting up and utilising antler (after Ulbricht); a = basal burr, b = crown, c = tines, d = beam

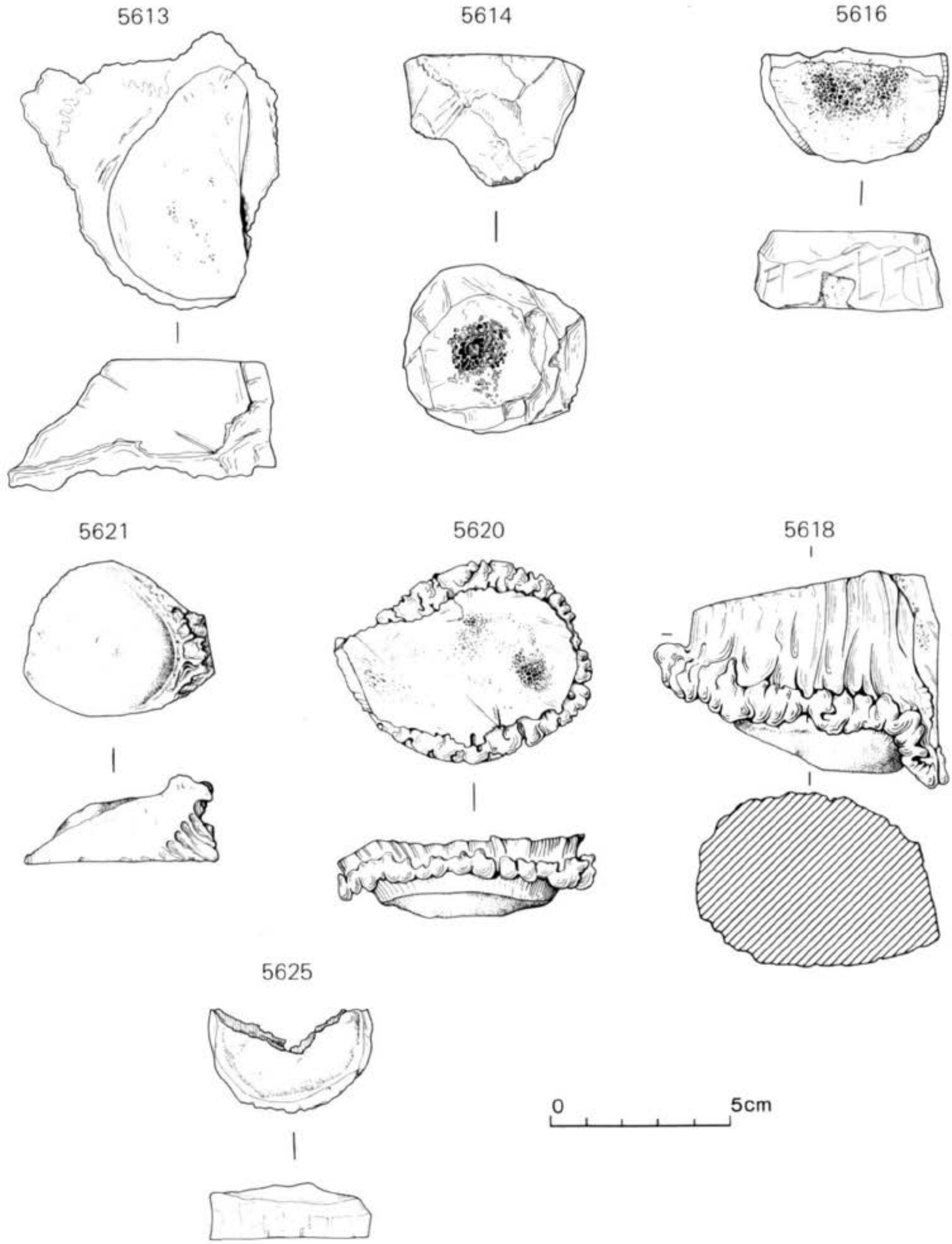
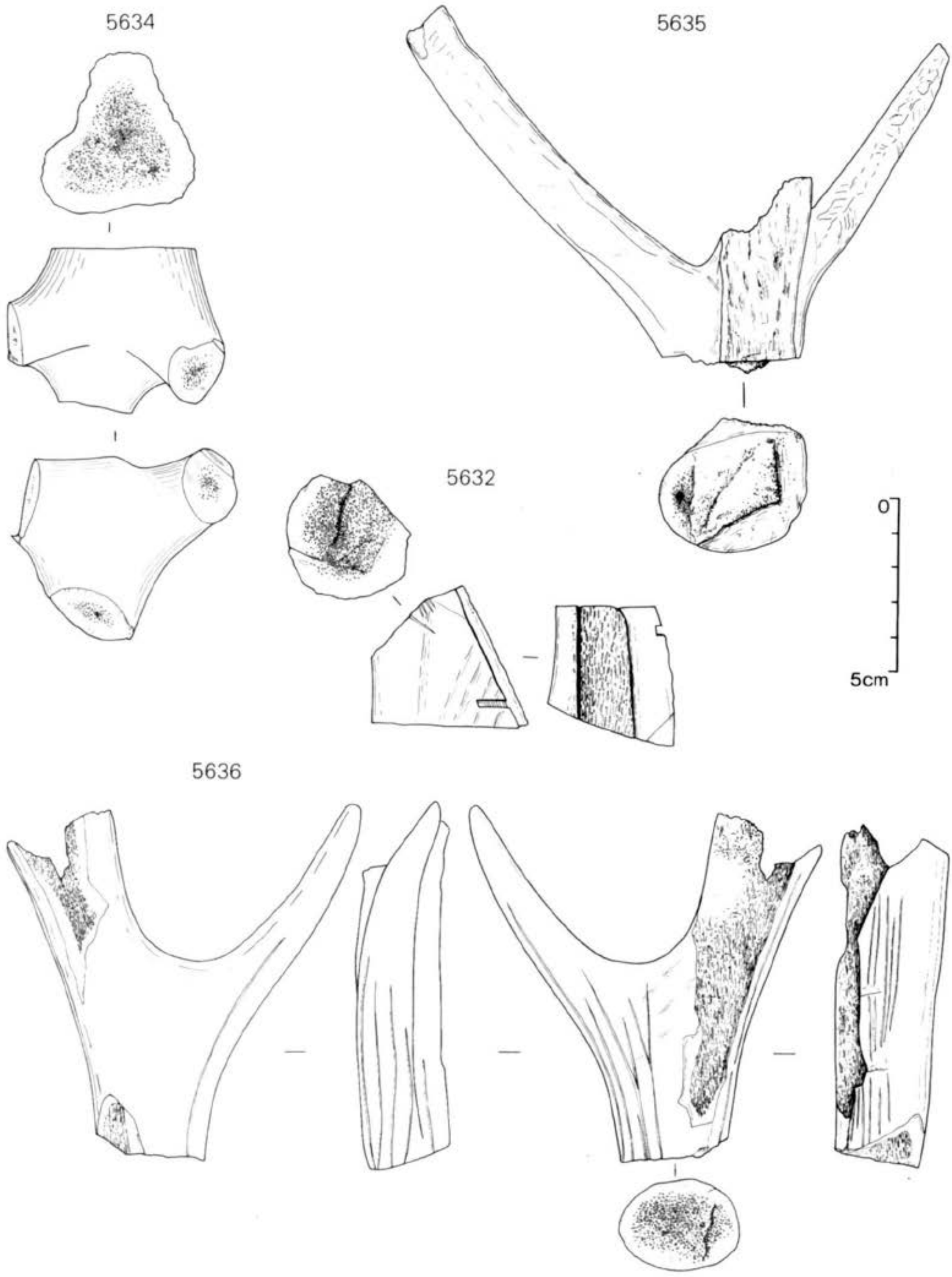


*Fig. 617 (above and facing) Antler working: fragments and offcuts of pedicle (*5613–14, 5616*) and burr (*5618, 5620–1, 5625*); offcuts of crown (*5632, 5634–6*). Scale 1:2*


5634
5635
5632
0
5cm
5636

possibly in small numbers only (ibid., 35). The antlers were usually collected after having been naturally shed; occasionally they were removed from dead animals.

The offcuts found indicate that complete antlers were divided up on site for use in composite combs. This process is well understood (see Fig.616), having been noted from several contemporary sites, such as Hedeby in northern Germany (Ulbricht 1978), and Ribe (Ambrosiani 1981) and Lund (Christophersen 1980) in Scandinavia. The antler was prepared in several stages, the first being the removal of the pedicle, basal burr (a), and crown (b). The tines (c) were also removed; those which were not too curved were occasionally used in handled combs (see p.1389), or as connecting plates (Ambrosiani 1981, 112). The remaining beam (d) was then sawn into lengths appropriate for either connecting plates or tooth plates, and split longitudinally, usually into quadrants, from which the useless inner cancellous tissue and irregular outer surface were removed. The resulting plates of compact tissue were shaped into the connecting plates and tooth plates required, and the comb then assembled. The comb would be decorated at this stage, then the tooth plates were riveted between the connecting plates, and the teeth cut. The final stage involved the trimming of the tooth plates.

Pedicles and burrs (Fig.617)

Pedicles are small protuberances on either side of the deer skull. The antlers grow from the pedicle and are shed from it each year. There are three fragments and two offcuts of pedicle (*5613–17*); these must have been removed from dead animals in the field or have been brought to the site still attached to the carcasses.

5613 and *5615* are 'calvaria', that is pedicle fragments still attached to parts of antler skulls; *5614* appears to have been broken off a skull. The antlers have been sawn off all of them. Two of the pedicles, *5616–17*, have been worked, each with both faces sawn and sides trimmed, and roughly broken, *5617* across a perforation. It is clear that in each instance the faces were sawn from both sides, as the cuts did not quite meet. The pieces removed were obviously snapped off from each face. *5616–17* may be from the same pedicle as they were found together in the same context; it is possible that both were being formed into objects but were discarded when they broke. Pedicles consist of a high proportion of compact material and have been used to produce objects such as spindle whorls; whorls made from pedicles were found at Ribe, for example, although they were identified there as counters (Ambrosiani 1981, 124). The perforation on *5617* suggests that it was also originally destined to become a spindle whorl.

There are four largely complete shed burrs and twelve burr offcuts from the site (*5618–31*). The burr forms the base of the shed antler. *5618–20* and *5627* are almost complete burrs, each with the beam removed, either by cuts at an oblique angle as on *5618* and *5627*, or horizontally as on *5619–20*. The marks from the saw are visible on all the burrs, and on *5620* it is possible to see that the saw has been used to cut from at least two directions. This has been noted on burrs from other sites, and was clearly done to ensure that the blade did not become stuck too far into the beam (MacGregor 1985, 55). On all but one occasion the beam was broken off after the cut was almost through; only one cut is clean.

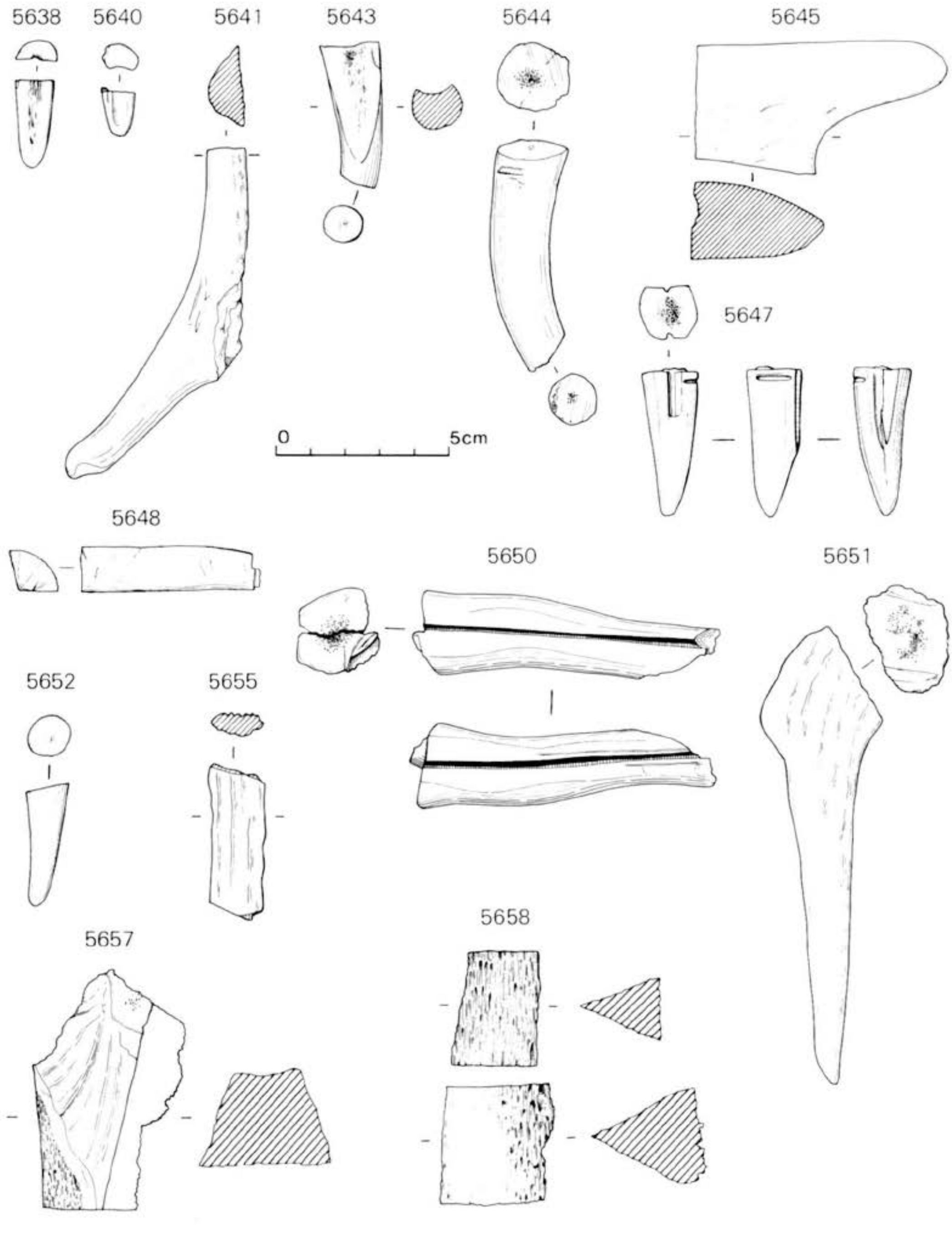
Burrs *5621*, *5628* and *5630–1* have been cut through by the oblique saw cuts removing the beam. In addition, all but *5630* have had their edges partially knife-trimmed in order to remove the 'coronet' or convoluted surface of the surrounding 'corona'. *5625* seems to have been shaped in a similar fashion to the pedicle offcuts *5616–17*, and may also have been broken in the process of being made into a spindle whorl. *5622–4*, *5626* and *5629* are small offcuts of burrs, resulting from the trimming process, and presumably waste.

Offcuts of crown (Fig.617)

5632–6 are offcuts from the crown area, the point at the top of the beam from which one or more tines project. The beam on *5634* has been sawn off, and the three tines sawn and broken off for use. *5635–6* both retain tines. *5635* has been partially sawn (from three sides) and partially broken off from the beam; one tine has been almost completely broken away. The points of both remaining tines appear to have been naturally lost, and one tine has been knife-trimmed all along its inside face. On *5636* a series of scored lines run longitudinally from the base towards the tips of the surviving tines. Their function is uncertain, but they may mark lines along which the beam below the crown was to be split; it is unlikely that this piece would have been utilised itself, as the curves and large proportion of cancellous tissue in this part of the antler rendered it almost useless. The larger offcuts *5632–3* have both been sawn off at the base, and have two oblique faces from which tines have been removed. *5632* has a rectangular notch just above the base, indicating where it was to be cut off from the rest of the beam. The smaller offcut, *5633*, has been sawn on one face and roughly broken on another; it also appears to be from the crown area.

Tines and tine tips (Fig.618)

There are 214 offcuts of tines from the site (Table 86), the majority of which were discarded as waste. Over one-third of these are tines and tine tips which have been split longitudinally, and two offcuts show how tines were prepared for this process. The tip of *5650* has been roughly broken off, but at the base it has been partially sawn and partially broken off from the beam. Facet cuts on two opposed faces run the length of the tine, and deep V-sectioned grooves have been cut with a knife into these facets, also running from base to tip. A crack across the base of the tine connects the two grooves. Similarly, *5647*, which is a tip, has facets and grooves on two faces, cut from the base and extending along approximately half its length; it must have been removed from a marked but unsplit tine. *5648* is a quadrant- shaped offcut from a tine which has been split. The tines may have been split with wedges, as at Hedeby where a beam section was found which had been marked by grooves and had a wedge made from a tine hammered into it at one end (MacGregor 1985,


5638
5640
5641
5643
5644
5645
5647
0
5cm
5648
5650
5651
5652
5655
5657
5658

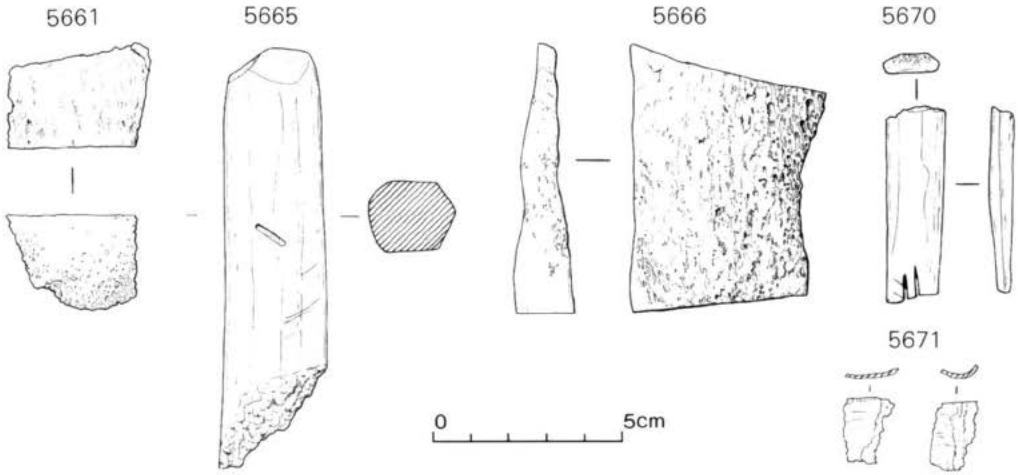


*Fig.618 (above and facing) Antler working: tine tips (*5638, 5640–1, 5643–5, 5647–8, 5650–2*); offcuts of beam (*5655, 5657–8*), medullary tissue (*5661, 5665–6*) and compact tissue (*5670*); shavings (*5671*). Scale 1:2*

57). Ambrosiani (1981, 112) suggests that any unshaped tine tip could be used as a wedge, but the majority of the tips found at Fishergate seem too short to have served this purpose.

Most of the tine tips from the site remained unmodified after their removal, although several have been adapted further. These include some which have been made into artefacts (see p.1261–3) and others with no apparent function. *5642* and *5646* have been shaped with longitudinal facet cuts on two faces at their bases; *5649*, which also has a facet cut, is split. *5637* is a tip which has been split, cut off across a small perforation, and carefully shaped with facet cuts.

The extreme tips have been sawn off *5644* and *5654*, leaving strongly curved tines, each ideally shaped to form the handle of a handled comb. *5643* has also had its tip cut off and is

Table 86 Number of offcuts of tine by period

Type	Period 3	Period 4	Period 6
Shaped	3	4	4
From crown	4	1	–
Notched	5	3	5
Unworked	35	30	40
Split	52	13	15
Total	99	51	64

partially split at one end, while *5639*, which has been burnt, has also been split, had its tip broken away, and been trimmed on its external face.

The remaining offcuts are unworked tips. These include those sawn off at the crown, such as *5645*, and others with notches cut into them, usually at the base, presumably marking the point at which they were to be removed from the tine. The majority, however, are either completely unworked, e.g. *5640–1* and *5651–2*, or split or partially split, e.g. *5638* and *5653*.

The tips are of various lengths and diameters, and all have been sawn or partially sawn and partially broken away from the tines. All seem to have been discarded as waste, and the only difference between them is that some were cut from unworked tines, while others were cut from tines which had been split while the tip was still in place.

The number of tines can be used to estimate the minimum number of complete antlers that must have come to the site. Fishergate produced 134 waste tines, not including the split tines. Using MacGregor's hypothesis that the average mature red deer antler would have had six tines (1985, 71), 22 antlers may be postulated. The split tines may represent another four or perhaps six. This figure is considerably higher than might be expected from the eleven burrs recovered from the site; it indicates that more burrs, and undoubtedly other material also, have been lost to the archaeological record, having been discarded outside the limits of the area excavated or in the river.

Offcuts of beam (Fig.618)

Once the tines had been removed, the beam itself was sawn up. This was the part of the antler from which the connecting plates were fashioned. There are only 28 offcuts of beam which retain the compact outer tissue (Table 87), but the relatively small number of beam offcuts relative to other types of offcut is not surprising because as much of the beam as possible was utilised and little wasted. These offcuts are from beams which have been split either into two, e.g. *5656*, or into quadrants, e.g. *5657*. On some the medullary tissue has been partially or completely removed, e.g. *5655*. This was the next stage in the process, but these pieces were probably rejected because they were too curved, too irregularly shaped or too small to be of use in making any part of a comb.

Table 87 Number of offcuts of beam by period

Type	Period 3	Period 4	Period 6
Split	13	1	–
Quadrant	11	–	3
Total	24	1	3

Medullary tissue and shavings (Fig.618)

Thirty-six offcuts are from quadrants of medullary tissue, the debris which results from stripping off the plates of compact tissue (Table 88). They vary in size and shape, but all have trapezoidal or triangular sections, which distinguishes them from the more numerous irregular fragments and shavings (see below).

5658 contains two complete cores of quadrants, with triangular sections, a single plate of compact tissue having been stripped off from each. Cores such as these have also been found at Coppergate (MacGregor, *AY* 17 in prep.), and in very large numbers at Lund (Christophersen 1980, 160) and Hamwic (Ian Riddler, pers. comm.).

The other offcuts of medullary tissue are more irregularly shaped, and most have trapezoidal or subtrapezoidal sections, e.g. *5661*. *5660* consists largely of medullary tissue, but still has some compact tissue attached. At one end there are two parallel grooves which clearly mark where the remaining compact tissue was to be separated from the core. However, the resulting strip would have been too small to be made into any part of a comb, and so the complete offcut was discarded.

5658, *5660*, *5667* and *5669* comprise six offcuts which retain the original lengths of the quadrants, varying from 26·5mm (*5669*) to 34mm (*5667*), with four of the six being approximately 34mm long. These dimensions are similar to those recorded by Christophersen at Lund, where the standard length of the cores was 34–9mm. Christophersen notes that the plates removed would have formed tooth plate rather than connecting plate blanks (Christophersen 1980, 160).

There are four large subrectangular offcuts (*5659*, *5663–4*, *5666*), of rectangular or trapezoidal section, which are clearly not offcuts of quadrants, but appear to be cut from beam split longitudinally. Apart from *5666*, they are all from areas of the beam from which tines have been removed; *5663* has been partially burnt. *5668* is an unusual offcut of medullary tissue, being rectangular in shape and section, cut square on sides, faces and ends, and resembling a tooth plate blank. *5665* is a particularly large piece of medullary tissue, fashioned from a beam which has had strips of compact tissue removed from all sides, producing an irregular polygonal section. One side is considerably smoother than the other, and may perhaps have been worn down as a result of having been used as an abrasive. Composed almost entirely of medullary tissue, *5662* appears to have been discoidal originally, with knife-trimmed edges, but it has broken across an off-centre perforation; it may represent an abandoned attempt to make a counter or spindle whorl.

In addition to these offcuts from quadrants, there are 710 irregularly shaped offcuts and shavings of medullary tissue, e.g. *5671* (Table 88). The plates of compact tissue which were split off from the cores must have required further shaping and smoothing, and these tiny waste pieces presumably resulted from this process. Ambrosiani comments on the paucity of this type of waste from Ribe, and suggests that some of the material may have been filed off with a rasp, which would produce little debris (Ambrosiani 1981, 126). However, there is

Table 88 Number of offcuts of medullary tissue by period

Type	Period 3	Period 4	Period 6
Quadrant	20	8	8
Shavings	626	77	7
Total	646	85	15

no evidence for the use of such a tool, and at Fishergate it is clear that knives and chisels were employed.

Hornworking (Fig.619)

There is very slight evidence from the site for the working of horn, with only eight offcuts of horncore (*5517–22*) recovered. *5517–18, 5520* and the three adjoining fragments comprising *5521* are from horns which have been sawn or partially sawn off at the base, while *5522* is a square fragment of porous tissue possibly broken off a core. However, *5519* is a rectangular strip of the outer compact tissue which, unlike the other offcuts, has clearly been deliberately cut and shaped.

Offcuts of horncore are frequently the only indicators of the presence of horn which is itself very perishable. Two methods for the removal of the horn sheath from the core were commonly used: either the core would be sawn through at the base, and the sheath separated in cylindrical pieces, or the horn would be slid off a slightly rotting core, the sheath having been loosened by the decay (MacGregor 1985, 52). The offcuts sawn at the base suggest that the first method was employed on this site.

There is evidence from a number of contemporary sites, including Ribe, that horn was utilised to make combs and other items such as knife handles. Ambrosiani notes that if only part of the horn was required, the core and horn would be cut up into sections, the core

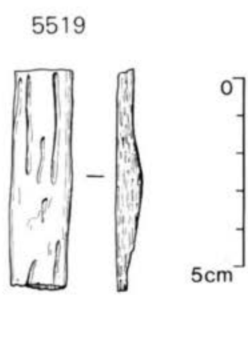


Fig.619 Hornworking debris: horncore offcut 5519. *Scale 1:2*

providing support while the horn was being worked (Ambrosiani 1981, 100). This may explain the shape of *5519*. Seven of the eight horncore offcuts derive from Anglian contexts and indicate that there was some hornworking on the site during that period, although the extent of the activity is unclear.

Comb manufacture at Fishergate

As noted on p.1245, the majority of the antler worked on site was used to make composite combs. Bone was also used, however, and both materials are represented among offcuts from the process of assembling the combs.

An analysis of the use of bone and antler in the composite combs reveals certain preferences for one material as opposed to the other, depending on which part of the comb was being made. Considering both single- and double-sided combs, it can be seen that almost four times as many utilised end plates were of antler rather than bone (11:3), and over four times as many tooth plates (31:7). This accords with MacGregor's claim that antler was far better suited for use as teeth, because of its superior toughness and ability to absorb the shocks and sudden impact loads imposed by use on tangled hair (MacGregor 1985, 29). This pattern is not repeated for the blanks, however, where both materials are used approximately equally, suggesting that bone plates were quite frequently rejected and discarded at an early stage as a result of their inferiority.

By contrast, there is no clear preference in the manufacture of connecting plates, with almost equal numbers of utilised plates of antler and of bone (25:22). Connecting plates suffered considerably less stress than tooth plates, so bone could be used successfully for these parts. Comb makers may have considered bone a suitable alternative for connecting plates when stocks of antler were low or difficult to obtain, or they may have found the materials equally acceptable. Of the ten connecting plate blanks, seven were of bone, the remainder of antler.

Bone and antler were clearly considered important materials by the inhabitants of the site at Fishergate, as they were used to make not only combs but also other tools and artefacts. Bone would have been readily available, as indicated by the quantities of unworked domestic animal bones (*AY* 15/4); it seems likely that the main source of the worked bone would have been the carcasses of animals killed for food. Evidence for the slaughtering and butchering of animals was found in certain areas of the site (*AY* 15/4, 282). In contrast, the antler appears to have been specially supplied. The greater numbers of burrs as opposed to pedicles found at Fishergate (see p.1250) indicate that the majority of the antler coming to the site had been naturally shed and subsequently collected, rather than brought to the site on the carcass. This is corroborated by the very small number of deer bones from the site (*AY* 15/4, 259), and mirrors the evidence from Anglo-Scandinavian sites in York, such as 5 Coppergate (p.150, *AY* 17/3) and 16–22 Coppergate (MacGregor, *AY* 17 in prep.), from elsewhere in Britain, such as Flaxengate, Lincoln, (Mann 1982, 44), from Dublin (Ó Ríordáin 1971, 75), and from sites in Scandinavia, such as Ribe (Ambrosiani 1981, 99) and Lund (Christophersen 1980, 156) (see Figs.611–12).

A number of authors who have studied bone and antler debris from contemporary sites in northern Europe have made suggestions about the nature and scale of comb manufacture on these sites. Christophersen, working on material from Lund (1980), and Ambrosiani, studying the bone and antler from Ribe and Birka (1981), both suggest that the debris recovered from these particular sites indicates occasional visits by itinerant craftsmen, rather than settled or permanent craftsmen or workshops. Ulbricht's analysis of the material from Hedeby led her to suggest that too few combs were being produced to indicate any specialist comb makers at all (Ulbricht 1978, 138). There are pitfalls, however, in attempting to extrapolate the probable scale of manufacture from what has been recovered. An unknown amount of debris is likely to have been deposited outside the area of excavation. At Fishergate, for example, much could have been dumped in the river. In addition, a certain amount will not have survived deposition, and it is probable that only a fraction of the original material will remain, as pointed out by Tweddle in his study of debris from 16–22 Coppergate (1990, 37). The evidence from Fishergate shows that all stages of the comb making process were undertaken on site, but the scale of manufacture and status of the craftsmen involved cannot be ascertained.

Comb manufacturing debris

Blanks (Fig.620)

Both tooth plate and connecting plate blanks have been recovered. These are plates which have been shaped from strips of compact tissue but have been left unfinished.

Tooth plate blanks

There are seventeen tooth plate blanks of which nine are of bone (*5493–501*) and eight of antler (*5672–9*). The blanks are identified by their rectangular shape and section, and their cut sides and ends, most having been discarded because they were damaged or broken. They represent two distinct stages in comb manufacture. The majority failed to reach the stage of inclusion within an assembled comb, as indicated by the lack of rivet holes. These include *5497* and *5673*, which are bevelled at one end in preparation for cutting of the teeth but have broken in half longitudinally. *5494–6*, which are all of bone and of similar sizes, were found together; *5494* is complete, but has bent at one end and is thus unusable, while the other two are incompletely shaped. *5493*, *5674* and *5677* are complete and appear ready for use. *5499*, *5501*, *5676* and *5679* are all tooth plates which reached the next stage in the manufacturing process, having been riveted into combs but then breaking across the rivet holes before any teeth could be cut. *5670* is the wrong shape for a tooth plate blank, but a craftsman seems to have used it to practise tooth cutting as it has two angled cuts at one end.

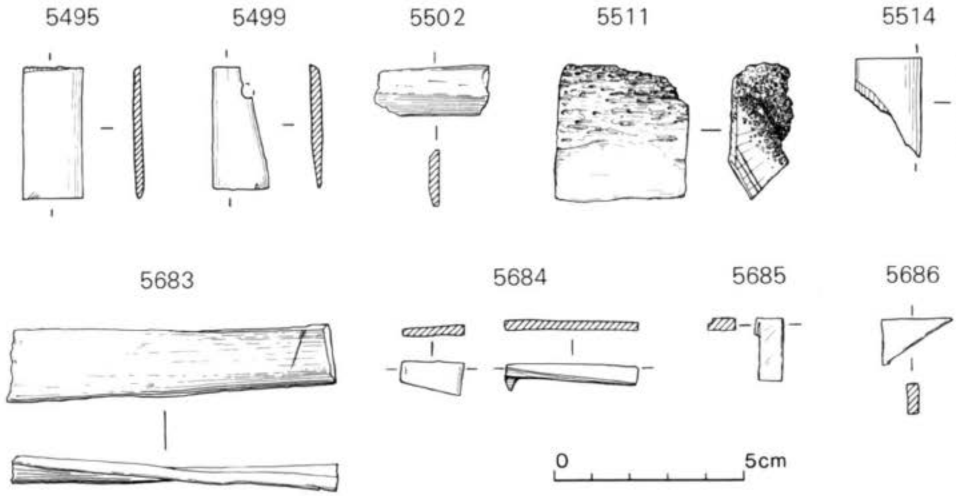


Fig.620 Comb making: bone tooth plate blanks (5495, 5499); connecting plate blanks of bone (5502) and antler (5683); antler tooth plate trimmings (5684–6); miscellaneous bone offcuts (5511, 5514). Scale 1:2

The dimensions of the tooth plate blanks vary, the shortest being 21·8mm (*5672*), the longest 44·7mm (*5678*); the majority fall into the 30–40mm range. These dimensions correspond fairly closely to those of the cores noted on p.1255, confirming that the cores were cut to size for the manufacture of tooth plates.

Connecting plate blanks

There are thirteen connecting plate blank fragments, nine of bone (*5502–10*) and four of antler (*5680–3*), all unfinished, and identified by their subrectangular or trapezoidal shapes and cut edges. Five of the blanks, *5502, 5504, 5506, 5510, 5680*, have been shaped with longitudinal facet cuts along their edges and all have subtrapezoidal sections and broken ends. *5681* and *5683* are subrectangular strips of compact tissue, broken at one end and also warped, which no doubt accounts for their rejection. *5503, 5505, 5507–9* and *5682* are also fragmentary; all except *5505* and *5508* have perforations for rivet holes, *5503* has two, and *5507* is broken across its perforation.

Tooth plate trimmings (Figs.620–1)

There are 288 trimmings from tooth plates, identified as such by their shapes. Most are trapezoidal, e.g. *5684*, a smaller number are rectangular, e.g. *5685*, and a few are triangular,

Table 89 Number of antler and bone tooth plate trimmings by period

Material	Period 3	Period 4	Period 6	Total
Antler	138	60	13	211
Bone	60	15	2	77
Total	198	75	15	288

e.g. *5686*. They were removed from the top edges or backs of the fixed tooth plates, so that the backs were flush with the top edges of the connecting plates. All were cut off with a saw, the majority being sawn from one end and broken off close to the other, producing a characteristic projection at the break point.

As Table 89 shows, approximately 73% of the trimmings are of antler, the remainder of bone. As would be expected, this ratio of antler to bone is similar to the ratio of the materials of the utilised tooth plates (see p.1396).

Miscellaneous offcuts (Figs.620–1)

In addition to the identifiable offcuts, there are miscellaneous offcuts of both antler and bone. The antler offcuts are variously shaped; most appear to be trimmings, though it is not clear from which part of the comb making process they derive. The majority are cut from plates of compact tissue, and it seems likely that they are offcuts from the shaping of the connecting and tooth plate blanks. Again, although it is impossible to identify all the bone offcuts as deriving from comb manufacture, this is what the majority probably represent. The types of bone have not been identified in all cases, but those that have are predominantly rib or split rib, which could be used to make connecting plates and, more rarely, tooth plates. Two of the offcuts (*5515–16*) are the discarded sawn off articular ends of long bones; such offcuts have been found in large numbers at Hamwic (I. Riddler, pers. comm.) and also in smaller quantities at Dorestad (Clason 1980, 246). Many of the bone offcuts were found together with identifiable comb offcuts, including *5512–14*, all recovered from the same Anglian pit fill as the bone tooth plate blanks *5494–6*.

Table 90 Number of miscellaneous offcuts of bone and antler by period

Material	Period 3	Period 4	Period 6	Total
Antler	84	40	18	142
Bone	210	39	27	276
Total	294	79	45	418

Fig.621 Bone working debris (5511), evidence of comb manufacture on the site

Other antler and bone artefacts

A variety of bone and antler items were found on the site apart from combs; most, if not all, are likely to have been manufactured there.

Modified tines (Fig.622)

Several modified and decorated tine tips were recovered, presumably waste from the comb making on site; their functions, if any, are uncertain. *5693* is formed from a split tip, and is perforated just off-centre; it may have been used as a piece on which a craftsman could try out decorative techniques, as it has three ring-and-dot motifs around the perforation, each of which has been scribed to a different depth. Also decorated, but incomplete, *5691* has a highly polished surface, indicating considerable use. Its pointed end and subcircular section are similar to those found on pin-beaters used in weaving (see pp.1269–70); however, such objects need to be smooth to be used successfully, and the incised decoration on *5691* would have interfered with this.

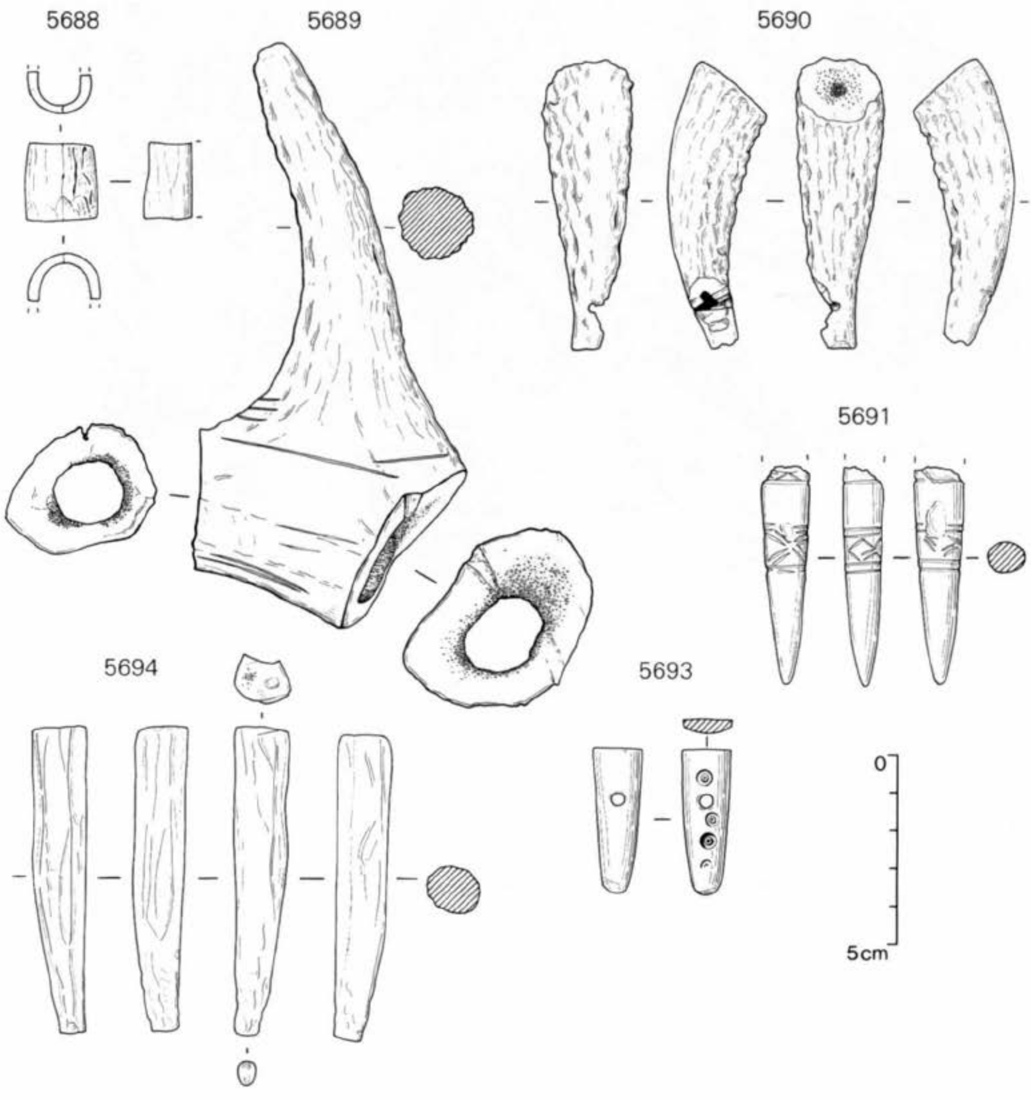


Fig.622 Antler artefacts: modified and decorated tine tips (5688, 5690–1, 5693–4), and tool (5689). Scale 1:2

Shaped but undecorated tips of uncertain use include *5694*, which has been sawn at both ends and has facet cuts on all faces. The polished surface suggests that it has been much used. *5692* has four facet cuts at its tip, producing a point of rectangular section. *5690* has been sawn off at the base and perforated close to the tip, although the perforation has subsequently been cut into from one face. This perforation contains the remains of an iron rivet. *5688* was found in levelling associated with the Period 4b cemetery. It has been made by hollowing out part of an antler tine to form a slightly tapering cylinder, now incomplete. Worked tines have previously been found in York at Parliament Street (*746, 750, AY* 17/4).

Antler tool (Fig.622)

Recovered from build-up levels associated with the Period 4b cemetery, *5689* may be part of an agricultural tool. It has been made from part of the main beam of an antler, cut at both ends and hollowed out to form a socket; one tine on the beam has been left intact, the other removed. If attached to a long handle, the point could have been used as a hoe or weeding tool. Double-pronged tools, made in a similar fashion, have been identified as rakes or hoes (MacGregor 1985, 178–9). A similar single-pronged object, with incised decoration, was found at Clifford Street, York (Waterman 1959, 93, pl.XXII, 3).

Bone toggle (Fig.623)

A bone toggle, *5523*, was found in a Period 4z pit. It has been fashioned from a pig metatarsal, unmodified apart from a drilled central transverse perforation. One surface of the toggle shows signs of polish on both sides of the perforation, probably the result of use. Such objects are commonly found on sites of the Anglo-Scandinavian and early medieval periods. In the past it has been suggested that they may have been bobbins, playthings or dress fasteners, but recent research has indicated that they may have been used as very simple musical instruments, being spun on cords which passed through the perforations (Brown and Lawson 1990, 589). This interpretation is backed up by the traditional use of such bones in this way in Scandinavia, where they were known as 'buzz-bones', the custom surviving into the 20th century in some parts of Norway (ibid.). Examples have been found previously in York at Clifford Street (Waterman 1959, 93, fig.19, 18) and in Anglo-Scandinavian levels at 16–22 Coppergate (MacGregor, *AY* 17 in prep.), and elsewhere in Britain at Flaxengate, Lincoln (Mann 1982, 12–13, fig.9), Thetford (Rogerson and Dallas 1984, 182, fig.199, 100–1), and in late Anglo-Saxon levels at St Peter's Street, Northampton (Oakley and Harman 1979, 313–14, fig.139, 65–9) (see Fig.611).

Socketed bone point (Fig.623)

Found in the Period 3a boundary ditch, *5524* is made from a hollowed-out metatarsal from a cow, with a shaped and slightly worn point at one end. The function of such objects is unknown, although the wear patterns found on other examples, with the tips often

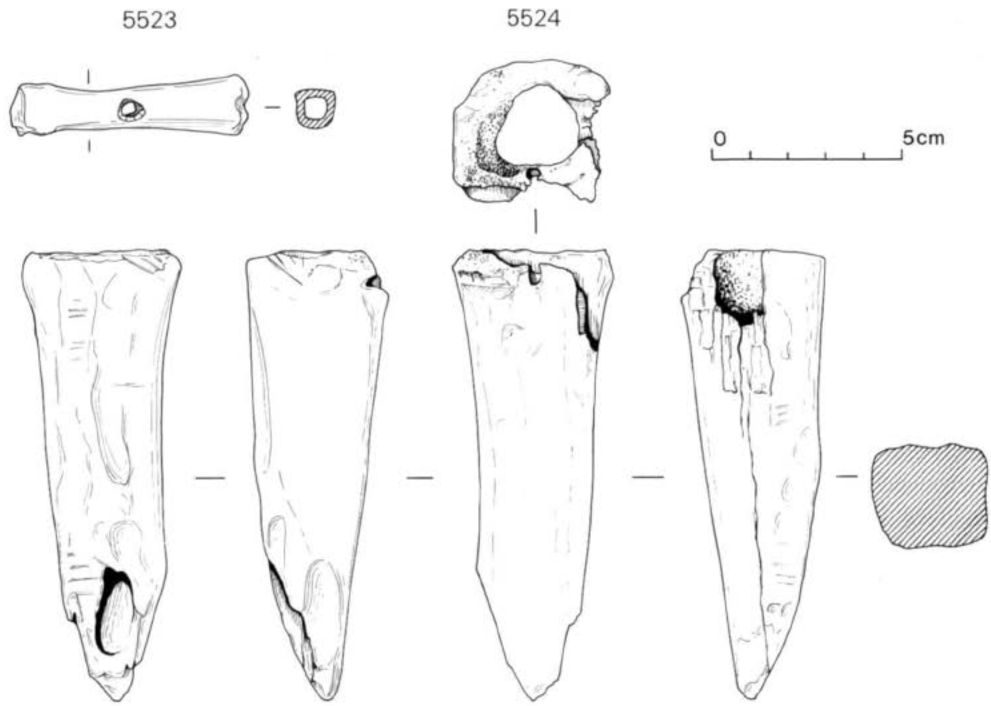


Fig.623 Bone artefacts: toggle (5523) and socketed point (5524). Scale 1:2

polished, indicate that they were used with a thrusting action (pp.96–7, *AY* 17/3). They may have been used as gouges, possibly in leatherworking (Mann 1982, 31), as tallow-holders (Roes 1963, 47), or in net making or mending. Points have been found in some numbers in York, coming from sites on Clifford Street (Waterman 1959, 93, pl.XXII, 4–7), 6–8 Pavement (*518–21*, *AY* 17/3), and 16–22 Coppergate (MacGregor, *AY* 17 in prep.). Similar points have also been recovered from sites in the Frisian terp-mounds (Roes 1963, 47, pl.XLII, 6, 8), and several sites of the Anglo-Scandinavian period in England, including Flaxengate, Lincoln (Mann 1982, 31, fig.32).

Leatherworking (Fig.624)

Evidence of leatherworking is provided by four awls and a fifth possible awl. As with the other craft tools, these come from contexts of both periods. *4948* derives from the Period 3b charcoal-rich deposit, and *4949* was found in the boundary ditch of Period 3c; the other three examples, *4950–2*, come from Period 4 contexts.

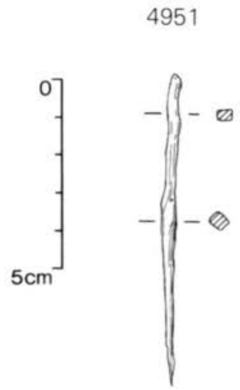


Fig.624 Leatherworking tools: awl 4951. *Scale 1:2*

Awls are tools with two arms of roughly equal length which taper from the centre. All the awls from Fishergate have one arm of diamond-shaped section. These were probably the working arms, the diamond-shaped section at the tip being less likely to tear the leather than any other shape (Attwater 1961, 28). The upper arms are square or rectangular in section, apart from that on *4949*, which is subcircular. The tips of *4949* and *4951* have been broken off, and the end of the upper arm on *4948* has been slightly twisted, showing how it was broken off by the smith. The handles into which the upper arms would have been hafted were probably of wood, as two York examples from 6–8 Pavement illustrate (*422–3, AY* 17/3). A fifth possible awl is *4950*, which has lost its upper end. It has a diamond-shaped section throughout and tapers slightly at each end.

Awls have occasionally been found on other sites of the Anglian period, for example at the 9th century iron smelting site at Ramsbury (Evison 1980, fig.21, 9–13). The excavations at Helgö, particularly those on the 8th century workshop site, also produced many awls of varying lengths (Tomtlund 1978, 21–3, table 8). Later examples have been recovered from late Anglo-Saxon levels at St Peter's Street, Northampton (Goodall et al. 1979, 273, fig.119, 56), and 10th and 11th century deposits at Goltho (Goodall 1987, 178, fig.156, 27–8) (see Figs.611–12). In York, 16–22 Coppergate produced 38 awls from Anglo-Scandinavian deposits (*2706–43, AY* 17/6); of these, eighteen had one or both arms of diamond-shaped section, and they ranged in length from 62 to 164mm (p.552, *AY* 17/6). The Fishergate awls fall into the lower end of this range.

Textile manufacture (Figs.625–7)

Tools used in the preparation and sewing of textiles were found from contexts of both periods. These include iron comb teeth, spindle whorls, loom weight fragments, bone and antler weaving tools, and iron needles and shears.

Comb teeth (Fig.625)

Fifteen spikes, of which four come from Period 3 contexts (*4953–6*) and the remainder from Period 4 (*4957–67*), appear to represent the teeth of comb-like tools used in the preparation of fibres prior to spinning. Similar teeth recovered from Shakenoak Farm were identified as fragments of linen heckles (Brown 1973, 134), used to prepare flax before spinning. Alternatively, they may have been used to straighten and align the fibres of raw wool. Parts of a comb, containing traces of wool fibres, were found at 16–22 Coppergate. The comb consisted of a wooden frame, from which iron teeth projected vertically on one side, held in place by an iron binding; the original wooden handle did not survive (*2273*, *AY* 17/6). Over 180 individual teeth, of circular or square section, were also recovered from that site (*2274–458*, *AY* 17/6).

The teeth from Fishergate are all of square section, apart from *4954* and *4958* which have subcircular sections. They are slender, and taper from the upper end to a pointed tip. They may be distinguished from nail shanks, which they closely resemble, by the head shape (if present), and the shape of the shank. Two different head shapes can be seen. The majority of the heads have been cut at an angle, e.g. *4957*. Other teeth, e.g. *4960* and *4967*, have 'bearded' or stepped heads, created by partially cutting and partially breaking off the spike from its parent strip. This is typical of the many comb teeth recovered from 16–22 Coppergate (p.540, *AY* 17/6). Apart from the head shapes, it is the droop or slight curve to the shank, evident on the majority of the spikes, which is most indicative of comb teeth. This shape is the result of the tension put on the teeth when the comb is drawn through the wool.

Analysis of the lengths of the complete teeth shows a range from 78mm (*4963*) to 105mm (*4967*). Sixty-six percent fall within the range of 85–100mm. These may be compared with the 188 comb teeth which were found at 16–22 Coppergate, of which c.90% of those whose complete length survives measured 75–115mm (p.540, *AY* 17/6). The thicknesses of the Fishergate teeth range from 4·1mm (*4963*) to 6mm (*4962*).

Similar comb teeth have been recovered from early and middle Anglo-Saxon sites elsewhere in Britain, including Shakenoak Farm (Brown 1973), Southampton (Addyman and Hill 1969, fig.24, 3–4), and Maxey, Northants. (Addyman 1964, 60, fig.16, 15–17). In York, in addition to those found at 16–22 Coppergate, teeth have been identified at 6–8 Pavement (*418–21*, *AY* 17/3) and Parliament Street (*722–3*, *AY* 17/4).

Spindle whorls (Fig.625)

Penelope Walton Rogers has studied the spindle whorls (*4424–36*, *5525–6*) and loom weights (*4621–31*) and provides the following report:

There are 15 spindle whorls or fragments of spindle whorls from 46–54 Fishergate: five are from Period 3, three from Period 4, six from Period 6 and one unprovenanced. Two of the whorls, *5525–6*, are made from cattle femur heads (S. O'Connor, pers. comm.).

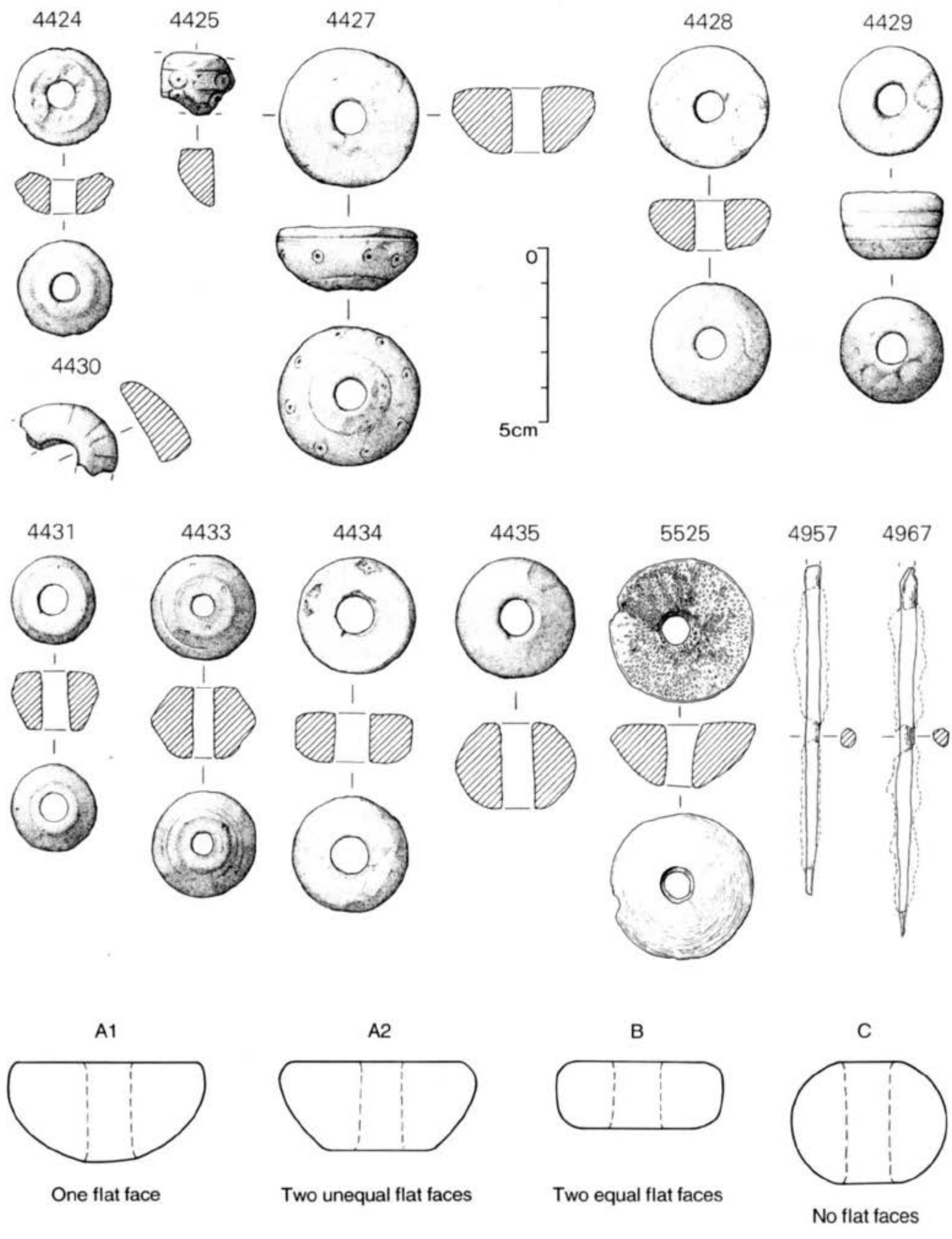


Fig. 625 (a) Textile manufacture, preparation of fibres: stone spindle whorls, form A1 (4424–5, 4427–9), form A1/A2 (4430), form A2 (4431), form B (4433–4), form C (4435); bone spindle whorl (5525); iron comb teeth (4957, 4967). Scale 1:2

(b) Spindle whorl types, based on the number of flat faces

The remainder are of stone: ten are chalk, two argillaceous rocks — mudstone or siltstone — and one of uncertain material, perhaps an igneous rock (G.D. Gaunt, pers. comm.).

The whorls vary in shape. The two bone whorls are chopped from the rounded end of the femur and are therefore approximately hemispherical. The stone whorls consist of four truncated biconical, three cylindrical, one rounded conical, three roughly hemispherical, one spherical and one of uncertain form. In all cases the central hole has been drilled from either end and at least two, *4433–4*, have been lathe-turned. Two whorls, *4425* and *4427*, have been decorated with rows of incised ring-and-dot; *4424* has encircling grooves and *4430* has vertical incised lines; the rest are undecorated.

Whorls such as these are used when spinning with a suspended spindle. They are wedged on to the end of the spindle, in order to weight it and to keep up the momentum while spinning.

Cattle femur heads are by nature a suitable shape for whorls and, as illustrated by *5525–6*, require only trimming with a knife and drilling to be ready for use. Bone whorls of this type were used over a considerable period of time, although at 16–22 Coppergate their numbers reached a peak in the mid 10th to 11th century, while those from Winchester show a similar peak in the 11th century (Woodland 1990, 217, fig.45f). One of the Fishergate bone whorls, *5525* from Period 4z, has been dated to the 11th–12th century and the other, *5526* from Period 6a, was found with residual Anglo-Saxon material.

Stone spindle whorls of the Anglo-Saxon and medieval periods generally prove to be made from local materials (Woodland 1990, 216; Oakley and Hall 1979, 287; Murray 1982, 184). Dr G.D. Gaunt, who identified the lithic origin of the Fishergate whorls, has pointed out that their raw material could be picked up at the foot of outcrops in the region, the chalk from the Yorkshire Wolds and the argillaceous rocks from the eastern flanks of the Pennines or, in the case of *4431*, perhaps from further afield. Dr Gaunt's full report is held on archive and can be obtained, on request, from the York Archaeological Trust.

The lack of standard shapes among stone whorls has foiled previous attempts to construct a type-series (Hedges 1980, 56; Woodland 1990, 218). In York, however, certain types can be shown to predominate at certain periods (Walton Rogers, *AY* 17 in prep.). The large collection of whorls from 16–22 Coppergate could be divided into categories based on the number of flat faces: form A1 has one, form A2 has two, one larger than the other, form B has two of equal size, and form C has none (see Fig.625b). At Coppergate, forms A1 and A2 were most common in the 9th to 10th centuries, continuing in dwindling numbers into later periods; form B predominated from the mid 10th to mid 11th centuries and form C from the Norman period onwards.

If the Fishergate stone whorls are classified in the same way, those from the 8th to 9th centuries (Period 3) prove to be forms A1 and A2. This extends the use of A1 and A2 forms back into the Anglian occupation, before the Scandinavian incursions — a fact recently confirmed by examination of a large number of whorls from late 7th to early 9th century Flixborough, South Humberside, almost all of which are form A1. Two further examples from Fishergate of forms A1/2, *4427* and *4430*, are from Period 4; two more, *4428–9*, are from Period 6. One of the Period 4 examples, however, was found in the make-up of the floor of the church (R. Kemp, pers. comm.), likely to be a secondary deposit, while one at least of the Period 6 examples, *4429*, was accompanied by residual Anglo-Saxon pottery (A.J. Mainman, pers. comm.) and therefore belongs with the 8th/9th century group. Similarly, the two whorls of form B from Period 6 levels must be regarded as suspect in date. Leaving aside the insecurely dated examples, the Fishergate whorls would appear to be typical of the York and Humberside region in the 8th–10th centuries.

Loom weights (Fig.626)

Eleven fragments of baked-clay loom weights were recovered from 46–54 Fishergate, three from Period 3z (*4621–3*), four from Period 4z (*4624–7*), three from Period 6a/b (*4628–30*), and one unstratified (*4631*). None is well preserved but it is obvious that the larger fragments are from circular weights — that is, annular, bun-shaped or intermediate between the two. Their original weight can be estimated only roughly, at about 400–500g.

Weights of this kind were used with the warp-weighted loom, in order to tension the warp. Although this loom remained essentially the same for many centuries, each period had its own distinctive shape of loom weight, the circular form being characteristic of the 5th–10th centuries; many of this type have been recovered from the Anglo-Saxon village at West Stow, Suffolk, for example (West 1985, I, 138). However, the date at which this type of loom ceased to be used has been confused by some contradictory evidence which requires clarification.

The warp-weighted loom, with circular loom weights, is generally assumed to have gone out of use in towns by the end of the 10th century (Pritchard 1984, 66). Certainly, at 16–22 Coppergate, in the centre of York, only one of 33 circular loom weights was as late as the Norman period (Walton Rogers, *AY* 17 in prep.). Late examples of bun-shaped weights are, however, known from 11th–12th century St Cross, Hampshire (Hedges 1978), from 11th–12th century Waltham Abbey, Essex (Huggins and Huggins 1973, 178), and from Rochester, Kent, where a kiln for firing loom weights was abandoned with weights in situ in about AD 1100 (Harrison 1972, 123–4).

St Cross is the site of a rural settlement, the hamlet of Sparkford on the outskirts of Winchester, and there is no evidence from Winchester itself of a warp-weighted loom as late as the 11th century (Keene 1990, 204). The most likely explanation is that city weavers gave up the traditional warp-weighted loom in the late 10th or early 11th century, while in rural or suburban parts it continued into the late 11th century. The abandonment of the Rochester kiln may mark the end of the final phase in the loom's life. Suggestions by historians (e.g. Woodger 1981) that the warp-weighted loom continued on into the 13th century do not appear to be supported by the archaeological evidence, either for the town or the country.

The Fishergate loom weights from Period 3 are those to be expected from an Anglo-Saxon settlement. Those from Period 4 are securely dated to the 11th–12th century and are from the new suburban settlement, outside the old town (see p.1211). The Period 6 loom weights were all retrieved from deposits which contained a high proportion of residual pottery (A.J. Mainman, pers. comm.) and are almost certainly redeposited Anglo-Saxon or Anglo-Norman weights. Altogether, the Fishergate material adds to the evidence that rural and suburban weavers continued to use the warp-weighted loom into the 11th century, some three or four generations after it had become redundant in towns.

Weaving tools (Fig.626)

In addition to the spindle whorls and loom weights, two weaving tools were also found. *5527* is a bone pin-beater or thread-picker, a double-pointed tool used to separate threads

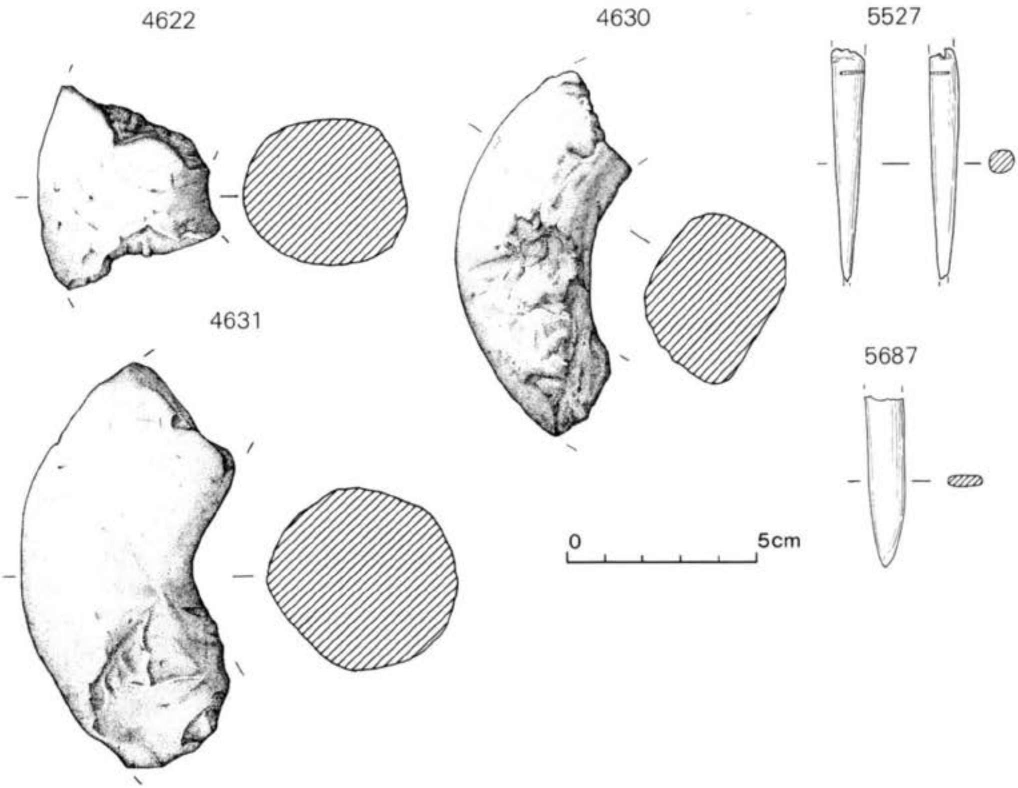


*Fig.626 Textile manufacture, weaving: fired clay loom weights (*4622, 4630–1*); bone pin-beater (*5527*) and antler picker-cum-beater (*5687*). Scale 1:2*

on a warp-weighted loom. Only one point survives, which is polished all over as a result of use. Such tools have been found on early and middle Anglo-Saxon sites, including Shakenoak (Brodribb et al. 1972, 122, fig.62), Cox Lane, Ipswich (West 1963, 276, fig.55, 7–8), and Southampton (Addyman and Hill 1969, 72, fig.29), while a mid to late 10th century context at Winchester also produced an example (Brown 1990a, 229). These objects are rarely found after the 10th century, no doubt reflecting the decline in use of the warp-weighted loom at this time. It seems most likely that *5527* was used during the Anglian period at Fishergate, although it was found residually in dumped soil associated with the construction of the Gilbertine Priory.

5687 was found in an area of levelling associated with the Period 4b burials. It is an antler tool, of a type described by David Brown as a 'picker-cum-beater' (Brown 1990a, 227–8). These tools are double-ended, but only the broad, flat end of *5687* survives; the other, more pointed, end is broken. It is polished on both faces, and the tip is worn, indicating that the tool has been well used. Brown suggests that these picker-cum-beaters would have been suitable for tapestry and other patterned cloth weaving, and would have been more appropriate to weaving on a two-beam, rather than a warp-weighted, loom. The two-beam loom may have been in use in England by the 9th century; if so, it is certainly possible that the Fishergate picker-cum-beater, which comes from an 11th century deposit, was used with this type of loom. Similar tools have been found previously in York (Waterman 1959, 85, pl.XVI, 10–11), and on many other late Anglo-Saxon sites, including Goltho (MacGregor 1987, 191, figs.161–2), Flaxengate, Lincoln (Mann 1982, 25, fig.24, 209–13), Winchester (Brown 1990a, 227–8), and Thetford, where many were decorated at the broad end (Rogerson and Dallas 1984, 170, figs.191–3) (see Fig.611).

Needles (Fig.627)

Twelve iron needles and needle fragments have been recovered from the site, six from Period 3 contexts (*4968–73*) and six from Period 4 deposits (*4974–9*). Apart from *4968* which has a shank of subsquare section, the shanks are of circular or subcircular section. The shanks of three needles show signs of having been hammered into shape (*4973–4* and *4979*).

Studies of the needles from 16–22 Coppergate revealed that two different methods were used to shape the head and eye (pp.544–5, *AY* 17/6); both can be identified on the Fishergate needles. One method involved flattening the head end of the needle and punching a hole, or two adjoining holes, to form the eye. At Fishergate this method was used on *4969*, *4971* and *4978*, producing subcircular eyes. Alternatively, the top of the shank was split into two and the ends rejoined, leaving an oval or lentoid gap which formed the eye. Seven needles from Fishergate appear to have been shaped in this way (*4968, 4970, 4972–4, 4976–7*). On *4977*, the eye is off-centre; the top of the needle has been left cut square, and not rounded off, indicating that this particular example may have been discarded during manufacture. *4973* may also be unfinished. Both methods of manufacture seem to have been in use contemporaneously at Fishergate, as at Coppergate. At Coppergate, however, there was a discernible trend during the Anglo-Scandinavian period towards the use of the punched method (p.547, *AY* 17/6); unfortunately, the sample from Fishergate is too small to produce a meaningful comparison.

Complete lengths can be measured on five of the needles (*4968, 4970, 4972, 4976–7*); these range from 40mm (*4972*) to 67·8mm (*4968*), with four of the five in the range 40–56mm. At Coppergate, 72% measured 40–60mm (p.545, *AY* 17/6). The sizes of the eyes also vary, from c.1·5 to 3mm in length, suggesting the use of different types and thicknesses of thread on the site.

Needles are not common finds on middle or late Anglo-Saxon or Anglo-Scandinavian sites, although the small size of these objects may have led to many being overlooked in excavations where recovery was entirely by hand. Apart from the considerable number

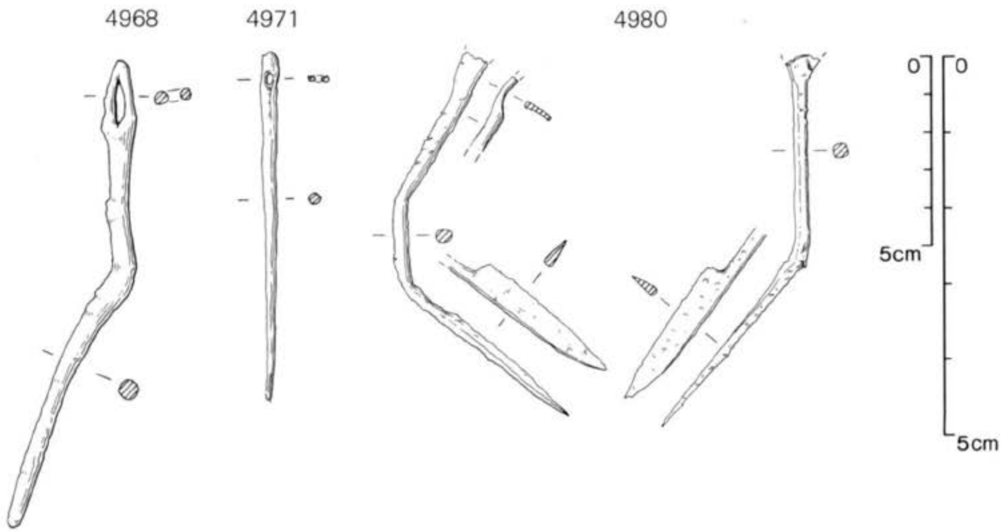


Fig.627 Textile manufacture, finishing: iron needles (4968, 4971) and shears (4980). Scale: needles 1:1, shears 1:2

found at 16–22 Coppergate, York has produced a further example from Parliament Street (*711*, *AY* 17/4). Elsewhere in the country, needles have been recovered from 10th century deposits at Goltho (Goodall 1987, 177, fig.156, 26) and Thetford (I.H. Goodall 1984, 79, fig.119, 32). The cemetery at Birka produced two examples (Arbman 1940, Taf.169, 8–9).

Shears (Fig.627)

A virtually complete pair of shears, *4980*, was recovered from a Period 3z pit. The shears had been broken transversely through the bow. Part of the bow is missing, but it appears to have been slightly spring-looped, and narrowed and thickened at each end into arms of subcircular section. The shoulder at the junction of the arm and blades is concave, and the subtriangular blades taper to the tip. Shears seem to have developed in shape during the Anglo-Saxon period, early examples having a simple inverted U-shaped bow and a plain curve at the shoulder (Lethbridge 1931, 48, fig.22, 8; Evison 1987, fig.38, 75/2). The slight looping, as seen on the Fishergate shears, seems to develop during the middle Anglo-Saxon period; a pair of similar shape was found at Maxey (Addyman 1964, 61, fig.16, 11), and another pair came from Hedeby (Müller-Wille 1973, 30, Abb.5, 1). Other examples of shears from York have more pronounced loops, and are probably later in date (e.g. *710*, *AY*

17/4; *2688–700*, *AY* 17/6; Waterman 1959, 103, fig.25, 6). The small size of the Fishergate shears suggests that they were probably used in sewing and the finishing of cloth, rather than for shearing.

In addition to the textile tools, several fragments of textiles were recovered; these are discussed on pp.1345–6.

Other tools

Knives (Fig.628)

Of all the tools found on the site, those recovered in greatest abundance are the knives. Twenty-nine knives and knife fragments derive from Period 3 contexts, and 26 from Period 4 contexts; two with possibly pre-medieval features come from 6a deposits. All the knives have, or originally had, whittle tangs, which would have been slotted into the knife handle.

Thirty-two of the knives have been assigned to one of the five groups identified by Ottaway in his study of the knives from 16–22 Coppergate (p.559, *AY* 17/6). These groups are based on the form of the back, or upper edge, of the knife, and have been categorised A–E, groups A and C having been further subdivided. Ottaway's method of determining a blade's back form is, firstly, to establish whether it has two straight parts meeting at an angle (form A), a straight rear and curved front part (form B if concave, form C if convex), a wholly curved convex back (form D) or a wholly straight back (form E). Secondly, any knife with a blade back which is wholly straight or has a straight rear part (all forms except D) is placed on a horizontal line between the tip of the blade and the mid-point of the tip of the tang to determine whether the straight part is horizontal or slopes up or down. Reference should be made to *AY* 17/6 for more detailed discussion of these groups.

Back form A

Three knives (*4981–3*) belong to this group, which embraces knives which have blades with 'angle-backs', the straight front and rear parts meeting at an angle. Back form A knives have been divided by Ottaway into three subgroups (pp.561–5, *AY* 17/6). *4981*, which was found in a Period 4z pit, is of the subgroup A1, with a back which is straight and horizontal up to the angled tip. The other two knives belong to subgroup A2, in which the back is straight and upwardly sloping at the rear; *4982* derives from a Period 3c pit, while *4983* was recovered from a 6a soil dump. Ottaway notes that the angle-back style of blade is long-lived, originating in the Roman period (p.563, ibid.); the A2 form does not appear, however, until the late 8th or 9th century. Angle-backs were particularly common from the 9th to 11th centuries, but only occasional post-Conquest examples are known (p.564, ibid.). This suggests that *4983* must have been residual in its 13th century context. In contrast to the single form A knife from Anglian contexts at Fishergate, this type formed almost half of the knives from Hamwic examined by Ottaway (1990), and over half of those

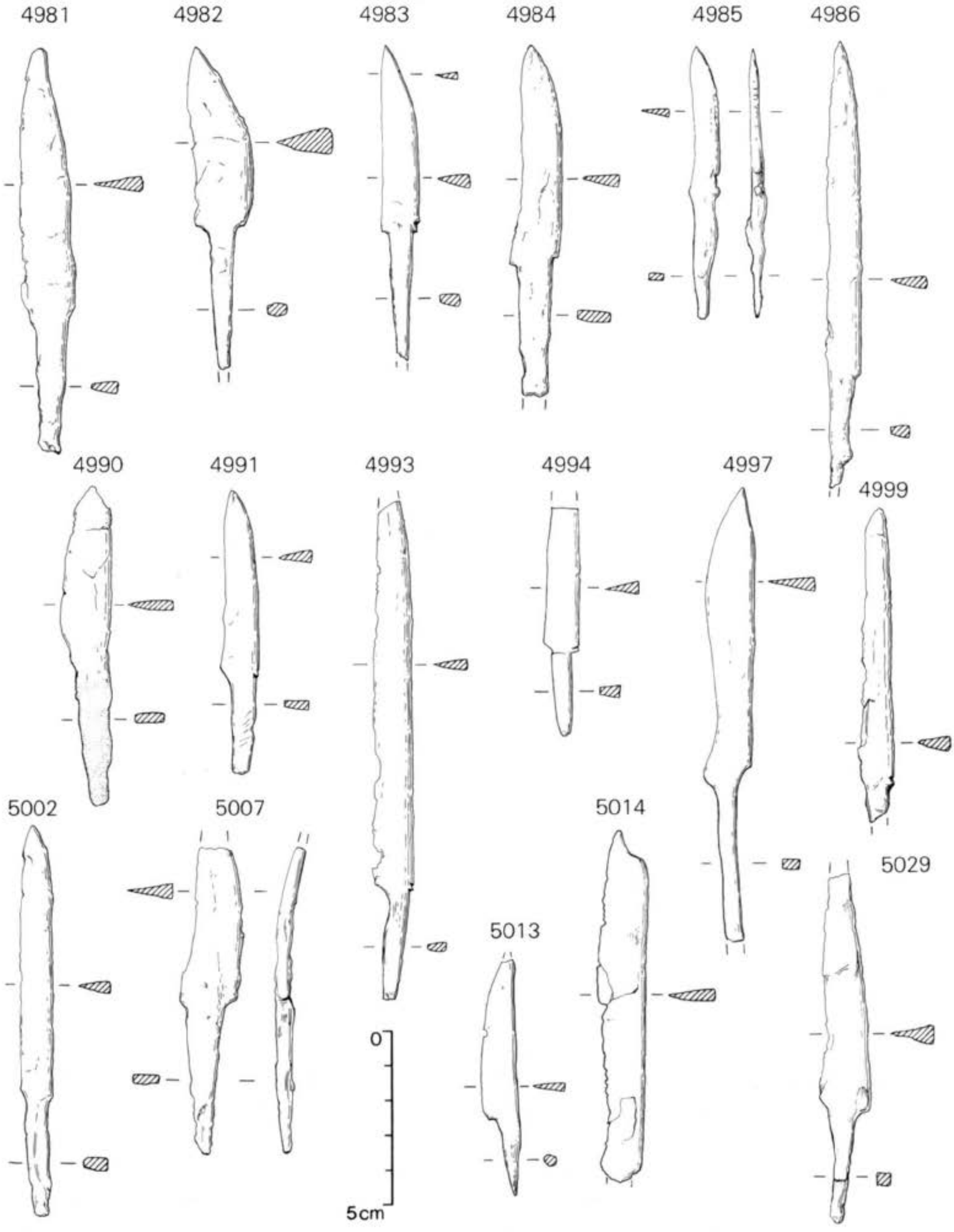


Fig.628 Knives: back forms A1 (4981), *A2* (4982–3), *C1* (4984–6, 4990–1, 4993–4, 4997, 4999), *C2* (5002) *and D* (5007); *other knives* (5013–14), *including one with horn or wood handle remains* (5029). *Scale 1:2*

from the middle Anglo-Saxon site at Thwing, Yorkshire (P.J. Ottaway, pers. comm.). Examples have been recovered from several other middle Saxon sites, including Maxey (Addyman 1964, fig.16, 4), and Little Paxton, Cambridgeshire (Addyman 1969, 86, fig.16, 2–3). Contemporary sites on the Continent which have produced back form A knives include Dorestad (Van Es and Verwers 1980, fig.137, 2). Apart from 16–22 Coppergate, knives of this type have been found on other sites in York including Hungate (Richardson 1959, 82, fig.18, 11), 6–8 Pavement (*427*, *AY* 17/3), and elsewhere in the city (Waterman 1959, fig.7, 1–2).

Back form C

Twenty-three of the identifiable knives from the Fishergate site (72%) belong to this group, which comprises knives with backs which are straight for most of their length, but then curve down close to the tip. Ottaway has further divided this group into three subgroups, C1–C3 (pp.565–70, *AY* 17/6). C1 knives have backs which are straight and horizontal before curving down to the tip; sixteen of the Fishergate knives are of this shape (*4984–99*). Six knives belong to group C2 (*5000–5*) in which the straight backs slope upwards before curving down, and one knife (*5006*) belongs to C3, in which the back slopes downwards. Types C1 and C2 derive from contexts in Periods 3 and 4; one residual example with a notch (*4999*) came from the cemetery soil in Period 6a (see p.1277). The single C3 example comes from a Period 4z context.

The preponderance of this knife type at Fishergate mirrors a similar picture at Hamwic (P.J. Ottaway, pers. comm.), and also at 16–22 Coppergate, where 55% of the identifiable knives were assigned to back form C (p.565, *AY* 17/6). At Coppergate, as at Fishergate, C1 knives were the most common; no C3 knives were found at Hamwic (P.J. Ottaway, pers. comm.). Knives of back form C have been found on sites as early as the 7th century, at the cemetery at Winnall, Hampshire, for example (Meaney and Hawkes 1970, 28), and on all the middle Anglo-Saxon sites which also produced back form A knives (see above). Other back form C knives occur in medieval contexts on Fishergate (Rogers, *AY* 17 in prep.), and the type appears to be long-lived; it roughly corresponds to Goodall's medieval type B (Goodall 1980a, 80–1, fig.10B).

Back form D

Knives in this group are characterised by slightly convex backs which curve downwards from the shoulder to the tip (p.572, *AY* 17/6). There are six knives of this type from Fishergate (*5007–12*) and these occur in both Periods 3 and 4. Only three have complete blades, but all are similar in length, ranging from 44mm (*5010*) to 48·6mm (*5008*). There were 43 knives of this back form at 16–22 Coppergate, representing a similar percentage of the total to those found at Fishergate. The Coppergate examples had a range of blade lengths of 39–87mm (p.572, ibid.); this style obviously embraced a much wider variation in size than is suggested by the small number from Fishergate.

Once again, this type seems to have been long-lived, appearing in the Roman period (Manning 1985, 113, type 10), at 8th century Helgö (Tomtlund 1973, 43, fig.1, 2), and on later Anglo-Saxon sites, such as Goltho (Goodall 1987, 179, fig.157) and Thetford (I.H. Goodall 1984, 84, fig.123). It also occurs in the medieval period (Goodall 1980a, 82, fig.10, type I). Examples have been found in York at Hungate (Richardson 1959, 82, fig.18, 7), and on other sites in the city (Waterman 1959, 73, fig.7, 7–8).

No examples of Ottaway's back forms B or E were recovered from Fishergate.

Other knives

A small knife *5013*, from a Period 3c pit or post-hole, is of a well-known Roman type, with a tang set in line with a concave blade back, and a cutting edge which curves up to the tip (Manning 1985, 116, fig.29, type 23). This seems to be an Iron Age form which extended into the early Roman period, being found in 1st and early 2nd century contexts (ibid.); *5013* is thus probably residual.

5014, which derives from a levelling deposit in Period 4b, is a knife blade with a horizontal back and a short concave curve to the tip. The cutting edge is uneven and worn, but it clearly has the remains of a series of serrations with squared tips towards the tang. A serrated knife with a blade of similar length to *5014* was recovered at 16–22 Coppergate (*2983*, *AY* 17/6), and the Mästermyr hoard also contained a knife blade which was partially serrated (Arwidsson and Berg 1983, 13, pl.29, 40).

Twenty-three knives were too fragmentary to be identified as belonging to any particular group.

Cutting edges

As a result of wear and corrosion, it is sometimes difficult to determine the original form of the cutting edges of the knives. Most, however, were probably horizontal and straight, sometimes curving up towards the tip; many survive in this form. Six of the knives have a cutting edge of an elongated S-shape, probably the result of continual wear and sharpening. This shape is commonly found on knives of the 9th to 11th centuries and may be related to the blade construction, being found most frequently on blades with a steel core covered by an iron sheath (pp.572, 574, *AY* 17/6).

The cutting edges would presumably have been sharpened with hones, several examples of which were recovered from the site (see pp.1313–16).

Notched blades

Seven knives, comprising *4985*, *4991* and *5000* from Period 3 contexts, *4993* and *5027* from Period 4, and *4983* and *4999* from Period 6, exhibit notches which have been cut into the blade back, at or close to the shoulder between the tang and back. The notches are V-shaped in section, apart from that on *4985*, which may be a double notch, having a W-shaped section. *4985* also has a series of transverse grooves on the top of the back.

Notches have been noted previously on a few knives of the middle Anglo-Saxon period, including a number from Hamwic (P.J. Ottaway, pers. comm.), but they seem more common in the later 9th to 10th centuries. One was noted on a late Saxon knife from Portchester, for example (Hinton and Welch 1976, 200, fig.133, 24), and ten blades from 16–22 Coppergate also had these features (pp.580–1, Table 33, *AY* 17/6). They do not, however, appear to be found on medieval knives, so *4983* and *4999* are probably residual in their Period 6 deposits. Notches seem to be most commonly found on back form A knives (P.J. Ottaway, pers. comm.); the majority of the notched knives from Fishergate are of back form C, but this may simply reflect the relatively large number of such knives from the site. The significance of notches is uncertain, but they may have acted as makers' or owners' marks.

The uses of knives

The knives from Fishergate comprise a range of forms and sizes; size is the most useful indicator of function. The shortest blades are c.40mm long; these must have been used in delicate work. Small knives, such as *5004* and the serrated knife *5014*, may have been used in the making and decoration of bone and antler combs. Combs were clearly being manufactured on the site, and show evidence of both knife- and saw-cut decoration (see p.1404). At the other end of the spectrum, *5019* has a fairly broad blade over 125mm long; a knife of this size must have had a very different function, perhaps in hunting or butchery. Sixty-four percent of the knives had blades 45–85mm long, and would have had a wide variety of craft and domestic applications.

Metallography of the knives (Figs.629–32)

By Karen Wiemer

Note: a glossary appears on p.1505.

Introduction

Ten whittle tang knives from Periods 3 and 4, which had a cross-section of metal remaining and which were not required for display, were selected for analysis. All were relatively small, with blade lengths ranging from 42–92mm, widths 7–15mm, and complete lengths with tang 79–129mm. None contained pattern welding. Sections for analysis were taken from the cutting edge of each knife, and also from the back where possible. The methods of analysis are described in detail on pp.1278–80. The knives were classified according to the back form types proposed by Ottaway (p.559, *AY* 17/6). The three manufacturing types, based on the macrostructure of blade cross-sections, are derived from the comprehensive typology presented by Tylecote (Tylecote and Gilmour 1986, 6) and illustrated in Fig.178, p.484, *AY* 17/6.

Type 0: Iron blade without a steel cutting edge

Type 1: Steel core with low-carbon iron sheath; 'sandwich' type

Type 2: Steel cutting edge welded on to an iron back

Type 3: Piled iron; layers of iron and/or steel of varying thickness and carbon content

Type 4: Steel sheath wrapped around an iron core

Type 5: All steel blade

Methods of analysis

The ten knives were sectioned and examined metallographically and compositionally. The method of manufacture, microstructures present, minor elements in the metal, and micro-hardness measurements are given for each knife.

The following types of iron are referred to in the discussion of the artefacts: ferritic iron or pure iron containing less than 0·1% alloy, phosphoric iron or low-carbon iron containing approximately 0·05 to 0·50% phosphorus, and steel, usually hypoeutectoid, containing less than 0·8% carbon as alloy (McDonnell 1989a).

The knives were measured, drawn and X-radiographed at varying intensities and times to determine the extent of remaining metal and to check for obvious or possible weld lines. A low-speed saw was used to cut a wedge-shaped sample from the cutting edge and, if possible, a second section from the knife back. Samples were cut to intersect any possible welds observed in the radiographs. The location of samples removed is noted in the drawing of each knife (Fig.629). Samples were mounted in conducting bakelite or vacuum-mounted in cold curing resin. The surface perpendicular to the knife back or edge was studied in all but one instance. Due to the paucity of metal remaining in the perpendicular face, the section from knife *4989* was mounted to show the angled face. The samples were ground on standard silicon carbide paper, polished to a one or one-quarter micron diamond finish, and then examined under a metallurgical microscope before and after etching in 2% nital (2% nitric acid in alcohol).

Electron microprobe analysis of minor elements (P, S, Mo, Ti, V, Cr, Mn, Co, Ni, Cu, Zn, As) in the metal matrix was carried out using a Cameca SX 50 with a Wavelength Dispersive Link attachment. The detected values are listed in tables following the discussion of each knife. 'Trace' (tr) refers to average concentrations of no more than 0·02%. Few conclusions have been presented specific to these measurements since they, and analyses of the inclusions within the metal matrix, are being collected for an ongoing detailed study of ancient iron. Micro-hardness values were obtained using a Leitz RZD-DO unit with a 100g

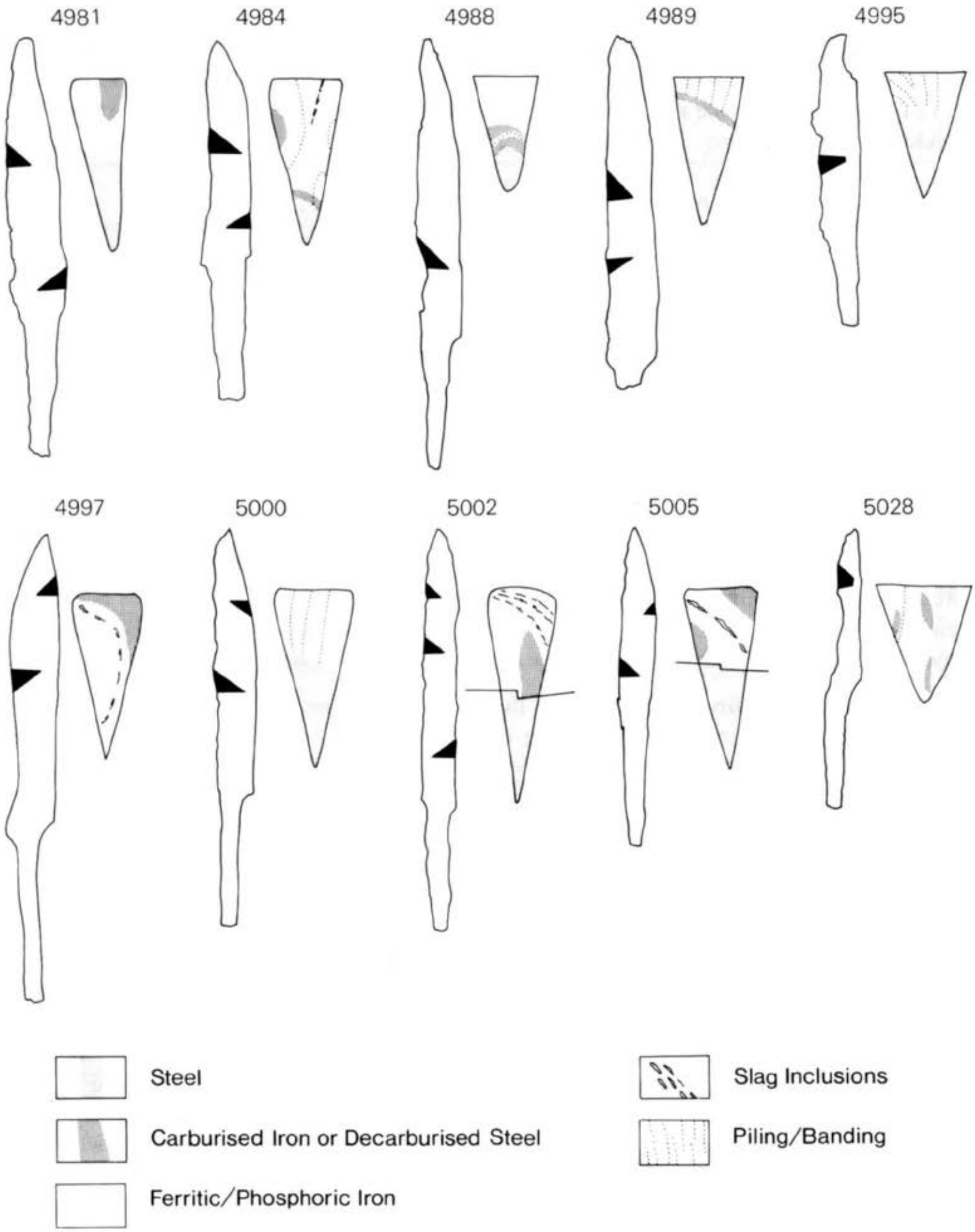


Fig. 629 Location of sections and schematic cross-sections of the metallurgically analysed knives

load and lowering and dwell times of fifteen seconds each. These are given as μHV numbers. Grain size measurements are presented as ASTM values 1–8, where 1 is the largest size and 8 is the smallest. The measurements were determined using a standard ASTM grain size eyepiece at a total magnification of ×100. These values are also listed for each knife.

Results of knife analyses

Knife 4981 (Figs.628–9; Tables 91–2)

This knife was quite well preserved. The tang was relatively wide and joined the blade at an angled shoulder. The cutting edge was straight, except below the shoulder where it seemed to be worn, and curved up to the point of the blade. The knife back was straight and horizontal up to the tip, indicating that *4981* is a back form A1 knife.

A weld was visible in the radiograph, most distinctly where it ended at the base of the tang. The end of the blade had a shallowly scalloped outline and the back had a very fibrous corrosion pattern. A rounded corrosion pattern and a serrated or scalloped outline of the cutting edge are generally characteristic of steel microstructures, while a fibrous pattern is typical of ferritic or phosphoric iron very low in carbon. The point of the blade had mineralised and one section in the back seemed to have corroded preferentially.

A wedge was cut from the edge and the back. There was no obvious weld in either polished section. The metal of the cutting edge was relatively clean and contained mainly elongated dark inclusions and stringers, the largest of which had specks of a white second phase. Large, light, two-phase inclusions and many small spheroidal ones were present near the middle of the section. Some of these inclusions had broken. A column of internal corrosion existed along one side of the edge section and oxide encased some inclusions. Much corrosion also surrounded inclusions in the back. A wide range of sizes and shapes of inclusions was present. Some contained a lighter dendritic phase. The inclusions in the back were oriented vertically on one side and randomly elsewhere.

Three fine, diagonal, white weld lines with three vertical white lines descending from them were visible after etching. The lines were due to arsenic segregation during working of the steel (Tylecote and Thomsen 1973). Some carbon had diffused across the weld into the back. The blade had a homogeneous structure of spheroidised carbides very similar to that of *4995* and was estimated to be a medium-carbon steel (μHV = 298). The edge probably originally consisted of fine martensite but had been over-tempered. The wear on the cutting edge may indicate that the knife underwent this heat treatment some time after manufacture.

The back was made of very low-carbon ferritic iron. A region of finer ferrite grains with spheroidal grain boundary cementite indicated that some carbon had diffused into the back of the knife. The latter structure would have resulted from holding the knife at a

Table 91 Minor element composition of iron and steel in *4981*

		Element (wt %)				
Region		P	S	Ni	As	Mo
Edge:		tr	–	–	tr	–
Weld:		–	–	0.03	0.13	–
Back:	Ferrite in upper right (ASTM 6)	tr	–	–	tr	tr
	Ferrite on left side (ASTM 4)	0.03	tr	tr	–	–

temperature below the eutectoid for some time. Samuels (1980) explains that the temperature must usually be above 600°C in order for significant spheroidisation to occur. The large equiaxed ferrite grains (ASTM 3–4) may have undergone recrystallisation; for pure ferrite this will begin at about 500°C and progress rapidly at 650°C (Rollason 1973, 164). The slightly carburised region had finer grains since cementite particles tend to arrest the migration of grain boundaries and pin them (Samuels 1980, 63).

Hardness measurements of the ferrite grains in the back indicated a low phosphorus content. A local concentration of phosphorus may have been responsible for one slightly higher hardness measurement.

The carbides of the cutting edge were preserved as white particles in dense corrosion along one side of the sample.

Summary

4981 was of type 2 manufacture with a medium-carbon steel edge butt-welded to a good-quality ferritic back. It was the only knife which contained no phosphoric iron. The weld was excellent and almost entirely free of inclusions. The blade had probably first been water-quenched from just above the upper critical temperature to produce fine martensite. The knife had subsequently been heated to below 700°C and held at temperature long

Table 92 Hardness values for regions in *4981*

Region		**Hardness** (μHV)
Cutting edge:	Spheroidised martensite at tip	278
	Spheroidised martensite midway to weld	321
	Spheroidised martensite below weld	306
Back:	Ferrite on right side (ASTM 5–6)	149
	Ferrite in middle (ASTM 3) slight ghosting	131
	Ferrite in middle (ASTM 3)	147
	Ferrite in middle (ASTM 3) smaller grain	134
	Ferrite on left side (ASTM 4) slight ghosting	183

enough for the carbides to precipitate and spheroidise, resulting in a poor cutting edge (μHV = 298). Had this knife been lightly tempered after quenching it would have been of very high quality. The wear of the cutting edge may indicate that a spheroidising heat treatment occurred after the knife had been in service for some time, having initially been competently tempered.

Knife 4984 (Figs.628–9; Tables 93–4)

This was one of the best-preserved knives examined. Its tang, set central to the blade, was wider than the tangs of all the other knives. The cutting edge followed a shallow 'S' curve, usually taken to indicate wear. The point of the blade had broken. *4984* was of back form C1, with a straight back curving down to the point of the blade and a sharply angled shoulder.

X-radiography confirmed that a complete metal cross-section remained for almost the entire length of the knife with the join between the blade and the tang being the most corroded region. The cutting edge had a scalloped corrosion pattern. A weld was visible particularly near the tip of the knife. This ran the length of the blade and curved down to end at the base of the tang. A fibrous corrosion pattern in the back and a somewhat rounded pattern along the weld line were visible. A wedge was cut from the back and the cutting edge.

The weld was obvious in the as-polished condition as a string of light two- and three-phase inclusions arranged in a slightly arched, shallow diagonal crossing the lower quarter of the cutting edge. Some of the inclusions were quite angular. Weld metal survived in the corrosion surrounding the blade at either side of the weld. The metal of the edge section was cleaner than that of the back and contained relatively large, vertically oriented, dark inclusions with sharp ends. Above the weld there were many large and small light inclusions containing a lighter dendritic phase. Some had very irregular shapes. A layer of corrosion surrounded several of the light inclusions. The back of the knife seemed to consist of five or six pieces of metal with the bulk of the inclusions on one side. Throughout the sample there were inclusions which appeared to have been broken or to have small pieces missing.

Etching revealed a white weld line with two descending white lines. The edge was estimated to be a medium-carbon steel and consisted of very fine pearlite colonies (μHV = 382) at the tip with a small proportion of harder tempered martensite or bainite (μHV = 428). There had been some carbon diffusion across the weld, producing a narrow decarburised region below the weld and a zone of pearlite and ferrite above it. A coarse-grained ferritic or phosphoric structure predominated in the back, with a region of fine pearlite and Widmanstätten ferrite (μHV = 304) where carbon had entered by diffusion along one side. There was a watery shimmer or 'ghosting' effect, owing to the presence of phosphorus, in some of the grains in the back. The composition of the edge was consistent

Table 93 Minor element composition of iron and steel in *4984*

		Element (wt %)							
Region		P	S	Ni	Co	Cu	As	Mo	Mn
Edge		tr	0.16	–	–	0.03	0.03	–	–
Weld		tr	0.17	tr	0.08	0.03	0.20	–	–
Back:	lower right (S1)	0.08	0.16	–	0.05	–	–	–	–
	centre (S1)	0.07	0.20	–	tr	–	–	–	–
	upper left (S1)	0.07	0.18	tr	0.03	–	–	tr	–
	right (S2)	0.06	0.22	–	0.03	–	–	–	–
	top centre (S2)	0.10	0.21	–	0.03	–	–	–	–
	lower left (S2)	0.08	0.22	–	0.04	tr	–	0.03	0.06

Note: S1 = edge sample; S2 = back sample

throughout, with white lines arising from arsenic segregation during working of the steel and forge-welding. *4984* had an unusually high sulphur content (average S = 0·2%).

Summary

4984 was a type 2 knife with a medium-carbon steel edge and a phosphoric iron back. It had the highest sulphur content of all the knives analysed. The slight nodularisation of the cementite platelets and the relatively coarse prior austenite grain size revealed by the orientation of the pearlite colonies indicate that the blade had probably been heated into the fully austenitic region (approx. 800–50°C) and quenched at a rate similar to that of a modern oil quench. Tylecote and Rollason report that slack quenching in oil will produce hard-tempered martensite and softer fine nodular pearlite (Tylecote and Gilmour 1986, 17; Rollason 1973, 183). It does not follow, however, that the quenching medium used in antiquity was necessarily oil. The average hardness of the edge (μHV = 383) was adequate and the relatively small amount of weld remaining may indicate that the knife had been much used and resharpened.

Table 94 Hardness values for regions in *4984*

Region		**Hardness** (μHV)
Cutting edge:	Fine pearlite at very tip	388
	Tempered martensite or bainite	428
	Fine nodular pearlite near weld	346
Back:	Phosphoric iron on right (ASTM 3)	142
	Phosphoric iron top centre (ASTM 4)	142
	Fine pearlite and ferrite on left (ASTM <8)	304

Knife 4988 (Fig.629; Tables 95–6)

Knife *4988* was broken at the base of the tang and at the tip of the blade. Corrosion products were flaking off the length of the blade. The back of the knife was cracked and the cutting edge was jagged and uneven. The tang was set below the back and joined the blade at an angled shoulder. A straight back sloping down to the tip identified the knife as of back form C1.

X-radiography revealed that the remaining metallic cutting edge had a rounded, scalloped corrosion pattern and that a fibrous pattern was present in regions of the back. No weld line was apparent.

A single edge section was removed. In the unetched condition a slightly arched string of light multi-phase inclusions indicated a butt-weld. There were large patches of internal corrosion throughout the section. Corrosion was also entering at one side of the weld and could be seen forming around some inclusions within the metal. The metal of the cutting edge was much cleaner than that above the weld and contained mostly single-phase dark inclusions and some lighter two-phase inclusions. These were vertically oriented and present even in the extreme tip. Most of the inclusions in the back were small, dark and angular. There were also a few light, vertically oriented, two-phase stringers.

The weld became clearer on etching, confirming the type 2 manufacture of the knife. The blade consisted of a medium-carbon steel having a fine pearlitic structure at the cutting edge. The steel had decarburised progressively away from the edge with Widmanstätten ferrite and small regions of pearlite present near the weld. The back consisted of a single piece of very coarse-grained (ASTM 1–2) equiaxed phosphoric iron. Regions of smaller grains existed along one side (ASTM 6) and where a small amount of carbon had diffused into the section just above the weld (ASTM 8). At low magnification, some of the grains in the back exhibited the 'ghosting' associated with phosphoric iron. The phosphorus content was also reflected in the hardness.

Midway between the edge and the weld, pro-eutectoid ferrite outlined coarse prior austenite grains. The temperature to which steel has been heated essentially determines the

Table 95 Minor element composition of iron and steel in *4988*

	Element (wt %)					
Region	P	Ni	Co	Mo	Cu	As
Edge	0.07	0.09	0.07	tr	tr	tr
Weld	0.04	0.23	0.06	tr	0.03	0.10
Back	0.31	0.16	0.06	–	–	–

Table 96 Hardness values for regions in *4988*

Region		Hardness (µHV)
Cutting edge:	Pearlite at tip	314
	Pearlite midway to weld	269
	Pearlite and ferrite midway to weld	228
	Ferrite in decarburised region below weld	141
Back:	Phosphoric iron (ASTM 1–2)	179

austenite grain size since austenitic grain growth at a given temperature is initially rapid and then decreases (Rollason 1973; Samuels 1980, 253). Fine austenite grains are produced when a steel is heated just above the temperature at which it is fully austenitic, i.e. its upper critical temperature, with grain size increasing as the temperature is raised.

Summary

4988 was a type 2 knife with a medium-carbon steel edge butt-welded to a phosphoric iron back. A large prior austenite grain size, the presence of Widmanstätten ferrite, and the very large phosphoric iron grain size revealed that this knife had been heated to a high temperature (probably over 850°C) during manufacture. The extensive decarburisation of the steel edge and its mainly pearlitic microstructure further indicated that knife *4988* had been heated well into the austenitic region, held at temperature for some time before having been forge-welded to the back, and then air-cooled at a rate too slow to form a hardened structure. The hardness of the fine pearlite at the tip (µHV = 314) is adequate but far from optimal.

On re-examination of the radiograph of *4988* once the method of manufacture had been established, the weld could be seen at the end of the blade by the sharp demarcation between the mineralised back and the metal edge.

Knife 4989 (Fig.629; Tables 97–8)

This knife had broken at the very tip and at the base of the tang. The tang was central to the blade and ended at an angled shoulder. The cutting edge was straight and may have been worn. The back was straight and curved down to the tip, identifying this knife as of back form C1. A weld line was visible in the radiograph as a distinct band running from the tip to the base of the tang. The edge had a shallow scalloped corrosion pattern and was cracked through to the back near the tip. A fibrous corrosion pattern was visible above the weld line and near the mineralised tang.

The first sample removed from the cutting edge consisted primarily of dense corrosion and a second wedge was cut. This section was mounted to expose the angled face since the perpendicular face did not contain much metal. Unfortunately, the mineralised cross-section at the base of the tang snapped during sampling.

In the unetched condition a weld could clearly be seen as a diagonal string of multi-phase inclusions crossing the top of the section. This confirmed that *4989* was of type 2 manufacture. Although corrosion had formed around some weld inclusions, the weld metal was more corrosion-resistant than that of the back. Both ends of the weld extended into the corrosion surrounding the sample. The back was made up of several regions containing varying amounts of light and dark single- and two-phase inclusions. Some sections had corroded down to the weld. The inclusions in the cutting edge were larger than those in the back and consisted mainly of dark stringers oriented along two vertical bands. Corrosion had formed around inclusions well inside the section and also surrounded some inclusions near the side. There were some smaller light inclusions near the cutting edge.

Etching revealed a transverse yellow-white weld line caused by nickel and arsenic segregation (Tylecote and Thomsen 1973). A narrow decarburised region was visible below the weld with a corresponding zone in the overlying metal into which the carbon had diffused during welding. The remaining pieces of metal in the back were all phosphoric iron. The average phosphorus content of the cross-section was 0·21%. The phosphorus level of the edge was unusually high for a piece of steel. Widmanstätten ferrite was present in the back above the weld and there was some cementite at ferrite grain boundaries in one section of the back.

The edge made up the bulk of the sample and had a fairly even microstructure consisting of fine pearlite with some slightly bainitic regions. The carbon content of the edge was estimated at 0·6–0·7% as there was only a small amount of free ferrite present in an essentially pearlitic structure. Midway between the weld and the tip, a network of pro-eutectoid ferrite grains revealed a fairly coarse prior austenite grain size. The hardest

Table 97 Minor element composition of iron and steel in *4989*

Region		**Element** (wt %) P	Ni	As	Mo	Co	Cu
Edge		0.21	0.11	0.07	–	tr	tr
Weld		0.04	1.61	0.77	tr	0.10	0.14
Back:	left	0.17	0.03	–	tr	–	–
	middle	0.16	0.13	0.09	–	–	tr
	top right	0.22	0.04	–	–	–	–
	right	0.30	0.04	–	–	–	–

Table 98 Hardness values for regions in *4989*

Region		Hardness (µHV)
Cutting edge:	Tempered martensite at tip	551
	Fine pearlite with some tempered carbide	445
Back:	left (ASTM 6–7)	246
	middle (ASTM 3–4)	164
	right (variable grain size)	154

region was the cutting tip of the blade (µHV = 551). The structure at the extreme tip was probably tempered martensite, but soon gave way to a microstructure that consisted mainly of fine pearlite colonies with some tempered carbides (µHV = 441).

Summary

4989 was a type 2 knife made by welding a high-carbon steel edge to a phosphoric iron back. The steel was essentially pearlitic with very little free ferrite and some martensite or bainite at the very edge. The cutting edge was slack-quenched from just above the upper critical temperature to produce hardened structures at the very tip. These were tempered by heat leaving the more slowly cooled knife back which also reduced the core cooling rate and permitted a network of ferrite grains to form before the eutectoid transformation temperature was reached. The hardness of this knife is good (µHV = 551), but would have been much greater had the cooling been rapid enough to produce a fully hardened edge.

Knife 4995 (Figs.629–30; Tables 99–100)

This was the most corroded knife analysed. The tang was central to the blade and was slightly bent. The remaining portion of the back was straight which would indicate that this was a back form C1 knife.

X-radiography revealed that the point of the blade was completely mineralised and that a region of metal cutting edge remained below the shoulder. A weld line was visible along the edge and a fibrous corrosion pattern was evident in the back. A single cutting edge sample was removed.

In the unetched condition a weld line was indicated by an arched string of one- and two-phase inclusions. The metal of the weld extended into the corrosion around the edge section. There was extensive internal corrosion below the weld and thin, dark, elongated, vertically oriented inclusions predominated. Some diagonally oriented inclusions and a few lighter, two-phase inclusions were also present. The metal at the very edge was quite clean. The inclusions above the weld were also vertically oriented. These were light with a lighter

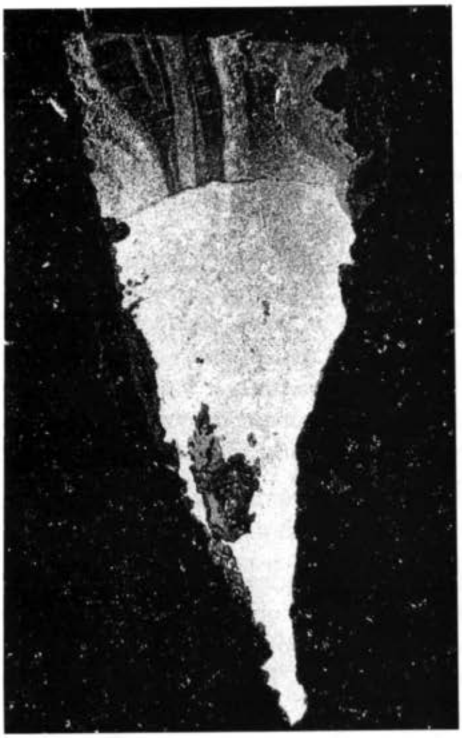


Fig. 630 Knife 4995 showing manufacturing type 2. The edge consists of steel (over-tempered martensite) and contains some dark internal corrosion. Approximately eight layers of ferritic and phosphoric iron make up the back of the knife. The weld appears as a dark line. The weld and several bands in the back are high in arsenic and have all etched in a similar manner. Magnification ×20

globular or dendritic second phase and were present as small stringers and small spheroidal and subround inclusions. Some of these appeared to have been broken.

Etching revealed a white butt-weld line, a homogeneous microstructure of spheroidised carbides containing a few white segregation lines in the edge, and about eight vertical layers of iron in the back. Two bands in the back also appeared yellow-white after etching. The grain boundaries were not clear but the grains seemed relatively coarse (ASTM 3–4). These regions were very high in arsenic (average As = 1·42%) and low in phosphorus, and were slightly harder than pure ferritic iron (average μHV = 164). The other layers consisted of ferritic and phosphoric iron of varying grain sizes. A diagonal band with the highest phosphorus level (P = 0·18%) was very susceptible to deep etching in nital.

There was a limited amount of carbon diffusion across the weld. Arsenic, nickel and cobalt had concentrated in the weld. The carbon content of the edge was approximately 0·6%. The original microstructure of the cutting edge was unclear due to excessive tempering, but it had probably consisted of fine martensite from which cementite had later

Table 99 Minor element composition of iron and steel in *4995*

Region		Element (wt %) P	S	Ni	Co	Cu	As	Mo
Edge		0.04	–	0.07	0.11	–	–	tr
Weld		tr	–	0.21	0.16	tr	0.53	tr
Some bands in back:	right side (ASTM 5)	0.07	–	tr	tr	–	0.03	–
	right (grain size unclear)	0.02	–	0.06	0.04	–	1.42	–
	centre (ASTM 8–9)	tr	–	tr	–	–	0.43	–
	centre (grain size unclear)	tr	tr	0.04	0.03	–	1.42	–
	left diagonal (ASTM 7–8)	0.18	–	0.06	0.03	–	tr	–
	left (ASTM 8)	0.09	–	0.05	tr	–	0.04	–

separated as spheroidised carbides. The low average hardness of the tip (μHV = 261) reflected the spheroidising heat treatment.

Summary

4995 was of type 2 manufacture with a high-carbon, hypoeutectoid cutting edge and a back consisting of distinct layers of phosphoric and ferritic iron. Two of the ferritic bands were very high in arsenic. The blade had probably been water-quenched from above about 750°C to produce a uniform hard martensitic blade. However, the knife had subsequently been held at just below the lower critical temperature (approx. 650 to 700°C) for a period of time long enough to spheroidise the structure and greatly soften the edge. This heat treatment may or may not have been intentional. If the curve of the cutting edge is taken to indicate wear, then it is possible that the knife was over-tempered after it had first been competently heat treated and used for some time.

Table 100 Hardness values for regions in *4995*

Region		Hardness (μHV)
Cutting edge:	Spheroidised martensite at tip	286
	Spheroidised martensite near weld	237
Bands in back from right to left:	Ferritic/phosphoric iron (ASTM 5)	124
	Ferrite (ASTM 7)	173
	Ferrite, high As (grain size unclear)	185
	Ferrite (ASTM 8–9)	163
	Ferrite, high As (grain size unclear)	156
	Phosphoric iron (ASTM 8)	150

Knife 4997 (Figs.628–9, 631; Tables 101–2)

4997 was in excellent condition. The knife had a sloping shoulder and a relatively narrow tang. The cutting edge had a pronounced, elongated 'S' shape perhaps owing to sharpening and wear. The end of the tang had broken. The back was straight and curved down to the tip, characteristic of a back form C1 knife.

X-radiography showed *4997* to be different from the rest of the group sampled. The metal was very clean, with no scalloped or fibrous regions. There were some spheroidal regions above the edge of the blade and it was thought that the knife was made of a single piece of very clean steel.

The metal from both sections was very clean. The edge contained some small gritty inclusions and a few small, light, single- and two-phase inclusions. Near one side there was a vertical band of light stringers containing fine light dendrites. There were small regions of corrosion surrounding a few of the stringers and entering from the side. The line of stringers continued along one side of the back section and arched to follow the back of the knife before ending. These stringers were larger and had cracked during working. There were also some smaller inclusions near the very back of the section.

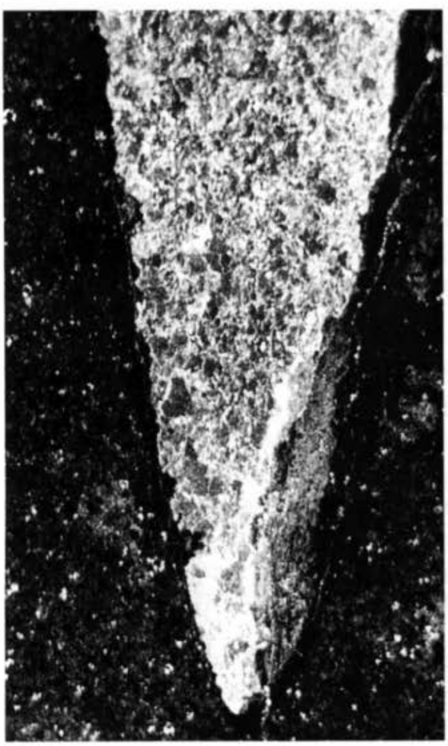


Fig.631 Knife 4997 *showing manufacturing type 0. The edge consists entirely of large, equiaxed ferrite grains; the knife lacks a steel cutting edge. Magnification ×21*

Table 101 Minor element composition of iron and steel in *4997*

Region		Element (wt %) P	Ni	Co	Cu	Mo
Edge:	P.Iron left of slag line (ASTM 3–4)	0.06	0.06	0.03	tr	tr
	P.Iron in tip right of slag line (ASTM 4)	0.08	0.06	0.03	tr	tr
Back:	P.Iron left of slag line (ASTM 3–4)	0.07	0.05	0.03	–	tr
	P.Iron left of slag line (ASTM 7–8)	0.09	0.06	tr	tr	–

Note: P.Iron = Phosphoric Iron

Etching revealed that *4997* consisted entirely of large-grained phosphoric iron with faint ghosting in some large and small grains (ASTM 3–4). The grains of the cutting tip were only slightly finer than those of the rest of the knife (ASTM 4, µHV = 148). Corrosion was entering along grain boundaries in the edge section. The phosphorus content of the metal was low throughout but sufficient to categorise the iron as phosphoric. Uniform minor element levels indicated that the knife had been made out of one piece of iron that had been folded during working.

Some carbon had diffused into a small portion of the back resulting in a region of finer ferrite grains and pearlite. The lamellar cementite in the pearlite had spheroidised indicating that the knife had been heated to below the eutectoid temperature for some time (cf. *4981* and *4995*). The low-carbon ferrite grains also appear to have undergone recrystallisation and grain growth.

Given the lack of corrosion along the existing edge, it seemed unlikely that *4997* had originally been of type 2 manufacture but had lost its steel edge. Some carbon diffusion into the edge would also be expected had it once been welded to steel.

Table 102 Hardness values for regions in *4997*

Region		Hardness (µHV)
Cutting edge:	P.Iron at tip (ASTM 4)	144
	P.Iron back from tip (ASTM 3–4)	152
	P.Iron further back (ASTM 3–4)	113
Back:	Ferrite and pearlite in carburised region	165
	P.Iron on right side (ASTM 2)	139
	P.Iron in centre (ASTM 3) slight ghosting	103
	P.Iron on left side (ASTM 4) slight ghosting	119

Summary

4997 was of type 0 manufacture, consisting entirely of coarse-grained phosphoric iron (ASTM 3–4, μHV = 148). It was the best-preserved knife of the group sampled and was made of the cleanest metal. However, it contained no trace of a hard cutting edge.

Knife 5000 (Fig.629; Tables 103–4)

The blade of *5000* had been bent between the tip and the shoulder. Most of the corrosion was concentrated along the tang. The cutting edge was straight but worn and the extreme tip had been broken. The knife had a sloping shoulder and a tang central to the blade. This was the only knife to be sectioned which had a possible notch. The form of the back was straight, sloping up before curving down to the tip, identifying *5000* as of back form C2.

A possible weld line was faintly visible in the radiograph. A steel corrosion pattern could be seen near the point of the blade but not near the shoulder where the edge seemed most worn. The back had a fibrous corrosion pattern characteristic of wrought iron.

The back and cutting edge were sampled. The sections were mounted in bakelite but did not set properly and so were broken out to be remounted in low-viscosity cold curing resin. Unfortunately, the back section was lost during this process and a second section had to be removed. The knife broke during sampling where a completely mineralised cross-section resulted after the first wedge was cut from the back.

The method of manufacture was not obvious in the unetched condition. The edge section contained large patches of internal corrosion and a wide range of sizes and types of vertically oriented inclusions. These were not arranged in bands and consisted of groups of small spheroidal inclusions, larger dark inclusions with sharp ends which, in some cases, contained a fine white second phase, and some light inclusions with a globular white second phase. There were also many small light inclusions near the very edge.

The back section contained two vertical bands of many small light inclusions separated by two bands of cleaner metal with larger light inclusions. Many of these seemed to have been broken and almost all, regardless of size, contained a globular second phase. Upon etching, this section could be seen to consist almost entirely of ferritic or phosphoric iron roughly divided into four alternating bands of coarse and fine grains corresponding to the bands of high- and low-inclusion concentration. The inclusions were often located at or along grain boundaries. Some of the grains in the larger-grained bands (ASTM 3–4) had a slight watery ghosting shimmer, and, as was indicated by micro-hardness measurements and confirmed by microprobe analysis, the back consisted of layers of coarse-grained phosphoric iron (average P = 0·08%) and ferritic iron of a finer grain size.

Etching revealed that *5000* was of type 2 manufacture with a white transverse weld line located in an upper corner of the edge section. The weld region contained a few small

Table 103 Minor element composition of iron and steel in *5000*

Region		**Element** (wt %) P	S	Ni	Co	Cu	As	Mo
Edge		tr	–	tr	–	0.05	tr	tr
Weld		–	tr	0.09	tr	0.04	0.59	–
Back:	left side (ASTM 3)	0.07	tr	–	–	–	0.06	–
	left (ASTM 6)	–	tr	tr	–	0.04	0.03	tr
	middle (ASTM 3–4)	0.08	tr	–	tr	0.03	0.08	tr
	right (ASTM 7)	0.04	–	–	–	0.03	tr	tr

isolated inclusions. Carbon had diffused across the weld producing some fine pearlite and Widmanstätten ferrite above the weld and a slightly decarburised region containing some very spiky, feathery Widmanstätten ferrite below the weld. There were two vertical white lines in the pearlitic microstructure of the edge which did not meet the weld. These were probably due to concentration of minor elements during working of the steel under oxidising conditions (Tylecote and Thomsen 1973).

The prior austenite grain size was revealed below the weld by a network of pro-eutectoid ferrite surrounding colonies of fine pearlite. The amount of ferrite decreased and the prior austenite grain size increased nearer the edge of the blade. The microstructure consisted of fine nodular pearlite colonies (µHV = 394) surrounding tempered lower-carbon martensite or bainite (µHV = 479). There were approximately equal amounts of both phases in the edge, corresponding to a carbon content of about 0·6%. The fine nodular pearlite was a good example of the structure referred to by some as 'troostite'; this exists in steel that has been oil-quenched from above the austenising temperature, in this case approximately 750°C (Tylecote and Gilmour 1986, 17; Rollason 1973, 183, 185). Pearlite colonies form

Table 104 Hardness values for regions in *5000*

Region		**Hardness** (µHV)
Cutting edge:	Fine nodular pearlite at tip	396
	Tempered martensite/bainite	479
	Fine nodular pearlite toward weld	392
Back:	Ferrite band on left side (ASTM 3)	138
	Ferrite band on left (ASTM 6)	130
	Ferrite band in centre (ASTM 3–4)	136
	Ferrite band on right (ASTM 7)	177

first, followed by the transformation of austenite into martensite or bainite, depending on the cooling rate, and all the structures are autotempered by heat leaving the knife back.

Summary

5000 is of type 2 manufacture with a slack-quenched, high-carbon, hypoeutectoid cutting edge of reasonable hardness (μHV = 428) and a back consisting of four alternating layers of ferritic and phosphoric iron. The weld was only faintly visible in the radiograph, perhaps because it contained so few inclusions. The nodular and tempered structures of the cutting edge were sufficiently ductile to allow the blade to bend without cracking when the knife was deformed in antiquity.

Knife 5002 (Figs.628–9; Tables 105–6)

This knife had corroded extensively particularly at the blade-tang interface. The cutting edge was straight, curving up to the point, and may have been slightly worn below the shoulder. *5002* was a back form C2 knife with a long straight back which inclined slightly before curving down to the tip of the blade.

A possible weld line was visible in the radiograph, most clearly near the base of the tang. A thin cross-section of metal remained. A fibrous corrosion pattern was apparent in parts of the back. The cutting edge had a slightly serrated profile particularly near the tip. There were rounded darker regions in the back.

Initially two samples were removed. A second edge section was cut since the first wedge was small and failed to intersect a weld.

The two unetched edge sections were very clean and neither gave an indication of how the knife had been made. The edge section removed first contained small dark spheroidal and subround inclusions and some larger inclusions, a few of which were two-phased. Corrosion had entered the second edge section along inclusions near the surface. Most of the inclusions present were relatively large, medium to dark, some containing a fine light phase. The back section was also quite clean with most inclusions arranged in three parallel arches which curved along the back and down the side of the sample. These consisted of small stringers and spheroidal inclusions with a globular second phase and a few darker inclusions. Corrosion surrounded some of these inclusions, in particular where the three lines of inclusions met the back of the knife. Light and dark spheroidal inclusions were well dispersed throughout the rest of the section.

Etching did not reveal any welds. The edge sections consisted of tempered martensite (average μHV = 630, 641) while the back was made of very low-carbon ferrite with a slightly carburised region at the bottom of the sample. Based on the radiographic evidence, the slight carbon diffusion into the back, and the difference in the composition of the iron in the edge and the back, it was concluded that *5002* was of type 2 manufacture.

Table 105 Minor element composition of iron and steel in *5002*

		Element (wt %)					
Region		P	S	Ni	Co	As	Mo
Edge:	first sample	tr	–	tr	–	0.04	tr
	second sample	tr	–	tr	–	0.04	tr
Back:	left side (ASTM 4–5)	0.05	tr	–	tr	tr	–
	top (ASTM 4–5)	0.05	–	–	0.04	–	–
	middle (ASTM 4–5)	0.04	tr	–	tr	–	–
	right side (ASTM 7)	0.04	–	–	0.03	–	–

Flecks of a white pro-eutectoid phase outlined the prior austenite grains in the core of the edge section. Some of the particles were retained in the corrosion at the side of the sample which indicated that the pro-eutectoid phase was corrosion-resistant carbide rather than ferrite. The steel edge was slightly hypereutectoid and was estimated to contain 1·0% carbon.

The minor element composition of the back was constant throughout, indicating that it had been forged from a single piece of ferritic/phosphoric iron. The phosphorus content was just at the border between ferritic and phosphoric iron. The back consisted almost entirely of coarse-grained ferritic/phosphoric iron (ASTM 4–5) with hardness measurements reflecting the low phosphorus levels (μHV = 113–47). Spheroidised cementite was located at ferrite grain boundaries and there was some quench ageing visible within the grains of the carburised region.

Table 106 Hardness values for regions in *5002*

Region		**Hardness** (μHV)
Edge:	(first sample) Tempered martensite	630
	(second sample) Tempered martensite	651
	(from tip to back of section)	615
		653
		620
		588
		488
Back:	Ferrite and pearlite (ASTM 7) lower right	162
	Ferritic/phosphoric iron on left (ASTM 4)	147
	Ferritic/phosphoric on left (ASTM 4) slight ghosting	146
	Ferritic/phosphoric iron on left (ASTM 5)	120

Summary

5002 was a high-quality type 2 knife with a slightly hypereutectoid steel edge welded to a ferritic/phosphoric back. The edge had been rapidly quenched from above the upper critical temperature (approx. 825°C) and then lightly tempered or autotempered. This was a well-made knife that had been competently heat treated to produce a very good cutting edge (μHV = 636).

Knife 5005 (Fig.629; Tables 107–8)

Knife *5005* was bent at the shoulder and cracked along the edge at the base of the tang. The cutting edge was straight but slightly irregular near the tip of the blade. The tang met the back at a slightly sloping shoulder. The back was straight, rising from the tang before curving down to the tip; this classified *5005* as a back form C2 knife.

The radiograph showed clearly that the crack in the blade followed the curve of a weld. Most of the width of the blade consisted of the welded edge. The back contained a fibrous corrosion pattern while the edge had a clearly scalloped steely outline.

A sample was removed from the cutting edge and the back. The polished edge section contained an abundance of fine, dark, vertically oriented stringers and irregular inclusions. Many of the inclusions had broken. There were a few light specks in some of the larger inclusions. A layer of corrosion surrounded some of the inclusions. There was noticeably cleaner metal at the tip and to one side at the back of the section. The back section was much dirtier with a large mass of internal corrosion and two or three very large stringers dividing the sample diagonally. These stringers had regions of corrosion surrounding them and consisted of a light matrix containing two darker phases. There were also many small, dark, spheroidal, subround and very irregular inclusions containing a light globular phase and fine dendrites of another phase. Most of these inclusions followed the orientation of the large stringers.

Table 107 Minor element composition of iron and steel in *5005*

		Element (wt %)				
Region		P	Ni	Co	As	Mo
Edge		tr	0.05	–	0.10	tr
Back:	upper right (ASTM 8)	0.06	0.08	–	0.04	–
	middle (ASTM 5–6)	0.25	0.06	–	tr	–
	lower left (ASTM 7)	0.10	0.08	tr	–	–
	etching region	0.46	0.09	tr	0.06	–

Table 108 Hardness values for regions in *5005*

Region		**Hardness** (μHV)
Edge:	Tempered martensite in retained austenite at tip	665
		725
	Tempered martensite in retained austenite behind tip	707
	Tempered martensite in retained austenite at back of section	755
Back:	Pearlite and Widmanstätten ferrite (ASTM 7) lower left	203
	Ferrite below slag line (ASTM 5)	122
	Ferrite above slag line (ASTM 6)	152
	Pearlite and ferrite (ASTM 8) upper right	192

Upon etching it was evident that neither wedge had intersected a weld. However, on the basis of the radiographic evidence and the two completely different types of iron of which the back and edge were made, *5005* was ascribed type 2 manufacture.

The microstructure of the cutting edge was very homogeneous and consisted of coarse tempered martensite in a matrix of retained austenite (Rollason 1973, 184). The carbon content of the martensite and the amount in solution in the retained austenite cannot be estimated; however, the composition of the edge must be in the hypereutectoid range, probably 0·8 to 1·1% carbon, since retained austenite cannot be detected in steels of less than eutectoid composition (0·8% carbon) by optical microscopy (Samuels 1980, 310). The edge hardness (μHV = 713) agrees with this estimate and is within the range of values expected for such a microstructure (Rollason 1973, 185, fig.128). A very rapid quench from above the upper critical temperature (approx. 800 to 900°C), followed by a light temper, would produce this microstructure.

The back seemed to be made of a single piece of phosphoric iron, folded over and forged once, thereby incorporating much slag. Carbon had diffused into portions of the back at a temperature high enough for the phosphorus to concentrate in the metal surrounding the slag inclusions (average P = 0·3%), resulting in lower phosphorus (average P = 0·08%) and higher carbon regions at the sides of the back section (Stead 1918, 192). It is possible that *5005* was heated to a fully austenitised state in a reducing atmosphere. The region with the highest phosphorus level (P = 0·25%) had the largest grain size (ASTM 5–6). The finer-grained (ASTM 7–8), higher carbon, regions consisted of plain and Widmanstätten ferrite plus a tempered low-carbon structure (average μHV = 197). Several regions particularly high in phosphorus (P = 0·46%) were susceptible to deep etching in nital.

Summary

5005 had the best edge of all the knives sampled (μHV = 713). It was a type 2 knife made by forge-welding a high-carbon steel edge to a phosphoric iron back. This was probably heated to above 850°C, and the blade was rapidly quenched, producing martensite in a retained austenite matrix. The martensite had been slightly tempered as the back of the knife cooled. The soft phosphoric back of the knife had bent while the harder, more brittle edge had cracked along the weld when the knife was bent in antiquity. The poorly made phosphoric back was in marked contrast to the excellent cutting edge.

Knife 5028 (Figs.629, 632; Tables 109–10)

5028 was quite corroded and was the most heavily worn knife of the group sampled. The cutting edge rose to meet a straight level back. The radiograph showed relatively clean metal with a fibrous corrosion pattern only visible near the tang. The cutting edge was very irregular with a serrated but not clearly scalloped profile; it was especially worn below the shoulder. A single wedge was removed from the cutting edge. The mineralised end of the tang broke during sampling.

The polished section contained five distinct bands of vertically oriented inclusions which indicated that *5028* was probably of type 1 manufacture. The region along the right side had

Fig.632 Knife 5028 *showing manufacturing type 1. A tempered martensite steel layer (light band, second from right on sample cross-section) is flanked by three layers of phosphoric iron. Much carbon has diffused unevenly into the iron from the steel, resulting in lighter and darker etching regions in the iron. Preferential wear of the right sheath has displaced the steel layer from the centre of the edge. Magnification ×22*

Table 109 Minor element composition of iron and steel in *5028*

	Element (wt %)				
Region	P	Ni	Co	Cu	As
Right side band	0.35	–	tr	–	–
Tempered martensite band	tr	0.03	tr	0.06	0.03
Central band	0.25	0.04	0.03	0.35	0.05
Left flank	0.48	tr	tr	0.09	0.03
White segregation line	0.03	0.46	0.20	1.87	0.68

many small, spheroidal, light inclusions and a few two-phase stringers. The next band was made of cleaner metal with long, thin, dark stringers along the centre. Some inclusions in both of these bands had been broken. Those of the middle band were small, light, single- and two-phase stringers and spheroidal inclusions. This band had fewer broken inclusions than the first two. The next band consisted of cleaner metal with a few large medium to dark stringers. The left side of the sample contained many small spheroidal and elongated light to medium inclusions.

Etching revealed four distinct metal layers and confirmed that *5028* was of type 1 manufacture. A band of tempered martensite (μHV = 407) was outlined by white weld lines on each side which extended into the surrounding corrosion. This steel layer was probably the intended cutting edge, but improper sharpening had exposed the adjacent soft

Table 110 Hardness values for regions in *5028*

Region		**Hardness** (μHV)
Ferrite and pearlite in right flank (ASTM 8)		220
Tempered martensite band: tip		384
		388
	midway to back of section	435
	back of section	421
Cutting edge:	Low-carbon iron tip	224
	Region of carbon diffusion across weld to martensite	519
Bainitic region in middle band		446
		483
Widmanstätten ferrite and fine pearlite next to bainitic region		313
Widmanstätten ferrite		222
Left flank:	Bainitic region	303
	Low-carbon region	214

phosphoric iron layer at the cutting tip (μHV = 224). Some of the structures in the carbon diffusion zone between the steel and phosphoric iron bands were much harder than the tempered martensite (μHV = 519, 483). There was a small amount of pro-eutectoid ferrite present in the tempered martensite band outlining the prior austenite grains. This band was estimated to contain approximately 0·6% carbon.

The three remaining layers were made of high-phosphorus iron. Carbon had diffused unevenly into these bands and they contained a wide variety of structures ranging from Widmanstätten ferrite, pearlite and low-carbon phosphoric iron, to tempered low-carbon bainites and martensite. The middle band adjacent to the tempered martensite layer had a particularly variable microstructure.

5028 was made by forge-welding a piece of high-carbon steel to several pieces of phosphoric iron. The size of the prior austenite grains, the extensive and irregular diffusion of carbon into the phosphoric iron, and the presence of Widmanstätten ferrite all indicated that the knife had been raised to a temperature above the upper critical temperature of the steel (approx. 750 to 800°C), quenched in water, and tempered. Above 800°C, phosphorus has some mobility in iron and diffuses out of the areas being entered by carbon to concentrate in ferritic regions. At lower temperatures carbon may continue to diffuse easily into low-phosphorus iron while phosphorus remains essentially immobile; this would produce a very non-homogeneous microstructure (Stead 1918, 192).

Summary

5028 was a well-made type 1 knife which had been incorrectly sharpened, displacing a high-carbon steel layer and exposing a band of phosphoric iron at the cutting edge. The steel layer was joined to three layers of phosphoric iron by two very clean welds. The knife had been water-quenched from a temperature in the fully austenitic region, probably above 800°C, to produce a well-tempered martensitic edge (μHV = 407). The wear of the edge and the shape of the blade were a result of the sandwich construction of the knife.

Discussion of results

Ten knives from 46–54 Fishergate were examined metallographically, of which five came from Period 3 (Anglian) contexts and five from Period 4 (11th and 12th century) contexts (Table 111).

The five knives from Period 3 were all of manufacturing type 2. As a complement to the metallographic data, the X-radiographs of knives which had not been sampled were assessed for evidence of welds. The results of this survey are summarised in Table 112. It was possible to obtain information from a further 20 knives, of which eight had obvious welds and twelve had possible welds. Although it is not possible to be certain that a knife has a welded-on cutting edge until a cross-section has been analysed, the X-radiographs and metallography indicate that in the Anglian period the welding-on of a steel edge to a ferritic or phosphoric iron back was the predominant method of manufacturing the knives found at 46–54 Fishergate.

Table 111 Summary of data and results

Knife	Dimensions (mm)			Typology		Hardness (μHV)		Microstructure	
	Blade length	Back length	Blade width	Back form	Manuf.	Max.	C.edge (av.)	C.edge	Back/ sides
4981 (4z)	116	73	15	A1	2	321*	298	SM	Ferrite
4984 (3b)	100	63	14	C1	2	433*	383	FNP, TM/TB	P.Iron
4988 (3z)	120	85	13–15	C1	2	329	314	FP	P.Iron
4989 (3z)	98	92	14	C1	2	551	469	Pearlite, TM	P.Iron
4995 (4z)	90	64	10–11	C1	2	298	261	SM	Ferrite, P.Iron
4997 (4z)	129	85	10–13	C1	0	154	148	P.Iron	P.Iron
5000 (3c)	115	72	12	C2	2	490	428	FNP, TM	Ferrite, P.Iron
5002 (3z)	112	75	9	C2	2	657	630	TM	P/Ferritic Iron
			Second edge section:			653	641		
5005 (4z)	88	53	9	C2	2	755**	713	TM, RA	P.Iron
5028 (4b)	79	42	5–8	–	1	519	407	TM	P.Iron

Notes:
Dimensions are approximate
Maximum hardness measurement was at or near tip of cutting edge unless otherwise indicated (* = midway to weld; ** = back of edge section)
C.edge = Cutting edge, TM = Tempered Martensite, SM = Spheroidised Martensite, TB = Tempered Bainite, FP = Fine Pearlite, FNP = Fine Nodular Pearlite, RA = Retained Austenite, P.Iron = Phosphoric Iron

Of the five knives examined from Period 4, three were of manufacturing type 2, one of type 0 and one of type 1. The X-radiographs of the other 21 knives of this period revealed three with obvious welds and fourteen with possible welds.

The metals used were ferritic iron, phosphoric iron, and steel. Most of the knife backs were made of layers of metal, but the bands of iron were relatively wide rather than finely piled. Only one knife back (*4981*) consisted entirely of ferritic iron. Two knives (*4995* and *5000*) contained alternating layers of ferritic and phosphoric iron while the remainder had backs made entirely of phosphoric iron. The phosphorus levels fell roughly into two groups: between 0·05 and 0·08%, and above 0·15%. The highest phosphorus level measured was 0·5% in the sheath of the type 1 knife (*5028*) and the back of a type 2 knife (*5005*). Most of the iron belonged to the lower phosphorus group. The micro-hardness values of this metal were higher than those of pure ferritic iron and reflected varying low phosphorus levels in the metal analysed. Rigid discrimination between ferritic and phosphoric iron is difficult and probably not advisable when the phosphorus content just reaches the level defined for phosphoric iron (P = 0·05%). The 'ghosting' often observed in phosphoric iron was limited to a watery shimmer in individual grains. There was no consistent difference in hardness between grains with and without this effect.

Table 112 Information from radiographs of Fishergate knives not otherwise analysed

Knife	Weld	Possible weld	No weld	Mineralised/ fragment	Comment
Period 3					
4982				X	
4985		X			
4986	X				
4987					not seen
4990	X				
4991	X				
5001	X				
5007				X	
5008				X	
5009		X			
5010					not clear
5013	X				
5015		X			
5016	X				
5017	X				
5018				X	
5019	X				
5020				X	
5021					not clear
5022				X	
5023					not seen
5024		X			
5025				X	
5026				X	
Period 4					
4992					not seen
4993	X				
4994	X				
4996			X		
4998					not clear
5003		X			
5004				X	
5006				X	
5011	X				
5012				X	
5014					not seen
5027				X	
5029		X			
5030		X			
5031				X	
5032				X	
5033		X			
5034				X	
5035				X	
5036				X	
5037					not seen

All the steel edges had been heated to above their fully austenitic temperature, but had been cooled at different rates. Only one of these knives (*4988*) had been cooled too slowly to contain any hardened structures and consisted entirely of fine pearlite. Three edges (*4984, 4989, 5000*) had been slack-quenched, resulting in a microstructure of fine pearlite and tempered martensite or bainites. Three knives (*5002, 5005, 5028*) had been rapidly quenched to produce blades of tempered martensite and martensite in retained austenite. *5005* was clearly hypereutectoid, while one of the martensitic edges was of slightly hypereutectoid steel. Two Period 4 knives (*4981, 4995*) had a homogeneous microstructure of soft spheroidised carbides, probably due to over tempering of martensite. Both edges showed evidence of wear and use, manifested as an elongated S-shape, which would seem to indicate that the heat treatment occurred some time after manufacture and may have been accidental. The type 0 knife (*4997*) may also have undergone such a heat treatment since it contained spheroidised cementite where some carbon had diffused into the back. Mis-sharpening has displaced the steel layer in the type 1 knife and exposed a softer cutting edge. McDonnell has reported further examples and cautioned that repair and unintentional heat treatments may greatly alter the quality of a tool (McDonnell 1989a, 378).

Yellow-white segregation lines caused by arsenic concentration were observed in several welds and steel edges. The compositions of the edges were consistent throughout, so the white lines probably indicate the working of a single piece of steel under oxidising conditions (Tylecote and Thomsen 1973). One knife contained several relatively wide bands of ferritic iron high in arsenic among the layers comprising its back. The hardness of these regions was comparable to that of phosphoric iron.

Some etched grains of ferritic and low-phosphorus iron had a finely pitted, dirty appearance due to quench ageing. This occurs in iron which has been rapidly cooled through some portion of the range between 725 and 400°C and later heated to a temperature slightly above ambient. Carbon will be in solid solution in the iron and moderate heating will allow small particles of carbide to precipitate. These can increase the hardness of the ferrite grains and are attacked when etched with nital. Quench ageing may be due to heating in antiquity or may simply result from precipitation over a very long time. Samuels reports that it may also be caused by use of a thermosetting mount (i.e. bakelite) (Samuels 1980, 69–70, 107).

Internal corrosion was present in all the types of iron used in the knives. Corrosion entered along grain boundaries and inclusions near the sides of sections and also surrounded inclusions well inside the metal matrix. Corrosion formed around slag and weld inclusions. The metal of four of the seven welds observed extended into the corrosion encasing the edge and seemed to be more corrosion-resistant than the steel below and the iron above. These were all white weld lines.

X-radiography provided a good starting point for the metallurgical investigation. Welds were present in all the artefacts in which they had been anticipated. However, the X-radiographs were assessed conservatively and sectioning revealed more welds than were predicted. Knives which in the X-radiographs had a scalloped or rather wavy profile to their cutting edges were consistently found to have blades containing steel. The type 0 knife (*4997*), fabricated from a piece of very clean phosphoric iron, had a radiograph distinctly different from those of the other knives.

Comparative data

By Patrick Ottaway and Karen Wiemer

When the 46–54 Fishergate knives are added to those from 16–22 Coppergate (*AY* 17/6) the total number examined metallographically from contexts of the period c.800–1200 at York is 70. This is the largest number from a single centre in England and has provided an unparalleled opportunity to study the development of knife making

Table 113 Knives examined metallographically from early Anglo-Saxon sites: manufacturing type and hardness

(Average HV in this table and following tables is the average of maximum value for each specimen. In rows where several specimens are quoted the maximum value for single specimens is given under the average heading.)

		Manufacturing type					
Site		0	1	2	3	4	5
Empingham	No.	2	1	1	2	4	1
	Average µHV	218	236	258	238	604	644
	Range µHV	199–236	–	–	230–45	433–797	–
Loveden Hill	No.		1		2		2
	Average µHV		724		201		218
	Range µHV		–		160–242		128–308
Polhill	No.	2					
	Average HV	150					
	Range HV	150					
Poundbury	No.	1	1	4	1		
	Average HV	210	330	505	214		
	Range HV	–	–	330–615	–		
West Stow	No.	3		1	1		
	HV	n/a		n/a	300		

Note: n/a = information not available

Sources: Wiemer forthcoming (Empingham, Rutland); McDonnell 1989b (Loveden Hill, Lincs.); Cox 1973 (Polhill, Kent); Tylecote 1987 (Poundbury, Dorset); Tylecote and Gilmour 1986 (West Stow, Suffolk)

Table 114 Middle Anglo-Saxon knives examined metallographically

		Manufacturing type			
Site		0	1	2	3
Fishergate, Period 3	No.			5	
	Average HV			398	
	Range HV			314–641	
Fishergate, *Period 4	No.	1	1	1	
	HV	148	407	713	
Hamwic (8th–9th century)	No.	1	1	10	2
	Average HV	235	488	543	396
	Range HV	–	–	158–772	185–607
Ramsbury (8th–9th century)	No.			1	
	HV			830	

* = the two over-tempered knives are excluded
Sources: McDonnell 1987a, 1987b (Hamwic); Tylecote et al. 1980 (Ramsbury)

techniques in the post-Roman period. It is therefore appropriate in this report to add some further discussion of the 46–54 Fishergate and 16–22 Coppergate data and to refer to comparable data from elsewhere (Tables 113–17). The size of the sample of knives from Anglo-Saxon and medieval contexts which have been examined metallographically may still be considered small and the accuracy with which individual specimens can be dated is

Table 115 Knives examined metallographically from 16–22 Coppergate: manufacturing type

	Manufacturing type						
Period	0	1	2	3	4	5	Total
3 (c.850–900)	–	1	8	–	1	–	10
4A (c.900–25)	–	1	2	–	–	–	3
4B (c.925–75)	2	6	3	2	2	1	16
5A (c.975)	–	1	1	–	–	–	2
5B (c.975–1050)	1	6	2	–	–	–	9
4/5 (10th–11th century)	–	1	1	–	–	–	2
5Cr (c.1050–1100)	1	1	1	–	–	1	4
1982.22 (Anglo-Scan.)	–	1	–	–	–	–	1
6 (late 11th–12th century)	1	10	2	–	–	–	13
Total	5	28	20	2	3	2	60

Table 116 Knives examined metallographically from 16–22 Coppergate: Vickers Hardness of cutting edge (see p.**3:B14**, *AY* 17/6, for explanation of Vickers Hardness)

Period	No.	Range	Average
3/4A (c.850–925)	11	244–927	586
4B/5A (c.925–75)	18	161–985	464
5B/5Cr (c.975–1100)	12	110–1283	382
6 (late 11th–12th century)	13	149–752	426

Note: This table lists only those knives for which Vickers Hardness data were available

variable, but some trends may be suggested. It is to be hoped, moreover, that the conclusions offered below will serve as a basis for further investigation.

The data from the metallographic examination of knives of early Anglo-Saxon date (5th–7th century) appear to show considerable diversity in the smithing techniques employed. Amongst the eleven knives from the Empingham cemetery, for instance, there was at least one example of all the principal manufacturing types (Table 113). As far as the quality of blades is concerned, some knives from Empingham and elsewhere exhibit very high hardness figures as a result of efficient quenching and tempering, but others had been inexpertly heat-treated. They would have been relatively poor tools, although perfectly suitable for certain tasks. It may also be noted that in the Empingham and Poundbury assemblages there is some correlation between manufacturing technique and quality. At Empingham, for example, the type 4 and 5 knives (average µHV = 624) were of much better quality than those of types 0–3 (average µHV = 238).

In addition to those from 46–54 Fishergate, the sample of knives of the middle Anglo-Saxon period examined metallographically comes exclusively from Hamwic, with the exception of a single blade from Ramsbury. When the analytical data are compared with those from the earlier period, the most striking feature is the predominance of manufacturing type 2. There are only four exceptions, all from Hamwic (Table 114).

When the Fishergate and Hamwic data are compared in detail the results are very similar; all the knives exhibit a high degree of competence in manufacturing techniques. Both groups of knives had slack-quenched martensitic, pearlitic, or over-tempered spheroidised carbide edges (McDonnell 1988). The average hardness of the type 2 Hamwic knives was greater than that of the knives from Fishergate, but the range of hardness values was similar. The Hamwic knife backs were made of ferritic and phosphoric iron whereas those from Fishergate, like those of Anglo-Scandinavian date from 16–22 Coppergate, for the most part contained phosphoric iron (McDonnell 1986).

Knives examined metallographically which can be securely associated with contexts of the later 9th–early 10th centuries include thirteen from 16–22 Coppergate (Periods 3 and

Table 117 Late 9th–12th century knives examined metallographically from sites other than 16–22 Coppergate

		Manufacturing type				
Site		0	1	2	3	4
Beverley (late 9th–11th cent.)	No. HV	1 118				1 592
Beverley (late 11th–12th cent.)	No. Average HV Range HV		4 448 214–560			
Canterbury (11th–12th cent.)	No. Average HV Range HV	1 206 –	2 344 n/a			1 330 –
Winchester (late 9th–mid 11th cent.)	No. Average HV Range HV	1 113 –	2 423 313–523	3 392 102–636		
Winchester (mid 11th–12th cent.)	No. Average HV Range HV		4 508 290–633	4 436 229–551	2 121 99–143	

Note: n/a = information not available
Sources: McDonnell 1991 (Beverley, Humberside); Wall 1990 (Canterbury, Kent); Tylecote 1990 (Winchester)

4A) and one from Winchester. All but three are of manufacturing type 2 (one from York is pattern-welded) and all but two (one from Coppergate and the Winchester knife) were efficiently quenched and tempered. The average hardness value of the group was greater than that of knives in any earlier or later period. Although the average hardness for type 2 knives was less than that of those in the Coppergate Period 4B/5A group, the overall average hardness of the 4B/5A knives was lower because of poorer knives of other manufacturing types. When both consistency and quality are considered, therefore, the Period 3/4A group appears to represent the pinnacle of the bladesmith's achievement in the post-Roman period (Table 116).

Period 4B at 16–22 Coppergate (925–75) is characterised by a greater diversity in smithing techniques and all five principal manufacturing types were represented among the sixteen blades examined. For the first time variants of type 1 make up a substantial proportion of the sample, with six examples. It is appropriate, therefore, that the only type 1 blade from the 46–54 Fishergate sample came from Period 4. From the later 10th century until c.1200 the evidence from York is that variants of manufacturing type 1 were most frequently used in knife smithing. While the evidence for the popularity of type 1 in the late

11th–12th century is not so pronounced at Winchester, the four knives of this date from Beverley were all of type 1 (Table 117).

In a sense manufacturing type 1 is an improvement on type 2 since, all other things being equal, a blade with a central steel core could be subjected to heavier wear before becoming useless than a blade with a cutting edge formed from a butt-welded steel strip. The Coppergate evidence suggests, however, that in general, although quenching and tempering were still performed to a good standard after Periods 3/4A, the quality of steel declined somewhat as manifested by lower average hardness figures (McDonnell 1989a, 378–9). This is due primarily, however, to the hardness values of knives of manufacturing types other than 2 since the later Anglo-Scandinavian and medieval knives of best quality from Coppergate remain those with the butt-welded cutting edges (ibid., 379). It should also be noted that some of the latter may be residual in contexts of periods later than 4A. Knife *5005* from 46–54 Fishergate, which is the hardest of the Period 4 knives from that site, may also be residual. It has a C2 back form and is therefore unlikely to be later than the 10th century (p.570, *AY* 17/6). At Winchester there appears to be no pronounced distinction in hardness between butt-welded knives and those made in other ways.

In conclusion, it may be suggested that the knives from Period 3 at Fishergate confirm the evidence from Hamwic that, when compared with the earlier Anglo-Saxon period, the 8th–early 9th century was a period not so much of innovation in smithing techniques but of greater standardisation and a higher general level of skill. It appears from the 16–22 Coppergate sample that the quality of smithing remained high in the late 9th and early 10th centuries. During the 10th century the most obvious change in blade manufacture was the growing preference for variants of manufacturing type 1. By the 11th–12th centuries this had become dominant. Increasing use of type 1 was accompanied not so much by a decline in the quality of blades as by a greater variability in quality than in the 8th–early 10th centuries.

Interpretation of the trends identified above in a wider context is difficult given the small sample size and the problems of accurately dating individual specimens. It is possible, however, that the apparent move towards greater standardisation and better quality in the 8th–9th centuries was due both to the increasingly competitive economic environment of proto-urban and early urban sites such as Southampton and York, and to greater opportunities for smiths to communicate and share knowledge in these large permanent settlements. The changes in the 10th century may represent an element of deliberate diversification to suit a more sophisticated market, one part of which demanded high quality blades for which it was prepared to pay while other consumers were happy with poorer quality, but cheaper, blades.

Handles (Figs.633–4)

A fragment of a decorated bone handle, *5528*, and two socketed handles made of antler, *5695–6*, were all probably knife or tool handles.

Dr D. Tweddle comments on the decorated handle fragment *5528*, which was recovered from the Period 3c boundary ditch:

> The fragment *5528* is subrectangular and roughly broken on all its edges, except to the right where it is neatly squared. It is of curved section, with the inner face worked and the outer face decorated.
>
> It is evidently part of a handle — probably, but not certainly, a knife handle — with a reconstructed diameter of c.22·5–25mm, and an original length of between 70 and 100mm, the smallest size that can conveniently be gripped. There was an axial perforation c.10mm in diameter into which fitted a whittle tang, the outer end of which was turned over to hold the handle in place. The surviving fragment is decorated with the substantial remains of a single longitudinal field, separated by a double raised frame from the marginal remains of a second similar field. As reconstructed, there would originally have been six such longitudinal fields.
>
> The surviving field is decorated with two animals in procession, facing towards the squared end and crouching on the lower border of the field. Each animal has a rounded head with a pair of long, parallel-sided jaws with squared ends. The eye is indicated by a ring-and-dot and from the back of the head project long ears. On the left-hand animal the bases of two ears are clearly visible, one above the other. On the right-hand animal only the curve of the lower ear survives, but this indicates that the ears were originally long, at least one-third as long as the body of the animal. A narrow collar separates the head from the animal's body, which is long and narrow and slopes upwards towards the hind quarters. The back leg is bent forward under the body, and the front leg extends forward under the lower jaw. In each case the feet are subtriangular and divided into three toes. Only about half of the left-hand animal survives, but enough is preserved to demonstrate that it was almost identical with the right-hand animal. The main difference lies in the fact that it is biting the rear leg of the right-hand animal. The jaws of the right-hand animal, in contrast, butt up against the surviving end.
>
> Below this decorative field are the marginal remains of a second, but they are too fragmentary for the design to be recovered. It appears, however, to have been another

Fig.633 Bone knife handle fragment, 5528. *L.36·5mm*

animal frieze, as the remains of two feet can be identified facing the panel above. The design cannot have been a mirror image of the surviving panel as at the right-hand end of the field there is a broad frame, not present in the corresponding position in the upper panel. Moreover, the right foot in the lower panel is angled away from, not towards, the right-hand end of the field, suggesting that the animal was originally facing to the left. In the upper field all the feet angle in the direction the animals are facing. It must be concluded that each of the six decorative fields or panels on the handle was filled with an animal frieze, alternately facing the outer and inner end of the handle. Given the suggested length of the handle, each frieze consisted originally of three or four animals.

The animal friezes on the handle clearly belong to Salin's style II (Speake 1980), in which the animals are treated as organic individuals, rather than as separate disassociated components as is the case with style I animals. Birds, ribbon-like animals and quadrupeds are all employed in style II, either separately or in combination, and one popular way of arranging quadrupeds was in procession. Often the animals are S-shaped, turning back to bite at their own bodies with the long jaws employed on the Fishergate piece, an approach used on the gilt-bronze disc from Allington Hill, Cambridgeshire (ibid., fig.8a, pl.15b), and on the back of a composite disc brooch from Faversham, Kent (ibid., fig.8c). Elsewhere the animals face forward and bite at the one in front as on a repoussé silver mount from Caenby, Lincolnshire (ibid., fig.8i, pl.15k), or on the vertical panels of f.192v of the Book of Durrow (ibid., fig.8m; Alexander 1978, no.6, pl.22). It is to this latter group of processional designs that the Fishergate piece belongs.

The individual animals of the Fishergate piece share specific features with the animals of other style II processional friezes, particularly the elongated, parallel-sided jaws, the triangular feet with two or three toes, and the collar separating the head from the neck. These are more or less universal features of style II animals. Other details of the Fishergate animals are less easy to parallel, such as the small rounded heads each filled with a prominent eye. These are absent from the Book of Durrow and the Allington Hill mount, for example, but are present on the Caenby disc and the bronze die from Salmonby, Lincolnshire (Speake 1980, fig.8l, pl.15e). The long, paired ears of the Fishergate piece are even more difficult to parallel. Ears are usually absent in style II, and where they do occur, as on f.192v of the Book of Durrow, they are small and pointed and fit closely to the neck; usually only a single ear is depicted.

The Fishergate piece also lacks some key features of style II animals, notably a contour line on the body, used, for example, on the Allington Hill mount and the Salmonby die, but also absent on the Caenby disc. Equally, the Fishergate piece lacks the pear-shaped or lentoid treatment of the rear or front leg. This feature is employed on many style II processional friezes — on the Allington Hill mount, the Caenby disc, the Salmonby die and the friezes on f.192v of the Book of Durrow — although there are other examples where it is absent, notably on the disc from Standlake, Oxfordshire (Speake 1980, fig.8h, pl.15c), and the sketch on the rear of the Faversham brooch.

The differences between the animals on the Fishergate piece and on the other style II processional friezes may be related to differences in material. Most processional friezes, apart from those in the Book of Durrow, are in metal, whereas the Fishergate piece is of bone. However, this argument is not compelling. Bone is a reasonably easy material to work, and fully capable of taking the fine detail seen, for example, in the Book of Durrow, a fact which is demonstrated by the bone plaque from Southampton (Campbell 1982, 102, fig.3), decorated with interlacing style II animals. Here the bodies are both contoured and have the lentoid hip seen on the metalwork. The reason for the absence of these features on the Fishergate piece may have more to do with date than the material employed.

Style II was probably used in England from the late 6th century, following its introduction from Scandinavia, and continued throughout the 7th century (Speake 1980, 91–7). Wilson (in Wilson and Blunt 1961, 99f.) and Webster (1982, 22–3, figs.1–2) have both stressed that the style continued into the 8th century, exemplified by the corner animals on the front face of the Frank's Casket (Wilson 1984, fig.37; Webster 1982, fig.1c), being transformed and assimilated into insular animal art of the type familiar from the manuscripts of early Northumbria. On f.2r of the late 7th or early 8th century Durham Cathedral Lib. MS A.II.17 (Alexander 1978, no.10, pl.47), for example, the initial letters are filled with S-shaped animals with long jaws either turned back and biting themselves, or biting the animal in front. Although these animals are enmeshed in dense interlace, there is little doubt that they are direct descendants of those on the style II metalwork processional friezes of the 7th century. A similar processional frieze also occurs on the initial of f.2r of Corpus Christi College MS 197B (ibid., no.12, pl.49), another work of the late 7th or early 8th century.

The Fishergate piece appears to belong towards the end of this date range, with the simplification of the animals involving the loss of features such as the lentoid hip, and the addition of others such as the long, prominent ears. That the lentoid hip survived until at least c.675 is demonstrated by the Book of Durrow (Alexander 1978, no.6), whereas the first use of elongated ears is apparently in the early 8th century, on the Frank's Casket and in the Durham and Corpus Christi College manuscripts. A date of c.700 for the Fishergate piece is, on these grounds, perfectly acceptable.

Speake has claimed that style II is essentially an aristocratic style, associated particularly with sumptuous metalwork (Speake 1980, 38–40). The presence of *5528* at Fishergate may emphasise its aristocratic links, although the piece could equally have been made in a workshop on the site.

Antler handle *5695* was found in the Period 3a boundary ditch. Made from a slightly curving tine, this handle would have been suitable for a large tool or whittle-tanged knife. The medullary tissue has been completely removed from the tine to form the socket, except at the broad end, where the tissue has been left intact. Partial recutting of the other end, which is incomplete, may represent attempts to extract the tang from the handle; a large crack runs the entire length of the tine, and may have necessitated the replacement of the handle. Also fashioned from a hollowed out tine, *5696* was recovered from the fill of a robber trench in the Period 6c demolition of parts of the Gilbertine church, but is likely to be residual. In contrast to *5695*, the tang would have been fixed into the broad end of this tine.

York has previously produced bone and antler knife handles, occasionally with the iron knife blade intact, as at Clifford Street (Waterman 1959, 73, fig.7, 12). More commonly they are detached; examples of these come from Parliament Street (*744*, *AY* 17/4), Clifford Street (Waterman 1959, 93, fig.19, 12), and 16–22 Coppergate (MacGregor, *AY* 17 in prep.). Bone handles appear to be more common than those of antler, probably because the curves of antler tines limited the shape of the handles. Such handles are often decorated; examples have been recovered from Flaxengate, Lincoln (Mann 1982, 19–20, fig.18), and Thetford (Rogerson and Dallas 1984, 183, fig.201).

The paucity of handles recovered suggests that horn and wood, which were poorly preserved in the prevailing soil conditions, may have been more commonly used as handles

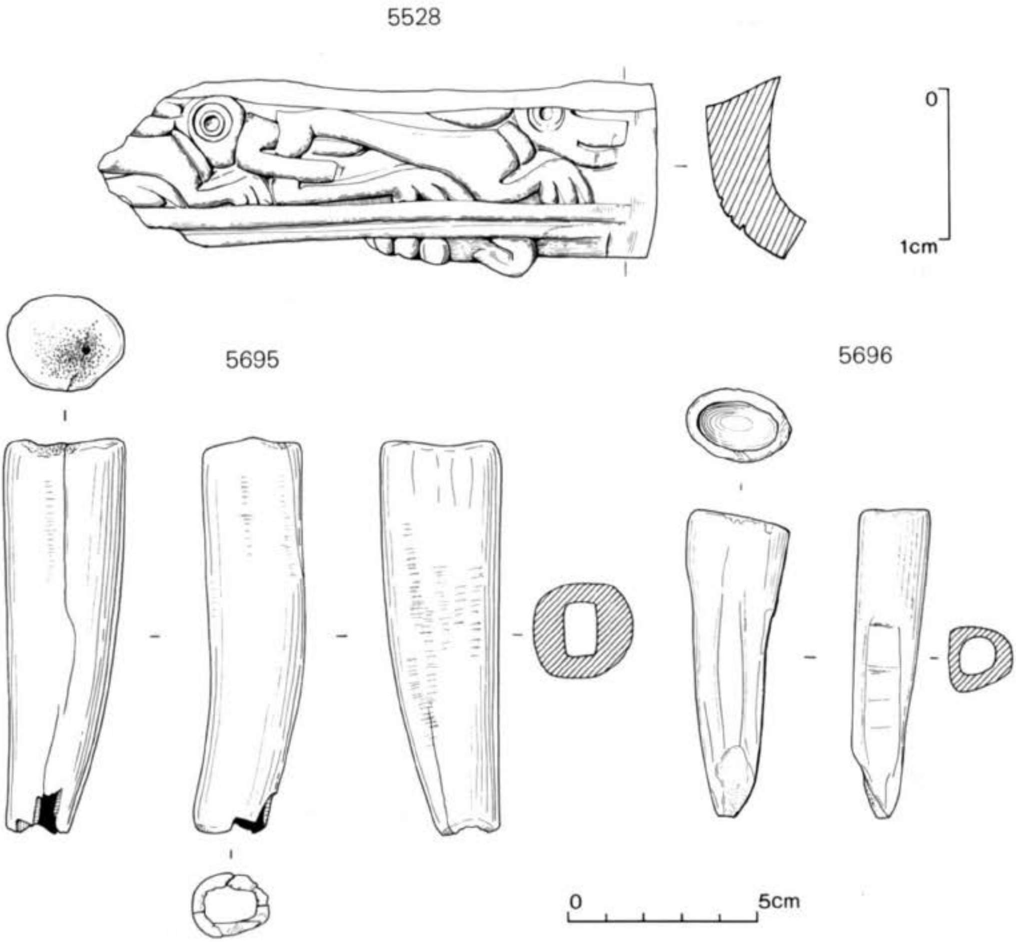


Fig. 634 Handles of bone (5528) and antler (5695–6). Scale 1:2, 5528 2:1

than bone and antler, which survived deposition well. Evidence for the use of wood and horn as handles is provided by mineralised organic remains on the tangs of five knives. Two knives have traces of horn (*4982* and *4990*), two have traces of wood (*5001* and *5011*), and one has either horn or wood remains (*5029*). *4986* has traces of mineralised leather all over it, which may derive from a sheath.

Hones (Fig.635)

Three hone fragments were found in Period 3 deposits (*4437–9*) and nine in Period 4 contexts (*4440–7*). *4448–50*, which were found in Period 6a contexts, and *4451*, found in a Period 6c context, are almost certainly residual. All the hones were studied by **Dr G.D. Gaunt**, using hand-specimen observations.

Dr G.D. Gaunt comments:

> All three hones from Period 3 are made of sandstone. *4437* is made of a highly compacted greywacke-like sandstone, probably derived from Ordovician or Silurian rocks in the Lake District or southern Scotland.
>
> *4438* is a fine-grained calcareous sandstone, and probably comes from a source in north-eastern Yorkshire such as the Eller Beck Formation, parts of the Cloughton Formation or the Scarborough Formation, all in the Middle Jurassic sequences of the Hambleton and/or Howardian Hills, or from the Upper Jurassic Corallian Group around the Vale of Pickering.
>
> *4439* is typical of Coal Measures sandstone, and, less commonly, of fine-grained sandstones in the Millstone Grit, indicating a source in the Upper Carboniferous sequences on the eastern flanks of the Pennines.

4437 is broken at the upper end, and broadens slightly at the other, which has been bevelled from both faces, forming a rounded edge. There are deep transverse grooves at this end, and faint scratches are visible on one face. The unusual shape of *4439* suggests that it may be a 'secondary hone', perhaps a re-used fragment from a slab or other architectural stone (Moore 1978, 65). During post-excavation research *4438* was found to adjoin sf7540, which was discovered in a Period 4z context; both fragments have a shallow sharpening groove.

The hones found in Period 4 comprise four large examples of sandstone, a slender hone (or touchstone) of basalt or dolerite type, and small fragments of quartz-muscovite schist and phyllite. Three hones of phyllite were also recovered from Period 6 contexts, as was one hone made of calcareous sandstone.

Dr G.D. Gaunt comments:

> *4441* is a slightly micaceous sandstone, which may have Ordovician or Silurian origins, although alternatively it may be derived from certain well-compacted Carboniferous rocks, notably in the Lower Carboniferous of the Anglo-Scottish border and the circum-Eden valley areas, or in the Pennine Yoredale sequence. It is not clear whether this was taken from an outcrop, or from an erratic source in the area around York.
>
> *4445* is a darkly muscovite-laminated sandstone, probably derived from the Coal Measures. *4442* and *4447* are of a similar sandstone to *4439* (see above).
>
> *4446* appears to be of basalt or dolerite type, of uncertain provenance. It contains numerous pale crystals, possibly of microporphyritic feldspars, softer and more eroded than the more fine-grained groundmass, a feature that produces a pitted surface which would render it usable as a hone or touchstone.

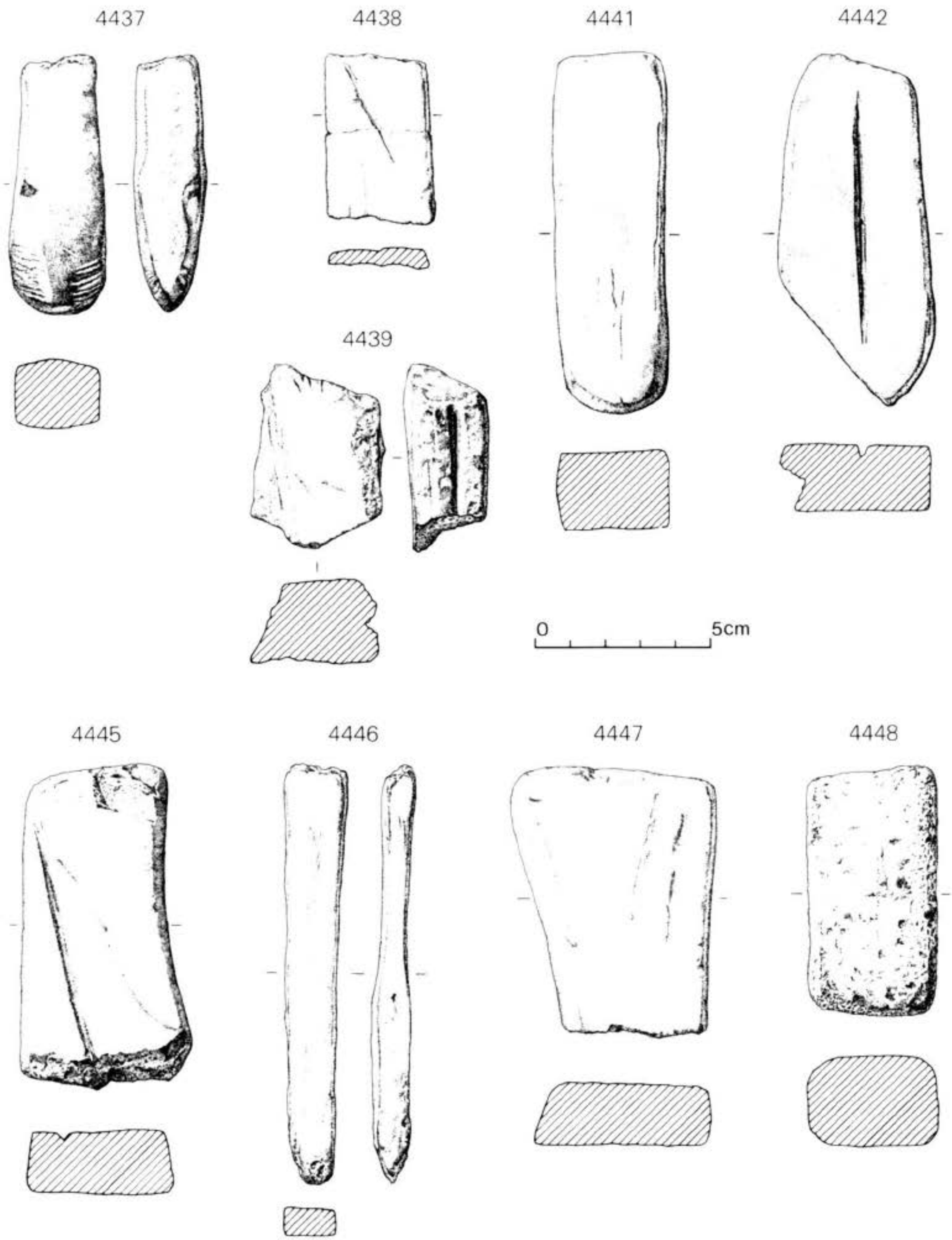


Fig. 635 Hones of sandstone (4437–9, 4441–2, 4445, 4447–8) and of basalt or dolerite type (4446). Scale 1:2

> *4448* is a calcareous sandstone containing glauconite, indicating a probable provenance in the Kentish Rag in the Lower Cretaceous succession of southern England.
>
> *4440* is a tiny fragment of quartz-muscovite schist. *4443–4* and *4449–51* are all fragments of quartz-muscovite phyllite. The source of the schist was identified by Ellis as Eidsborg, in the Telemark area of Norway, and this location was confirmed by potassium-argon radiometric-dating tests (Ellis 1969, 150). Such tests on phyllite hones, combined with natural remanent magnetisation studies and petrological evidence, suggest a different, and as yet uncertain, Norwegian source (Crosby and Mitchell 1987, 502).

The three large hones all show signs of having been used for sharpening: *4442* and *4445* both have deep grooves, similar to the one on *4439*. There are shallower grooves and scratches visible on *4441* and *4447*. *4446* is very smooth and worn, particularly at the broader end. Two fragments of phyllite derive from the same Period 4z pit and are so similar in appearance that they are likely to be from the same hone, although they do not join. None of the other three phyllite hones, which are all fragmentary, bears any clear signs of wear.

Many hones from the middle and late Anglo-Saxon periods in England have been petrographically studied and provenanced, and certain common types have emerged. Apart from the basaltic hone or touchstone *4446*, all the hones recovered from the site are of well-recognised types, as described by Moore (1978, 61–73), and the pattern of use conforms to that found on other contemporary sites. Sandstone hones were in use at Fishergate in both periods; they were used exclusively during the Anglian period, while Period 4 saw the use of stones from more varied sources, including the imported schists and phyllites. The introduction of these Norwegian stones into England has been linked to the Scandinavian invasion and settlement (Ellis 1969, 149), and their absence from Fishergate prior to Period 4 is consistent with this suggestion. Phyllite, which was less commonly used than schist (Moore 1978, 67, fig.3), is thought to have declined in use after the 11th century (Crosby and Mitchell 1987, 484), although it occurs sporadically after that date, at Winchester for example (Ellis and Moore 1990, 284). Although the phyllite fragments found in Period 6 contexts could be late examples of their type, it is more likely that they are residual; all three derive from contexts compatible with this interpretation. The Kentish Rag hone *4448* is probably a residual Roman hone, this type of stone being in common use in Roman times but occurring infrequently thereafter (Moore 1978, 69).

Ellis and Moore (1990, 869), in their study of the hones from Winchester, suggest that the contemporaneous use of hones of both local and imported stones may reflect differing functions, the schist hones being used for delicate blades and craftsmen's tools, and the chunkier, coarse-grained hones on agricultural, and other large-bladed, tools. On the basis of hones found previously in York, MacGregor concluded that the coarser local stones would have been used for initial sharpening, and the finer schist hones for fining the cutting edge (p.79, *AY* 17/3). As 46–54 Fishergate has produced few large iron tools, MacGregor's suggestion seems a more appropriate explanation of the occurrence of both coarse- and fine-grained hones on the site during Period 4 than Ellis and Moore's. In addition to sharpening knife blades, the hones may have been used to maintain the sharp tips of other tools, such as awls and needles, which have been found in some numbers at Fishergate (see pp.1264–5 and 1271–2). The grooves visible on several of the hones, for example *4442* and *4445*, could result from this type of use.

Hones of Kentish Ragstone, similar to *4448*, have been found previously in York, during excavations of the Roman sewers on Church Street (*5–6*, *AY* 17/1), and the General Accident site, 24–30 Tanner Row (Hooley, *AY* 17 in prep.). The site at Lloyds Bank, Pavement, produced hones of schist, phyllite and sandstone (*382–91*, *AY* 17/3); schist and phyllite hones were also found in the sewer trench excavations on Parliament Street (*684–5*, *978*, *AY* 17/4). Hones of Norwegian and local stone have been recovered from many other contemporary sites in England, including Flaxengate, Lincoln (Mann 1982, 27–30, figs.27–30), St Peter's Street, Northampton (Moore and Oakley 1979, 280–3, fig.123), North Elmham, Norfolk (Moore 1980, 489–90, fig.261), and Winchester (Ellis and Moore 1990, 279–88) (see Fig.611).

Flints

A large number of prehistoric flints were recovered from the site; a quick examination of these revealed that most were waste flakes or unworked pieces. They are not reported upon further.

Raw materials and unfinished objects

Haematite

Fragments of reddle-type haematite, an iron oxide, were recovered from the site; four fragments came from Period 2 contexts (*4452*), 41 from contexts in Period 3 (*4453–6*), and 24 from Period 4 deposits (*4457*). Although haematite may be used in iron smelting, there is no evidence that this process was undertaken on the site (see p.1226), and it is more likely that these fragments would have been used as pigments, cosmetics or as jeweller's rouge to polish metal.

Dr G.D. Gaunt comments:

> All the fragments of haematite are brick red, earthy, largely structureless and formless, typical of the reddle variety. Haematite occurs in some sedimentary rocks, but almost invariably in minute and finely disseminated amounts, and even small concentrations of the mineral are rare. The largest concentrations in Britain are in south-western Cumbria, occurring as veins and replacement masses of reddle type on and within Lower Carboniferous limestones. It is highly probable that these fragments derive from that source.

Marcasite

4458 is a fragment of marcasite, which is an orthorhombic sulphide of iron (S. O'Connor, pers. comm.). It appears to have been shaped, and all its faces are highly polished, but its function is unknown. It was recovered from a Period 3z post-hole.

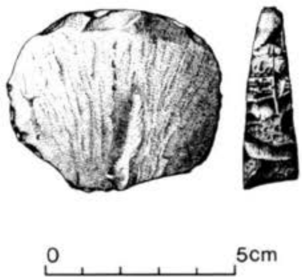


Fig.636 Jet roughout 4570. *Scale 1:2*

Jet (Fig.636)

Apart from a single bead (see p.1378), the only other artefact of jet is a roughout, *4570*, recovered from a Period 4z pit. Suboval, with some knife-cut shaping of the sides, it seems to be in the early stages of manufacture, and is made of good quality 'plank' jet (M. Read, pers. comm.). Neither face has been worked, and it is of irregular thickness. The size and shape of the roughout are similar to that of a jet pendant found on the site of the railway station in York (Waterman 1959, 99); this site also produced roughouts of jet ornaments and pins (RCHMY 63, pl.70). The pendant takes the form of a coiled serpent, a design well known from Viking Age Norway and Sweden. Jet objects and manufacturing debris have also been found in Anglo-Scandinavian levels at 16–22 Coppergate (Roesdahl et al. 1981, YAJG6–11, 13), and from a site on Clifford Street (ibid., YAJG12). The raw material was almost certainly brought to York from Whitby, North Yorkshire, one of the most important sources of jet in western Europe.

Fishing (Figs.637–8)

As the site is situated close to the River Foss, it is not surprising that evidence of fishing was found. A fish market is known to have been held on Foss Bridge from at least the 11th century and the name Fishergate itself derives from OE *fiscere* or ON *fiskari* meaning 'fisherman' (*AY* 11/2 in prep.). Analysis of the bones from Period 3 indicates that most fish were derived from the local rivers and estuary, while Period 4 saw an increase in the importance of marine species such as herring to the diet (*AY* 15/4, 267). Artefactual evidence for fishing is provided by iron fish hooks and a possible bone gorge, used in line fishing, and sinkers of stone and lead alloy, used to weigh down nets; both line and net fishing were undertaken in both periods.

Fish hooks (Fig.637)

The three fish hooks (*5038–9, 5041*) and a fourth possible fish hook fragment (*5040*) are all of iron. *5038–9* are both largely intact, and were recovered from Period 3b and 3z pits

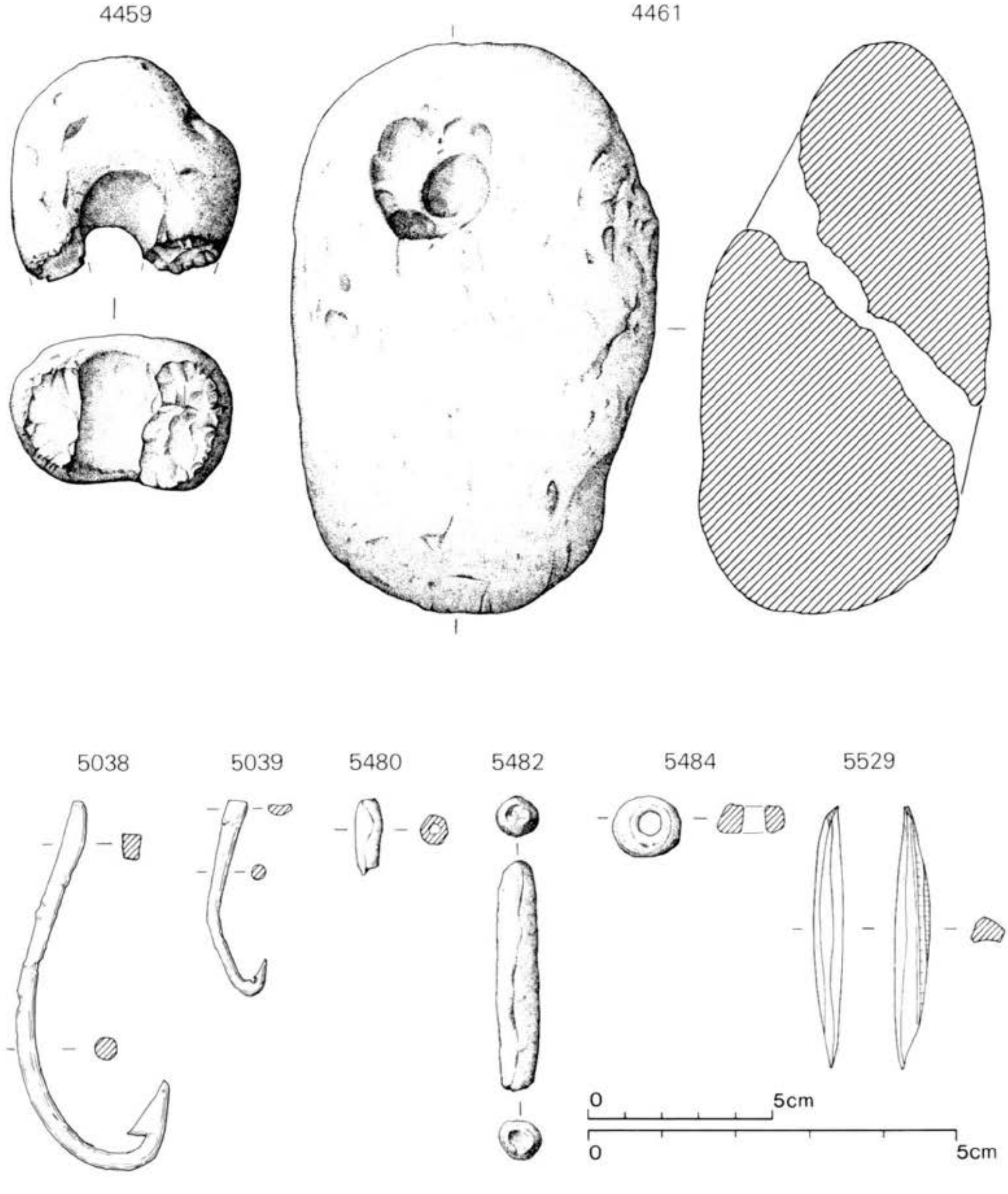


Fig. 637 Fishing equipment: stone net sinkers (4459, 4461)*; iron fish hooks* (5038–9)*; lead alloy net sinkers* (5480, 5482)*; lead alloy net weight* (5484)*; bone gorge* (5529)*. Scale 1:2, fish hooks 1:1*

respectively. Both are barbed, but differ considerably in size; although incomplete, *5038* (49·2mm) is still almost twice as long as *5039* (25·1mm). The terminal on the larger hook is missing, but it may originally have been looped, or splayed as on *5039*, the splay having been formed by flattening the upper end of the hook shank. The third hook *5041*, which comes from a Period 4z pit, is of a similar size to *5039*, but has lost both its terminal and the end of its pointed hook. *5040*, which was found in a Period 4z post-hole, has lost its hook entirely, but has a splayed terminal similar to *5039*. These hooks would have been used in line fishing, and could have been employed to catch marine or freshwater fish. The size of *5038* indicates that it would have been used in the pursuit of fish such as pike or cod, while the smaller hooks would have caught smaller species (A.K.G. Jones, pers. comm.).

Large fish hooks have been found on other sites in York, including 6–8 Pavement (Roesdahl et al. 1981, YDL2), and in Anglo-Scandinavian levels at 16–22 Coppergate, where three hooks of a similar size to *5038* were recovered (*2991, 2993, 2995, AY* 17/6). Hooks as small as *5039* and *5041* do not appear to have been found on other contemporary sites, in York or elsewhere, but this may be the result of defects in techniques of recovery. Both these hooks were retrieved from sieved samples and might well have been missed on a site where recovery was solely by hand.

Gorge (Fig.637)

A crudely shaped bone object, *5529*, perhaps a gorge, was found in a Period 3z pit. Such objects, often made of a piece of wood, pointed at each end, would be tied to the fishing line and inserted longitudinally into a fish used as bait to catch larger species. When the bait was swallowed by the hunted fish, the line would be pulled and the gorge would be forced into a fixed transverse position within the fish's body (Steane and Foreman 1988, 143). Gorges do not seem to have been recovered or recognised from other sites in this country, but they have been found in some numbers in early medieval levels at Wolin, Poland (ibid.). Sixteen early medieval wooden gorges, 100–130mm in length, were also found at Elisenhof in northern Germany, probably used in cod fishing (Heinrich 1986).

Net sinkers (Fig.637)

There are three net sinkers of stone, one from a Period 3c pit (*4459*), the other two (*4460–1*) from Period 4 pits. All three are subovoid in shape, and have naturally formed perforations. Similar perforated stones have been recovered from the Upper Thames (Thomas 1981, 129–32) and from sites further downstream (Steane and Foreman 1988, 162–70). They have been interpreted as net sinkers largely because of their riverine find spots (ibid., 165), and they have tentatively been dated as medieval. Although earlier in date, the sinkers from Fishergate are broadly comparable in terms of weight and size of perforation to those recorded by Thomas. Only one other stone sinker, of Anglo-Scandinavian date, has previously been found in York, on Clifford Street (Waterman 1959, 99, fig.23, 14).

Dr G.D. Gaunt comments:

Two of the weights, *4459–60*, are made of nodular flint, and originated in the Upper Cretaceous Chalk Group, which forms the Yorkshire and Lincolnshire Wolds. Nodular flints are virtually confined to the Welton Chalk Formation. Provenance from these regions or from derived glacial and/or beach deposits in adjacent areas is assumed.

4461 is of a sandstone which may have originated in the Carboniferous, that is, from Yoredale, Millstone Grit or Coal Measures sequences, but the general angularity of its grains and its well-compacted nature suggest an older, probably Lower Palaeozoic, rock. The subrounded shape and natural perforation imply provenance from a glacial, river or beach deposit.

In addition to the stone sinkers, there are three net sinkers of lead alloy from Period 3 deposits (*5477–9*) and four from Period 4z features (*5480–3*). All have a cylindrical or elongated ovoid shape, with an axial perforation and a longitudinal seam. Each has been shaped from a piece of lead alloy sheet, which has been wrapped around a rope running along the lower edge of the net to weigh it down. All except one (*5482*) are open at both ends of the perforation and could have been slid on and off the net as required. The sinkers vary in length from 21mm (*5480*) to 61·9mm (*5482*) and in weight from 4·3g (*5480*) to 38·6g (*5482*). The diameters of the perforations range from 2·2mm (*5480*) to 4mm (*5481*) and must reflect the thickness of the ropes to which they were attached. In addition to these cylindrical sinkers, there are two discoidal objects of lead alloy, *5484–5*, which may also have acted as net weights. Both have central perforations, and their weights fit into the same range as the cylindrical examples.

Cylindrical lead weights have been found on sites ranging from the pre-Roman Iron Age, such as Glastonbury and Meare in Somerset (Steane and Foreman 1988, 162), to Byland Abbey's fishponds at Oldstead Grange (Kemp forthcoming), and the wreck of a 15th century vessel at Blackfriars, London (Marsden 1971–2, 9). The site at Oldstead Grange produced two types of lead weight; type 1 weights were cylindrical or quoit-shaped, and weighed 80–430g, while the type 2 weights were cylindrical and weighed 3–60g (Kemp forthcoming). J. McDonnell has suggested that the type 1 weights would have been attached to seine nets (1981, 30), which were thrown out and formed circular walls surrounding the fish. The lighter sinkers would have been used on hand nets. As the flint weights from Fishergate are of a similar shape and weight to many of the type 1 weights from Oldstead, these may also have been used on seine nets. The lead alloy sinkers may have been used in conjunction with hand nets.

It is interesting to note the artefactual evidence for fishing in Period 3. Most of the food eaten at Fishergate at this time appears to have been provided from elsewhere, in the form of live animals brought to the site (*AY* 15/4, 282); the fishing equipment indicates that efforts were made by the inhabitants to supplement this food supply.

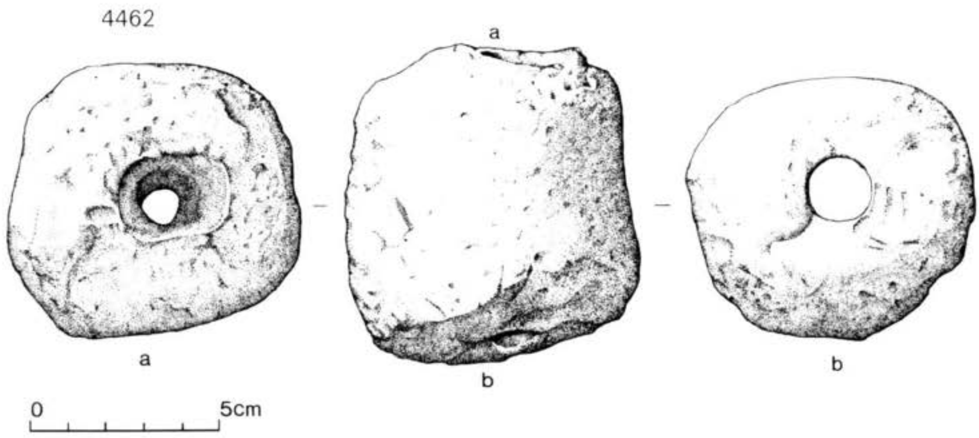


Fig.638 Stone weight 4462. *Scale 1:2*

Stone weight (Fig.638)

A perforated weight, *4462*, found in a Period 3a pit, is subcylindrical and made of chalk. Although it is possible that the weight was used as a net sinker, two chalk weights having come from sites on the Thames (Thomas 1981, 130), a material such as chalk seems inappropriate for an object which would be continuously immersed in water. Thomas (ibid.) suggests alternative uses as a thatch weight or a loom weight. However, no chalk loom weights have yet been found and this object is considerably heavier than any known loom weight of the Anglo-Saxon period (P. Walton Rogers, pers. comm.).

Dr G.D. Gaunt comments:

This chalk weight originated in the Upper Cretaceous Chalk Group which forms the Yorkshire and Lincolnshire Wolds, so provenance from these regions or from derived glacial and/or beach deposits in adjacent areas is assumed.

Domestic/household equipment

Rotary querns (Figs.639–41)

A complete rotary quern, comprising both upper and lower stones, and 123 quern fragments were recovered from the site. The intact stones and three fragments are made of sandstone, but the remainder are all of vesicular lava, and these are considered first.

Seventy-six fragments of querns made of lava derive from Period 3 deposits (*4463–503*), with 26 coming from Period 4 contexts (*4504–12, 4514, 4516–27*). Eighteen fragments were found in Period 6 deposits (*4528–39, 4541–2*) and one (*4544*) was unstratified; most of these are small in size, and are probably residual.

Five fragments (*4495, 4503, 4508, 4512*) can positively be identified as parts of upper stones, and all show signs of considerable wear on their grinding surfaces, particularly on the outer edge. The grinding surface of *4508* appears especially well used, and has five parallel grooves of varying depth, which may represent attempts to renew the roughness. *4512* has been broken across a channel cut from the upper face through to the side for the insertion of a thong which was pulled to rotate the upper stone. This was an alternative to the more commonly used wooden handle, fitted into a socket on the upper face of the upper stone.

The remaining fragments are only identifiable as parts of querns by their rock type, which is not known to have been quarried for any other type of artefact. They vary in size, many being small chips, presumably broken off during use or when discarded. In common with the identifiable stones, many of the larger fragments are worn. Four of the fragments (*4477, 4484, 4514, 4527*) show signs of wear on both faces; they may have been broken off discarded querns and then re-used, perhaps as small hand-held grinding stones or rubbers. Four other fragments, *4471, 4481, 4536–7*, have been deliberately cut to shape, and may also have been used in this way; all show signs of wear on at least one face. *4528* has a flat base, and sides diverging up to a subconvex upper face with a central dimple. There are no signs of wear, however, and although the piece has clearly been deliberately shaped, its function is unclear.

Dr G.D. Gaunt comments on the lava querns:

> Mayen lava is a silica-undersaturated trachybasalt with abundant open vesicles. In certain archaeological accounts it is referred to as tephrite, but, because some olivine is generally present (Kars 1980, 398–9), basanite would be petrologically a more correct name. The main minerals are the feldspathoids nepheline and leucite (some large enough to be seen by the naked eye as white to pale green crystals), plagioclase feldspar, and the dark pyroxene augite (also visible to the naked eye in places). Outcrops of this distinctive lava, which is of Quaternary age, occur in the north-eastern part of the Eifel region of Germany, mainly in the Mayen area 20–25km west of Koblenz.

The intact upper and lower sandstone quernstones *4513* were found together in a Period 4z pit (Fig.641). The lower stone is finer grained than the upper, and has a slightly convex grinding surface, with large smooth areas on its outer edge as a result of wear. The central perforation tapers up to the grinding face. The upper stone, which has two handle holes, has a worn and slightly concave grinding surface to complement the grinding surface of the lower stone. It has a larger perforation, with a flange around it on the upper face. This acted as a funnel for the grain, which was poured in through the perforation. A shallow groove on each side of the perforation on the grinding face indicates that the stone may have been fitted with a rynd. The rynd, probably made of wood, was a strip which went across the perforation, each end sitting in a groove. It had a central hole, which allowed the upper

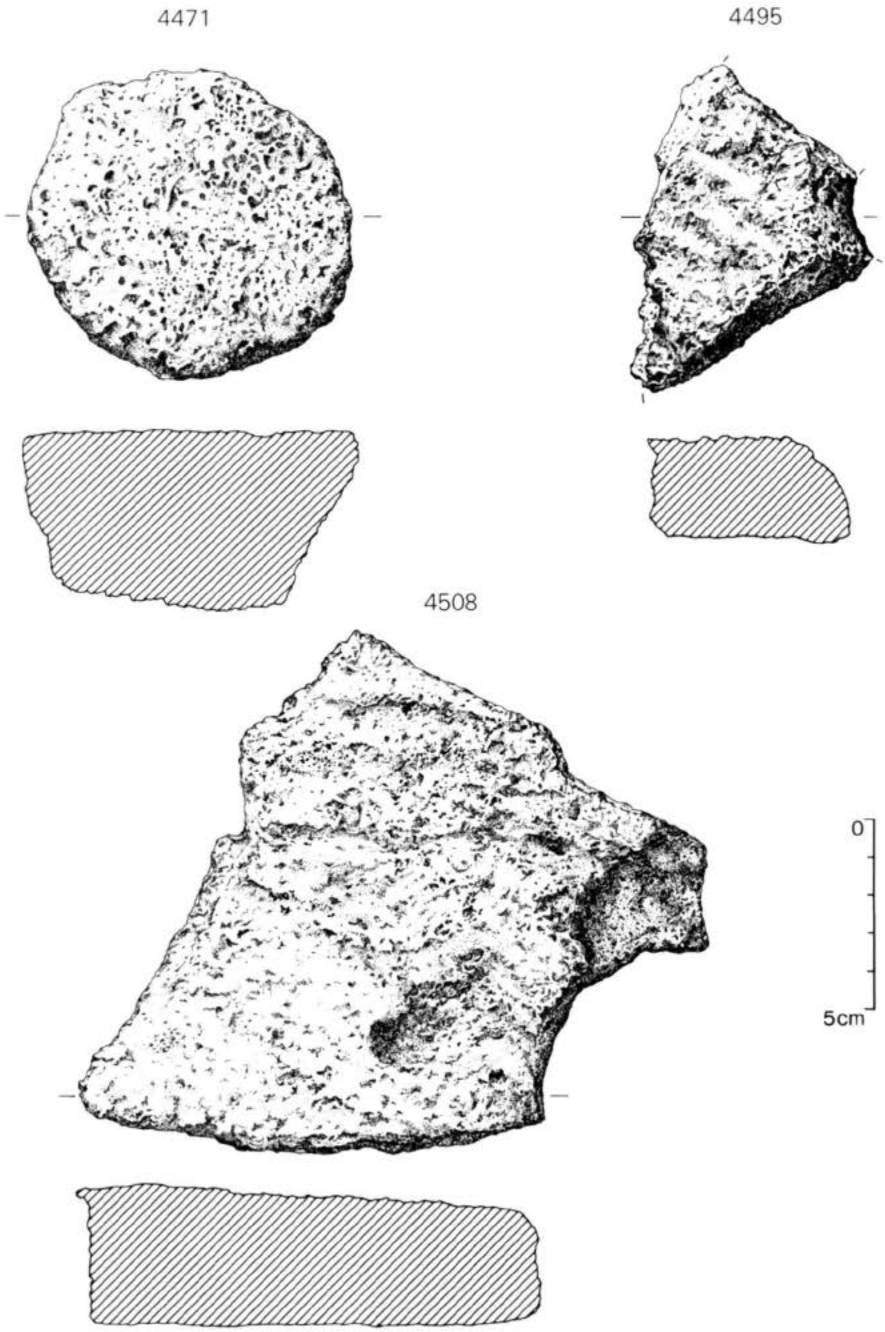
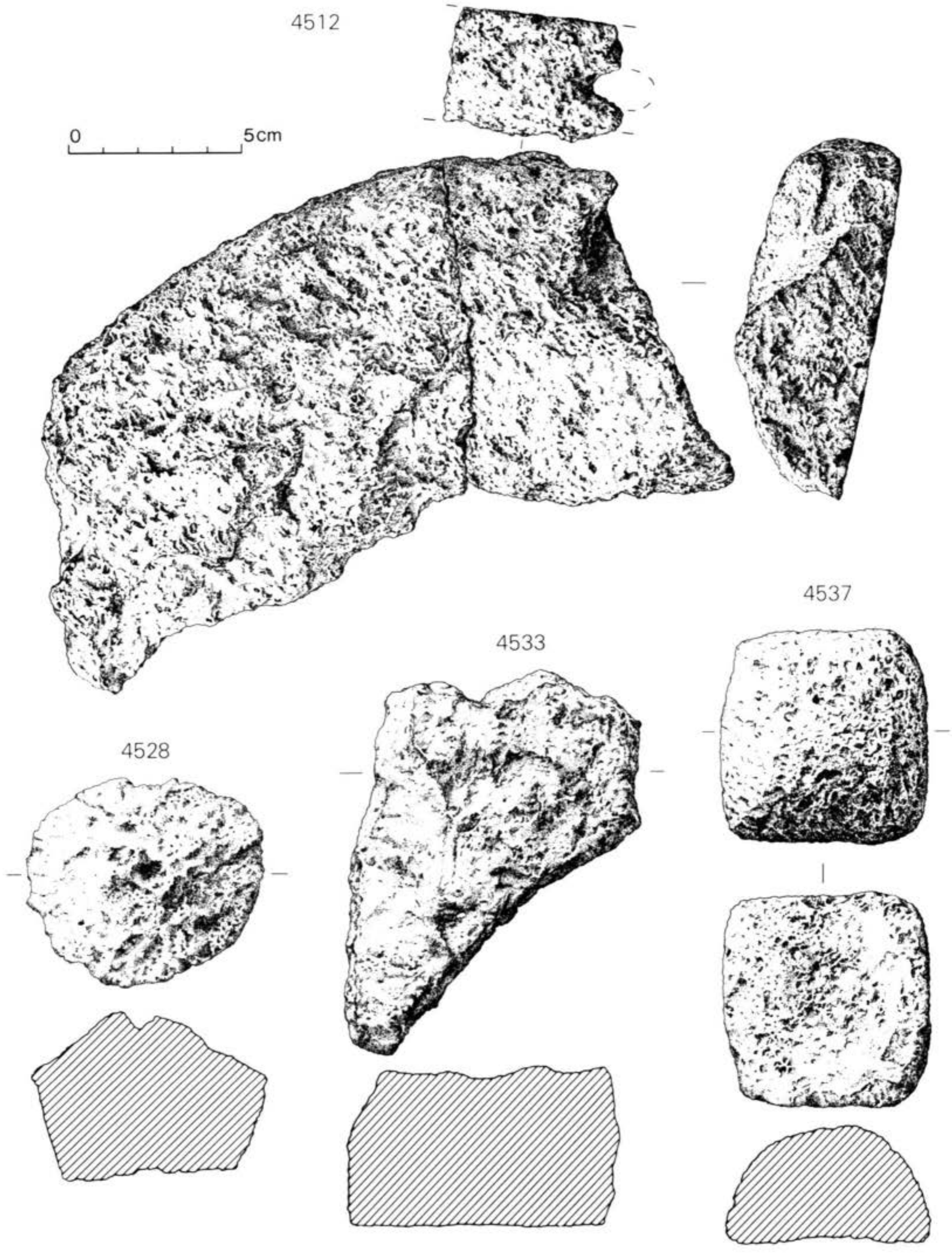
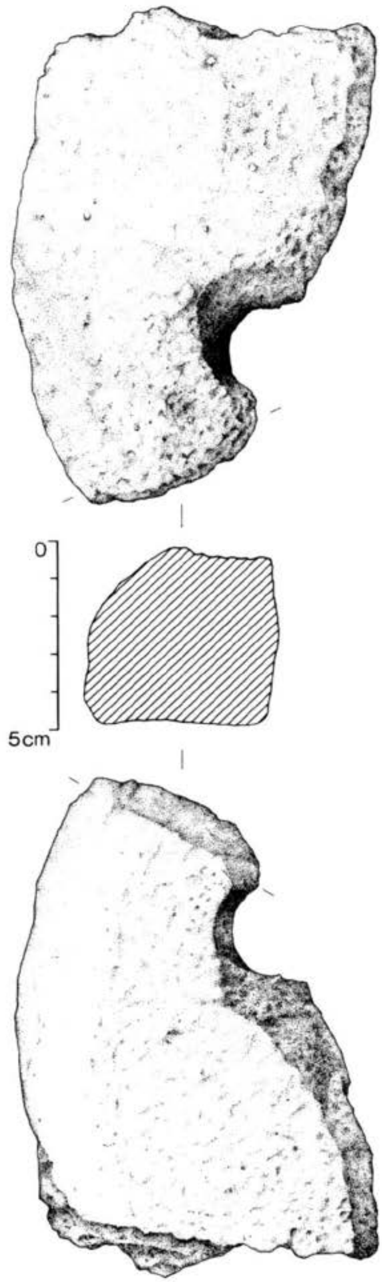


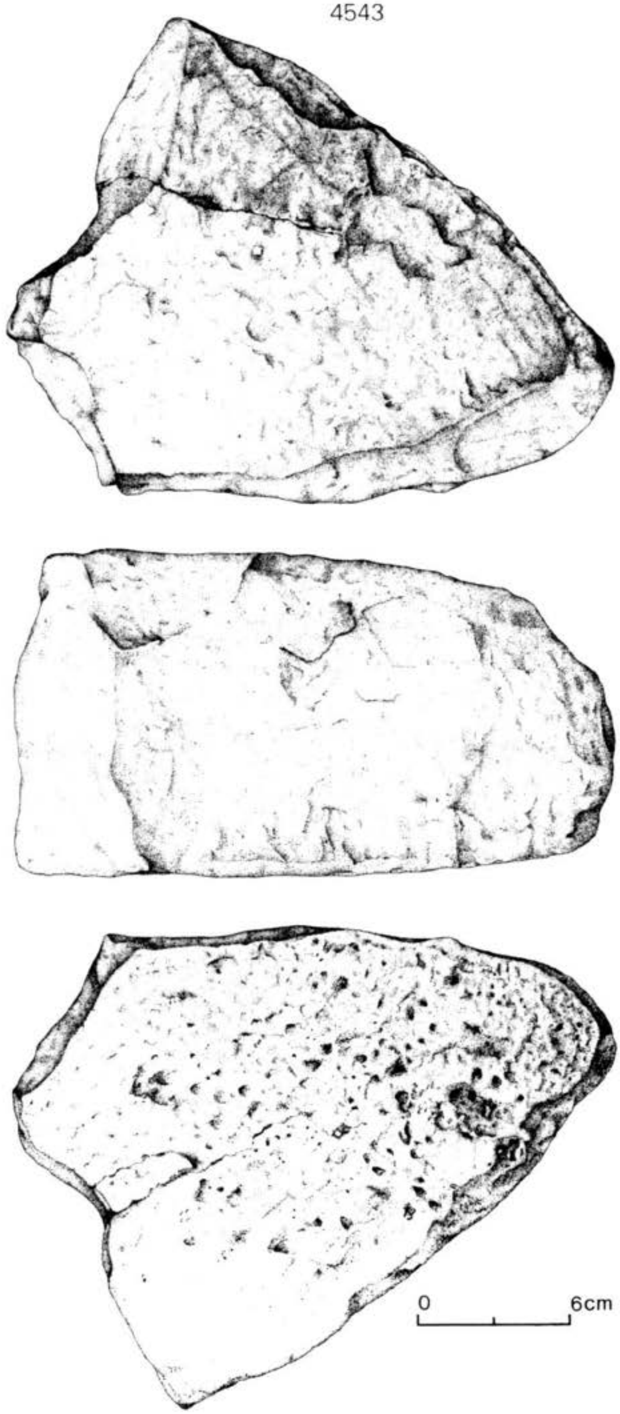
*Fig. 639 (pp. 1323–5) Rotary quern fragments of lava (*4471, 4495, 4508, 4512, 4528, 4533, 4537*) and sandstone (*4540, 4543*). Scale 1:2,* 4543 *1:3*


4512
0 5cm
4537
4533
4528

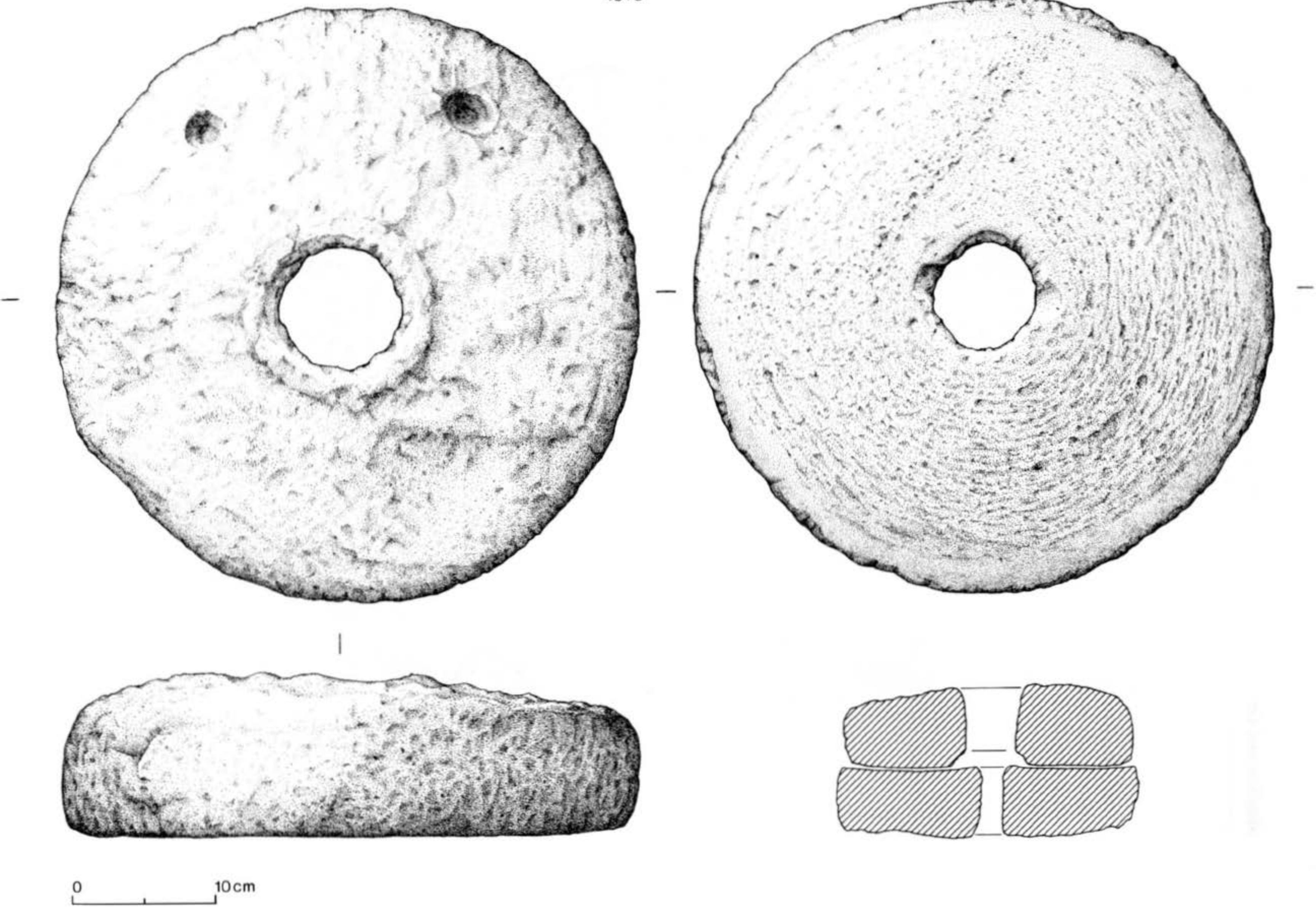
4540

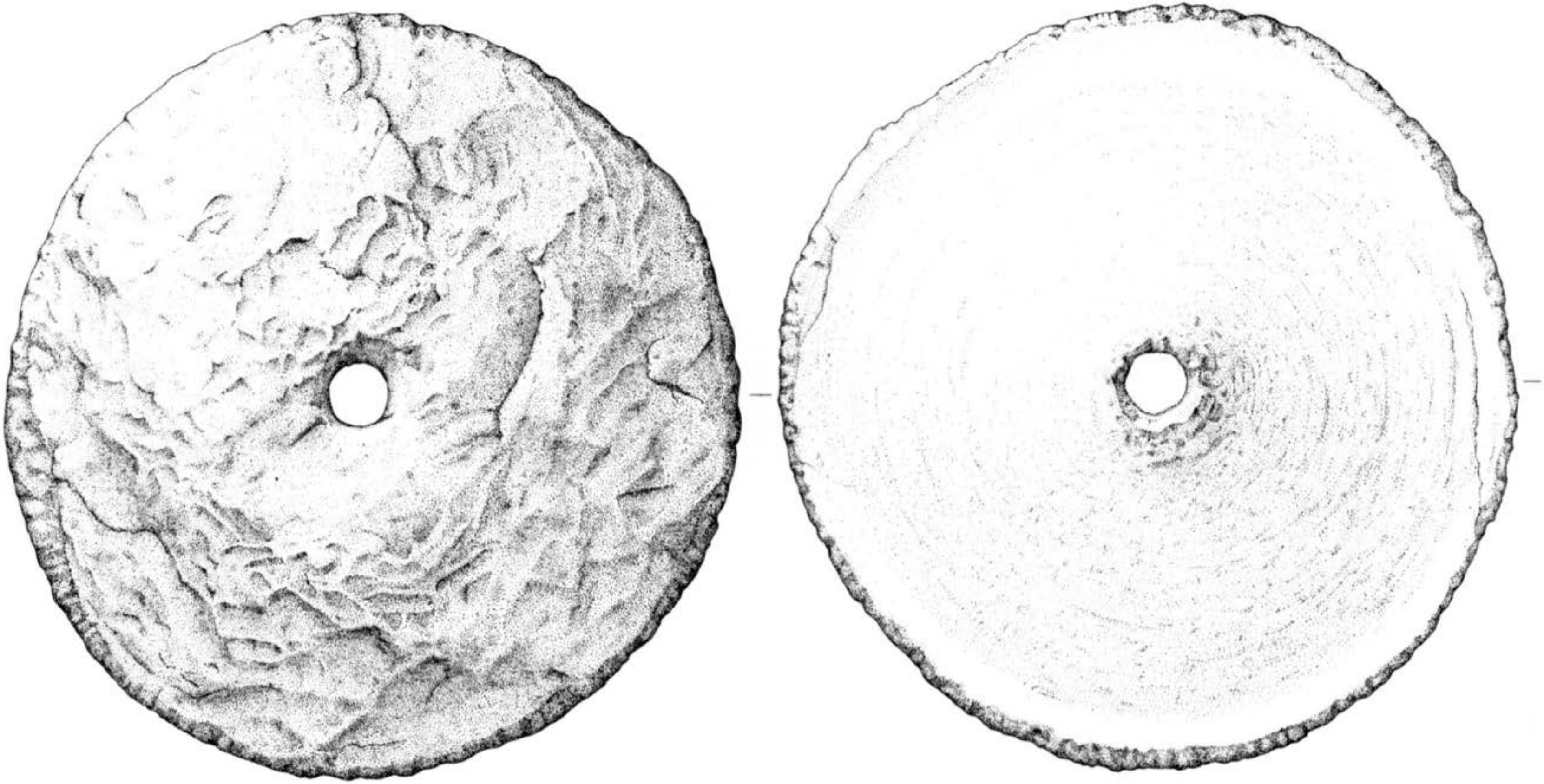


4543



4513





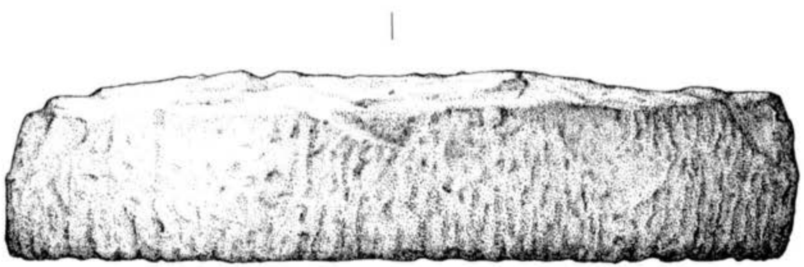


Fig. 640 Complete sandstone rotary quern (4513), comprising upper and lower stone. Scale 1:4, section 1:8

Fig. 641 Pair of sandstone rotary querns (4513) as found on the site. D. 408·8mm (lower stone), 400·5mm (upper stone). Scale unit 0·1m

stone to be centred over the lower stone on a spindle. These wooden rynds do not survive in the archaeological record, but lava quernstones with integral stone rynds have been found at the *emporium* of Dorestad, at the confluence of the rivers Lek and Rhine in the Netherlands (Parkhouse 1976, 185).

4515 is a fragment of upper stone, broken across a vertical handle hole. It was recovered from cemetery soil of Period 4z. Two other fragments, *4540* and *4543*, also from upper stones, were found residually, the former in cemetery soil of Period 6a/b, the latter in the backfill of Period 7a robber trenches in the area of the priory church. All are smooth at the outside edge on their grinding faces, indicating considerable use. Unlike all the other pieces found residually, *4543* is a very large quern fragment. It is unlikely to have been used as a quern in the medieval period, however, since prohibitions against hand-querns came into force during the 12th century, following the introduction of water-mills, and they quickly ceased to be used (Biddle and Smith 1990, 882–3). Thus it seems likely that *4543* was in use during the 11th or 12th century occupation of the site, and that it was later found and re-used — perhaps for backfilling — during the 16th century demolition of the priory.

Dr G.D. Gaunt comments on the sandstone querns:

> Apart from *4543*, all are made of partly coarse-grained sandstones, typically found in the Millstone Grit sequence of the Pennines. The nearest outcrops of Millstone Grit sandstones to York are between the Thorner and Follifoot areas, but more distant sources farther north, adjacent to tributaries of the River Ouse such as the Ure and the Skell, may have been utilised to take advantage of river transport.
>
> *4543* is a fine- to (slightly) coarse-grained sandstone containing flattish voids suggestive of shelly-fossil moulds. An appreciable number of lithologically closely comparable quern fragments, in some of which the moulds are recognisably of Jurassic marine bivalves, have been found at Wharram Percy in the Yorkshire Wolds. The source of these fragments is provisionally identified as a crinoid-poor facies of the Crinoid Grit, part of the Middle Jurassic Scarborough Formation in the Hambleton and Howardian Hills. *4543* will have the same provenance.

Few of the quern fragments are large enough to allow estimates of the original diameters to be made. The larger fragments *4503, 4505, 4512–13, 4515* and *4543* are remarkably standard, all being approximately 400–420mm across. These dimensions fall within the 380–440mm range recorded from Flaxengate (Mann 1982, 55), but are considerably smaller than those found at 6–8 Pavement in York, which varied from 480–520mm (*374–7, AY* 17/3), and those from Dorestad, which averaged c.500mm (Parkhouse 1976, 182–6). Lava appears to have been used exclusively for quernstones on the site during Period 3, sandstone querns being found only in Period 4 and residually in later contexts. The superiority of lava over other locally available stone for grindstones may account for its exclusive use in the Anglian period at Fishergate, but the presence of imported querns may also reflect the trading function of the site.

Lava querns were traded in large quantities throughout north-western Europe; there is evidence that roughed-out querns were shipped from the quarries in Mayen up the Rhine to Dorestad, where they were finished off before being exported to England and Scandinavia (Parkhouse 1976, 186). They have been recovered from many middle and late Anglo-Saxon sites across Britain, including Ipswich, London (Parkhouse 1977, 71), Southampton (Addyman and Hill 1969, 78, fig.32, 1), Lincoln (Mann 1982, 21–2, fig.20), and Winchester (Biddle and Smith 1990, 882–3, figs.267, 269). Anglo-Scandinavian sites in York have also produced quernstone fragments of lava (p.74, *AY* 17/3) and sandstone (*374–7, AY* 17/3; *682, AY* 17/4).

Metal vessel fragments (Fig.642)

A decorative fragment of copper alloy sheet and an iron suspension loop were found, both of which may originally have been attached to wooden buckets.

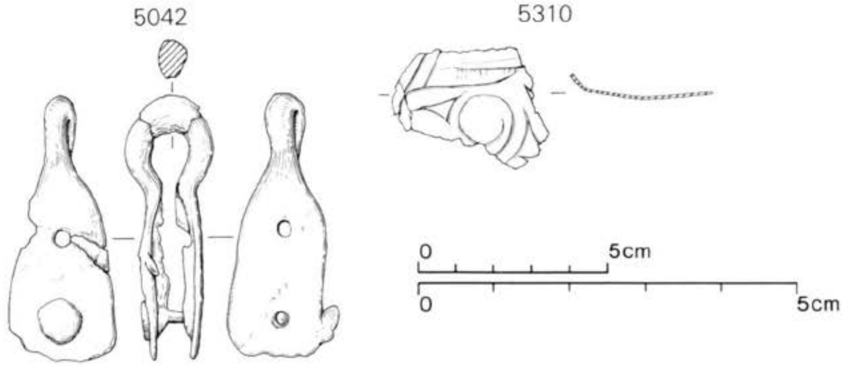


Fig.642 Metal vessels: iron suspension loop (5042), scale 1:2; copper alloy vessel fragment (5310), scale 1:1

5310 is a small, irregularly shaped, fragment of copper alloy sheet. All its edges have been roughly broken, one across a tiny perforation, and one face has incised decoration. The pattern incorporates a spiral, curving lines, and a small area of hatching, which together form a design similar to that on a decorated bucket found in a grave at Birka (Arbman 1940, Tafs.203–4). That wooden bucket was covered in decorated copper alloy sheet, and the design on *5310* closely resembles the upper and middle zones of decoration on the bucket. These contain spiral-hipped birds within vine bushes and vine scrolls, the vine scroll decoration indicating a probable Northumbrian origin for the bucket (Youngs 1989, 121–2, pl.120). Although found in a 9th century grave, the bucket was probably made in the 8th century (ibid.). *5310* may derive from a similar vessel, in use during the Anglian period on the site, although it was found residually in a Period 6b occupation deposit.

Found in a Period 4z feature, *5042* has a U-shaped loop, each end flattened into a broad plate with two rivet holes. One surviving rivet still joins the two plates. This fitting could have been riveted to either side of a vessel rim, so that the handle terminal could be attached to the loop. A similar fitting was recovered from 16–22 Coppergate (*3545*, *AY* 17/6).

Flesh hook (Fig.643)

5043, which comes from a Period 4d pit, is a two-pronged iron flesh hook, an implement used primarily to remove meat from cooking vessels placed over fires. It has a tang, which would have been hafted into a wooden handle, and the tips of both prongs form hooks. This type of flesh hook, with two or three prongs split from the same tang, originates in the late Anglo-Saxon period and continues in use until the 13th century (Goodall 1980a, 159, fig.111). A three-pronged example was found on the Lloyds Bank site, 6–8 Pavement, York

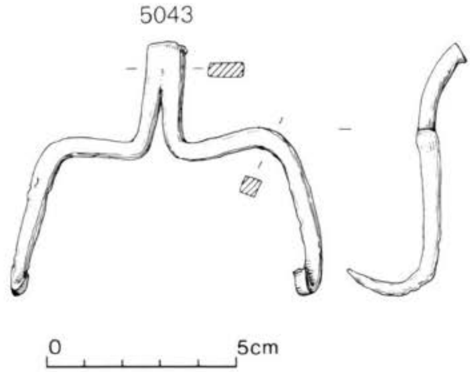


Fig.643 Iron flesh hook 5043. *Scale 1:2*

(*428*, *AY* 17/3), and others have been found in 10th/11th century levels at Thetford (I.H. Goodall 1984, 95, fig.133, 193–5) and Goltho (Goodall 1987, 183, fig.159, 119).

Glass (Figs.644–9)

By Dr J.R. Hunter and C.M Jackson

Introduction

The excavations at Fishergate produced over 1100 fragments of glass (not including medieval painted window glass) from the various periods of occupation represented, from Roman to post-medieval times; of this, approximately 25% can be confidently attributed to vessels, window glass or glassworking waste of the Roman or Anglo-Saxon periods. As is common on most deeply stratified sites, this material contains a substantial residual component; it is also highly fragmentary, most of the pieces lacking traces of decoration or even basic form. This inevitably limits the overall interpretation of the assemblage, although the use of quantification methods and physical analysis (Inductively Coupled Plasma Spectrometry — ICPS) goes some way to complement the relatively small typological data set available (see pp.1339–42).

Discussion of the vessel glass

Analysis of the vessel fragments which exhibit diagnostic features reveals a broad cross-section of rims, bases and other prominent elements (Table 118); there seems to be no significant bias in the parts of vessels represented. Rims and bases together constitute 14% of the identified vessel fragments by count.

Rims (Figs.644–6)

Of the 28 rims recorded, thirteen were Roman, though none came from contemporary Roman contexts. Fifteen rims could be ascribed to the Anglo-Saxon period on the basis of typological criteria. Eleven of the fifteen derived from residual contexts ranging from Period 4 to Period 8 (11th–19th centuries).

Roman rims

In common with the rest of the assemblage, rims were in general small and awkward to classify, a difficulty compounded by heat distortion on a number of fragments. It was nevertheless possible to identify vessels with cut rims including *4674*, possibly from a colourless 4th century segmental bowl, *4687*, which belonged to the neck of a thick-walled blue-green vessel, and *4635*, from a yellowish-green 4th century cup or beaker decorated with applied bands and blobs (Isings Form 96 or 106). Another possible cup fragment is *4676* which may be part of a cylindrical cup with double base ring (Isings Form 85), belonging to the late 2nd–early 3rd centuries. *4670* and *4692* are probably from a folded rimmed bowl or jar, and *4683* from a small open-lipped flask of 1st to 2nd century date; *4675* is also from a flask or jar, while *4682* comprises part of the rim and handle of a bath flask (Isings Form 61). *4684* is an example of a late 1st to early 2nd century blue-green bottle, showing evidence of a rim with attached handle fragment. *4634*, a fragment of deep cobalt blue, may be from a 1st century cast plate; *4702–3* are fragments from unidentifiable vessels.

It is difficult to date assemblages of this character, but a spread of material between the 1st and 4th centuries is indicated by several fragments of the 1st to 2nd centuries, for example *4634, 4670* and *4683*, and the 4th century decorated beaker *4635*.

Table 118 Distribution of Roman and Anglo-Saxon rims, bases and handles by period

Period	Rims	Bases	Handles
2	–	–	–
3	13	4	–
4	8	–	–
6	6	4	2
7	–	–	–
8	1	–	–
Unstrat.	–	1	–

Anglo-Saxon rims

Despite the degree of residuality evident from rims of Anglo-Saxon type, the fifteen examples identified conform to assemblage groups known from elsewhere, particularly Saxon Hamwic (Hunter 1980; Hunter and Heyworth forthcoming). The majority are of a characteristic blue-green colour and exhibit folded or tubular rims characteristic of the palm cup/funnel beaker series which can be dated to the middle to later Anglo-Saxon periods, the 7th to early 10th centuries. Within this series, palm cup types tend to be identified by thick tubular rims of which *4695* is a typical example. There is a tendency for the rims to develop a narrower profile, while retaining the cavity, and for the lip to become outsplayed in the funnel beaker proper. This interim stage is possibly evident in three examples, *4696–7* and *4699*, the last of these being of an unusual dark green colour. The estimated rim diameters, between 90 and 110mm, accord with those from other sites (e.g. Hunter 1980, 69). A further example, *4694*, lacks the tubular rim, but appears to show a suitably splayed profile.

An example of a typical funnel beaker form with thickened folded rim, smoothed on the inside, can be seen in *4693*; it is well paralleled at Southampton. The final developed form,

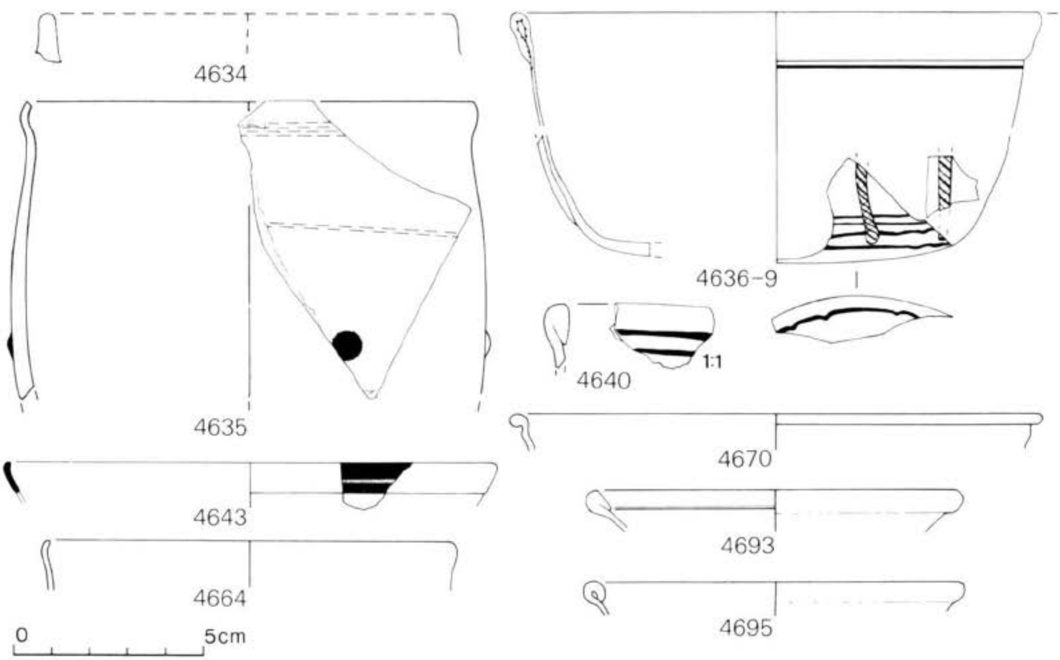


Fig. 644 Vessel glass: rims, Roman (4634–5, 4670) and Anglo-Saxon (4643, 4664, 4693, 4695). 4636–9 is a blue-green bowl of the Valsgärde type. The decoration on 4636–7 occurs on the inside of the folded rim and must therefore have been applied prior to folding. Scale 1:2, 4640 1:1

usually with a thinner, rounded rim, appears in three examples, *4664–5* and *4701*, two of which are of light green glass. This characteristic shade of light green has been noted from the Southampton material where the fragments fall into either light blue or light green categories, and where the question of colouring has been investigated analytically (Hunter and Heyworth forthcoming). The colours of the Fishergate palm cups/funnel beakers conform to those observed elsewhere. A fourth fragment, *4704*, of thin light blue glass, shows a narrow tubular rim which might be viewed as leading to this final stage. These latest examples of the sequence are invariably also characterised, as here, by a fully outsplayed lip and narrow body profile. A final late example, *4643*, shows a narrow, rounded rim of blue glass approximately 10mm deep, applied to an apparently colourless vessel. This unusual piece is paralleled in Scandinavia at both Helgö (Holmqvist 1964, 256) and Birka (Arbman 1943, pl.190.1) (see Fig.612).

Apart from fragments of the palm cup/funnel beaker series, three other vessel forms may be identified. One fragment, *4698*, a dark blue-green heat-distorted example with rounded rim, may originally have exhibited applied horizontal trails and would seem to belong to a tall beaker vessel style which was already established by the 7th century (Harden 1956, 141, VIII).

A blue-green bowl of the Valsgärde type (e.g. Arwidsson 1932, pl.XIV) is represented by the six fragments *4636–9*. This has a thick rim folded to a depth of 16mm and is decorated with horizontal opaque white marvered trails and applied vertical reticella rods. It is interesting to note that the marvering occurs on the **inside** of the folded rim and so must have been applied prior to folding. The Valsgärde bowl, from Gamla Uppsala parish, Uppland, Sweden, was recovered intact from boat grave 6 together with two claw beakers. Semi-spherical in form, with a height of approximately 63mm and a rim diameter of 135mm, the bowl is characterised by a thick folded dark green rim, horizontal opaque yellow marvered trails set below the rim, and a decoration of applied bands of reticella rods (Arwidsson 1932). These rods are the same colour as the vessel (light blue-green) and contain opaque yellow spirals. A band of four rods is applied horizontally 30mm below the rim, and the lower body is decorated with 48 single vertical rods terminating at the base. The similarity with the Fishergate fragments lies in the vessel form, thick folded rim and general application of the reticella rods. The Valsgärde piece is more ornate, and probably of better quality than the Fishergate pieces, although all clearly belong to the same genre. Bowl fragments like these appear only rarely, for example at Saxon Hamwic (Hunter 1980, 69, fig.11, 2, 8); they seem to represent one of the few non-funnel beaker types being produced at the time.

The final rim, *4640*, shows a folded profile of opaque red glass decorated with horizontal yellow marvered trails. The profile and narrow diameter suggest a squat jar type of vessel. The phenomenon of opaque red glass has been the subject of detailed discussion elsewhere (Hunter and Heyworth forthcoming) and indicates great expertise, both in the selection of raw materials and in the technical process itself. *4640* is therefore a piece of particular interest.

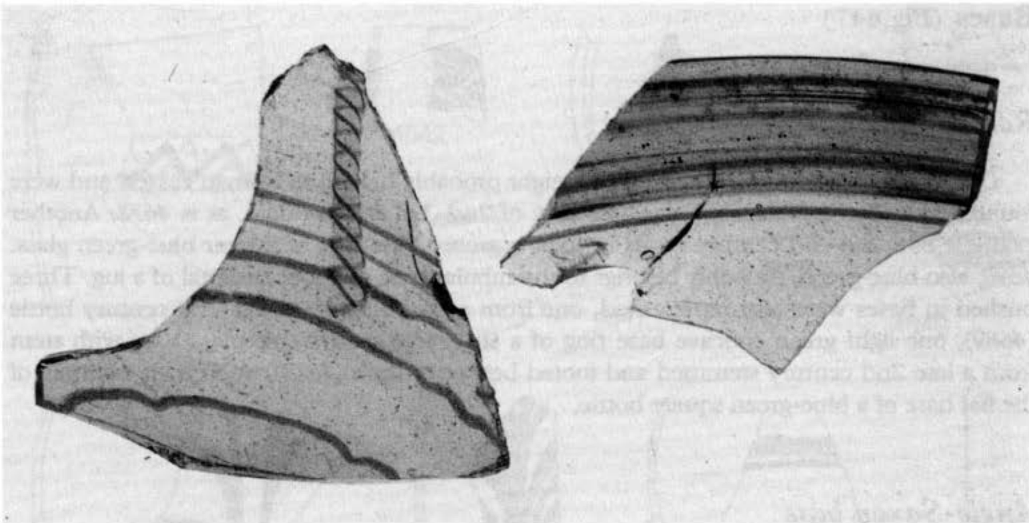


Fig. 645 Rim and base fragments (4637) *from the same glass bowl. L. 52mm (rim), 46mm (base)*

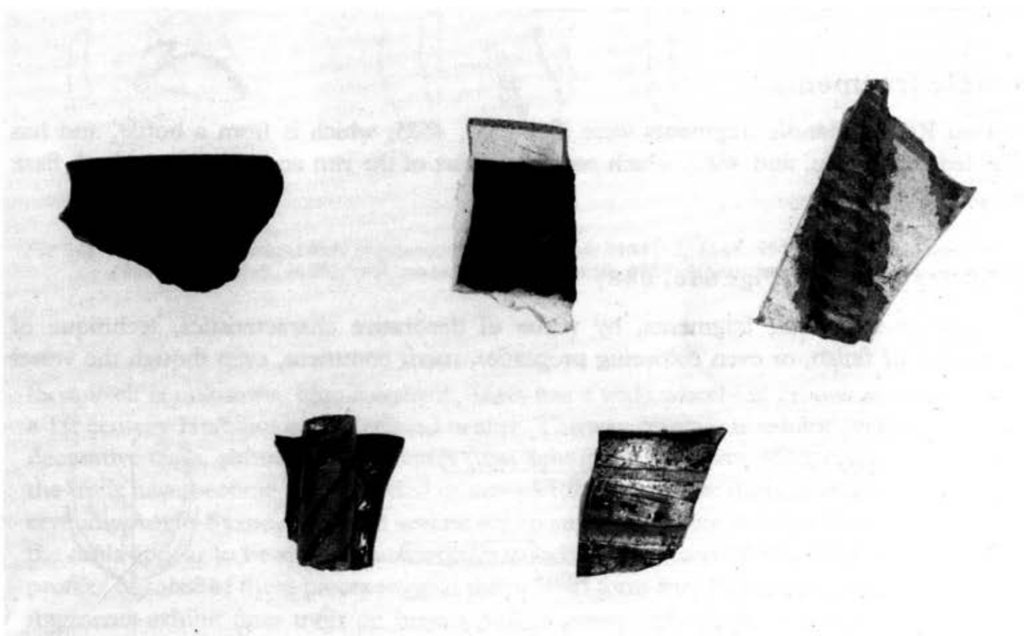


Fig. 646 Decorated body and rim fragments: (l. to r. top) **4640, 4642, 4644;** *(l. to r. bottom)* **4647, 4648.**
L. (largest) 16·7mm

Bases (Fig.647)

Roman bases

Of the nine base fragments recovered, eight probably belong to Roman vessels and were found residually. *4677* is a tubular base ring of 2nd–3rd century date, as is *4678*. Another example of a 2nd–3rd century vessel is *4688*, a grozed base ring of thicker blue-green glass. *4690*, also blue-green, probably belongs to the tubular base of a foot pedestal of a jug. Three pushed-in bases were also represented, one from a thin blue-green 1st–2nd century bottle (*4689*), one light green concave base ring of a jar (*4669*), and a colourless base with stem from a late 2nd century stemmed and footed beaker or flask (*4673*). *4686* is an example of the flat base of a blue-green square bottle.

Anglo-Saxon base

Only one piece of Anglo-Saxon glass, *4691*, appears to be represented among the bases — a partial base from the palm cup/funnel beaker series belonging to the earlier rather than the later part of the sequence. This blue-green piece, with a rounded rather than a flat base, also exhibits mould-blown ribbed decoration.

Handle fragments

Two Roman handle fragments were identified: *4685*, which is from a bottle, and has moulded decoration, and *4682*, which comprises part of the rim and handle of a bath flask (see p.1332).

Body fragments (Figs.646, 648)

Many of the vessel fragments, by virtue of decorative characteristics, technique of production or finish, or even colouring properties, merit comment, even though the vessel

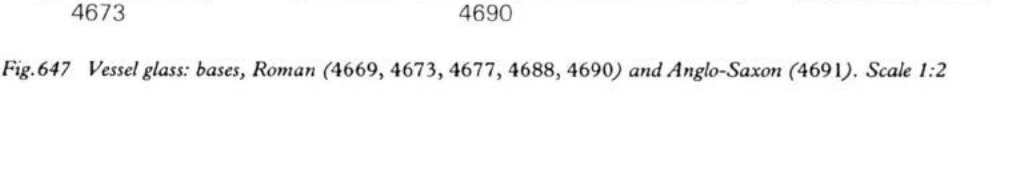


*Fig.647 Vessel glass: bases, Roman (*4669, 4673, 4677, 4688, 4690*) and Anglo-Saxon (*4691*). Scale 1:2*

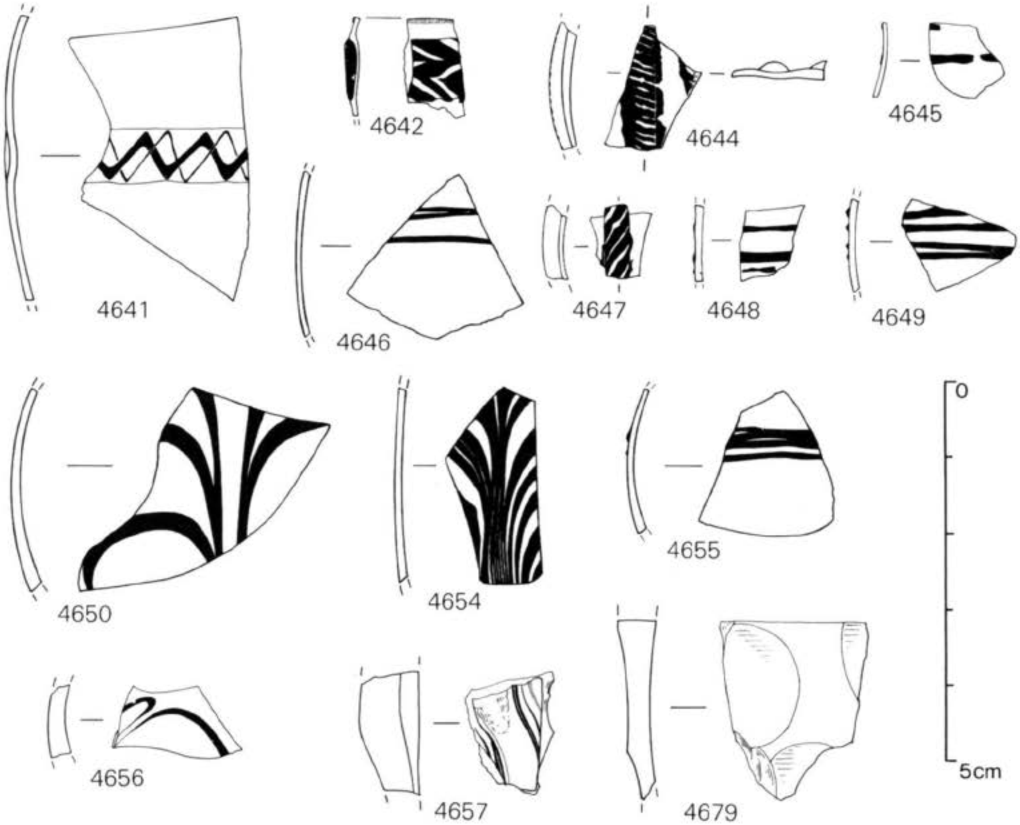


Fig.648 Vessel glass: decorated body fragments, with reticella rods (4641–2, 4644, 4647, 4657)*; with marvered trails* (4645–6, 4648–9, 4655)*; with combed marvering* (4650, 4654, 4656)*; faceted* (4679)*. Scale 1:2*

form itself is unknown. One fragment, *4660*, has a wide wheel-cut groove and may be from a 1st century Hofheim cup or related beaker. Thirteen fragments exhibit evidence of applied decorative trails, although in two cases (one light green fragment *4666*, one colourless *4681*) the trails have become badly eroded or completely lost. These thirteen fragments are almost certainly Anglo-Saxon, although several are so small that there is scope for doubt. Several of the trails appear to be applied horizontally to light blue vessels (*4705, 4709, 4712, 4714*); the profiles of some of these pieces suggest that a bowl form may be represented. The remaining fragments exhibit finer trails on brown, yellow-green, light green, colourless and light blue vessels (*4659, 4661, 4671, 4680, 4708* respectively). Two fragments, one bright blue (*4658*) and one bright green (*4663*), bear horizontal trails which have merged into the vessel wall. All thirteen pieces can be paralleled with decorative types known from the middle Anglo-

Saxon period; only six, however, are stratified from Period 3, the remainder occurring residually.

Coloured marvered trails and reticella rods now probably represent the most commonly used decorative feature on glass from middle Anglo-Saxon contexts. Reticella glass involves the winding of narrow coloured trails around a thin glass rod which was then applied as decoration to the vessel wall. The finished wares seem to be of high quality and technical accomplishment; a possible workshop has been identified in Denmark (Callmer 1982, 150). Sixteen body fragments with these forms of decoration were recovered (*4641–2, 4644–57*), of which four were from Period 3 contexts and the rest residual.

Seven items show characteristic opaque yellow marvered trailing, almost certainly applied horizontally, probably near the rim of the vessel. The trailing was characteristically uneven and applied to light blue vessels *4651–2* and *4655*. Three examples (*4646, 4648–9*) are on light green vessels. A final example, *4645*, shows broken opaque yellow marvered trailing applied to an opaque vessel. Opaque yellow marvered trailing is often characteristic of vessels which also bear applied reticella rods. The combination was seen on three (*4642–3, 4647*) of the five fragments with reticella rods. *4644* and *4647* show rods applied to light green vessel forms, the rods themselves being wound with opaque yellow spirals. In the case of *4644*, the spiral marvering has spread into the vessel wall itself. A further example, *4642*, shows a band of three reticella rods marvered into the surface of a colourless vessel; there are opaque white spirals around dark red rods. The surfaces of the rods lie flush with the metal surface which also bears an opaque yellow marvered trail. *4641* is a particularly fine example of the brown bowl form; a reticella trail has been marvered flush into the vessel wall to a width of approximately 10mm, the spirals being of alternate thick and thin opaque white glass. *4657* probably represents the end of a reticella trail, perhaps from the base of the vessel. Both vessel and trail are predominantly of a turquoise blue glass with the trail bearing alternate spirals in opaque yellow and opaque red glass.

The remaining pieces in this group show a different facet of the marvering technique, namely the use of combed festooning. One of these, *4656*, may belong to the reticella vessel *4657* (see above); the unusual turquoise blue colouring is identical. The last three items, *4650, 4653–4*, probably belong to light blue jars or small bowls, possibly all to the same vessel. All exhibit carefully combed marvering, although *4653* appears to have been subjected to heat. These fragments emphasise the presence of high-quality wares within the assemblage; parallels are few, but include pieces from Southampton (Hunter 1980, 70).

A wide range of colour was also present in a number of pieces not exhibiting other decorative or technological attributes. Nine of them were a bright turquoise blue (*4715–23*), the majority from extremely thin-walled, finely blown vessels; *4722* exhibits numerous bubbles. A further thicker-walled example, *4724*, was of cobalt blue. The other items consisted of five fine, light brown fragments (*4725–9*), and a bright green fragment, *4662*. Unfortunately, none of these fragments was sufficiently large to enable any other observations to be made.

Table 119 Uncatalogued Roman and Anglo-Saxon body fragments by period (vessels unidentified)

Period	Uncatalogued Roman body fragments	Uncatalogued Anglo-Saxon body fragments
2	3	–
3	48	7
4	32	6
6	36	12

Note: One fragment of Roman bottle glass was also found in an unstratified context

The technological characteristics of several pieces added to their decorative appeal, notably *4679*, an example of a Roman faceted vessel of the 2nd or 3rd century, and seven other examples, some of which probably belong to Anglo-Saxon mould-blown jars. These exhibit ribbing characteristics best illustrated on a squat jar from Gotland (Nerman 1969–75, pl.85). Three of the Fishergate fragments are light blue (*4706, 4713*), one is light green (*4668*) and one is light brown (*4727*). Squat jars are often highly coloured, as seen in the dark green and purple examples from Southampton (Hunter 1980, 70). Another ribbed fragment (*4667*) may be of Roman origin. Of the final three pieces, two seem to be vessel fragments which have been grozed (*4707, 4711*), the latter being a Roman bottle fragment. This phenomenon is occasionally identified at other sites and suggests a shortage of glass for glazing purposes. The final piece, *4710*, also indicates re-use and is probably a sherd of Roman window glass which has been heated and moulded to the shape of an implement. The edges are flame-rounded but no wear marks are evident. Of these ten pieces which exhibit technological characteristics appropriate to known Roman or Anglo-Saxon vessel types, only four were recovered from contemporary contexts; the remainder are residual.

Apart from the vessel glass already mentioned, many other body fragments of various colours could be identified as Roman or Anglo-Saxon, although the vessel forms from which they derived could not be recognised. These body fragments are listed in Table 119.

Results of the analytical investigation of the vessel glass

Seventy-five of the Fishergate fragments were sampled for analysis, selection being made according to criteria of period, colour or typological characteristics. They included both Roman (26) and Anglo-Saxon (22) fragments, defined according to typological and/or contextual criteria. The remaining fragments were medieval and will be published in Rogers, *AY* 17 in prep. In each case sampling required the careful removal of approximately 100mg of the fragment; care was taken to avoid any decorative elements which might contaminate the analytical data.

Table 120 Means and standard deviations for analyses of chemical composition of Roman and Anglo-Saxon glass

	Roman glass %	Anglo-Saxon glass %
Al_2O_3	2.41 ± 0.28	2.51 ± 0.20
Fe_2O_3	0.65 ± 0.30	0.75 ± 0.17
MgO	0.58 ± 0.14	0.68 ± 0.09
CaO	6.72 ± 0.85	7.01 ± 0.45
Na_2O	18.23 ± 1.58	17.79 ± 1.49
K_2O	0.82 ± 0.29	1.00 ± 0.37
TiO_2	0.11 ± 0.11	0.12 ± 0.02
P_2O_5	0.12 ± 0.04	0.14 ± 0.03
MnO	0.41 ± 0.37	0.56 ± 0.35
Pb	0.03 ± 0.02	0.19 ± 0.31
Sb	0.20 ± 0.17	0.22 ± 0.14
	ppm	
Ba	231 ± 54	294 ± 79
Co	17 ± 39	12 ± 6
Cr	24 ± 11	26 ± 8
Cu	141 ± 210	2168 ± 5417
Li	9 ± 4	16 ± 5
Ni	17 ± 4	19 ± 4
Sc	2 ± 1	2 ± 1
Sr	416 ± 45	441 ± 31
V	18 ± 8	21 ± 5
Y	8 ± 1	9 ± 1
Zn	33 ± 13	272 ± 963

Note: The distributions for Cu and Zn are not normal

Various authors have turned to physical investigation in glass studies in an attempt to clarify provenance and/or date (Sayre and Smith 1961; Sanderson and Hunter 1980; Jackson et al. 1990); recent studies have demonstrated the need to undertake analysis across a full range of major, minor and trace elements (Jackson et al. 1991). Here, in order to supplement information gained from typological assessment, a programme was initiated using ICPS, a wet chemical technique which allows the determination of a relatively large suite of elements simultaneously (Thompson and Walsh 1981; Heyworth 1991).

The mean values for the Roman and Anglo-Saxon pieces are listed in Table 120 and show that both groups are of the durable soda-lime-silica type.

Although some minor inconsistencies are evident, there appears to be no diagnostic difference in the chemical composition, for those elements analysed, between the glass assigned to the Roman period and that assigned to the Anglo-Saxon period. This was further supported by statistical analysis. Using this data, therefore, it is almost impossible to identify the period of a vessel on the basis of its composition. This may point to continuity in the glass manufacturing and/or trade which supplied York throughout the period represented by the material analysed.

However, glass production is a complex process in which numerous factors can influence the final composition, and it might be noted here that the data comprise glasses of different form, quality and colour, including blue-green, light blue and green, turquoise, colourless, dark green and brown fragments. It is possible, therefore, that potential discriminants between the two groups may have been masked by the different chemical constituents added to the glass as part of the colouring, decolouring or purifying process. Removal of the strongly coloured glasses here allows for a more direct compositional comparison between colourless and blue-green glasses, colours which are common to both periods.

Forty fragments were analysed on this basis, 23 Roman (including three colourless) and seventeen Anglo-Saxon (including five colourless). The small sample size of the colourless fragments should be borne in mind when interpreting the data. The blue-green glass does not separate according to period but, as Table 121 suggests, the colourless glass can be identified in two discrete groups; this is also evident statistically from the use of discriminant analysis. Previous work at Bradford on Roman glass from York, Mancetter (Warwickshire) and Leicester (Jackson et al. 1990) suggests that the main decolouriser used was antimony (Sb); this also seems to be true of the Roman glass at Fishergate. By contrast, however, it appears that manganese (Mn) is being used in the Anglo-Saxon period in addition to antimony.

Table 121 Means and standard deviations for analyses of chemical composition of Roman and Anglo-Saxon glass of comparable colour

	Roman colourless glass (3 samples) %	Anglo-Saxon colourless glass (5 samples) %
Al_2O_3	2.12 ± 0.47	2.37 ± 0.11
Fe_2O_3	0.32 ± 0.02	0.62 ± 0.20
MgO	0.44 ± 0.06	0.67 ± 0.12
CaO	5.97 ± 1.32	6.97 ± 0.60
Na_2O	19.32 ± 1.03	18.73 ± 1.78
K_2O	0.49 ± 0.05	0.74 ± 0.15
TiO_2	0.07 ± 0.01	0.13 ± 0.05
P_2O_5	0.06 ± 0.01	0.13 ± 0.03
MnO	0.06 ± 0.01	0.14 ± 0.36
Pb	0.01 ± 0.01	0.08 ± 0.09
Sb	0.32 ± 0.27	0.26 ± 0.24

Colourless glass, traditionally viewed as a high-quality ware, may have been produced using a different source material from the other glass items recovered. In the production of colourless glass, selection of raw materials was of paramount importance. The blue-green glass, on the other hand, represents a more common form of glass vessel (blue-green is the 'natural' colour of glass which has no additives), for which the selection of raw materials was less critical. Its production will almost certainly have entailed the addition of cullet which may have had wide-ranging origins. Although the cullet will have conformed to the main compositional type of glass represented (high soda-lime-silica), its varied character has the effect of obscuring any subtleties of compositional change.

The overview, therefore, suggests that colourless glass of both periods was produced with a greater degree of care and that a qualitative difference may be inferred between colourless and naturally coloured glass. From the data presented it is interesting to note that although antimony (Sb) is present in glass from both periods and may have been added as a decolourant, the levels of manganese (MnO), which was also used as a glass decolouriser, appear to be slightly higher in the Anglo-Saxon glass.

Window glass

Fifteen fragments of window glass were identified on the basis of characteristic surface effects. *4730*, *4732–4* and *4736–7* are thick blue-green fragments typical of Roman window glass. *4736* showed signs of grozing, and *4730* and *4733* exhibited flame-rounded edges. All were recovered residually. The other nine fragments (*4731*, *4735*, *4738–44*) were more difficult to classify, in general being less thick, c.3mm as compared to 5–6mm in the Roman examples. *4731*, however, although only 3·2mm thick, appeared to be of Roman type and exhibited some possible grozing. Among the remaining pieces, no window glass of the quality seen at Jarrow, Monkwearmouth or Winchester (e.g. Cramp 1970; Biddle and Hunter 1990) was identified (see Fig.611). The pieces were of poorer metal and finish and did not readily conform to any of the groups classified at Winchester, for example. The likely regrozing of vessels has already been noted, indicating a shortage of glass; these pieces may therefore belong to a later period of glazing towards the end of the durable (or soda-lime-silicate) tradition. By analogy with window glass from elsewhere, *4744* almost certainly fits this category, as may the colourless piece *4740*. The remaining four pieces all came from Period 3 contexts and consisted of a fragment from a blue quarry, possibly of geometric shape and with fine grozing (*4742*), a small grozed light green fragment (*4743*), and a colourless partly grozed piece (*4739*). The final piece (*4735*) also showed evidence for grozing, but appeared to have been distorted by heat.

Waste/other glass (Fig.649)

Several items may indicate the possibility of glassworking activity. The presence of droplet trails *4751–2*, all characteristically dark, and *4745* and *4748*, a colourless droplet and

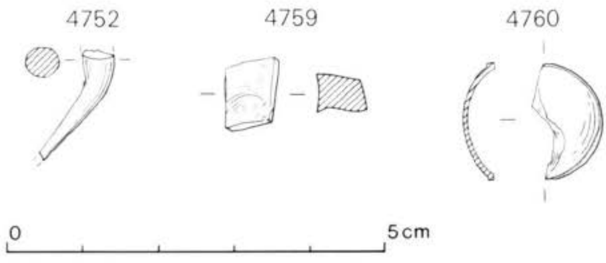


Fig. 649 Other glass: manufacturing waste (4752); tessera (4759); mount (4760). Scale 1:1

trail respectively, suggests the existence of some working process, perhaps the melting down of cullet or glass items for reworking. *4759* is a dark blue tessera, almost certainly of Roman origin. Such pieces are known to have been used in post-Roman glassworking (Theophilus, trans. Dodwell 1961, Book 2, Ch.12) and have been interpreted accordingly in archaeological contexts (e.g. Lundström 1974). A second possible tessera fragment, *4758*, is blue-green in colour.

The presence of fragments of two glass mounts, one green (*4761*) and one a hollow turquoise blue example (*4760*), may indicate a type of item being produced, although both could equally be parts of other imported goods. The majority of pieces in this category appear, however, to represent large lumps of waste or remelted material up to 10g in weight. These had no apparent form and were recovered in various colours, suggesting perhaps that cullet was melted down into coloured units for reworking. Two were light blue (*4746* and *4753*), and three were opaque green (*4747, 4749* and *4755*). The melting down of glass for reworking is technologically simple and seems to have been a widespread practice; material of this type is relatively common, particularly on sites with trading connections which facilitated the acquisition of cullet.

Three further fragments of opaque dark green glass with smoothed outer surfaces (*4750, 4754* and *4757*) may belong to linen smoothers; other examples from the late Anglo-Saxon/medieval periods have been found at Northampton (Oakley 1979, 297–8). The Fishergate pieces come from Periods 4z, 6a and 6a/b respectively, which is consistent with such an interpretation. Linen smoothers are characteristically broad, semi-spherical pieces of solid opaque glass, usually 70–90mm across, giving the impression of a non-durable nature. A final item (*4756*), probably from the neck of a green vessel, shows signs of reworking.

Conclusion

The assemblage of glass fragments from Fishergate provides a useful overview of glass forms available in urban York in the 1st millennium AD. This is perhaps less valuable in the Roman period where the few identifiable types are largely predictable. The later material is a more important addition to the understanding of middle Anglo-Saxon England, and serves to identify York's position within a trade and distribution network which also appears to have embraced Ipswich and Hamwic, on the evidence of excavated material.

The fragments of palm cups/funnel beakers from this site have extended the distribution of this form northwards. Evidence of quality craftsmanship, including festooned decoration and reticella rods, places York within the mainstream trade of north-west Europe at this time. The distribution of types appears to be characteristic of the period — namely a predominance of palm/funnel forms but also a small number of tall beakers, squat jars and bowls paralleled in Harden's original seriation of Anglo-Saxon glass vessels (1956). The Fishergate examples, however, exhibit a wider range of decorative attributes. As far as is known, all the vessels were imported, although the precise location of manufacture is open to speculation. It is interesting to note that the analytical data (see pp.1340–2) suggest a close similarity between Anglo-Saxon and Roman raw materials, although with an important distinction in decolouring elements. A common origin might still be assumed for vessels of the two periods; it certainly cannot be ruled out on the evidence of the analysis of the Fishergate assemblage.

As far as can be interpreted from the nature of the material recovered, almost all the vessel fragments listed may be assumed to have been from vessels used within the town as opposed to representing cullet or a similar raw material for use in a secondary process. The presence of high-quality glass is therefore interpreted as an accurate reflection of its use within urban York during the middle Anglo-Saxon period. The minority presence of waste must, however, attest to the occurrence of reworking at some level. The fact that much of the material was residual means, however, that both the prestige pieces and the reworked items could have been introduced to the site from other parts of York.

The problem of residuality may also have implications for the date range of the material represented; no forms from the early post-Roman period were identified, but this may reflect a bias in the distribution of material at Fishergate rather than reflecting the situation in York as a whole. The same argument might be applied to the low level of window glass recovered. It is difficult to believe that a centre of York's political and ecclesiastical standing could have lacked the high-quality window glass seen at Jarrow, Monkwearmouth and Winchester in the late 7th and early 8th centuries. Those fragments identified probably belong to a slightly later period, and attest to a deterioration in quality which was also evident elsewhere. The occurrence of grozed vessel fragments is an important confirmation of an apparent general shortage of window glass in this period. See also Rogers, *AY* 17 in prep. for a discussion of the absence of significant quantities of later glass.

Personal items

Dress and associated items

Penelope Walton Rogers has studied the raw fibre and textile fragments found on the site and provides the following report:

Sheepskin

Several fragments of an animal skin, *5786*, were recovered from an 8th century level (Period 3a). The fragments were identified as sheepskin from the fibres still rooted in the skin, which H.M. Appleyard has identified by microscopy as sheep's wool. The fleece is only 30mm long, with traces of first-year tips, which suggests that it has come from a lamb.

The quality of the wool is 'hairy medium', according to M.L. Ryder's system of classifying fleece types (Ryder 1969); the fibres are predominantly without pigment (Table 122). When freshly prepared, the skin would probably have resembled that of a young, white-woolled, Cheviot lamb. The skin has evidently seen considerable wear, as the fibre ends are badly abraded, as if rubbed against a hard, rough surface (Cooke and Lomas 1990, 222–3).

Wool of the hairy medium type has been available to British textile workers since the Roman period or earlier (Ryder 1983, 180). It is the raw material of many Anglo-Saxon textiles (ibid., 189; Pritchard 1984, 49) and it makes up 30% of the raw wool recovered from Anglo-Scandinavian levels at 16–22 Coppergate (p.301, *AY* 17/5). Wool from dead animals, some of them lambs, was included in the Coppergate collection (pp.308–9, *AY* 17/5).

There is ample textual evidence that skins and furs were traded and made into garments during the 8th century (Owen 1976, II, 532–3). Sheepskin was also used to line the sheaths of knives. The abrasive wear visible on the Fishergate fragments suggests that this particular skin has been put to some more strenuous use.

Table 122 Fleece type of fibres from skin *5786* (identification derived from measurement of the diameters of 100 fibres; figures in microns)

Range	Mode	Mean	SD	Pearson coeff. of skew and distrib.	Medullas	Pigment	Fleece type
20–52, 73, 75, 76	30	32.8	± 10.5	+0.67 pos. skewed	3%	4%	hairy medium

Raw wool

One small clump of wool fibres, *5787*, comes from a level dated to the first half of the 11th century (Period 4a). The fibres have both roots and tips, indicating that they, too, have come from a dead lamb. The fleece would have been very short, about 20mm. There were too few fibres to allow identification of the fleece type, but the presence of some coarse hairs, over 100 microns in diameter, suggests that the fleece is 'hairy' or 'hairy medium' in type, and, as such, similar to several of the contemporary lambswools from 16–22 Coppergate (p.309, *AY* 17/5).

Textiles

5788, a fragment of coarse wool textile woven in 2/1 twill, was recovered from the same 8th century context as the sheepskin. The remains of a much finer wool textile, probably also in 2/1 twill, was found on the outer face of an iron coffin fitting, *5264*, from the late 11th–12th century cemetery (see p.1433).

2/1 twill was not a common weave before the Norman period. In the early Anglo-Saxon period it seems to have been used predominantly for fine-quality goods, for example, in the comparatively rare pieces from the cemeteries at Sewerby in Yorkshire (Crowfoot 1985, 52), and Spong Hill (Crowfoot and Jones 1984, 25) and Bergh Apton (Crowfoot 1978, 100) in Norfolk. Only in the later collections of the 10th and 11th centuries, such as those from Milk Street, London (Pritchard 1982, 204), Saddler Street, Durham (Crowfoot 1979, 37), and Lower Brook Street, Winchester (Crowfoot 1990, 484), is the weave represented among coarse fabrics as well as fine (see Fig.611 for site locations). By the late 11th century 2/1 twill had become more firmly established in a range of qualities and it remained the main weave for wool clothing fabrics until the mid 14th century (pp.385–6, *AY* 17/5).

The coarse 8th century piece from Fishergate is therefore an interesting addition to the corpus of Anglo-Saxon textiles and one with no clear parallels in the early or middle Anglo-Saxon periods. The finer piece from the coffin fitting (see Fig.704) is, on the other hand, entirely in keeping with its 11th–12th century date. Similar examples, in fine glossy wool yarns, are recorded from 11th–12th century Saddler Street, Durham (Crowfoot 1979, 37), and from 11th century Lloyds Bank, York (p.103, *AY* 17/3). The presence of a good-quality fabric such as this on the outside of the coffin may indicate that it was used as a pall.

Buckles (Figs.650–1)

Three iron (*5044–6*) and four copper alloy (*5311–14*) buckles were recovered. One strap-end plate fragment (*5315*), a second possible fragment (*5316*) and a possible buckle pin (*5047*) were also found.

5045, with its narrow bow and iron plates with copper alloy rivets for the strap attachment, was recovered from the Period 3b charcoal-laden deposit. It appears to be of a type commonly found in the 7th century and is virtually identical to a buckle from a male grave in the Buckland Anglo-Saxon cemetery in Dover, thought to have been used to fasten a sword belt (Evison 1987, 90, fig.20, 33/5). Very similar iron and copper alloy buckles were also found in the Anglo-Saxon cemeteries at Holywell, Suffolk, and Burwell, Cambridgeshire (Lethbridge 1931, 30, fig.13, D; 18, fig.14, D; 48, fig.22, 2), Caistor-by-Norwich (Green 1973, 212, fig.63, 13), Winnall, Winchester (Meaney and Hawkes 1970, 42–3, fig.13, 1), and Garton Slack, Yorkshire (Leeds 1936, 100, pl.XXVIII) (see Fig.611).

The D-shaped buckle *5044* was found in a Period 3b pit. This buckle shape appears to have been very long-lived; it is frequently found in the Roman period (Manning 1985, 147), and continues into the medieval period, when it was the most common type (Goodall

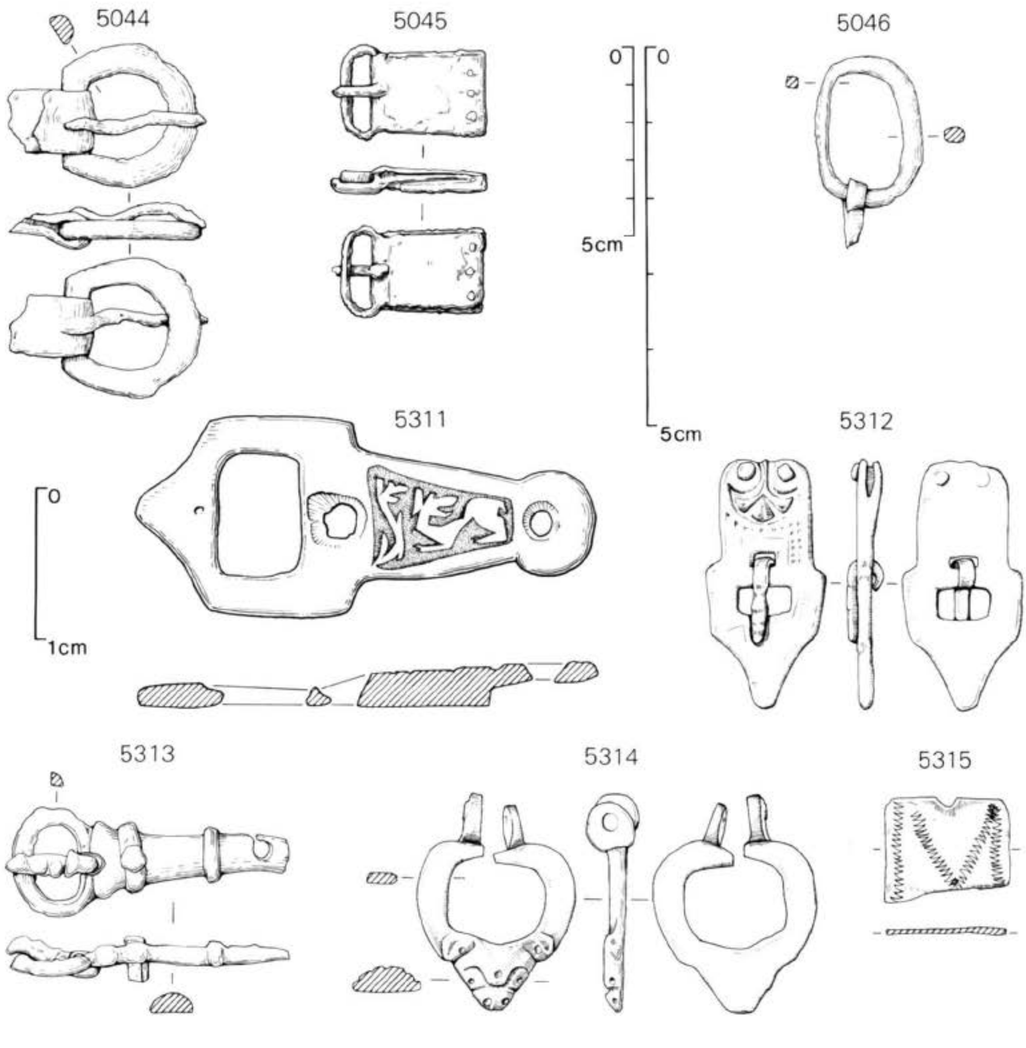


*Fig.650 Buckles of iron (*5044–6*) and copper alloy (*5311–14*); copper alloy strap-end plate fragment (*5315*). Scale 1:1,* 5045–6 *1:2,* 5311 *2:1*

1980a, 171). A similar buckle was found in a middle Anglo-Saxon foundation trench at North Elmham, Norfolk (Goodall 1980b, 516, fig.267, 119).

The third iron buckle, *5046*, derives from a Period 4z pit or post-hole. Suboval in shape, it retains part of its pin. This type has been found previously in 10th–11th century levels at Thetford (I.H. Goodall 1984, 98, fig.137, 244). The identity of *5047* is uncertain, but it may be an incomplete buckle pin.

The copper alloy buckles *5311–14* have each been cast in one piece, and all were found residually. *5311*, from a Period 4z ditch, is unusual. The buckle is subrectangular with a subtriangular projection at the tip, and the strap attachment plate, which tapers to the terminal, is decorated with an engraved stylised animal design. This shows a crouching beast, with its head turned back towards its tail, and possibly a second beast. The field within which the design appears, and the outline of the animal(s), is defined by silver inlay. The crouched animal, with its squarish snout, shaped hip, and speckled body with triangular indentations, made with the point of a graver, is in the Trewhiddle style of ornament (Wilson 1964, 24). This particular design is similar to that on a strap-end found at Whitby, dated to the early 9th century (Peers and Radford 1943, 56–7, fig.11, 7). Indeed, the shape of the tip may itself be an imitation of the tips of 9th century strap-ends, which are commonly formed in the shape of stylised animal heads (Wilson 1964, 62). *5312*, which is silver plated, is very similar in shape, with a projection at the tip, but a squarer terminal to the strap attachment plate. At the terminal, between the rivets, there is a design of pendent leaves. The use of a three-element plant between the rivet holes suggests that these buckles formed sets with standard 9th century strap-ends, which are similarly decorated. The buckles are also of much the same size as the strap-ends. This is important as it confirms that some strap-ends at least were used as parts of buckle sets, if not for belts then perhaps for items such as horse harness or sword baldrics, forming matching sets. A buckle, identical in form to *5311* and *5312*, was found at the old railway station in York in 1845 (*AY* 7/1 in prep.).

The shape of the buckle loop on *5311* and *5312* may be a stripped down form of that used on *5314*, with the animal head on its tip reduced to a protruding triangle. Otherwise *5314* is rather different, with a suboval loop and a prominent animal head in the front, and with two lugs at the open end of the loop through which an iron pin passed and to which the buckle pin and strap attachment plates were presumably joined. This is an unusual design, but a similar example, attributed to the late Anglo-Saxon or early Norman period, was found at Meols, Cheshire (Bu'lock 1960, 25, fig.7g). This buckle is clearly residual, having been recovered from a post-medieval context; comparison with other buckles found at Fishergate indicates that this piece, too, is 9th century, belonging to the earlier part of the date range suggested for the Meols buckle.

5313 comprises a small buckle with a long and tapering strap attachment plate with decorative collars, and two rivets. Buckles of similar shape have been found in an 11th–12th century pit at North Elmham (Goodall 1980b, 503, fig.263, 20), and during the excavation of a late Anglo-Saxon/Norman moated site at Southoe Manor, Huntingdonshire

Fig.651 Iron and copper alloy buckles (l. to r. top 5311, 5312; *bottom* 5313, 5045, 5314*). W. (largest) 24·8mm*

(Lethbridge and Tebbutt 1938, 163, pl.1b). The plate on the Southoe buckle terminates in an animal head which is very similar to those found on 9th century strap-ends, indicating that it may be of late Saxon rather than of Norman date. *5313* was recovered from Period 6b levelling deposits associated with the priory cloister, and is thus clearly residual. Its similarity to the Southoe Manor buckle means that it may tentatively be dated to the later 9th century, in common with the other strap-end buckles found at Fishergate.

Found in a Period 4z grave, *5315* is a buckle plate fragment which would originally have been attached to a buckle. It has been decorated with an engraved design of zig-zag lines, probably created by rocking a chisel or similar tool from side to side as it was moved across the plate. This is known as 'rocked-tracer ornament' (Goodall 1981, 69), or 'walked scorper design' (Oakley and Webster 1979, 250). The earliest-known examples of this decorative technique date from the late 9th/10th century. It has been found on a finger-ring from St Peter's Street, Northampton, thought to date from the late 9th to mid 11th centuries (ibid.), and on a buckle recovered from a mid 10th to early 11th century context at Winchester (Hinton 1990a, 510). This type of decoration is, however, most commonly associated with medieval objects, including strap-ends (e.g. Goodall and Goodall 1977, 148, fig.30, 1). *5316*, a fragment of strip with a rivet in one corner, which may be part of a buckle plate, was also found in the Period 4z cemetery.

Strap-ends (Fig.652)

Strap-ends are relatively common finds on middle and late Anglo-Saxon sites; five have been recovered at 46–54 Fishergate, although one (*5317*) seems to have been intrusive in its context, and all the others (*5318–21*) residual in theirs. These objects were probably attached to the ends of belts or straps. They have been interpreted as the ends of silk ribbons used as book markers (Peers and Radford 1943, 56), but it is more likely that they were used with buckles and other belt fittings, with which they have often been found (Wilson 1964, 63).

The earliest of the strap-ends found at Fishergate is probably *5318*. It is very narrow, tapering slightly from the terminal which is broken on one face, and has three pairs of incised lines decorating the main body of the strap-end. The closest parallels to *5318* are from Portchester, where a similar strap-end was recovered from an 8th to mid 9th century building (Hinton and Welch 1976, 216, fig.136, 52), and Maxey, where the strap-end was found in association with middle Anglo-Saxon pottery (Addyman 1964, 62, fig.17, 1). Both these examples are more angular than *5318*, but the shapes and decoration are similar, and so an 8th or early 9th century date may be postulated for the Fishergate piece. An iron strap-end found at the middle Anglo-Saxon smelting site at Ramsbury in Wiltshire, although broader, is also similar (Evison 1980, 35, fig.20, 6). Two further examples of this strap-end form were found at North Elmham in residual contexts (Goodall 1980b, 503, fig.263, 13–14) (see Fig.611).

Found in a Period 3a ditch or pit, *5317* tapers to a poorly defined animal head at its tip and has been decorated on the main part of the strap-end with stamped crescents and an engraved geometric design, originally filled with enamel which is now decayed. A second strap-end, *5321*, is decorated in a similar fashion, has a similarly defined tip, and also reveals traces of enamel, but it is considerably thicker, and is more rectangular at the terminal. A strap-end found at Ramsbury, Wiltshire, closely resembles these examples (Evison 1980, 34, fig.20, 2). On all three strap-ends, the snout and eye areas of the head are in relief and defined with angular grooves, a design also found on a 9th century strap-end from

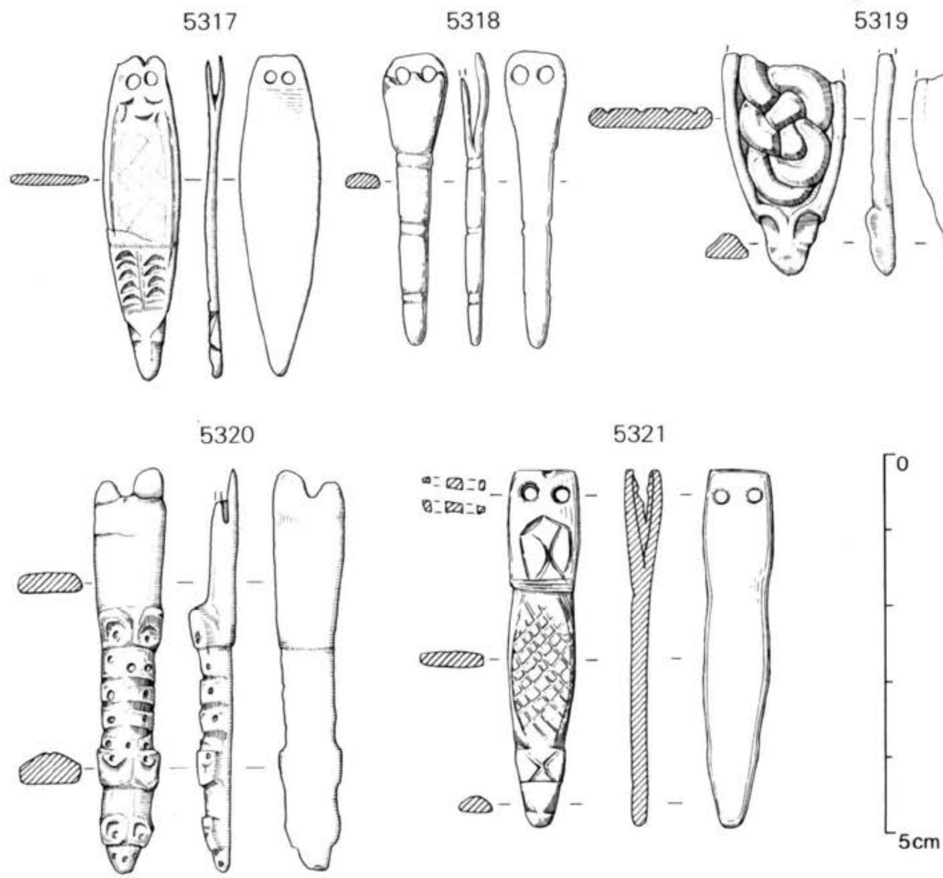


Fig.652 Copper alloy strap-ends 5317–21. *Scale 1:1*

Youlgreave, Derbyshire (Wilson 1964, 203, pl.XLII, 139). This appears to be a 9th century type (ibid., 27), which suggests that *5317* was intrusive in its 8th century context.

The animal head motif appears three times on *5320*, a long narrow strap-end, partially broken across the terminal. The head has pronounced raised ears and a squarish snout at the tip; behind this is relief decoration which resembles two opposed pairs of similar ears and snouts. A number of parallels to *5320* exist; a piece with a similarly narrow form and pronounced head and ears was found, for example, at Cheddar (Wilson 1979, 282–3, fig.95, 90). That strap-end was dated to the 9th century on the basis of its form and context; *5320* is probably of a similar date.

Although incomplete, *5319* is easily recognisable as a strap-end since it tapers from the broken end to the animal head at the tip. Immediately behind the head, the plate is filled with relief decoration of a regular ribbon-interlace pattern. In common with the majority of the strap-ends found at Fishergate, this belongs to the 9th century. A similar interlace pattern appears on a strap-end from Youlgreave (Wilson 1964, 202, pl.XLII, 137). That this piece belongs towards the end of the century is suggested by the rounded form of the tip; the transition from animal head terminal to rounded tip with only vestigial remains of an animal head appears to have taken place at the turn of the 9th and 10th centuries.

Similar strap-ends to those from Fishergate have been found previously in York, at 16–22 Coppergate (Roesdahl et al. 1981, YD36, 38) and St Mary Bishophill Senior (ibid., YD39), as well as at other unrecorded sites in the city (Waterman 1959, 76–7, fig.10, 1–5). Others found in the north of England include twelve recovered from Whitby Abbey (Peers and Radford 1943, 55–8, fig.11), four from Meols (Bu'lock 1960, 10, fig.4a–d), several from Ryther, Yorkshire, and a single example from Dacre in Cumbria (D. Tweddle, pers. comm.).

Belt fittings (Fig.653)

The belt fittings comprise two, or possibly three, belt loops, two strap fittings, and two other fittings of uncertain function, which may be associated with belts or straps. *5048*, found in a Period 3z pit, and *5049*, from a 4z context, are both iron loops, clenched at the tips. Two loops closely resembling *5048* were recovered from a grave at Yeavering, Northumberland, in association with a buckle, and were interpreted as belt loops (Hope-Taylor 1977, 185, fig.87, 2). *5049*, which is incomplete, seems originally to have formed a complete rectangular loop. A third possible belt loop is *5322*, made of copper alloy and found in an unstratified context. A similar loop was recovered from a 10th to mid 11th century deposit at Cheddar (Wilson 1979, 286, fig.94, 51), which may indicate a late Anglo-Saxon date for *5322*. (See Fig.611 for site locations.)

Two small strap fittings of iron, *5050* and *5052*, have been found in Period 3b contexts, both associated with the charcoal deposit. These fittings have a U-shaped loop with flattened ends, and two rivets pass through each end. They are similar in size, but *5050* has lost part of its loop and one of its ends. The rivets survive on both fittings; they have been tin plated all over on *5050* and are made of copper alloy on *5052*. A fragment of a second loop found with *5052* may have been part of an associated fitting.

Fittings of this type have been found in several Anglo-Saxon cemeteries, including Holywell in Suffolk, Burwell in Cambridgeshire (Lethbridge 1931), Dunstable in Bedfordshire (Matthews 1962) and Buckland, Dover (Evison 1987). At both Holywell and Burwell cemeteries, these fittings were found attached to rings and in association with small hasps. In one Holywell burial the fittings were found with the remains of a leather case or pouch (Lethbridge 1931, 39, fig.18, B3), while in a grave at Burwell they were found with a chatelaine (ibid., 65, fig.33, 8). At Buckland, such fittings were found in four graves, all of

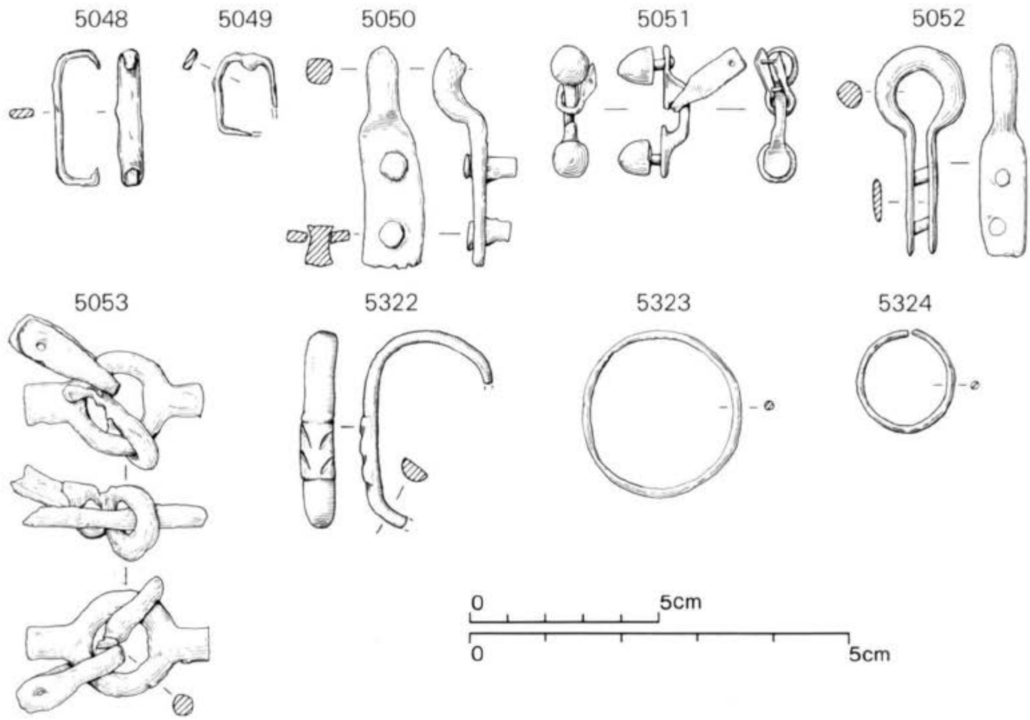


Fig.653 Belt fittings: loops of iron (5048–9) and copper alloy (5322); iron strap fittings (5050–3); copper alloy suspension rings (5323–4). Scale 1:1, 5048–9 *and* 5051 *1:2*

which contained keys (Evison 1987, 117). A male burial at Dunstable was accompanied by a knife which had lost its sheath but retained three looped fittings, evidently used to attach the sheath to a belt (Matthews 1962, 30, fig.2, 2). These examples suggest that the fittings were used to suspend objects from belts or girdles.

Apart from the cemetery finds, early to middle Anglo-Saxon levels at Shakenoak Farm also produced a linked pair of fittings (Brown 1972, 90, fig.39, 175). These examples must date from the late 6th to early 8th centuries (Brodribb et al. 1972, 29), so the Fishergate fittings may be contemporary with their Period 3b contexts.

5051 was also found in the Period 3b charcoal deposit. Conical terminals are pendent from each discoidal end of the bowed stem, which has a small strap fitting, similar to *5052*, attached to it. The precise function of this fitting is unknown, but the terminals may have been pushed horizontally through perforations in a belt so that they were located on its inner face. The bow and its strap fitting would appear on the outer face, thus enabling objects to be hung from the belt.

Another possible belt fitting is the fragmentary *5053*, derived from a Period 4z slot. This is an iron ring with a squared projection on each side and two small strap fittings, each with a single rivet hole, looped through the ring. Again, the function of this fitting is unclear.

Two plain copper alloy rings, *5323–4*, may also have been used as suspension rings on belt fittings.

Enamelled mount (Figs.654–5)

An enamelled mount or fitting, *5325*, was found in a Period 4z pit. It is made of copper alloy, and the top surface of the hollow dome is decorated with the figure of a prancing animal, its head looking back towards its upright tail. The figure of the animal has been picked out by enamelling the field around it with opaque yellow, blue and blue-green glass. The projecting tab is also decorated with an incised semi-chevron and stamped circles.

The device of the 'backward-looking animal' is paralleled on a number of copper alloy disc brooches, found predominantly in East Anglia. Of sixteen brooches of this type described by Smedley and Owles in 1965 (pp.166–78), fourteen had been found in either Norfolk or Suffolk . Until recently, the only examples of the brooches recorded outside East Anglia were found in the south of England, in Oxfordshire (Hinton 1974, 20), Winchester, and Faversham, Kent (Smedley and Owles 1965). In the past few years, however, five have been recorded within the kingdom of Lindsey (K. Leahy, pers. comm.), and the site at 16–22 Coppergate in York produced two examples (Hall 1984, fig.60; Roesdahl et al. 1981, YD11, YD13). The brooches from York currently represent the most northerly known examples.

Although *5325* is not a disc brooch, it clearly has the same origins as these East Anglian brooches. The design of the beast itself is identical, although the orientation of the animal, which is looking from right to left, is opposite to that found on the vast majority of the

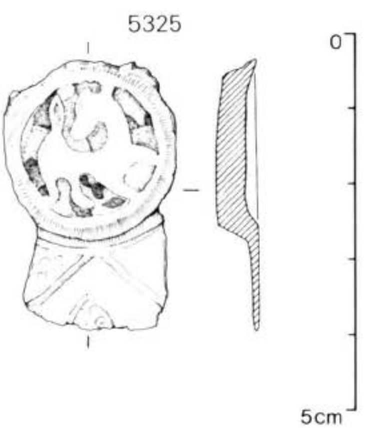


Fig.654 Enamelled copper alloy mount 5325. *Scale 1:1*

Fig. 655 (top left) Enamelled copper alloy mount, 5325. L.36·4mm

Fig. 656 (above) Gold mount fragment, 5440. D.5·2mm

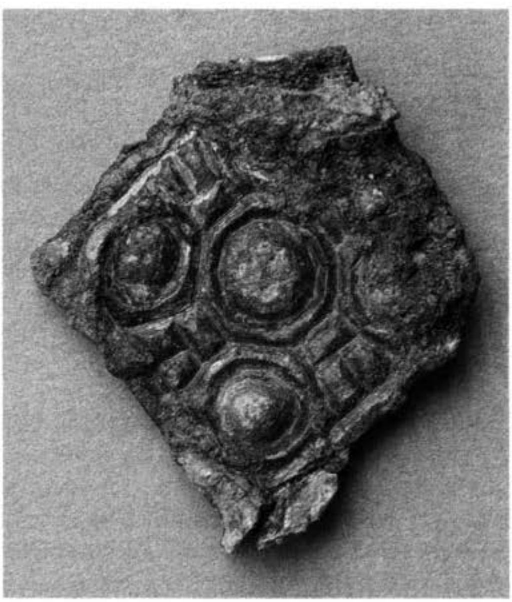


Fig. 657 (left) Copper alloy penannular brooch terminal, 5333. L.30·8mm brooches; of the sixteen recorded by Smedley and Owles, only two had the same orientation as the Fishergate beast (1965, 174). Nevertheless, the style of these disc brooches was certainly known to the manufacturer of the Fishergate piece, and it seems likely that the fitting itself originally derived from East Anglia.

Despite the recovery of so many of these brooches, their date remains uncertain. Smedley and Owles proposed an 8th–9th century date, noting a similarity with the design of some 8th century sceattas (1965, 167); Wilson has claimed that a 9th–10th century date is more appropriate (Wilson 1964, 122, 178). It is only recently, however, that any brooches of this type have been found in well-stratified contexts. In York, a brooch was found in a 10th century context at 16–22 Coppergate (Roesdahl et al. 1981, YD11), and another, also from a 10th century context, was found at a site on School Street, Ipswich (J. Newman, pers. comm.).

The use of enamel on *5325* may also be an indicator of a 10th century date. The technique of champlevé enamelling was known in the pagan Saxon period, but there is relatively little evidence of its use by English craftsmen during the 8th and 9th centuries, although odd items of cloisonné enamel do occur, such as the Alfred Jewel (Webster and Backhouse 1991, no.260) and the Minster Lovell Jewel (ibid., no.259). Several champlevé enamelled artefacts of the 10th–11th centuries have been identified, however. These include a brooch found at Hyde Abbey, Westminster (Wilson 1975, 204), and a disc found at Brasenose College, Oxford (Evison 1977, 4), which indicate that the technique was being practised in England at this time. If a 10th century date is proposed for *5325*, which was found in a Period 4z deposit, it is probably one of only a handful of artefacts found at Fishergate deriving from the time of the site's abandonment between Periods 3 and 4 (see also the lead alloy pendant *5486*, p.1375). Such objects must have been brought to the site in imported soil during later activity. Alternatively, if the mount is contemporary with Period 4 use of the site, the design of the backward-looking animal must still have been employed as late as the 11th century.

Gold fitting (Figs.656, 658)

A tiny fragment of a gold object, *5440*, was found in a Period 4z pit. Semi-circular in shape, it is made of sheet, has been decorated around the circumference with punched dots, and appears to have been cut across a central perforation on the lower edge. The precise function of this object is uncertain, though it might be a decorative mount fragment.

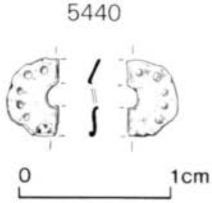


Fig.658 Gold mount fragment, 5440. *Scale 2:1*

Brooches (Fig.657, 659)

Fragments from three bow brooches (*5326–8*), four penannular brooches (*5329–31* and *5333*), and a cruciform brooch (*5332*) were found at Fishergate. Apart from *5332–3*, all are Roman forms. **Dr H.E.M. Cool** comments on the Roman brooches:

> One penannular brooch, *5329*, and all the bow brooches are Roman forms of 1st and 2nd century date. The other penannular brooches, *5330–1*, may be dated between the late 4th and the 7th century. Two of the bow brooches are examples of common Romano-British types. *5328* belongs to the variety of trumpet brooch with a moulded acanthus at the front of the bow only (Hull type 158C; Hattatt 1989, 84, no.1530). Trumpet brooches were in existence by the mid-Flavian period and continued in use for about a century. Examples of this class are very common and many varieties are known; however, the precise chronology of the variants has not been established and thus *5328* can only be dated to the broad later 1st to mid–late 2nd century date assigned to the type as a whole. T-shaped brooches such as *5327* were in use contemporaneously with trumpet brooches, though they appear to have gone out of use earlier, in the mid 2nd century (Hattatt 1987, 100). As with the trumpet brooches, there are many varieties but these are not closely datable.
>
> The third bow brooch *5326* is a much less common form and does not appear to be closely paralleled. It is a hinged brooch with a slightly expanded head forming vestigial wings. It clearly belongs to the Colchester derivative family of brooches and, as such, is most likely to belong to the second half of the 1st century.
>
> The only complete penannular brooch from Fishergate, *5329*, has grooved knob terminals and belongs to Fowler's type A2 (Fowler 1960, 152). This common form was originally dated to the 1st to 4th century (ibid., 174), but is most likely to have had its main *floruit* in the 1st and 2nd centuries. An interesting feature of *5329* is the careful formation of the humped pin whose tip has been hammered flat to form a small lozenge-shaped plate. *5331* is an example of Fowler type G (ibid., 153). The hoop is decorated with a spiral groove and the terminals are plain. It belongs to type G1 although the spiral decoration on the hoop is unusual and not one of the normal attributes of the type (Dickinson 1982, 46). Type G penannular brooches may have developed in the late Roman period but appear to belong predominantly to the 5th and 6th centuries (ibid., 54). *5330* is another penannular brooch, with a ribbed hoop. As it lacks terminals it cannot be closely identified but the ribbed decoration suggests that it was type E, F or G and thus in use contemporaneously with *5331* (Fowler 1963, 99).

Found in a Period 4z grave, *5332* is almost certainly a side knob from an arm of a cruciform brooch. Made of leaded bronze, it retains part of the iron spring bar to which the brooch's pin and spring would have been attached. There are traces of brass brazing on the underside of the knob which may relate to the attachment of the knob to the brooch arm.

The cruciform brooch as a type seems to have developed on the Continent and in Norway during the second half of the 4th century (Hirst 1985, 57); English examples are usually dated to the 5th–late 6th centuries (Hattatt 1985, 207). A classification of cruciform brooches, based on the development of the knobs on the head and the style of ornament on the foot, was made by Åberg in 1926, and this typology is generally still accepted today (Hirst 1985, 58). According to Åberg's typology (1926, 33), *5332* must have belonged to a group I brooch; these are characterised by their full-round knobs (other types have knobs

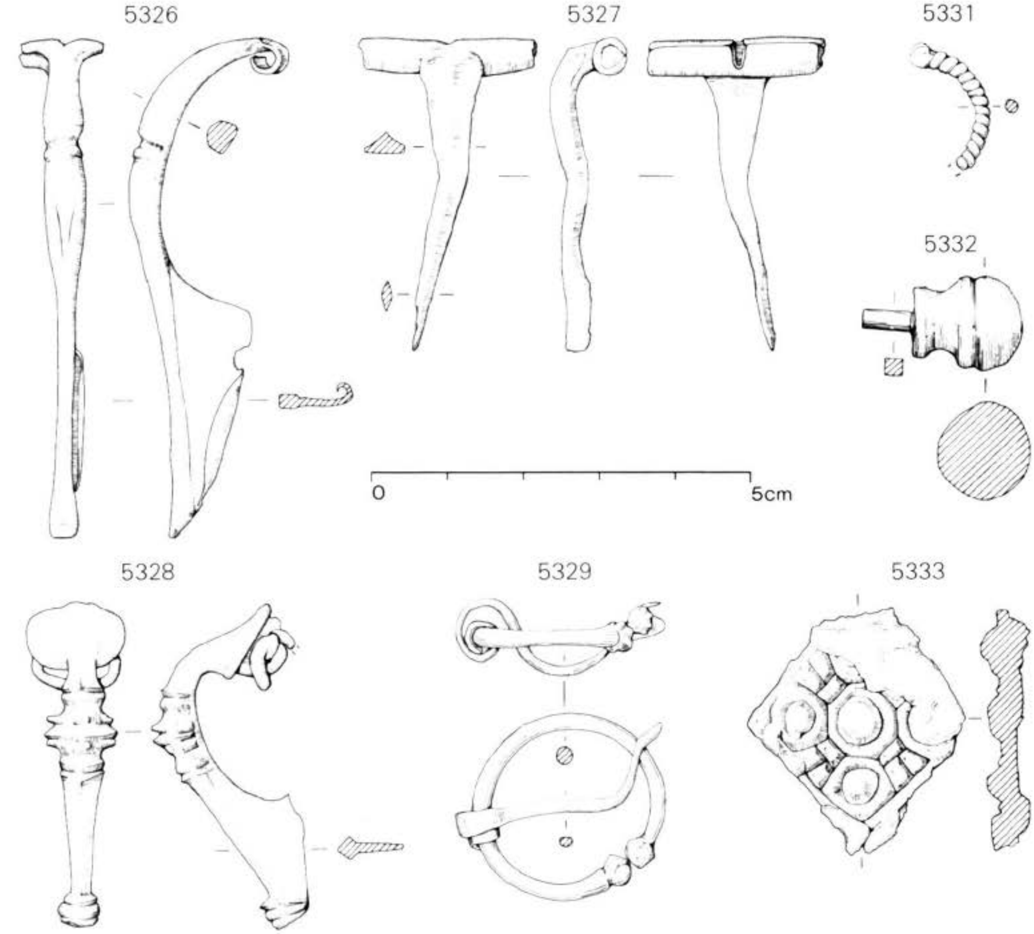


Fig. 659 Roman brooches: bow brooches (5326–8) and penannular brooches (5329, 5331); other brooches: knob of a cruciform brooch (5332) and terminal of a penannular brooch (5333). Scale 1:1

which are half-round in section). The full-round knobs were often slotted onto the main body of the brooch, while the others were cast with the rest of the brooch in one piece. The majority of cruciform brooches seem to have been found in the south and east of the country (ibid., 56), but Åberg notes two other group I examples from Yorkshire, from Driffield and Rudston (ibid., 35–6, figs.50, 54). As a group I brooch fragment, it seems likely that *5332* dates to the 5th or early 6th century; it may be contemporary with two of the penannular brooches (*5330–1*) and certainly pre-dates the Anglian occupation of the site.

5333 (Fig.657) is a large lozenge-shaped penannular brooch terminal which has been broken off the hoop of the brooch at one corner. It is decorated with a boss in each corner and one in the centre, surrounded by chip-carved relief geometric pattern, with traces of gilding in the recesses. It is similar in shape to terminals found on Pictish penannular brooches, such as one in the hoard found on St Ninian's Isle, Shetland (Wilson 1973, 69–70, pl.XXXIIa). This suggests an 8th century date for *5333*, although it was found residually in a Period 6a dump associated with levelling material brought in before the building of the eastern alley of the priory cloister. A 9th century penannular brooch terminal was found at 16–22 Coppergate (Roesdahl et al. 1981, YTC14).

Garment hooks (Fig.660)

Three of these objects, also known as hooked tags, were recovered from the site; two are of copper alloy, *5334–5*, the latter being fragmentary, while the third (*5435*) is silver. The complete hooks are similar in form, having subcircular plates, and tapering underturned hooks at one end. *5334* has two small perforations close to the butt end, and is decorated on the front face with a rouletted design; *5435* is plain and has a single perforation. Only the hook part of the tag remains on *5335*, but an attempt seems to have been made at some stage to perforate the broader end of the fragment, perhaps so that it could be re-used.

Garment hooks are sometimes found with triangular plates (e.g. Goodall 1980b, 502–3, fig.263). Several of this form have been recovered from graves, including a pair found behind the knees of a body at Winchester (Biddle 1965, 256); this discovery prompted the suggestion that hooks of both designs may have been used in cross-gartering (Wilson in Biddle 1965, 264). The slight nature of the hooks indicates that they could only have acted as light fasteners.

The earliest-known garment hooks date to the 7th century, occurring for example at Shakenoak Farm (Dickinson 1973, 116). Other sites in the country which have produced these objects include Southampton (Addyman and Hill 1969, 70, fig.29, 6) and Winchester, which produced examples of silver, copper alloy and iron, including five with circular plates (Hinton 1990b, 548). Both Lincoln (Roesdahl et al. 1981, G3–4) and Thetford (A.R. Goodall 1984, 68, fig.111, 32–9) have produced manufacturing debris

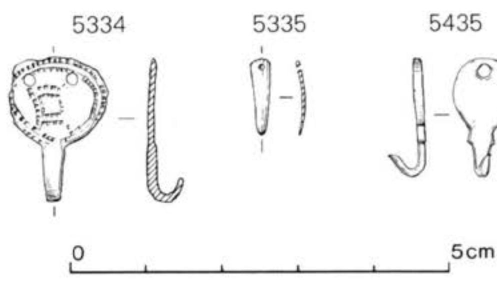


Fig.660 Garment hooks of copper alloy (5334–5) and silver (5435). Scale 1:1

associated with these hooks. In York, similar hooks have been found at 6–8 Pavement (*450*, *AY* 17/3) and 16–22 Coppergate (Roesdahl et al. 1981, YD20). These finds indicate that such objects had a long period of use, the latest examples from Winchester being thought to date to the 11th century (Hinton 1990b, 549). The Fishergate garment hooks, two of which derive from Period 4z pits and the third from a Period 6a soil dump, may thus have come from the earlier phases of Period 4 activity, although they might possibly be residual from the Anglian occupation of the site.

Pins (Figs.661–7)

The site produced a large number of pins of copper alloy, iron and bone. Apart from a single copper alloy hair pin, all are thought to have been used to fasten clothing.

Hair pin (Fig.661)

Dr H.E.M. Cool provides the following comments on the hair pin *5336*, which was found in a Period 3a pit/sunken-featured building.

> This is a Roman hair pin with a head in the form of a hand holding an ovoid object which probably represented an egg, an apple or a pomegranate. Metal hair pins like these were in use during the second half of the 1st century and appear to have been most common during the first part of that period. Such pins were widespread throughout the Empire and many variants on the basic theme are known (Arthur 1977).

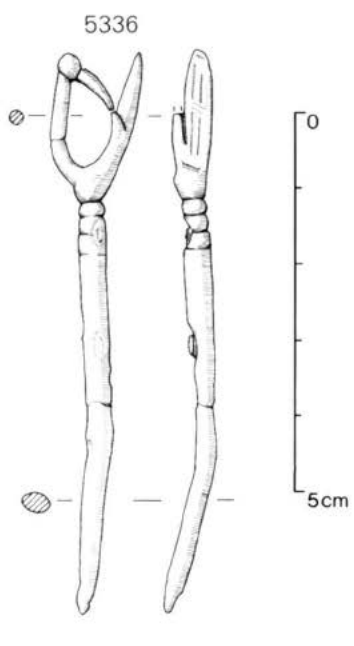


Fig.661 Copper alloy hair pin, 5336. Scale 1:1

The examples found in Britain can be divided between a very homogeneous group of pins on which the second to fourth fingers are made from a solid block (Cool 1991, 157, fig.5, 1–2, group 7A) and a much more diverse group on which each finger is fully formed (ibid., 157, fig.5, 5 and 7, group 7B). The pins of group 7A, to which *5336* belongs, are all likely to have come from the same workshop, perhaps in Britain as most of the known examples are concentrated here. Hitherto all the group 7A pins found in Britain have come from southern sites; this example from Fishergate is the most northerly one known to date.

Copper alloy dress pins (Figs.662–4)

There are 36 copper alloy pins with decorative heads, of which nine derive from Period 3 contexts (*5337–8, 5350, 5356, 5363–4, 5366–8*), thirteen from Period 4 deposits (*5339–43, 5351–3, 5357, 5360–1, 5369–70*), and fourteen which must be residual from medieval and post-medieval contexts (*5344–9, 5354–5, 5358–9, 5362, 5365, 5371–2*). These are discussed according to head shape.

Twenty-nine of the 36 pins have expanded globular or polyhedral heads. The most commonly found head shape is globular, thirteen pins falling into this category (*5337–49*). The heads of *5338* and *5343* have longitudinal facets; the heads of two others have been decorated, *5341* with a series of punched dots and *5344* with ring-and-dot. All the pins have been cast but several have been incompletely finished off, including *5345* on which part of the casting which should have been smoothed off is still evident on the top of the head.

Cuboid or polyhedral heads are found on six of the pins (*5350–5*); all have lozenge-shaped facets and chamfered corners apart from *5355*, which may be unfinished. Traces left from filing down the heads are visible on *5351–2*. As on the globular headed pins, ring-and-dot motifs and stamped depressions are used as decoration.

Four pins have biconical heads with flat tops (*5356–9*), and three have faceted biconical heads (*5360–2*); all are undecorated. Inverted conical heads are found on two pins, *5363–4*, the latter with a slightly rounded top. *5365* has a subconical head.

Certain features are common to most of the pin types. Collars are frequently present immediately below the head, for example on *5341* and *5363*. The shanks on many of the pins have a swelling towards the tip (e.g. *5342*) and on some the cross-section changes from circular to square at this point (e.g. *5338*). The swelling of the shank presumably helped to prevent the pin slipping out of position once it had pierced the clothing it was securing; the hipped design with square cross-section was even more effective. The same features are found on bone pins (MacGregor 1985, 116). It is possible that these similarities between the bone and copper alloy pins resulted from metalworkers copying established bone pin designs. Piece moulds from the Isle of Birsay indicate that the copper alloy cast pins were of similar designs to bone pins found on the site (Curle 1982, 33, fig.57).

Apart from those with inverted conical heads, all these pin types have previously been recovered from sites in York (Waterman 1959, 78, fig.11). Elsewhere, similar pins have been found on predominantly middle Anglo-Saxon sites, including Whitby Abbey (Peers and Radford 1943, 63–4, figs.13–14), Southampton (Addyman and Hill 1969, 68, fig.26),

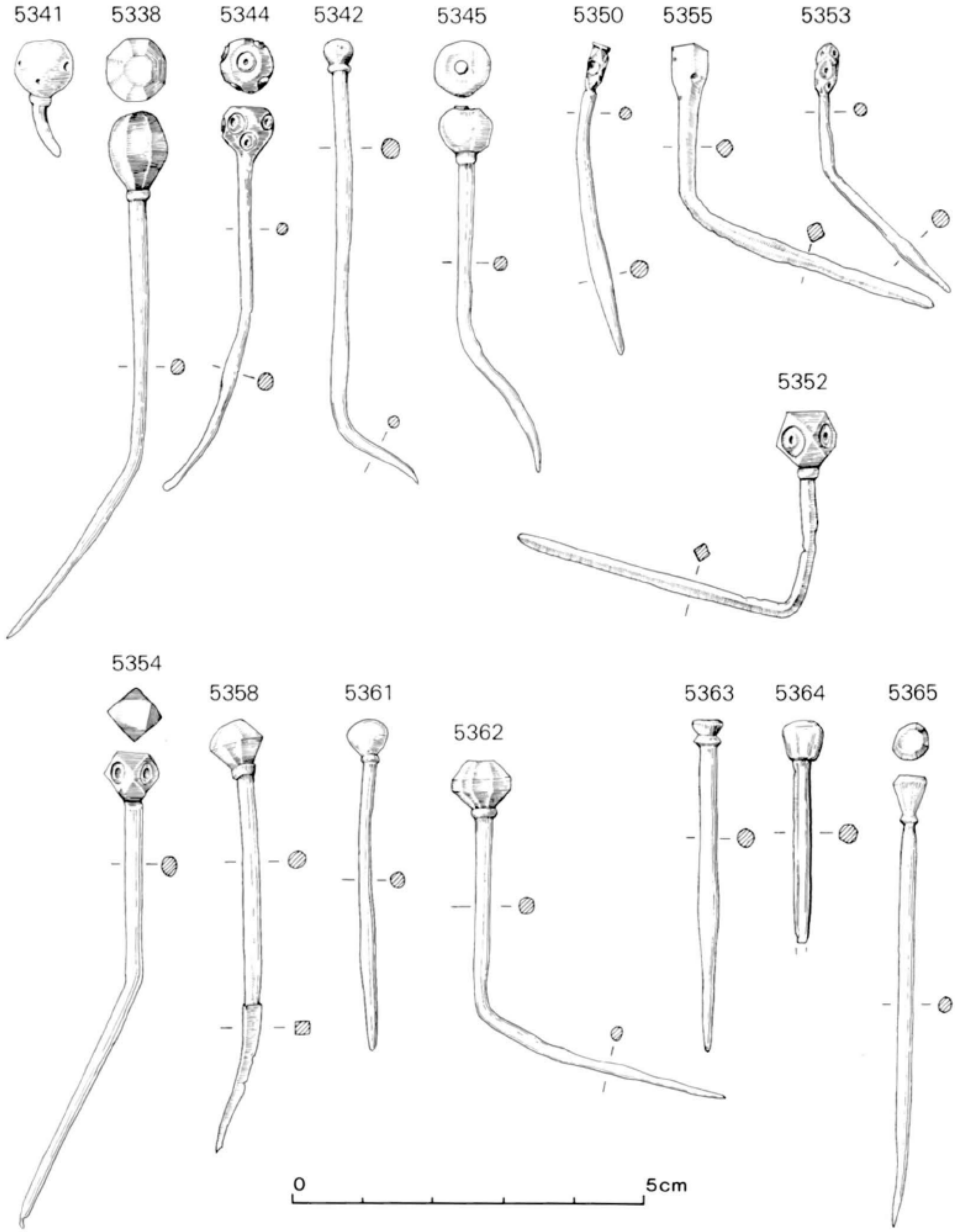


Fig. 662 Copper alloy dress pins: with globular or subglobular heads (5338, 5341–2, 5344–5); with cuboid or polyhedral heads (5350, 5352–5); with biconical heads (5358, 5361–2); with inverted conical heads (5363–4); with subconical head (5365). Scale 1:1

Meols, Cheshire (Bu'lock 1960, 9, fig.3), and Ryther, Yorkshire (D. Tweddle, pers. comm.). Most of these pins have been found on sites of the 7th–9th centuries; they are not often recovered from Anglo-Scandinavian sites (Bu'lock 1960), which points to their probable demise in the 9th century. Twenty-three of the 29 pins with expanded polyhedral heads were recovered from Period 4 or Period 6 contexts, which suggests that almost 80% were residual. This figure endorses the level of residuality indicated by some of the other material from the site, including the crucibles and vessel glass (see pp.1233 and 1331).

The earliest dress pins recovered are *5366–7*, which were both found in the charcoal-laden deposit of Period 3b. They are of a type known as 'linked' pins, which were used in pairs. The Fishergate pins are of slightly different sizes and do not appear to constitute a pair, but each has a flat pentagonal head with a perforation. The perforation was for the attachment of a chain which linked the pins together, and part of a chain survives on *5366*. The majority of linked pins previously found have come from 7th century burials. Elaborate examples of gold and silver, sometimes set with precious stones, are known from Roundway Down, Wiltshire (Leeds 1936, 109, fig.23b; Youngs 1989, 53–4, pl.40), and Chamberlain's Barn, Leighton Buzzard (Hyslop 1963, 198, figs.13a, 16c), while plainer pins of silver and copper alloy, more akin to the Fishergate finds, were recovered from three graves at Winnall, Winchester (Meaney 1970, 36–7, fig.9), and from the Anglo-Saxon monastery at Hartlepool (Jackson 1989, 182, fig.33, 4–5) (see Fig.611). The position in the grave of the pins found at Chamberlain's Barn indicated that they had probably been used to secure a cloak or similar outer garment at the neck (Hyslop 1963, 198), while one of the pins found at Winnall appeared to have been re-used to secure a head-dress, or as a hair pin (Meaney 1970, 37).

There are two examples of pins with spiral heads, *5368* found in a Period 3z post-hole and *5369* in a Period 4b grave. The heads have been formed by splitting the top of the shank into two wires, and coiling them inwards to form a heart shape. Such pins may represent a poor woman's version of linked pins, with which they appear to be contemporary (Hawkes 1973, 283). Both silver and copper alloy pins of this type have been found, particularly on middle Anglo-Saxon sites; many derive from 7th century graves, as at Eccles in Kent (ibid., 283–5, fig.4). Early Anglo-Saxon Shakenoak (Pretty 1972, 84–5) and the middle Anglo-Saxon monastery at Hartlepool (Jackson 1989, 182, fig.33, 8) have also produced such pins. Examples found in 10th century levels at 16–22 Coppergate (Tweddle, *AY* 17 in prep.) are likely to be residual, but suggest that the type is long-lived.

A pin type with a flat, lozenge-shaped head appears to have been introduced into Britain during the Anglo-Scandinavian period. Fishergate has produced three examples, of which *5370* was found in a Period 4d pit, *5371* in the Period 6b limestone surface south of the church (possibly a road surface), and *5372* in an unstratified context; *5371–2* were both residual in their contexts. Characteristic of these pins are the projections on three corners of the head, as on *5371* and *5372*. The heads of *5370* and *5371* are perforated, and two of the pins are decorated, *5370* with ring-and-dot, *5372* with incised rocker-arm tracery. Again, this type of pin has been found on other sites in York, mainly in 11th century contexts, as at 16–22 Coppergate and within the grave of Wulfstan, Archbishop of York 1002–23

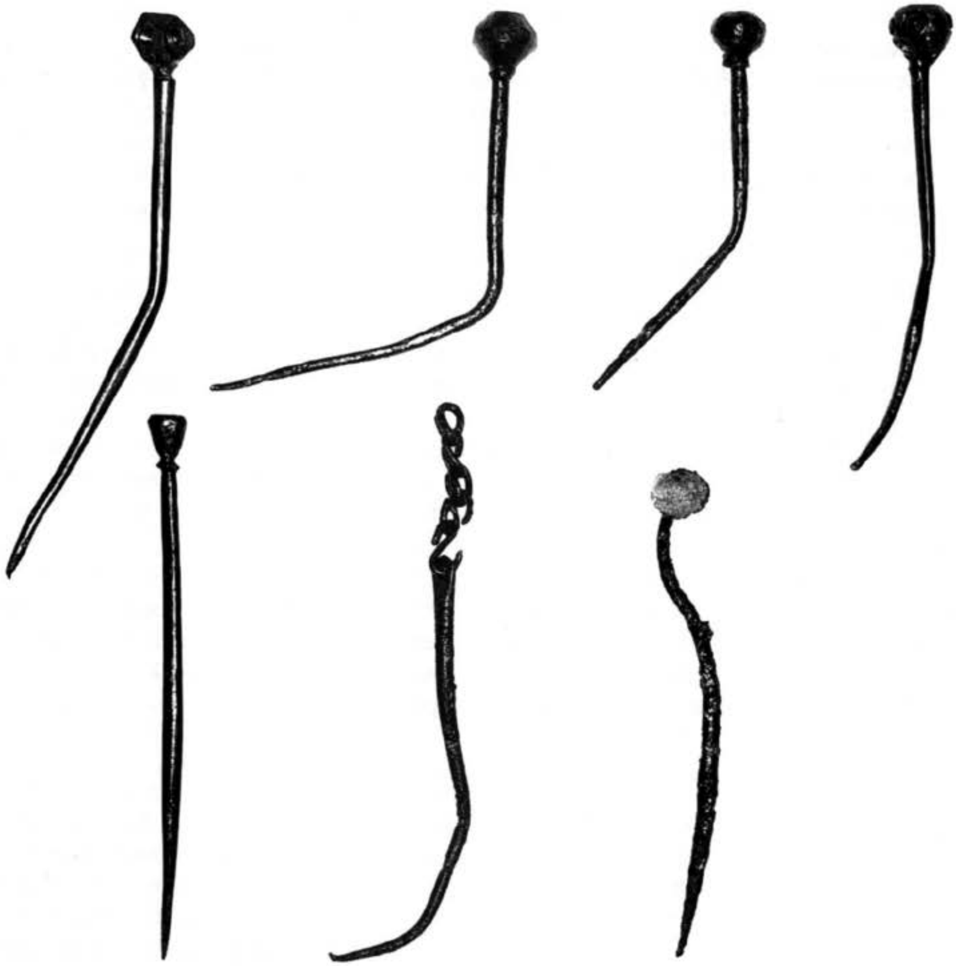


Fig. 663 Copper alloy and iron dress pins (l. to r. top 5354, 5362, 5348, 5344; *bottom* 5365, 5366, 5056*). L. (longest) 70·8mm*

(Roesdahl et al. 1981, YD48). Another example was recovered at 36 St Andrewgate (MacGregor 1978, fig.28, 6).

There are fifteen pins which are now headless (*5373–87*). Five are from Period 3 and 4 contexts, the remainder derive residually from Period 6 deposits. Many share the characteristics of the shanks on the other pins, having swellings towards the tip. The upper ends, however, have mostly been cut square, or are slightly rounded, possibly to allow for the addition of a separately made head. Two of the headless pins, *5383* and *5386*, have

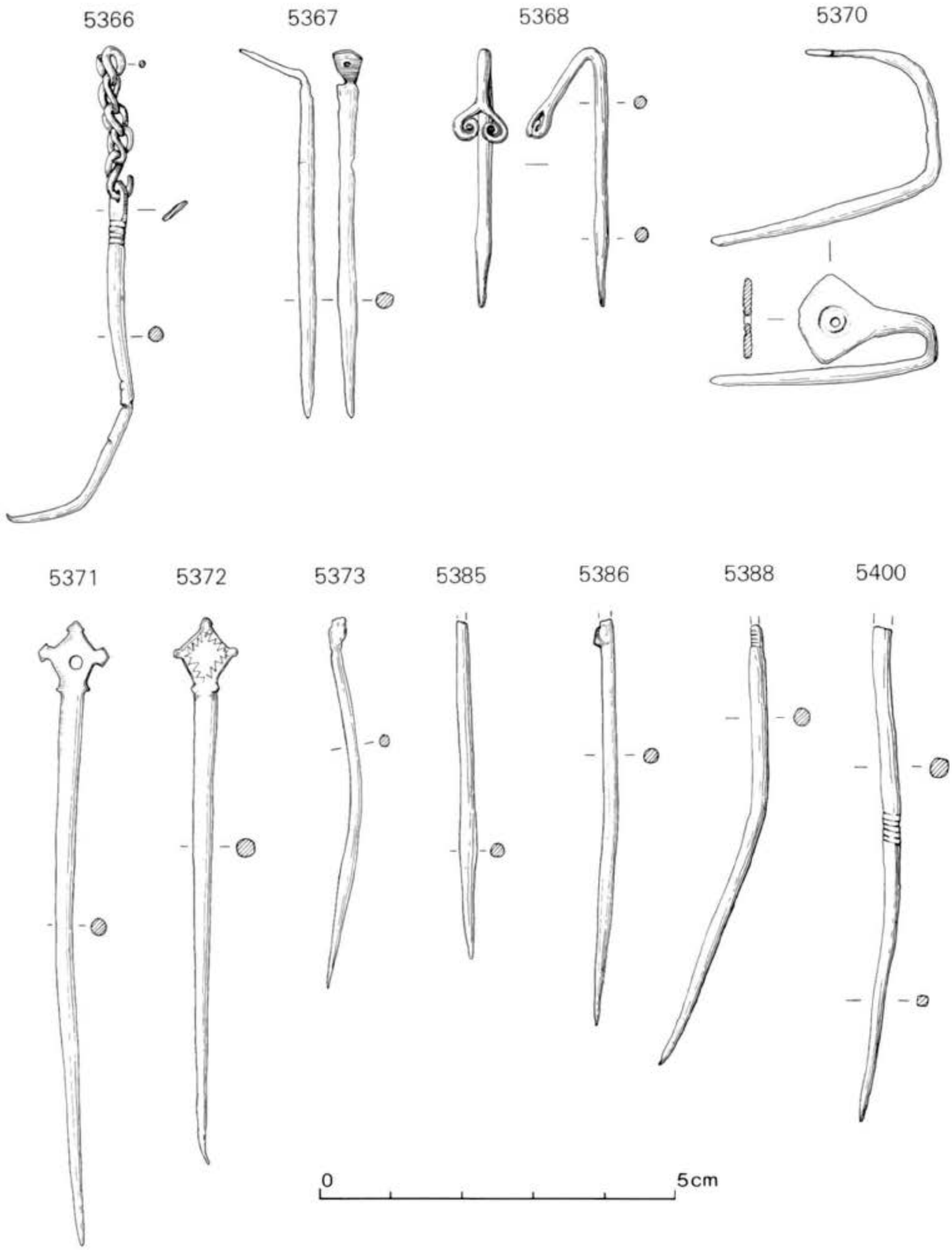


Fig.664 Copper alloy dress pins: linked pins (5366–7); with spiral head (5368); with lozenge-shaped heads (5370–2); headless (5373, 5385–6); decorated shanks (5388, 5400). Scale 1:1

traces of solder at the upper end of the shank, presumably used to attach a head which is now lost. Although headless pins could have been used in the same way as the other pins, the evidence suggests that these are unfinished or incomplete, and implies two different methods of pin manufacture. Many pins were clearly cast in one piece, but others had cast shanks and separately produced heads, perhaps of a different material. Headless pins do not seem to have been recognised on many other sites in Britain, but have been found at Shakenoak (Brodribb et al. 1972, 70, fig.31, 158–73), Southampton (Addyman 1969, 68, fig.26, 12–13), 16–22 Coppergate (Tweddle, *AY* 17 in prep.), and Flixborough, South Humberside (K. Leahy, pers. comm.).

Twenty-six pin shank fragments which have been ascribed to the pin types described on pp.1361–4 were also found (*5388–410*). Fifteen were from Period 3 and 4 contexts, the remainder from Period 6 deposits. The Anglian shanks found in medieval contexts were distinguished from medieval pin shanks by their larger diameters. The multiple box-and-whisker plot shows the range of shank diameters of complete Anglian and medieval pins (see Shennan 1988, 45–7, for further information on box-and-whisker plots). Apart from the single outlier in each group (marked by the small squares), which appear to be unusually large examples, the shank diameters encompass a range from the top to the bottom of the vertical lines (whiskers). Thus it can be seen that the Anglian pins range from 1·4 to 2·6mm;

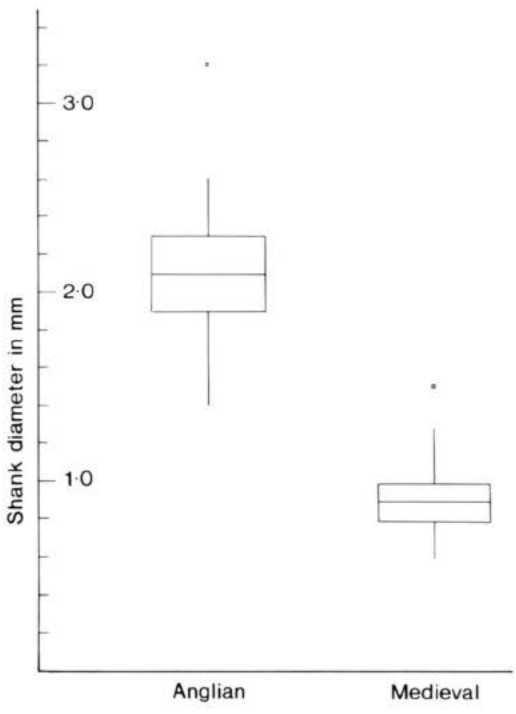


Fig.665 A multiple box-and-whisker plot of the shank diameters of complete Anglian and medieval copper alloy dress pins

the box indicates that 50% of the shanks have diameters 1·9–2·3mm, the median being 2·1mm. On this basis, pin shanks from medieval contexts with a diameter greater than 1·4mm are considered most likely to be from Anglian pins and have been included here.

Iron dress pins (Figs.663, 666)

Fourteen iron pins (*5054–67*) and 30 shanks and shank fragments (*5068–97*) were recovered. Fifteen of the pins and pin fragments derive from Period 3 contexts and eleven from Period 4. Apart from one shank fragment (*5068*) which was found in the Roman agricultural soil and could possibly be from a Roman pin, the remainder were recovered from medieval and later layers, and are thought to be residual.

Seven of the pins have globular or semi-spherical heads of lead alloy (see p.1231). The heads appear to have been formed from pieces of lead wrapped around the top of the iron shank, which can be seen protruding slightly above the head on some pins, e.g. *5061*. The other pins have integral iron heads, one being subcuboid (*5066*), two cuboid and faceted (e.g. *5064*) and three globular (e.g. *5059*).

Iron pins with iron or non-ferrous heads have rarely been noted on other sites, although both types were found in 10th century levels at 16–22 Coppergate (e.g. *3799*, *3815*, *AY 17/6*). Several pins with iron heads were recovered at Shakenoak Farm (Brown 1972, 106, fig.52, 321, 324–8), while a single example with a non-ferrous head was recovered from Wicken Bonhunt, in a middle Anglo-Saxon context (P.J. Ottaway, pers. comm.). As these iron pins appear to come from sites spanning the entire Anglo-Saxon period, it is perhaps surprising that more have not been recognised.

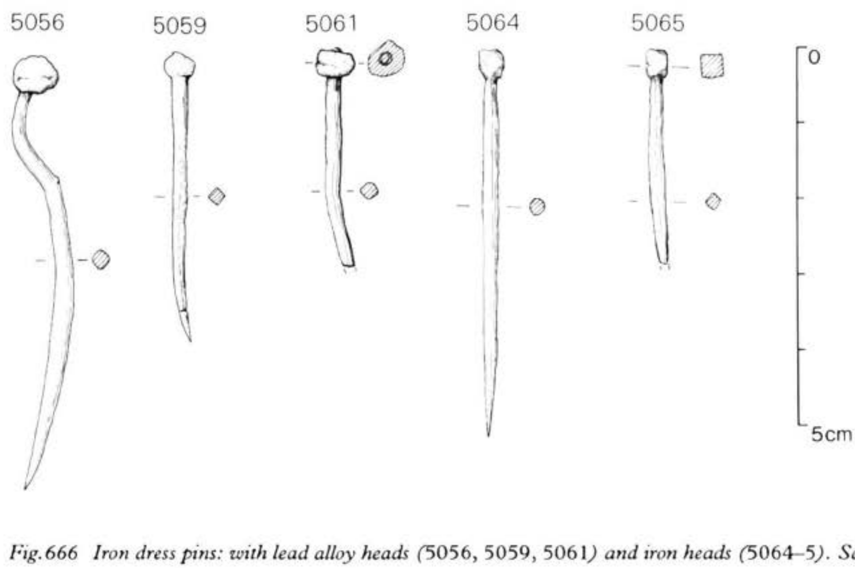


*Fig.666 Iron dress pins: with lead alloy heads (*5056, 5059, 5061*) and iron heads (*5064–5*). Scale 1:1*

Bone pins (Fig.667)

Thirty-eight bone pins and pin fragments were recovered from the site, of which one (*5530*) was found in Roman levels and is probably intrusive. Eighteen derived from Period 3 contexts (*5531–48*), seven from Period 4 contexts (*5549–55*), and twelve, which are probably residual, from medieval and post-medieval contexts (*5556–67*).

5544 is a headless pin, with a polished tapering shank and upper end cut square. This type of pin appears most commonly in Roman contexts, as in the Roman sewer in York

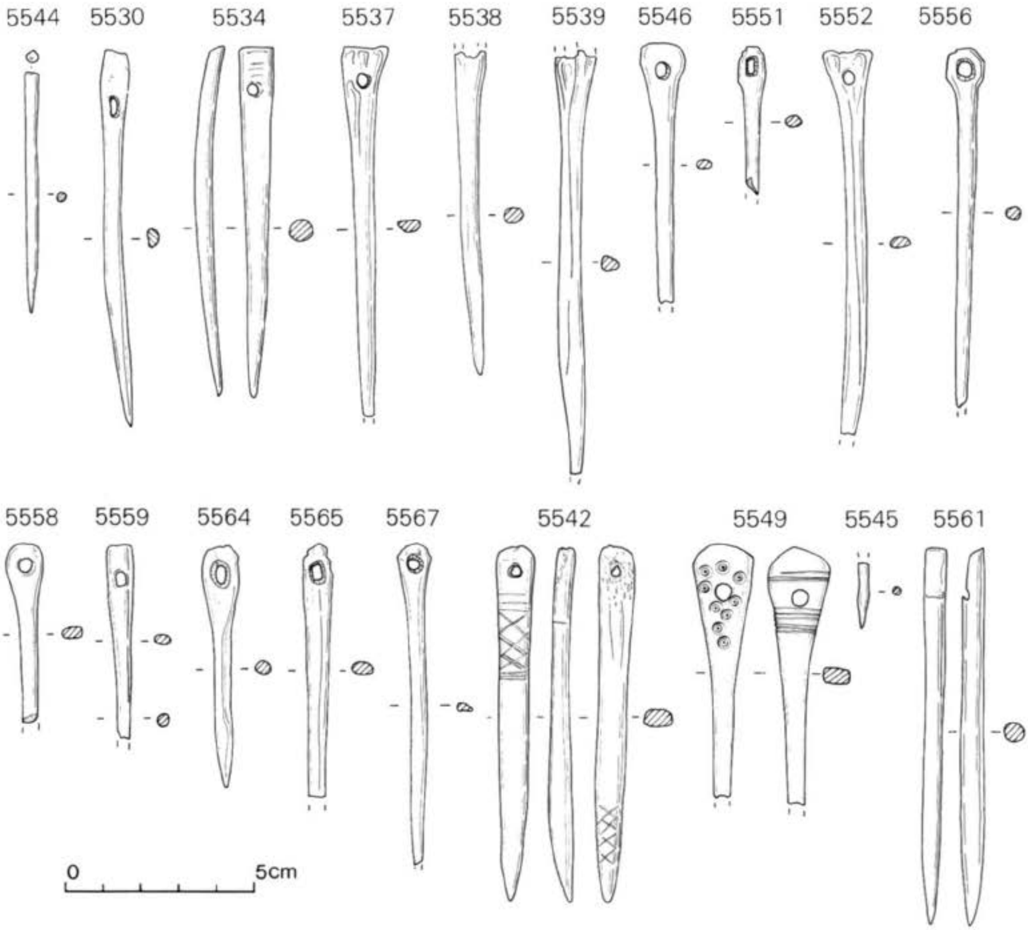


Fig.667 Bone dress pins: headless (5544); with plain heads (5530, 5534, 5537–9, 5546, 5551–2, 5556, 5558–9, 5564–5, 5567); with decorated heads (5542, 5549); shanks (5545, 5561). Scale 1:2

(*125*, *AY* 17/1), and *5544* may thus be residual. Its similarity to the headless copper alloy pins from the site suggests, however, that it could be contemporary with them.

Apart from the fragmentary pins which have lost their heads, all the others have expanded heads. Like the copper alloy pins, some also have swollen shanks, e.g. *5564*. The pins have been made from pig fibulae or cattle long bones, and are of a class of pin with a broad date range, from the Iron Age to the Anglo-Scandinavian period (p.91, *AY* 17/3). The pig fibulae were easily adapted to become pins. Most of the shafts have been trimmed to some extent to produce the taper, but in many cases the only other modification made was the perforation drilled in the distal end of the bone which formed the head, as on *5537* and *5552*. On other pins the heads have been shaped, being subrectangular (e.g. *5551* and *5564*), trapezoidal (*5534*) or circular (e.g. *5556* and *5558*).

Pins such as these have been found on many sites of the Anglian and Anglo-Scandinavian periods. In York they have been recovered from Clifford Street (Waterman 1959, fig.14), 6–8 Pavement (*499–502*, *AY* 17/3), Parliament Street (*742*, *AY* 17/4), and 16–22 Coppergate (Roesdahl et al. 1981, YAB31). Outside York they have been found at Shakenoak Farm (Brodribb et al. 1972, 129, fig.64), Thetford (Rogerson and Dallas 1984, 167–70, figs.189–90), Flaxengate, Lincoln (Mann 1982, 6, fig.6), and Northampton (Oakley and Harman 1979, 310, fig.138). Sites in Southampton have produced both finished pins and blanks, providing evidence of their manufacture by boneworkers there (Addyman and Hill 1969, 76, pl.VIb). These pins are also found at Hedeby (Schwarz-Mackensen 1976, Abb.16) and Lund (Lindström 1976, 276, pl.240) (see Figs.611–12).

Apart from these commonly found pins, there are two more unusual pins, both decorated. *5542*, which was found in a Period 3c pit, has a shank of subrectangular section, slightly expanded close to the tip, and a shaped head; a large area of cancellous tissue is visible on the reverse face of the head. There are incised saltires on the front face just below the head, and on the tip on the reverse, although here the decoration is crudely executed. *5549*, which is incomplete, was recovered from a Period 4b pit. It has a paddle-shaped head, decorated on both faces around a perforation, with ring-and-dot motifs on one face and incised transverse lines on the other. Pins similar to these have been found previously in York (Waterman 1959, fig.14, 25–6; MacGregor 1978, fig.30, 4), but they do not appear to be known from other sites in Britain. Hedeby (Schwarz-Mackensen 1976, Abb.11, 10) and Lund (Lindström 1976, 277, pl.241, 10), however, have produced comparable pins.

There has been some discussion as to the correct identification of these bone objects. Many have perforated heads and they have frequently been described as needles (Brodribb et al. 1972, 129, fig.64; Hinton 1980, 77, fig.15, 4), or as weaving implements (S. Keene 1990, 232–3). They are more usually identified as dress pins, because their broad and roughly finished heads would be poorly suited to needlework (MacGregor 1985, 121). However, examples found with thread whipped around them at Hedeby suggest they may have made suitable implements for *nålebinding* or looped needle knitting (see p.227, *AY* 17/4; pp.342–3, *AY* 17/5).

Items of jewellery

Ear-rings (Figs.668, 670)

There are four copper alloy ear-rings from the site, one from a Period 3z context (*5411*), two from Period 4 contexts (*5412–13*) and one which appears to be residual (*5414*). All the ear-rings are penannular and of subcircular section, although *5411* has become distorted.

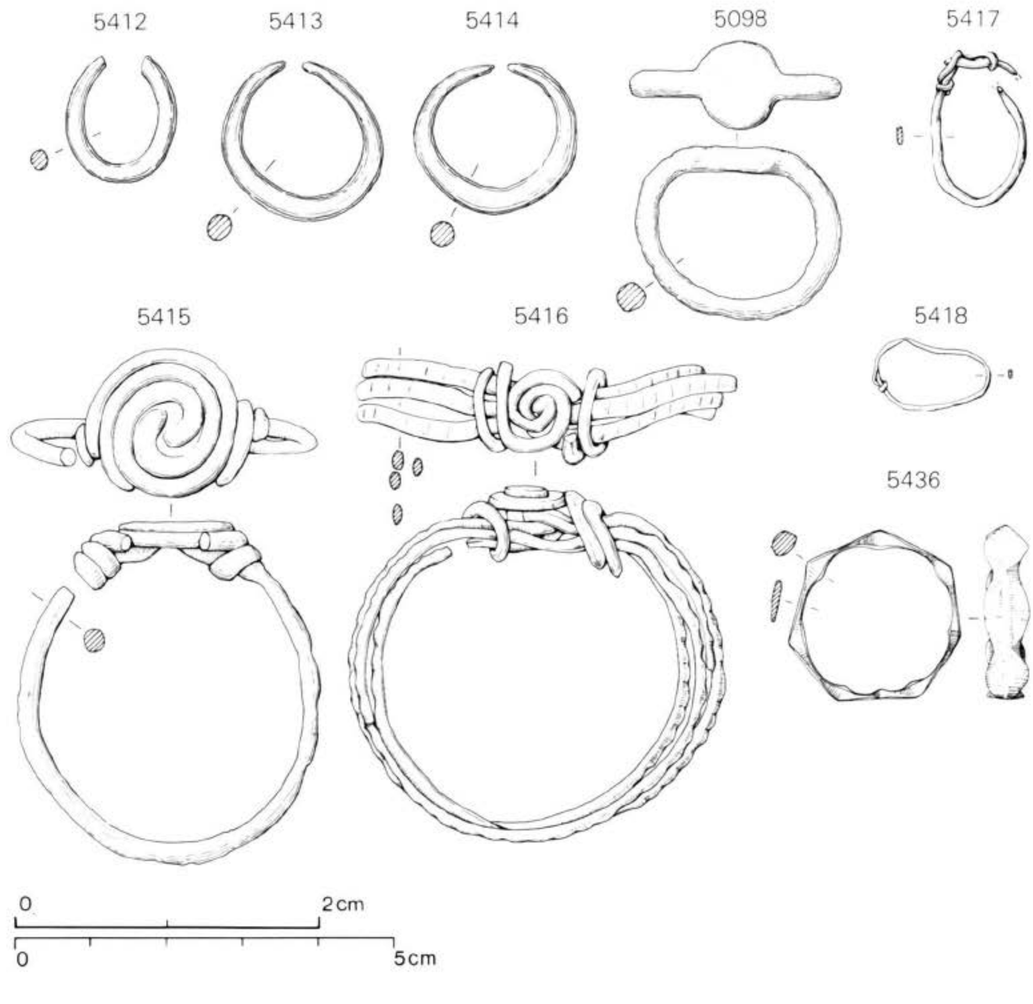


Fig.668 Copper alloy ear-rings (5412–14); finger-rings of iron (5098), copper alloy (5415–16) and silver (5436); twisted wire rings of copper alloy (5417–18). Scale 1:1, 5415–16 2:1

The type is the most common to be found in the Roman period (Allason-Jones 1989, 2), but it seems to be long-lived, occurring in the Anglo-Saxon period, for example in the cemeteries at Winnall (Meaney 1970, 37–8, fig.9), and in 10th–11th century deposits at Thetford (A.R. Goodall 1984, 69, fig.110, 17–20). This dating range suggests that, apart from *5414* which derives from a post-medieval context, the ear-rings are likely to be contemporary with their contexts. A solid gold ear-ring (*5789*) of 9th–11th century date was dug up in a field adjacent to the Redfearn's Glass Factory in the late 19th century. It was of the same form as the copper alloy ear-rings, but its present location is unknown (see Christie's Fine Antiquities Catalogue, 10 July 1987, p.34, no.110) (Fig.670b).

Finger-rings (Figs.668–9)

Finger-rings of silver (*5436*), iron (*5098*) and copper alloy (*5415–16*) were recovered from the site.

The silver ring *5436* was found in a post-medieval context but is clearly residual. It is seven-sided, each side having been hammered into an ovoid facet; one facet bears faint traces of a cross in relief. A similar ring, six-sided and of copper alloy, was found at 16–22 Coppergate in mid 10th century levels (Roesdahl et al. 1981, YD24). A silver ring of hexagonal shape formed part of the 9th century Trewhiddle hoard from Cornwall (Wilson and Blunt 1961, 85, pl.XXVIId) and a gold, eight-faceted ring recovered at Llysfaen in Anglesey, Wales, is also thought to be mid 9th century in date (Oman 1930, 63–4). It thus seems probable that the Fishergate and Coppergate rings were made in the 9th or possibly 10th century.

5098 is a large, suboval ring of iron with a subcircular bezel. There are no traces of an intaglio in the bezel, but such a setting may originally have been present. The point at which the two ends of the ring were joined can be seen, the remains of the brazing of the scarf-weld still being visible. There are also traces of brass plating over the ring.

Although found in a Period 4z deposit, the ring is almost certainly Roman. During the late Republican and early Imperial periods, the use of gold finger-rings was restricted by law to the highest social classes (Manning 1985, 78), and iron finger-rings were common. The sumptuary laws declined in importance in the 2nd and 3rd centuries as social conditions changed; consequently the number of iron finger-rings in use diminished. *5098* may be a late example of 3rd century date, and this might help to explain the presence of brass plating. It is unusual to find brass plating on Roman iron finger-rings, and it is difficult to envisage an iron ring being plated to give the appearance of gold when the social distinction between gold and iron was well understood. By the 3rd century, however, such an apparently contradictory combination might not have seemed so strange to either manufacturer or wearer (H.E.M. Cool, pers. comm.).

The copper alloy rings *5415–16* are both made from wire which has been wound to form the hoop. In the case of *5416* the wire has been wound four times, the ends being coiled to form a flat bezel, finished off by being twisted around the ring. This design has been found previously in silver, copper alloy and iron in a number of Anglo-Saxon cemeteries, including

a

b

Fig.669 (a) Finger-ring of silver (5436), D.22·1mm

(b) Finger-ring of copper alloy (5416), D.24·3mm

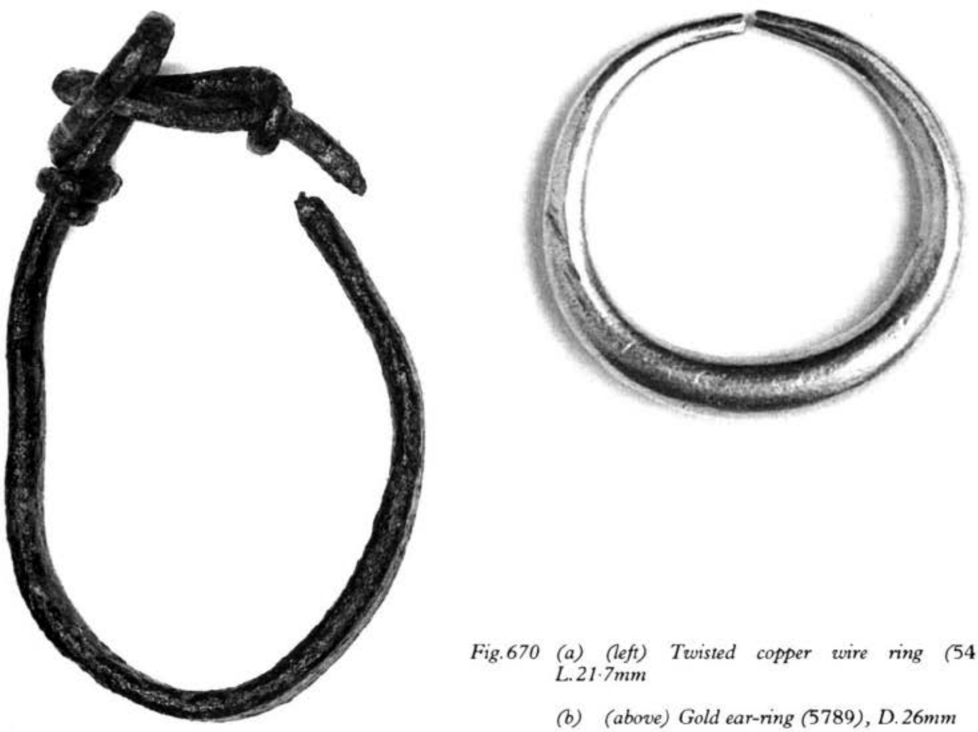


Fig.670 (a) (left) Twisted copper wire ring (5417), L.21·7mm

(b) (above) Gold ear-ring (5789), D.26mm

those at Finglesham, Kent (Chadwick 1958, 39, fig.6m), Spong Hill, Norfolk (Hills 1977, 26, fig.123, 1465), and Buckland, Dover (Evison 1987, fig.4, F3). At Chamberlain's Barn, Leighton Buzzard (Hyslop 1963, 199, fig.13), and Burwell, Suffolk (Lethbridge 1931, 67–70, fig.36, 3), such rings appeared to form part of necklaces; at Burwell they were associated with bulla pendants (ibid.), of which Fishergate has also produced an example (see p.1374). The wound and coiled design was used in the Roman period, and this may have been copied during the mid 6th to mid 7th centuries, when the majority of these rings appear (Hyslop 1963, 199). It seems likely that the two rings from Fishergate also date from the 7th century.

In addition to the finger-rings recovered during the excavations, an important gold ring was found on the Redfearn's Glass Factory site c.1930. The bezel takes the form of a pair of confronted animals, viewed from above, flanking a human head. The rear quarters of the animals develop into plant scroll (MacGregor 1978, 42, fig.24, 9; *AY* 7/1 in prep.). This ring dates to the 9th century and probably to the period before the Viking conquest of York. Comparisons which can be drawn between the ornament on the ring and the decoration of

Fig. 663 Copper alloy and iron dress pins (l. to r. top 5354, 5362, 5348, 5344; *bottom* 5365, 5366, 5056*). L. (longest) 70·8mm*

(Roesdahl et al. 1981, YD48). Another example was recovered at 36 St Andrewgate (MacGregor 1978, fig.28, 6).

There are fifteen pins which are now headless (*5373–87*). Five are from Period 3 and 4 contexts, the remainder derive residually from Period 6 deposits. Many share the characteristics of the shanks on the other pins, having swellings towards the tip. The upper ends, however, have mostly been cut square, or are slightly rounded, possibly to allow for the addition of a separately made head. Two of the headless pins, *5383* and *5386*, have

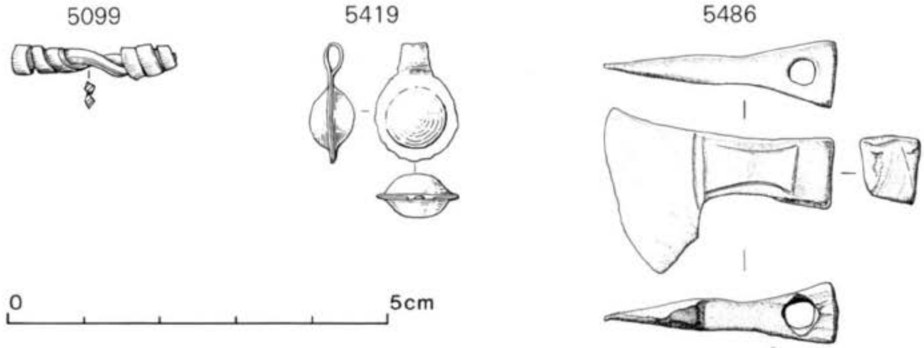


Fig.671 Iron bracelet fragment (5099); pendants of copper alloy (5419) and lead alloy (5486). Scale 1:1

Hyslop notes that these pendants were produced and worn during the 7th century (Hyslop 1963, 199–200).

The small lead alloy axe-head, *5486*, was found residually in demolition-derived material associated with alterations to the Gilbertine priory church in Period 6c. Model axes were used by the Romans as lucky charms or perhaps votive offerings (Green 1981, 258), but the shape of this axe-head, with its asymmetrically expanding blade, indicates a Viking rather than Roman origin. A full-size iron axe-head of similar shape was found in Anglo-Scandinavian levels at 16–22 Coppergate (*2253*, *AY* 17/6). This smaller version from Fishergate may have been used as a pendant or amulet, suspended via the socket which bears an incised design. Miniature axe-heads, and also Thor's hammers, were particularly popular designs for pendants amongst the Vikings (Graham-Campbell 1980a, 133, pl.461). A similar example, made of bone, was recovered from a 10th century level at Flaxengate, Lincoln (Mann 1982, 11, fig.8, 81). In common with other 10th century artefacts found at 46–54 Fishergate, the pendant was probably brought to the site in soil imported to level the area during the construction of the priory.

Gemstones (Figs.672, 675)

Three gemstones (*4574–6*) were found in Period 3z deposits; *4574* derived from a roadside ditch, *4575* from a post-hole, and *4576* from a pit. They were examined by **S. Rees**, who has contributed the following report:

> The term gemstone is used to describe minerals which have been selected for their colour and physical properties for use in ornamentation. It was important to establish that these items were stone and not glass, which is often used to imitate gemstones, and also to identify the type of gemstone. The stones were initially examined under a binocular microscope at ×100 and ×160, using incident light and then transmitted light.

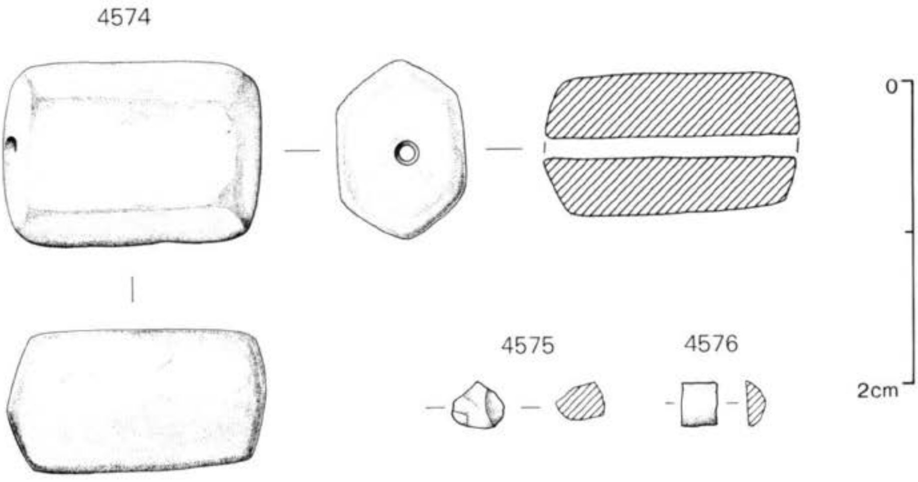


Fig.672 Gemstones: emerald bead (4574) and fragments of garnet (4575–6). Scale 2:1

A subrectangular bead of hexagonal section, *4574* is perforated along its long axis. Under incident light the surface of the stone has a dull vitreous lustre and appears to have had quite a lot of wear. Under transmitted light the stone is almost opaque as a result of many cracks and flaws (Fig.675). There are no air bubbles visible to indicate that this is glass, and when tested it proved to be harder than glass. The green colour, the hardness and the hexagonal section are characteristic of a natural emerald crystal, and this identification was confirmed (by Marjorie Hutchinson) using a refractometer at the Ancient Monuments Laboratory.

4575 is a small subspheroid fragment or chip. Under incident light the outer surface of the stone appears chipped, with some areas weathered to a waxy lustre. Under transmitted light the stone exhibits a rich red semi-transparent colour with no sign of the bubbles or inclusions indicative of glass. Tests showed that it is harder than glass and is therefore a mineral. Under ultra-violet light no fluorescence occurred to indicate ruby or spinel, and thus it was concluded that this fragment is probably a garnet.

4576 is square, of plano-convex section, and orange-red in colour. Under incident light the outer surface has a smooth, polished, shiny lustre. The convex surface and the sides have more pitting and scratching than the flat face. Under transmitted light the stone appears transparent with no inclusions and no air bubbles. A hardness test confirmed that it is a mineral. Under ultra-violet light no fluorescence occurred to indicate a ruby, and so it is likely that this piece is also a garnet. Because of their small size, both garnets had to be investigated by X-ray fluorescence spectroscopy using EDAX no-standards program.

Minerals have been mined for use as gemstones for several thousand years. The Egyptians used them in their jewellery, and the Etruscans and Greeks were using them by the 5th century BC. Trade links opened up by Alexander the Great in Egypt, India, Ceylon and Mesopotamia made available a greater range and supply of gemstones; trade also introduced the ideas of the Persians who used gemstones, pearls and glass paste in jewellery. Later, as the Roman Empire expanded, the art and jewellery of the Hellenistic world were assimilated, further expanding the use of gemstones. With their large trade network, the Romans had access to sources and supplies of many different types of gems. From the 1st century BC, gem collecting became increasingly popular; mystical and medicinal properties were attributed to many gems and they came to be valued for these as much as for their use in ornamentation. Easily transportable, durable and highly valued, it is possible that some gems had a long and varied life over several hundred years.

Emeralds of hexagonal section have been found since the Egyptian period. The natural hexagonal crystal shape of the stone was easy to refine, using fine abrasives such as clay or sand for polishing the outer surface. The perforation was probably made using a drill, perhaps of wood, with a flint or tubular metal drill bit and abrasive powder, such as emery. The bead could have been suspended on a necklace or used as a pendant on an ear-ring. The metal used for suspension would probably have been gold, as it is easily worked and its colour complements the green of the stone. *4574* may originally have been part of a piece of Roman jewellery, and could have been re-used at a later date; the outer surface of the stone is quite worn, suggesting that it may have been of some antiquity at the time it was deposited. There are examples in the medieval period in Europe of Roman cameos being incorporated into pieces, and this gemstone may have been used in a similar way. The emerald probably originated from mines in Egypt, which had been worked since c.2000 BC, such as those in the Sikait/Zabra region of the eastern desert. Other sources for ancient emeralds are India and possibly the Urals, although all the mines have not yet been identified, making it difficult to trace the emeralds back to their precise source.

During the post-Roman period, garnets were widely used in jewellery in central and western Europe. The ease with which they could be split in the horizontal plane made them popular for use as inlays in cloisonné settings on objects such as buckles and brooches. *4576*, with its convex upper surface, may have been cut with an abrasive wheel; experiments to replicate garnet cutting of this period have been carried out using such a wheel, and have produced garnets of identical appearance (Bimson 1985, 128). The size and shape of *4576* suggest that it could have been used in a cloisonné setting (Arrhenius 1971). *4575* may be a chip, from the working of a larger piece, but it is also possible that, despite its small size, it could have been mounted in jewellery. Garnets are complex silicates and are classified into six types depending upon the proportions of the various minerals they contain. The Fishergate garnets have the same elements in virtually identical proportions, so it can be assumed that they came from the same area. These elements, particularly the unusually high chromium content, indicate that they are of the pyrope type. The source for such garnets in the post-Roman period may be Bohemia, in the north-west of present-day Czechoslovakia; mines in this area were mentioned by Agricola, and necklaces of such garnets have been found in Bronze Age graves near the mining areas (Rouse 1986, 45). Other garnets from this period which have been analysed include those in the Sutton Hoo jewellery, which are mostly of almandine type, thought to come from India. The garnets found at Fishergate could have fallen out of their original settings, or they could have been traded in their raw state and incorporated into metalwork on site.

Garnets were popular for use as jewellery settings during the early Anglo-Saxon period throughout Europe, but they appear to go out of use in Britain towards the end of 7th century, and they are rarely used in Western Europe after the 8th century (Wilson 1964, 17). This indicates that the two pieces found at Fishergate date to the 7th century at the latest; although found in Anglian deposits, they may either pre-date Anglian activity on the site or derive from the earliest phase of the Anglian settlement in the late 7th century.

Beads

Apart from the emerald bead, 94 other beads and bead fragments were recovered from the site. These are made of stone, jet, shale, amber, fired clay and glass, the vast majority of them (c.95%) being made of glass.

Stone bead (Fig.673)

A globular bead of stone, *4545*, was recovered from a Period 4z pit.

Dr G.D. Gaunt comments on the stone type:

> The bead is made of largely unrecrystallised detrital granular limestone, which is almost certainly of Mesozoic or younger age. It is unlike any Jurassic or Cretaceous limestone in northern England or the Midlands, and it may be a manufactured import from the European mainland.

In the light of Dr Gaunt's suggestion of a European provenance for *4545*, it is interesting to note that limestone beads were also recovered during excavations at the *emporium* at Helgö, Sweden (Lundström 1981, 5). Although these beads probably pre-date *4545*, which was found in an 11th–12th century context, it is possible that the Fishergate example may have come from a similar source, perhaps during the Anglo-Scandinavian period.

Jet and shale beads (Fig.673)

One bead of jet and one probably of shale were found on the site. *4571* derives from a Period 3z pit and is globular, made from hard 'plank' jet (M. Read, pers. comm.), as was the roughout (see p.1317). *4572*, from a Period 4z pit, is discoidal and probably made of shale. The globular bead form in glass was used in the Roman period, and appears to have been long-lived (see p.1380); the same may be true of the jet form. A bead similar to *4571*, and thought to be Roman, was found in a dump at the General Accident site, 24–36 Tanner Row, in York (Hooley, *AY* 17 in prep.), while 16–22 Coppergate produced two globular beads from mid 10th and late 11th century levels (Mainman et al., *AY* 17 in prep.). Although possibly Roman, *4571* may be an Anglian example of this form in jet. Discoidal jet and shale beads, similar to *4572*, have been found previously in York, at 16–22 Coppergate, in late 10th to mid 11th century deposits (Mainman et al., *AY* 17 in prep.).

Amber bead

A small fragment of amber from a Period 4z pit, *4573* appears to be part of a bead of uncertain form. Evidence for the manufacture of amber beads in York during the Anglo-Scandinavian period has been recovered from Clifford Street, where finger-rings and

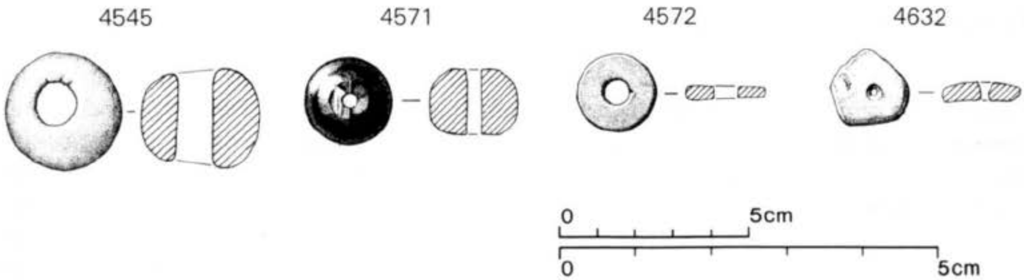


*Fig.673 Beads of stone (*4545*), jet (*4571*), shale (*4572*) and fired clay (*4632*). Scale 1:1,* 4632 *1:2*

pendants were also produced (Waterman 1959, 94–6). Other sites in the city where amber beads have been found include 6–8 Pavement (*393–6, AY* 17/3) and 16–22 Coppergate (Roesdahl et al. 1981, YAJG5). Raw amber may have been imported from the coasts of the Baltic or of south-west Jutland, but fragments washed up on the beaches of the east coast of England may have provided a more local source (ibid., 137).

Fired clay bead (Fig.673)

A subdiscoidal bead, *4632* was found in the cemetery build-up of Period 4b. It has been roughly chipped out of a sherd of Roman samian pottery, which was presumably found residually on the site and re-used, perhaps during the 11th century. Sherds of Roman pottery, including samian ware, were recovered in small quantities from the site (*AY* 16/6, 564).

Glass and frit beads (Figs.674, 676–7)

Four beads were found in deposits associated with Roman plough soil (*4790, 4811, 4828–9*), 28 derived from Period 3 contexts (*4762–5, 4784–5, 4791–9, 4812–13, 4819–20, 4823–4, 4830–1, 4837–8, 4841*), 31 from Period 4 contexts (*4766–76, 4786–8, 4800–4, 4814, 4825, 4832–5, 4839–40, 4842, 4844*), and 26 were thought to be residual, from medieval and post-medieval contexts (*4777–83, 4789, 4805–10, 4815–18, 4821–2, 4826–7, 4836, 4843, 4845*).

Nine different shapes of bead were recorded; these are described as globular, annular, cylindrical, gadrooned, ovoid, melon, rectangular, biconical and pear-shaped. The shape of ten fragmentary beads could not be ascertained. Apart from five polychrome examples, all the beads are monochrome; the main colours used are shades of yellow, green, blue, red, purple, and very dark glass which appears black.

Monochrome beads (Fig.674)

The form most commonly found on the site is globular, the term being applied to beads whose height is more than half their diameter (after Guido 1978, 69). Twenty-five beads are globular or subglobular, fifteen occurring in Periods 3 and 4 contexts, the remainder being residual. They are found in many different colours, the most common being yellow, green, and very dark/black. Two of the globular beads (*4842–3*) are red and are made of frit. A third globular bead (*4770*) has lost all trace of its original colour. The beads made of frit are the largest, *4843* having a diameter of 12·8mm and a height of 9·4mm. The next largest has a diameter of 10·2mm (*4772*), but 82% have diameters of 3–7mm. The maximum height (excluding *4843*) is 7·9mm (*4772*), 78% of the beads being 2–5mm high.

There are six annular, or ring-shaped, beads. They have a height which is less than half their diameter (see Henderson, p.213, *AY* 17/4). Five were recovered from Period 3 and 4 contexts, the other being residual. These are mainly shades of blue and yellow, with one green example. The five complete beads vary in size, the largest example being *4789*, with a diameter of 16·9mm and height of 6·3mm. *4786* and *4787* are similar in size, having diameters of 7·5mm and 7mm respectively, and heights of 3·5mm and 3·1mm respectively; *4785* and *4788* are approximately half the size of these.

Annular and globular glass beads are found frequently in Roman contexts (Guido 1978, 65–71), but they are also relatively common finds in middle Anglo-Saxon cemeteries (Hirst 1985, 62–6; Hyslop 1963, 198–9), and they were recovered in some numbers from the Anglo-Scandinavian levels at 16–22 Coppergate (Hall 1984, 104, fig.124). Examples have also been found in 12th century contexts at 34 Shambles, York, together with evidence of bead manufacture (pp.210–26, *AY* 17/4).

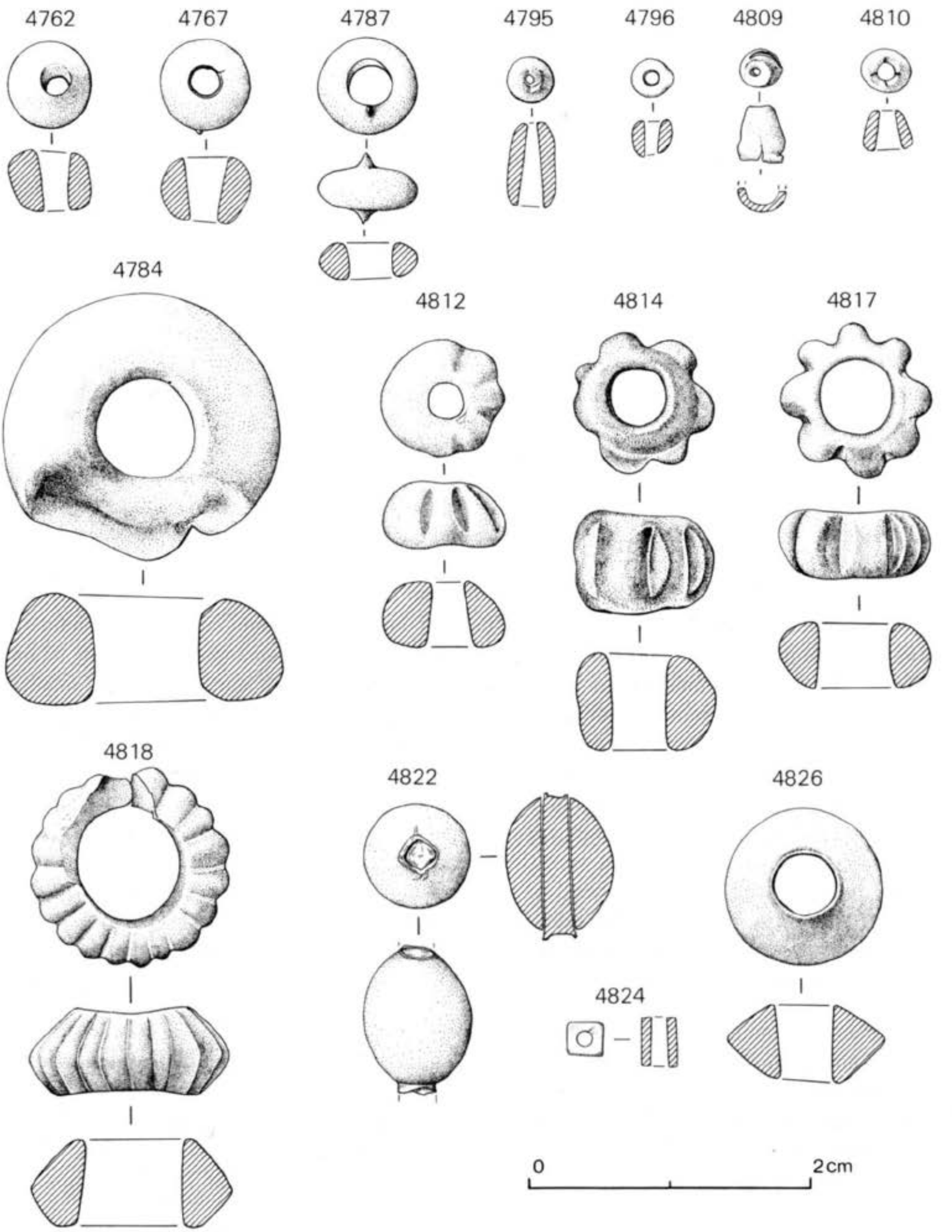
Cylindrical beads are only slightly less numerous than the globular beads. Twenty-four beads from Fishergate are cylindrical or subcylindrical, many tapering slightly towards one end (e.g. *4795*). Sixteen of the beads derived from Period 3 and 4 contexts, with one found in a Roman ditch fill, and the remainder apparently residual in medieval deposits. Apart from one very large green bead made of frit (*4844*), all these beads were remarkably standard in size and colour. Fifteen (62%) were of the same green, and four were other shades of green. Other colours included yellow and very dark/black. The glass beads had diameters ranging from 2·2mm (*4807*) to 3·5mm (*4795*), and heights of 2·5mm (*4796*) to 6·2mm (*4795*). Few of these beads have been found in the past (although their small size may have resulted in many being missed during excavation), and they appear, so far, to be unknown outside York. Those which have been found are all of green glass; they derive from Anglo-Scandinavian contexts at two sites on Pavement (*403–5*, *AY* 17/3; Waterman 1959, 104, fig.25, 20–2), and at 16–22 Coppergate (Hall 1984, 104). It may be significant that, unlike the annular and globular beads found in York, this form was not found on the site at the Shambles, indicating that it may have had a more restricted period of use. A date range within the Anglian and Anglo-Scandinavian periods seems most likely for these beads. Although *4790* was recovered from the probable Roman ditch fill, its similarity to the other cylindrical beads, and the fact that it seems to be a previously unknown Roman type, indicates that it may be intrusive. The tiny size of the beads suggests that they may have been sewn onto clothing, rather than used in jewellery (p.89, *AY* 17/3).

Eight of the beads are gadrooned, or multi-lobed. Three occur in Period 3 and 4 contexts, one in a Roman ditch fill, and four are residual. They are of various colours including blue, green, purple, dark green and very dark/black. Gadroons are usually found all around the bead, but *4812* is unusual in having them on one side only. The number of gadroons on each complete bead varies enormously; *4812* has three, *4814* seven, *4817* eight, and *4818* eighteen. The shapes also vary, being annular (*4817–18*), cylindrical (*4814*), and truncated conical (*4812*). Small gadrooned beads such as these are occasionally found in Roman Britain (Guido 1978, 99), and *4811*, found in the same Roman ditch fill as the cylindrical *4790*, may be an example of one of these. They are more commonly found in post-Roman contexts, however, as at the cemetery at Chamberlain's Barn, Leighton Buzzard (Hyslop 1963, 199, fig.17g). They have also been found in some numbers in Anglo-Scandinavian York at Pavement (Waterman 1959, 104, fig.25, 17) and 16–22 Coppergate (Hall 1984, 104, fig.124).

Four beads are ovoid, with heights greater than their diameters. Two were recovered from Period 3 contexts, and two from Period 6 contexts; however, the similarity of the latter to those found in Anglian deposits indicates that they may be residual. The colours found are blue-green, pale to mid blue, and yellow-brown. All four beads are roughly similar in size, with diameters ranging from 6·5mm (*4819*) to 7·7mm (*4822*), and heights from 8·6mm (*4819*) to 10·4mm (*4822*). The shape of these beads is unusual and does not seem to be paralleled elsewhere in Britain on any Roman or pre-Conquest sites, although similar examples have been recovered from sites in northern Europe, such as Birka (Arbman 1940, Taf.115, 4). Two of the ovoid beads from Fishergate, *4819*, found in a Period 3 context, and *4822*, from a Period 6 deposit, have the remains of hollow tubes of copper alloy within their perforations. A fragmentary bead of uncertain shape, *4836* also has a copper alloy lining. The hollow copper alloy tubes appear to have been used to cover and decorate the necklace string on which the beads were threaded. The thread itself, presumably an organic material, has perished. An ovoid bead of green glass recovered from a 15th/16th century context at Wharram Percy, North Yorkshire, also with a copper alloy lining and thought to be from a rosary (Andrews 1979, 131, fig.71, 39), is likely to be from a similar necklace and was clearly residual in its context.

There are fragments of two melon beads, one made of blue glass (*4823*) and one of turquoise-coloured frit (*4845*). Although lobed in a similar fashion to the gadrooned beads, the melon beads can be distinguished by their much greater sizes. Both melon bead fragments have heights which, at 18·2mm (*4823*) and 17·9mm (*4845*), are almost three times greater than that of the largest gadrooned bead. With their characteristic blue colouring, these beads are also almost certainly Roman, dating from the 1st–2nd centuries (Guido 1978, 100).

The two rectangular beads are blue, of square section and of similar sizes, with widths of 2·4mm (*4824*) and 2·9mm (*4825*) and heights of 3·7mm (*4824*) and 4·1mm (*4825*). These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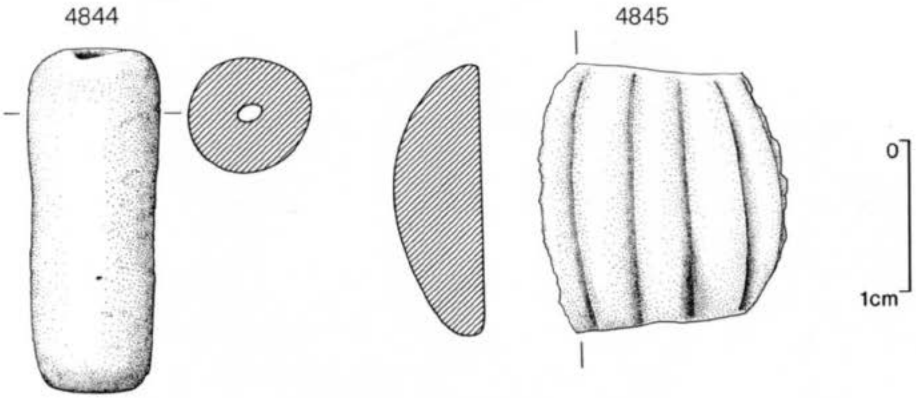


*Fig.674 (facing and above) Glass beads (monochrome): globular (*4762, 4767*); annular (*4784, 4787*); cylindrical (*4795–6, 4809–10*); gadrooned (*4812, 4814, 4817–18*); ovoid (*4822*); rectangular (*4824*); biconical (*4826*). Frit beads (monochrome): cylindrical (*4844*) and melon (*4845*). Scale 2:1*

are examples of another Roman type, previously found in contexts of the mid 2nd–4th centuries (Brewer 1986, 147; Guido 1978, 96).

4826 and *4827* are both biconical, but are otherwise dissimilar. *4826* is angularly biconical and blue, a recognised Roman type, most commonly found in later Roman contexts, although Guido suggests that the form may have survived into the post-Roman period (Guido 1978, 97). *4827* is more elongated, less angular, and much smaller, but this is also a long-lived Roman form (ibid., 98). *4828* is green, incomplete, and appears pear-shaped. It was found in a Roman context in Period 2 and is a known Roman form (ibid., 99).

Polychrome beads (Figs.676–7)

Three complete and two fragmentary polychrome beads were found on the site. The three complete examples were recovered from Period 3 contexts (*4837–8, 4841*), and the fragments from Period 4z deposits (*4839–40*). *4837* and *4838* are both globular and share a similar decorative treatment, with marvered (or smoothed) blotches of coloured glass applied in apparently random designs. The applied colours used in the decoration are red, yellow and white, which appear on both beads, and green, which is used only on *4837*. Gaps have been left between the spots of colour on *4838* so that the opaque blue-black colour of the bead itself is visible in certain areas; on *4837*, however, the glass of the bead itself is almost completely obscured by the decoration. The fragmentary and more delicately made beads *4839–40* also have applied and marvered irregularly shaped spots, but these are more scattered over the surface and are one colour only, yellow in both cases. *4841* is a very

Fig. 675 Emerald bead, 4574. *L. 17·2mm*

Fig. 676 Polychrome glass beads (l. to r. top 4841, 4838, 4837; *bottom* 4839, 4840*). D. (largest) 9mm*

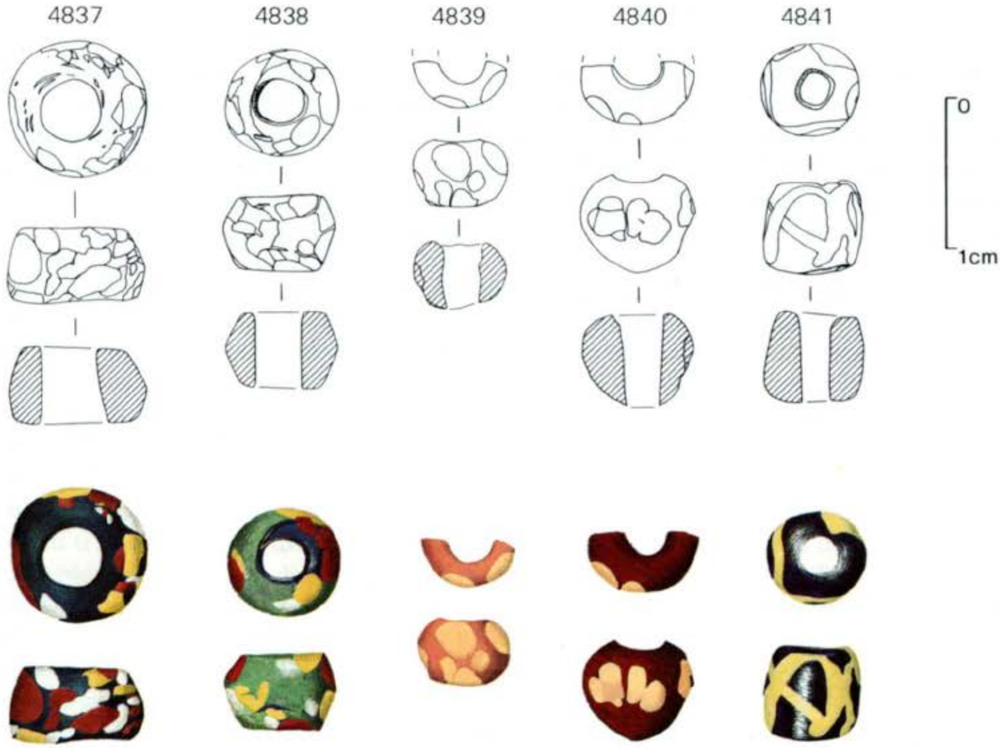


Fig.677 Polychrome glass beads, 4837–41. *Scale 2:1*

dark/black cylindrical bead decorated with an applied double-wave design in yellow, the waves having been marvered over the circumference of the bead, though they are unsmoothed where they extend over the ends.

Glass beads with decorative coloured designs are found as early as the Iron Age in Britain (Guido 1978, 45f.), but the beads found at Fishergate are more closely paralleled by the polychromatic beads which occur in early to middle Anglo-Saxon contexts. Beads with similar multi-coloured decoration were found in the cemeteries at Sewerby, Yorkshire (Hirst 1985, 68, fig.23), and Buckland, Dover (Evison 1987, 63–5, fig.12), and the settlement and graves at West Stow (Evison and Cooper 1985, 73–5, fig.276) (see Fig.611). The post-Roman cemetery at Schretzheim in south-east Germany produced a large number of polychrome beads; those most similar to the Fishergate examples came from graves of the late 6th–mid 7th century (Koch 1977, Farbtaf.1–3). These parallels suggest that all the polychrome beads found at 46–54 Fishergate are likely to derive from the Anglian occupation of the site.

Bead manufacture

A number of the beads found at Fishergate appear to be malformed or poorly finished after manufacture, most having been made by winding a glass rod around a wire (Guido 1978, 7). These include one of the annular beads, *4787*, which retains tiny projections at each end where it was removed from the glass rod. The cylindrical beads were spirally wound, some of them apparently carelessly as indicated by gaps in the beads, for example *4805* and *4809*. *4831* has been compressed at one end and is consequently misshapen.

Although badly formed beads are usually found on sites where there has been bead manufacture (see for example pp.210–26, *AY* 17/4), other evidence of glassworking at Fishergate is slight; it is insufficient to prove that beads were being made there. Apart from the failed or malformed beads, which are few by comparison with the complete and perfect examples, the only other indications of bead making are fragments of melted glass or possible manufacturing waste (*4745–57*). The small quantities of waste recovered do not necessarily indicate limited glassworking on the site as most waste would have been recycled and little discarded. However, large numbers of misshapen beads and offcuts of rods would probably have been found if bead manufacture was being carried out on any scale. It is more likely that the beads which found their way to Fishergate had been made elsewhere, probably in the centre of York.

Fossils

One fossil was found in a Period 2 context (*4546*), eighteen in Period 3 contexts (*4547–54, 4560–4*), and five in Period 4 contexts (*4555–9*). The majority of the fossils recovered are single crinoid ossicles, which were possibly used as beads; others are stone fragments containing various fossils including brachiopods, bivalves, gastropods and coral.

Dr G.D. Gaunt comments:

The majority of the fossils consist either of individual calcitic and silicified crinoid ossicles or of fossiliferous rock fragments of silicified limestone containing crinoid ossicles. All the ossicles have cylindrical disc shapes of Carboniferous type. In the northern Pennines, crinoid debris is common in some of the Lower Carboniferous limestones, in silicified limestones and cherts in the succeeding Yoredale sequence, and in the Harrogate Roadstone (itself mainly silicified limestone) locally at the base of the Millstone Grit sequence. Although a few erratics of silicified limestone occur around York, it is almost certain that only one of these fragments was obtained from an erratic source, the others being insufficiently worn and the protruding ossicles too small and fragile to have survived glacial transportation. There is little doubt, therefore, that the rock fragments and ossicles were obtained from outcrops, the nearest silicified limestone being the Harrogate Roadstone, cropping out under and south-west of that town. The fragments containing brachiopods, bivalves and gastropods are from the same range of strata and region as the crinoidal items, only one having an undoubted erratic shape. A subrounded limestone pebble contains a large part of one simple coral preserved in recrystallised calcite with the coralline structure still distinct. The coral is of Carboniferous type, as is the limestone; the shape of the pebble implies an erratic source, possibly in the York area.

Fossils such as these have been found elsewhere in York, including the General Accident site, 24–30 Tanner Row, and 5 Rougier Street (Hooley, *AY* 17 in prep.), while larger types, such as echinoderms, were found in the sewer trench excavations on Parliament Street (*691*, *AY* 17/4), and 16–22 Coppergate (p.186, *AY* 17/4). The sources of the fossils, apart from the coralline example, suggest that they travelled some distance and that they might have been deliberately collected. Oakley has noted that lengths of crinoid ossicles, composed of several discs and with a natural central perforation, were used in the Bronze Age as beads, and that, since at least the 17th century, they have been known in northern England as St Cuthbert's beads (Oakley 1965, 16). The single joints found at Fishergate could have had a similar function. Coralline and other fossiliferous rocks also seem to have been collected in the past because of their unusual appearance (ibid., 119–20).

Toilet implements

Tweezers (Fig.678)

One arm of a pair of tweezers, *5420*, was found in a Period 4z pit, but is probably residual. With its broad triangular end, curving inwards at the tip, and its narrow arm decorated with transverse incised lines, it closely resembles an arm found at Whitby Abbey (Peers and Radford 1943, 62, fig.13, 5), one of five different types of tweezers recorded there. Similar tweezers, also with incurved tips but with a more gradual taper from tip to loop, were recovered from Shakenoak Farm, from a context broadly dated from the mid 5th to early 8th century (Brodribb et al. 1972, 69, fig.30, 134–5). This shape of tweezers has rarely been found, and its date range is uncertain; the presence of such tweezers at Whitby

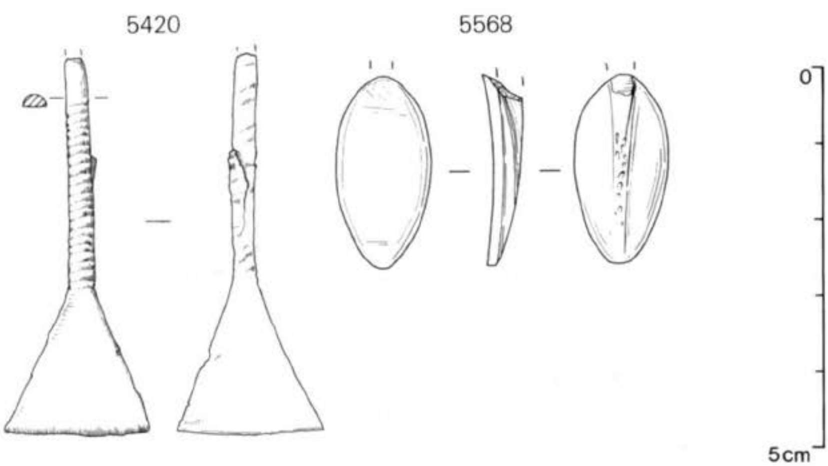


Fig.678 Toilet implements: copper alloy tweezers (5420) and bone spoon (5568). Scale 1:1

Abbey indicates a 7th–9th century date for the type (Peers and Radford 1943, 30), while their absence on any later site suggests that the type may not have been much used after the 9th century. They may have been used for cosmetic purposes, or possibly for handling precious metal embroidery threads (Roesdahl et al. 1981, YD29).

Spoon (Fig.678)

Part of a bone spoon (*5568*) was found in a Period 3z context. Although only the shallow, oval bowl survives, it is possible to see the line of the handle, which extended as a moulding along the underside of the bowl, almost to the tip. Perhaps used as a cosmetic spoon, the form appears to be Roman; the extended moulding is seen on several spoons of the mid 1st to mid 2nd centuries, although the bowls are usually round (Wickenden 1988, 107, fig.72, 25; Cunliffe 1964, 91, fig.24, 16; Jackson 1980, 29, fig.10, 6). The oval bowl is more commonly found in 3rd and 4th century contexts (London Museum 1930, 106), from which period this particular spoon probably derives. Roman bone spoons have previously been found in York on the General Accident site on Tanner Row, which produced two examples (Hooley, *AY* 17 in prep.).

Hair combs (Figs.679–85)

In all, the site produced six partially complete combs and 149 comb fragments, all from composite combs. Almost two-thirds of the fragments can be identified as coming from either single-sided or double-sided combs. Few of these, however, are sufficiently complete or distinctive to be confidently assigned to any of the typological groups of single- and double-sided combs outlined by authors such as Roes (1963), Ambrosiani (1981) and MacGregor (1985, 82–96).

In the following discussion, descriptions of the combs largely employ MacGregor's terminology (1985, 74–5), although connecting plate has been used in preference to side plate.

Single-sided combs

Five of the six partially intact combs are single-sided, as are the fragments of thirteen end plates, 22 tooth plates and thirteen connecting plates. Combs identified include handled and non-handled forms, although the majority of pieces are too fragmentary to be assigned to any particular type.

Handled combs (Figs.679–80)

There are three partially complete handled combs, and also a handle fragment and three end plates which are from combs of this type. Handled combs were almost invariably single-sided. Two alternative methods were used to construct them. Most commonly, a longitudinal slot was cut into a tine from the tip end; the slot occupied approximately half the length of the tine, the remainder acting as the handle. The tooth plates were then inserted into the slot and riveted in place. The other method involved two connecting plates, riveted together at one end, forming the handle; beyond the handle, stepped cuts were made on the inside of each plate, and the tooth plates were set into the gap created between the connecting plates by the stepped cuts. Both these methods were used at Fishergate.

Found in a Period 3a pit, *5697* is made from a slightly curved tine into which a slot has been cut; a drilled perforation acted as a guide when the slot was being made. There is incised decoration around the end of the handle and on one side only along the slot.

The other handled combs were constructed using the alternative method mentioned above. In two cases, *5569–70*, both handles and tooth plates were made of bone. Only a small fragment of the inner end plate remains attached to the handle of *5570*, which has identical incised decoration on both sides. The comb was recovered from a Period 4z pit, but is likely to be residual. The upper and lower edges of the plates of *5569* have been cut to produce flat faces, and the end of the handle has been cut square; a perforation close to the end allowed the comb to be suspended from a belt. A sliver of bone at the end of the slot acted as a wedge to the end plate. The top edge, or back, of the end plate has a curved projection, the far end of which appears to have been cut across the ring-and-dot motifs on one face of the plate, presumably the front. There are also lateral cut marks on the rear face close to the top. The projection may originally have curved down to touch the top of the back; it may have been perforated in a design similar to an end plate found at 6–8 Pavement, York (*529*, *AY* 17/3). The nearest continental parallels for this design are found on an end plate from Dorestad (Roes 1965, 62, 216, pl.XXVIII), and another found during the excavations of a terp-mound in the north of Frisia (Roes 1963, pl.XXV, 1). The handle of *5569* is decorated with incised saltires and ring-and-dot motifs on both sides, although the patterns differ slightly. The lateral cuts on the end plate and the different designs on the handle plates suggest that this comb may have been repaired or redesigned at some stage. It was retrieved from a Period 3c pit.

Three end plates may also have been parts of handled combs. The curved profile of *5706* suggests that it probably formed the end plate of a handled comb, while the rectangular shape of *5573* indicates that it may have been a first tooth plate, situated at the handle end. Alternatively, it is just possible that both could be parts of asymmetrical combs; this type of comb is rarely found in Britain, however, although it is known from the Continent, for example in Frisia (Roes 1963, 23–4, pl.XXIX). *5575* resembles the end plate on *5569* with its decorative perforation, and thus may also come from a similar handled comb. *5571* is a handle plate fragment, identified as such by the characteristic stepped cuts on its inner face. Both *5571* and *5573* were found in Period 3 contexts, while *5575* and *5706* were found residually.

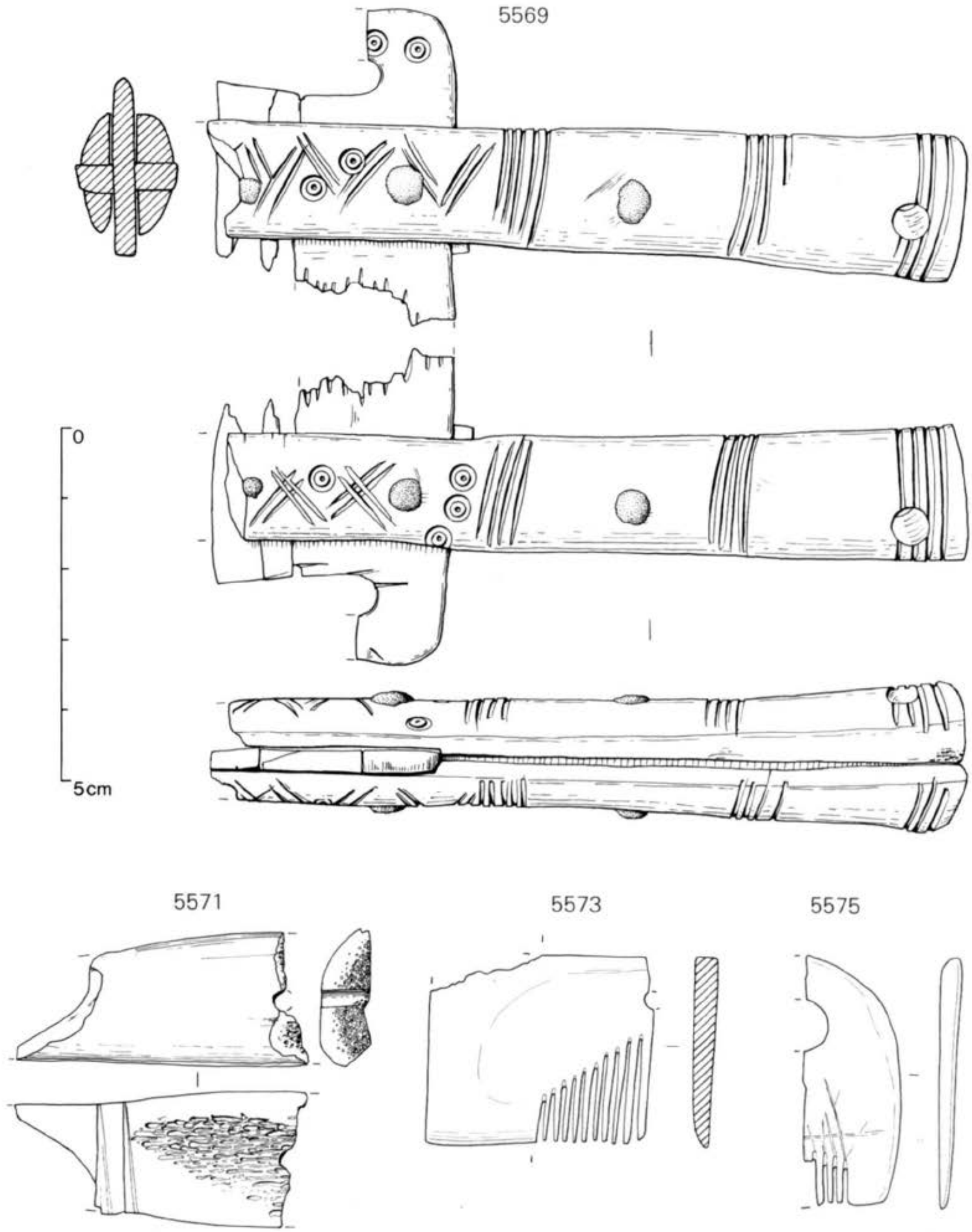
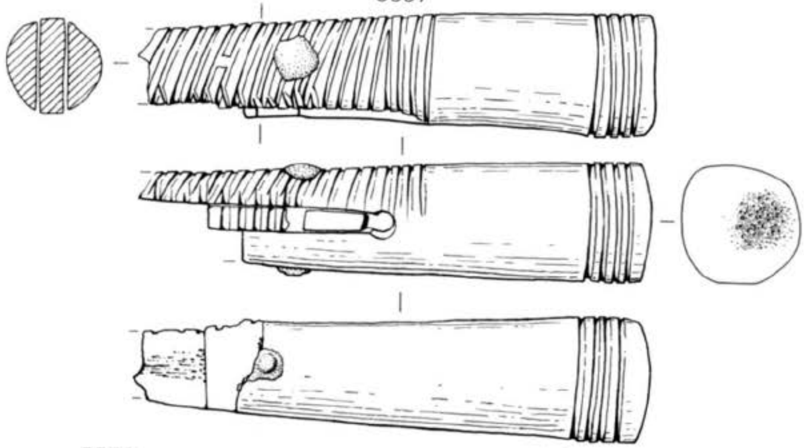
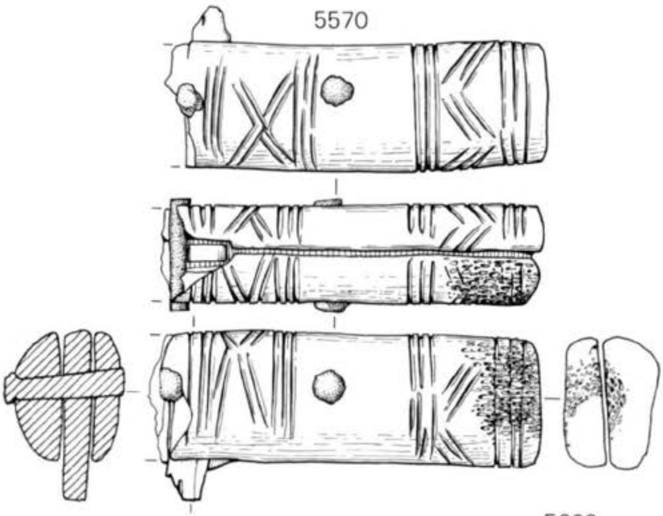


*Fig. 679 (pp. 1390–3) Single-sided hair combs of bone and antler: handled combs and fragments (*5569–71, 5573, 5575, 5697, 5706*); winged comb fragments (*5698, 5701–4, 5707–8, 5728*); fragments from combs with double connecting plates (*5716, 5718*); and a comb with deep, thin connecting plates (*5699*). Scale 1:1*

5697



5570



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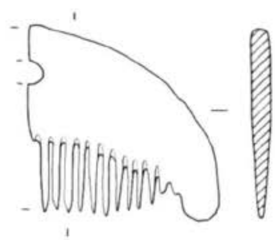
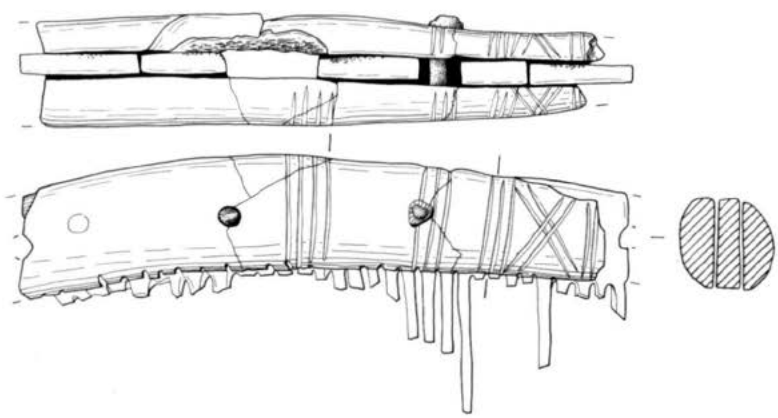
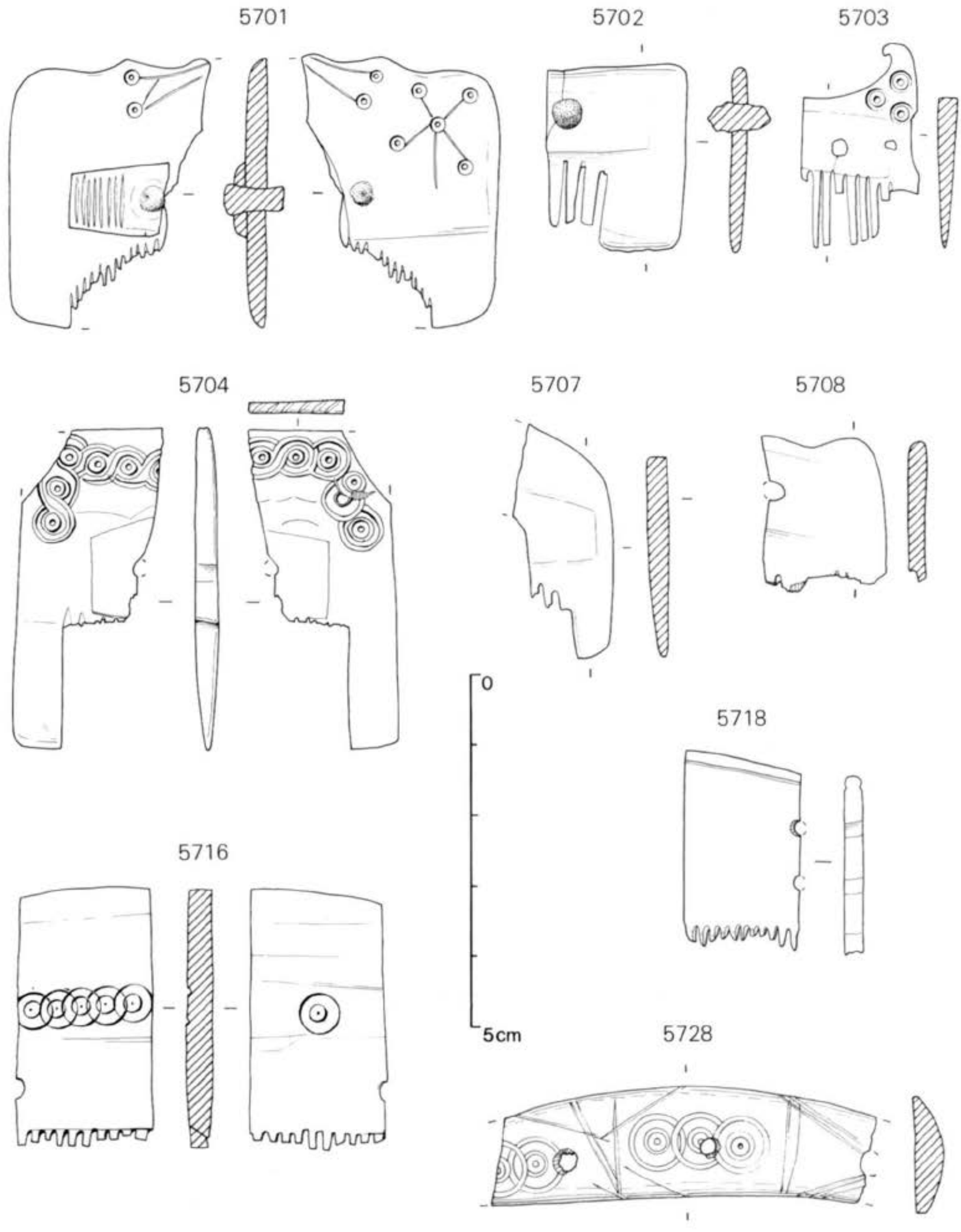


5698

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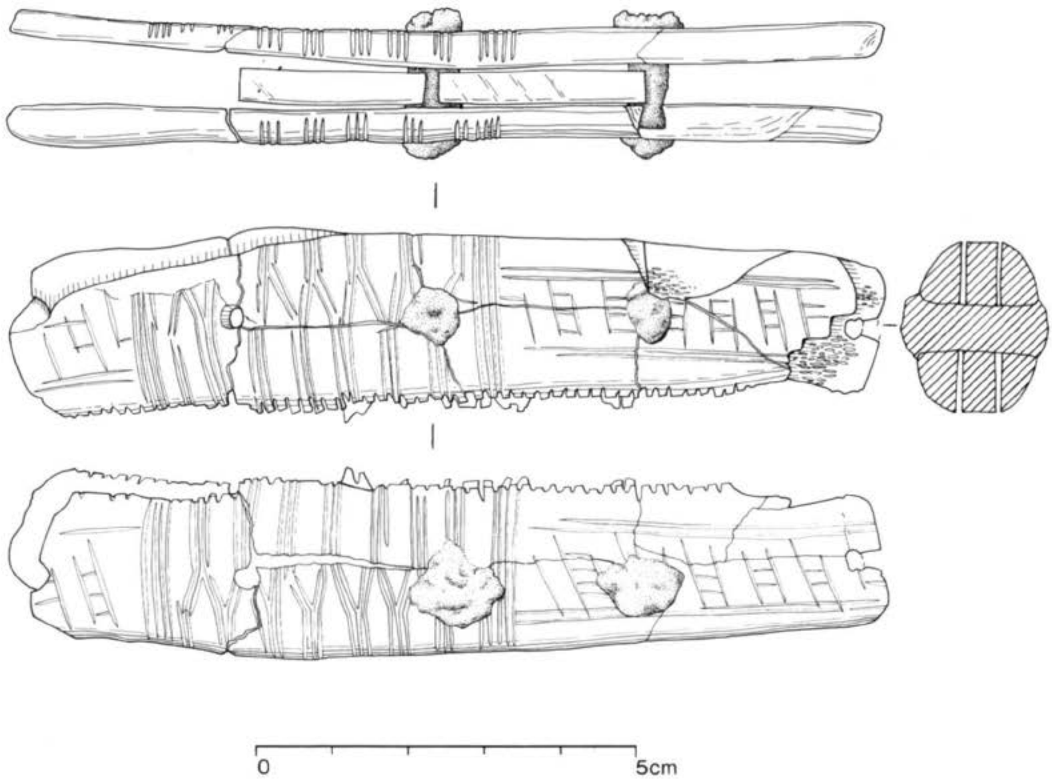

Alexander has suggested that antler would have been the preferred material for handled combs (Alexander 1987, 103), but although antler was readily available in York, bone appears to have been equally used, perhaps as a cheaper alternative. This is seen at other York sites; at 16–22 Coppergate eleven handled combs were recovered, of which six were of antler and five of bone (MacGregor, *AY* 17 in prep.). Similarly, one handled comb of bone and one of antler were recovered from excavations at the Barbican Leisure Centre site in York (sfs30 and 33, unpublished).

The two-piece handle, as exemplified by *5569*, appears to be a middle and late Anglo-Saxon design with a northern distribution, having been found elsewhere at sites such as Hartlepool (Jackson 1989, 195, fig.37), Whitby (Peers and Radford 1943, 70, fig.20), and Cambois, Northumberland (Alexander 1987, 102–3, fig.5). The slotted bone or tine handled comb seems to be the only type known in the south, however, with all examples to date from London (London Museum 1935, 152–3, fig.30; Riddler forthcoming a) and Hamwic (Hinton 1980, 77, fig.15, 3; Riddler forthcoming b) being of this design.

Fig.680 Bone handled comb 5569. *L.105·9mm*

On the Continent, antler handled combs have been found in excavations at Dorestad, where a date range of c.700–850 was suggested for the type (Roes 1963, 22–3, pl.XXVIII), and in small numbers in Scandinavia, for example at Birka (Arbman 1937, 238). The handled comb is much more frequently found in middle and late Anglo-Saxon Britain, however, with recent research suggesting that at least 100 have been recovered from sites of this period throughout the country (Riddler forthcoming a).

Other single-sided combs (Figs.679, 681)

Two tooth plates, *5716* and *5718*, are fragments of combs which had double connecting plates. *5716* has been decorated on both faces with ring-and-dot motifs along a central transverse zone, which has a more polished appearance than the rest of the plate. This decoration would only have been visible on a comb which had a pair of lower horizontal connecting plates and a second pair of convex plates forming the back, the intervening space being filled by the tooth plates. *5718*, with its rounded angled back and incised decoration following the line of the back, has two semi-circular rivet holes, indicating that it was also attached to two pairs of connecting plates. The use of a second pair of connecting plates is known on combs from the early and middle Anglo-Saxon periods; the design of *5716* is similar to that of combs from the later part of this date range, including examples from New Wintles Farm, Oxfordshire (MacGregor 1985, 86, fig.49b), Hamwic, and Brandon, Suffolk (I. Riddler, pers. comm.). *5716* derives from a Period 3z pit, while *5718* was recovered residually from a Period 4b deposit.

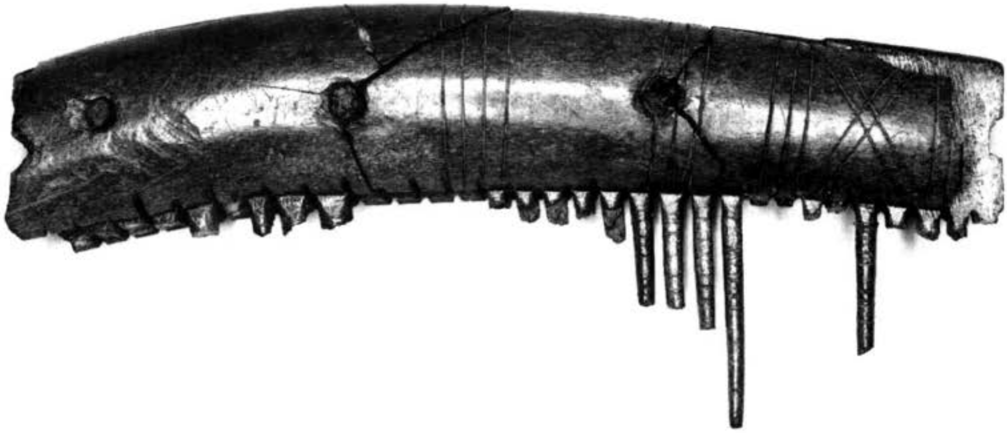

Fig.681 Antler winged comb 5698. *L.78mm*

The partially complete comb *5698* and the connecting plate *5728* are of a comb type characterised by connecting plates with convex backs. These usually have large end plates, often with angled or convex backs, which extend above the top edges and beyond the ends of the connecting plates, and they have accordingly been termed 'winged' combs (Roes 1963, 19). In addition to *5698* and *5728*, there are several end plates which appear to belong to this type, including *5703* which has a short hooked projection rising above the connecting plates. The slightly concave back of the plate develops from the projection, and ring-and-dot motifs fill the area between the top of the projection and the upper edge of the connecting plates. A similar end plate recovered from a cremation at the early Anglo-Saxon cemetery at Loveden Hill is thought to be 7th century in date (I. Riddler, pers. comm.). *5572* and *5702* both have backs which were angled down towards the top of the connecting plates to which they were attached. The rectangular end plate of *5704* extended considerably above the upper edges and beyond the ends of the connecting plates, advantage being taken of these visible areas to add an unusual interlocking ring-and-dot decoration. The backs of both *5701* and *5708* are scalloped; on *5701* the area around the end of the connecting plate has been decorated with ring-and-dot motifs linked by incised lines, although unusually the pattern is not identical on both faces. The pronounced convexity to the back of *5707* indicates that it may also have been part of a winged comb.

The winged comb appears to be a form of the early and middle Anglo-Saxon periods; examples have been found at the cemetery of Burwell (Lethbridge 1931, figs.25, 34, 36) and at West Stow (West 1985, fig.73, 2), while middle Saxon sites have also produced a number, e.g. Southampton (Addyman and Hill 1969, pl.VIIa). Several winged combs have been recovered previously in York, from Clifford Street (Waterman 1959, fig.16), and the type was particularly well represented amongst combs found during excavations of terp-mounds in the Frisian area (Roes 1963, 19–21, pls.XXI–V). Apart from *5704* and *5707–8*, which must have been residual, the winged comb fragments were recovered from Anglian contexts; all are likely to date from the 7th to 8th centuries.

5699 retains both connecting plates and has two toothless tooth plates still riveted in position. It has a slightly convex back and approximately horizontal lower edge, but lacks end plates. Its unusual incised decoration includes Y-shaped and Z-shaped motifs. It is similar to examples in MacGregor's broad grouping of combs with deep thin side plates (connecting plates), which appear to date from the 9th–mid 10th centuries (MacGregor 1985, 88–9). Examples have previously been found in York (Waterman 1959, fig.17, 2), and on other sites in England, including Caistor in Lincolnshire (Thompson 1954, 77–8). The type has also been widely recognised in northern Europe, particularly in 10th century levels, at sites including Birka (Ambrosiani 1981, 19, fig.4, type A) and Hedeby (ibid., 28) (see Fig.612). The Fishergate example is clearly residual, as it was recovered from a 13th century context.

End plates

In addition to those mentioned on pp.1394–5, there are three other end plates. *5700* and *5705* are too fragmentary to be further classified; *5574* may be unfinished and was perhaps discarded as a result of damage. Its back and teeth appear incomplete, and it is broken at one end.

Tooth plates (Fig.682)

Nineteen tooth plate fragments (*5576–9, 5709–15, 5719–26*), four of bone and fifteen of antler, derive from single-sided combs, but none is distinctive enough to be identified as coming from any particular comb type. The majority of the plates have lost their teeth, but stumps survive in most cases. The plates are mainly rectangular or subrectangular with slightly angled backs which would have followed the line of the back of the connecting plates. The backs are usually flat but occasionally, as on *5710*, they are convex. All the plates have a semi-circular notch cut into one side, allowing them to be fixed in place between the connecting plates by rivets. The teeth are usually regularly cut and equally spaced, but vary in number from four (*5711*) to fifteen (*5579*) per tooth plate, and from four to nine teeth per 10mm; 82% have between five and seven teeth per 10mm. All the teeth are of rectangular or subrectangular section and have tapering sharpened tips. Occasionally, thin transverse grooves can be seen on the front of the teeth; it has been suggested that they may result from the comb having been slid in and out of a comb case (p.93, *AY* 17/3). The teeth have usually been cut at an angle, so are slightly longer on one face.

Two tooth plates have decorative backs. The upper edge of *5710* would have been easily seen as it projected above the comb back. *5723* has incised cross-hatching on the

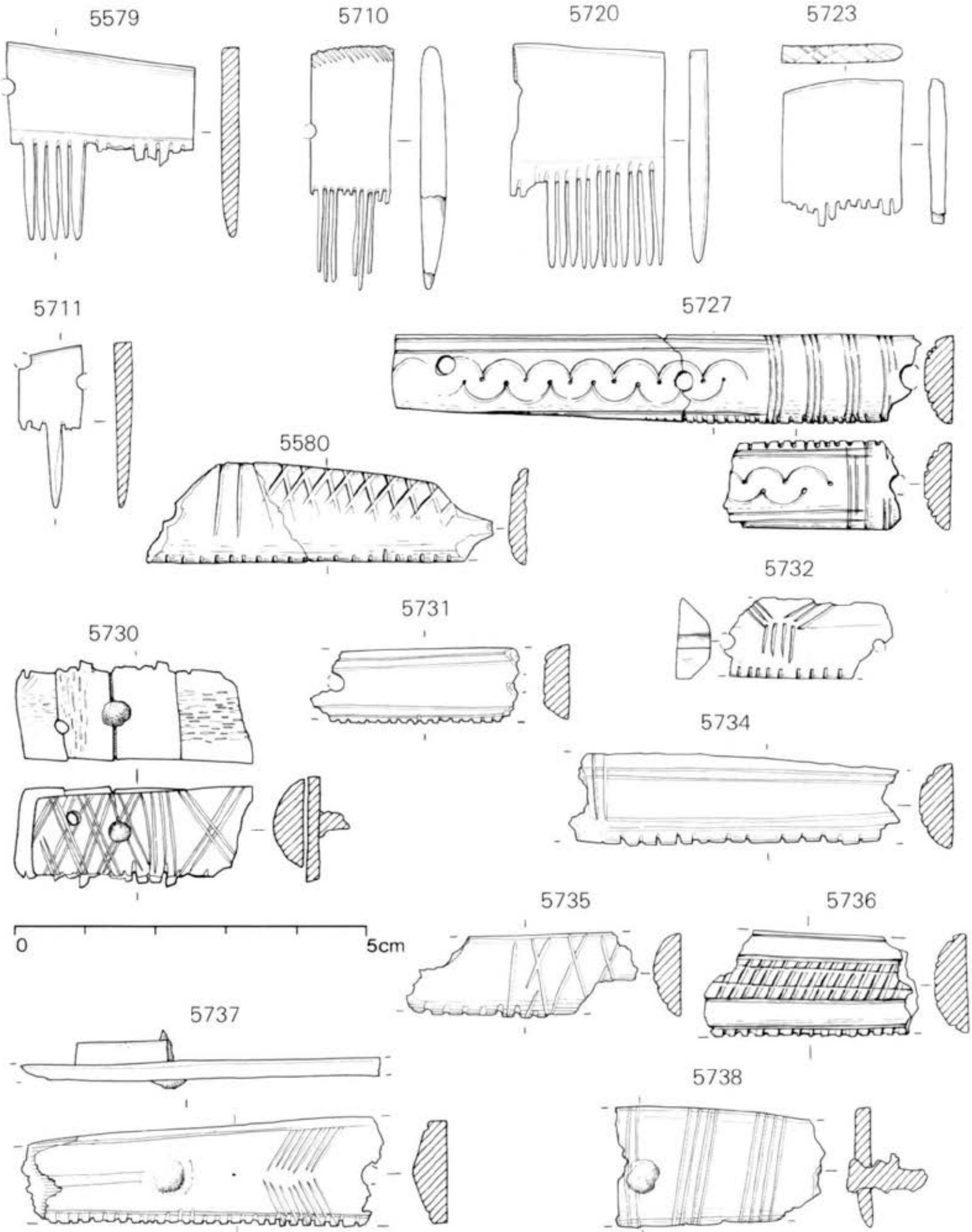

Fig. 682 Single-sided hair combs of bone and antler: tooth plates (5579, 5710–11, 5720, 5723) and connecting plates (5580, 5727, 5730–2, 5734–8). Scale 1:1

back itself, decoration which would only have been visible when looking down on the top of the comb. *5711*, which is particularly small, may have been altered. In addition to the usual hole on one side, there is another semi-circular hole in one of the upper corners of the plate. This may be the remains of the original rivet hole of what was once a larger tooth plate, cut down for re-use. The facility to repair or replace certain elements of composite combs was one of the advantages of an otherwise cumbersome method of construction.

Connecting plates (Fig.682)

Fourteen fragments of connecting plates (*5580–1, 5727, 5729–38*) can be identified as coming from single-sided combs; all are decorated. The plates are all of a similar shape, with a horizontal or occasionally convex lower edge, with tooth cutting marks, and an angled or convex back, the plate broadening towards the centre. Formed from beams or tines, the antler plates tend to become thicker as they broaden, while the bone plates are more uniform. They all have a plano-convex or trapezoidal section. Three of the fragments (*5730, 5737–8*) retain iron rivets, and *5730* and *5737* also have tooth plate fragments attached. The rivet holes were clearly points of weakness, as at least one end of each fragment has been broken across one rivet hole, and on several fragments both ends have been broken at these points.

Several decorative designs have been employed on the connecting plates. *5731* and *5734* both have longitudinal lines along each edge, the latter also having a pair of transverse lines. Bands of transverse lines appear on *5738* and on *5733*, where groups of three short lines alternate along the median axis and one edge. *5732* has a Y-shaped pattern, similar to that on *5699* (see pp.1393, 1396), and *5736* has a median field of oblique lines broken by two faint longitudinal lines, and also longitudinal lines along each edge. Cross-hatching occurs on *5581* and *5729*, and in combination with transverse lines on *5730* and *5580*. Other motifs include saltires, e.g. *5735*, chevrons, e.g. *5737*, and ring-and-dot, as on *5727* with its unusual wave pattern.

Double-sided combs (Figs.683–4)

There are fifteen fragments of double-sided combs, comprising one partially complete comb, one end plate, eleven tooth plates and three connecting plate fragments. Combs with teeth of the same gauge and of two different gauges are both represented.

5739 comprises two fragments of connecting plates with tooth plates in situ, and one end plate fragment, all from the same comb. Only one of the connecting plates has saw marks from cutting the teeth which are present on both edges. It is clear that a new connecting plate has been attached by way of repair. Although the end plate and three surviving tooth plates are incomplete, it can be seen from the stumps that all had teeth of identical size.

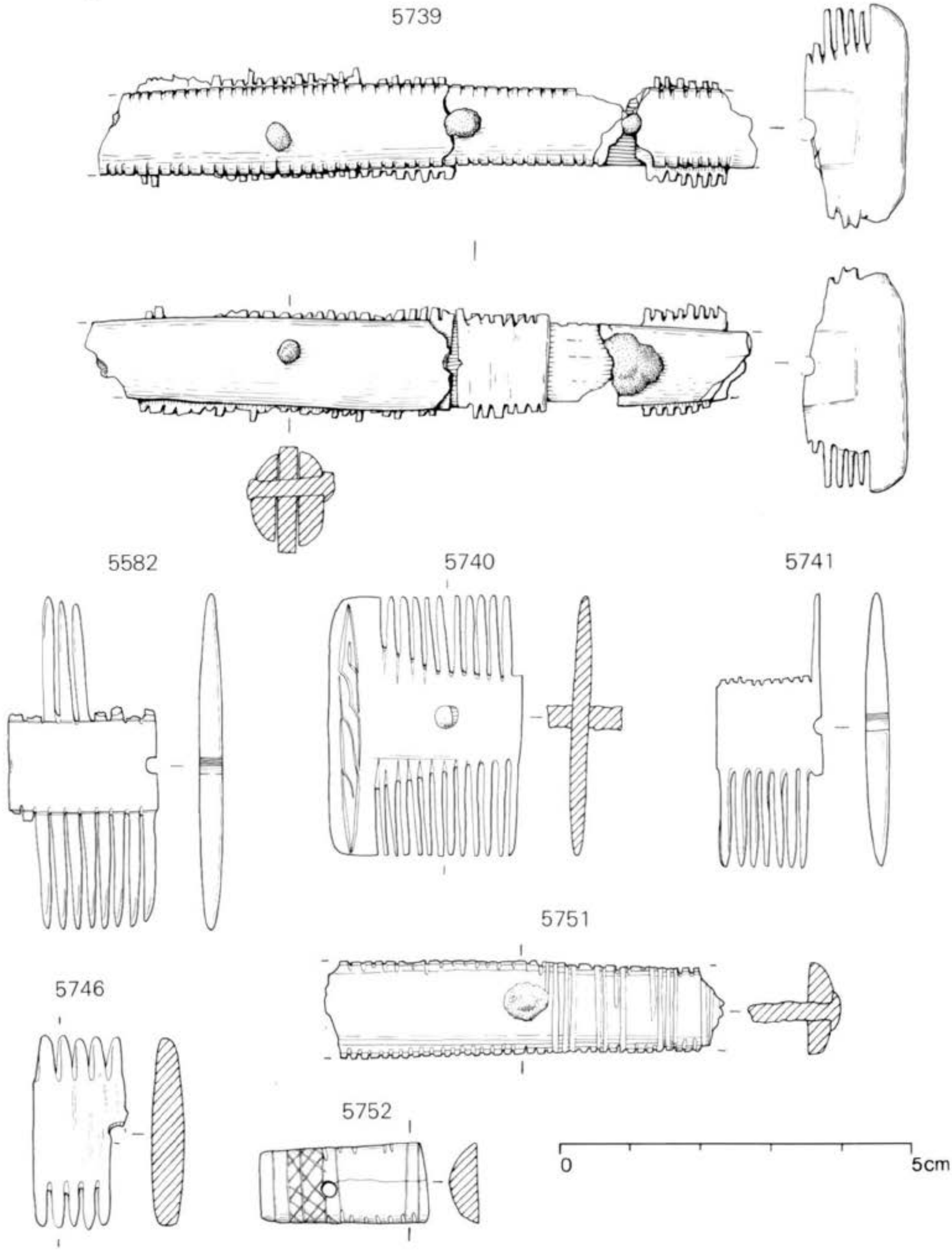

Fig. 683 Double-sided hair combs of bone and antler: partially complete comb (5739); end plate (5740); tooth plates (5582, 5741, 5746); connecting plates (5751–2). Scale 1:1

Fig.684 Double-sided end plate of antler (5740); note the tooth cutting lines. L.37·1mm

End plate (Figs.683–4)

The only other double-sided end plate is *5740*, which had twelve teeth on one side, and eleven on the other, of which ten survive. The end of the plate has been decorated with an elliptical field filled with a fret pattern, similar to that on *5699* (see p.1393). Scribed laying-out lines, marking the positions of the teeth, are visible running from the tops of the shorter end teeth up to the line of the lower edge of the connecting plate.

Tooth plates (Fig.683)

Of the eleven double-sided tooth plates (*5582, 5741–50*), two (*5741* and *5748*) have coarse teeth on one edge and fine teeth on the other; *5741* has five and seven teeth per 10mm, and *5748* has three and five per 10mm. The provision of fine and coarse teeth is common on combs of the Roman period, and also on those of the Anglo-Scandinavian period and later, but seems rare during the Anglian period when the teeth tend to be more evenly sized (MacGregor 1985, 92). Recovered from the fill of a Period 3b slot, *5741* may be one of the uncommon Anglian examples; *5748* was found in a Period 4z post-hole and is likely to be later in date. Such combs have been found previously in York, on Clifford Street (Waterman 1959, fig.17, 3), and also from two unrecorded sites (ibid., pl.XVIII, 10–11); these examples probably date to the Viking period.

The numbers of teeth can be counted on both sides of all but one (*5747*) of the other nine tooth plates; all have one extra tooth on one side. This arrangement of teeth is the result of cutting the first tooth on each side in slightly different positions. It appears that on most combs there was no marking out of the positions of the teeth on each side before

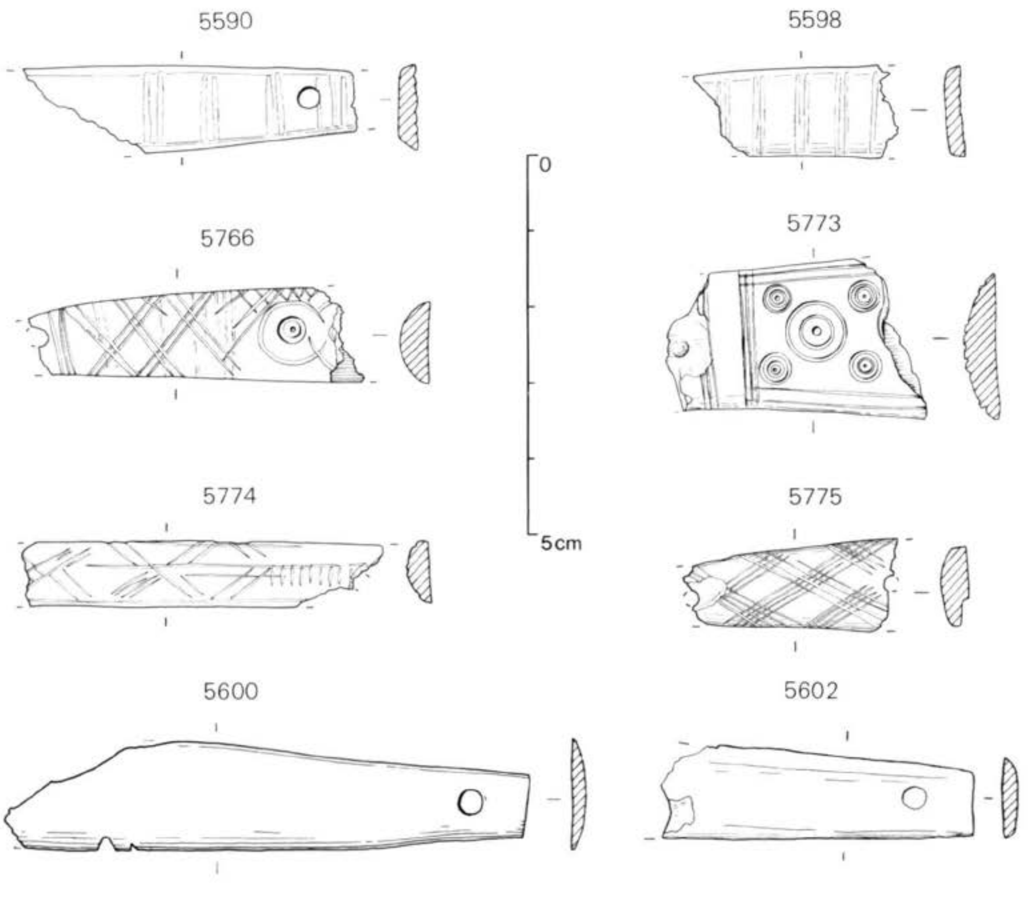

*Fig.685 Connecting plate fragments of bone and antler from combs of indeterminate form: decorated (*5590, 5598, 5766, 5773–5*); undecorated (*5600, 5602*). Scale 1:1*

cutting, which results in these slight differences. This was not invariably the case, however, as such lines are apparent on the end plate *5740* (see p.1400). All the tooth plates have teeth of similar size, with six per 10mm, apart from *5582* which has only four per 10mm.

Connecting plates (Fig.683)

There are three fragments of connecting plates, *5583* and *5751–2*, all with tooth cutting marks along both edges. As with the single-sided plates, these connecting plates have a plano-convex section, and the single example of bone (*5583*) is much thinner than the antler plates. This bone plate is undecorated, but the two antler plates are decorated, *5752* with overall transverse lines and cross-hatching, *5751* with bands of transverse lines to one side only of an approximately central rivet.

Fragments of combs of indeterminate form (Fig.685)

There are 62 fragments which cannot firmly be attributed to either type of comb. Some are teeth which have broken off tooth plates (*5584–5, 5753–7*). Others are tiny fragments from the lower edges of tooth plates (*5758* and *5760*), or parts of tooth plates which have lost their teeth (*5586–7, 5759*). Fifty fragments are of connecting plates which lack tooth sawing marks, and therefore cannot be positively identified as parts of either single-sided or double-sided combs. Most of these are decorated, the majority with bands of transverse or oblique lines, lozenges or cross-hatching (*5588–99, 5761–75*). *5772* and *5773* have ring-and-dot decoration, and *5766* appears to have been redecorated; it has ring-and-dot motifs at one end, but the other end originally had transverse lines, subsequently replaced with cross-hatching. The remaining fragments (*5600–8, 5776–83*) are undecorated.

To conclude, then, although many fragments of comb were recovered, few comb types could be identified. Moreover, when considered together, these fragments may represent only a small number of combs. Despite this, some trends are clear. For example, single-sided combs are far more common at Fishergate than double-sided varieties. This contrasts markedly with assemblages from many early Anglo-Saxon sites where single- and double-sided combs appear with similar frequency, as at West Stow (West 1985, 126). During the middle Anglo-Saxon period, however, there seems to be more variation in their distribution, double-sided combs being as common as single-sided at Hamwic (I. Riddler, pers. comm.) but rare at sites such as Brandon, Suffolk (West 1985). In addition, antler appears to have been the preferred material at Fishergate, being used more frequently than bone for the single-sided combs and almost exclusively for the double-sided combs. This preference was also noticeable amongst the comb making debris (see p.1247).

Comb cases (Fig.686)

Comb cases were designed to protect combs when not in use and were usually made of antler or bone (MacGregor 1985, 96), although leather cases are occasionally found, as at

Birka (Arbman 1940, Taf.161, 2). The comb would be slid into the case, which generally had a perforation at each end, one to allow the suspension of the case from the body, the other corresponding to a similar hole in one of the end plates of the comb, which could be secured within the case by a peg. Comb cases may have been particularly associated with men — Ambrosiani has noted that at the Birka cemetery cases were found in male graves only (Ambrosiani 1981, 89) — although it is possible that women used cases made of materials more likely to perish during prolonged deposition.

Two fragments from the site may be parts of comb cases, although identification is uncertain. *5609* is made of bone, with a slot at one end, formed by three adjoining perforations, and a large perforation at the other, all the holes having been made after the object had been decorated with ring-and-dot motifs and cross-hatching. Apart from the lack of a decorative terminal, it is identical to a fragment found during excavations of terp-mounds in Frisia, and interpreted by Roes as part of a comb case (1963, pl.XXXI, 8). Decorated objects of similar shape in the Yorkshire Museum (Roesdahl et al. 1981, YAB46) and from Anglo-Saxon Southampton (Holdsworth 1976, 47, fig.21, 9) are, however, described as plaques. It was suggested that the example from Southampton may have been attached to textile or leather (ibid.).

5784 is a fragment of unusual shape, which may be the terminal of an antler comb case. Decorated with ring-and-dot motifs, it has projections which may have represented the ear and snout of an animal head, and has broken across both a circular and a subrectangular perforation. It resembles the zoomorphic terminals found on barred comb cases thought to date from the 5th century (Hills 1981, 108). Such cases, and their combs, which are of triangular or barred zoomorphic type, have been found in England at the early Anglo-Saxon cemetery at Spong Hill in Norfolk (Hills 1977; 1981), and also in the Frisian terp-mounds (Roes 1963, pl.XII). These parallels suggest that *5784* may originate in the 5th century, and thus considerably pre-date the Anglian occupation of the site.

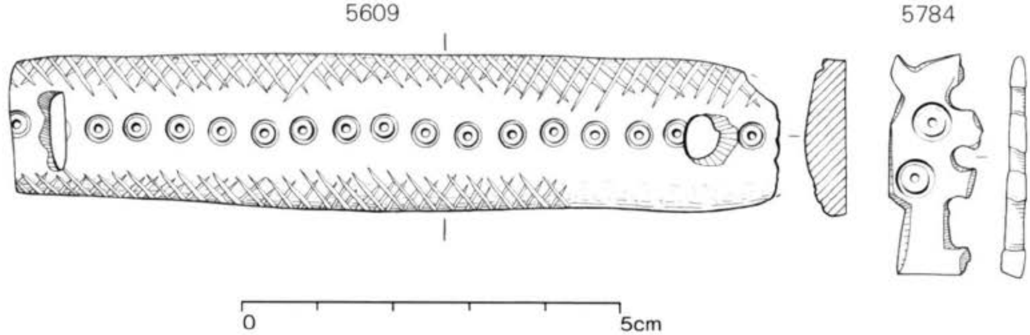

Fig.686 Comb case fragments of bone (5609) and antler (5784). Scale 1:1

Decoration

A variety of decorative designs have been employed on these combs, and, as noted on pp.1396 and 1400, these have not been restricted to connecting plates. End plates also offered an opportunity for decoration. Moreover, although the arrangement of the various elements of the composite combs was such that little tended to be seen of the individual tooth plates, some of these have also been decorated.

Several examples of decorated combs show that the incised decoration of the individual parts must have been executed before the comb was assembled. On *5697* (Fig.679), for example, it is clear that the decoration was carried out before the teeth were cut into the tooth plates, as the tooth sawing marks are cut into the pattern. Similarly, on *5727* (Fig.682) both rivet holes perforate the incised wave design. Occasionally, the marks made in sawing the teeth, after the comb had been put together, were themselves used as a decorative design, as on one side of *5739* (Fig.683), which is otherwise undecorated.

Many of the designs on the Fishergate examples are common on combs of this period. This is particularly true of the incised parallel lines, which may be transverse (e.g. *5593*), oblique (e.g. *5765*) or occasionally in the form of lozenges (e.g. *5774*, Fig.685). These lines often occur in pairs, and are either knife-cut as on *5572* or, more commonly, saw-cut as on *5590* (Fig.685). It is possible that double-bladed saws were sometimes used in creating these patterns, as the pairs of lines are often identically spaced, at approximately 1mm apart, a phenomenon that has been recognised previously at a number of other sites (MacGregor 1985, 55). These lines may form the only decoration, as on *5761*, or may be used in combination with other designs such as cross-hatching (e.g. *5752*, Fig.683), saltires (e.g. *5570*, Fig.679), ring-and-dot motifs (e.g. *5609*, Fig.686), and, exceptionally, several of these (e.g. *5569*, Fig.679).

More unusual line decoration is seen on *5699* (Fig.679), which combines two designs. At each end there is a defined zone which contains a pattern of Z-shapes, while the intervening field is decorated with bands of transverse lines which diverge to form a series of Y-shapes. This latter design is similar to that on a comb case from York (Waterman 1959, pl.XIX, 8), and is also seen on a similar comb from Lund (Persson 1976, pl.289, 12A).

Ring-and-dot is the other commonly employed motif; like the incised lines, it appears in a variety of forms and combinations. Such motifs are always regularly inscribed, and must have been made using tools with radial points, either fixed or possibly variable, which turned around a central point (MacGregor 1985, 60). Each motif consists of one or two concentric circles, the single circles ranging in diameter from 2mm (*5701*) to 4mm (*5569*) (see Fig.679), and the doubles from 3·7mm to 7·7mm (*5773* has both extremes) (see Fig.685). They occur in combination with cross-hatching (*5766*, Fig.685), linked by curved lines (*5701*, Fig.679), and in various interlinked arrangements (*5704, 5716, 5728*, Fig.679). The interlinked motifs are not commonly found on other sites, but have been noted previously on some Frisian combs (Roes 1963, pls.IV, VII, IX). The wave design seen on *5727* (Fig.682) appears to be a particularly unusual variation, although it is found on the Zweins casket (Roes 1963, pl.LXIII, 10) and has also been used on a comb from Hamwic (I. Riddler, pers. comm.).

The designs on the comb fragments are usually found all over, but some of the patterns show the deliberate use of zoning, the patterns being confined to particular areas, as on *5751* (Fig.683) and *5737* (Fig.682) which are decorated only to one side of the existing rivet. On others, such as *5734* (Fig.682), fields have been defined, in this instance by longitudinal lines along each edge, although the interior remains blank. A similar field on *5736* (Fig.682) contains a median row of short oblique lines.

It is interesting to note that the decoration on the slotted tine handled comb *5697* is restricted to one side, whereas the two-piece handles on *5569* and *5570* are decorated on both sides (see Fig.679). One-sided decoration on handled combs, particularly those with slotted handles, has been noted elsewhere, for example on combs from London (Riddler forthcoming a) and North Elmham (Wade-Martins 1980, 485). The reasons for this are unclear. Being made of one piece, it would have been difficult to cut identical patterns on both sides of a slotted handle, but two-piece handles, which could be decorated before being assembled, are also known with this feature (ibid., 485, fig.259, 5). It has been suggested that this is a stylistic feature typical of Frisian combs, which indicates a possible Frisian origin for handled combs (MacGregor 1985, 92). The most plausible explanation, however, is that it was thought desirable to have a 'display side' to these combs (Riddler forthcoming a). The presence of a suspension hole on *5569* supports this suggestion.

Recreation (Figs.687–8)

Playing piece (Fig.687)

A conical object of chalk from a Period 4z pit, *4565* is of uncertain function but may be a playing piece. It has a small hole gouged out of its base, which may have acted as a peg hole. This feature has been noted on bone objects of similar shape found on several sites, including Goltho Manor (MacGregor 1987, 191–2). The form is thought to have been introduced to this country by the Vikings, and it is likely that pieces were used in the playing of *hnefatafl*, a Viking board game (MacGregor 1985, 135). Other *hnefatafl* pieces of chalk, smaller than *4565*, have been found at 16–22 Coppergate (Roesdahl et al. 1981, YDL30). The provenance of the stone from which *4565* is made is likely to be the same as that of the stone weight *4462*, that is the Yorkshire and Lincolnshire Wolds (G.D. Gaunt, pers. comm.).

Gaming counters (Fig.687)

4633 is roughly discoidal and has been chipped out of a Roman fired clay tile; it was found in the Period 4b cemetery build-up. A similar, though slightly larger, disc from All Saints' Church, Pavement, was interpreted as a gaming counter (*1226*, *AY* 17/4), as were

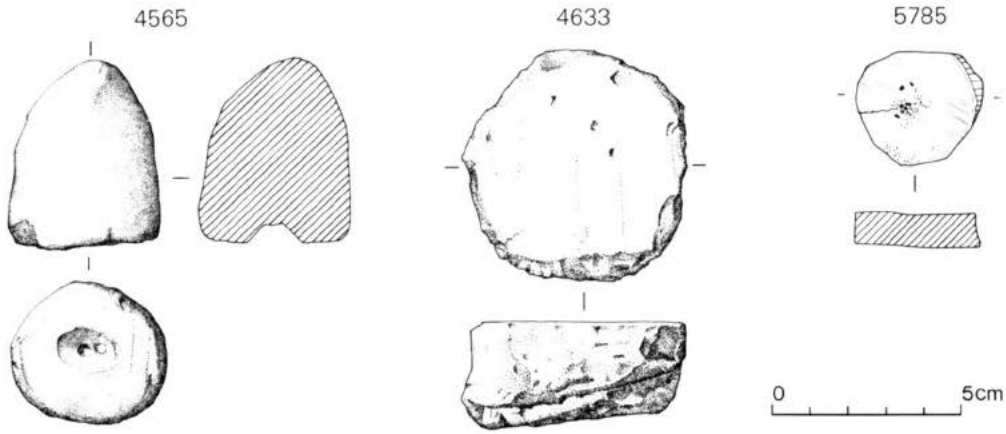

Fig.687 Gaming pieces: hnefatafl *piece (4565); counters of fired clay (4633) and of antler (5785). Scale 1:2*

several found at Winchester (Brown 1990b, 696). Another possible counter is *5785*, which is approximately discoidal and cut from an antler tine; it was recovered from a Period 4z deposit. It has been suggested that counters such as these were used to play 'tables', a board game which seems to have arrived in England from France during the 11th or early 12th century (ibid.).

Skates (Fig.688)

Two skates, *5610–11*, were recovered from the same backfilling and levelling deposit in the Period 4b cemetery. They probably form a pair, although they differ slightly in size. *5610* was made from a horse metapodial and *5611* from a horse metatarsal. Each has an upswept toe at the distal end of the bone, and an axial heel hole at the proximal end for the fitting of a strap. The strap would have been fixed in the hole by a peg, probably wooden (MacGregor 1976, 59). Both skates have been flattened, by knife cutting, on the underside of the bone, which would have been the face in contact with the ice; *5610* has also been trimmed on the upper face, in the area where the heel of the skater would sit.

The earliest skates recovered come from Germany, and appear to date from the Iron Age (MacGregor 1976, 64). They have, however, been more commonly found on post-Roman sites throughout Europe. In northern Europe they have been found on sites including terp-mounds in Frisia (Roes 1963, 57–9, pl.XLVIII), Dorestad (Roes 1965, 51, fig.29; Clason 1980, 243–6, fig.170), Lund (Cinthio 1976, 383–5, figs.335–7) and Birka (Arbman 1940, Taf.157) (see Fig.612).

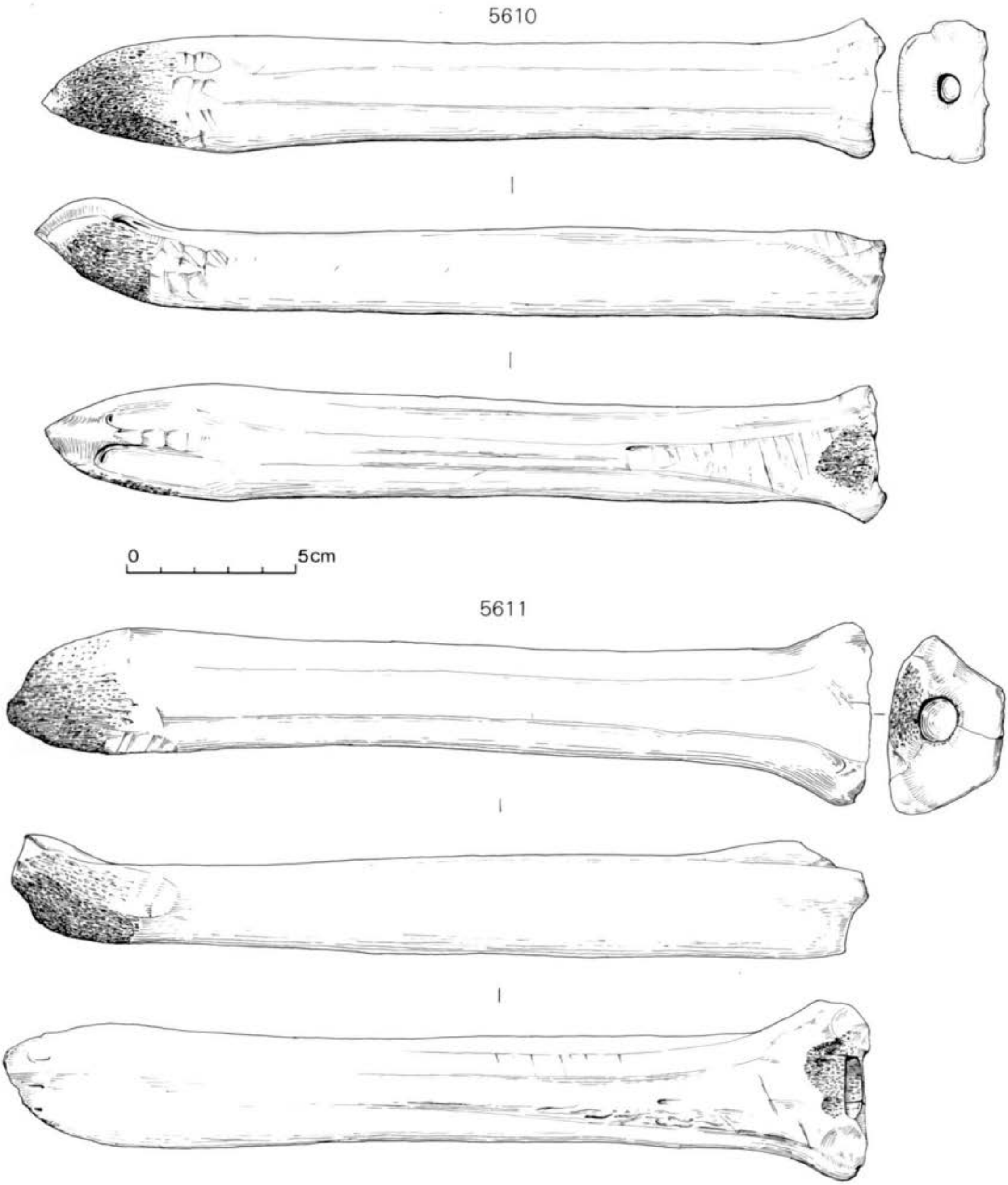

Fig. 688 Bone skates 5610–11. *Scale 1:2*

Numerous skates have been found previously in York, scattered across the city and on sites of varying proximity to the Rivers Ouse and Foss. Single finds have been recovered from Hungate (Richardson 1959, 100, fig.28, 13), King's Square (Wenham 1970, 168, pl.V), Leadmill Lane (*660*, *AY* 17/3), and 58–9 Skeldergate (sf880, unpublished), two from The Bedern (sfs788 and 1742, unpublished), two from the Barbican Leisure Centre, Paragon Street (sfs565 and 579, unpublished), and more than 40 from 16–22 Coppergate (MacGregor, *AY* 17 in prep.). Many of these derive from Anglo-Scandinavian contexts (MacGregor 1976, 65), although one skate from Paragon Street was found in a probable 8th century context. Taken together, these finds imply that, during the Anglo-Scandinavian period in particular, the river and other areas of water, such as ponds, must have been quite frequently frozen over, although further evidence for this remains elusive (ibid., 67). It may be assumed, however, that the skates found at Fishergate were put to good use on the nearby Rivers Foss and Ouse.

Other contemporary sites in England which have produced skates include Flaxengate, Lincoln (Mann 1982, 16–18, fig.15), St Peter's Street, Northampton (Oakley and Harman 1979, 315, fig.140), Winchester (MacGregor 1990, 708, fig.199), and Thetford (Rogerson and Dallas 1984, 179, figs.195–7) (see Fig.611).

Structural metalwork and fittings (Figs.689–95)

Nails (Fig.689)

Nails were found in considerable numbers on the site, but apart from the investigation of a few unusual examples, such as those with traces of plating, and studies of the horseshoe and coffin nails (see pp.1430 and 1436–7), they have not been analysed in any detail. Table 123 lists the total numbers of uncatalogued nails and nail fragments. Only the examples discussed in the text have been catalogued.

Table 123 Total numbers of uncatalogued nails and nail fragments by period

Period	Total numbers
2	9
3a	28
3b	47
3c	48
3z	51
4a	7
4b	55
4c	3
4d	30
4z	214

The uses of nails

The nails, which are of various sizes, would have had a variety of applications: in structural timbers, furniture such as chests, smaller boxes and caskets, and a wide range of other wooden objects. Some of the more unusual types are noted below.

Three small dome-headed nails, *5103* and *5105–6*, range in length from approximately 7 to 10mm. *5103* derives from a Period 3 context, the others from Period 4, but all may be residual Roman hobnails; if not residual they are probably decorative tacks. They may be compared with 125 examples found at 16–22 Coppergate (p.611, *AY* 17/6).

There are also four very large dome-headed nails, of which *5100–2* derive from Period 3 contexts and *5104* from Period 4. The heads vary in diameter from approximately 17 to 35mm. The head alone of *5101* survives, with a large central perforation; it has clearly been made separately from the shank, which is lost. The heads of *5102* and *5104* both have traces of tin plating, that of *5104* also having decorative grooves. Two shank fragments from Period 3c deposits, *5107–8*, were also plated, the former with copper, the latter with a tin-lead coating. Similar large dome-headed nails were found at 16–22 Coppergate although none was plated (p.611, *AY* 17/6); that site also produced a nail similar to *5104* (*3065*, *AY* 17/6). These nails must represent some of the earliest artefacts to have been tin plated, this technology only coming into use during the 8th century (p.613, *AY* 17/6), and they would presumably have had a decorative purpose. Another decorative nail is *5421*, made of copper alloy and found in a build-up layer in the Period 4b cemetery. Similar silver and copper alloy tacks and nails were found in some numbers at Winchester, occasionally in burials and mainly in late Anglo-Saxon contexts (Groves 1990, 1104). *5109*, from a Period 4b context, was found perforating a strip of lead alloy, which had been folded back over the nail head, while two other nails have been coated in lead, *5110* possibly accidentally covered by run-off, *5111* presumably deliberately to provide protection from corrosion.

Rivets and studs (Fig.689)

Five rivets were found, two of iron (*5112–13*) and three of copper alloy (*5422–4*), which have become separated from the objects to which they were originally fitted. Both ends of *5113*, which was found in a Period 3b pit, show signs of having been hammered. *5422*, from a Period 3z post-hole, has a biconical head, while *5423*, found in a Period 4z pit, has a square head, slightly domed in the centre, and a square washer; *5424*, also from a Period 4z pit, has a flat subcircular head. The head shape of *5112*, which perforates a lozenge-shaped washer, is unclear.

5425 is a domed stud of copper alloy with a central perforation, which has lost its shank. It was found in a Period 4z grave. This may have been a decorative fitting on a belt or possibly a small box. Rivets and studs are found on various objects, including small belt fittings such as *5050* and *5052* (see p.1352), larger fittings on vessels, e.g. *5042* (see p.1330), buckles such as *5045* (see p.1346), and antler and bone combs (see Fig.679).

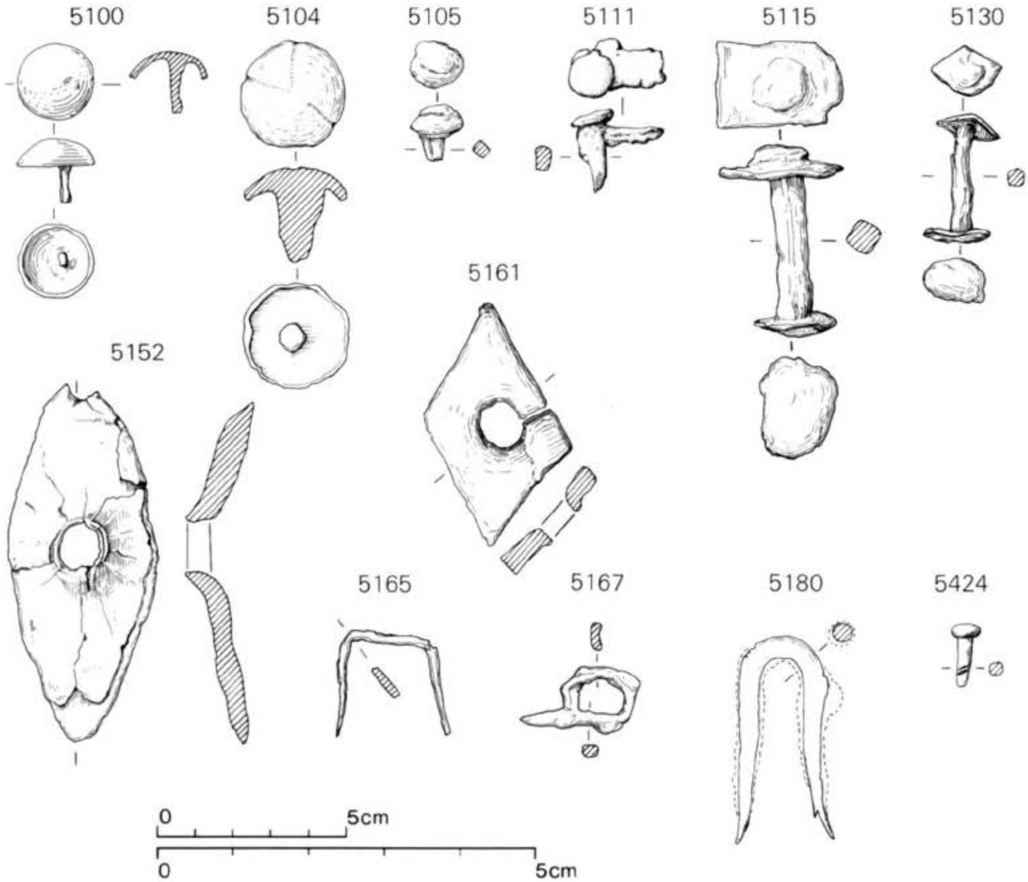

*Fig.689 Structural metalwork: iron nails (*5100, 5104–5, 5111*); iron clench bolts and roves (*5115, 5130, 5152, 5161*); iron staples, rectangular (*5165, 5167*) and U-shaped (*5180*); copper alloy rivet (*5424*). Scale 1:2;* 5104 *and* 5424 *1:1*

Clench bolts and roves (Figs.689–90)

Fifty-one clench bolts and fifteen roves were recovered from the site, three bolts (*5114–16*) and six roves (*5148–53*) deriving from Period 3 deposits, the remainder of the bolts (*5117–47*) and roves (*5154–62*) coming from Period 4 features. A clench bolt was used to join two or more pieces of timber together. It consisted of a nail, which was hammered through the wood and then had a perforated plate, or rove, set over its tip. The tip was hammered flat, or clenched, over the rove, which helped to secure the nail in the wood (see Fig.257, *AY* 17/6).

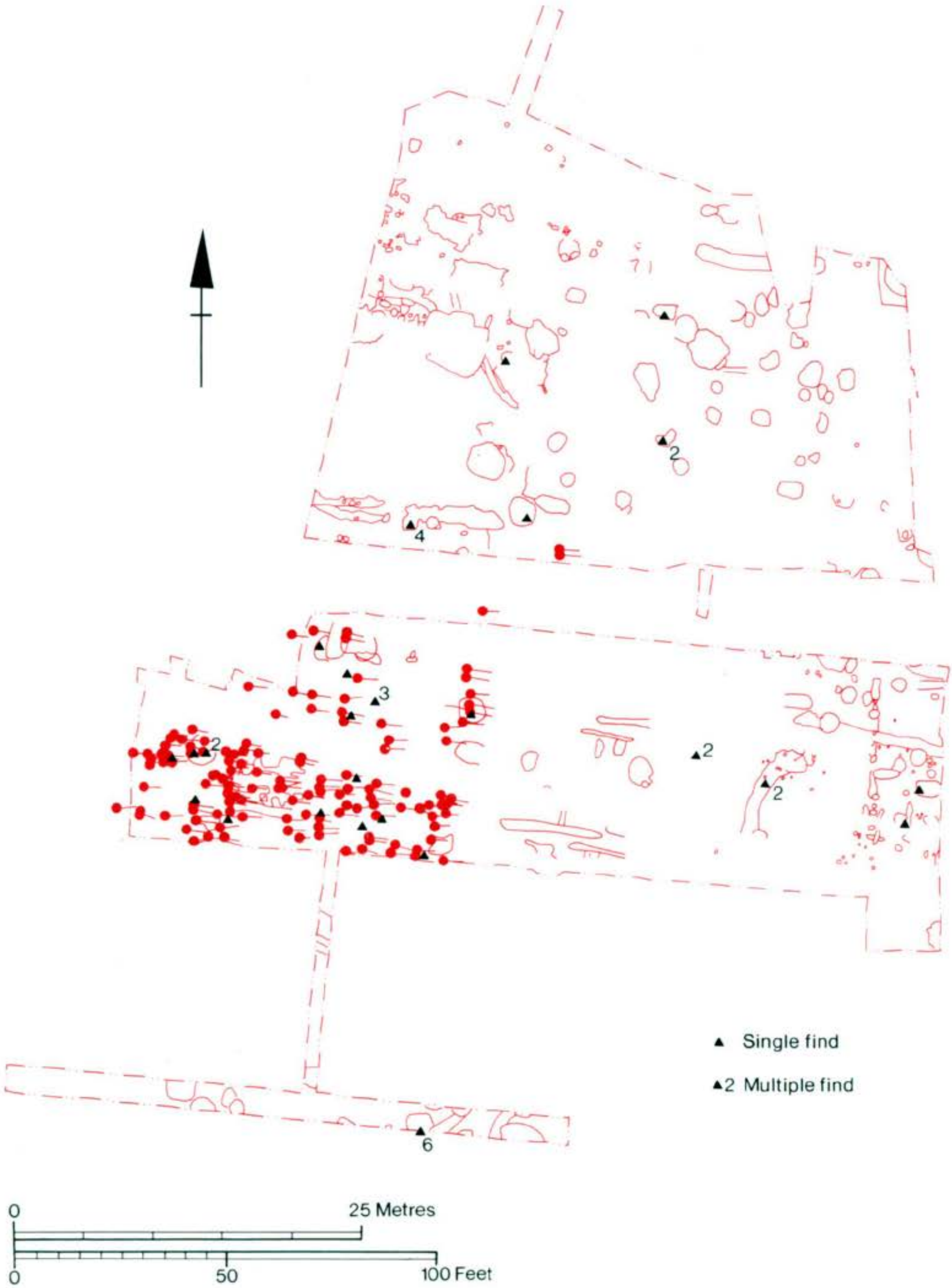

Fig.690 Distribution plot of all clench bolts and roves from Periods 4a–4z across the site. Scale 1:500

Many of the clench bolts were covered in thick corrosion; although all were X-rayed, only three bolts and four roves received conservation treatment to reveal features. The clench bolt heads are usually approximately circular and either flat or slightly domed. The shank section appears to be square or rectangular, and the roves are usually lozenge-shaped, as on *5130*, or rectangular, as on *5115*. Occasionally, they are square (e.g. *5159*) or elliptical (e.g. *5152*).

It was possible to measure the complete lengths of 35 clench bolts with their roves still attached. The shortest bolt (*5125*) was 28mm long from the top of the head to the underside of the rove, and the longest (*5124*) was 71·5mm. Approximately 78% of the clench bolts measured 30–50mm in length. The distance between the underside of the bolt head and the top of the rove provides an indication of the thickness of wood that could have been held. These measurements are invariably 10–20mm shorter than the overall bolt length, providing a range of thicknesses of c.20–50mm. As the majority of bolts were found with the roves still attached, it seems likely that the wood through which they originally passed rotted away; a number of the bolts still have mineralised wood remains attached (e.g. *5119*). Two roves, *5155* and *5161*, appear to have been torn away from their bolts, possibly when the bolts were removed from the wood.

Clench bolts were used in various timber constructions including ships. The technique of clinker building, used to make ships in the Roman period (Manning 1985, 132), and also in the Anglo-Saxon and Anglo-Scandinavian periods, involved the use of clench bolts to hold together the ends of the overlapping planks (Graham-Campbell 1980b, 45). The richly furnished 7th century burial in Mound 1 at Sutton Hoo, for example, originally contained a clinker-built ship (Green 1963, 53, fig.14), as did the Viking Age boat burial at Balladoole, Arbory, on the Isle of Man (Bersu and Wilson 1966, 13–14, pl.III). Similar bolts have also been recovered from several inland sites, such as the middle Anglo-Saxon smelting site at Ramsbury, Wiltshire (Haslam 1980, 39, fig.23, 28), where they must have been used in other timber structures. At Thetford, where they were found in 10th century levels, it was suggested that they might have been used in the construction of doors (I.H. Goodall 1984, 88, fig.129, 136–7).

At Fishergate, 28% of the clench bolts (fifteen) and roves (one) from Period 4 deposits were found in graves, indicating a further use in the construction of coffins. Of these, five clench bolts came from the Period 4b cemetery, the remainder being found in Period 4d and 4z graves. These bolts are remarkably standard in length, averaging c.40mm, and most have lozenge-shaped roves attached. Clinker-built coffins have also been found at the pre-Conquest cemetery at Barton-upon-Humber (Rodwell and Rodwell 1982, 290–2), and at Birka (Arbman 1940, Taf.281). The other clench bolts found at Fishergate may derive from graves which have been disturbed, but the possibility that some originate from ships cannot be ruled out, particularly as the site is adjacent to both the Ouse and the Foss. A distribution plot of the clench bolts found in Period 4 contexts (Fig.690) reveals that find spots are concentrated on the western half of the site; although close to the river, this is also the area of the Period 4 cemetery.

Staples (Fig.689)

The site produced 21 staples or staple fragments, twelve deriving from Period 3 deposits, *5163–9, 5176–9, 5183*, and nine from Period 4 features, *5170–5, 5180–2*. Apart from *5183*, whose identity is uncertain, all the staples are either rectangular or U-shaped. Both types come from both periods.

Rectangular staples

This type, of which there are thirteen examples, has arms set approximately at right-angles to the top of the staple. The arms may be longer than the width of the staple, as on *5165*, or shorter, as on *5169*. The arms usually taper towards the tips, which tend to be rounded and are occasionally clenched (*5167*). The section is usually rectangular. Measurements across the staples (the bow) vary from approximately 16mm (*5170*) to 52·5mm (*5169*); these dimensions fit into the range noted at 16–22 Coppergate, where the majority were 15–50mm wide (p.619, *AY* 17/6). The majority of the staples have incomplete arms, but those which are complete range from approximately 11mm (*5168*) to 34mm (*5169*) in length; many of those at Coppergate were longer.

U-shaped staples

There are seven staples of this type, of which three are complete. They are of rectangular or subcircular section, and the arms usually taper at the tip to a point; the tips of *5180* are slightly out-turned. The arms vary in length from approximately 20mm (*5176*) to 56mm (*5180*).

5183 may be an example of an incomplete looped staple. This type is similar to the U-shaped staple, but the arms curve in below the top of the staple forming a loop.

Staples had many uses, which are reflected by the variety of sizes and shapes in which they are found. Their main function was to join pieces of wood together, in structures or in pieces of furniture; smaller staples were occasionally used to repair wooden artefacts, such as bowls (e.g. *970, AY* 17/4). Examples from 16–22 Coppergate were found in association with other fittings, such as handles; these were probably used on boxes and chests. Others functioned as suspension loops, as on a soapstone bowl (*3225, AY* 17/6).

Binding strips (Fig.691)

Six fragments of binding strips, which may have been used to bind containers such as boxes or caskets, were found on the site. Two of the fragments are plated; *5184*, which has a tin-lead plating, and *5186*, with tin plating, were both recovered from Period 3z pits. Both fragments lack terminals; their ends have broken across the perforations by which the strips would have been attached to the container. *5184* has a plano-convex section, while *5186* has a rectangular section. The plating on the strips would probably have covered all the surfaces originally, but on both *5184* and *5186* it survives only in transverse grooves on the upper faces, and in patches on the sides and reverse faces.

Part of *5188* is bent at an angle; it is possible that this binding may have been used to reinforce the corner of a box or other container. *5187* and *5189* are both broken at one end across perforations, while *5185* is unperforated and slightly curved.

Iron binding strips of various widths, often with non-ferrous plating, have been found on a number of contemporary and slightly later sites in Britain. A plated fragment, very similar to the two plated bindings from Fishergate, was found in a middle Anglo-Saxon pit at North Elmham (Goodall 1980b, 514, fig.267, 95). Other examples come from Thetford (I.H. Goodall 1984, 89, fig.130) and 11th century deposits at St Peter's Street, Northampton (Goodall 1979, 273, fig.119, 82–3).

5426 may be a fragment of a copper alloy binding strip. It is broken at one end across a perforation and there is a second perforation towards the other end. This has been decorated with oblique incised grooves on each side.

Perforated iron strips

Fragments of perforated iron strips (*5190–2*) of various sizes were found. The precise function of these is uncertain, but the larger fragments are likely to have been used as fittings on structural timbers, while smaller strips, such as *5191*, may have been used on wooden vessels.

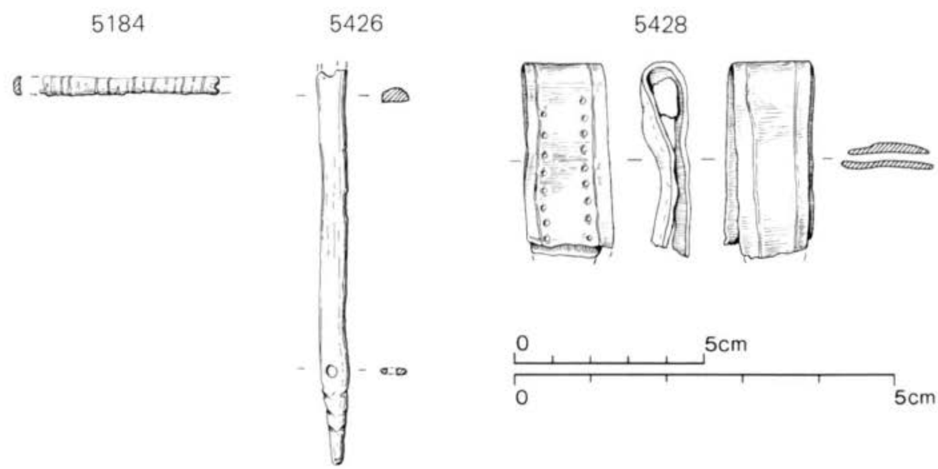

*Fig.691 Binding strips of iron (*5184*) and copper alloy (*5426*); decorated copper alloy strip (*5428*). Scale 1:1,* 5184 *1:2*

Copper alloy strip fragments (Fig.691)

There are four fragments of copper alloy strips from Periods 3 and 4, the functions of which are again uncertain. *5428* and *5430* are decorated. *5428* is folded in half and decorated with an incised line along each edge, with punched dots along the inside of each line on one half only; *5430* also has an incised line along each edge. Both pieces have been cut at one end and broken at the other. *5427* and *5429* are both irregularly shaped fragments with perforations.

Hinges and hinge pivots (Fig.692)

There are eleven strap hinges and strap hinge fragments, and four hinge pivots. Eight of the hinges were found in Period 3 features (*5193–4, 5196–201*) and three in Period 4z contexts (*5195, 5202–3*). All the hinge pivots (*5204–7*) came from Period 4 contexts.

Hinges

Rectangular strap hinges with two different forms of eye were found on the site. *5193–5* are from hinges with looped eyes, while *5196* has a rolled up eye; *5199* and *5203* may also be fragments of this hinge type. The remaining five (*5197–8, 5200–2*) appear to be parts of hinges, but are too fragmentary to be further identified.

5193 is part of a linked hinge. It has one rounded end with an incompletely looped eye, the strap then tapering to the other end. A rivet survives close to the eye. *5194–5* are fragments of similar hinges. The linked hinge was used on chests, being fitted vertically on the back, with the eye at the top. The looped end of a second strap, which was fixed across the chest top, engaged in the eye, forming a hinge which enabled the lid to be lifted. This type of hinge can be seen on the chest found in the late 10th century Mästermyr hoard (Arwidsson and Berg 1983, 7–8, fig.1, pl.1), and examples were also found at 16–22 Coppergate (e.g. *3307*, Fig.260, *AY* 17/6).

The eye on each of these hinges was formed by drawing out the end of the strap, curving it round to provide the loop, and then welding the end back onto the strap. This method provided a stronger link than piercing the strap, and is also found on other fittings such as hasps. It is thought to be characteristic of the mid to late Anglo-Saxon and Anglo-Scandinavian periods (p.625, *AY* 17/6).

The rolled eye on the second type of hinge was shaped by tapering and extending the end and curving it up, round and down; it was then either forged in with the rest of the strap, butted up, or left slightly open. This type of hinge was used with a pivot (see p.1416), which fitted through the loop. Large hinges would have been used on structural fittings such as doors or shutters, while others, possibly including *5203*, may have been fitted to pieces of furniture, such as chests. *5196* and *5199*, which are both fairly small, may have been used on caskets or small boxes.

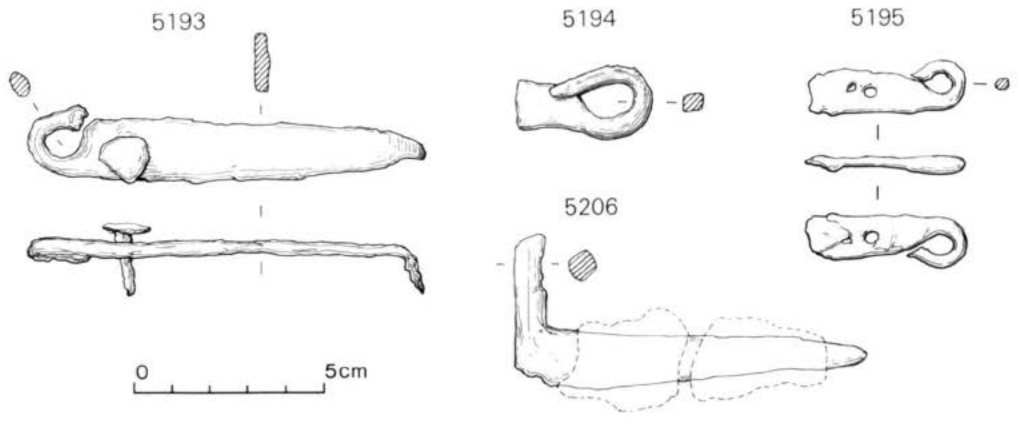

Fig.692 Door furniture: hinges (5193–5) and hinge pivot (5206). Scale 1:2

Hinge pivots

Of the four hinge pivots (*5204–7*), two are complete. Each has a tapering shank of subrectangular section, and a guide arm of subcircular section, approximately perpendicular to the shank. The pivots vary in size, with the two complete examples having shanks of 38mm (*5205*) and 88·5mm (*5206*) in length. The guide arms are more similar in length, being 31·4mm and 36mm respectively.

The dimensions of the pivots reflect their function. They were used to hang doors and shutters, the shank being driven into the wall or jamb, and the guide arm being slotted into the hinge eye. The relative lengths of the shanks suggest that a pivot such as *5206* would have carried much more weight than *5205*. *5204* derives from a Period 4b pit, and the others are all from Period 4z deposits.

Handles (Fig.693)

Two handles were found in Period 4z contexts. *5208* is slightly curved, and broken at one end; part of a staple is attached to the other end, which is looped. Its size suggests that it would have been fixed to a chest or box; several similar handles with looped terminals were found associated with wooden boxes in graves in the Buckland cemetery at Dover (Evison 1987, 101). Five handles, also likely to have been used on chests, and made from spirally twisted strips, were found in Anglo-Scandinavian levels at 16–22 Coppergate (*3499–500, 3502, 3505–6, AY* 17/6). Larger examples, probably handles for buckets or cauldrons, are known from Shakenoak Farm (Brown 1972, 90, fig.40, 178) and late 9th century levels at North Elmham (Goodall 1980b, 514, fig.267, 90).

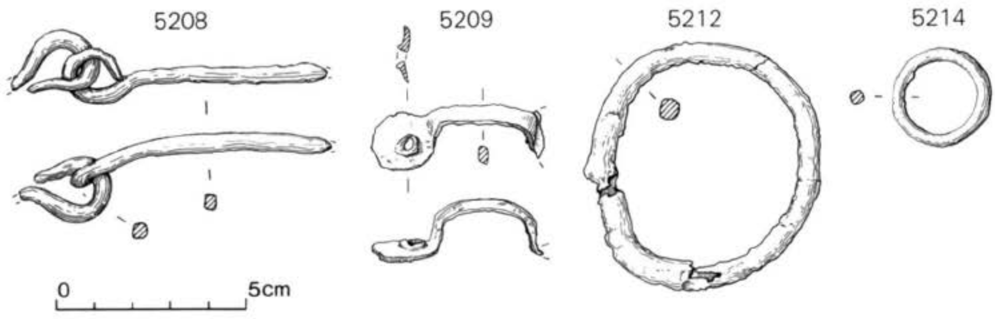

Fig.693 Iron handles (5208–9) and rings (5212, 5214). Scale 1:2

5209 is also incomplete; it has one subdiscoidal perforated terminal, the other terminal having been broken off. The handle is curved, of rectangular section, and would probably have been fixed to a box or chest lid. This type of handle is well known in the medieval period (Goodall 1980a, 118–19), but it does not appear to have been found previously in a pre-13th century context.

Chain link

5210 is a figure-8 shaped chain link, from a Period 3z pit, found with an incomplete iron ring. An iron hook *5223* (see p.1418) was also found in the same pit. The figure-8 shape was commonly used for chain from the Roman period onwards and was apparently favoured over other shapes, such as plain ovals, for its superior strength (Manning 1985, 139, pl.64). Chains were mainly used for suspension, and links are often found attached to rings or hooks, as at Goltho for example (Goodall 1987, 184, fig.158, 124).

Rings (Fig.693)

There are five plain rings, of which three are from Period 3 contexts (*5211–13*), and two from Period 4 (*5214–15*). The most common method of manufacturing rings was to weld together the ends of a curved iron strip; on *5215* traces of the scarf-weld can be seen. Of either subrectangular or circular section, the rings vary considerably in size. *5212* is very much larger than any of the others, with an outer diameter of 64mm, and it may have been used for the suspension of objects such as cauldrons, or as a handle for a door or chest (Goodall 1980a, 170, fig.85). Three of the rings have diameters of 20–27mm (*5211, 5214–15*); rings of this size had been used at Birka as box handles (Arbman 1940, Taf.269, 1).

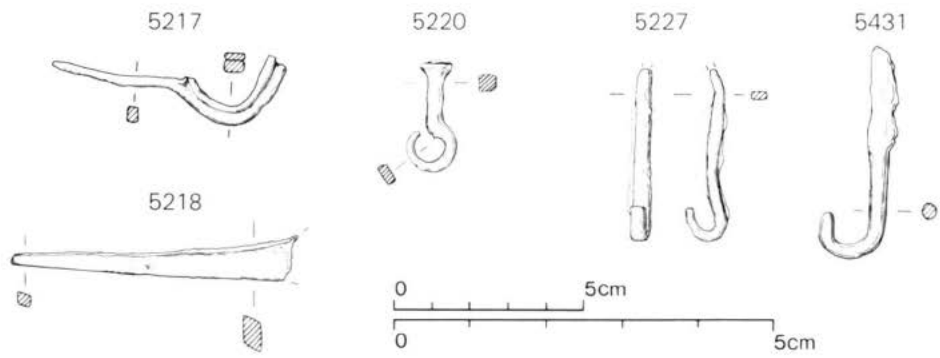

Fig.694 Hooks: iron wall hooks (5217–18), iron swivel hook (5220), iron hook with looped eye (5227) and copper alloy hook (5431). Scale 1:2, 5431 1:1

Hooks (Fig.694)

Twelve hooks or hook fragments (*5216–27*) were recovered from the site; three different types can be identified.

Wall hooks

There are four wall hook fragments, *5216–19*, all retaining their shanks which were driven into the wall. The other arm, which curved up and acted as the hook, survives only on *5216–17*.

Swivel hooks

The only certain example of a swivel hook is *5220*, although *5221*, which is incomplete, may also be a hook of this type. Both derive from Period 4z contexts. A swivel hook was used with a ring, which could rotate around the terminal of the hook. Small examples such as *5220*, may have been used on harness straps or curb bits (Goodall 1980a, 169). Swivel hooks are known from the Roman period (Manning 1985, 138, pl.64, S4), but have rarely been found before the medieval period, although one was discovered in an early 12th century deposit at Goltho (Goodall 1987, 184, fig.159, 125).

Hooks with looped eyes

5222–3 are the only hooks with complete looped eyes, but four incomplete hooks, which have all lost their upper ends (*5224–7*), are also probably of this type. The loop is completely closed on *5223* but partially open on *5222*. Both hooks with complete eyes are small, the largest (*5222*) being only 30mm long; three of the other hooks are longer, however, the largest being 45mm (*5227*). Apart from *5226–7*, all the hooks of this type were found in Period 3 contexts.

In addition to the iron hooks, a small copper alloy hook fragment, *5431*, was recovered. The upper part of the hook has been broken away, leaving part of a narrow shank, which has traces of mineralised wood at the broken end, and a hooked lower end. The function of this hook is uncertain.

Lead alloy objects

Two lead alloy objects, *5487–8*, both from Period 4z contexts, are of uncertain function. Both are cylindrical and fairly small, *5488* having a broad flat head which has been twisted and distorted. Although *5487* may perhaps be a small weight, it is possible that both objects were used to plug small holes in masonry or timber.

Ferrule (Fig.695)

The site has produced a complete ferrule, *5228*, which was found in a Period 4z pit, and a possible ferrule fragment, *5229*, from the Period 3b charcoal-rich deposit. *5228*, which is cone-shaped, has been formed from folded iron sheet, with the seam open along two-thirds of its length. The upper edge is partially broken on one face across a small perforation, through which a rivet would have passed. This would have secured the ferrule to the base of a pole or staff to protect it from wear. *5229* has been broken longitudinally and tapers from one end to the other.

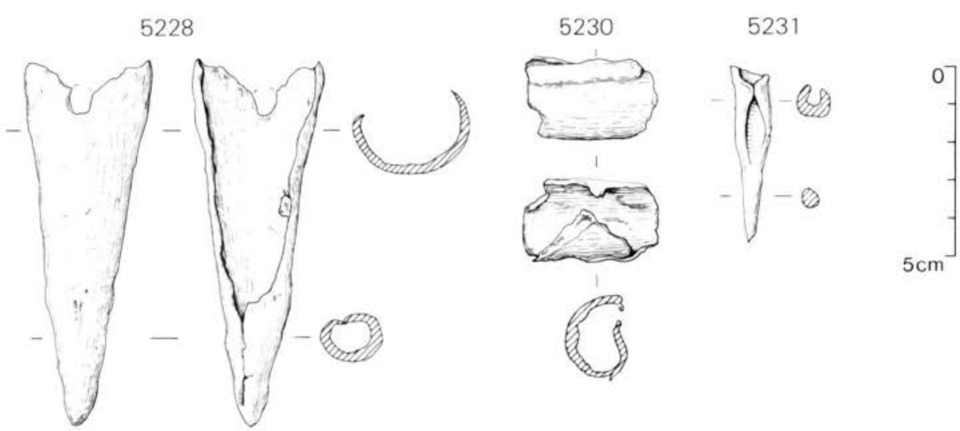

Fig.695 Miscellaneous iron objects: ferrule (5228), collar (5230) and candle holder (5231). Scale 1:2

Collar (Fig.695)

Found in a Period 4z context, *5230* is an incomplete circular collar. Simply formed by rolling up an iron strip, it has been plated all over with copper. Such objects were used as bindings on wooden handles, for example on tools (Goodall 1980a, 170).

Candle holder (Fig.695)

The only example of an iron candle holder is *5231*, which derives from a Period 4c context. It has a socket at one end, which has been created by hammering the upper end of the holder flat, and then curving the flattened sides round to one face. The candle would be inserted into the socket, and the tapering shank of the holder driven into a wooden beam or set into a bracket. *5231* is very similar to a holder found in pre-Anglo-Scandinavian levels at 16–22 Coppergate (*3674*, *AY* 17/6), and to an example found in 11th–12th century levels at North Elmham (Goodall 1980b, 514, fig.267, 93).

Locks and keys (Figs.696–700)

The site has produced two lock fragments, both from Period 3z contexts (*5232–3*), and ten keys or key fragments, of which three derive from Period 3 (*5234–5, 5432*), four from Period 4 (*5236–7, 5240–1*) and three residually from Period 6a/b (*5238–9, 5242*). A chatelaine was recovered from the Period 3b charcoal layer (*5243–5*).

Locks (Fig.696)

The two lock fragments *5232–3* were both recovered from Period 3z contexts, but they are from different types of lock. *5232* is from a fixed lock, a type which would have been permanently fixed to the door or chest it was securing. *5233* is part of a portable padlock. Such padlocks were either box- or barrel-shaped. A full description with diagrams of the operation of both these lock types can be found in *AY* 17/6 (pp.657–67, 678).

Fixed locks

There are two types of fixed lock which both involve the use of sliding bolts. *5232* is the bolt from a lock which had a leaf spring mechanism, which would have been released by a slide key (see p.1423). It would probably have been fitted to a chest. Bolts from this type of lock are composed of a rectangular or oval plate, with narrow projecting arms at each end, one being longer than the other. *5232* has a suboval plate, with a perforation on either side of a central slot; bolts used in these locks can, alternatively, simply have perforations (e.g. *3607*, *AY* 17/6). The holes-and-slot design of *5232* indicates that the lock would have been opened with a T-shaped slide key.

Lock fragments are found less often than the keys used to operate them, but a few bolts from this lock type have previously been recovered. The earliest examples seem to date from

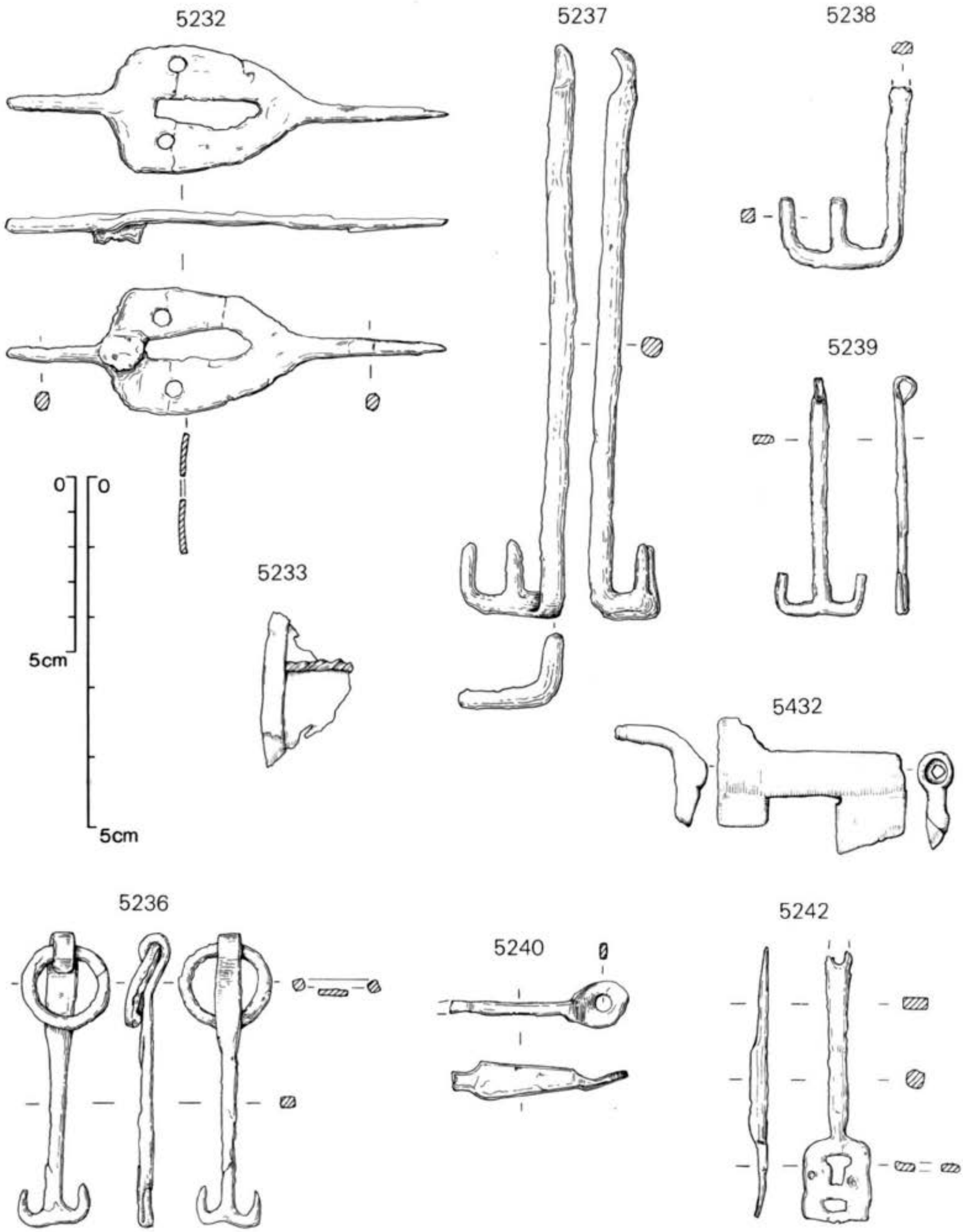

Fig.696 Locks and keys: fixed lock bolt (5232) and barrel padlock fragment (5233); slide keys (5236–9) and padlock keys (5240, 5242); copper alloy lever lock key (5432). Scale 1:2, lever lock key 1:1

the late Roman period (Manning 1985, 95, pl.42, O66), but they have more frequently been recovered from sites, particularly cemeteries, of the early to middle Anglo-Saxon period. Several of these bolts were found in the 6th–7th century cemetery at Buckland, Dover (Evison 1987, 100–1, figs.59/4a, 60/6a), for example, while an 8th–9th century chest burial at Dacre in Cumbria also produced one (Ottaway forthcoming) and nineteen were recovered from the cemetery of the 8th–9th century settlement at Thwing, Yorkshire (P.J. Ottaway, pers. comm.). Few examples of this type of lock are known from post-9th century deposits, although a bolt from 16–22 Coppergate, found in a medieval context, was thought to be Anglo-Scandinavian in date (sf5088, *AY* 17/6).

Padlocks

5233 is a small fragment of a barrel padlock, from a Period 3z pit. The fragment, which appears to have been broken off one end of the lock, has a wavy profile but would originally have been convex. It has one straight edge with a superimposed iron strip running along it, which has been brazed onto the body. Meeting this strip at right-angles is a spirally twisted rod, also brazed on. Traces of copper alloy indicate that the entire object may originally have been plated.

Apart from fragments of a 7th century barrel padlock illustrated by Faussett (1856, 8–10, pl.10), the only other known padlocks of this type which are of pre-Viking date come from Sweden. The workshop site at Helgö produced ten barrel padlocks, including examples with traces of copper plating. These locks are thought to pre-date the box padlock type in Helgö and to date from the 6th–9th centuries (Tomtlund 1978, 10–12). In Britain, most examples have been found on sites dating to the 10th–11th centuries. An almost complete barrel padlock was found at 16–22 Coppergate (*3610*, *AY* 17/6); other sites in Britain which have produced padlocks of this period include St Peter's Street, Northampton (Goodall 1979, 268, fig.116, 3), and Lincoln (White 1980, fig.16). Two well-preserved box padlocks of the Anglo-Scandinavian period have also been found in York, at Skeldergate (MacGregor 1978, 44–5, fig.27, 2) and Hungate (Richardson 1959, 82–3, fig.18, 2). The locks from Hungate and Coppergate both have spirally twisted rods as decoration, and all the padlocks noted above show evidence of copper alloy plating.

Keys (Figs.696–7)

Apart from the keys on the chatelaine, considered on pp.1425–8, three key types, each used with a different kind of lock, have been identified at Fishergate. One of these, *5432*, may be a Roman type, six are slide keys (*5234–9*), and three would have opened barrel or box padlocks (*5240–2*).

Lever lock key

A small and incomplete copper alloy key, *5432*, would have been used with a lever lock (Manning 1985, 94). Keys used with this type of lock have hollow stems, with bits at right-angles and a bow at the upper end. Although the key type continued in use into the 11th century (p.669, *AY* 17/6), earliest examples are Roman in date (Manning 1985, 94). The size of *5432* and the material of which it is made indicate that it may be a Roman key. Finger-ring keys, with a bit attached to a ring, and used on lever locks, are usually made of copper alloy (London Museum 1930, 75, pl.XXXI, 10), and although *5432* is a little longer than other keys of this type (e.g. Manning 1985, pl.42, O64) it could have operated in the same fashion.

Slide keys

The six slide keys derive from Periods 3 (*5234–5*), 4 (*5236–7*), and 6a/b (*5238–9*), the two from Period 6 levels clearly being residual. Slide keys were used on locks with sliding bolts and springs, and were either T-shaped or L-shaped. Both these forms are represented at Fishergate. Three of the keys are basically L-shaped, although all have an extra central prong, not always found on this type. The other three keys are T-shaped, and would have been used on a lock incorporating a bolt like *5232* (see p.1420). Three of the slide keys have lost their upper ends, but those which survive are looped and would presumably have hung from a ring; a ring survives on *5236*. One key, *5235*, has remnants of copper plating with traces of lead and tin. The complete keys vary considerably in length; at 160mm, *5237* is almost twice the length of the longer of the other two keys (*5236*).

Both T-shaped and L-shaped keys were used in the Roman period (Manning 1985, 90, fig.25) and are common finds in early Anglo-Saxon cemeteries, such as Holywell, Suffolk (Lethbridge 1931, 14–16, fig.7, C3), and Buckland, Dover (Evison 1987, fig.58, 142/2). They are also found on middle Anglo-Saxon sites, such as Thwing (P.J. Ottaway, pers. comm.). They seem to go out of use during the 9th century along with locks with sliding bolts (pp.674–5, *AY* 17/6), although York has produced a few late examples from Anglo-Scandinavian contexts, including six from 16–22 Coppergate (*3655–60*, *AY* 17/6) and one found in the sewer trench excavation on Parliament Street (*715*, *AY* 17/4).

Padlock keys

The site has produced two box padlock keys, *5240* and *5242*, and a bit fragment from either a box or barrel padlock key (*5241*). *5240–1* come from Period 4z deposits, while *5242*, from a 6a/b context, is probably residual. The keys have bits in line with the stem, a design which could be used to open certain types of both box and barrel padlocks, although the shape of the bit differed; those used on box padlocks had rectangular bits, while those used on barrel padlocks had circular bits. Both types had ward cuts in the bits, which enabled the keys to be inserted into the lock and passed over the springs, compressing them and ejecting the bolt. The subrectangular bit of *5242* has a T-shaped ward cut, with small perforations on each side and a smaller trapezoidal cut below; part of a loop for suspension has survived at the upper end. Although *5240* has lost its bit, it has a shaped stem which is very similar to two box padlock keys found in medieval contexts at Cheswick Green, West Midlands, and at Goltho, Lincolnshire (Goodall 1980a, fig.97, I181, I184), and it is therefore most likely

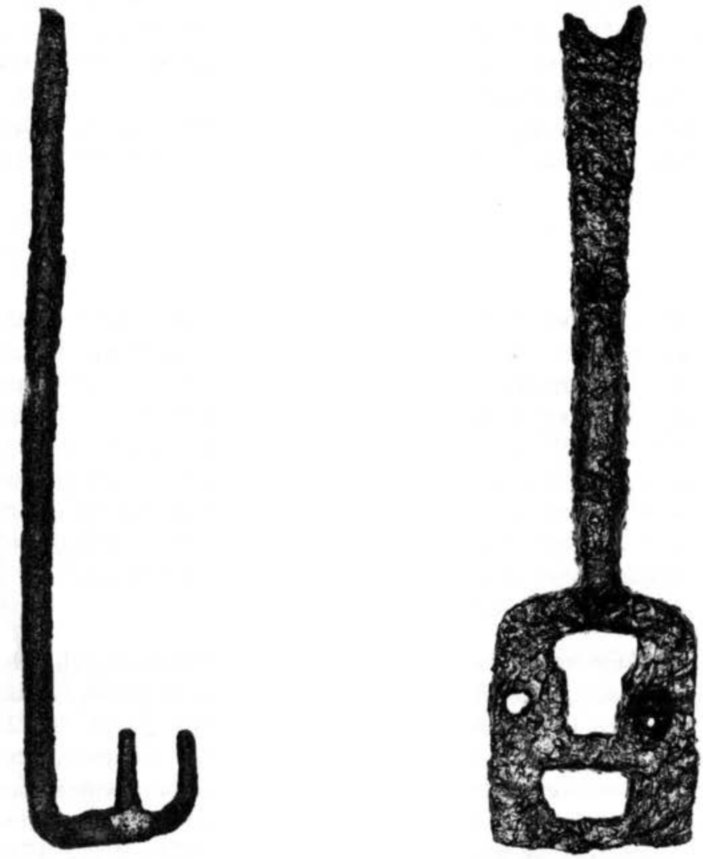

Fig.697 (a) (left) Slide key 5237, *L. 160·3mm*

(b) (right) Padlock key 5242, *L. 76·2mm*

that it was also used on a box padlock. There are traces of tin plating, which probably covered the whole object originally.

5241 is a fragment of a bit with parts of two ward cuts surviving; however, as the original shape of the bit itself is unclear, it is impossible to determine whether it belonged to a box or barrel padlock key.

Barrel padlocks and their keys were used throughout the medieval period (Goodall 1980a, 130), but box padlocks do not seem to have been used after the 11th century (ibid., 123). As noted previously, York has produced two box padlocks, the Hungate find having a key hole suitable for the Fishergate keys. Keys for this type of lock have also been found at 16–22 Coppergate (*3671–3*, *AY* 17/6). Apart from these, there is a copper alloy key from Whitby Abbey (Peers and Radford 1943, fig.17, 1). Examples from Scandinavia include several from Birka (Arbman 1940, Taf.274, 2–3). Two box padlock keys have been found in England in medieval contexts (Goodall 1980a, 123, fig.97, I181, I184), but these are thought to be residual (p.677, *AY* 17/6). This seems also to be the case with *5242*, which was recovered from 13th–14th century cemetery soil associated with the priory.

Chatelaine (Figs.698–700)

The remains of a chatelaine were discovered together in the charcoal layer of Period 3b. They comprise a T-shaped key (*5244*), a hooked object which may also be key (*5243*), and lengths of chain (*5245*). Attached to the hooked object are fragments of two others whose function cannot be identified. Despite the fragmentary nature of the remains, it was possible to reconstruct the probable appearance of the chatelaine. The individual parts seem to have

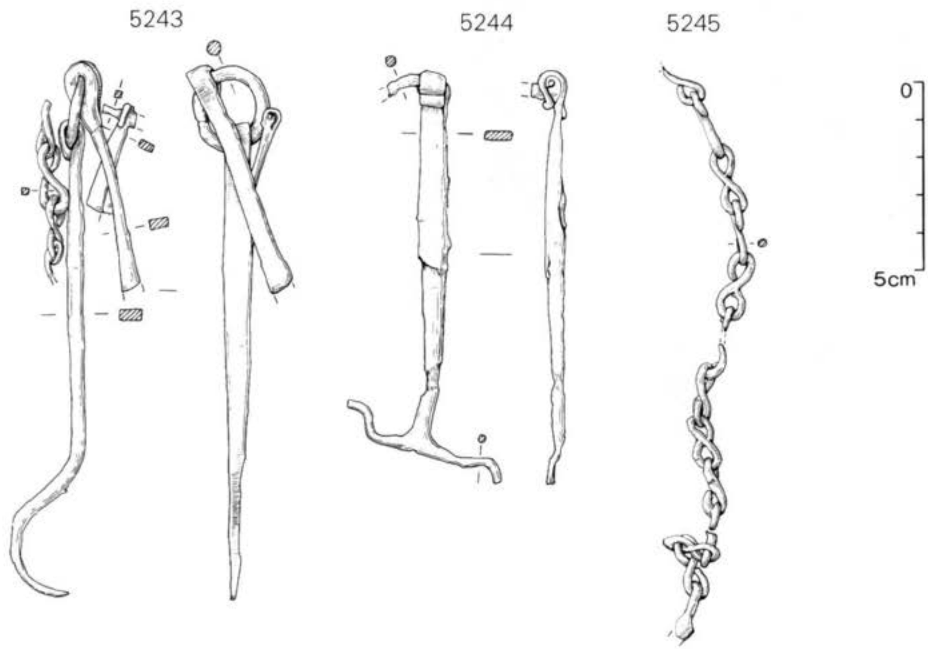

Fig.698 Chatelaine, 5243–5. *Scale 1:2*

Fig.699 Chatelaine fragments 5243-5 after conservation. L. (longest key) 122-3mm

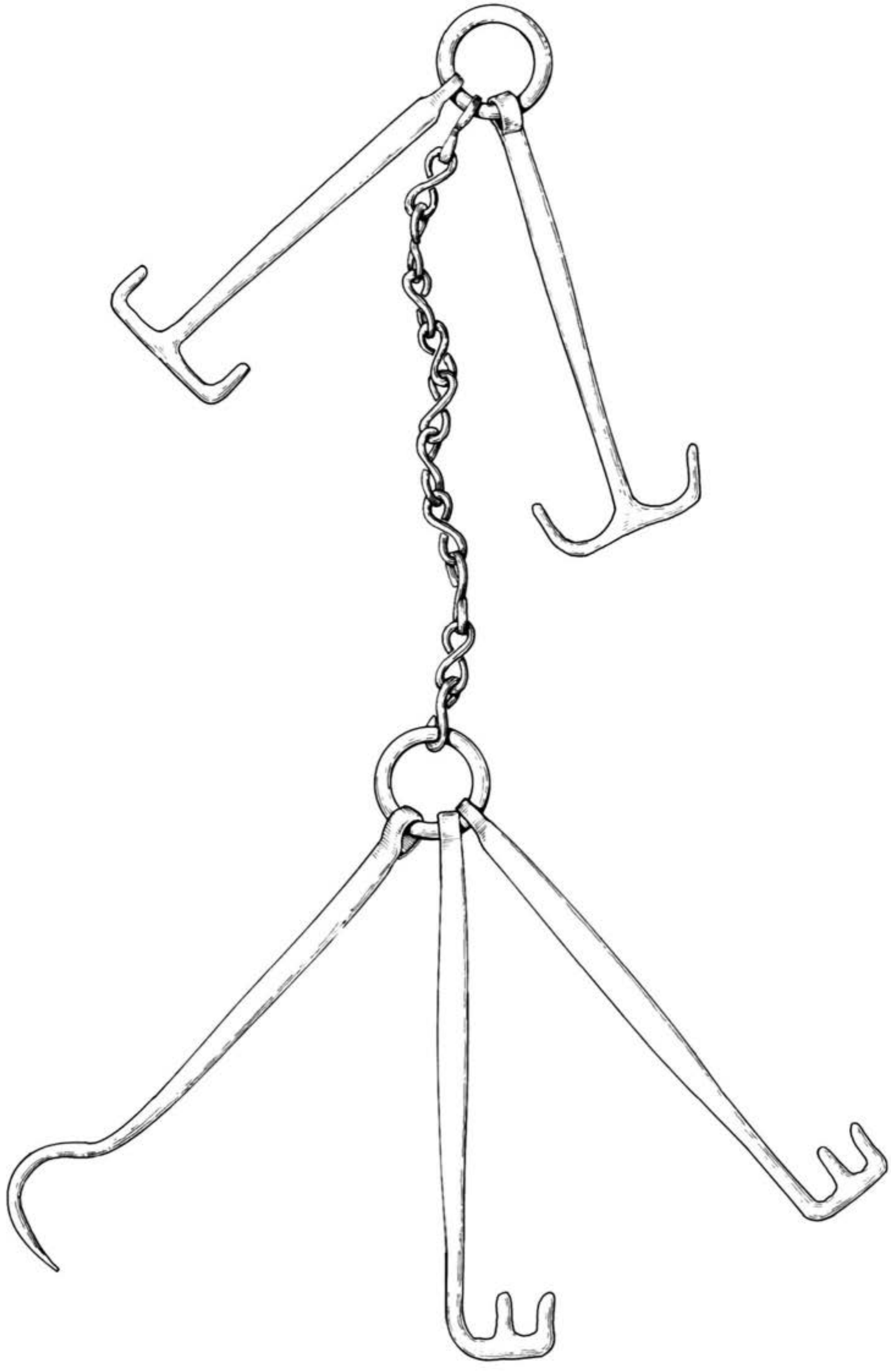

Fig. 700 Interpretation of the original design of the chatelaine

been attached to two iron rings, which originally may have been linked together, perhaps by the chains, or possibly attached to a larger ring which did not survive.

Chatelaines are commonly found in graves of the later 6th and 7th centuries (Green 1973, 212), and have been recovered from several cemeteries, including those at Burwell, Cambridgeshire (Lethbridge 1931, 49, fig.22, 10; 54, fig.27, 8; 62, fig.32, 5; 64, fig.33, 1–2), and Driffield, Humberside (Mortimer 1905, pl.CIX, fig.854), and from a mid to late 7th century grave at Milfield, Northumberland (Scull and Harding 1990, 8–11, fig.9). They are often associated with female graves; all the chatelaines and keys from the cemetery at Buckland, Dover, for example, were found with women (Evison 1987, 116–17). This was also the case at Caistor-by-Norwich, Norfolk, where the sex of the body could be determined (Green 1973, 212, figs.60–2). The burial at Milfield was also thought to be female (Scull and Harding 1990, 11). At Sewerby, Yorkshire, objects with hooked ends similar to that on *5243* were found and were interpreted as keys or latch-lifters (Hirst 1985, 88, fig.47, G.38), while at Buckland many had hooked or T-shaped ends (Evison 1987, 116–17). One of the rings on the Milfield chatelaine had toilet implements attached to it as well as keys (Scull and Harding 1990, 8). The keys are often found in groups; at Buckland, groups of two or four on iron rings were noted (Evison 1987, 116–17). Several of the women seem to have had more than one bunch of keys, suspended from the waist on one side of the body. They were possibly linked by iron rods, found in some of the graves, or perhaps by leather thongs now lost (ibid.). Like the Fishergate example, several chatelaines from the cemetery at Burwell had chains attached (Lethbridge 1931, figs.22, 32–3), as did the one found at Milfield (Scull and Harding 1990, 8); these may have had the same function as the iron rods at Buckland. Although the keys found on chatelaines were almost certainly functional, the arrangement whereby they would hang down from the wearer's waist indicates that the chatelaine was considered worthy of display, and possibly bore implications of status.

Chatelaines have not been found in post-7th century contexts. As noted above, previous finds have all come from graves and furnished graves do not occur after the 7th century because of the influence of Christianity. The fact that these objects have not been recovered from any sites of the 8th century or later suggests, however, that they actually went out of use during the 7th century; thus a 7th century date can probably be assigned to the Fishergate chatelaine.

Horse equipment (Fig.701)

Spur goad

A goad or point from a prick spur, *5246*, was found in a Period 3c pit. The point, which has broken off its spur, would have been situated at the back of the spur, opposite the heel of the rider; it was used to prod or goad the horse. The elongated, rounded conical tip shape is characteristic of the earliest prick spurs, recorded as type 1 in the London Museum

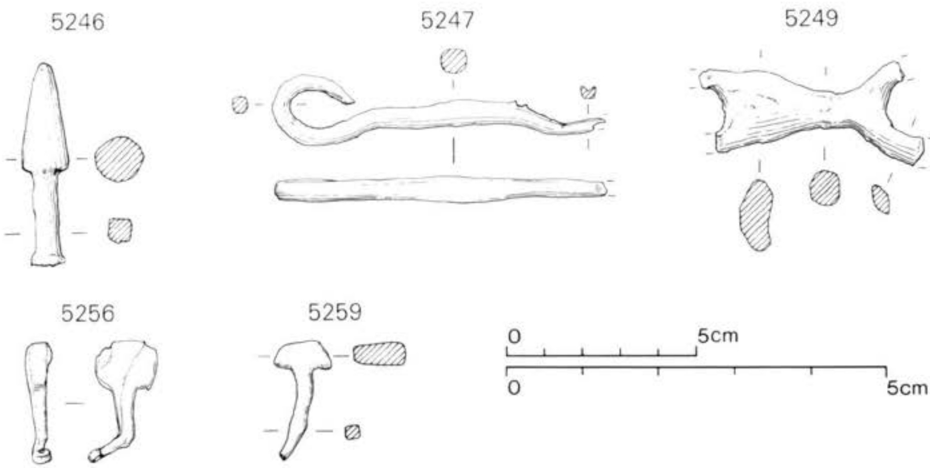

Fig.701 Horse equipment: spur goad (5246), snaffle bit links (5247, 5249) and horseshoe nails (5256, 5259). Scale 1:2, spur goad 1:1

Medieval Catalogue (1940, 94, fig.28). They seem to be 9th century in date (Koch 1982, 71), which would correspond well with the Period 3c context.

Bits

There are three objects which are parts of snaffle bits, a type of bridle bit used from the Roman through to the medieval period. *5247*, found in a Period 3b pit, and *5248*, from a Period 4z context, are both links of two-piece mouthpieces. Each link consisted of a bar with looped ends, one bar having both loops in the same plane, at right-angles to the bar, the other with one loop in the same plane as the bar and one at 90° to it. The two bars were linked together to form the mouthpiece, with rings attached to the loops at either end to which the reins were fastened. *5247* has loops in different planes, but *5248* is broken at one end and it is impossible to determine the nature of its second loop. This type of mouthpiece, LMMC type 2 (1940, 81, fig.19b), probably the most commonly used throughout the medieval period, was certainly in use by the early Anglo-Saxon period, several examples having been found at Shakenoak Farm (Brown 1972, 113, fig.39, 167–70, 172). A further possible mouthpiece fragment was recovered from Maxey (Addyman 1964, 60, fig.16, 14). Sites on Coppergate have produced a complete snaffle bit (Waterman 1959, 74, fig.8, 1) and nine mouthpiece links, all similar to *5247* (*3840–7, 3850, AY* 17/6), and 10th century levels at Thetford have also produced several examples (I.H. Goodall 1984, 100, fig.138, 254–7). In Sweden, mouthpieces of this type have been found at Birka (Arbman 1940, Taf.27, 1).

Strap link

The strap link fragment *5249* was recovered from a Period 4z feature. It has a thick central bar, and originally had a broad loop at each end, both now broken transversely. Strap links, which have also been termed 'side links' (Goodall 1987, 184) and 'bridle attachment links' (p.706, *AY* 17/6), were sometimes used instead of rings to link the reins to the bridle bit, and were found on the snaffle bit from Coppergate (Waterman 1959, 74, fig.8, 1). Other examples have been found in 11th century contexts at Goltho (Goodall 1987, 184, fig.160, 160–1) and Winchester (Goodall 1990, 1043–4).

Horseshoe nails

No horseshoes were recovered from Period 3 or 4 contexts, but eleven nails of the type used to fasten the shoes were found in Period 4 deposits (*5250–60*). Apart from two which have expanded heads with ears (*5259–60*), all the horseshoe nails belong to a long-lived type known as fiddle-keys, found in 11th–13th century contexts (Clark 1986, 2). *5259–60* are of a later type, previously found in 13th–14th century contexts (ibid., 3). The Fishergate pair may therefore be very early examples of their type, or are possibly intrusive in their contexts. The tips of fiddle-key nails were clenched over the horseshoe, and six of these nails still retain clenched or bent up tips. The fiddle-key nails vary in length from approximately 28mm (*5252*) to 47mm (*5256*), a range consistent with that recorded at 16–22 Coppergate (p.707, *AY* 17/6).

Few horseshoes have been recovered from pre-Norman contexts in Britain; they are far more common in late 11th and 12th century contexts (p.709, *AY* 17/6). The fiddle-key nails from Fishergate fit well into this chronological pattern, only one of the twelve (*5250*) being derived from a certain pre-1050 context.

Weapons (Fig.702)

Ballista balls

Two roughly spherical objects, *4566* from a Period 3b pit and *4567* found in a Period 4z pit or post-hole, may be stray residual Roman ballista balls. Similar objects have been recovered from earlier excavations at York, mainly within the Roman fortress (Wenham 1962, 575–6, pl.XXXI), but a site at Skeldergate also produced a single example (*268*, *AY* 17/2).

Dr G.D. Gaunt comments:

> The rounded shape of *4566* appears to be entirely natural, so it is almost certainly an erratic. Igneous rocks comparable to *4566* occur in the Lake District and Scotland, and are present, although rarely, as erratics throughout northern England, so this ball may have been picked up locally. The rounded shape of *4567* may be partly artificial, because erratics of Permian Lower Magnesian Limestone, although sparsely present in the York area, are not usually naturally spherical.

Swords (Fig.702)

Four pieces of sword have been recovered from the site. These consist of a pommel or upper guard made of bone (*5612*), two iron pommels (*5261–2*) and an iron hilt guard (*5263*). The bone guard, found in a Period 3b pit, appears to be the earliest in date. The iron pommels and hilt guard were found residually in medieval contexts.

5612 is elliptical in shape, with downswept ends. It has a small central slot, formed by drilling three tiny conjoining holes. The small size of the slot suggests that this piece would have been fitted on to the top end of a sword, where the tang is narrowest, and indicates that *5612* is probably an upper guard. Guards of bone and antler were popular in the Roman period, and continued in use into the Anglo-Saxon period (MacGregor 1985, 165–7). Fifth century swords, of which few examples have so far been recovered in this country, usually had upper and lower guards of wood, bone or horn, with no pommel, but a lozenge-shaped washer to hold the end of the tang in place (Bone 1989, 64). Although *5612* could be an upper guard of this type, such an early date is inconsistent with other finds from Fishergate. It is more likely to be the upper guard of a sword belonging to Petersen's special type 1 (Petersen 1919, 63), this category later being subdivided into two further groups by Aner (Dunning and Evison 1961, 130–1). *5612* appears to be most closely paralleled by a sword in Aner's group 1, which he dated to the first half of the 8th century. Apart from the Fishergate guard, the only other sword pieces of skeletal material found in York are an antler guard from a site at Clifford Street (Waterman 1959, 72, fig.5, 3) and a whalebone pommel from Coppergate which probably dates from the 11th or 12th century.

The pommel *5262* is trilobate in shape, with a central subrectangular socket which tapers up from the curved lower face of the pommel to the upper face. This type of pommel is found on the Petersen type L swords, which are 9th or early 10th century in date. Although *5262* is undecorated, such pommels often have decorative mounts. Tenth century levels at 16–22 Coppergate produced a pommel of this type (*3943*, *AY* 17/6), which had clearly lost mounts and applied strips, while a similar example found in Acomb, York, retained its decoration (Youngs et al. 1984, 249, pl.XVIII). This sword type was very long-lived, being illustrated on grave slabs into the medieval period. The guard *5263* also belongs to a type L sword. With rounded ends and a subrectangular socket, it has the convex shape characteristic of a hilt guard, which would be positioned at the top of the blade, curving away from the hilt.

Although *5262–3* were found residually in different Period 6c contexts (5243 and 5147 respectively), it is possible that both may originally have belonged to the same sword. They were found only seven metres apart and both derive from the same episode, associated with the demolition of the priory aisles and chancel in the mid 14th century. In this area the layers were considerably mixed, containing pottery which included 11th–12th century gritty ware, and it seems very likely that the sword pieces could have been dispersed during the demolition. The sizes of the two pieces also suggest that they may have fitted on the same sword. Comparison of the Fishergate pieces with the pommel and guard on another type L sword, found at Gilling West, North Yorkshire (Watkin 1986, 93–9, figs.3, 5), shows that

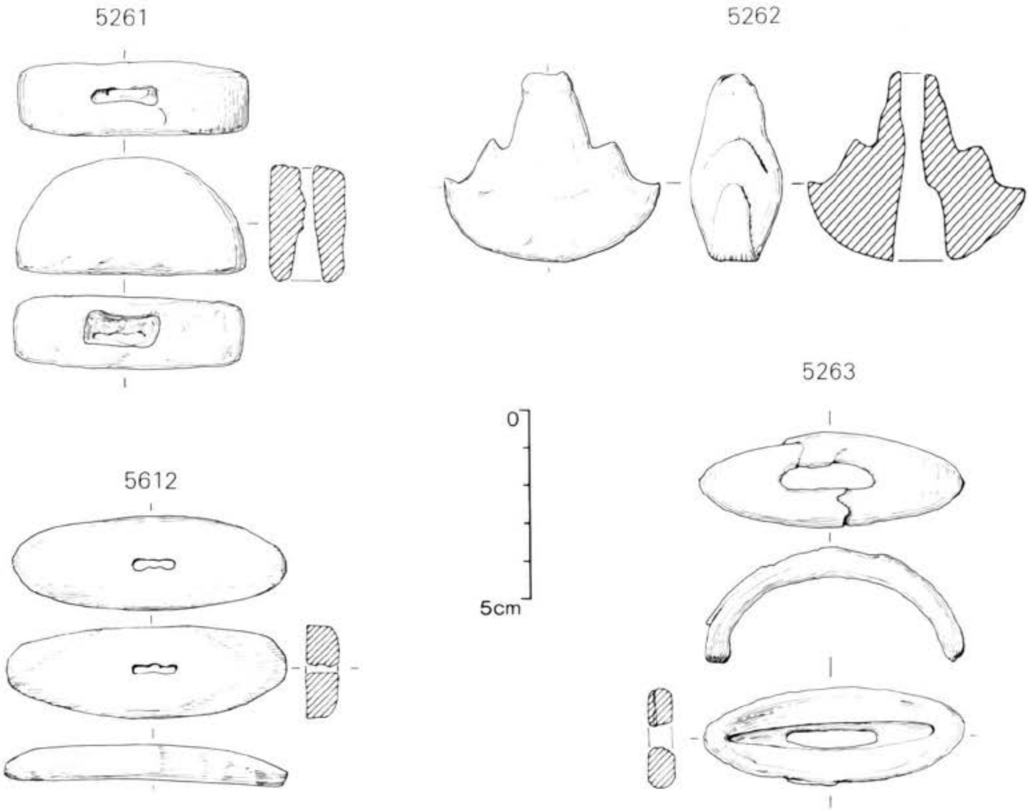

Fig.702 Sword components: type X sword pommel (5261); type L sword pommel (5262) and hilt guard (5263); bone pommel guard (5612). Scale 1:2

although the Fishergate pieces are slightly smaller, the ratio of the width across the pommel to the width from one end of the guard to the other is the same, at approximately 0·8:1 in both cases. Although a small amount of later 9th and 10th century material was recovered from 46–54 Fishergate (see p.1443), it seems more likely that the sword to which the pommel and hilt guard belonged was associated with the Anglian settlement. Therefore it probably dates to the first rather than the second half of the 9th century.

The type L sword has been found on other sites in Britain, many in the north and east of the country, for example Fiskerton in Lincolnshire, Wensley in North Yorkshire, Norwich (Wilson 1965, 33–5, 41–2, pls.II–III, VII) and Santon Downham in Norfolk (Evison 1969, 333–5, fig.2). It was a type also much favoured by the Vikings, examples having been recovered from all over Scandinavia and Iceland.

The other pommel *5261* is semi-circular in shape, the upper face being convex. This corresponds to pommels on Petersen's type X sword, which has been found in 10th century contexts in Norway, for example at Kaupang (Blindheim et al. 1981, pls.7, 67) (see Fig.612). The type has rarely been found in Britain, but two other type X swords are known from York (Waterman 1959, 71–2, fig.5, 1–2), and another from Nottingham (Shetelig 1940, 15).

As noted on p.1211, the site at 46–54 Fishergate was deserted between c.860 and 1000, producing neither coins nor pottery dating to this period. As part of a 10th century sword, *5261* originates from this period of abandonment; it was, however, found in a soil dump used in levelling during the construction of the priory in the early 13th century. It therefore seems most likely that *5261* arrived in soil imported from elsewhere in the city, and was never associated with any occupation of the site at Fishergate.

Religious practice

The various phases of the Period 4 cemetery produced evidence of wooden coffins, including a chest re-used as a coffin.

Coffin fitting (Figs.703–5)

Three adjoining fragments of a coffin fitting, *5264*, were found in a grave of the Period 4d cemetery. The fragments are from a large iron strap hinge, with a scrolled bifurcated terminal at one end and a large U-shaped eye at the other. Nails survive at both ends, linking the terminal to the strap and perforating both arms of the decorative scroll; the remains of two other nails are visible along the length of the strap. All over the strap, patches of unidentifiable mineralised wood have survived on the reverse face. On the upper face, mineralised fine woollen textile is present (see p.1346).

The fitting appears to have acted as a hinge. The wood remains show the grain of the wood running transversely across the strap, suggesting that it was placed across the coffin lid, hingeing it to the box. The eye of the hinge would probably have engaged with a looped strap on the back of the coffin, of the form of *5193* (see p.1415) though considerably larger (see Fig.705). A hinged lid would have been unnecessary on a coffin, which indicates that it was probably a re-used chest. The use of chests for burials, rather than purpose-made coffins, has been noted on a number of sites ranging in date from 8th–9th century graves at the monastic site of Dacre, Cumbria (Newman 1989, 233), and Ailey Hill, Ripon (unpublished), to 10th–11th century graves at Repton, Derbyshire (P.J. Ottaway, pers. comm.).

It is not easy to explain the presence of textiles on the top of the strap, and thus presumably on the top of the coffin lid. The most likely explanation is that a cloth such as a pall was laid over the coffin at the time of burial and was left in the grave. Alternatively, it is

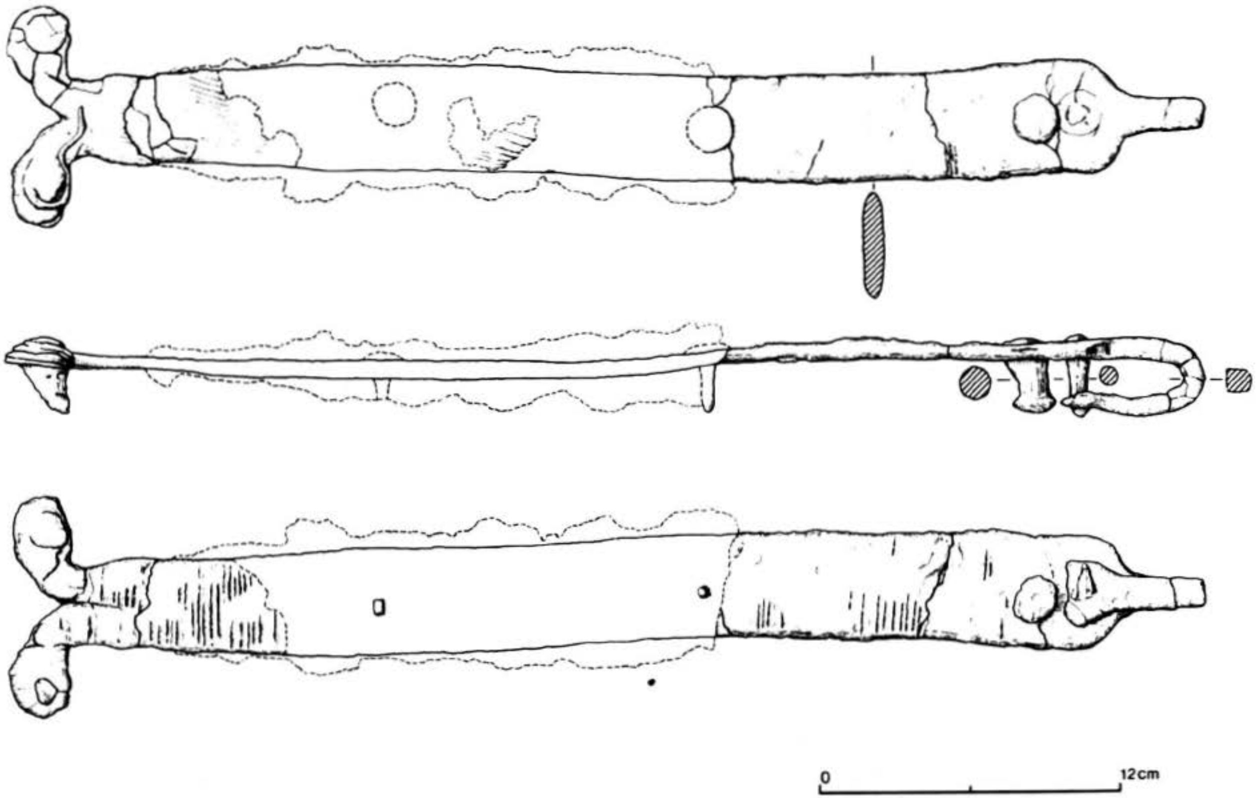

Fig. 703 Coffin fitting 5264. Scale 1:3

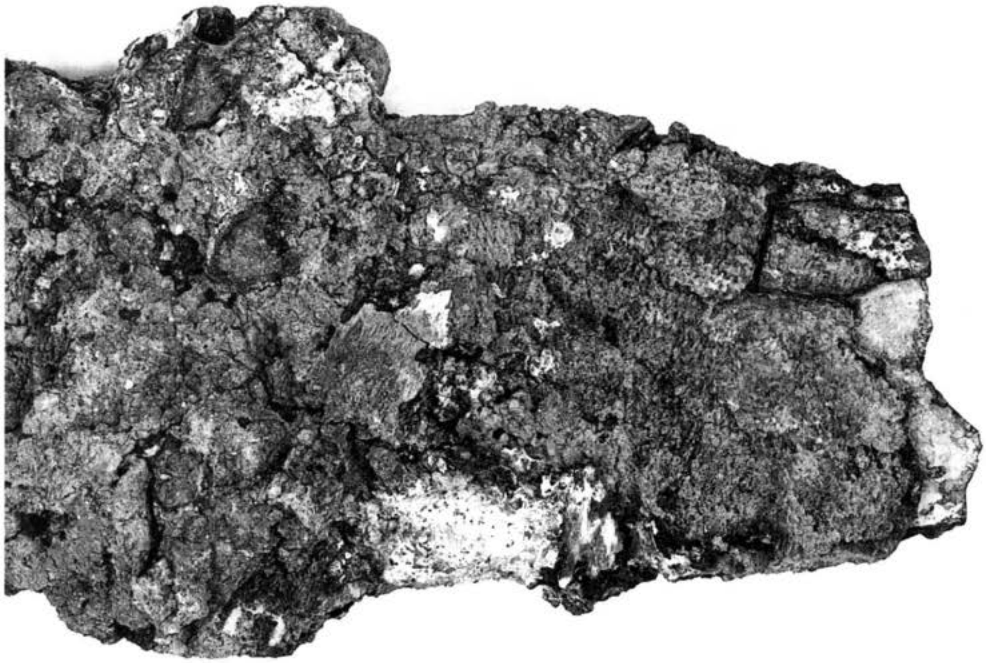

Fig.704 Detail of the mineralised textile remains on coffin fitting 5264. *Textile remains 35 × 20mm*

possible that the textiles may derive from an intrusive body, placed in a shroud in the grave on top of the coffin. It seems unlikely, however, that the shrouded body would have been laid directly onto the coffin lid, and, despite the fact that burial 2368 had been cut away below the elbows (*AY* 12/2 forthcoming), there were no indications that the grave had been disturbed by a second burial. The cutting away of the burial does, however, explain the survival of only one hinge strap.

The dimensions of the fitting provide some clues as to the likely size of the coffin/chest. The complete length of the hinge is 467·8mm. The hinge did not necessarily span the entire width of the lid, but its length must represent the lid's minimum width. The thickness of the lid may be indicated by the gap of 17·6mm between the eye terminal and the strap. This measurement may be compared with those of planks used on coffins found at Castle Green, Hereford, in graves dating from the 9th to 11th centuries (Shoesmith 1980, 36, table 4). There, traces of wood on nails indicated the use of planks 15–25mm thick (ibid.).

Chest hinge straps have been found in other graves of the 11th–12th centuries, for example at Winchester (P.J. Ottaway, pers. comm.). The scrolled bifurcated shape of the

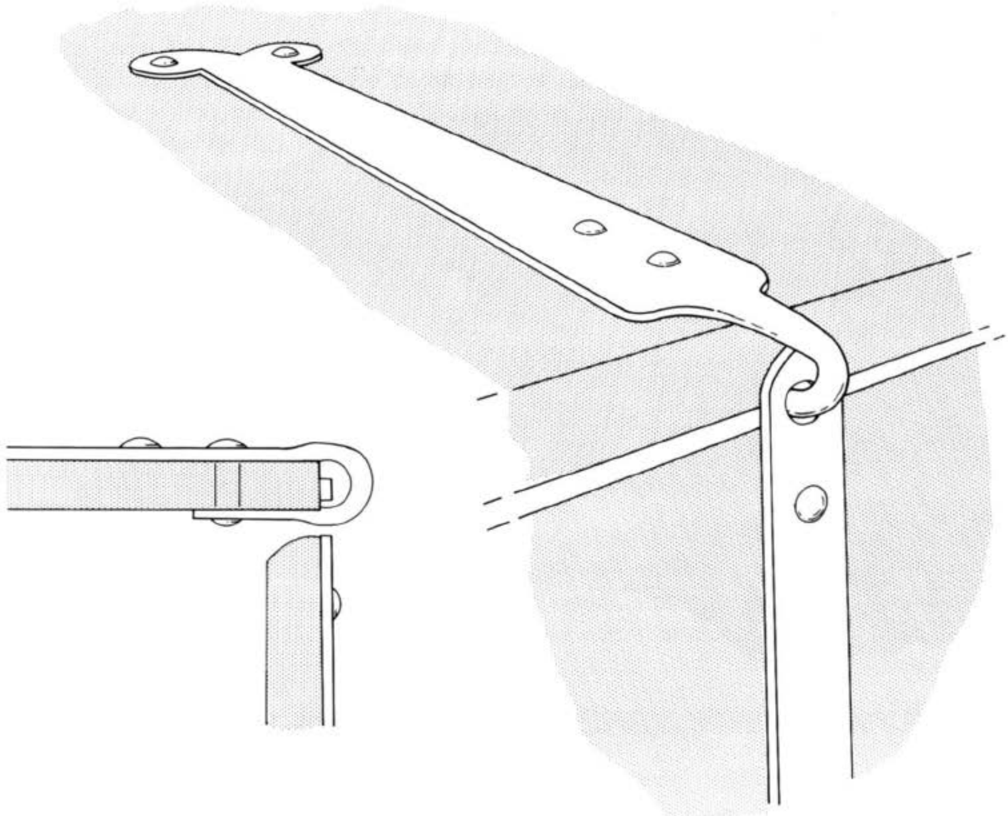

Fig. 705 Diagram showing the operation of coffin fitting 5264

terminal is known from other hinges of the 12th century, including one example from Stonar, Kent (Goodall 1980a, 165, fig.80, 494). Two further examples of this terminal shape were found in recent excavations in York at 22 Piccadilly (sfs583 and 585, unpublished).

Coffin nails

Nine graves of the Period 4d cemetery produced nails, but only two (contexts 2331 and 2364) produced nails and nail fragments (16) with traces of wood attached, indicating that they were probably from coffins (*5265–70*). Four Period 4z graves produced nails, but only one (context 1574) produced nails and fragments (9) with wood attached (*5271–5*). No nails were found in any of the Period 4b graves. As there is no way of determining whether the nails without wood attached were used on coffins or are residual, only the probable coffin nails are discussed here.

Only seven coffin nails from the total found in the graves from both Periods 4d and 4z were complete; they varied in length from approximately 41mm (*5266*) to 81mm (*5269*). Where measurable, the diameters of the heads varied from approximately 12mm (*5275*) to 22mm (*5269*), the majority being 19–22mm across. None of the wood remains were sufficiently large to indicate the thickness of planks used. The measurements of the nails may be compared with those of the coffin nails from the 9th–11th century graves found at Castle Green, Hereford, of which the majority were 47–65mm long, with head diameters of 15–26mm (Shoesmith 1980, 36).

One of the nails, *5274*, had traces of tin plating on both the head and shank.

Miscellaneous objects

Stone objects

Found in a Period 3z pit, *4568* is a fragment of an originally circular stone object, of plano-convex section, with a diameter of approximately 100mm. Its function is unknown.

Dr G.D. Gaunt comments:

> *4568* is made of a sandstone which is typical of the more coarse-grained varieties of Millstone Grit, except for the large size of the muscovite flakes, which suggests the possibility of other Upper Carboniferous sources.

The shaped and polished stone fragment *4569*, found in a Period 4z pit, may be part of a slab or other monumental stone, probably of the Roman period, and thus residual.

Dr G.D. Gaunt comments:

> This fragment of granite or quartz diorite may be made from a locally derived erratic from the Lake District or Scotland. If it is part of a monumental or ornamental stone, however, it may have been brought from a considerable distance, possibly even from the European mainland.

Iron objects (Fig.706)

The clappers of two iron bells, *5276–7*, have been found in Period 3 deposits. Both retain their hooked suspension loops at the upper end, for attachment to the bells, which may have been worn by sheep or goats. Clappers are more commonly found than the bells themselves, and have been recovered from early to middle Anglo-Saxon levels at Shakenoak Farm (Brown 1972, 90, fig.39, 165–6), the middle Anglo-Saxon iron smelting site at Ramsbury (Evison 1980, 39, fig.23, 23), and 9th–11th century deposits at Cheddar (Wilson 1979, 271, fig.91, 101, 201).

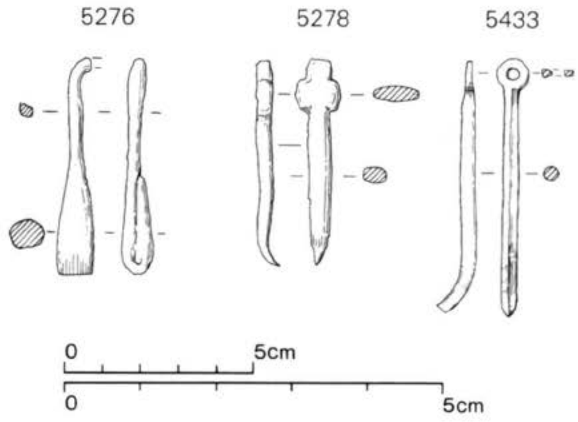

Fig.706 Bell clapper (5276) and two objects of uncertain identity, of iron (5278) and copper alloy (5433). Scale 1:2, 5433 *1:1*

The identification of *5278* is uncertain. Of rectangular section, it is cross-shaped, with short arms close to one end and the stem tapering to a point at the other. It was found in a Period 4a pit.

Copper alloy objects (Fig.706)

5433, which was recovered from a levelling deposit in the Period 4b cemetery, is also of uncertain function. The shank is of circular section and the upper end has been hammered and shaped into a perforated disc. The lower end of the object curves slightly and the tip has been broken off.

A possible book mount of copper alloy sheet, sf4684, was recovered from a Period 4z pit. Cut in the shape of the gable end of a building, with a cross at the top, it seems most likely that this object is associated with the priory and is intrusive in its context. A full description and report will appear in Rogers, *AY* 17 in prep.

Perforated shells

Five fragments of oyster shell were found, all with deliberately made perforations (*5489–92*). Similar oyster shells were found at 6–8 Pavement, York (*495–7*, Fig.78, *AY* 17/3), but their function is unclear. Crushed oyster shell was used as a tempering agent in local or regional Anglian pottery (*AY* 16/6, 566–7).

General Discussion and Conclusions

The excavations at 46–54 Fishergate produced archaeological evidence of activity from the Roman period to the Dissolution in the 16th century, although the sequence was not unbroken. The finds include one of the largest assemblages of artefacts of the Anglian period so far recovered, not only in York but anywhere north of the Humber; it is this assemblage, along with finds from the 11th–12th century occupation of the site, which is discussed in this report.

The primary significance of the Anglian assemblage from Fishergate lies in the recovery of many artefacts from well-stratified contexts of the late 7th to mid 9th centuries. Contemporary material previously found in the city has, for the most part, been retrieved from undatable deposits, or from later levels in which the objects appear residually (*AY* 7/1 in prep.). Apart from a number of coin hoards, the objects have mainly been casually recovered individual items, or small groups distributed across the old Roman centre (*AY* 7/1 in prep.). In contrast, the artefacts found at Fishergate can be considered in conjunction with the coins, pottery, animal bones and other evidence (see other fascicules in *The Archaeology of York*); when drawn together, all these strands provide evidence not only of the site's internal activities, but also of the part it played in inter-regional and international trading networks.

The Roman period

A small quantity of pottery (*AY* 16/6, 564), vessel glass and personal items was recovered from the Roman period, when the site appears to have been ploughed, the assemblage spanning a broad date range from the 1st to 4th centuries. It included two vessel glass fragments which date to the third quarter of the 1st century and thus belong to the earliest period of activity in Roman York. Several objects fashioned from discarded Roman material by later inhabitants of the site were also found. While the personal items may represent losses made by those involved in Roman agricultural activity, the pottery and glass are more likely to derive from the spreading of domestic rubbish as manure. Roman activity in the area is confirmed by part of a 1st–2nd century Roman cremation cemetery discovered a little further south on the east side of Fishergate between Winterscale Street and Melbourne Street (RCHMY 1962, 69).

The Anglian settlement

It is difficult to establish a precise starting date for occupation on the site. Although the earliest coin suggests that occupation had started by c. AD 700 (*AY* 18 in prep.), a small number of artefacts apparently of mid–late 7th century date, including a well-preserved iron chatelaine and other personal items of jewellery and dress, were recovered. In addition, some of the pottery types, such as the Ipswich ware and some imports, have their origins in the later 7th century (*AY* 16/6, 568). This indicates that the Anglian occupation may have begun in the second half of the 7th century.

As noted in Table 76, Anglian occupation of the site can be divided into three subperiods. Period 3a represents the initial phase of the settlement, in which three structures, two boundary ditches, a palisade and numerous pits were recognised. Possible re-organisation occurred in Period 3b, when a charcoal-laden deposit seems to have been spread site-wide, structures were dismantled and pits back-filled. While this may represent a second period of occupation, it is more likely that the settlement was deliberately but temporarily abandoned. A more limited settlement is apparent in Period 3c; evidence of structures was lacking, but there was a new boundary ditch and pits associated with this subperiod. Both the animal bone and ceramic assemblages indicate that much, if not all, of the material recovered from Period 3b was redeposited material from Period 3a (*AY* 15/4, 283; *AY* 16/6, 595, 606–7). The artefactual evidence seems to confirm this interpretation, the majority of the 7th century finds occurring in the Period 3b charcoal layer. Fewer features and no clear evidence of structures can be ascribed to Period 3c. As a result there are fewer finds and a smaller pottery assemblage; Periods 3a and 3b produced approximately three times as much material as Period 3c. The range of material does not appear significantly different, however, with broadly similar domestic artefacts and craft debris recovered in all periods. The features assigned to Period 3z lacked any stratigraphic relationship to either Period 3a, 3b or 3c, but were thought most likely to have belonged to Period 3a (*AY* 7/2 in prep.); the finds recovered from these features do not provide any dating evidence to confirm or contradict this interpretation.

Unfortunately, the excavations failed to locate the original extent of the Anglian settlement, although in both Periods 3a and 3c ditches on the eastern side of the site appear to have represented boundaries, and the river may also have acted as a boundary to the west. Anglian features are known to have extended beyond the limits of the 1985–6 excavations to the west, north and south (*AY* 7/2 in prep.). Excavations on the site of the Barbican Baths at Paragon Street in 1973 produced evidence of Anglian activity in the form of copper alloy pins and an enamelled cross-brooch as well as coins of King Eadberht and Æthelred (*AY* 7/1 in prep.). Subsequent excavations there in 1987 and 1988, however, produced only limited evidence, although later use of the site as a cattle market may have truncated deposits (*AY* 7/1 in prep.).

Away from this part of the city, other possible areas of Anglian activity which may be contemporary with that at Fishergate have been tentatively identified as a result of recent comprehensive reviews of both finds (*AY* 7/1 in prep.) and pottery (*AY* 16/6). Anglian pottery was discovered on a number of sites on both sides of the Ouse upstream from Fishergate, particularly on the south-west bank (*AY* 16/6, 561), while individual finds of the 8th century have also been grouped along the banks of the river. Historical and, to a lesser extent, archaeological evidence point to the existence of a royal and ecclesiastical centre within the Roman fortress walls. In addition, 8th century sculptures recovered in the vicinity of the Roman *principia*, and across the river close to Holy Trinity Priory, Micklegate, indicate ecclesiastical activity in these areas. In the 9th century further possible foci are suggested by the recovery of finds from the areas of Bootham Bar, Clifford Street, Tanner Row and Skeldergate. How the site at Fishergate related to these parts of the city remains unclear, but it appears that after the site was abandoned c.860, the old Roman centre of the city, in the area of the fortress and *colonia*, may have been re-occupied (*AY* 16/6, 650).

The discovery of Anglian occupation at 46–54 Fishergate not only adds an important proto-urban dimension to the framework of Anglian settlements in the region (see pp.1442–3), but might also indicate the location of a northern *emporium* or *wic*. The site at Fishergate, with its riverside location (see Fig.601) and apparently planned layout (*AY* 7/2 in prep.), resembles other contemporary riverine and estuarine trading sites. These include Hamwic, established by the early 8th century (Brisbane 1988, 101), Ipswich, where there is evidence of Anglo-Saxon activity by the early 7th century (Wade 1988, 93), and Lundenwic; all have been termed *emporia* by Hodges (1982), who views them as settlements maintained by the regional king or chief for the purposes of controlling trade in valuable prestige goods. Apart from similarity of position, Fishergate has other features in common with the *emporia*. These include the apparent provisioning of the site with much of its food requirements (*AY* 15/4, 282). Comparison of the finds assemblages from the other sites with that from Fishergate tends to confirm these similarities and strengthens the argument for the identification of 46–54 Fishergate as part of Eoforwic.

The artefactual evidence shows that there was a broad range of craft and industrial activity at 46–54 Fishergate in the Anglian period. Period 3 deposits produced debris from ironworking and non-ferrous metalworking and from bone and antler working; tools used in both types of metalworking were also found. Despite the lack of survival of organic materials such as wood and leather, evidence for the working of both materials on the site is provided by a few woodworking and leatherworking tools. Similarly, few fragments of textiles survived deposition, but tools used in spinning, fibre preparation and textile manufacture were recovered. Some reworking of glass may also have been carried out. Evidence of all these crafts and industries was recovered at Hamwic, where the minting of coins and some pottery production was also indicated (Brisbane 1988, 104). Sites excavated within the middle Anglo-Saxon area of activity at Ipswich have shown that, in addition to mass production of pottery, spinning and weaving, bone and antler working, ironworking and leatherworking were all undertaken there, too (Wade 1988, 95). Crafts and industries identified in Lundenwic included cloth working, ironworking and non-ferrous metalworking, and horn and antler working (Cowie and Whytehead 1989, 712–13).

Although several crafts were clearly undertaken at Fishergate during the Anglian period, no defined zones of industrial and domestic activity could be identified. Attempts were made to analyse statistically the material recovered from all pit groups and the fills of the ditches to determine any patterns of disposal, but the results were inconclusive; it seems most likely that all types of debris were disposed of randomly across the site. The lack of foci is perhaps not unexpected on a small site which must represent only a part of the original settlement, but the same lack of craft specialisation is apparent at other more widely excavated *emporia*, in particular Ipswich. Ipswich produced evidence for crafts which were fairly evenly spread across the area of middle Anglo-Saxon activity (Wade 1988, 95), while at Lundenwic no evidence of specialisation in particular areas was found (Cowie and Whytehead 1989, 712). At Hamwic, studies have suggested that bone working may have been carried out in certain defined areas (I. Riddler, pers. comm.), but foci of other craft activities have not been identified.

The scale of industrial and craft production at Fishergate is equally difficult to ascertain. Although the limited amounts of debris recovered would appear to point to industry and craft on a small scale, much of this type of waste would have been recycled, particularly that from metalworking. More could have been dumped in the river or outside the boundaries of the excavation; much evidence from the site must therefore be missing. With such uncertainty as to what percentage of the original site, and of the original manufacturing capacity, has been recovered, it is impossible to assess confidently the scale of production on the site.

The evidence of production at Fishergate may be compared with that from the other *emporia*. Ipswich, for example, was making pottery on a large scale, for markets within and, to a lesser extent, outside the East Anglian kingdom (Wade 1988, 96). It has been argued that Hamwic was also preparing and producing goods, such as wool and possibly leather, which were intended both for the local market and for export (Brisbane 1988, 106). The large number of loom weights recovered from sites in Lundenwic have led to suggestions that cloth was perhaps produced there for export (Cowie and Whytehead 1989, 715). Although the products of Ipswich have been found elsewhere, those of Hamwic and Lundenwic have not; this may explain the assumption that items of organic materials, which do not survive deposition well, were produced for export from these sites. This may also have been the case at Fishergate, but lack of evidence precludes any estimates of the extent of production, or the possible destinations of the products.

In addition to providing evidence of crafts, the Fishergate assemblage produced a range of artefacts which throw light on the lives led by the inhabitants of the site. These include personal items such as strap-ends, buckles and belt fittings, finger- and ear-rings, brooches, beads, pendants, and many bone and antler combs. The recovery of a gold ring (*5789*) from the Redfearn's Glass Factory site in about 1930, prior to the excavation campaign, indicates that some personal items in use on the site were of high quality (see p.1373). Domestic equipment such as rotary querns and vessels of glass and metal was found, as were structural fittings including locks and keys, hooks, staples, nails and hinges. Fishing and horse-riding equipment were also recovered.

Unfortunately, we have little knowledge of contemporary activity in the hinterland of Eoforwic, but, in the wider region, a number of sites excavated or identified during the 1980s and early 1990s have enhanced our understanding of the nature of settlement in the region during the Anglian period. These include apparently high-status sites at Flixborough, South Humberside, and Thwing, in the centre of the Yorkshire Wolds; the former may have been a monastic site, and yielded a wide range of artefacts and craft tools and debris (Leahy in Webster and Backhouse 1991, 94–101). Also extensively excavated are sites at West Heslerton in the Vale of Pickering, and Wharram Percy on the Yorkshire Wolds, both rural settlements, while metal detector finds have identified sites at Newbald, North Humberside, and Cottam, also on the Wolds (Haldenby 1990, 51–63). As these sites are studied, and the material from them published, it should be possible to gain a clearer understanding of their nature and the regional framework within which the site at 46–54 Fishergate fits.

Despite a lack of evidence that Fishergate was producing goods for an external market, items are known to have been imported to the site, both from within England and from the Continent. The stone artefacts recovered from Fishergate are particularly informative in identifying regions in the north of England with which contacts were maintained. Much of the stone was obtained locally, but more distant sources were also exploited. Sandstone from the Pennines and north-east Yorkshire was utilised to make hones, for example, while flint and chalk from the Wolds were used for weights and spindle whorls. Haematite was brought from the Lake District, possibly for use as a pigment, and fossils seem to have been collected from outcrops in Wensleydale and Swaledale. The jet used to make the bead found in an Anglian pit may have been brought from the Yorkshire coast, possibly from Whitby. Amongst the pottery recovered from the site, Ipswich and Ipswich-type wares represented a small percentage of the total assemblage, and indicate contact with the East Anglian kingdom (*AY* 16/6, 581).

There is also evidence for contact with the Continent, although the quantity and range of artefactual material is limited. Fine vessel glass, similar to that found at Hamwic, may have been imported from the Rhineland and northern France (see Hunter 1980, 59). Pottery from both these regions was also recovered from the site (*AY* 16/6, 571, 579), while the lava rotary querns originated in the Mayen area of the Rhineland. These were probably transported up the Rhine to Dorestad, the Frisian *emporium* situated at the confluence of the Rivers Rhine and Lek. Roughed-out lava querns were finished off at Dorestad (Parkhouse 1976, 186) ready for export, and it seems very likely that both the querns and Mayen pottery found at Fishergate arrived at the site via Dorestad. Additional evidence for links with Frisia is provided by two series D sceattas (*AY* 18 in prep.) and a decorated comb case or mount (*5609*), directly paralleled by a piece found during excavations of a series of terp-mounds in Frisia (Roes 1963, pl.XXXI, 8). Alcuin, in the later 8th century, comments on foreigners in York; this has been interpreted as a reference to Frisian merchants (Godman 1982, 7, n.35–6), although the historical validity of such an interpretation remains open to doubt (*AY* 7/2 in prep.).

Occupation of the site is thought to have ceased in the mid 9th century, both coin and pottery evidence indicating desertion c.860 (*AY* 18 in prep.; *AY* 16/6, 611–12, 651). The pottery sequence points to re-occupation of the site in Period 4a, c.1000 (ibid.). Several artefacts which can be dated to the late 9th or 10th century were, however, found at Fishergate, thus falling into the period when the area is presumed to have been deserted. These include a strap-end, the lead alloy axe-head pendant and three copper alloy dress pins. With such strong ceramic evidence for a lack of occupation at 46–54 Fishergate during the later 9th and 10th centuries, these few objects cannot be held to prove occupation of the site in this period. They may rather represent casual single losses; alternatively, they may have originated in soil brought in to level the site when the Gilbertine Priory was constructed (*AY* 11/2 in prep.).

The 11th and 12th century settlement

Re-occupation of the site is indicated by a single timber structure and a series of pits of uncertain function (Period 4a). The structure was subsequently replaced by a second and the pits were overlain by a cemetery, associated with a possible timber church (Period 4b). In Period 4c this may have been superseded by a stone church. In Period 4d pits replaced the 4a structure, and more graves were cut. These features seem to have belonged to a settlement which formed part of a ribbon suburb along Fishergate (*AY* 11/2 in prep.). Unfortunately, most of the finds (approximately 75%) derive from Period 4z features, which cannot be assigned stratigraphically to any specific part of Period 4.

Apart from the structures identified in Periods 4a and 4b, there is a lack of evidence for dwellings or workshops on the site during the 11th and 12th centuries; rubbish pits, however, found around the church and cemetery, suggest some occupation nearby. It seems likely that the area represents part of a suburban community with its own church, and that part of the site was used for rubbish disposal by the inhabitants. Industrial and craft working evidence is similar to that in Period 3; tools and debris from ironworking, and tools used in woodworking, leatherworking, and textile preparation and production all occurred in Period 4 deposits. It is difficult to tell, however, how many of these artefacts are residual from the same activities in the earlier settlement; this problem was also noted in the animal bone assemblage (*AY* 15/4, 230). Many artefacts are certainly residual; the crucibles, for example, are thought to derive largely from Period 3 activity, and all but one of the copper alloy dress pins from Period 4 deposits are typologically earlier. In addition, virtually all the vessel glass recovered from Period 4 contexts was residual. The vast majority of the bone and antler working debris found in Period 4 deposits is also likely to derive from the Anglian period, when comb making was a significant activity. On the basis of these clearly residual finds, it seems very likely that a high proportion of the rest of the undatable material recovered from Period 4 features is also residual. This residuality is most likely to result from the continuous digging of pits and graves across the site during Period 4.

The Period 4 cemetery produced evidence of the use of wooden coffins in the form of a number of coffin nails, and also a substantial fitting from what was almost certainly a chest re-used as a coffin.

Evidence of trade within England and with the Continent is scantier than in Period 3, but some artefacts suggest such contacts. The roughout *4570* is made of jet which was almost certainly derived from the Yorkshire coast, where the amber for bead fragment *4573* may also have been picked up. It is more likely, however, that the amber was brought over from the Baltic. Fragments of hones of mica-schist and phyllite derive from Norway; these hone types were introduced to this country during the Anglo-Scandinavian period (Ellis 1969, 149), and thus these examples may confidently be attributed to Period 4 activity on the site.

Conclusion

The primary significance of the artefact assemblage discussed in this report lies in the quantity and range of finds from the Anglian period which were recovered. Before the excavations at 46–54 Fishergate, understanding of the pre-Viking period in York was extremely limited, based mainly on individual finds or small groups of objects and pottery found across the city. This assemblage has provided evidence of a settlement where trading and craft and industrial activities were of great importance; it has added considerably to knowledge of the lives of the Anglian inhabitants of Eoforwic. From a wider perspective, this assemblage must also be viewed as an important addition to the ever-increasing corpus of material relating to north-east England in the Anglian period. Furthermore, on a national and even an international level, the finds have considerably aided interpretation of the nature of trading and other activities in Anglian *emporia*. The material has thus been of great value in enhancing understanding of this still relatively poorly documented period.

Catalogue

The catalogue numbers follow consecutively those on p.1172, *AY* 17/8. Each entry ends with the small find number, prefixed sf, preceded by context number; a list of provenances appears on pp.1496–8. If a catalogue entry incorporates more than one item or fragment, the dimensions given relate to the largest item.

Abbreviations: L. = length; W. = width; T. = thickness; D. = diameter; H. = height; Wt. = weight

Stone

Mould

4423 Irregularly shaped block of rectangular section, with one original bevelled edge, others roughly broken, one corner partially cut away. There is an elongated oval-shaped cutout with angled edges on the smooth upper face, at oblique angle to all edges, also shallow scratches to one side of cutout. Sandstone, pale brownish grey, fine-grained, with sparse muscovite. Probably Coal Measures but could be Middle Jurassic. L.128.7, W.123.8, T.26.2mm; cutout: L.57.7, W.9.7, H.2.4mm 1166 sf557 (P3z) (*Fig.609*)

Spindle whorls

Form A1

4424 Incomplete, truncated biconical, with concave upper face, grooves around lower half. Chalk, white, fine-grained. Chalk Group, possibly Ferriby Chalk Formation. D.27.2, H.11.6mm, Wt.8.6g 3397 sf7281 (P3b) (*Fig.625*)

4425 Fragment, truncated biconical, sides decorated with incised ring-and-dot. Chalk, white, fine-grained. Chalk Group, possibly Ferriby Chalk Formation. W.21.9, T.11, H.16.4mm, Wt.4.2g 4847 sf6051 (P3c) (*Fig.625*)

4426 Fragment, cylindrical, with rounded lower face. Chalk, white, very fine-grained. Chalk Group. L.23, H.12.3mm, Wt.7g 10031 sf8592 (P3z)

4427 Flattened hemisphere, decorated with ring-and-dot motifs and two incised lines. Chalk, white, fine-grained. Chalk Group, possibly Ferriby Chalk Formation. D.39.4, H.18.6mm, Wt.32.9g 3391 sf5437 (P4z) (*Fig.625*)

4428 Shallow hemisphere. Chalk, white, very fine-grained. Chalk Group. D.34.5, H.14.2mm, Wt.21.5g 5261 sf6998 (P6a) (*Fig.625*)

4429 Deep hemisphere, with elliptical circumference and three incised lines encircling sides. Chalk, pale brownish pink, fine-grained, with scattered fossil debris. Chalk Group, probably Ferriby Chalk Formation (Red Chalk or Pink Band). D.31, H.19mm, Wt.21.6g 5110 sf5606 (P6c) (*Fig.625*)

Form A1 or A2

4430 Fragment, rounded conical, with vertical incised lines on sides. Chalk, white, very fine-grained. Chalk Group. L.30.7, H.25.1mm, Wt.12.8g 1598 sf6524 (P4b) (*Fig.625*)

Form A2

4431 Truncated biconical. Siltstone or silty mudstone, dark grey to black, hard. Probably Lower Palaeozoic or Upper Carboniferous. D.29.4, H.16.9mm, Wt.10.3g 10180 sf4777 (P3a) (*Fig.625*)

Form B

4432 Fragment, shallow cylindrical. Chalk, white, fine-grained. Chalk Group, possibly Ferriby Chalk Formation. D.46.4, H.12.9mm, Wt.17.1g 5375 sf6097 (P6a)

4433 Truncated biconical, with lathe marks around sides. Either ceramic or fine-grained igneous rock, probably extrusive. D.29.6, H.19.6mm, Wt.17.1g 3239 sf8171 (P6a) (*Fig.625*)

4434 Rounded cylindrical. Chalk, white, very fine-grained. Chalk Group. D.34.2, H.18.7mm, Wt.17.2g 5345 sf6098 (P6a/b) (*Fig.625*)

Form C

4435 Spherical. Chalk, white, very fine-grained. Chalk Group. D.34.6, H.24.2mm, Wt.30.4g sf8378 (unstratified) (*Fig.625*)

Unidentified form

4436 Fragment, with faint incised lines around sides. Mudstone, dark grey. Probably Coal Measures but could be Millstone Grit. L.35.1, T.4.3mm, Wt.3.4g 4848 sf6160 (P3z)

Hones

4437 Rectangular section, upper end squared off, both faces faceted and bevelled to lower rounded end. Sandstone, dark grey, fine- to medium-grained, highly compacted, with scattered muscovite and dark minerals. Lower Palaeozoic. L.71.7, W.27.2, T.22.2mm 3440 sf5036 (P3a) (*Fig.635*)

4438 Fragment, adjoining sf7540. Originally of rectangular section, both ends broken. Sandstone, pale grey, fine-grained, strongly calcareous, with sparse minute fossil debris. Middle or Upper Jurassic. L.22.6, W.29, T.6.3mm 5715 sf8027 (P3b) (*Fig.635*)

4439 Fragment, originally of rectangular section, both ends broken, one edge broken, other with groove. Sandstone, pale grey, fine-grained, with sparse muscovite. Upper Carboniferous, probably Coal Measures. L.52.6, W.36.2, T.21.4mm 5727 sf8438 (P3b) (*Fig.635*)

4440 Fragment, of rectangular section, both ends roughly broken. Schist, pale grey, quartz-muscovite. L.20.9, W.16.5, T.5.6mm 2403 sf6599 (P4b)

4441 Rectangular section, one end squared off, other rounded. Sandstone, pale to medium grey, fine-grained, highly compacted, with sparse muscovite. Lower Palaeozoic or Carboniferous. L.105.5, W.34.3, T.22.6mm 5748 sf7866 (P4b) (*Fig.635*)

4442 Rectangular section, one end squared, other pointed, one face with deep median groove. Sandstone, pale grey, fine-grained, with sparse muscovite. Upper Carboniferous, probably Coal Measures. L.97.5, W.44.2, T.19.5mm 1231 sf1616 (P4z) (*Fig.635*)

4443 Fragment, originally of rectangular section, both ends broken. Phyllite, medium grey, quartz-muscovite. L.43, W.17.4, T.15.8mm 5236 sf6081 (P4z)

4444 Fragment, originally of rectangular section, both ends roughly broken. Phyllite, medium grey, quartz-muscovite L.43.6, W.17.6, T.9.6mm 5236 sf6249 (P4z)

4445 Rectangular section, one edge curving out to broken end, other end partially cut, deep oblique groove on one face. Sandstone, greyish white, fine-grained, with appreciable muscovite concentrated on dark laminae. Upper Carboniferous, probably Coal Measures of Elland Flags type. L.91.6, W.48.9, T.17.7mm 7080 sf6865 (P4z) (*Fig.635*)

4446 Rectangular section, waisted, both faces bevelled to one end, other end partially sawn. Appears to be igneous rock of basalt or dolerite type, dark grey, with numerous paler crystals, possibly microporphyritic feldspars. L.119.1, W.18.5, T.10.8mm 7080 sf6872 (P4z) (*Fig.635*)

— Fragment, adjoining *4438*. Sandstone. L.26.5, W.30, T.6.1mm 5507 sf7540 (P4z) (*Fig.635*)

4447 Rectangular section, expanding towards one end, both ends partially cut, shallow parallel grooves on one face. Sandstone, pale grey, fine-grained, with sparse muscovite. Upper Carboniferous, probably Coal Measures. L.76.2, W.58.6, T.21mm 5422 sf7954 (P4z) (*Fig.635*)

4448 Rectangular section, ends squared off. Sandstone, greyish white, fine-grained, calcareous, with sparse glauconite. Probably Lower Cretaceous Kentish Rag. L.71.7, W.37.3, T.28.4mm 5233 sf6127 (P6a) (*Fig.635*)

4449 Fragment, of irregular section, both ends roughly broken, all but one edge broken along natural cleavages. Phyllite, pale to medium grey, quartz-muscovite. L.33.5, W.27.9, T.9.9mm 10056 sf8600 (P6a)

4450 Rectangular section, tapering from one end to other, both broken, one face formed by cleavage. Phyllite, medium grey, quartz-muscovite. L.75, W.20, T.11.9mm 5261 sf9095 (P6a)

4451 Fragment, originally of rectangular section, both ends and one face broken away. Phyllite, pale grey, quartz-muscovite. L.32.1, W.20.5, T.7.1mm 2305 sf8317 (P6c)

Haematite

4452 Four fragments, brick red. L.22.5, W.13.5, T.5.4mm 4271 sf1663; 3390 sf7339; 1110 sf9344 (P2)

4453 Seventeen fragments, brick red. L.25, W.22.1, T.17.9mm 3464 sf5135; 10259 sf5738; 10259 sf6811; 3420 sf7155; 10208 sf7210; 3434 sf7242; 10235 sf7453; 3453 sf7784 (P3a)

4454 Nine fragments, brick red. L.19, W.12.1, T.7.3mm 10229 sf7133; 3414 sf7134; 7097 sf7343; 3423 sf7735; 5573 sf7904; 10213 sf8238 (P3b)

4455 Five fragments, brick red. L.29.1, W.19.2, T.9.9mm 3361 sf4763; 5530 sf7515; 3367 sf8791 (P3c)

4456 Thirteen fragments, brick red. L.36.2, W.26.6, T.21.7mm 10161 sf5190; 4943 sf6324; 4869 sf6508; 4792 sf6573; 4792 sf6576; 10153 sf7439; 10031 sf8588 (P3z)

4457 Twenty-four fragments, brick red. L.21.9, W.15.9, T.10.1mm 4876 sf6365; 4876 sf6406; 10071 sf6877; 10134 sf6892; 3470 sf7072; 10142 sf7075; 10149 sf7448; 3478 sf7536; 3478 sf7755; 5540 sf7835; 3388 sf8080 (P4z)

Marcasite

4458 Fragment, of plano-convex section, trapezoidal, ends squared off, surfaces highly polished. L.25.5, W.11.3, T.5.2mm 3421 sf8256 (P3z)

Net sinkers

4459 Incomplete, roughly broken across perforation. Flint, pale brownish grey, part of naturally rounded and perforated nodule. Welton Chalk Formation of Chalk Group. L.57.5, W.62.8, T.41.8mm, Wt.202g 5519 sf9107 (P3c) (*Fig.637*)

4460 Incomplete, roughly broken at one side and across perforation. Flint, completely white, patinated, part of naturally rounded and perforated nodule. Welton Chalk Formation of Chalk Group. L.60, W.51.2, T.44.2mm, Wt.177g 5380 sf7820 (P4b)

4461 Naturally ovoid stone, with oblique perforation. Sandstone, pale greyish brown, fine- to medium-grained, possibly erratic cobble. Carboniferous or older. L.153, W.99.3, T.70.9mm, Wt.1396g 7177 sf5508 (P4z) (*Fig.637*)

Weight

4462 Roughly cylindrical, axially perforated, with one end squared off, other rounded. Chalk, white, very fine-grained. Chalk Group. D.68.4, L.82mm, Wt.479g 2480 sf7992 (P3a) (*Fig.638*)

Rotary querns

4463 Fragment, lava. L.84, W.69.3, T.57.9mm 3455 sf8499 (P3a)

4464 Fragment, lava. L.25.9, W.21.4, T.6.2mm 3440 sf8510 (P3a)

4465 Fragment, lava. L.27.7, W.18.8, T.6.6mm 3464 sf8512 (P3a)

4466 Seven fragments, lava. L.44.4, W.40.3, T.29.6mm 4880 sf8548 (P3a)

4467 Fragment, lava. L.31.1, W.20.2, T.10.8mm 10214 sf8786 (P3a)

4468 Three fragments, lava. L.40.2, W.22.7, T.23.2mm 10180 sf8902 (P3a)

4469 Four fragments, lava. L.25, W.19.2, T.7.7mm 10180 sf8906 (P3a)

4470 Fragment, lava. L.19.2, W.13.2, T.7.5mm 3415 sf8975 (P3a)

4471 Fragment, shaped into a truncated cone, with wear on one face, lava. D.84, T.47.1mm 3360 sf4792 (P3b) (*Fig.639*)

4472 Two fragments, lava. L.28.6, W.25.7, T.11mm 5727 sf8501 (P3b)

4473 Three fragments, lava. L.35.7, W.28.8, T.13.5mm 3360 sf8502 (P3b)

4474 Two fragments, lava. L.47, W.24.2, T.8mm 3348 sf8503 (P3b)

4475 Seven fragments, lava. L.24.2, W.21.7, T.8.2mm 3360 sf8636 (P3b)

4476 Three fragments, lava. L.38.1, W.24.6, T.6.2mm 3360 sf8729 (P3b)

4477 Fragment, with signs of wear on both faces, lava. L.62.8, W.59.2, T.27.5mm 2267 sf8758 (P3b)

4478 Fragment, lava. L.53.3, W.52.8, T.50.5mm 5292 sf8903 (P3b)

4479 Two fragments, lava. L.35.2, W.26.9, T.30.4mm 7097 sf8976 (P3b)

4480 Three fragments, lava. L.22.3, W.21.8, T.10mm 3348 sf9018 (P3b)

4481 Fragment, of rectangular section, one straight edge bevelled, others roughly broken, signs of wear, lava. L.79.9, W.58.1, T.19.4mm 3362 sf5789 (P3c)

4482 Fragment, lava. L.40.7, W.31.3, T.29mm 3361 sf8505 (P3c)

4483 Five fragments, lava. L.27.6, W.23.7, T.22.9mm 3354 sf8507 (P3c)

4484 Fragment, faces worn smooth, lava. L.53.3, W.49, T.18.9mm 4847 sf8508 (P3c)

4485 Fragment, lava. L.20.3, W.17.3, T.12mm 4851 sf8702 (P3c)

4486 Fragment, lava. L.24.4, W.14.5, T.7.1mm 3362 sf8792 (P3c)

4487 Two fragments, lava. L.37, W.25, T.12.8mm 3337 sf8854 (P3c)

4488 Fragment, lava. L.42.5, W.36.4, T.26.8mm 3354 sf8856 (P3c)

4489 Two fragments, lava. L.21.8, W.19.7, T.6.7mm 4851 sf8859 (P3c)

4490 Two fragments, lava. L.32.3, W.20, T.22.7mm 3354 sf8900 (P3c)

4491 Two fragments, lava. L.25.8, W.16.2, T.7mm 3364 sf8907 (P3c)

4492 Fragment, lava. L.31.7, W.30.8, T.30.4mm 5519 sf9110 (P3c)

4493 Fragment, lava. L.44.6, W.32.6, T.10.2mm 5519 sf9111 (P3c)

4494 Fragment, lava. L.44.1, W.29.3, T.13.2mm 4851 sf9153 (P3c)

4495 Fragment, from upper stone, all edges roughly broken, part of central perforation remaining, grinding surface worn smooth, lava. L.89.1, W.66.7, T.27.9mm 3354 sf9154 (P3c) (*Fig.639*)

4496 Fragment, lava. L.45.9, W.36.9, T.13.4mm 4851 sf9157 (P3c)

4497 Fragment, lava. L.23.7, W.16.5, T.6.3mm 3364 sf9202 (P3c)

4498 Two fragments, lava. L.59.2, W.53.3, T.32.2mm 4918 sf5957 (P3z)

4499 Fragment, lava. L.61.6, W.39.5, T.37.6mm 6495 sf8310 (P3z)

4500 Fragment, lava. D.24.6, T.8.9mm 3463 sf8509 (P3z)

4501 Fragment, lava. L.23.9, W.21, T.7.5mm 4792 sf8511 (P3z)

4502 Fragment, lava. L.28.4, W.18.8, T.7mm 4888 sf8513 (P3z)

4503 Fragment, from the outer edge of an upper stone, grinding surface worn smooth, lava. L.68.8, W.49.5, T.25.4mm 4848 sf8704 (P3z)

4504 Fragment, lava. L.44.1, W.28.6, T.19.8mm 6493 sf8312 (P4a)

4505 Fragment, from outer edge of stone, parts of grinding surface worn smooth, lava. L.85.5, W.60.4, T.53.7mm; original D.400mm (approx.) 1895 sf7960 (P4b)

4506 Fragment, lava. L.46.3, W.28.8, T.26.8mm 6402 sf8085 (P4b)

4507 Fragment, lava. L.64.7, W.52.9, T.33mm 6425 sf8090 (P4c)

4508 Fragment, from upper stone, all edges roughly broken, but part of perforation remaining. Parts of the grinding surface are worn very smooth, lava. L.146.1, W.134.4, T.37mm; perforation: D.75mm 5663 sf7700 (P4d) (*Fig.639*)

4509 Fragment, lava. L.57.1, W.32, T.24.5mm 1311 sf1553 (P4z)

4510 Fragment, lava. L.48.7, W.30.3, T.18.2mm 1255 sf1651 (P4z)

4511 Fragment, lava. L.26.2, W.21.2, T.14.6mm 1255 sf1791 (P4z)

4512 Two fragments, adjoining, from outer edge of upper stone, parts of grinding surface worn smooth. There is a channel from the upper face through to one side, lava. W.100, T.36.8mm; original D.400mm (approx.) 3407 sf4897 (P4z) (*Fig.639*)

4513 Lower stone, slightly convex grinding surface, with two opposed bands of wear close to the edge. The lower surface is uneven, with peck marks; peck marks also present around the edge. The central perforation tapers towards the grinding face and has a slightly raised rim on the grinding surface. Sandstone, pale grey, medium- to (slightly) coarse-grained. Millstone Grit. D.408.8, T.90mm; perforation: D.54.4mm. Upper stone, slightly concave grinding surface, with one long band and a few patches of wear close to the edge. The upper face and sides are pecked, and there are two handle holes of similar diameters but slightly different depths in the upper face. The central perforation is flanged, and tapers to the grinding face. On either side of the perforation on the grinding face are rynd grooves. Sandstone, pale grey, medium- to coarse-grained (up to 2mm wide). Millstone Grit. D.400.5, T.108mm; perforation: D.94.3mm; handle holes: D.27.4mm; groove: L.9, W.24.9mm 3391 sfs5271 (lower) and 5272 (upper) (P4z) (*Figs.640–1*)

4514 Fragment, with signs of wear, lava. L.66.6, W.39.8, T.28.4mm 7177 sf5516 (P4z)

4515 Fragment, from outer edge of upper stone, roughly broken across the handle socket, grinding face pecked and worn. Sandstone, pale greyish brown, medium- to (slightly) coarse-grained. Millstone Grit. L.198.7, W.135.2, T.43mm; original D.380mm (approx.) 6150 sf6187 (P4z)

4516 Fragment, lava. L.29.5, W.22.1, T.7.3mm 4849 sf8504 (P4z)

4517 Fragment, lava. L.93.2, W.43.4, T.35.6mm 4876 sf8506 (P4z)

4518 Two fragments, lava. L.35.4, W.18.9, T.11.4mm 3351 sf8671 (P4z)

4519 Three fragments, lava. L.26.9, W.25.5, T.6.2mm 3391 sf8703 (P4z)

4520 Two fragments, lava. L.28.1, W.23.6, T.7.9mm 4849 sf8790 (P4z)

4521 Fragment, lava. L.32.4, W.22.4, T.9.3mm 3370 sf8843 (P4z)

4522 Fragment, lava. L.26, W.15.7, T.6mm 10094 sf8849 (P4z)

4523 Fragment, lava. L.35.6, W.29.6, T.11.8mm 3407 sf8860 (P4z)

4524 Fragment, lava. L.23.7, W.21.3, T.9.4mm 4849 sf8861 (P4z)

4525 Fragment, lava. L.43.2, W.38.4, T.32.2mm 4849 sf8904 (P4z)

4526 Fragment, lava. L.41.6, W.27.7, T.19.2mm 4849 sf9155 (P4z)

4527 Fragment, faces worn smooth, lava. L.93.3, W.59.4, T.32.8mm 4876 sf9158 (P4z)

4528 Fragment, with a flat base, sides diverging up to a subconvex upper face, with a central dimple, lava. L.67.5, W.61.3, T.47.2mm 3352 sf4374 (P6a) (*Fig.639*)

4529 Fragment, from outer edge of stone, with parts of one face worn smooth, lava. L.98.4, W.97.1, T.25.9mm; original D.400mm (approx.) 4694 sf6817 (P6a)

4530 Fragment, lava. L.46.1, W.35.4, T.24.4mm 6307 sf7660 (P6a)

4531 Fragment, lava. L.25.1, W.22, T.9.1mm 3234 sf8701 (P6a)

4532 Two fragments, lava. L.19.6, W.16.9, T.6.1mm 10056 sf8857 (P6a)

4533 Fragment, with grinding surface slightly smooth, lava. L.120.6, W.78.9, T.49.3mm 3227 sf8894 (P6a) (*Fig.639*)

4534 Three fragments, lava. L.40, W.39.2, T.25mm 3352 sf8901 (P6a)

4535 Fragment, lava. L.25.2, W.16.4, T.11mm 3239 sf8905 (P6a)

4536 Fragment, D-shaped, of plano-convex section, with patches of wear on one face, lava. L.90.6, W.43.6, T.36.3mm 4694 sf9160 (P6a)

4537 Fragment, of plano-convex section, with traces of mortar on flat face, and patches of wear, lava. L.60.6, W.60.1, T.38.9mm 5295 sf5226 (P6b) (*Fig.639*)

4538 Two fragments, adjoining, grinding surface worn smooth in patches, lava. L.101.6, W.94.9, T.62.1mm 1584 sf8036 (P6b)

4539 Fragment, lava. L.20.2, W.16.2, T.9.1mm 4639 sf8974 (P6b)

4540 Fragment, from outer edge of upper stone, broken near edge across socket, which fully perforates stone. Sandstone, pale brownish grey to reddish brown, medium- to coarse-grained. Reddish colouring due to heat. Millstone Grit. L.130.9, W.88.1, T.47.7mm; original D.380mm (approx.) 5245 sf6281 (P6a/b) (*Fig.639*)

4541 Fragment, lava. L.23, W.18.4, T.9.4mm 10138 sf8500 (P6a/b)

4542 Fragment, lava. L.34.2, W.25.9, T.13mm 2381 sf6208 (P6c)

4543 Fragment, from upper stone, one edge being part of the circumference, the other edges roughly broken. On the lower face, the surface at the circumference is worn smooth, the upper convex face is irregular and uneven. Sandstone, pale grey, fine- to (slightly) coarse-grained, containing flattish voids suggestive of shelly-fossil moulds. Probably Crinoid Grit, part of the Middle Jurassic Scarborough Formation. L.181.5, W.169.6, T.127.7mm; original D.420mm (approx.) 2061 sf2611 (P7a) (*Fig.639*)

4544 Fragment, lava. L.24.8, W.17, T.10.2mm sf8858 (unstratified)

Bead

4545 Spherical, with axial perforation. Limestone, white, fine- to medium-grained. Provenance uncertain. D.15.4, H.12.4mm 3370 sf7302 (P4z) (*Fig.673*)

Fossils

4546 Crinoid ossicle in partly silicified limestone. Yoredale Sequence or Harrogate Roadstone. D.5.6, L.1.8mm 4209 sf829 (P2)

4547 Crinoid ossicles in silicified limestone. Yoredale Sequence or Harrogate Roadstone. D.4, L.9.5mm 10183 sf6435 (P3a)

4548 Crinoid ossicle, calcitic, Carboniferous Limestone, Yoredale Sequence or Harrogate Roadstone. D.4.1, L.4mm 10208 sf6932 (P3a)

4549 Moulds of crinoid ossicles in silicified limestone; small subangular erratic cobble. Yoredale Sequence or Harrogate Roadstone. L.66, W.55.5, T.37mm 3455 sf8514 (P3a)

4550 Crinoid ossicles in silicified limestone. Yoredale Sequence or Harrogate Roadstone. L.22, W.16.4, T.10mm 10180 sf9355 (P3a)

4551 Crinoid ossicles in silicified limestone. Yoredale Sequence or Harrogate Roadstone. D.9.7, L.15.7mm 5687 sf8672 (P3b)

4552 Moulds of crinoid ossicles and fossil fragments in coarsely recrystallised silicified limestone. Yoredale Sequence or Harrogate Roadstone. L.41.4, W.37.9, T.30.4mm 3361 sf9151 (P3c)

4553 Crinoid ossicle, silicified. Yoredale Sequence or Harrogate Roadstone. D.2.4, L.1mm 4788 sf6741 (P3z)

4554 Three fragments of crinoid ossicle, silicified. Yoredale Sequence or Harrogate Roadstone. D.4.3, L.0.8mm 1163 sf9293 (P3z)

4555 Crinoid ossicle, calcitic. Carboniferous Limestone, Yoredale Sequence or Harrogate Roadstone. D.3.2, L.2.5mm 1143 sf870 (P4z)

4556 Crinoid ossicle, calcitic. Carboniferous Limestone, Yoredale Sequence or Harrogate Roadstone. D.2.6, L.1mm 10167 sf7198 (P4z)

4557 Crinoid ossicle, silicified. Yoredale Sequence or Harrogate Roadstone. D.3.7, L.1.8mm 3370 sf7301 (P4z)

4558 Crinoid ossicle, calcitic. Carboniferous Limestone, Yoredale Sequence or Harrogate Roadstone. D.3, L.1.2mm 5540 sf7837 (P4z)

4559 Casts and moulds of crinoid ossicles, brachiopods in silicified limestone. Yoredale Sequence or Harrogate Roadstone. L.52.4, W.32, T.16mm 3388 sf8515 (P4z)

4560 Coral, simple type, in pale grey limestone; erratic pebble. Carboniferous Limestone. L.32.8, W.23.2, T.15.8mm 3420 sf8855 (P3a)

4561 Two fossils, comprising moulds of gastropod, brachiopod, and indeterminate fossils in pale grey chert. Yoredale Sequence. Also crinoid ossicle moulds and casts in silicified limestone, Yoredale Sequence or Harrogate Roadstone. L.29.4, W.26.8, T.26mm 7097 sf8630 (P3b)

4562 Four fossils, indeterminate shells in silicified limestone; erratic cobble. Also crinoid ossicles and fossil debris in silicified limestone. All Yoredale Sequence or Harrogate Roadstone. L.81.6, W.55.7, T.14.6mm 3360 sf9363 (P3b)

4563 Coarsely ribbed brachiopod and ?bivalves in pale grey silicified limestone. Yoredale Sequence or Harrogate Roadstone. L.33.2, W.32, T.11.3mm 3354 sf8561 (P3c)

4564 Two fossils, comprising bivalve, gastropod and indeterminate fossils in white very fine-grained chalk. Chalk Group. L.36.6, W.33.4, T.15.8mm 3377 sf8680 (P3c)

Playing piece

4565 Conical, with rounded apex, base with shallow central hollow, faces smooth. Chalk, white, very fine-grained. Chalk Group. D.38.2, H.49.1mm 10039 sf3097 (P4z) (*Fig.687*)

Ballista balls

4566 Roughly spherical, with smooth surface. Igneous rock within diorite-gabbro-syenite range, greyish white, medium- to slightly coarse-grained, with abundant white feldspar and black mineral probably augite or hornblende; erratic. D.60.4mm 5687 sf8674 (P3b)

4567 Spherical, with rough surface. Limestone, greyish white, moderately oolitic, mainly dolomitic. Lower Magnesian Limestone. D.56mm, Wt.170g 3370 sf8789 (P4z)

Stone fragments

4568 Fragment, of plano-convex section, from edge of circular object. Sandstone, pale brownish grey with scattered muscovite, medium- to coarse-grained. Upper Carboniferous, probably Millstone Grit. L.35, W.28.8, T.23.3mm; original D.100mm (approx.) 3424 sf7457 (P3z)

4569 Fragment, of D-shaped section, rear face and both ends broken away. Granite or quartz diorite, pale grey, medium-grained, with sparse quartz, abundant white feldspar and black ?hornblende. L.61.6, W.35.1, T.9.7mm 1253 sf1701 (P4z)

Jet and shale

4570 Jet roughout, suboval, of subrectangular section, thickness decreasing markedly from one side to the other. Both faces are unworked, one formed from a fracture, and there are knife-cut facets around the sides. L.55.6, W.49.1, T.14.2mm 1262 sf1057 (P4z) (*Fig.636*)

4571 Jet bead, globular, with end facets flattened, one damaged, outer surface polished. D.11.4, H.8.8mm 1106 sf849 (P3z) (*Fig.673*)

4572 Bead, probably of shale, discoidal, with rounded edges. D.10.5, H.2mm 4876 sf8172 (P4z) (*Fig.673*)

Amber

4573 Bead fragment, irregularly shaped, with one convex face, others roughly broken. L.5.8, W.4.8, T.4.2mm 10039 sf8957 (P4z)

Gemstones

4574 Bead formed from naturally shaped emerald, subrectangular, of flattened hexagonal section, with axial perforation, end facets convex, opaque green. L.17.2, W.12.4, T.9.6mm 1292 sf1121 (P3z) (*Figs.672, 675*)

4575 Fragment of garnet, subspherical, dark red. L.3.5, W.3, T.2.4mm 3451 sf6947 (P3z) (*Fig.672*)

4576 Setting of garnet, square, of plano-convex section, ends squared, orange-red. L.2.7, W.2.2, T.0.9mm 4661 sf8430 (P3z) (*Fig.672*)

Fired clay

Crucibles

4577 Rim fragment, vitrified, unknown fabric. L.18, W.15, T.5mm 10180 sf9829 (P3a)

4578 Body or base fragment, vitrified, unknown fabric. L.25, W.20, T.9mm 7114 sf5330 (P3b)

4579 Base fragment, vitrified, unknown fabric. L.20, W.20, T.3mm 3360 sf8249 (P3b) (Catalogued as *2479* in *AY* 16/6)

4580 Body fragment, vitrified, unknown fabric. L.20.8, W.17.9, T.6mm 2267 sf8795 (P3b)

4581 Body fragment, vitrified, fine pale grey fabric. L.22.8, W.15, T.4mm 5715 sf8847 (P3b)

4582 Body fragment, vitrified, unknown fabric. L.20, W.14, T.5mm 7097 sf9826 (P3b)

4583 Base fragment, vitrified, fine pale grey fabric. L.36, W.33, T.7mm 2453 sf9827 (P3b)

4584 Two fragments, one body and one base, vitrified, unknown fabric. L.23.5, W.18.5, T.8mm 3354 sf4395 (P3c)

4585 Body fragment, vitrified, unknown fabric. L.21.8, W.17.5, T.5mm 3354 sf4432 (P3c)

4586 Body fragment, vitrified, fine pale grey fabric. L.20, W.3, T.5mm 5591 sf7916 (P3c)

4587 Base fragment, vitrified, unknown fabric. L.20, W.12, T.8mm 4888 sf5752 (P3z)

4588 Body fragment, vitrified, unknown fabric. L.18.9, W.11.5, T.5mm 4913, sf6064 (P3z)

4589 Body fragment, vitrified, unknown fabric. L.22, W.16, T.3mm 4792 sf8239 (P3z)

4590 Body fragment, vitrified, unknown fabric. L.20, W.18, T.4mm 3463 sf8241 (P3z)

4591 Three fragments, one rim and two body, vitrified, unknown fabric. L.17.4, W.15.8, T.5mm 3463 sf8970 (P3z) (*Fig.608*)

4592 Rim fragment, vitrified, unknown fabric. L.21, W.18, T.6mm 2446 sf8057 (P4a)

4593 Rim fragment, with internal metal residue, vitrified, unknown fabric. L.22, W.15, T.6mm 2266 sf8077 (P4a)

4594 Rim fragment, thumb size, with traces of metal residue, vitrified, unknown fabric. L.35, W.22, T.5mm 2266 sf8435 (P4a) (Catalogued as *2541* in *AY* 16/6)

4595 Rim fragment, vitrified, unknown fabric. L.25, W.17, T.6mm 2438 sf9825 (P4b) (*Fig.608*)

4596 Rim fragment, vitrified, unknown fabric. L.15, W.15, T.3mm 5526 sf8056 (P4d)

4597 Crucible base, of oxidised gritty fabric, with high-lead glass. L.32.7, W.14.8, T.10.3mm 1258 sf1069 (P4z)

4598 Base with internal high-lead glass, Stamford ware. L.36, W.32, T.5mm 10166 sf4788 (P4z)

4599 Complete crucible, thumb size, vitrified, unknown fabric. D.25, L.25mm, T.4mm 3407 sf4863 (P4z) (*Fig.608*) (Catalogued as *2540* in *AY* 16/6)

4600 Body fragment, vitrified, unknown fabric. L.18, W.15, T.6mm 4961 sf6288 (P4z)

4601 Rim fragment, vitrified, unknown fabric. L.16, W.15, T.7mm 4939 sf6429 (P4z)

4602 Three fragments, two rims and one body, vitrified, unknown fabric. Largest rim fragment: L.23, W.18, T.11mm 3407 sf8737 (P4z)

4603 Two fragments, one rim/lip and one base, vitrified, fine pale grey fabric. L.21.9, W.12.8, T.6mm 3407 sf8848 (P4z)

4604 Rim fragment, vitrified, unknown fabric. L.28, W.24, T.8mm 3407 sf8983 (P4z)

4605 Knob, vitrified, unknown fabric. L.32, W.25, T.16mm 10141 sf9828 (P4z) (*Fig.608*)

4606 Rim fragment, with metal residue, vitrified, unknown fabric. L.34, W.22, T.6mm 3103 sf1381 (P6a)

4607 Body fragment, vitrified, unknown fabric.

L.25, W.20, T.12mm 1237 sf9819 (P6a)

4608 Rim with internal high-lead glass, oxidised gritty fabric. L.32, W.18, T.9mm 5518 sf9889 (P6a/b)

4609 Rim fragment with pouring lip, vitrified, ?Stamford ware. L.51, W.36, T.4mm 1386 sf9890 (P6e)

4610 Body sherd with high-lead glass, unknown fabric. L.11.4, W.9.4, T.4.2mm 4253 sf1061 (P6z)

4611 Base fragment, vitrified, unknown fabric. L.26.4, W.17.4, T.4.5mm sf9091 (unstratified)

Moulds

4612 Two fragments, one with original inner surface surviving. L.25, W.13, T.11mm 4847 sf8527 (P3c)

4613 Fragment, with textile impression on smooth face. L.24, W.18, T.10mm 10153 sf9821 (P3z)

4614 Seventeen fragments, three with smooth inner surfaces. L.37, W.25, T.14mm 4848 sf9893 (P3z)

4615 Fragment, with a metal fragment trapped in convoluted inner surface. L.40, W.25, T.15mm 7080 sf6866 (P4z) (Catalogued as *2542* in *AY* 16/6)

4616 Fragment with red-orange vitrified inner surface. L.28, W.23, T.15mm 5201 sf9201 (P4z)

4617 Fragment, with irregular markings on inner surface. L.25, W.21, T.9mm 4849 sf9822 (P4z)

4618 Seven fragments, two with inner surfaces surviving. L.21, W.20, T.13mm 10144 sf9823 (P4z)

4619 Fragment, with uneven inner surface. L.35, W.22, T.14mm 3407 sf9824 (P4z)

4620 Fragment, with irregular markings on inner surface. L.34, W.25, T.13mm 4196 sf9820 (P6c)

Loom weights

4621 Fragment, irregularly shaped. L.70, T.22.5, H.38mm, Wt.50g 1105 sf282 (P3z)

4622 Fragment, bun-shaped, crudely fashioned. L.48, W.42, T.39.6mm, Wt.71g 1115 sf291 (P3z) (*Fig.626*)

4623 Fragment, of amorphous shape. L.62, W.35, T.20mm, Wt.33g 1265 sf1442 (P3z)

4624 Fragment, bun-shaped, crudely fashioned. L.52, T.18, H.27mm, Wt.14g 1257 sf1126 (P4z)

4625 Fragment, form intermediate between bun-shaped and annular, crudely fashioned. D.96.7, W.43, H.27.3mm, Wt.122g 5279 sf4873 (P4z)

4626 Fragment, bun-shaped, crudely fashioned. L.43, T.49.4, H.38.8mm, Wt.63g 5420 sf6475 (P4z)

4627 Fragment, form intermediate between bun-shaped and annular, crudely fashioned, of D-shaped section. L.96.2, T.26, H.36.6mm, Wt.103g 5496 sf7478 (P4z)

4628 Fragment, bun-shaped, crudely fashioned. L.71.4, W.49, T.24mm, Wt.73g 1080 sf240 (P6a)

4629 Fragment, irregularly shaped. L.47, T.42, H.30mm, Wt.29g 5375 sf6012 (P6a)

4630 Fragment, annular or intermediate between bun-shaped and annular, crudely fashioned, D-shaped cross-section. L.94, W.38, T.42mm, Wt.163g 5097 sf4874 (P6a/b) (*Fig.626*)

4631 Fragment, annular or intermediate between bun-shaped and annular, crudely fashioned, almost circular in cross-section. L.106.5, W.46, T.50.4mm, Wt.245g sf8070 (unstratified) (*Fig.626*)

Bead

4632 Irregularly shaped, of rectangular section, perforated, chipped from body sherd of red samian ware, abraded. L.20.3, W.19.8, T.3.8mm 1895 sf8039 (P4b) (*Fig.673*)

Counter

4633 Subdiscoidal, chipped out of a plain unglazed tile. D.59, T.26.6mm 1865 sf7888 (P4b) (*Fig.687*)

Glass

Note: The vessel glass is ordered, for working purposes only, according to (a) technology; (b) colour; (c) date; (d) site period

Vessel glass

Cast

4634 Plate rim fragment, deep blue, rounded rim. T.6.5mm; original rim: D.110mm (approx.) 1133 sf507 (P3z) (*Fig.644*)

Blown

Polychrome

4635 Cup or beaker rim fragment. Light yellowish-green, curved rim, edge cracked off smoothly but not ground, slightly convex curved side. One abraded band below rim edge, one on upper body, also small applied blue blob. T.2.6mm; original rim: D.60mm (approx.) 10056 sf3389 (P6a) (*Fig.644*)

4636 Rim fragment, blue-green, with tubular rim folded to form shoulder on outer surface, decorated with fine horizontal opaque white trails in glass matrix, ten trails evident, rim formed after trails applied, and thus on inside of cavity. T.4mm; original rim: D.150mm (approx.) 6497 sf8318 (P3z) (*Fig.644*)

4637 Two bowl fragments, one rim and one base, light blue, probably from the same vessel as *4636*. The rim is folded outwards, to a depth of 15mm down the vessel side, leaving a cavity. The vessel side and the inside of the rim are decorated with horizontal opaque white marvered trails, the decoration applied before the rim was folded. The body area of the base fragment is decorated with a vertical but slightly angled applied reticella rod exhibiting opaque white spiral and horizontal opaque white marvered trails; a trail also appears on the edge of the base itself. Rim fragment: L.52, W.31, T.5mm; base fragment: L.46, W.43, T.4, H.30mm 1073 sf199 (P3z) (*Figs.644–5*)

4638 Bowl body fragment, probably from same vessel as *4636*, light blue, decorated with an applied reticella rod exhibiting an opaque white spiral. L.20, W.11, T.1mm 1070 sf184 (P4z) (*Fig.644*)

4639 Two bowl fragments, one rim and one body, light blue, probably from the same vessel as *4636*. The rim is folded outwards, to a depth of 15mm down the vessel side, leaving a cavity. The vessel side and the inside of the rim are decorated with horizontal opaque white marvered trails, the decoration applied before the rim was folded. The body fragment is decorated with an applied reticella rod exhibiting an opaque white spiral. Rim fragment: L.20, W.13, T.6mm; body fragment: L.18, W.13, T.1mm 1055 sf117 (P6a) (*Fig.644*)

4640 Jar rim fragment, opaque red, vertical rim folded inwards, cavity fused, decorated with applied horizontal opaque yellow marvered trails on outer surface. T.3mm; original rim: D.50mm (approx.) 1258 sf1043 (P4z) (*Figs.644, 646*)

4641 Bowl body fragment, brown, decorated with horizontal applied clear reticella trail containing alternate thick and thin opaque white trails, trail flattened and sunk into body, forming interlacing W-pattern. L.41.5, W.22.6, T.1mm 5432 sf6470 (P3c) (*Fig.648*)

4642 Body fragment, colourless, decorated with band of three opaque red reticella rods containing white spirals and also horizontal opaque yellow marvered trail. L.14, W.7.9, T.1mm 7075 sf4819 (P4z) (*Figs.646, 648*)

4643 Funnel beaker rim fragment, blue on colourless body, rim rounded and slightly inturned. T.2.3mm; original rim: D.130mm (approx.) 5348 sf5803 (P4z) (*Fig.644*)

4644 Body fragment, funnel series, light green, decorated with applied reticella rod with opaque yellow spirals, badly marvered. L.16.7, W.12, T.1mm 1258 sf1060 (P4z) (*Figs.646, 648*)

4645 Body fragment, dark green in transmitted light appearing dark opaque red/black in reflected light, slight carination at one edge, decorated with broken horizontal opaque yellow marvered trail, some iridescence. L.13, W.9.2, T.1.1mm 10056 sf3470 (P6a) (*Fig.648*)

4646 Body fragment, light green, decorated with opaque yellow marvered trails. L.22.4, W.23.5, T.1.5mm 5261 sf5221 (P6a) (*Fig.648*)

4647 Body fragment, light green, decorated with applied reticella rod, slightly smoothed onto vessel, with opaque yellow spirals, evidence of iridescence. L.9.8, W.8.2, T.1mm 4694 sf5303 (P6a) (*Figs.646, 648*)

4648 Body fragment, light green, decorated with three horizontal opaque yellow marvered trails, two thin and one thick, some iridescence. L.10, W.8, T.1.3mm 5375 sf6791 (P6a) (*Figs.646, 648*)

4649 Body fragment, light green, decorated with four horizontal uneven opaque yellow marvered trails. L.15.6, W.11.3, T.1.4mm 6470 sf8105 (P6a) (*Fig.648*)

4650 Bowl body fragment, light blue, decorated with opaque white combed marvering. L.35, W.19.2, T.2.3mm 3447 sf5017 (P3a) (*Fig.648*)

4651 Body fragment, light blue, decorated with horizontal opaque yellow marvered trails. L.6.9, W.4.4, T.0.9mm 1932 sf8621 (P3z)

4652 Body fragment, light blue, with evidence of angle where shoulder joins neck, showing traces of opaque yellow marvering. L.10.7, W.7.2, T.0.9mm 2386 sf6824 (P4b)

4653 Body fragment, light blue, exhibiting opaque white combed marvering, bubbly, heat frosted and distorted. L.25, W.16, T.2.4mm 3352 sf4419 (P6a)

4654 Body fragment, light blue, decorated with fine white combed marvering. L.27.5, W.12.7, T.1.4mm 3342 sf4475 (P6a) (*Fig.648*)

4655 Body fragment, light blue, decorated with horizontal opaque yellow marvered trails, small bubbles in matrix. L.19.6, W.24, T.1.3mm 10140 sf4480 (P6a/b) (*Fig.648*)

4656 Body fragment, turquoise blue, decorated with marvered opaque white combed trails. L.17, W.9.6, T.3.5mm 10139 sf4288 (P3c) (*Fig.648*)

4657 Body fragment, turquoise blue, terminal of applied reticella trail containing opaque yellow and red spirals, trail thickens towards one end. L.15.8, W.10.1, T.7.9mm 4280 sf1575 (P4z) (*Fig.648*)

4658 Body fragment, bright blue, decorated with applied horizontal ribs with thin horizontal red trail in bubbly matrix. L.15.6, W.14.9, T.0.8mm 10183 sf4813 (P3a)

Brown

4659 Body fragment, decorated with applied trail. L.6.9, W.6.4, T.1.8mm 10196 sf9193 (P3b)

Yellow-green

4660 Body fragment from Hofheim cup or related beaker form, applied trails. L.13.9, W.13.4, T.1.8mm 4271 sf1146 (P2)

4661 Body fragment, decorated with fine applied horizontal trail. L.7.7, W.7, T.1.3mm 3414 sf7135 (P3b)

Bright green

4662 Body fragment. L.10.2, W.8.4, T.2.4mm 5727 sf7899 (P3b)

4663 Body fragment, decorated with narrow applied horizontal trail. L.14.8, W.10.6, T.1.9mm 3323 sf4249 (P6c)

Light green

4664 Funnel beaker rim fragment; rim rounded, slightly inturned. T.2.3mm; original rim: D.110mm (approx.) 3360 sf6011 (P3b) (*Fig.644*)

4665 Funnel beaker rim fragment; rim rounded and slightly thickened. T.1mm; original rim: D.120mm (approx.) 5577 sf7555 (P8)

4666 Body fragment, evidence of former trailing. L.15.5, W.11.2, T.1.5mm 4889 sf5748 (P4z)

4667 Body fragment, mould-blown ribs, some iridescence. L.12.5, W.9.2, T.2.2mm 3342 sf4310 (P6a)

4668 Body fragment, showing evidence of one mould-blown horizontal rib. L.12.2, W.9.3, T.2.8mm 5375 sf6797 (P6a)

4669 Jar base fragment, from open pushed base, sloping inwards deeply to form exaggerated base ring, very worn. T.2.3mm; original base: D.60mm (approx.) 5302 sf5882 (P6b) (*Fig.647*)

4670 Rim fragment, rim turned in and then folded out and rounded to form shoulder. T.4.9mm; original rim: D.140mm (approx.) 7075 sf4870 (P4z) (*Fig.644*)

4671 Body fragment, decorated with horizontal applied trail. L.10, W.10.3, T.3mm 1292 sf1773 (P3z)

4672 Body fragment, with evidence of moulded vertical rib in fabric. L.14.3, W.10, T.1.9mm 3421 sf4869 (P3z)

Colourless

4673 Beaker or flask base fragment, with dulled outer surface, part of lower body, with short cylindrical solid stem, top convex, foot with fire-rounded edge. Body, stem and foot made in three parts, pontil scar on underside of foot, terminal of vertical trail on lower body. T.3mm; original foot: D.40mm (approx.) 1075 sf1573 (P6a) (*Fig.647*)

4674 Segmental bowl rim fragment; rim ground, slightly inturned. T.1.3mm; original rim: D.80mm (approx.) 5554 sf7497 (P3b)

4675 Flask or jar rim fragment, green-tinged colourless, funnel mouth, rim edge rolled in. T.7.6mm; original rim: D.55mm (approx.) 10139 sf4721 (P3c)

4676 Rim fragment, rounded, slightly outsplayed. T.1mm; original rim: D.80mm (approx.) 2343 sf5812 (P6a)

4677 Base fragment, part of tubular base ring and base. T.2mm; original base: D.50mm (approx.) 2453 sf8052 (P3b) (*Fig.647*)

4678 Base fragment, folded forming cavity. T.2.6mm; original base: D.20mm (approx.) 1763 sf7559 (P6a)

4679 Bowl or cup body fragment, convex curved, with parts of three circular facets in two rows, wheel-ground. L.29.6, W.19, T.5.2mm 10039 sf3016 (P4z) (*Fig.648*)

4680 Body fragment, decorated with applied horizontal trail. L.10.4, W.9.9, T.1mm 7080 sf6869 (P4z)

4681 Body fragment, with two wheel-cut lines. L.14.1, W.12, T.1.4mm 10142 sf7077 (P4z)

Blue-green

4682 Bath flask rim and handle fragment, part of loop handle retaining outer edge of folded and flattened rim. T.2mm; original rim: D.60mm (approx.) 4693 sf4364 (P6a)

4683 Rim fragment, from narrow-necked vessel with lip, rim folded outwards and smoothed flat horizontally to form lip. T.3mm; original rim: D.40mm (approx.) 1090 sf193 (P3z)

4684 Bottle rim fragment, rim out-turned and folded in, smoothed to form horizontal lip, also evidence of handle attachment. T.7mm; original rim: D.50mm (approx.) 3350 sf4780 (P3b)

4685 Bottle handle fragment, with reeded decoration on outer surface. L.13, W.10.4, T.3.7mm 5254 sf4687 (P6a/b)

4686 Square bottle base fragment, with evidence of grozing on one side. L.17, W.12.1, T.5.4mm 7071 sf4998 (P6z)

4687 Neck fragment, cut, ground and outsplayed, signs of heat distortion. L.11.9, W.10, T.1.6mm; original neck: D.20mm (approx.) 10183 sf4810 (P3a)

4688 Base fragment, tubular pushed-in base ring, showing cavity, causing convex indentation on inside of vessel, heavily weathered. T.8.3mm; original base: D.70mm (approx.) 3000 sf8081 (unstratified) (*Fig.647*)

4689 Base fragment, with slight carination at one end, base concave. L.19, W.11.7, T.1.2mm 10183 sf4854 (P3a)

4690 Jug base fragment, high-cut base ring, tubular, folded out and then in. T.3mm; original base: D.120mm (approx.) 3360 sf5972 (P3b) (*Fig.647*)

4691 Two palm cup or funnel beaker base fragments, adjoining, with mould-blown vertical ribbing. L.40.7, W.34, T.4mm 3337 sf4334 (P3c) (*Fig.647*)

4692 Jar rim fragment, folded out, then in and rounded, no cavity, heat distorted. T.2mm; original rim: D.90mm (approx.) 5279 sf4894 (P4z)

4693 Funnel beaker rim fragment, folded outwards, then inturned to form rounded rim, slightly outsplayed. T.2mm; original rim: D.110mm (approx.) 4792 sf5488 (P3z) (*Fig.644*)

4694 Rim fragment, folded outwards and slightly outsplayed. T.4.3mm; original rim: D.120mm (approx.) 3391 sf5757 (P4z)

4695 Rim fragment, tubular rim, folded out, round and inwards. T.5mm; original rim: D.100mm (approx.) 3354 sf4384 (P3c) (*Fig. 644*)

4696 Rim fragment, with folded tubular rim, slightly outsplayed. T.3.3mm; original rim: D.110mm (approx.) 4280 sf1148 (P4z)

4697 Rim fragment, tubular rim folded out and then inwards. T.2mm; original rim: D.100mm (approx.) 5352 sf6202 (P4z)

4698 Tall beaker rim fragment, dark blue-green, with rounded rim and evidence of applied horizontal trail close to rim, heat distorted. T.4mm; original rim: D.80mm (approx.) 5420 sf6526 (P4z)

4699 Rim fragment, dark blue-green, rolled out and turned in forming rounded rim, slightly outsplayed. T.1mm; original rim: D.120mm (approx.) 5312 sf5677 (P6b)

4700 Body fragment, dark blue-green. L.9.2, W.4.7, T.1.6mm 3434 sf7243 (P3a)

Light blue

4701 Funnel beaker rim fragment, rim rounded, some iridescence. T.2.9mm; original rim: D.100mm (approx.) 4918 sf5985 (P3z)

4702 Rim fragment, rim rounded and slightly outsplayed. T.1.9mm; original rim: D.120mm (approx.) 4866 sf5630 (P3b)

4703 Rim fragment, cut and ground, some iridescence, heat affected. L.11, W.9, T.3.5mm 4848 sf5684 (P3z)

4704 Rim fragment, narrow tubular rim, outfolded and slightly outsplayed. T.1mm; original rim: D.90mm (approx.) 5348 sf5984 (P4z)

4705 Body fragment, with flattened applied trail forming rib, bubbly matrix. L.18.1, W.15.9, T.1mm 10196 sf5076 (P3b)

4706 Body fragment, thickened in places forming ribs, very bubbly. L.18.8, W.16.4, T.1.9mm 3348 sf8955 (P3b)

4707 Body fragment, traces of grozing on one surface. L.12, W.11.2, T.2.1mm 3362 sf4468 (P3c)

4708 Body fragment, decorated with narrow applied trail forming small horizontal rib, some iridescence. L.9.9, W.5.4, T.1.3mm 4921 sf6050 (P3z)

4709 Body fragment, decorated with three narrow horizontal applied trails 4–5mm apart. L.18, W.14.8, T.2mm 5376 sf6728 (P4b)

4710 Body fragment, heat affected, re-used window glass. L.32.9, W.29.9, T.3mm 2438 sf7237 (P4b)

4711 Bottle body fragment, with evidence of grozing on one surface. L.19.6, W.15.9, T.2.7mm 4849 sf6371 (P4z)

4712 Bowl body fragment, from lower part of bowl, decorated with two horizontal applied trails, one lost. L.20.4, W.20.1, T.2.2mm 3342 sf4196 (P6a)

4713 Two body fragments, one with moulded wide shallow ribs, bubbly, other undiagnostic. L.11.9, W.9.1, T.1mm 4710 sf4416 (P6a)

4714 Body fragment, decorated with two narrow horizontal applied trails. L.13.9, W.10, T.1mm 4082 sf5966 (P7b)

Turquoise blue

4715 Fragment. L.8.3, W.5.3, T.3.9mm 10259 sf7193 (P3a)

4716 Body fragment. L.12.3, W.7.6, T.0.7mm 5587 sf7796 (P3b)

4717 Body fragment. L.6.2, W.4.4, T.1.6mm 1105 sf845 (P3z)

4718 Body fragment. L.10.6, W.8.3, T.0.9mm 4792 sf5510 (P3z)

4719 Body fragment, fine bubbles in matrix, ribbed. L.6.7, W.5.9, T.0.8mm 3424 sf7455 (P3z)

4720 Body fragment. L.12.4, W.9.5, T.1.9mm 5748 sf7971 (P4b)

4721 Body fragment. L.10.6, W.5.9, T.2mm 10149 sf7921 (P4z)

4722 Body fragment, bubbly. L.12.8, W.10.9, T.0.8mm 10077 sf3400 (P6a)

4723 Body fragment. L.9.4, W.4.6, T.0.5mm 4680 sf6771 (P6a)

Cobalt blue

4724 Body fragment. L.10, W.6.7, T.2.6mm 4694 sf5634 (P6a)

Light brown

4725 Body fragment. L.13.1, W.7.5, T.0.8mm 5397 sf6387 (P4z)

4726 Fragment. L.7.6, W.4.6, T.0.6mm 1234 sf9181 (P4z)

4727 Body fragment, with ribbing. L.15.2, W.9.4, T.1mm 4242 sf1065 (P4z)

4728 Body fragment. L.12, W.9, T.1.5mm 4694 sf5642 (P6a)

4729 Body fragment. L.8.7, W.6.7, T.1.1mm 3342 sf7142 (P6a)

Window glass

Blue-green

4730 Fragment, cast, flame-rounded at one edge. L.25.6, W.17.1, T.5.2mm 5292 sf5042 (P3b)

4731 Fragment, cast, grozed on two edges, heat affected. L.19, W.14.3, T.3.2mm 10168 sf5734 (P3b)

4732 Fragment, cast. L.23.2, W.12, T.6mm 3354 sf4619 (P3c)

4733 Fragment, with flame-rounded edge. L.22.9, W.6.9, T.5mm 1115 sf298 (P3z)

4734 Fragment, cast, heavily worn on smooth surface, rounded on one edge, some iridescence. L.25.3, W.15, T.4.3mm 4792 sf5517 (P3z)

4735 Fragment, badly worn on both surfaces, evidence of grozing on one edge, heat crazed at one edge. L.12.6, W.10, T.3.1mm 4792 sf6244 (P3z)

4736 Fragment, cast, with rounded edge and evidence of grozing. L.16.3, W.8.6, T.3mm 10142 sf9961 (P4z)

4737 Fragment, both surfaces exhibiting evidence of pitting. L.17.3, W.12.1, T.3.6mm 4281 sf1111 (P6z)

Colourless

4738 Fragment, cast, with some evidence of grozing on one side. L.36, W.31.9, T.3.3mm 10139 sf4345 (P3c)

4739 Fragment, one edge grozed L.9, W.8, T.2mm 1167 sf8162 (P3z).

4740 Fragment, or grozed re-used vessel fragment. L.21.1, W.8.3, T.3.9mm 1287 sf8133 (P4z)

4741 Fragment, grozing on one edge. L.9.7, W.5.8, T.3mm 3342 sf7141 (P6a)

Blue

4742 Fragment, geometric, with evidence of fine grozing at one edge. L.24.2, W.18, T.1.9mm 10196 sf5073 (P3b)

Light green

4743 Fragment, with evidence of grozing on two edges. L.17.3, W.13.7, T.1.6mm 10168 sf8440 (P3b)

4744 Fragment, some iridescence, heat distorted. L.10.8, W.8.2, T.3.2mm 4103 sf629 (P6c)

Waste glass

4745 Fragment, colourless, a curved tapering droplet. D.3, L.6.6mm 5573 sf7903 (P3b)

4746 Fragment, light blue, pitted, heat affected. L.16.5, W.12.1, T.6mm 3377 sf4681 (P3c)

4747 Fragment, opaque green, folded, heat affected and bubbly on one surface. L.10, W.7.2, T.5mm 4902 sf5780 (P3z)

4748 Trail, colourless. L.7, W.2, T.2mm 1106 sf8127 (P3z)

4749 Fragment, opaque green, globular drip with trail. L.16.7, W.4.9, T.2.9mm 1229 sf824 (P4z)

4750 Waste or linen smoother fragment, opaque dark green. L.25.6, W.15, T.7.8mm 7075 sf4817 (P4z)

4751 Two fragments, both opaque red, heat-affected trails. D.2.5, L.12.7mm 3407 sf7190 (P4z)

4752 Trail, opaque black, tapering. L.16.5, W.4, T.3mm 5424 sf7233 (P4z) (*Fig.649*)

4753 Large fragment, light blue, heat affected, pitted, broken at one end. L.26, W.15, T.7mm 3334 sf4609 (P6a)

4754 Waste or linen smoother fragment, opaque dark green. L.19.8, W.16.9, T.10.6mm 4716 sf6760 (P6a)

4755 Fragment, opaque green, heat-affected crazed chip. L.23, W.13, T.11mm 6126 sf7362 (P6b)

4756 Fragment, green, chipped and curved; heat-affected vessel fragment. L.9.4, W.9.6, T.2mm 10004 sf2595 (P6a/b)

4757 Waste or linen smoother fragment, opaque dark green. L.16.8, W.7.2, T.5.5mm 5338 sf5703 (P6a/b)

Tesserae

4758 Fragment, blue-green. L.12.4, W.9.7, T.6.5mm 3342 sf4405 (P6a)

4759 Opaque blue, subsquare. L.8.3, W.8, T.4.9mm 4802 sf5589 (P6a) (*Fig.649*)

Mounts

4760 Fragment, turquoise blue, originally circular, convex. D.15, W.9, T.1.2mm 3385 sf4641 (P3b) (*Fig.649*)

4761 Fragment, bright green, semi-spherical. L.13, W.9.4, T.5mm 4716 sf5629 (P6a)

Beads

Monochrome

Globular

4762 Yellow, with slightly tapering perforation. D.6, H.4.4mm 1176 sf644 (P3z) (*Fig.674*)

4763 Green, with tapering perforation. D.3.8, H.2.6mm 1184 sf686 (P3z)

4764 Malformed, opaque yellow, lower end obliquely angled, with tapering perforation. D.3.4, H.2.1mm 1105 sf8114 (P3z)

4765 Irregularly globular, very dark colour appearing black. D.3.9, H.2.2mm 1942 sf8375 (P3z)

4766 Irregularly globular, very dark colour appearing black. D.3.4, H.2.4mm 6452 sf8660 (P4a)

4767 Opaque dark red, with slight projection. D.6.5, H.5.4mm 5346 sf6379 (P4d) (*Fig.674*)

4768 Green, with tapering perforation. D.2.6, H.1.9mm 1282 sf1180 (P4z)

4769 Dark green, with tapering perforation. D.4.2, H.3.8mm 10072 sf6597 (P4z)

4770 Irregularly globular, opaque buff colour. D.3.8, H.3.2mm 10142 sf6815 (P4z)

4771 Blue, very pitted and badly weathered. D.5, H.3mm 3411 sf6913 (P4z)

4772 Incomplete, very pale blue. D.10.2, H.7.9mm 5525 sf7179 (P4z)

4773 Malformed, opaque pale green, with one end cut straight across, other end unfinished, irregular perforation. D.6.2, H.4.8mm 5525 sf7262 (P4z)

4774 Yellow. D.3, H.2.1mm 10157 sf8189 (P4z)

4775 Very dark colour appearing black. D.4.9, H.4mm 5201 sf8954 (P4z)

4776 Subglobular, green, one end obliquely angled, tapering perforation. D.6.2, H.4.2mm 10039 sf8956 (P4z)

4777 Very dark colour appearing black, with tapering perforation. D.5.1, H.4mm 3287 sf8185 (P6a)

4778 Incomplete, opaque yellow. D.4.9, H.4.1mm 3287 sf8186 (P6a)

4779 Two beads, one irregularly globular, malformed, green, with incomplete perforation; other fragmentary, orange-yellow. Bead:

D.5.1, H.3.1mm; fragment: W.5, H.2.5mm 10076 sf9372 (P6a)

4780 Incomplete, green. D.7.1, H.4.6mm 3331 sf4065 (P6a/b)

4781 Incomplete, yellow, with tapering perforation. D.6.1, H.5.6mm 10034 sf6557 (P6a/b)

4782 Incomplete, yellow, with tapering perforation. D.8.5, H.4.9mm 5206 sf8396 (P6a/b)

4783 Incomplete, yellow. W.7.7, H.4.6mm 4003 sf706 (P6z)

Annular

4784 Incomplete, blue. D.19.4, H.8.5mm 10183 sf4804 (P3a) (*Fig.674*)

4785 Green, with tapering perforation. D.3.2, H.1.5mm 1217 sf8116 (P3z)

4786 Pale yellow. D.7.5, H.3.5mm 1148 sf415 (P4z)

4787 Light blue, with small projections at each end. D.7, H.3.1mm 10039 sf3096 (P4z) (*Fig.674*)

4788 Pale yellow, pitted and weathered. D.3.8, H.1.4mm 3407 sf6750 (P4z)

4789 Bead or small finger-ring fragment, pale yellow. D.16.9, H.6.3mm 3503 sf455 (P6a)

Cylindrical

4790 Incomplete, blue-green. D.3, H.3.5mm 1110 sf386 (P2)

4791 Fragment, green. W.3, H.3.4mm 10205 sf6970 (P3a)

4792 Irregularly cylindrical, green, with perforation tapering to pinhole at one end, which is unfinished. D.3, H.2.7mm 3420 sf7156 (P3a)

4793 Subcylindrical, malformed, green, upper end obliquely angled, with tapering perforation. D.2.5, H.3.6mm 3377 sf4634 (P3c)

4794 Irregularly cylindrical, malformed, pale green, with tapering perforation, projection on one side at upper end. D.2.6, H.2.8mm 5591 sf7917 (P3c)

4795 Green, with tapering perforation. D.3.5, H.6.2mm 1167 sf593 (P3z) (*Fig.674*)

4796 Opaque yellow, with tapering perforation. D.2.8, H.2.5mm 1106 sf850 (P3z) (*Fig.674*)

4797 Fragment, green. W.1.8, H.3.2mm 1280 sf1112 (P3z)

4798 Green, with tapering perforation. D.2.9, H.5mm 1348 sf1752 (P3z)

4799 Three fragments, green. D.2.6, H.3.5mm 1944 sf8304 (P3z)

4800 Green, slightly bulging in centre, with tapering perforation. D.3.2, H.5.8mm 1150 sf586 (P4z)

4801 Incomplete, green, with tapering perforation. D.2.9, H.5mm 1147 sf843 (P4z)

4802 Malformed, green, with tapering perforation. D.3.5, H.3.6mm 1143 sf860 (P4z)

4803 Fragment, green, with tapering perforation. D.3.5, H.5.4mm 1234 sf8124 (P4z)

4804 Irregularly cylindrical, very dark colour appearing black, one end obliquely angled. D.2.7, H.2.3mm 5201 sf9953 (P4z)

4805 Green, incompletely wound, with tapering perforation. D.2.9, H.4.6mm 5261 sf5333 (P6a)

4806 Fragment, green. W.2.5, H.5.6mm 3287 sf8187 (P6a)

4807 Incomplete, green, with tapering perforation. D.2.2, H.2.1mm 1075 sf8236 (P6a)

4808 Incomplete, green, with tapering perforation and indentation near one end. D.2.6, H.3.7mm 5091 sf6338 (P6a/b)

4809 Pale green, with tapering perforation, incompletely wound. D.2.8, H.4.2mm 5104 sf3424 (P6c) (*Fig.674*)

4810 Subcylindrical, green, with tapering perforation. D.3.1, H.2.9mm 4021 sf1712 (P7b) (*Fig.674*)

Gadrooned

4811 Fragment, purple. W.3.7, H.4.2mm 1110 sf1748 (P2)

4812 Semi-gadrooned, green, with tapering perforation. D.8.9, H.4.9mm 10183 sf4828 (P3a) (*Fig.674*)

4813 Fragment, opaque blue. L.7.7, W.4.4, T.2.5mm 10196 sf5010 (P3b)

4814 Dark green. D.9.9, H.6.7mm 5384 sf6340 (P4d) (*Fig.674*)

4815 Fragment, green, with tapering perforation, cracked at one end. W.7.6, H.7.7mm 1727 sf6968 (P6a)

4816 Fragment, very dark colour appearing black. W.8.5, H.8.7mm 10026 sf8622 (P6a)

4817 Blue. D.10, H.4.7mm 5305 sf5493 (P6b) (*Fig.674*)

4818 Incomplete, blue. D.14.3, H.6mm 2304 sf5779 (P6d) (*Fig.674*)

Ovoid

4819 Pale to mid blue, with tapering perforation, filled with copper alloy rod, glass cracked. D.6.5, H.8.6mm 3377 sf4589 (P3c)

4820 Blue-green, slightly cracked. D.7.2, H.9.8mm 1106 sf321 (P3z)

4821 Blue-green, laminating. D.6.6, H.9.9mm 3342 sf4197 (P6a)

4822 Yellow-brown, perforation filled with pure copper rod, broken off at both ends of bead. D.7.7, H.10.4mm 3342 sf4301 (P6a) (*Fig.674*)

Melon

4823 Incomplete, blue. D.23.2, H.18.2mm 2505 sf8049 (P3b)

Rectangular

4824 Square-sectioned, blue. W.2.4, H.3.7mm 10205 sf7738 (P3a) (*Fig.674*)

4825 Square-sectioned, blue. W.2.9, H.4.1mm 10142 sf6813 (P4z)

Biconical

4826 Blue. D.11.1, H.5.3mm 5117 sf3944 (P6c) (*Fig.674*)

4827 Blue-green. D.5.9, H.6.5mm 5577 sf7554 (P8)

Pear-shaped

4828 Fragment, green. D.4.9, H.5.5mm 1245 sf964 (P2)

Fragments of indeterminate shape

4829 Streaked blue-green, with tapering perforation. W.6.4, H.7.3mm 1296 sf1143 (P2)

4830 Pale blue-green. L.8.5, W.7, T.4.4mm 10180 sf4977 (P3a)

4831 Malformed, streaky green, compressed flat at one end, tapering perforation. D.5.4, H.16.2mm 1113 sf350 (P3z)

4832 Green. D.3.7, H.2.4mm 5389 sf6427 (P4b)

4833 Two fragments, blue. W.5.5, H.3.7mm 5705 sf8681 (P4b)

4834 Two fragments, very dark colour appearing black. D.6.4, L.4.7mm 4889 sf6300 (P4z)

4835 Green. W.4, H.4.1mm 4775 sf6448 (P4z)

4836 Pale blue-green, broken transversely, tapering perforation. The perforation contains copper alloy. D.8, H.7.5mm 5375 sf5998 (P6a)

Polychrome

4837 Globular, blue-grey, decorated with applied green background with random red, yellow and white blotches superimposed, tapering perforation. D.9, H.4.9mm 1106 sf311 (P3z) (*Figs.676–7*)

4838 Globular, opaque blue-black, decorated with randomly applied red, yellow, green and white blotches. D.7.3, H.5.5mm 1346 sf1792 (P3z) (*Figs.676–7*)

4839 Incomplete, globular, section very dark colour appearing black, decorated with opaque marvered buff-coloured background with yellow and white blobs in random pattern. D.6.1, H.4mm 4242 sf1045 (P4z) (*Fig.676*–7)

4840 Incomplete, globular, streaky red, opaque, decorated with inlaid opaque yellow blotches, with tapering perforation. D.7.3, H.6.1mm 7104 sf8798 (P4z) (*Figs.676–7*)

4841 Cylindrical, dark colour appearing black, decorated with applied opaque yellow crossed double waves. D.6.1, H.6.2mm 4848 sf5690 (P3z) (*Figs.676–7*)

Frit

Beads

4842 Globular, red, with slightly tapering perforation. D.11.2, H.8.7mm 5705 sf7831 (P4b)

4843 Globular, with tapering perforation and traces of red colouring. D.12.8, H.9.4mm 10070 sf5825 (P6a)

4844 Cylindrical, green. D.8.4, H.22.6mm 10178 sf4750 (P4z) (*Fig.674*)

4845 Incomplete melon, turquoise. W.16.4, H.17.9mm 5242 sf4739 (P6a/b) (*Fig.674*)

Iron

Strips

Note: All strips have rectangular or subrectangular sections unless otherwise stated

4846 Fragment, irregularly shaped, roughly broken at both ends. L.45.8, W.9.3, T.7.6mm 10211 sf5098 (P3a)

4847 Folded, with large areas of haematite on all faces. L.28.3, W.10.5, T.5.5mm; before folding: W.5.3mm 10183 sf5695 (P3a) (*Fig.607*)

4848 Fragment, tapering slightly to one end which is broken, spirally twisted towards other end which is also broken, twisted part slightly bent up. L.34.2, W.3.7, T.3.1mm 3415 sf5838 (P3a) (*Fig.607*)

4849 Fragment, subrectangular, both ends broken. L.36.5, W.9.9, T.5.1mm 4880 sf6352 (P3a)

4850 Fragment, subrectangular, one end cut square, other end broken. L.20.9, W.13, T.2.5mm 3420 sf7154 (P3a)

4851 Fragment, one end hammered flat, both ends broken. L.110.2, W.23.1, T.5.2mm 5764 sf8046 (P3a)

4852 Fragment, rectangular, almost split in two transversely, both ends broken. L.59.7, W.8.1, T.3mm 3350 sf4774 (P3b)

4853 Fragment, of trapezoidal section, tapering from one broken end to other which has been hammered flat on both sides. L.42.1, W.8.4, T.3.9mm 5292 sf5032 (P3b)

4854 Fragment, one end broken, other end broadening into square shape, bent up and broken across an off-centre perforation. L.43.8, W.15.2, T.1.9mm 3360 sf6627 (P3b)

4855 Fragment, roughly broken at one end, which curves up slightly, thinning to other end which is rounded. L.53.4, W.5.6, T.3.2mm 5587 sf7753 (P3b)

4856 Two fragments, one folded around the other, forming three layers, each piece subrectangular with one end and one side broken, rivet through all layers, copper plated all over on internal and external faces with small trace of tin. L.32.8, W.23, T.7mm 3326 sf8556 (P3b) (*Fig.607*)

4857 Fragment, irregularly shaped, hammered flat at one end, other end tapered. L.43.9, W.7.6, T.3.2mm 2267 sf8557 (P3b)

4858 Fragment, subrectangular, slightly curved, both ends broken. L.43, W.6.6, T.2.9mm 7097 sf8915 (P3b)

4859 Fragment, irregularly shaped, all edges broken. L.21.7, W.15.8, T.6.8mm 5687 sf8916 (P3b)

4860 Two fragments, irregularly shaped, wrapped around each other, with a fold visible along one edge, and a layer of copper alloy between them. The pieces are riveted together at one end, which is partially broken, and there are traces of a second rivet; the other ends are broken. There is some copper plating with tin, and a trace of lead on all faces. L.38.3, W.19.5, T.6mm 2267 sf9256 (P3b)

4861 Fragment, irregularly shaped, both ends broken. L.28, W.7.3, T.3mm 4847 sf6119 (P3c)

4862 Fragment, tapering slightly to one end, both ends broken. L.67.4, W.12, T.8.7mm 4851 sf6162 (P3c) (*Fig.607*)

4863 Fragment, tapering asymmetrically to one rounded end, other end cut obliquely. L.40.9, W.7.9, T.2.9mm 5519 sf7460 (P3c)

4864 Fragment, broken at one end and laterally torn across a perforation. L.23.9, W.14.8, T.2.4mm 5519 sf9114 (P3c)

4865 Two adjoining fragments, irregularly shaped, all ends and edges broken. L.45.6, W.27, T.8.1mm 5530 sf9223 (P3c)

4866 Subrectangular, both ends folded in to middle and compressed. L.24.9, W.21.4, T.4mm 3378 sf9236 (P3c)

4867 Fragment, subrectangular, both ends broken. L.29.9, W.12.6, T.3.1mm 4229 sf915 (P3z)

4868 Fragment, rectangular but slightly curved, with a perforation. One end is cut straight, and the strip thins rapidly towards the other end which has been roughly broken. L.51.4, W.17.5, T.9.9mm 1259 sf1096 (P3z)

4869 Fragment, tapering to one end which is cut square, other end broken. L.33, W.10.3, T.7.8mm 1259 sf1557 (P3z)

4870 Irregularly shaped and of irregular thickness, one end cut at oblique angle, other end roughly broken. L.58.8, W.9.5, T.4.9mm 4869 sf5729 (P3z)

4871 Rectangular, both ends cut square. L.35.5, W.6, T.5.4mm 4848 sf6158 (P3z)

4872 One end broken, tapering slightly to other. L.78.2, W.8.2, T.3.7mm 1926 sf8048 (P3z) (*Fig.607*)

4873 Fragment, irregularly shaped, one end broken, tapering to other end which is slightly bent. L.24.7, W.8.8, T.1.9mm 4848 sf8228 (P3z)

4874 Three strips, folded and welded together. One is folded round at one end, the second strip perpendicular to this and under it, both superimposed upon the third. The profile is irregularly wavy, and there is copper plating with traces of lead and tin on both faces. L.57, W.32.2, T.6.1mm 1932 sf8605 (P3z)

4875 Fragment, one end cut square, other end broken. L.25, W.5, T.5mm 4869 sf8803 (P3z)

4876 Fragment, irregularly shaped, tapering to one end, both ends broken. L.23.7, W.10.1, T.2.5mm 4661 sf8808 (P3z)

4877 Fragment, subrectangular, perforated at one end, both ends broken. L.53, W.24, T.6.4mm 6438 sf9109 (P3z)

4878 Two fragments, almost completely corroded away. 4669 sf9255 (P3z)

4879 Two adjoining fragments, subrectangular, tapering to one end which is slightly bent up, both ends broken, traces of wood on one face. L.56.3, W.24.6, T.4mm 4911 sf9472 (P3z)

4880 Fragment, tapering from one end which is broken to rounded tip, bent up into a curve. L.64.3, W.12.5, T.11.9mm 2263 sf5405 (P4b)

4881 Irregularly shaped, tapering to one end, both ends broken. L.67.2, W.10.6, T.5.5mm 2386 sf6835 (P4b)

4882 Fragment, partially folded at one end, other end roughly broken, whole slightly curved. L.23.6, W.4.3, T.3.6mm 2410 sf6917 (P4b)

4883 Tapers to one end, extreme tip broken off, upper end cut at angle. All sides show traces of hammering. L.90.8, W.4.7, T.4.6mm 1895 sf7990 (P4b)

4884 Fragment, one end bent up, both ends broken. L.40, W.15, T.10mm 2469 sf9261 (P4b)

4885 Tapers slightly to one end, both ends cut square. L.43.5, W.7.5, T.7.3mm 5346 sf5719 (P4d)

4886 Fragment, subrectangular, both ends broken, one during manufacture. Traces of hammering are evident. L.86.5, W.20.7, T.10.7mm 5365 sf6468 (P4d)

4887 Fragment, tapering slightly to one broken end, other end flattened. L.21.2, W.2.7, T.2mm 6243 sf6672 (P4d)

4888 Fragment, tapering to one end, both ends broken. L.41.3, W.5.2, T.3.8mm 1739 sf7177 (P4d)

4889 Fragment, one end cut square, other end broken, with traces of hammering close to the broken end. L.28.5, W.14.3, T.5.5mm 6326 sf7862 (P4d)

4890 Tapers to one end, which is slightly bent up, both ends cut square. The strip is spirally twisted along its entire length. D.4.3, L.67mm 1231 sf1130 (P4z)

4891 Tapers to one end, which is roughly broken, other end cut square. L.170, W.6.2, T.5.7mm 1231 sf1131 (P4z)

4892 Fragment, subrectangular, partially cut and partially broken transversely at one end, other end tapering into projection of trapezoidal section, which is broken. L.58.5, W.16.6, T.5mm 1282 sf1188 (P4z) (*Fig.607*)

4893 Fragment, both ends broken, slightly curved. L.34, W.11.6, T.5.6mm 4299 sf1268 (P4z)

4894 Fragment, irregularly shaped, both sides and ends broken. L.40.9, W.21, T.3mm 1255 sf1633 (P4z)

4895 Subrectangular, of irregular thickness, one end cut square, other broken. L.44.5, W.20.4, T.9.5mm 4280 sf1665 (P4z)

4896 Strip or unfinished knife, one end worked to form rough tang shape, other end tapering to rough point. L.176, W.8.9, T.8.8mm 7080 sf4146 (P4z) (*Fig.607*)

4897 Fragment, tapering to point at one end, other end roughly broken by twisting, slightly convex. L.58.1, W.4.2, T.4mm 4778 sf5380 (P4z)

4898 Fragment, one end flattened, other end twisted and broken during manufacture. L.49.9, W.7.4, T.4.2mm 4777 sf5385 (P4z)

4899 Fragment, spirally twisted along almost entire length apart from one end which is roughly broken, other end twisted up and broken. D.7.8, L.106.3mm; loop: D.28.7mm 5348 sf5786 (P4z) (*Fig.607*)

4900 Fragment, rectangular, broken at both ends. L.63.7, W.5.9, T.3.6mm 5348 sf5824 (P4z)

4901 One end cut square, other end cut at angle. L.39.8, W.9, T.7.8mm 1587 sf6120 (P4z)

4902 Fragment, subrectangular, both ends broken. L.32.7, W.12.9, T.1.6mm 6150 sf6180 (P4z)

4903 Fragment, tapering and flattening to one end, both ends broken. L.46.8, W.9.1, T.6.4mm 5393 sf6347 (P4z)

4904 Fragment, roughly broken at one end, with punched perforation close to this, tapering slightly to other end which is thickened, bent up and broken. L.102.9, W.15.3, T.2.6mm; thickened end: T.9mm 5431 sf6391 (P4z)

4905 Fragment, tapering from one end which has been hammered from one face to other end which is bent up, tip roughly broken. L.48.5, W.6.9, T.4.7mm 7128 sf6674 (P4z)

4906 Fragment, irregularly shaped, tapering to one end, both ends broken. L.44.9, W.9.5, T.5.7mm 10072 sf6898 (P4z)

4907 Fragment, irregularly shaped, both ends broken. L.26.8, W.9.8, T.4.9mm 3351 sf7334 (P4z)

4908 Fragment, tapering from one end to other, both ends broken, slightly curved. L.39.4, W.7.4, T.5.9mm 4849 sf8414 (P4z)

4909 Fragment, irregularly shaped, both ends broken. L.28.1, W.17.3, T.8.4mm 6247 sf9458 (P4z)

Plates

4910 Fragment, irregularly shaped, with one straight edge, broken transversely. L.44.5, W.27, T.4.2mm 10232 sf9254 (P3a)

4911 Fragment, irregularly shaped, with one straight edge, others roughly broken. L.37.4, W.31.8, T.3.5mm 4182 sf1355 (P3b)

4912 Fragment, subrectangular, both ends folded in to middle and compressed. L.30.6, W.18.9, T.10.5mm 5554 sf9267 (P3b)

4913 Fragment, irregularly shaped, one straight edge and part of one end survive, other edge and end roughly broken. There are traces of a rivet close to the straight edge. L.71.2, W.19.2, T.2mm 10139 sf4315 (P3c)

4914 Fragment, irregularly shaped, with one straight edge, others roughly broken. L.53.3, W.21.4, T.2.6mm 3354 sf4394 (P3c)

4915 Fragment, irregularly shaped, all edges curved. L.28.1, W.14.1, T.2.4mm 4847 sf8302 (P3c)

4916 Two fragments, both irregularly shaped, the larger with one straight edge, other edges broken, copper plating on both faces and on straight edge. The smaller fragment has all edges broken. L.44.5, W.42.6, T.1.6mm 3354 sf9238 (P3c)

4917 Fragment, subsquare, one side broken, others cut square. L.44.2, W.37.7, T.1.7mm 6436 sf8091 (P3z)

4918 Two fragments, larger irregularly shaped, all edges broken, smaller subrectangular, convex, both ends broken. L.31.6, W.22, T.3.8mm 1259 sf9228 (P3z)

4919 Fragment, irregularly shaped, two edges cut straight, others roughly broken. L.36.2, W.31.5, T.3.1mm 4852 sf9281 (P3z)

4920 Offcut, subtriangular, sides cut at angle from upper face. L.35, W.17, T.4.8mm 2266 sf6615 (P4a)

4921 Fragment, irregularly shaped, all edges broken. L.29.3, W.26, T.2.1mm 2266 sf8595 (P4a)

4922 Two fragments, the larger subrectangular, one end broken. The smaller is subtrapezoidal, one side and one end broken, with a central perforation. L.24.8, W.18.5, T.2.5mm 2266 sf9289 (P4a)

4923 Three adjoining fragments which form subsquare piece, with one straight edge, others broken. L.29.2, W.28.6, T.5mm 2386 sf6833 (P4b)

4924 Five fragments, all irregularly shaped. Largest subrectangular, with one surviving edge; a second fragment has one end folded over. L.56.1, W.31.3, T.2.5mm 6326 sf7897 (P4d)

4925 Two fragments, adjoining to form piece with one edge curved, others roughly broken. L.35.6, W.21.2, T.4.5mm 6326 sf9283 (P4d)

4926 Five fragments, all irregularly shaped, but three with one straight edge. L.49, W.48, T.2.2mm 6326 sf9290 (P4d)

4927 Fragment, irregularly shaped, all edges roughly broken. A rivet has been hammered through close to one edge, the shank hammered flat on the other side. L.44.9, W.30.2, T.0.9mm; rivet: L.3.2mm 4299 sf1496 (P4z)

4928 Fragment, irregularly shaped, edges broken. L.31.7, W.18.6, T.4.6mm 4299 sf1497 (P4z)

4929 Fragment, of quadrant shape, the convex edge torn. The fragment is plated all over with low-tin bronze. L.44.2, W.29.6, T.2.4mm 1255 sf1567 (P4z)

4930 Fragment, irregularly shaped, all edges broken, one across a perforation. L.60, W.35, T.5mm 10027 sf2960 (P4z)

4931 Fragment, irregularly shaped with one straight edge, others roughly broken. There is a single rivet in each of three corners, one rivet with square washer. L.89.2, W.55.7, T.2.1mm; rivet: L.10.6mm 10189 sf4890

(P4z) (*Fig.607*)

4932 Fragment, subrectangular, all edges broken. L.47.8, W.37, T.3.9mm 5393 sf6309 (P4z)

4933 Fragment, irregularly shaped, with one straight edge, others roughly broken. L.67.8, W.63.2, T.2mm 3370 sf7764 (P4z)

Punches

4934 Square section, upper end with burring on all sides, tapering gradually to the other end, extreme tip broken off. L.49.1, W.11, T.10.6mm 5587 sf8708 (P3b)

4935 Subrectangular section, with upper end heavily burred on three sides, stem tapering to tip, which is broken off. L.66.2, W.9.7, T.8.6mm 1942 sf8366 (P3z) (*Fig.613*)

4936 Incomplete, of rectangular section, tapering from upper end which is roughly broken to other end which is rounded but incomplete. L.62.6, W.8.4, T.7.2mm 1258 sf1050 (P4z) (*Fig.613*)

4937 Tanged, of rectangular section, tapering to point at one end, with shoulders between tang and lower body. L.100.2, W.8.4, T.6.9mm; tang: L.37.5mm 4715 sf6554 (P4z) (*Fig.613*)

Chisels

4938 Incomplete, of rectangular section, upper end burred on all faces, tapering to other end which has been roughly broken. L.40.4, W.21.1, T.6.1mm 10183 sf8353 (P3a)

4939 Rectangular section, upper end partially broken, thinning to rounded tip. L.96.2, W.16, T.15mm 2480 sf9940 (P3a) (*Fig.613*)

4940 Rectangular section, thinning out from upper end, with burring on one face, towards rounded tip. L.76.2, W.19.2, T.13mm 1865 sf7924 (P4b)

File

4941 Incomplete, of rectangular section, broken at upper end, tapering to point at other end, with shallow transverse grooves visible along one edge and faint traces of grooves on one face. L.50.7, W.6.9, T.5.5mm 5352 sf6458 (P4z) (*Fig.613*)

Augers

4942 Spoon auger, complete apart from extreme end of lanceolate tang, shaft of subsquare section, tapering slightly to scooped tip which is more worn on one side than the other. L.113.2mm; bit: L.17.4, W.5, T.3.6mm; tang: L.31.8, W.11.4, T.4.5mm 2480 sf7993 (P3a) (*Fig.614*)

4943 Fragment, with lanceolate tang and part of slightly tapering shaft of subcircular section. D.6.6, L.62.6mm; tang: L.30.1, W.12.5, T.7.5mm 2267 sf5426 (P3b) (*Fig.614*)

4944 Spoon auger, with shaft of subsquare section, thickening and broadening slightly to lanceolate tang, tip scooped symmetrically. L.229.1, W.8.3, T.8mm; tang: L.51, W.14.4, T.4.2mm; bit: L.38.1, T.7.2mm 1932 sf8088 (P3z) (*Fig.614*)

4945 Spoon auger, with shaft of rounded rectangular section, lanceolate tang, shaft tapering slightly to incomplete scooped tip. D.7.9, L.123.4mm; tang: L.42.9, W.13.8, T.4.8mm; bit: D.8.2, L.20.2mm 1820 sf7652 (P4b)

4946 Fragment, with part of lanceolate tang and shaft of square section, tip of tang broken off. L.92.6, W.8.7, T.5mm; tang: L.22.9, W.8.9, T.4.1mm 1865 sf8578 (P4b) (*Fig.614*)

4947 Twist auger, with shaft of square section, broadening and then narrowing to lanceolate tang, extreme tip of which is lost. At the tip there is a double twist into a point. L.150, T.7.4mm; tang: L.53.1, W.14, T.5.5mm 5352 sf6460 (P4z) (*Fig.614*)

Awls

4948 One arm of diamond-shaped section, tapering to tip, other arm of square section, end broken and slightly twisted. L.70.2, W.7.6, T.6.9mm 10196 sf5022 (P3b)

4949 One arm of diamond-shaped section, tapering to tip, other arm of subcircular section. L.60.1, W.3.3, T.3mm 3349 sf4358 (P3c)

4950 Both arms of diamond-shaped section, tapering slightly to tip at one end, other end broken. L.50.2, W.3.8, T.3.1mm 2403 sf6675 (P4b)

4951 One arm of diamond-shaped section, tip broken off, other of square section, both arms tapering to tips. L.80.3, W.4, T.3.6mm 5525 sf7175 (P4z) (*Fig.624*)

4952 One arm of diamond-shaped section, other of rectangular section, both tapering to tips. L.54.1, W.7.7, T.6.3mm 5352 sf9457 (P4z)

Comb teeth

Note: All teeth are of square or subsquare section unless otherwise stated, and all taper to a tip

4953 Head incomplete. L.95.9, W.6, T.5.8mm 5319 sf6704 (P3a)

4954 Subcircular section, tip broken off, head slightly angled, with burring. D.3.2, L.62.5mm 3360 sf4796 (P3b)

4955 Tip broken, head cut square, shank slightly curved. L.97.9, W.6.1, T.5.3mm 1259 sf1114 (P3z)

4956 Head broken, shank slightly curved. L.86.2, W.6.1, T.5.7mm 1259 sf1555 (P3z)

4957 Tip broken, head angled. L.93.4, W.5.1, T.4.5mm 5389 sf6140 (P4b) (*Fig.625*)

4958 Subcircular section, broken at both ends, part of shank bent up and almost broken off. D.5.9, L.99mm 2413 sf6948 (P4b)

4959 Angled head, shank slightly curved. L.80.8, W.5, T.4.5mm 1837 sf7810 (P4b)

4960 Head bearded, shank curved. L.96.4, W.5.6, T.5.5mm 5705 sf7832 (P4b)

4961 Head incomplete, shank slightly curved. L.88.5, W.4.9, T.4.4mm 5663 sf7710 (P4d)

4962 Tip broken off, angled head, shank slightly curved. L.78.4, W.7.5, T.6.9mm 1253 sf1016 (P4z)

4963 Angled head. L.78.8, W.4.1, T.3.5mm 5274 sf4826 (P4z)

4964 Rectangular section, angled head, bent. L.79.4, W.5.3, T.4mm 10178 sf4882 (P4z)

4965 Head angled, shank curved. L.91, W.6.4, T.5.9mm 4818 sf5533 (P4z)

4966 Both ends broken, shank curved. L.65, W.5.4, T.5mm 5348 sf5907 (P4z)

4967 Head bearded. L.105, W.5.1, T.5.1mm 5525 sf7123 (P4z) (*Fig.625*)

Needles

Note: All needles have shanks of circular or subcircular section unless otherwise stated

4968 Shank of subsquare section. Tip broken off, bent up near lentoid eye, which has been punched into the flattened end. L.67.8, W.3.9, T.2.5mm 3415 sf4838 (P3a) (*Fig.627*)

4969 Punched oval eye, tip broken off. D.1.4, L.38.6mm 10183 sf5720 (P3a)

4970 Irregular oval eye, formed by splitting shank, tip bent up. D.1.6, L.45.9mm 10168 sf5735 (P3b)

4971 Punched oval eye in flattened end, tip broken off. D.1.7, L.46.1mm 4848 sf5709 (P3z) (*Fig.627*)

4972 Oval eye formed by splitting shank. D.1.8, L.40mm 10153 sf7442 (P3z)

4973 Incomplete, lower part of shank broken off, with oval eye formed by splitting shank. L.20.4, W.2.5, T.1.2mm 1926 sf8305 (P3z)

4974 Large oval eye, formed by splitting shank, tip broken off. D.1.5, L.35.4mm 5389 sf6442 (P4b)

4975 Fragment, both ends broken, one across eye. D.1.9, L.24.3mm 5384 sf6430 (P4d)

4976 Oval eye formed by splitting shank. D.2.7, L.51mm 1258 sf1044 (P4z)

4977 Off-centre oval eye, formed by splitting shank, top of head squared. D.2.5, L.56.8mm 1231 sf1144 (P4z)

4978 Fragment, head and part of shank surviving, with punched oval eye in flattened head. D.2.9, L.18.6mm 3470 sf7071 (P4z)

4979 Shank fragment, both ends broken. D.2.2, L.26.3mm 5422 sf7952 (P4z)

Shears

4980 Almost complete, in two pieces, each with blade, arm and part of slightly spring-looped bow surviving. Subtriangular blades taper to tip. Both arms of subcircular section, bent up from blade. L.113.3mm; blade: L.44.4, W.8, T.3.1mm; arm: D.4.4mm; bow: L.11.5, W.8.1mm 4888 sfs5749 and 5939 (P3z) (*Fig.627*)

Knives

Note: All knives have whittle tangs; blades have triangular sections

Back form A1

4981 Back horizontal, angled down to tip, cutting edge worn and irregular. The tang is set central to the blade, with angular shoulder to the back. L.116.4, W.15.4, T.4mm; blade: L.69.6mm 4818 sf5566 (P4z) (*Fig.628*)

Back form A2

4982 Back straight, upward sloping, angled down to tip, cutting edge worn and irregular. The tang is set central to the blade, with a slightly convex shoulder, and there are traces of horn on both sides of the tang. L.92.3, W.17.8, T.7.9mm; blade: L.53.2mm 3354 sf4476 (P3c) (*Fig.628*)

4983 Back straight and upward sloping before angling down to tip, cutting edge straight. The tang is set central to the blade, the end broken off. There is a step cut into the back at the shoulder which is vertical. L.89.5, W.10.5, T.3.4mm; blade: L.52.5mm 3342 sf4203 (P6a) (*Fig.628*)

Back form C1

4984 Back straight, curving down to tip, cutting edge shallow elongated S-shape. The tang is set central to the blade, with an angular shoulder to the back slightly out of line with the beginning of the cutting edge; tip of tang broken off. L.100.1, W.14.1, T.4.7mm; blade: L.63mm 7070 sf4280 (P3b) (*Fig.628*)

4985 Back straight, curving down to tip, cutting edge slightly convex, curving up close to tip. The tang is set central to the blade, with an angular shoulder; W-shaped notch on back close to tang. There are regularly spaced transverse grooves on the blade back. L.78.2, W.9.4, T.2.9mm; blade: L.40mm 3360 sf4790 (P3b) (*Fig.628*)

4986 Back straight, curving down to tip, cutting edge straight, curving up towards tip. The tang is set in line with the cutting edge, with an angular shoulder to the back, the end of the tang broken off. There are traces of mineralised leather all over the knife. L.128.5, W.10, T.3.9mm; blade: L.94.9mm 5292 sf5013 (P3b) (*Fig.628*)

4987 Back straight, curving down to tip, cutting edge worn and irregular. The tang is set central to the blade, with a vertical shoulder to the back. L.108.3, W.10.4, T.3.5mm; blade: L.64.4mm 3364 sf7512 (P3c)

4988 Back straight, sloping down to tip, cutting edge straight, tip lost. The tang is set just below the back, with an angular shoulder. L.120, W.13.3, T.5.2mm; blade: L.84.7mm

1073 sf198 (P3z)

4989 Incomplete, most of tang broken off, back straight, curving down to tip, cutting edge straight, extreme tip broken off. The tang is set central to the blade, with angular shoulder. L.98.5, W.14.9, T.7.1mm; blade: L.92.9mm 1090 sf370 (P3z)

4990 Incomplete, tip broken off, back straight, cutting edge convex. The tang is set in line with the cutting edge, with a slight shoulder to the back. There are traces of mineralised ?horn on the tang. L.90.9, W.13.6, T.2.9mm; blade: L.52.4mm 1273 sf1070 (P3z) (*Fig.628*)

4991 Back straight, curving down to tip, cutting edge very shallow S-shape. The tang is set just below the back, with a slight shoulder. There is a V-shaped notch on the shoulder, transverse grooves on both faces of the tang, and a groove at the tip on both faces of the blade. L.80, W.10, T.3.4mm; blade: L.52.4mm 4711 sf5598 (P3z) (*Fig.628*)

4992 Incomplete, ends of tang and blade broken off, back straight before curving down to tip, cutting edge straight before curving up to tip. The tang is set central to the blade, with a vertical shoulder to the back. L.91, W.11.2, T.4.7mm; blade: L.69.1mm 2413 sf6963 (P4b)

4993 Incomplete, ends of tang and blade broken off, straight back, curving down towards tip, cutting edge straight and worn. Tang set just below back, notch cut into vertical shoulder. L.143.8, W.10.9, T.4.7mm; blade: L.111.9mm 2331 sf5680 (P4d) (*Fig.628*)

4994 Incomplete, tip of blade broken off, back straight, cutting edge straight before curving up to tip. The tang is set central to the blade and bent up slightly; vertical shoulder with W-shaped notch. There is a curved notch at the juncture of the tang and the cutting edge. L.65.4, W.10.7, T.3.8mm; blade: L.41.7mm 1231 sf1125 (P4z) (*Fig.628*)

4995 Straight back, sloping down to tip, extreme tip lost, cutting edge straight before curving up to tip. The tang is set central to the blade, with a slight shoulder. L.89.9, W.10.3, T.4.3mm; blade: L.63.5mm 3407 sf4784 (P4z) (*Fig.630*)

4996 Incomplete, tang broken off, back straight before curving down to tip, extreme tip broken off. The cutting edge is straight, then curves up to tip. L.87.5, W.12.6, T.4.6mm 3407 sf4820 (P4z)

4997 Straight back curving down to tip, elongated S-shaped cutting edge. The tang, which is slightly curved, is set central to the blade, with a concave shoulder to back; tip of tang broken off. L.129.4, W.13.5, T.4.3mm; blade: L.85.2mm 4876 sf6125 (P4z) (*Figs.628, 631*)

4998 Incomplete, majority of tang broken off, back straight, curving down to tip, cutting edge sloping up to tip. Tang set central to blade, with sloping shoulder. L.60.2, W.9.5, T.2.9mm; blade: L.55.8mm 10141 sf7976 (P4z)

4999 Incomplete, majority of tang broken off, back straight, curving down close to tip, cutting edge worn and irregular, curving up close to tip. The tang is set central to the blade and has an angular shoulder with V-shaped notch. L.89.2, W.8.9, T.3.8mm; blade: L.78.9mm 1055 sf124 (P6a) (*Fig.628*)

Back form C2

5000 Back straight, sloping up before curving down to tip, extreme tip lost, cutting edge worn but straight. The tang is set central to the blade, with sloping shoulder. L.110, W.11.8, T.3.7mm; blade: L.72.2mm 3362 sf4669 (P3c)

5001 Back straight, sloping up slightly before curving down to tip, cutting edge slightly S-shaped, curving up to tip. There are traces of mineralised wood on the tang, which is set just below the back, shape of shoulder unclear. L.109.8, W.10.6, T.2.8mm; blade: L.71.3mm 1273 sf1072 (P3z)

5002 Back straight, upward sloping, curving down close to tip, cutting edge straight, curving up to tip. The tang is set central to the blade, with angular shoulder. L.110.7, W.9.3, T.3.7mm; blade: L.77.5mm 1944 sf8252 (P3z) (*Fig.628*)

5003 Back slopes up slightly before angling down towards tip, extreme tip missing, worn cutting edge which is straight before angling up slightly to tip. The tang is set central to the blade, with a sloping shoulder. L.84.1, W.12.1, T.4.2mm; blade: L.68.7mm 2413 sf7051 (P4b)

5004 Back straight, sloping up before curving down to tip, cutting edge straight, curving up towards the tip. The tang is set central to the blade, with a convex shoulder to back which is slightly out of line with the beginning of the cutting edge. The end of the tang is broken off. L.54.2, W.10, T.3mm; blade: L.39.6mm 2459 sf7799 (P4b)

5005 Back straight, upward sloping before curving down to tip, cutting edge straight. The tang which is bent up is set central to the blade, with a very slight sloping shoulder. L.88.2, W.9.2, T.3.1mm; blade: L.52.5mm 5525 sf7125 (P4z)

Back form C3

5006 Incomplete, end of blade broken off, back sloping down towards tip, cutting edge straight. The tang is set in line with the cutting edge, with an angular shoulder. L.58.7, W.7.4, T.2.5mm; blade: L.35.8mm 5279 sf4997 (P4z)

Back form D

5007 Incomplete, ends of blade and tang broken off, back convex, curving down from shoulder to tip, cutting edge irregular and worn, with tiny notch, blade curved. The tang is set well below the back, with an angular shoulder. L.87.7, W.16.2, T.3.5mm; blade: L.45.2mm 3360 sf5975 (P3b) (*Fig.628*)

5008 Incomplete, end of blade broken off, back convex, cutting edge straight. The tang is set in line with the cutting edge, with convex shoulder to back. L.91.6, W.14.9, T.5.7mm; blade: L.48.6mm 5432 sf6466 (P3c)

5009 Incomplete, most of blade and end of tang broken off, back convex, cutting edge angled up to tip. The tang is set well below the back, with an angular shoulder. L.50.2, W.14.4, T.5.6mm; blade: L.23.6mm 10153 sf5315 (P3z)

5010 Incomplete, tang broken off, back slightly convex, curving down to tip, cutting edge elongated S-shape. L.44, W.9.8, T.4.9mm 4661 sf8807 (P3z)

5011 Incomplete, ends of blade and tang broken off, back and cutting edge convex. The tang is set central to the blade, with angular shoulder to back; there are traces of mineralised wood on the tang. L.66, W.9.4, T.4.5mm; blade: L.31.6mm 10164 sf5197 (P4z)

5012 Incomplete, ends of tang and blade roughly broken, back convex, cutting edge straight. The tang is set central to the blade, with a sloping shoulder to the back. L.45.4, W.6.7, T.2.9mm; blade: L.26.2mm 3373 sf8816 (P4z)

Other identifiable types

5013 Back slightly concave, cutting edge curving up to tip, with semi-circular notch. The tang is set in line with the blade back. L.67.1, W.10.1, T.3.7mm; blade: L.44.1mm 4851 sf8678 (P3c) (*Fig.628*)

5014 Incomplete, tang broken off, back straight, then curves concavely to tip, cutting edge elongated S-shape. There is a convex shoulder from the tang to the back, and traces of three V-shaped teeth survive on cutting edge close to the tang end. L.99.1, W.13.8, T.3.7mm 2459 sf7673 (P4b) (*Fig.628*)

Indeterminate back form

5015 Incomplete, back straight and downward sloping but majority broken off, with only a thin median core remaining, cutting edge curves up slightly to tip. The tang is set below the back, with angular shoulder to back. L.94.8, W.11.7, T.4.5mm; blade: L.57.6mm 5319 sf6851 (P3a)

5016 Two fragments of tang and blade, not adjoining. Tang tapers and thins to one end, other end broken. Blade broken at both ends, back straight, cutting edge curves up to tip. Tang: L.27.7, W.6.8, T.2.5mm; blade: L.46.7, W.11.4, T.3.1mm 3137 sf4225 (P3b)

5017 Tang fragment, tapering to one end, other end roughly broken. L.35.7, W.10.2, T.3.9mm 3360 sf4839 (P3b)

5018 Incomplete, tang broken off, blade back and cutting edge convex, tapering to tip which is bent back on itself. L.43.7, W.9, T.2mm 5292 sf5071 (P3b)

5019 Incomplete, tang and tip of blade broken off, back straight but curves down to tip, cutting edge worn but straight. L.125.7, W.17.7, T.8.2mm 2458 sf8571 (P3b)

5020 Incomplete, tang and tip of blade broken off, both ends of blade bent up. L.31.4, W.8, T.1.2mm 7097 sf8914 (P3b)

5021 Blade, in three adjoining fragments, back straight and horizontal, cutting edge concave, curving up to tip. L.74.7, W.17.3, T.7.5mm 7097 sf9226 (P3b)

5022 Blade fragment, curved, both ends broken. L.27.4, W.13.3, T.3.6mm 3348 sf9278 (P3b)

5023 Tang fragment, broadening and thinning out at one end, which is broken. L.39.7, W.12.3, T.3.6mm 3361 sf4554 (P3c)

5024 Incomplete, tang and part of blade only. Tang set central to blade, with sloping shoulder to back slightly out of line with beginning of cutting edge, end of tang bent up. L.61.6, W.11.8, T.2.9mm; blade: L.18.3mm 3377 sf4591 (P3c)

5025 Two blade fragments, shape of back and cutting edge uncertain. L.56.5, W.16, T.6.1mm 4851 sf6525 (P3c)

5026 Blade fragment, tang and blade tip broken off, one end of fragment bent back on itself. L.29.8, W.16, T.3.8mm 4847 sf9253 (P3c)

5027 Blade fragment, back straight, curving down to tip, notched cutting edge irregular and worn. L.33.6, W.12.7, T.3.8mm 2266 sf8601 (P4a)

5028 Incomplete, original shape of back uncertain, cutting edge very irregular, much worn. The tang is set below the back, with sloping shoulder, end broken off. L.78.6, W.8.9, T.5.3mm; blade: L.42.2mm 2403 sf6611 (P4b) (*Fig.632*)

5029 Incomplete, tip of blade and end of tang broken off, back straight to tip, cutting edge worn and irregular, angled up close to tip. There are horn or wood remains on the tang, which is set central to the blade, with a sloping shoulder to back. L.100.1, W.14.6, T.4.1mm; blade: L.67.3mm 2417 sf7026 (P4b) (*Fig.628*)

5030 Blade fragment, end broken off, back and cutting edge straight, sloping shoulder to back of blade. L.45.1, W.8.5, T.5.3mm 2417 sf7037 (P4b)

5031 Incomplete, majority of tang and blade tip broken off, back and cutting edge straight, sloping shoulder to back. L.30, W.8, T.1.5mm; blade: L.23.4mm 2431 sf7101 (P4b)

5032 Blade fragment, both ends broken. L.34.3, W.12.8, T.3.3mm 2438 sf7235 (P4b)

5033 Blade fragment, ends roughly broken, both back and cutting edge straight. L.57.3, W.9.1, T.4.2mm 2459 sf7595 (P4b)

5034 Incomplete, ends of blade and tang broken off, blade bent up making back shape uncertain, sloping shoulder to back, slightly out of line with beginning of cutting edge. L.32.9, W.11.2, T.2.6mm 10111 sf7013 (P4z)

5035 Blade fragment, tip only, back straight, cutting edge curving up. L.20.8, W.11.9, T.4mm 7063 sf8350 (P4z)

5036 Blade fragment, tapering slightly from one end to other, both ends roughly broken. L.29.6, W.14.6, T.3.8mm 5458 sf9257 (P4z)

5037 Blade fragment, broken at both ends, part of one side lost. L.44, W.13.1, T.3.5mm 3376 sf9500 (P4z)

Fish hooks

5038 Incomplete, terminal broken off, single barb, stem of square section. L.49.2, W.4.3, T.2.9mm; barb: L.7.5, W.3.8, T.2.4mm 2501 sf8523 (P3b) (*Fig.637*)

5039 With a single barb, stem of subcircular section, terminal splayed, slightly broken on one face. D.2.1, L.25.1mm; head: W.4.2, T.1.6mm 4913 sf9722 (P3z) (*Fig.637*)

5040 Incomplete, hook broken off, stem of rectangular section, bent up, with flattened terminal. L.15.1, W.7.6, T.2.7mm 10063 sf7507 (P4z)

5041 Incomplete, terminal and tip of hook roughly broken off, stem of subsquare section. L.24.2, W.2.3, T.2.2mm 5540 sf7836 (P4z)

Suspension loop

5042 Subcircular section, with two opposed broad subrectangular plates, widening out away from loop. Two rivet holes pass through each plate, one still containing rivet. One plate was broken across a perforation in antiquity. L.68.1mm; plate: W.27.6, T.2.1mm; rivet: L.15.2mm; loop: D.22.9, T.6.3mm 5525 sf7169 (P4z) (*Fig.642*)

Flesh hook

5043 Two arms of subsquare section, split from same tang, one slightly bent away from tang, the tips of both hooked up. The top of the tang has been hammered and is burred. W.80.9mm; arm: L.49, W.4.8, T.4.3mm; tang: L.30.3, W.9.4, T.4.3mm 5346 sf6211 (P4d) (*Fig.643*)

Buckles

5044 D-shaped, of subplano-convex section, with pin and end of strap attachment plate looped over bar. Bow: L.18, W.18.7, T.2.4mm; plate: L.11, W.8.4, T.1mm 2501 sf8619 (P3b) (*Fig.650*)

5045 Narrow oval bow of circular section, pin and rectangular strap attachment plates looped around it. There are three copper alloy rivets at the end of each plate. Bow: D.2.9, L.24.8mm; plate: L.29.2, W.22.4, T.2mm 3360 sf9235 (P3b) (*Figs.650–1*)

5046 Oval, of rectangular section, one side thicker than other. A fragment of the pin survives on the short side of the bow, looped around it, tip broken. L.39.4, W.28, T.4.4mm; pin: L.16mm 3351 sf4934 (P4z) (*Fig.650*)

5047 Buckle pin fragment, with loop at one end, stem of subsquare section, tip broken off. L.19.9, W.2.7, T.2.5mm; loop: D.4.8mm 5422 sf7953 (P4z)

Belt fittings

5048 Loop, rectangular shape and section, with inturned arms. L.36.3, W.6, T.2.3mm 4888 sf5777 (P3z) (*Fig.653*)

5049 Loop, incomplete, of rectangular section, originally rectangular, with inturned arms, one arm broken, other tapering to rounded end. L.22.1, W.16.4, T.5.7mm 3351 sf4921 (P4z) (*Fig.653*)

5050 Fitting, with incomplete loop of subcircular section, one end roughly broken, the other flattened to form a subrectangular plate, of rectangular section, with two rivets in situ, tips roughly broken off. The heads and shanks of both rivets are plated with tin. L.29.4, W.8.4, T.2.1mm; stem: D.3.6mm; rivet: D.4.9, L.7.5mm 3360 sf6009 (P3b) (*Fig.653*)

5051 Fitting, with narrow bowed stem of subrectangular section, both ends flattened into expanded perforated discs. An inverted conical terminal with rounded tip is suspended from each disc on stems of subcircular section, which perforate the discs, the ends being hammered down. A fitting of rectangular plates with two rivets is looped around the bowed stem. L.34.2, W.8, T.5.9mm; looped fitting: L.23.2, W.6.6, T.6.8mm; terminals: D.9.9, L.9.1mm 5573 sf7353 (P3b) (*Fig.653*)

5052 Fitting, with a loop of circular section, both ends flattened into subrectangular plates, one slightly broader than other. Two copper alloy rivets connect the plates. A fragment of a second loop was found. D.11.6, L.27.4mm; plate: W.6.1, T.1mm; rivets: L.3.6mm; loop section: D.3.1mm 5587 sf8406 (P3b) (*Fig.653*)

5053 Fitting, with ring of plano-convex section with a projection on either side of subrectangular section, one broken, other bevelled from one face. There is a looped fitting through the ring, of circular section, the ends flattened into expanded subrectangular plates with rounded ends, both perforated. The ring of a second attachment also remains. D.12.8, L.22.4, W.15, T.5mm; looped fitting: D.7.6, L.17.5, W.5.3mm 4849 sf9272 (P4z) (*Fig.653*)

Pins

Note: All pins have shanks of circular or subcircular section

5054 Subglobular lead head, top flat, tip of shank broken off, shank bent up. D.1.9, L.46.9mm; head: D.5mm 4784 sf5448 (P3z)

5055 Globular head of lead with traces of tin, cracked, shank curved, extreme tip broken off. D.4.6, L.40.6mm; head: D.5mm 6436 sf8092 (P3z)

5056 Irregularly globular lead alloy head, shank curves away just below head. D.2.4, L.51.4mm; head: D.6.6mm 4280 sf1152 (P4z) (*Figs.663, 666*)

5057 Incomplete, with subglobular head, tip of shank broken off. D.3.5, L.29.2; head: D.6.2mm 7080 sf6871 (P4z)

5058 Incomplete, in two adjoining fragments, part of globular lead alloy head and part of shank surviving. D.2.8, L.31.4mm; head: D.5.9mm 5540 sf8801 (P4z)

5059 Globular head, shank slightly twisted, tip bent. The pin is plated all over with lead-tin coating. D.2, L.38.9mm; head: D.4.7mm 4694 sf5628 (P6a) (*Fig.666*)

5060 Subglobular lead alloy head, at angle to shank. D.3.4, L.40.4mm; head: D.8.5mm 10076 sf9227 (P6a)

5061 Incomplete, with fragment of subglobular lead head; top flat, with top of shank projecting slightly in centre. D.2, L.29.1mm; head: D.5.4mm 10085 sf4953 (P6a/b) (*Fig.666*)

5062 Large thick subglobular head, bent at tip which is lost. There is a tin-lead coating on the head. D.3.8, L.48.9mm; head: D.9.4mm 4253 sf1066 (P6z)

5063 Incomplete and in two fragments, tip broken off, globular head of lead with traces of tin, partly broken off on one side. D.2.9mm; head: D.5.9mm 1000 sf7912 (unstratified)

5064 Faceted cuboid head, shank tapering to tip. D.2, L.48.3mm; head: W.3.1mm 4913 sf5881 (P3z) (*Fig.666*)

5065 Faceted cuboid head, shank tip broken off. D.2, L.27.5mm; head: W.2.8mm 2446 sf7586 (P4a) (*Fig.666*)

5066 Subcuboid head, shank tip broken off. D.1.3, L.38.8; head: W.2.9mm 1831 sf7684 (P6a)

5067 Incomplete, with spherical head, tip of shank broken off. D.1.8, L.37.4mm; head: D.3mm 5195 sf4130 (P6a/b)

5068 Shank fragment, broken at both ends. D.2, L.24.8mm 3435 sf5012 (P2)

5069 Shank fragment, broken at both ends. D.3.8, L.29.4mm 3415 sf4978 (P3a)

5070 Shank fragment, upper end broken off. D.4.6, L.33.6mm 10180 sf5004 (P3a)

5071 Shank fragment, upper end broken off. D.3.4, L.42.9mm 4880 sf6355 (P3a)

5072 Shank fragment, upper end broken off. D.4.1, L.14.1mm 10168 sf5737 (P3b)

5073 Shank fragment, upper end broken off. D.2.5, L.13.9mm 10196 sf6483 (P3b)

5074 Shank fragment, both ends broken off. D.1.9, L.47.1mm 2453 sf7988 (P3b)

5075 Shank fragment, broken at both ends, slightly curved. D.2.3, L.28.2mm 4847 sf5953 (P3c)

5076 Shank fragment, broken at upper end, tip bent and almost broken off. D.3.5, L.47mm 3361 sf6093 (P3c)

5077 Shank fragment, broken at both ends, slight central swelling. D.2.9, L.50.9mm 1203 sf718 (P3z)

5078 Shank fragment, broken at upper end. D.2.2, L.30.2mm 4784 sf5449 (P3z)

5079 Shank fragment, both ends broken. D.2.3, L.21mm 4788 sf6393 (P3z)

5080 Shank fragment, broken at upper end. D.1.3, L.41.9mm 6438 sf9112 (P3z)

5081 Shank fragment, broken at upper end. D.4.2, L.51.8mm 2413 sf6964 (P4b)

5082 Shank fragment, broken at upper end. D.1.8, L.14.3mm 5384 sf6703 (P4d)

5083 Shank fragment, both ends broken. D.1.4, L.53.7mm 1253 sf1559 (P4z)

5084 Shank fragment, upper end roughly broken. D.4.5, L.46.4mm 1255 sf1634 (P4z)

5085 Shank fragment, broken at upper end, tip slightly bent. D.2.9, L.42mm 1248 sf1649 (P4z)

5086 Shank fragment, broken at both ends. D.2.3, L.39.7mm 5424 sf6228 (P4z)

5087 Shank fragment, broken at upper end. D.2.5, L.47.4mm 5395 sf6264 (P4z)

5088 Shank fragment, broken at upper end. D.1.3, L.31.7mm 4676 sf3657 (P6a)

5089 Shank fragment, broken at upper end, plated all over with lead-tin coating. D.2.2, L.33.3mm 4710 sf4649 (P6a)

5090 Shank fragment, both ends broken. D.6.6, L.51.5mm 3352 sf4969 (P6a)

5091 Shank fragment, broken at upper end. D.2.8, L.29.3mm 4694 sf5159 (P6a)

5092 Shank fragment, broken at both ends. D.3.9, L.35.7mm 5375 sf7040 (P6a)

5093 Shank fragment, broken at upper end. D.2.8, L.30.3mm 3562 sf8040 (P6a)

5094 Shank fragment, broken at upper end. D.2.6, L.37.6mm 5312 sf7927 (P6b)

5095 Shank fragment, slightly bent, both ends broken. D.4, L.41mm 2083 sf2864 (P7a)

5096 Shank, tip bent up slightly, upper end squared off. D.1.7, L.47.5mm 8016 sf8266 (P7c)

5097 Shank fragment, tip slightly bent up. D.3.6, L.41.9mm 5092 sf5898 (P10)

Finger-ring

5098 Oval, of circular section, becoming rectangular section on one side which has integral plain disc within band. The ends of the ring have been joined by a scarf weld, and brazed with copper (with trace of zinc). D. (across ring) 22.6mm; section: D.2.6mm; disc:

D.10.3, T.3mm 5279 sf4898 (P4z) (*Fig.668*)

Bracelet

5099 Fragment, only expanding joint remains. Rectangular-sectioned hoop, joint formed from terminals overlapping and wrapping around each other two and a half times. L.21.6mm; hoop section: W.2.4, T.1.6mm 4936 sf6317 (P3z) (*Fig.671*)

Nails

Note: All nails have square-sectioned shanks

5100 Domed head with narrow flat rim, shank off-centre. D.19.8, T.2mm; shank: L.13.8, W.3.8, T.3.7mm 10183 sf9176 (P3a) (*Fig.689*)

5101 Domed head only, hollow, central perforation. D.35.2, T.3.8mm; perforation: D.5mm 3360 sf5977 (P3b)

5102 Domed head, extreme tip of shank broken off. There are traces of tin plating on head. L.20.8, W.5.8mm; head: D.17.1, T.1.7mm 3360 sf8639 (P3b)

5103 Dome-headed. L.10.4, W.4.3, T.3.7mm; head: D.9.9mm 1105 sf846 (P3z)

5104 Domed head, decorated with three triangular grooves radiating out from centre, head plated with tin on all faces, shank tip broken off. D.14.5, L.11.8mm; shank: W.3.4mm 3391 sf7063 (P4z) (*Fig.689*)

5105 Dome-headed. L.7.7, W.2.8, T.2.4mm; head: ·D.6.9mm 10121 sf8357 (P4z) (*Fig.689*)

5106 Dome-headed, tip of shank broken off. D.7.4, L.6.7mm 10123 sf8725 (P4z)

5107 Shank fragment, plated all over with copper. L.28, W.4, T.3.3mm 3367 sf6739 (P3c)

5108 Shank fragment, plated with tin-lead coating. L.36.4, W.2.3, T.2.3mm 5591 sf7914 (P3c)

5109 Nail perforating subrectangular lead alloy strip, one end folded up and over nail, the other end roughly broken. Nail head corroded, but originally flat and circular. L.48.1mm; strip: L.51.7, W.15.7, T.2.2mm 6404 sf8094 (P4b)

5110 Flat circular head, entirely coated in lead alloy. L.48.5, W.24.6, T.13.6mm 4239 sf1034 (P4z)

5111 Flat circular head, entirely covered in lead which extends in small strip to one side of nail. D.13.6, L.20.8mm; run-off: L.23.9, W.14.8, T.4.4mm 10072 sf6604 (P4z) (*Fig.689*)

Rivets

5112 Square-sectioned shank perforating convex lozenge-shaped plate, of rectangular section, both ends broken. There are slight traces of coating on the plate. L.19, W.3, T.3mm; plate: L.16.1, W.8.5, T.0.8mm 5687 sf8021 (P3b)

5113 Square-sectioned shank, both ends slightly burred. L.17.5, W.5, T.4.9mm 2501 sf8620 (P3b)

Clench bolts

Note: All clench bolts have flat circular or subcircular heads and shanks with square or subsquare sections

5114 Bolt with lozenge-shaped rove, in two adjoining fragments. L.70.5, W.6.1mm; rove: L.31, W.27.8mm 3362 sf4458 (P3c)

5115 Bolt with rectangular rove. L.50.2, W.7.6mm; rove: L.29.2, W.23, T.1.8mm 3354 sf8569 (P3c) (*Fig.689*)

5116 Bolt with subrectangular rove. L.44.4, W.10.7mm; rove: L.21.9, W.17.8, T.4.2mm 1090 sf153 (P3z)

5117 Bolt with square rove, head of bolt partially broken away. L.43.3, W.9mm; rove: L.21, W.19.7, T.4mm 2403 sf6584 (P4b)

5118 Bolt with lozenge-shaped rove. L.39.4, W.6.5mm; rove: L.21.2mm 5598 sf7615 (P4b)

5119 Two bolts, one headless, both with lozenge-shaped roves, one with wood remains attached. L.33.7, W.7mm; rove: L.28.4, W.18.9mm 2459 sf7871 (P4b)

5120 Bolt with lozenge-shaped rove. L.40, W.7.5mm; rove: L.24.5mm 1865 sf7925 (P4b)

5121 Bolt with lozenge-shaped rove. L.30.4, W.8.3mm; rove: L.32.2, W.21, T.3.3mm 1882 sf7962 (P4b)

5122 Four bolts with lozenge-shaped and rectangular roves. L.39.4, W.11mm; rove: L.48.6, W.29.9mm 1896 sf7966 (P4b)

5123 Bolt with rectangular rove. L.41.7, W.7mm; rove: L.25.3, W.18, T.3.2mm 1850 sf7876 (P4c)

5124 Bolt with rectangular rove. L.71.5, W.11.6mm; rove: L.32.9, W.26.6, T.6.2mm 6410 sf8069 (P4c)

5125 Bolt with lozenge-shaped rove. L.28, W.7.5mm; rove: L.21, W.17, T.1.6mm 2262 sf9761 (P4c)

5126 Bolt with incomplete lozenge-shaped rove. L.36.5, W.6.3mm; rove: L.18.1, W.14.9, T.3.7mm 1833 sf7692 (P4d)

5127 Bolt shank fragment, with rectangular rove. L.26, W.7.8mm; rove: L.18.3, W.15.3, T.2.6mm 1282 sf1184 (P4z)

5128 Bolt shank with rectangular rove. L.19.9, W.7.5mm; rove: L.22.9, W.16.8, T.3.3mm 1282 sf1185 (P4z)

5129 Bolt with lozenge-shaped rove, roughly torn and twisted. L.38.3, W.6.3mm; rove: L.26.6, W.16, T.3mm 1282 sf1187 (P4z)

5130 Bolt with lozenge-shaped rove. L.32.7, W.4.1mm; rove: L.18, W.12.8, T.0.8mm 1293 sf1574 (P4z) (*Fig.689*)

5131 Bolt shank with fragmentary rove. L.27.9, W.11mm; rove: L.19, W.12.9, T.2.9mm 1293 sf1608 (P4z)

5132 Bolt with incomplete rove. L.32.7, W.8.8mm; rove: L.16.8, W.13.6, T.5.2mm 1293 sf1609 (P4z)

5133 Bolt with subsquare rove. L.45.2, W.8.9mm; rove: L.19.1, T.5.9mm 4350 sf1840 (P4z)

5134 Bolt with lozenge-shaped rove. L.59.9, W.7.2mm; rove: L.29.6mm 7063 sf3322 (P4z)

5135 Bolt with lozenge-shaped rove. L.48.6, W.8mm; rove: L.34.9, W.30.3, T.4mm 7063 sf3323 (P4z)

5136 Bolt with lozenge-shaped rove. L.53.8, W.7.2mm; rove: L.28.4mm 7063 sf3327 (P4z)

5137 Bolt with lozenge-shaped rove. L.45.8, W.7.6mm; rove: L.28.3mm 7063 sf4126 (P4z)

5138 Bolt with subrectangular rove. L.60.3, W.13mm; rove: L.32.9, W.23.9, T.3.2mm 3407 sf5536 (P4z)

5139 Bolt with lozenge-shaped rove. L.31.4mm, W.4.4mm; rove: L.29, T.8.4mm 5348 sf5821 (P4z)

5140 Bolt with incomplete square rove. L.38.2, W.8.9mm; rove: L.16.7, W.14.7mm 5431 sf6398 (P4z)

5141 Two bolts with subrectangular roves, one bolt with head broken off. L.65.2, W.9mm; rove: L.30.2, W.22.3mm 6191 sf6471 (P4z)

5142 Bolt with lozenge-shaped rove. L.37.4, W.6.5mm; rove: L.22.9, W.21.5mm 5348 sf6727 (P4z)

5143 Two bolts with rectangular roves. L.43.8, W.7.4mm; rove: L.29.5, W.22.2, T.6.8mm 6252 sf6862 (P4z)

5144 Seven bolts, six with rectangular and lozenge-shaped roves. L.46.6, W.8mm; rove: L.25.7, W.13.8mm 6260 sf6958 (P4z)

5145 Seven bolts, one without rove, one without head, roves rectangular and lozenge-shaped, all with wood attached. L.46.1, W.10.4mm; rove: L.40.5, W.27.1, T.4.1mm 6268 sf7107 (P4z)

5146 Bolt with sublozenge-shaped rove. L.37.5, W.10mm; rove: L.24.9, W.21, T.5.4mm 5606 sf7675 (P4z)

5147 Bolt with rectangular rove. L.38.6, W.6mm; rove: L.27.5, W.24.3, T.3.8mm 6260 sf7722 (P4z)

Roves

5148 Square fragment. L.18.8, W.18.5, T.3.7mm 10183 sf8431 (P3a)

5149 Lozenge-shaped fragment, one end broken off. L.41.8, W.22.5, T.2.5mm 2453 sf9274 (P3b)

5150 Lozenge-shaped. L.26.8, W.24, T.3mm 5591 sf8358 (P3c)

5151 Irregularly shaped fragment, broken across perforation. L.35.1, W.23.5, T.2.5mm 3354 sf8912 (P3c)

5152 Elliptical, convex, one end broken, with substantial collar on underside where perforation punched through. L.94.4, W.38, T.5.7mm; around hole: T.12.1mm 5432 sf9461 (P3c) (*Fig.689*)

5153 Lozenge-shaped, with fragment of clench bolt in perforation. L.52.9, W.35.6, T.3.6mm; bolt fragment: L.22.5mm 1940 sf8368 (P3z)

5154 Square. L.19.8, W.18.3, T.2.6mm 2266 sf8442 (P4a)

5155 Rectangular, perforated off-centre, hole torn through to one edge. L.32.8, W.16.5, T.3.3mm 2403 sf6593 (P4b)

5156 Rectangular fragment, with remains of bolt through perforation. L.36, W.31.3, T.5.9mm; bolt: L.25mm 2386 sf9243 (P4b)

5157 Lozenge-shaped, perforated slightly off-centre. L.38.4, W.25.6, T.3.8mm 2370 sf9463 (P4d)

5158 Lozenge-shaped, perforated off-centre. L.40.2, W.27.2, T.4.8mm 4299 sf1267 (P4z)

5159 Square. L.25.8, W.25, T.4.9mm 3355 sf4624 (P4z)

5160 Subrectangular. L.26.8, W.18.4mm 5420 sf9252 (P4z)

5161 Lozenge-shaped, perforation torn through to one edge. L.63.9, W.39.2, T.4mm 4715 sf9258 (P4z) (*Fig.689*)

5162 Subrectangular fragment. L.23, W.16, T.1.8mm 3355 sf9271 (P4z)

Staples

Rectangular

5163 Fragment, of rectangular section, both arms partially broken and bent up. L.20.2, W.5.5, T.1.9mm; across bow: W.17.7mm 3137 sf4211 (P3b)

5164 Fragment, of rectangular section, part of bow and one arm survive, arm tapering to tip. L.25, W.4.6, T.2.9mm; arm: L.14.6mm 3350 sf4372 (P3b)

5165 Rectangular section, tips of arms rounded. L.23.5, W.10.7, T.2.9mm; arm: L.27.9mm 5573 sf7516 (P3b) (*Fig.689*)

5166 Fragment, one arm completely broken off, tip of other arm also broken off. L.45.6, W.5.5, T.2.2mm; arm: L.17mm 2453 sf7770 (P3b)

5167 Rectangular section, both arms hammered up at ends into L-shapes. L.29.6, W.7.7, T.2.2mm; across bow: W.17mm 10168 sf8550 (P3b) (*Fig.689*)

5168 Rectangular section, tapering arms. L.35.4, W.6.7, T.2.8mm; arm: L.11.4mm 4711 sf5704 (P3z)

5169 Rectangular section, one arm bent. L.52.5, W.6.8, T.4.1mm; arm: L.34.3mm 4911 sf5842 (P3z)

5170 Rectangular section, tips of both arms broken. L.23.6, W.7.4, T.3.5mm; bow: L.16.2mm 1865 sf8003 (P4b)

5171 Two arm fragments. L.30.4, W.7.6, T.4.2mm 5663 sf7698 (P4d)

5172 Rectangular section, tip of one arm broken off. L.45.9, W.7, T.5.4mm; arm: L.17.4mm 1231 sf1120 (P4z)

5173 Fragment, of rectangular section, one arm and part of bow missing, tip of surviving arm broken off. L.23, W.12, T.5.3mm 5348 sf5908 (P4z)

5174 Fragment, of rectangular section, tips of both arms broken off. L.20.1, W.8.2, T.4.2mm; arm: L.16.1mm 4849 sf6113 (P4z)

5175 Fragment, of rectangular section, tips of both arms broken. L.34.4, W.7.8, T.3.9mm; arm: L.19.1mm 10124 sf7014 (P4z)

U-shaped

5176 Rectangular section, rounded tips to arms. L.20.3, W.6.9, T.3mm; across bow: L.15.9mm 3360 sf5011 (P3b)

5177 Fragment, of subcircular section, one arm only surviving. D.7, L.49mm 5587 sf7804 (P3b)

5178 Fragment, of subcircular section, most of one arm missing. D.5.2, L.23.9 2453 sf7987 (P3b)

5179 Fragment, of subcircular section, one arm broken off, other tapering to tip, broken at upper end. D.4.2, L.53.9mm 3326 sf8433 (P3b)

5180 Rectangular section, arms tapering to pointed tips, slightly out-turned. L.55.9, W.7, T.5.3mm; across bow: L.23.5mm 1255 sf1566 (P4z) (*Fig.689*)

5181 Subrectangular section, one arm twisted across other, arms tapering to pointed tips. L.43.4, W.22, T.9.7mm; across bow: L.21mm 1300 sf1749 (P4z)

5182 Fragment, of rectangular section, one arm broken off, other tapering to tip. L.31.3, W.8.5, T.4.1mm 7177 sf5535 (P4z)

Indeterminate form

5183 Fragment, of subrectangular section, one arm tapering to tip, other arm broken off. L.40.4, W.5.5, T.4.9mm 3354 sf8416 (P3c)

Binding strips

5184 Fragment, of plano-convex section, rectangular, both ends broken across perforations. The strip has tin-lead coating along each side and along whole of upper face within transverse grooves, with traces also on reverse face. L.47, W.4.7, T.2.6mm 1163 sf505 (P3z) (*Fig.691*)

5185 Fragment, of subrectangular shape and section, both ends broken, one face slightly corrugated. L.42.6, W.18.6, T.4.5mm 4321 sf1171 (P3z)

5186 Fragment, rectangular and of subrectangular section, both ends broken, one across a perforation, this end being slightly bent up. There is tin plating along both sides, on lower face and in oblique grooves on upper face. L.54.1, W.6.4, T.3.7mm 1926 sf8078 (P3z)

5187 Fragment, of rectangular section, tapering slightly to one end, broken across perforation, other end broken across broader countersunk perforation. L.61.3, W.7.2, T.3.2mm 2438 sf7846 (P4b)

5188 Fragment, subrectangular and of rectangular section, both ends broken, curved at one end. L.28.7, W.23.8, T.1.9mm 5393 sf6277 (P4z)

5189 Fragment, of rectangular section, curved, one end broken across perforation, other end also broken. L.33.2, W.10.8, T.4.9mm 4876 sf8410 (P4z)

Perforated strips

5190 Fragment, of subrectangular shape and section, one end cut square, other broken, strip perforated in the centre by rivet. L.18.9, W.7.9, T.4.5mm; rivet: L.17mm 4847 sf5950 (P3c)

5191 Fragment, subrectangular and of rectangular section, with two perforations, one end slightly bent up and broken. L.32.2, W.12.4, T.2.6mm 7080 sf6732 (P4z)

5192 Fragment, subtrapezoidal and of rectangular section, two sides broken across punched perforations. L.24.2, W.18.4, T.4.4mm 4775 sf8441 (P4z)

Hinges

5193 Subrectangular and of rectangular section, tapering to one end which is rounded and bent up. The other end is perforated, the eye being slightly torn, with a large rivet close to it. L.104.3, W.16.1, T.4.9mm; rivet: L.20.2mm 7097 sf4598 (P3b) (*Fig.692*)

5194 Fragment, subrectangular and of rectangular section, with oval looped eye at one end, other end roughly broken. L.36.3, W.18.8, T.5mm 3360 sf6846 (P3b) (*Fig.692*)

5195 Fragment, subrectangular and of rectangular section, with incompletely closed looped eye at one end, other end broken, two perforations. L.41.2, W.13.5, T.4.6mm 5496 sf7775 (P4z) (*Fig.692*)

5196 Fragment, subrectangular and of rectangular section, with rolled up eye at one end, butted up, other end roughly broken, mineralised wood remains attached. L.37.7, W.10, T.1.7mm 1942 sf9240 (P3z)

5197 Fragment, of subrectangular shape and section, slightly curved, one end rounded with perforation, other end broken. L.43.2, W.15, T.2.8mm 10214 sf5157 (P3a)

5198 Fragment, of subrectangular section, irregularly shaped, one edge partially broken, both ends broken, one across perforation. L.29.2, W.14.8, T.2mm 10214 sf5158 (P3a)

5199 Fragment, subrectangular and of rectangular section, tapering slightly to one end, both ends broken. L.67, W.8.6, T.4.3mm 3415 sf5258 (P3a)

5200 Fragment, of rectangular section, tapering from one broken end to other rounded end. L.33.9, W.13.7, T.3.6mm 1259 sf1556 (P3z)

5201 Fragment, of rectangular section, irregularly shaped, perforated, one end rounded, other broken transversely. L.32.8, W.19, T.1.7mm 3424 sf9354 (P3z)

5202 Fragment, of subrectangular section, irregularly shaped, one end and one edge broken, other end rounded, with median perforation. L.49, W.24.9, T.2.5mm 5279 sf5127 (P4z)

5203 Fragment, subrectangular and of rectangular section, one end broken transversely and bent up; at other end there is a projection which is bent up. L.90.9, W.26, T.2mm 4818 sf5544 (P4z)

Hinge pivots

5204 Incomplete, ends of shank and guide arm broken, shank of rectangular section, guide arm of circular section. L.30.6, W.19.3, T.6.8mm; guide arm: D.9.4, L.28.2mm 5389 sf9485 (P4b)

5205 Tapering shank of rectangular section, guide arm of circular section. L.38, W.11.3, T.6.7mm; guide arm: L.31.4mm 1255 sf1116 (P4z)

5206 Shank of rectangular section, tapering to rounded tip, guide arm of subcircular section, top rounded. L.88.5, W.15.4, T.7mm; guide arm: D.8.8, L.36mm 5201 sf4214 (P4z) (*Fig.692*)

5207 Fragment, shank broken off, guide arm of subcircular section. D.7.4, L.31.2mm 10099 sf9222 (P4z)

Handles

5208 Incomplete, with stem of rectangular section, broken at one end, other end looped, slightly open, with fragment of staple through loop. L.67.9, W.4.4, T.4mm; staple: D.17.3, L.23.4, W.4.2, T.4mm; loop: D.15.2mm 5348 sf5762 (P4z) (*Fig.693*)

5209 Incomplete, with bowed stem of rectangular section, subdiscoidal terminal at one end, perforated off-centre, terminal at other end broken off. L.44.8, W.4.8, T.3.4mm; terminal: D.15.2, T.2.1mm 1257 sf1040 (P4z) (*Fig.693*)

Chain link

5210 Figure-8 shape, of rectangular section, with nail shank through one loop. Also two adjoining fragments of ring, of circular section. L.32.2, W.14.3, T.5mm; nail shank: L.19.6mm 1932 sf8589 (P3z)

Rings

5211 Annular, of subrectangular section. D.26.7, T.5.2mm 3377 sf8604 (P3c)

5212 Subcircular, of subrectangular section. D.64.1; section: D.6.2mm 1207 sf727 (P3z) (*Fig.693*)

5213 Annular, incomplete, of circular section, one end flattened at break. D.12.8; section: D.2.6mm 1228 sf1717 (P3z)

5214 Annular, of circular section. D.26.1; section: D.2.9mm 1231 sf1550 (P4z) (*Fig.693*)

5215 Annular, of circular section, incompletely joined, one end broken. D.20.5mm; section: D.2.5mm 3470 sf4808 (P4z)

Wall hooks

5216 Rectangular section, tapering to one end which is flat with rounded tip, other end curved up, tip broken off. L.42.6, W.6, T.2.9mm 5587 sf7579 (P3b)

5217 Rectangular section, tapering to curved hook. There is possible copper plating on upper surface and sides of hook. L.59, W.5.9, T.5.6mm 2505 sf8068 (P3b) (*Fig.694*)

5218 Fragment, of rectangular section, tapering asymmetrically from one broken end to rounded shank end. L.73.9, W.11.1, T.5.6mm 4847 sf5948 (P3c) (*Fig.694*)

5219 Fragment, of rectangular section, most of hook broken off, shank tapering to point. L.87, W.6.2, T.3.8mm 2455 sf7581 (P4b)

Swivel hooks

5220 Square section, terminal square and flat, end of hook slightly broken. L.29.4, T.4.7mm; terminal: W.9.5mm 1282 sf1570 (P4z) (*Fig.694*)

5221 Incomplete, of subsquare section, terminal and extreme tip of hook broken off. L.33.7, W.6.8, T.4.9mm 4876 sf8463 (P4z)

Other hooks

5222 Incomplete, of rectangular section, with looped eye at one end, incompletely closed, tapering to other end which is broken. L.30.7, W.7.8, T.5.9mm; across hook: D.13.7mm 4851 sf8677 (P3c)

5223 Incomplete, of rectangular section, looped oval eye at one end, stem curved, other end broken. L.19.6, W.8.3, T.3.6mm; across hook: W.19.4mm 1932 sf8603 (P3z)

5224 Incomplete, of rectangular section, tapering to upper end, terminal and tip of hook broken. L.33.3, W.7.7, T.6mm 3362 sf4625 (P3c)

5225 Incomplete, of subcircular section, terminal broken off. D.3, L.25.6mm 4869 sf5892 (P3z)

5226 Incomplete, of circular section, in two adjoining fragments, tapering slightly to one end which is hooked up, both ends incomplete. D.4.6, L.48.6mm 1231 sf1619 (P4z)

5227 Incomplete, of rectangular section, tapering to terminal which is broken off. L.45.6, W.4.8, T.2.5mm; across hook: W.11.6mm 3391 sf7064 (P4z) (*Fig.694*)

Ferrules

5228 Conical and socketed, tapering to a closed rounded tip. The upper edge is partially broken away at the front across a perforation. The ferrule is open at the back from the upper edge over approximately two-thirds of its length, and there is a longitudinal split down the tip. L.94.4, W.33.2, T.1.5mm 5274 sf4952 (P4z) (*Fig.695*)

5229 Incomplete, subcircular, tapering slightly to one end, which is partially broken, upper end cut square. D.40.6, L.69.3, T.7.1mm 2458 sf8570 (P3b)

Collar

5230 Incomplete, tubular, broken laterally and at both ends. It is formed from at least two pieces of sheet, with brazing visible along one join, and is plated with copper all over interior and exterior surfaces. D.21.6, L.34.8, T.1.4mm 7063 sf3324 (P4z) (*Fig.695*)

Candle holder

5231 Circular socket at upper end, top of socket roughly broken, tapering to pointed tip of square section. L.45.8, W.8.7, T.5.9mm; socket: D.9.6mm 2262 sf6528 (P4c) (*Fig.695*)

Locks

5232 Lock bolt, of rectangular section, edges convex with projection of square section at one end, tip slightly broken, bolt tapering to other end which has longer projection, tapering to a point. There is a longitudinal subrectangular slot in the centre of the bolt, with a circular perforation on each side at the bolt's broader end. L.124.6, W.36, T.4.6mm; long projection: L.39.6, W.6.8, T.3.6mm 10016 sf2859 (P3z) (*Fig.696*)

5233 Padlock fragment, subtriangular, two sides roughly broken. Along the third side of the iron sheet fragment a strip of copper alloy is attached, with a second iron strip superimposed, the copper alloy strip extending beyond the iron at one end. A spirally twisted rod is brazed to the sheet fragment perpendicular to the strips; it is riveted to the sheet and covered by the two-layered border. The border is wavy in profile, and the triangular fragment has traces of copper plating with tin and lead all over on both faces. L.45.1, W.26.2, T.0.8mm; rod: D.2.5, L.25.8mm; border strips: W.7.2, T.2.9mm 3463 sf6641 (P3z) (*Fig.696*)

Keys

Slide keys

5234 Incomplete, of rectangular section, terminal broken off, with T-shaped bit, tips broken off, rectangular stem. L.30.3, W.7, T.5.5mm; across bit: W.23.8mm 2458 sf7594 (P3b)

5235 Incomplete, of circular section, part of bit and terminal broken off. The key is slightly bent; it has an L-shaped bit, the end of the prong roughly broken. There is a second prong in the centre of the bit. All over the key there is copper plating with traces of lead and tin. D.2.8, L.23.6; across bit: W.13.4mm 3354 sf8549 (P3c)

5236 Rectangular section, looped around ring at upper end, tapering and thickening towards T-shaped bit, tips of prongs pointed. L.82, W.7.9, T.3.7mm; ring: D.25.9, T.3.9mm 5665 sf7714 (P4b) (*Fig.696*)

5237 Stem of circular section, upper end flattened and curved into incomplete loop. The L-shaped bit is of subrectangular section and is bent away from the stem. There is a second prong in the centre of the bit. D.7.1, L.160.3mm; bit: L.29.4, W.7.1, T.5.9mm 1231 sf1113 (P4z) (*Figs.696–7*)

5238 Fragment, of rectangular section, broken transversely across stem which tapers to L-shaped bit with a second prong, both prongs with bevelled ends. L.55; stem: W.6.4mm, T.7mm; prong: L.20.7mm; across prongs: W.35.3mm 2217 sf5454 (P6a/b) (*Fig.696*)

5239 Rectangular section, upper end looped, stem tapering to T-shaped bit, prongs with bevelled ends. L.67.7mm; stem: W.5.5, T.4.2mm; prong: L.11.6mm; across bit: W.23.9mm 5405 sf6123 (P6a/b) (*Fig.696*)

Padlock keys

5240 Incomplete, laterally set bit broken off, with stem of rectangular shape and section. At the upper end the stem is obliquely angled down from the upper face towards the subdiscoidal terminal which is perforated. At the lower end the stem is bevelled from both faces close to the break, where the section is square. There are traces of tin plating on the stem. L.50, W.4.3, T.10.6mm; terminal: D.13, T.1.5mm 10099 sf4251 (P4z) (*Fig.696*)

5241 Bit fragment, of rectangular section, with one straight edge, broken laterally across two ward cuts, the upper semi-circular, the lower rectangular, and also broken transversely at upper end. L.21.2, W.9.6, T.2mm 10157 sf8183 (P4z)

5242 Key, with stem of rectangular section, broadening out towards the upper end which is broken across a perforation. The stem thickens towards the rectangular bit which is in line with it; the bit has a T-shaped ward cut with a trapezoidal cut below, and small circular perforations on each side of the T-shape. L.76.2mm; bit: W.19, T.3mm; stem: T.5.4mm 5184 sf4111 (P6a/b) (*Figs.696–7*)

Chatelaine

5243 Key, with stem of rectangular section, the upper end looped over a ring, stem tapering to the bit, which is hooked up and has a pointed tip. Also looped over the ring is a fragment of a second object with a stem of rectangular shape and section, the lower end transversely broken. Attached by corrosion to this object is a fragment of a third object, of rectangular section, broken at the lower end, looped at the upper end over a fragment of a second ring. Four figure-8 chain links on a ring fragment are attached to the key by corrosion, and to the complete ring by mineralised wood remains. L.122.3, W.6.2, T.3.6mm; ring: D.21.7, T.2.8mm; chain: L.46.3, T.1.9mm; second object: D.8.8, L.60.3, W.6, T.3.2mm; third object: L.36.9, W.4.7, T.2mm 10196 sf5054 (P3b) (*Figs.698–9*)

5244 Key, with stem of rectangular section, tapering from upper end, which is looped over a ring fragment, to the T-shaped bit, both prongs of circular section, their ends bent out of shape. The ring fragment joins the incomplete ring attached to the smallest fragment of *5243*. Two lengths of chain with figure-8 links were attached by corrosion to the key when first recovered. L.100.9, W.7.1, T.4.1mm; bit: D.3, W.42.4mm; chain (largest): L.47.5, T.2.7mm; chain loop: D.6.5mm 10196 sf5055 (P3b) (*Figs.698–9*)

5245 Chain length composed of four complete and two incomplete figure-8 links associated with *5243–4*. L.76.8, W.7.1, T.2mm; loop: D.6.9mm 10196 sf5057 (P3b) (*Figs.698–9*)

Horse equipment

5246 Spur goad or point with elongated conical terminal, stem of subsquare section, roughly broken at lower end. There are traces of tin plating on the sides of the terminal towards the stem. L.26.2mm; tip: D.6.4mm; stem: T.3.5mm 4847 sf6166 (P3c) (*Fig.701*)

5247 Bit mouthpiece link, incomplete, with shaft of subcircular section, tapering at both ends, one end with open oval loop, at other end loop incomplete. D.6.7, L.86.3mm; loop: L.21, W.18.9mm 5715 sf8029 (P3b) (*Fig.701*)

5248 Bit mouthpiece link, incomplete, one loop lost. The shaft is of square section at the looped end, and of subcircular section at the broken end. L.75, W.9.1, T.7.3mm; stem: D.7mm 4698 sf4120 (P4z)

5249 Strap link, incomplete, with shaft of suboval section, bifurcating at one end into a loop which has been broken transversely and is of lentoid section. Towards the other end the shaft broadens out, maintaining its thickness, then thins and bifurcates into another incomplete loop. L.58.3, W.19.9, T.9.7mm; loop: W.28.1, T.5mm 4715 sf9501 (P4z) (*Fig.701*)

Fiddle-key nails

5250 Incomplete, with semi-circular head, all metal lost. L.43, T.6.3mm 2439 sf7219 (P4a)

5251 Flat semi-circular head, tip slightly bent up. L.42.2, T.6mm; head: W.14.8mm 2359 sf6077 (P4d)

5252 Flat semi-circular head. L.27.6, W.5.8, T.5mm; head: W.18.8mm 1739 sf7199 (P4d)

5253 Incomplete head, tip clenched. L.44.9, W.5.8, T.5mm; head: L.9, W.9mm 1254 sf1018 (P4z)

5254 Semicircular head. L.41, W.17, T.10mm 1258 sf1042 (P4z)

5255 Incomplete sublozenge-shaped head, tip of shank broken off. L.29.3, W.6.8, T.4.2mm; head: L.16.6, W.15mm 1282 sf1182 (P4z)

5256 Incomplete, part of head broken off, shank partially broken, tip clenched. L.46.8, T.6mm; head: W.15.5mm 1255 sf1631 (P4z) (*Fig.701*)

5257 Incomplete, with semi-circular head, tip slightly bent. L.29.6, W.6.2, T.4.5mm; head: W.17.2mm 4775 sf6450 (P4z)

5258 Roughly semi-circular head, tip slightly clenched. L.32.8, W.6.8, T.5.6mm; head: W.21.2mm 7068 sf9273 (P4z)

Other horseshoe nails

5259 Expanded head with ears, shank curved up. L.32.2, W.4.1, T.4.6mm; head: W.15.3mm 4207 sf1667 (P4z) (*Fig.701*)

5260 Expanded head with ears, tip bent up. L.28.6, W.11.7, T.6.2mm 1282 sf1854 (P4z)

Swords

5261 Pommel, semi-circular, of rectangular section, with perforation tapering from upper convex face to lower horizontal face. D.62.4, T.18mm, Wt.175g 4694 sf9194 (P6a) (*Fig.702*)

5262 Pommel, trilobate, of oval section, with socket of subrectangular section, which tapers up from convex lower face. The sides curve in, indenting before tapering up to the top face, which is broken. L.50.3, W.55.6, T.22.9mm 5243 sf4459 (P6c) (*Fig.702*)

5263 Guard, convex, of rectangular section, tapers from the centre to the ends, which are rounded. There is a subrectangular hole on the lower face set within a median groove which tapers to ends. L.69.6, W.24.5, T.8.8mm; hole: L.23.7, W.5.7mm 5147 sf3953 (P6c) (*Fig.702*)

Coffin fitting

5264 Three adjoining fragments, making up a rectangular strap with a bifurcated scrolled terminal at one end with two rivets, terminating at the other end, which is incomplete, in a large vertical U-shaped eye, fixed to the strap by a nail, with a second nail adjacent.

Two other nails in the strap are visible on X-ray only. There are mineralised wood remains on the reverse of the strap, and mineralised textile remains on the other face, comprising 35 × 20mm of textile in ?2/1 twill, 18/Z × 14/S. Fibre identified as wool from Scanning Electron Microscope photograph. L.467.8, W.45, T.4.4mm; terminal: W.85.5mm; eye: L.56.7, H.17.6mm 2367 sf6116 (P4d) (*Figs.703–5*)

Coffin nails

5265 Fragment. L.45.3, W.6.6mm 2331 sf5693 (P4d)

5266 Nail and two fragments. L.40.9, W.5.9mm; head: D.20.2mm 2364 sf6109 (P4d)

5267 Fragment, with human bone and wood attached. L.15.4, W.8mm 2364 sf6110 (P4d)

5268 Two fragments, with wood. L.26.4, W.9.2mm 2364 sf6121 (P4d)

5269 Two nails. L.80.7, W.5.6mm; head: D.22.6mm 2364 sf6122 (P4d)

5270 Two nails and five fragments. L.80.8, W.6.5mm; head: D.19mm 2364 sf6126 (P4d)

5271 Nail with wood attached. L.61.2, W.6.6, T.6.3mm 1574 sf4745 (P4z)

5272 Fragment. L.27, W.10, T.8mm 1574 sf4755 (P4z)

5273 Fragment. L.35, W.10, T.15mm 1574 sf4756 (P4z)

5274 Incomplete, with traces of tin plating on the head and shank and also mineralised wood remains. L.49.6, W.4.8mm; head: D.21.7mm 1574 sf4760 (P4z)

5275 Nail and four fragments. L.46.7, W.5.4mm; head: D.11.9mm 1574 sf4842 (P4z)

Bell clappers

5276 Incomplete, with stem of rectangular section, upper end hooked slightly, most broken away, other end thickened. L.56.6, W.9, T.8.9mm 7097 sf8910 (P3b) (*Fig.706*)

5277 Stem of square section, tapering to hooked suspension loop, lower end thickened with end face irregularly concave. L.65.9, W.6.3, T.6.2mm; hook: L.17.7, W.3.1, T.2.4mm 3463 sf8911 (P3z)

Unidentified object

5278 Rectangular section, cross-shaped, with broad arms close to one end which has been cut square, the shaft tapering to a point at the other end which is slightly bent up. L.54.7, W.6.1, T.4.5mm; arms: L.12, W.8.5, T.3.3mm 2266 sf6624 (P4a) (*Fig.706*)

Copper alloy

Waste and offcuts

5279 Slag fragment. L.45, W.20, T.15mm 7097 sf4599 (P3b)

5280 Slag fragment. L.30.2, W.18.1, T.9.9mm 1144 sf888 (P4z)

5281 Melted fragment. L.7, W.5, T.4mm 7067 sf4241 (P4z)

5282 Wire offcut, of subsquare section at upper end which is cut square, tapering slightly to other end, which is of circular section and curved up. D.1.2, L.25mm 1302 sf1652 (P3z)

5283 Wire or pin shank fragment, of circular section, broken at both ends, one of which has been flattened. D.1.6, L.47.4mm 4911 sf5913 (P3z)

5284 Wire fragment, of subcircular section, both ends broken. D.1.1, L.9mm 2266 sf5417 (P4a)

5285 Wire fragment, of subcircular section, partially spirally twisted. D.2.8, L.24.8mm 2386 sf6832 (P4b)

5286 Wire length, of circular section, both ends rounded, slightly twisted. D.1.8, L.118.2mm 1895 sf8033 (P4b) (*Fig.610*)

5287 Wire fragment, of circular section, both ends broken. D.0.8, L.49.5mm 1729 sf7031 (P4d)

5288 Rod of subsquare section, one end cut obliquely, other end pinched off. D.2.4, L.55.5mm 3463 sf6639 (P3z)

5289 Rod of subcircular section, one end rounded, hammered flat at other end and broken. D.2.1, L.35.3mm 6452 sf8662 (P4a)

5290 Rod of square section, subrectangular, one end rounded, other end cut square. Two adjoining faces have a series of knife cuts. L.25, W.4.5, T.4.3mm 10157 sf4668 (P4z) (*Fig.610*)

5291 Rod, one end subsquare in section, of subcircular section below this, and remainder of trapezoidal section, both ends cut, hammered flat over majority of length, slightly twisted. L.69.7, W.2.4, T.1.5mm 4849 sf5621 (P4z) (*Fig.610*)

5292 Rod fragment, of square section, both ends broken. L.30.7, W.2, T.1.8mm 3391 sf6540 (P4z)

5293 Sheet offcut, subrectangular, tapering to both ends, which are broken. L.55.9, W.1.9, T.1.9mm 4182 sf1528 (P3b)

5294 Sheet offcut, subrectangular, both ends broken, slightly curved. L.17.2, W.3.7, T.0.6mm 3137 sf8581 (P3b)

5295 Sheet offcut, irregularly shaped, with two sides cut square, rest roughly broken and distorted. L.10.8, W.8.4, T.1.3mm 1305 sf1239 (P3z)

5296 Sheet offcut, irregularly shaped, two edges cut. L.39.1, W.4.8, T.1.6mm 5748 sf7867 (P4b)

5297 Three sheet offcuts, two adjoining, each with one edge from which discs have been stamped out, other edges straight. L.24.8, W.19.3, T.1mm 6150 sf6181 (P4z) (*Fig.610*)

5298 Sheet offcut, irregularly shaped, all edges cut apart from one which is roughly broken.

L.32.1, W.11.5, T.0.9mm 1143 sf8119 (P4z)

5299 Sheet fragment, irregularly shaped, all edges broken, remains of small perforation close to one edge. L.17.7, W.9.7, T.0.9mm 4915 sf6138 (P2)

5300 Sheet fragment, irregularly shaped, folded once and compressed, with one straight edge, rest roughly broken. There are traces of two rivet holes close to one end. L.42.3, W.21.5, T.4.2mm 10214 sf5160 (P3a)

5301 Sheet fragment, irregularly shaped, all edges broken. L.15, W.13.7, T.2.5mm 5554 sf7812 (P3b)

5302 Three sheet fragments, largest with remains of rivet in one corner. L.6.6, W.4.8, T.1.4mm 1115 sf290 (P3z)

5303 Sheet fragment, irregularly shaped, all edges roughly broken. L.36.7, W.22.7, T.0.9mm 4792 sf6535 (P3z)

5304 Sheet fragment, irregularly shaped, one edge cut straight, others broken. L.13.8, W.5.8, T.0.5mm 1143 sf876 (P4z)

5305 Sheet fragment, irregularly shaped, all sides broken. L.15.2, W.11.1, T.3.2mm 3470 sf4812 (P4z)

5306 Sheet fragment, irregularly shaped, with one straight edge, others roughly broken. L.19.9, W.7.4, T.1.9mm 7075 sf4818 (P4z)

5307 Sheet fragment, irregularly shaped, all edges broken. L.7.6, W.5.5, T.2.6mm 4889 sf5755 (P4z)

5308 Sheet fragment, irregularly shaped, one edge cut, others roughly broken. L.18, W.7, T.1.1mm 5236 sf6099 (P4z)

5309 Two sheet fragments, larger narrow and U-shaped, broken transversely at both ends, smaller irregularly shaped. L.12.8, W.2.2, T.0.6mm 1234 sf8128 (P4z)

Vessel

5310 Fragment, irregularly shaped, all edges broken, one across small perforation, decorated with incised curvilinear design. L.20.8, W.14.7, T.0.5mm 3145 sf4965 (P6b) (*Fig.642*)

Buckles

5311 Strap-end buckle, frame subpentagonal, of rectangular section, with perforation below bar for loop of pin which is missing. Strap attachment plate tapers from frame to subcircular perforated terminal at other end, which is split laterally, part broken off from lower face. Between the terminal and the perforation below the bar the plate is decorated with silver inlay defining a trapezoidal field and outlining a stylised animal, head looking back to tail, with possible second animal. L.30.4, W.13.6, T.2.8mm 1287 sf1343 (P4z) (*Figs.650–1*)

5312 Strap-end buckle, the frame subtrapezoidal and of rectangular section, sides drawn out concavely to rounded tip. The strap attachment plate is subrectangular, slightly narrower than the frame, with two rivets and a rounded terminal horizontally split, with leather surviving. The pin loops round an integral bar, between two rectangular perforations, and the tip rests in a subrectangular groove. The area around the rivets is decorated with stamped pendent leaves and punched squares, and the entire buckle bears traces of silver plating. L.33.2, W.16, T.4.8mm 4651 sf3610 (P6a) (*Figs.650–1*)

5313 Strap-end buckle with oval frame of subtriangular section, upper face convex, pin with curved tip looped around lower end of frame. The strap attachment plate of plano-convex section tapers away from the frame, with two adjacent collars, one perforated by loop of pin, other with central rivet which has organic remains on lower face. The attachment plate terminal, which is cut square, has a third collar and a torn perforation close to it. There are traces of gilding. L.37.4, W.14.8, T.2.7mm; rivet: L.6.1mm 3194 sf8223 (P6b) (*Figs.650–1*)

5314 Buckle with subrectangular frame, of rectangular section, tapering at one end to animal head terminal. At other end frame has been broken transversely, and there are two lugs with the remains of an iron bar which passed through the lugs. The animal head is subtriangular with ears in relief, eyes and snout represented by lines and dots. L.28.4, W.21, T.2.9mm 5101 sf3391 (P8) (*Figs.650–1*)

5315 Buckle strap attachment plate fragment, subrectangular, broken across both ends, one across a perforation, and decorated on one face with rocker-arm tracery along both edges and in diagonal lines from perforated end to median point of other end. L.15.9, W.12.9, T.0.8mm 1570 sf4724 (P4z) (*Fig.650*)

5316 Buckle strap attachment plate fragment, irregularly shaped, one straight edge, others roughly broken. A rivet survives in one corner. L.16.2, W.15, T.0.5mm; rivet: L.4.4mm 6150 sf6193 (P4z)

Strap-ends

5317 Rectangular section, split at butt end into two plates, each with two perforations; lower plate has squared end, upper plate has central notch. The strap-end broadens slightly and then tapers to a stylised animal head terminal, grooves indicating the snout and eyes. Below the perforations are several stamped crescents. The central field is defined by incised lines and filled with cross-hatching containing traces of enamel. Below are two parallel series of stamped crescents, separated by a longitudinal incised line. L.43.5, W.10.4, T.1.7mm 4870 sf5649 (P3a) (*Fig.652*)

5318 Rectangular section, split at butt end into two plates, each with two perforations. The end of one plate is broken across the perforations, end of other is rounded. The strap-end tapers and thickens to the terminal which is rounded. It is decorated with three pairs of incised transverse lines. L.38.7, W.8.4, T.2.7mm 4694 sf4736 (P6a) (*Fig.652*)

5319 Incomplete, of rectangular section, the butt end broken off and the sides convex. The strap-end tapers from the broken end to a terminal of debased zoomorphic form, and is decorated with an interlaced curvilinear design. L.29.6, W.16.6, T.3.4mm 5103 sf3263 (P6c) (*Fig.652*)

5320 Incomplete, of plano-convex section, broken at the butt end just beyond the point where it splits. The strap-end tapers gradually to a terminal, decorated in relief with two opposed animal heads comprising ears and eyes, the snouts merged together, with transverse grooves and punched dots along edges. There are traces of red enamel within the decoration and leather at the butt end. L.52.3, W.9.3, T.6mm 2381 sf6462 (P6c) (*Fig.652*)

5321 Rectangular section, split at butt end into two plates, each with two perforations. There is a slight V-shaped notch between perforations on the upper face, and an incised hexagonal design enclosing opposed semi-circles below. The strap-end is slightly waisted below this, and then tapers gradually to the animal head terminal, with ears delineated by an incised saltire, a rounded snout and slight depressions in the areas of the eyes. It is decorated with cross-hatching, with traces of red enamel, and there are leather remains at the butt end. L.46.8, W.8.8, T.4.9mm 1056 sf71 (P6z) (*Fig.652*)

Belt loop

5322 Incomplete, originally D-shaped, of plano-convex section, decorated with two pairs of diagonal notches on raised field. L.24.1, W.15.6, T.2mm 2000 sf6479 (unstratified) (*Fig.653*)

Rings

5323 Square section, subcircular, of irregular thickness, slightly twisted. D.22.2, T.1.3mm 3424 sf7035 (P3z) (*Fig.653*)

5324 Annular, incomplete, of circular section. D.13.8, T.1.1mm 1300 sf1750 (P4z) (*Fig.653*)

Mount

5325 A hollow, flat-topped dome, with flattened subrectangular tab of rectangular section at one end. The top of the dome has opaque yellow, blue and blue-green enamelled decoration defining the central figure of an animal with its head turned back to face its tail. The tab is decorated with incised semi-chevrons with a punched dot surround. L.36.4mm; dome: D.23.1, T.2.5, H.5.9mm; tab: L.14.6, W.19.3, T.0.8mm 10162 sf7184 (P4z) (*Figs.654–5*)

Brooches

5326 Colchester derivative, with slightly expanded head bent over and down to form hinge or spring case, broken on one side. D-sectioned curved bow, expanding over upper part of bow, tapered over lower part, foot flared, with two moulded horizontal cordons across front and sides of bow at widest part, two curving grooves parallel to edges over lower bow, two horizontal grooves across foot. Triangular catch-plate divided from bow by groove on either side, upper part of catch-plate missing. L.68mm; wings: W.12mm; bow: W.4.5, T.4.5mm 10180 sf4832 (P3a) (*Fig.659*)

5327 T-shaped, wings bent round with joint at back to form cylindrical hinge case retaining part of hinge bar, groove parallel to end of each wing. Curved triangular-sectioned tapering bow bent out of shape, upper sides of bow concave producing marked central ridge. Catch-plate is broken and part is missing. L.41mm; wing: W.23mm; bow section: W.7.5, T.3mm 10259 sf5581 (P3a) (*Fig.659*)

5328 Trumpet brooch with small oval trumpet head, upper part obscured, with groove parallel to top and one side; also central lug for securing spring of approximately four turns at back. Spring retains ends of loose wire, headloop and pin now missing. Bow tapers to central mouldings of flat-backed acanthus of three petals either side of narrow disc with two ribs above and below. Triangular-sectioned lower bow with groove parallel to each edge, cylindrical foot knob consisting of three cordons, central one widest, broken triangular catch-plate. L.43mm; acanthus section: W.9, T.7mm 10007 sf2333 (P6z) (*Fig.659*)

5329 Penannular brooch with circular-sectioned hoop and flat-fronted diagonally grooved knob terminals. Rectangular-sectioned humped pin wrapped around hoop one and a half times, pin hammered to oval section over central part, expanded tip hammered flat and twisted to one side. D.25.6mm; section: D.2.1mm; pin section: W.2, T.1.5mm 4915 sf5903 (P2) (*Fig.659*)

5330 Penannular brooch, incomplete, approximately one-quarter of oval-sectioned hoop with vertical grooves over front face, both ends broken. Square-sectioned humped pin with broken point expanding and wrapping around hoop. D.30mm; pin: L.24mm; brooch section: W.4, T.3mm 10161 sf5029 (P3z)

5331 Penannular brooch, incomplete, of subcircular section, decorated with deeply incised irregularly spaced spiral design. Subglobular terminal with slight faceting at one end, other end transversely broken. Original D.18.5mm (approx.); brooch section: D.2.6mm; terminal: D.3.4mm 5705 sf9628 (P4b) (*Fig.659*)

5332 Cruciform brooch side knob, subglobular, with interrupted circumferential groove at one end, where knob tapers in to waist before expanding again to a squared end. Part of an iron spring bar of square section is attached to this end of the knob, and there are traces of brass brazing (with some lead and tin) at this end. D.12.2, L.14.3mm; shank: L.6.8, W.2.8mm 6344 sf7939 (P4z) (*Fig.659*)

5333 Terminal of penannular brooch of rectangular section, sublozenge-shaped, broken off from hoop at one corner, edges obscured by corrosion. Decorated with relief geometric design, with a boss in each corner and one in the centre; bosses within subcircular fields, separated by groups of rectangles. Traces of gilding all over. L.30.8, W.27.8, T.1.4mm 3334 sf4240 (P6a) (*Figs.657, 659*)

Garment hooks

5334 Subcircular, with tapering projection, hooked up at lower end. There are two small perforations close to upper edge of head, with rouletted decoration around circumference and below perforations on external face only. L.19, T.1.2mm; head: L.11.6, W.13, T.0.5mm 10035 sf9216 (P4z) (*Fig.660*)

5335 Incomplete. Only hooked part survives, tapering from one broken end to rounded tip. There is an incomplete perforation at the wider end. L.9.7, W.2.6, T.0.6mm 4961 sf6292 (P4z) (*Fig.660*)

Hair pin

5336 Three adjoining fragments, point missing, shank surface pitted. Head depicts hand holding small ovoid with first finger and thumb, solid block with three vertical and two slightly diagonal grooves representing other fingers and knuckles, diagonal groove across back of hand. Circular-sectioned tapering shank with three grooves around top producing three cordons. L.75.5mm; head: D. (of thumb) 2.2, L.20.5mm; shank: D.3.5mm 3455 sf5101 (P3a) (*Fig.661*)

Dress pins

Note: All dress pins have shanks of circular or subcircular section unless otherwise stated

5337 Incomplete, globular head, shank broken off just below. There are traces of gilding on the head. L.5.7mm; head: D.4.3mm 3354 sf4385 (P3c)

5338 Subglobular head, longitudinally faceted, top flattened, with ring collar below. Shank hipped and of square section at tip, which is bent up. D.2.1, L.81.6mm; head: D.8mm 3468 sf5388 (P3z) (*Fig.662*)

5339 Incomplete, subglobular head, tapering slightly at bottom to ring collar, lower half of shank bent, tip lost. D.1.4, L.27.5mm; head: D.3.2mm 2386 sf6834 (P4b)

5340 Incomplete, subglobular head, part of shank lost. D.0.8, L.20.1mm; head: D.1.7mm 1072 sf131 (P4z)

5341 Incomplete, globular head, only small part of shank survives; entire pin corroded. The head is decorated with stamped depressions arranged in a zig-zag pattern; there is a ring collar. D.2, L.18mm; head: D.8.2mm 1570 sf4935 (P4z) (*Fig.662*)

5342 Subglobular head, top rounded, sides taper to ring collar, shank swollen towards tip, which is bent up. D.2.3, L.68mm; head: D.4.1mm 5279 sf5023 (P4z) (*Fig.662*)

5343 Incomplete, subglobular head, with eight longitudinal facets, top flat, with incomplete ring collar below, lower end of shank broken away. D.2.2, L.31.1mm; head: D.8mm 10157 sf8195 (P4z)

5344 Irregularly globular head, top flattened, decorated with stamped ring-and-dot motifs around sides and on top. Shank is of suboval section, with slight swelling close to tip, extreme tip broken off, lower half of shank bent up slightly. D.2.2, L.57.6mm; head: D.7.1mm 3327 sf4215 (P6a) (*Figs.662–3*)

5345 Globular head, top damaged, casting incompletely removed from top of head, ring collar below. Lower third of shank swollen and bent. D.2.3, L.56.4mm; head: D.7.4mm 4710 sf4451 (P6a) (*Fig.662*)

5346 Incomplete, irregularly globular head, top flattened, with ring collar below, shank tip missing. D.1.8, L.24.2mm; head: D.7.8mm 1075 sf8106 (P6a)

5347 Incomplete, globular head, with top flattened, shank tip broken off. D.1.9, L.29.4mm; head: D.7.6mm 5312 sf5672 (P6b)

5348 Globular head, top flattened, with incomplete ring collar, shank bent up at midpoint. D.2, L.50.9mm; head: D.6.6mm 4448 sf2669 (P7b) (*Fig.663*)

5349 Globular head, shank with swelling close to tip. D.2.2, L.41.3mm; head: D.3mm 5059 sf2466 (P8)

5350 Subrectangular head, of square section, lozenge-shaped facet on each side with punched dot; the top of the head is cut into a lozenge. The shank is slightly swollen close to the tip, the upper end slightly bent. D.2.1, L.45.5mm; head: L.7, W.3.4, T.2.8mm 3354 sf4415 (P3c) (*Fig.662*)

5351 Cuboid head, with lozenge-shaped facets and chamfered corners, decorated with irregularly stamped ring-and-dot motifs on sides. The shank is slightly swollen towards the tip, and the lower half is bent up level with head. D.2.3, L.80.3mm; head: L.6.1, W.5.4mm 2431 sf7092 (P4b)

5352 Cuboid head, with irregular lozenge-shaped and triangular facets on top and sides, the latter decorated with punched ring-and-dot motifs. The shank is of lozenge-shaped section, lower two-thirds bent up. D.2.3, L.70.2mm; head: L.8, W.7mm 5279 sf4943 (P4z) (*Fig.662*)

5353 Subrectangular head, of square section, multi-faceted, each facet decorated with subcircular depressions. The shank is swollen towards the tip and the lower half is bent up. D.2.1, L.39.9mm; head: L.6.9, W.2.9mm 5397 sf6272 (P4z) (*Fig.662*)

5354 Subcuboid head, with irregular pentagonal and triangular facets, top of head with lozenge-shaped facet, sides decorated with punched ring-and-dot motifs, some incomplete. File marks on head. The top of the shank is crudely cut to form an irregularly waisted neck, with a swelling just below the mid-point where the shank is bent up. D.2.4, L.70.8mm; head: W.6mm 3342 sf4189 (P6a) (*Figs.662–3*)

5355 Subrectangular head, of lozenge-shaped section. The shank is of subcircular section close to head but of lozenge-shaped section at swelling halfway down, lower two-thirds of shank bent up, extreme tip broken off. D.3.2, L.62.5mm; head: L.7.1, W.4.3mm 2218 sf5275 (P6a/b) (*Fig.662*)

5356 Incomplete, biconical head, tip of shank broken off. D.2.1, L.28.9mm; head: D.6.7mm 5727 sf7854 (P3b)

5357 Incomplete, with sub-biconical head, top flattened, ring collar below. The tip of the shank is broken off and the head bent away from the shank. D.1.7, L.24.3mm; head: D.6.1mm 2438 sf7290 (P4b)

5358 Incomplete, irregularly biconical head, ring collar below, shank hipped and of square section towards tip, extreme tip broken off. D.2.4, L.62.3mm; head: D.7.7mm; hip: W.2.1mm 3287 sf4177 (P6a) (*Fig.662*)

5359 Incomplete, biconical head, with irregular ring collar, shank slightly bent, tip missing. D.2.3, L.42mm; head: D.7.5mm 4905 sf5843 (P6a)

5360 Biconical head, top rounded, ring collar below. The shank is hipped, the lower third being of square section; the entire shank is bent up in three places. D.2.4, L.82.4mm; head: D.8.3mm 2386 sf6822 (P4b)

5361 Faceted biconical head, upper half rounded, ring collar below, shank with slight swelling close to tip which is broken off. D.2, L.47.3mm; head: L.5.1, W.6mm 4849 sf6174 (P4z) (*Fig.662*)

5362 Faceted biconical head, of octagonal section, small biconical collar. The shank is bent up halfway along length. D.2.2, L.70.4mm; head: L.6.5, W.7.8mm 7072 sf3964 (P6z) (*Figs.662–3*)

5363 Inverted conical head of circular section, ring collar below. The shank is swollen close to tip. D.2.4, L.46.9mm; head: D.4.2mm 3377 sf4663 (P3c) (*Fig.662*)

5364 Incomplete, truncated inverted conical head, rounded slightly on top. Part of the shank and tip are broken off. D.2.4, L.31.4mm; head: L.10, W.5.9mm 3424 sf4888 (P3z) (*Fig.662*)

5365 Subconical head, of suboval section, top flat, irregular collar below. D.2.4, L.65mm; head: D.5, L.5.3mm 2156 sf4573 (P6c) (*Figs.662–3*)

5366 Flat elongated pentagonal head, with length of chain attached through perforation. The shank is of subcircular section, the lower half bent up, and is decorated just below head with five incised transverse lines. The chain has five links, of circular section, each S-shaped with one end bent up at right-angles to other. D.2.3, L.64.1mm; head: L.5.8, W.4.1, T.1mm; chain: L.19.7mm; link: D.1, L.6.2, W.3.7mm 3326 sf4276 (P3b) (*Figs.663–4*)

5367 Flat elongated pentagonal head perforated close to top, head bent up from shank and almost broken off. The shank is swollen close to the tip, extreme tip broken off. A gouge on one side of the shank may have been deliberately made. D.2.7, L.64.4mm; head: L.10.6, W.5.4, T.1.3mm 3326 sf5027 (P3b) (*Fig.664*)

5368 Spiral head formed by splitting top of shank axially, flattening and inwardly spiralling each side. The shank has a slight swelling close to the tip and the upper third of the pin is bent over. D.1.7, L.52.9mm; head: W.7.7, T.1mm 3468 sf5357 (P3z) (*Fig.664*)

5369 Spiral head, both spirals bent away from shank which is bent up towards tip. D.2.2, L.50.8mm; head: W.7.7, T.1mm 2420 sf6988 (P4b)

5370 Sublozenge-shaped head of rectangular section, upper edge convex, head and lower half of shank both bent up at right-angles to rest of shank and parallel to each other. The shank is slightly swollen towards tip, extreme tip broken off. The head is perforated in the centre, with ring-and-dot motif encircling the hole on both faces. D.2.4, L.68.8mm; head: W.12.1, T.1.1mm 5526 sf7160 (P4d) (*Fig.664*)

5371 Lozenge-shaped head of rectangular section, with lozenge-shaped projections on three corners, head perforated in the centre. There is a slight collar below the head. The shank tip is bent up slightly. D.2.9, L.89.2mm; head: L.9.0, W.10.3, T.1.5mm 6135 sf6346 (P6b) (*Fig.664*)

5372 Lozenge-shaped head of rectangular section, with semi-oval projections on three corners, and decorated with a zig-zag pattern along sides on both faces. There is a slight collar below the head, and the tip of the shank is bent. D.2.9, L.77.4mm; head: L.8.5, W.9.4, T.1.9mm 10000 sf2169 (unstratified) (*Fig.664*)

5373 Headless, shank curved and slightly swollen close to tip, with a small longitudinal facet cut on one side, extreme tip broken off. There are traces of solder around upper end of shank. D.1.8, L.51.9mm 3362 sf4701 (P3c) (*Fig.664*)

5374 Headless, shank has slight swelling close to tip and is bent up at centre. D.2.2, L.54.9mm 2472 sf7942 (P4a)

5375 Headless, shank has slight swelling close to tip where it is bent up. D.1.9, L.33.5mm 10094 sf4121 (P4z)

5376 Headless. D.2, L.50.4mm 7067 sf4247 (P4z)

5377 Headless, upper third of shank bent up, slight swelling close to tip, extreme tip broken off. D.2, L.53.2mm 5279 sf5128 (P4z)

5378 Headless, shank has slight swelling close to tip. D.1.7, L.54.5mm 3104 sf1412 (P6a)

5379 Headless. D.1.7, L.53.7mm 3334 sf4238 (P6a)

5380 Headless, tip bent up. D.2, L.54.9mm 3342 sf4412 (P6a)

5381 Headless, shank has swelling close to tip and is bent slightly. D.2.3, L.38.1mm 3227 sf4673 (P6a)

5382 Headless, upper quarter of shank bent up. D.2.6, L.65.2mm 4694 sf5136 (P6a)

5383 Headless, with traces of lead-tin alloy solder at upper end, shank has slight swelling close to tip, extreme tip broken off. D.1.9, L.51.9mm 4802 sf5583 (P6a)

5384 Headless, shank has slight swelling close to tip which is slightly bent up. D.2.3, L.46.5mm 6173 sf6255 (P6b)

5385 Headless, shank swelling close to tip. D.2.5, L.53.1mm 10085 sf4287 (P6a/b) (*Fig.664*)

5386 Headless, top subrounded. Traces of solder close to the top, and tiny transverse grooves on all sides of the shank. D.2.1, L.57.6mm 5242 sf4575 (P6a/b)

5387 Headless, shank of circular section, no obvious swelling close to tip. D.1.6, L.52.7mm 1514 sf4134 (P6z)

5388 Incomplete, head broken off, shank slightly bent. Transverse incised lines decorate the top end of the shank. D.2.4, L.65.8mm 3420 sf5024 (P3a) (*Fig.664*)

5389 Two fragments, one of lower end of shank and tip, with swelling above tip, smaller fragment broken at both ends. D.1.7, L.32.3mm 5319 sf6721 (P3a)

5390 Shank fragment, with rounded tip. D.2.1, L.25mm 5687 sf9307 (P3b)

5391 Shank fragment, head and tip broken away. D.2.4, L.19.9mm 3377 sf8599 (P3c)

5392 Shank fragment, bent up towards tip. D.1.2, L.33.8mm 1926 sf8303 (P3z)

5393 Shank, in two fragments. D.1.9, L.51.9mm 1895 sf7995 (P4b)

5394 Shank, in two fragments. D.2, L.27.6mm 6404 sf8089 (P4b)

5395 Shank fragment, lower third bent up. D.1.1, L.50.6mm 1739 sf7222 (P4d)

5396 Shank fragment, with swelling, tip bent up slightly. D.2.4, L.21.9mm 3470 sf5483 (P4z)

5397 Shank fragment, slight swelling just above tip. D.2.1, L.41.5mm 6150 sf6185 (P4z)

5398 Shank fragment, slight swelling towards tip, extreme tip broken off. D.2.4, L.43mm 5612 sf7646 (P4z)

5399 Shank fragment, tip broken off. D.1.5, L.14.7mm 5201 sf8958 (P4z)

5400 Shank fragment, lower two-thirds of square section. Towards upper end the shank is decorated with six transverse incised lines. D.2.4, L.68.9mm; square section: W.2.3mm 4676 sf3652 (P6a) (*Fig.664*)

5401 Shank fragment, roughly broken at both ends, one end slightly bent. D.2.5, L.26mm 3334 sf5354 (P6a)

5402 Shank fragment, broken at both ends, one end bent up. D.2.1, L.47mm 4787 sf5456 (P6a)

5403 Shank fragment. D.1.7, L.27.5mm 2325 sf5683 (P6a)

5404 Shank fragment, broken at both ends. D.2.4, L.25mm 5375 sf6804 (P6a)

5405 Shank fragment, broken at both ends. D.2.1, L.21.1mm 1075 sf8169 (P6a)

5406 Fragment, head heavily corroded, probably broken off, shank with swelling, extreme tip missing. D.1.9, L.53.3mm 5305 sf5562 (P6b)

5407 Shank fragment. D.2.1, L.27.3mm 5242 sf4537 (P6a/b)

5408 Shank fragment, bent up into U-shape. D.1.6, L.43.2mm 10007 sf2370 (P6z)

5409 Shank fragment. D.2.9, L.17.9mm 7065 sf5412 (P6z)

5410 Shank fragment. D.1.6, L.34.4mm 1448 sf3833 (P7a)

Ear-rings

5411 Circular section, tapering to both ends which are rounded and twisted up. Perhaps simply a length of wire. D.1.8, L.56.2mm 4711 sf5601 (P3z)

5412 Oval, of circular section, tapering to ends which are not joined. D.2.4, L.16.7, W.14.4mm 2417 sf7028 (P4b) (*Fig.668*)

5413 Penannular, of circular section, tapering to ends. D.21mm; section: D.3mm 5348 sf5805 (P4z) (*Fig.668*)

5414 Penannular, of circular section, tapering to ends. D.22mm; section: D.3.3mm 5059 sf2407 (P8) (*Fig.668*)

Finger-rings

5415 Subcircular, incomplete, part of ring broken off close to coiled bezel. Made from a single length of wire, of circular section, the bezel formed by the ends of the wire being crossed and twisted outwards from the centre forming coils, the ends twisted around the ring to secure them. D.23.2mm; bezel: D.10.4mm; section: D.1.4mm 3137 sf4218 (P3b) (*Fig.668*)

5416 Subcircular, made from one length of wire of plano-convex section, wound round four times, and the ends wound spirally to form small bezel. The ring is decorated all over with small transverse grooves. D.24.3mm; wire: W.1.5, T.0.9mm 3334 sf4692 (P6a) (*Figs.668–9*)

Twisted wire rings

5417 Oval, incomplete, of rectangular section, ends looped together to form hoop, finished off by twisting around hoop, broken close to one loop. L.21.7, W.12.3, T.2.1mm 10072 sf6592 (P4z) (*Figs.668, 670*)

5418 Distorted by compression to suboval shape, of rectangular section, one end twisted around other in single twist. L.15.5, W.8.9, T.1.3mm; wire: W.0.6mm 1663 sf6595 (P6a) (*Fig.668*)

Pendant

5419 Subcircular, with attachment loop, made in one piece. Each side of the pendant is domed, and at the lower edge there are two tiny projections from one face which are folded over edge of other face to secure. D.12, L.16.6, T.6.3mm 10153 sf7162 (P3z) (*Fig.671*)

Tweezers

5420 Incomplete, only one arm surviving. The upper part of the arm is of plano-convex section and decorated with transverse incised lines. The arm broadens out into a triangular plate of rectangular section, incurved slightly at the extreme end and broken. L.50, W.19.8, T.1.9mm 1293 sf1166 (P4z) (*Fig.678*)

Nail

5421 Flat circular head, slightly torn, tapering shank. D.6.4, L.33.6mm 6402 sf8075 (P4b)

Rivets

5422 Biconical head, lower two-thirds of shank bent up at right-angles, extreme tip broken off. L.20.3, W.2.1, T.2mm; head: D.3.4mm 10130 sf6895 (P3z)

5423 Square head, slightly domed, with separate square perforated washer. L.4.5mm; washer: L.5.5, W.5.2, T.0.7mm 1143 sf810 (P4z)

5424 Subcircular head, two transverse grooves on one side of shank towards tip. L.8.3, W.1.9mm; head: D.3.7mm 4299 sf8147 (P4z) (*Fig.689*)

Stud head

5425 Hollow dome, centrally perforated. D.10.3, T.0.4mm 6247 sf6914 (P4z)

Binding strip

5426 Incomplete, formed from narrow strip of rectangular section which is slightly convex and broken at one end across a perforation. There is a second perforation towards the other end; from here the strip tapers and flattens to a point, and is slightly bent up. Below the lower perforation are three pairs of incised oblique notches. L.52, W.3.9, T.1.7mm 4847 sf6053 (P3c) (*Fig.691*)

Strips

5427 Fragment, broken transversely at both ends, one across a perforation. There is a rivet hole close to one side, with remains of a rivet. L.18.5, W.13.2, T.0.7mm 3367 sf4488 (P3c)

5428 Fragment, folded in half, both ends broken. A decorative groove runs along the edge on both faces, lines of punched holes along inside of grooves on one face. L.26.5, W.11.6, T.1.2mm; folded: T.6.2mm 2403 sf6679 (P4b) (*Fig.691*)

5429 Fragment, subrectangular, one end rounded, other end roughly broken. The strip is perforated close to the rounded end, and split from this hole to the end. L.17.3, W.7.2, T.0.6mm 2386 sf6888 (P4b)

5430 Fragment, shaped like a parallelogram, roughly broken at one end, decorated with incised line along each long edge. L.23.2, W.9.6, T.1.3mm 1143 sf681 (P4z)

Hook

5431 Incomplete, of subcircular section, with upper end of stem broken away, tapering to tip of hook. There are traces of mineralised wood on the upper part of the stem. D.1.3, L.14mm 10196 sf6482 (P3b) (*Fig.694*)

Key

5432 Incomplete, in two fragments, with short stem of circular section, hollow at bit end. Incomplete terminal of rectangular section, projecting perpendicularly from top of stem on both sides, broader on one side than other. The bit is incomplete and has two parallel wards in the lower edge. D.5.8, L.27mm; bit: L.13.8, W.10.1, T.3.3mm; terminal: W.7.3, T.3.8mm 3451 sf5079 (P3z) (*Fig.696*)

Unidentified object

5433 Incomplete, with stem of circular section, broken at one end, which curves up slightly. There is a flat circular terminal of rectangular section at the other end, perforated at centre. D.2.2, L.34mm; terminal: D.4.3, T.1.3mm 2413 sf7052 (P4b) (*Fig.706*)

Silver

Wire

5434 Six fragments, including two lengths twisted around each other, one with both ends broken, other with one broken end and one rounded end. Another fragment of wire, one end broken, other rounded, has broken off this. Two fragments of spirally twisted wire adjoin, one end rounded, other end flattened and slightly curved. Two other irregularly shaped fragments adjoin, each flattened at one end and having stem of subcircular section. Largest fragment: D.2.4, L.24.6mm 5554 sf7970 (P3b) (*Fig.610*)

Hook

5435 Garment hook, subcircular head with single perforation close to the top. At the lower end there is a small trapezoidal projection which tapers to form small hook with pointed tip. L.15.6mm; head: L.8.9, W.7.7, T.1.1mm; stem: W.2.2, T.1.2mm 4710 sf4519 (P6a) (*Fig.660*)

Finger-ring

5436 A septagonal hoop, each side an ovoid facet, one with cross in relief, another slightly damaged. D.22.1, W.5.9, T.2.1mm 1016 sf3 (P9) (*Figs.668–9*)

Gold

Waste and offcuts

5437 Wire length, irregularly bent into curves, tips of ends pinched off, with tiny loop towards one end, four slight twists irregularly spaced along length. D.0.3, L.243.1mm 10183 sf4802 (P3a)

5438 Wire fragment, one end twisted up in distorted figure-8, tips of both ends pinched off. D.0.3, L.11.8mm 5292 sf5040 (P3b) (*Fig.610*)

5439 Fragment of sheet, subrectangular, broken at one end across perforation, other end irregularly scalloped, sides irregular. L.6.9, W.2.4, T.0.4mm 10168 sf9689 (P3b)

Mount

5440 Incomplete, semi-circular, cut across a central perforation, with punched depressions around the circumference. The edge is folded up slightly on one side. D.5.2, T.0.1mm 1236 sf1002 (P4z) (*Figs.656, 658*)

Lead alloy

Run-off

5441 Three fragments. L.40.1, W.19.1, T.4.8mm 4847 sfs5952 and 8307; 4851 sf8711 (P3c)

5442 Four fragments. L.18, W.11.8, T.4.6mm 1163 sf8120; 1314 sf8143; 1292 sf8262; 1349 sf9349 (P3z)

5443 Fragment, with irregularly shaped sheet offcut attached. L.78.6, W.37.3, T.8mm 5376 sf6706 (P4b)

5444 Fragment, partially folded. L.43.4, W.29.3, T.9mm 1293 sf1674 (P4z)

5445 Fragment, formed around an object. L.41.6, W.37.5, T.9.4mm 10094 sf6856 (P4z) (*Fig.610*)

5446 Fragment, formed around a nail. L.19.1, W.15.8, T.3.6mm 7063 sf8351 (P4z)

5447 Fifteen fragments. L.36.7, W.30.7, T.8.7mm 1231 sf1617; 4920 sf5902; 5352 sf6192; 10099 sf6983; 5397 sf7523; 1253 sf8272; 3391 sf8342; 4876 sf8972; 1253 sf9299 (P4z)

Bars

5448 Fragment, of subsquare section, tapering to one end which is bent up. L.54.4, W.2, T.1.9mm 4788 sf6388 (P3z)

5449 Rectangular section, irregularly shaped, tapering to broken end, other end cut square, faces uneven, one with deep cuts, sides lipped. L.34.4, W.18.8, T.8.2mm 4852 sf6649 (P3z) (*Fig.610*)

Sheet

5450 Offcut, irregularly shaped, one end partially torn, two sides cut. L.27.6, W.18.1, T.4.1mm 10183 sf8563 (P3a)

5451 Offcut, subsquare, partially folded. L.25.6, W.10.3, T.4.1mm; folded: T.7.3mm 3137 sf8582 (P3b)

5452 Offcut, rectangular, twisted up at one end. L.13, W.3.2, T.0.9mm 4847 sf8341 (P3c)

5453 Offcut, subrectangular, ends bent up. L.35.4, W.4.1, T.2.6mm 3378 sf8374 (P3c)

5454 Offcut, subrectangular, ends twisted up. L.63.1, W.5.5, T.2.6mm 4848 sf5708 (P3z)

5455 Four offcuts, largest subtriangular, one end folded over, other bent up. L.51.4, W.14.9, T.3.3mm 1940 sf8364 (P3z)

5456 Offcut, subrectangular, all edges cut, one corner folded over. L.23.8, W.17.9, T.1.2mm; folded: T.2.5mm 1248 sf1552 (P4z)

5457 Offcut, irregularly shaped, two edges cut, one end bent up. L.35.8, W.11, T.3.5mm 1255 sf1565 (P4z)

5458 Offcut, rectangular, partially rolled up. L.40, W.19.5, T.4.4mm 1282 sf1585 (P4z)

5459 Offcut, rectangular, one edge and one corner folded in. L.33.6, W.15.6, T.0.5mm; folded: T.2.8mm 5236 sf6306 (P4z)

5460 Offcut, slightly twisted, one end rounded, other roughly broken. L.78, W.10.4, T.1.2mm 4849 sf6373 (P4z)

5461 Offcut, partially rolled up. L.8.5, W.2.6, T.0.9mm 4775 sf6447 (P4z)

5462 Offcut, rectangular, ends bent up. L.52.4, W.4.3, T.2.4mm 5348 sf6754 (P4z)

5463 Offcut, irregularly shaped, partially bent. L.29.3, W.7.1, T.2.4mm 10142 sf7079 (P4z)

5464 Offcut, irregularly shaped, folded. L.22.8, W.12.5, T.1mm; folded: T.5.6mm 5540 sf7527 (P4z)

5465 Offcut, rectangular, rolled up into irregular cylinder, overlapping edge visible. D.10.6, L.20mm; sheet: T.2.1mm 10124 sf8714 (P4z)

5466 Offcut, subrectangular, one edge cut, others roughly broken. L.22, W.19.1, T.1mm 3351 sf9097 (P4z)

5467 Offcut, irregularly shaped, ends cut, folded up. L.26.7, W.22, T.1mm; folded: T.5.7mm 10072 sf9300 (P4z)

5468 Offcut, irregularly shaped, partially folded, ends cut, lines scored in one side. L.24.4, W.19.1, T.2.7mm; folded: T.4.9mm 4849 sf9303 (P4z)

5469 Fragment, irregularly shaped, partially folded. L.32.4, W.28.6, T.2.1mm; folded: T.10.4mm 2458 sf7561 (P3b)

5470 Fragment or offcut, partially rolled up, one end left open. L.39, W.16.4, T.11.5mm 3360 sf8400 (P3b)

5471 Fragment, irregularly shaped, all sides roughly broken, one end folded up. L.27.5, W.18.7, T.2mm; folded: T.4.1mm 3360 sf8418 (P3b)

5472 Fragment, irregularly shaped, all edges roughly broken. L.51, W.30.9, T.1.1mm 1302 sf1787 (P3z)

5473 Fragment, folded, one side torn, both ends compressed. L.46.4, W.13.4, T.2mm; folded: T.9.5mm 2266 sf6618 (P4a)

5474 Fragment, irregularly shaped, all edges broken. L.18.7, W.14, T.2.6mm 2472 sf8340 (P4a)

5475 Fragment, irregularly shaped, one edge folded in. L.35.2, W.21.8, T.9.1mm; sheet: T.1.5mm 5352 sf6190 (P4z)

Strip

5476 Subrectangular, folded up and compressed, with two perforations. L.14.5, W.9.7, T.2mm; folded: T.6.5mm 1253 sf9301 (P4z)

Net sinkers

5477 Elongated ovoid shape, axial perforation, with tightly sealed longitudinal seam. D.9.7, L.27.4mm, Wt.12.9g 3350 sf4367 (P3b)

5478 Originally cylindrical but compressed to plano-convex section, with longitudinal seam. D.10.8, L.30.1mm, Wt.10.5g 3360 sf5979 (P3b)

5479 Subcylindrical, axial perforation, with longitudinal seam. D.12.9, L.46.5mm, Wt.31.5g 4321 sf1175 (P3z)

5480 Elongated ovoid shape, axial perforation, with tightly sealed but ragged longitudinal seam. D.7.3, L.21mm, Wt.4.3g 1238 sf904 (P4z) (*Fig.637*)

5481 Cylindrical, axial perforation, ragged overlapping edge visible. D.8.5, L.26.2mm, Wt.6.5g 5279 sf4990 (P4z)

5482 Cylindrical, with longitudinal seam, one end sealed, other end open. D.11.5, L.61.9mm, Wt.38.6g 10141 sf5120 (P4z) (*Fig.637*)

5483 Elongated ovoid shape, axial perforation, longitudinal seam. The object is distorted by a deep cut at one end. D.13.7, L.39.2mm, Wt.30.3g 3391 sf6636 (P4z)

Weights

5484 Discoidal, of irregular thickness, with large axial perforation. D.18, L.7.6mm, Wt.11.7g; perforation: D.6.3mm 10183 sf5721 (P3a) (*Fig.637*)

5485 Discoidal, of irregular thickness, perforated slightly off-centre. D.25.6, T.5.1mm, Wt.15g 4849 sf8806 (P4z)

Pendant

5486 Shaped as an axe-head, with asymmetrically expanding blade. Irregular convex cutting edge, subcircular socket, incised design on neck. L.30.4, W.19.8, T.8.5mm 5131 sf3827 (P6c) (*Fig.671*)

Unidentified objects

5487 Cylindrical, with flattened faces. D.12.3, H.8.5mm 4889 sf6299 (P4z)

5488 Subcylindrical stem, one end hammered flat and half folded in on itself, half bent up, other end roughly broken. D.11.2, L.24.6mm; hammered end: D.17.9, T.2.3mm 1253 sf8285 (P4z)

Shell

5489 Fragment of oyster, irregularly shaped, with off-centre drilled perforation. L.10.6, W.7.5, T.0.8mm 10196 sf6484 (P3b)

5490 Two fragments of oyster, both of irregular shape and with several perforations. L.26.5, W.17, T.3.1mm 2267 sf6621 (P3b)

5491 Fragment of lower valve of oyster, irregularly shaped, with square perforation just off-centre. L.54.5, W.41.2, T.5.2mm 4888 sf6027 (P3z)

5492 Fragment of upper valve of oyster, subcircular, with off-centre circular perforation. L.45.7, W.35.8, T.3.3mm 3391 sf6633 (P4z)

Bone

Tooth plate blanks

5493 Subrectangular shape and section. Also two offcuts of rectangular section, one square and the other subrectangular. Tooth plate blank: L.39.6, W.15.6, T.3.8mm 5319 sf6881 (P3a)

5494 Rectangular shape and section, bent and with a transverse crack close to one end. L.33.2, W.15.8, T.2.8mm 10139 sf4348 (P3c)

5495 Rectangular, of subrectangular section. L.34.4, W.15, T.2mm 10139 sf4349 (P3c) (*Fig. 620*)

5496 Unfinished, subrectangular, of subplano-convex section, all edges roughly cut. L.34.4, W.18.8, T.2.6mm 10139 sf4350 (P3c)

5497 Incomplete, broken laterally, subtrapezoidal, of subrectangular section, both ends chamfered. L.29, W.10.3, T.2.3mm 3362 sf4629 (P3c)

5498 Fragment, of subrectangular section, irregularly shaped, one edge broken across a perforation. Also tooth plate trimming, triangular. Tooth plate blank: L.19.2, W.12.8, T.2.5mm 7080 sf6868 (P4z)

5499 Incomplete, of subrectangular section, broken obliquely through a rivet hole, the lower end bevelled from one face. L.32.1, W.14.6, T.2.2mm 3342 sf4436 (P6a) (*Fig. 620*)

5500 Incomplete and unfinished, of rectangular section, broken obliquely down one edge, other edge and ends cut square. L.35.4, W.12.4, T.2.6mm 4710 sf4528 (P6a)

5501 Incomplete, of rectangular section, broken laterally across a rivet hole, both ends partially cut and partially broken. A scored line runs longitudinally alongside the rivet hole. Also offcut, irregularly shaped and of rectangular section, one end cut. Tooth plate blank: L.35.2, W.17, T.2.6mm 4716 sf5085 (P6a)

Connecting plate blanks

5502 Fragment, of subtrapezoidal section, subrectangular, both ends broken, longitudinal facet cut along one edge of upper face. L.30.3, W.13.5, T.3mm 5319 sf8949 (P3a) (*Fig. 620*)

5503 Fragment, of rectangular section, one end cut square, the other roughly broken, back obliquely angled down to this end, two rivet holes. L.57.7, W.10.3, T.3.4mm 5587 sf8676 (P3b)

5504 Fragment, of subtrapezoidal section, subrectangular, longitudinal facet cut along one edge, both ends broken. Also two subrectangular offcuts. Connecting plate blank: L.38.4, W.11.3, T.2.9mm 5587 sf8691 (P3b)

5505 Fragment, of rectangular section, subrectangular, back obliquely angled, roughly broken at both ends. L.37.9, W.13.7, T.3mm 3137 sf8782 (P3b)

5506 Fragment, of subtrapezoidal section, irregularly shaped, longitudinal facet cuts along both edges on upper face, both ends broken. L.70.8, W.20.7, T.4mm 2453 sf8951 (P3b)

5507 Fragment, of plano-convex section, one edge and one end broken across rivet hole. L.15.6, W.9.8, T.3.4mm 5376 sf9427 (P4b)

5508 Fragment, of plano-convex section, subrectangular, back obliquely angled, one end partially cut and partially broken, the other end roughly broken. L.36.5, W.14.2, T.3.2mm 5348 sf5988 (P4z)

5509 Subplano-convex section, subrectangular, one end partially sawn and partially broken, the other roughly broken. There is a perforation close to the partially sawn end. L.71.1, W.16.5, T.3.4mm 5420 sf6487 (P4z)

5510 Fragment, of plano-convex section, subrectangular, longitudinal facet cuts along both edges, both ends broken. L.51.6, W.12.7, T.3.1mm 5261 sf7689 (P6a)

Offcuts

5511 One hundred and thirty-one offcuts of split rib. Also 46 tooth plate trimmings, trapezoidal and rectangular. Largest offcut: L.81.4, W.18.8, T.3mm 10196 sf6480 (P3b) (*Figs. 620–1*)

5512 Rectangular section, subtrapezoidal, one end cut, other roughly broken. L.24, W.18.4, T.2.1mm 10139 sf4351 (P3c)

5513 Rectangular section, subtriangular, with two cut edges, other roughly broken. L.29.1, W.9.9, T.4.6mm 10139 sf4352 (P3c)

5514 Rectangular section, irregularly shaped, three edges cut, other roughly broken. L.25.9, W.16.8, T.2.6mm 10139 sf4354 (P3c) (*Fig. 620*)

5515 From end of long bone, sawn off transversely, irregularly shaped, some compact tissue removed. L.40.8, W.28.8, T.25.7mm 4869 sf5893 (P3z)

5516 From end of split long bone, one end cut. Also two irregularly shaped offcuts. Long bone offcut: L.62, W.34.7, T.29.8mm 4913 sf6065 (P3z)

Horncore offcuts

5517 Subcircular section, sawn off at base, tip roughly broken off. D.36.3, L.123.4mm 2457 sf7999 (P3b)

5518 Irregular section, partially sawn and partially broken off at base, tip roughly broken. L.56.7, W.33.8, T.18.1mm 2458 sf9434 (P3b)

5519 Rectangular shape and section, sawn off at one end, other end roughly broken. L.58.6, W.15.8, T.5.3mm 1105 sf881 (P3z) (*Fig. 619*)

5520 Subcircular section, partially sawn and partially broken off at base. D.17.4, L.76.4mm 4913 sf5982 (P3z)

5521 Irregular section, in three adjoining fragments, sawn off at base, rest roughly broken. L.49.7, W.23, T.15.4mm 4852 sf6800 (P3z)

5522 Medullary tissue, of trapezoidal section, subrectangular, one end cut, other end and edges roughly broken. L.20.6, W.20, T.9.2mm 1234 sf832 (P4z)

Toggle

5523 Toggle or musical instrument, made from pig metatarsal unmodified apart from a central transverse perforation. L.64.6, W.14.6, T.14.1mm 10028 sf9519 (P4z) (*Fig.623*)

Point

5524 Made from modified cow metatarsal, the upper end sawn off transversely and the interior hollowed out to form a socket which runs the length of the bone. At the tip there is an oblique cut, and part of the upper end is broken away. A longitudinal crack runs between both ends. D.39.4, L.119.5mm 10183 sf6040 (P3a) (*Fig.623*)

Spindle whorls

5525 Made from cattle femur caput, chopped from bone, drilled hole, edges knife-trimmed. D.41.9, H.21.5mm, Wt.14.6g 4242 sf1577 (P4z) (*Fig.625*)

5526 Made from cattle femur caput, chopped during butchery, with off-centre knife-cut hole, edges knife-trimmed, partially charred. D.43.9, H.21.4mm, Wt.14.3g 3342 sf4185 (P6a)

Pin-beater

5527 Incomplete, of subcircular section, one end broken away, tapering to other end, extreme tip of which has been broken off. D.8.6, L.62.4mm 4651 sf3726 (P6a) (*Fig.626*)

Handle

5528 Fragment, originally of circular section, subrectangular, roughly broken away at one end and both sides, the tang end surviving. It is decorated with the substantial remains of a longitudinal field and a small part of a second. The surviving field contains two crouching animals with long ears and sub-triangular feet, one gripping the other's back leg in its jaw. The decoration belongs to Salin's style II. L.36.5, W.12, T.6.3mm 3377 sf4618 (P3c) (*Figs.633–4*)

Gorge

5529 Irregular section, tapering to both ends from the centre, one end with a sharp point, the other with the tip broken, shaped by longitudinal knife cuts. L.70.7, W.8.1, T.7.9mm 4888 sf5753 (P3z) (*Fig.637*)

Pins

Note: Bone type has been identified wherever possible

5530 Made from a pig's fibula. Subrectangular head, with large suboval perforation, shank of subplano-convex section, tapering to flattened tip. L.100.2, W.7.6, T.3.7mm 4832 sf5567 (P2) (*Fig.667*)

5531 Incomplete, upper end broken off, shank of irregular section, tapering to point, shaped by facet cuts. L.71.1, W.6.6, T.3.8mm 2480 sf7994 (P3a)

5532 Shank fragment, upper end broken off, of suboval section, tapering to a point, with some longitudinal faceting, extreme tip broken off. L.25.3, W.4.2, T.3mm 3350 sf4574 (P3b)

5533 Shank fragment, upper end roughly broken off, of subplano-convex section, flattening and tapering towards tip which is shaped by longitudinal facet cuts. L.65.5, W.5.8, T.3.8mm 10168 sf4823 (P3b)

5534 Made from a cattle long bone shaft. Flat head, slightly expanded, with off-centre perforation, the top of the head modified, being irregularly chamfered. The shank, which tapers to a point, is of subcircular section with several areas of swelling; all surfaces are highly polished. L.92.5, W.9.2, T.4.8mm 7114 sf4904 (P3b) (*Fig.667*)

5535 Incomplete, head roughly broken away through a perforation. The shank is of irregular section, faceted longitudinally on one face, the other face unmodified; it tapers gradually to incomplete tip. L.83.7, W.9.6, T.4.9mm 7097 sf4919 (P3b)

5536 Shank fragment, roughly broken at both ends, of circular section, tapering gradually to one end. D.5.6, L.33.8mm 10168 sf6700 (P3b)

5537 Made from a pig's fibula. Expanded and perforated head, tapering to shank which is of subplano-convex section; shank has longitudinal facet cuts on one side, extreme tip broken off. L.97.6, W.12.5, T.4.8mm 2501 sf8034 (P3b) (*Fig.667*)

5538 Made from a pig's fibula. Incomplete, head broken across a perforation. The shank, of suboval section, tapers gradually to a point; all surfaces are highly polished. D.5.9, L.85.4mm 5715 sf8394 (P3b) (*Fig.667*)

5539 Made from a pig's fibula. Incomplete, head broken across subcircular perforation, shank of irregular section which tapers to tip, extreme tip broken off. L.110.8, W.11.5, T.4.2mm 5715 sf8953 (P3b) (*Fig.667*)

5540 Shank fragment, upper end broken off, of irregular section, tapers gradually to a point, longitudinally faceted on one face. L.35.4, W.5.5, T.3.3mm 10196 sf9324 (P3b)

5541 Shank fragment, upper end broken off, of oval section, tapering to tip, longitudinally faceted. L.66.9, W.5.6, T.3.3mm 3362 sf4587 (P3c)

5542 Made from a cattle long bone shaft. Perforated subrectangular head, top rounded slightly, shank of subrectangular section, longitudinally faceted on back face, slight swelling before tapering to tip. It is decorated on the front face below the perforation with a field, defined by three transverse incised lines above and below, containing three saltires; on the back face there are four incised saltires close to the tip. L.93.7, W.10, T.11mm 4847 sf6052 (P3c) (*Fig.667*)

5543 Made from a pig's fibula. Incomplete, part of shank broken off, head slightly expanded, top rounded and perforated, tapering to the shank which is of circular section. D.5.8, L.32.8, W.10mm 5571 sf7544 (P3c)

5544 Headless, the upper end cut flat. The shank, of circular section, is longitudinally faceted along its full length and tapers gradually to a point; all surfaces are highly polished. D.3.3, L.62.8mm 1203 sf717 (P3z) (*Fig.667*)

5545 Shank fragment, upper end broken off, of circular section, hipped, facet cut to tip. D.2.2, L.17.3mm 1346 sf1569 (P3z) (*Fig.667*)

5546 Made from a pig's fibula. Incomplete, tip broken off, expanded head with flattened top and perforation. The shank is of oval section, longitudinally faceted, and polished. L.67.6, W.12, T.3.4mm 10161 sf5062 (P3z) (*Fig.667*)

5547 Shank fragment, upper end broken off, of circular section, tapering to a point. D.2.2, L.27.6mm 4788 sf6394 (P3z)

5548 Incomplete, part of the shank and tip broken off, headless, the upper end cut square, shank of circular section. D.2.8, L.20.3mm 1106 sf8115 (P3z)

5549 Incomplete, part of shank broken off. Expanded and perforated head with rounded top, tapering to shank of circular section. The head is decorated on both faces, on one with incised transverse lines above and below perforation, on other with ring-and-dot motifs around perforation. L.66.5, W.16, T.4.8mm 5389 sf6141 (P4b) (*Fig.667*)

5550 Incomplete, upper end broken off, shank of subcircular section, tapering to tip. D.5.2, L.62mm 6404 sf8082 (P4b)

5551 Incomplete, part of shank and tip broken away. The head is subrectangular in shape and section, with a subrectangular perforation; the shank is of subcircular section. D.4.4, L.38.5mm; head: L.11.1, W.7.4, T.2.4mm 1258 sf1271 (P4z) (*Fig.667*)

5552 Made from a pig's fibula. Subtriangular head, the top of which is unmodified, with circular perforation. The shank, of suboval section, curves and tapers close to tip which has been broken off. L.100.7, W.13, T.4.8mm 1255 sf1525 (P4z) (*Fig.667*)

5553 Made from a pig's fibula. Incomplete, part of the head broken across a perforation, tapering to shank of subcircular section, tip broken off. D.4.2, L.55.6, W.8.4mm 5525 sf7158 (P4z)

5554 Shank fragment, broken at both ends, of subcircular section and longitudinally faceted. D.4.7, L.27.8mm 5348 sf7405 (P4z)

5555 Shank fragment, broken at both ends, of circular section, tapering to one end. D.7.4, L.30.8mm 4299 sf8952 (P4z)

5556 Expanded, flat, circular head, with large, subcircular perforation; shank of subcircular section, tapering to tip. D.4.4, L.94.9mm; Head: D.10.5mm 1211 sf744 (P6a) (*Fig.667*)

5557 Shank fragment, upper end roughly broken off, of subcircular section, tapering to tip, longitudinally faceted. D.4.6, L.36.2mm 4710 sf4602 (P6a)

5558 Made from a fibula or long bone shaft. Incomplete, circular perforated head, lower part of shank and tip broken off. The shank is of oval section and the pin is polished on all faces. L.47.4, W.9.8, T.3.8mm 3352 sf4966 (P6a) (*Fig.667*)

5559 Incomplete, part of shank and tip broken off, subrectangular head, sides shaped, top unmodified, with subcircular perforation, shank of subcircular section. L.50.5, W.6.8, T.3.5mm 2296 sf5540 (P6a) (*Fig.667*)

5560 Shank fragment, upper end broken off, of subcircular section, longitudinally faceted and tapering gradually to incomplete tip. D.5.3, L.56.8mm 4802 sf5591 (P6a)

5561 Shank fragment, upper end broken off, of circular section, tapering to tip. D.5.8, L.100mm 10004 sf4409 (P6a/b) (*Fig.667*)

5562 Shank fragment, upper end and part of shank broken off, of subcircular section, longitudinally faceted, tapering gradually to tip. D.4.9, L.36.9mm 2205 sf5273 (P6a/b)

5563 Made from a pig's fibula. Incomplete, head broken across perforation, shank of suboval section, tip roughly broken off. L.57.1, W.11.1, T.4.1mm 2147 sf5490 (P6c)

5564 Made from the long bone shaft of a large mammal. Head of subrectangular shape and section, top of head unmodified, with an oval perforation. The shank is of subcircular section with longitudinal faceting, and is hipped before tapering to tip. L.63.4, W.9.4, T.4.4mm 7031 sf2491 (P7a) (*Fig.667*)

5565 Made from a pig's fibula. Incomplete, originally in three adjoining pieces, top of head rounded but incomplete, with a subrectangular perforation. The shank, of suboval section, tapers to lower end, tip broken off. L.66.8, W.7.4, T.3.4mm 10000 sf5249 (unstratified) (*Fig.667*)

5566 Shank fragment, both ends broken off, of subcircular section, with longitudinal faceting, tapering slightly towards lower end. D.4.1, L.74mm 5000 sf5853 (unstratified)

5567 Made from a pig's fibula. Slightly expanded head, top rounded, with circular perforation, shank of subtrapezoidal section, longitudinally faceted and tapering towards incomplete tip. L.84.7, W.8.5, T.3.3mm 10000 sf5911 (unstratified) (*Fig.667*)

Spoon

5568 Incomplete, handle broken off, bowl oval and slightly dished. The line of the handle extends on the underside of the bowl, tapering and petering out towards other end. L.24.9, W.13, T.4.5mm 4914 sf6136 (P3z) (*Fig.678*)

Combs

Single-sided

5569 Handled, incomplete, the end plate and part of the first tooth plate survive, broken transversely across one of three iron rivets, five teeth per 10mm. The handle is formed from two tapering plates of subplano-convex section, cut in on the inner faces to form a slot, and with a suspension hole close to the end. A sliver of bone is wedged in to the slot on the lower edge next to the end plate. A curved projection from the end plate back has been cut in half. The handle is decorated on both sides with unmatched bands of incised transverse lines which are perforated by the suspension hole. The tooth plate section is decorated with zig-zag lines and ring-and-dot motifs on the front face, and a transverse row of ring-and-dot and double saltires with ring-and-dot between them on the reverse. The end plate is also decorated with ring-and-dot. Handle: L.105.9, W.21.3, T.22mm; end plate: L.44.9, W.22.8, T.2.6mm 4847 sf6056 (P3c) (*Figs. 679–80*)

5570 Handled, incomplete, with a fragment of the end plate surviving, broken transversely across an iron rivet, all teeth missing. The handle is made up of two riveted plates, of plano-convex section, with the end cut square, and stepped cuts on inner faces to accommodate the tooth plates. The handle has two fields of decoration, each defined by three incised transverse lines, the one at the end filled with incised zig-zags of three lines, the other with incised saltires of double lines. L.53, W.23.3, T.14.5mm 3391 sf6541 (P4z) (*Fig. 679*)

5571 Handle fragment, of plano-convex section, both ends broken, one across a rivet hole, with obliquely angled back, and stepped cuts on the inner face at one end. L.41.6, W.19.3, T.7.2mm 3354 sf8924 (P3c) (*Fig. 679*)

5572 Seven fragments from the same comb, including parts of both end plates with connecting plate fragments attached, the projecting backs of the end plates angled down. There are three fragments of connecting plate, of plano-convex section, with tooth sawing marks on lower edge, decorated with pairs of incised transverse lines, and two tooth plate fragments, one with a horizontal back and three teeth, the other with a convex back and all teeth missing. End plate: L.29.3, W.16, T.2.4mm; largest connecting plate fragment: L.28.9, W.13.1, T.3.6mm 5697 sf7885 (P3a)

5573 End plate, one corner broken off, with a horizontal back and straight vertical outer end. The teeth begin about half way along the length, becoming progressively longer away from the outer end. L.32.5, W.27.6, T.2.5mm 5587 sf8694 (P3b) (*Fig. 679*)

5574 End plate, incomplete, broken at outer end, several teeth broken off, with rivet hole at inner end, the back obliquely angled but incompletely trimmed. The teeth start well in from the outer end and are regularly spaced and cut, seven teeth per 10mm. L.26.6, W.19.8, T.2.3mm 2267 sf5432 (P3b)

5575 End plate, incomplete, broken transversely at the inner end across a curved projection above a perforation, the outer end slightly convex. The teeth begin some way in from the outer end, are cut progressively longer and are slightly curved. L.36.4, W.14.5, T.2.8mm 3388 sf6383 (P4z) (*Fig. 679*)

5576 Tooth plate, incomplete, with all ten teeth broken off, single surviving iron rivet towards one end, back obliquely angled, five teeth per 10mm. L.21.1, W.19.8, T.2.5mm; rivet: L.14.7mm 1292 sf1778 (P3z)

5577 Tooth plate, incomplete, broken transversely at one end, all teeth broken off. The back is obliquely angled, its top decorated with cross-hatched incised lines, estimated seven teeth per 10mm. L.26.4, W.9, T.2.9mm 4694 sf5632 (P6a)

5578 Tooth plate, incomplete, one end broken transversely, all teeth broken off, estimated six teeth per 10mm. L.20.2, W.8.6, T.2.4mm 5312 sf5664 (P6b)

5579 Tooth plate, incomplete, ten teeth broken off, five surviving, back obliquely angled, six teeth per 10mm. L.28.5, W.27, T.2.7mm 5289 sf4994 (P6a/b) (*Fig. 682*)

5580 Connecting plate fragment, of plano-convex section, both ends broken across rivet holes, back obliquely angled. There are tooth sawing marks along the lower edge and the plate is decorated with incised cross-hatching and transverse lines. L.31.9, W.13.4, T.2.9mm 1940 sf8321 (P3z) (*Fig. 682*)

5581 Connecting plate fragment, of plano-convex section, both ends broken through rivet holes, and part of the lower edge broken away. The back is obliquely angled, and there are regularly spaced tooth sawing marks along the lower edge. The fragment is decorated with incised cross-hatching. L.32.7, W.10.2, T.2.5mm 7075 sf4825 (P4z)

Double-sided

5582 Tooth plate, incomplete, originally with ten and nine teeth. Teeth are regularly cut and evenly spaced, of equal size on both sides, and there are scribed marking out lines on one face along both edges, four teeth per 10mm on both sides. L.47.9, W.21.5, T.3mm 3187 sf3204 (P6b) (*Fig. 683*)

5583 Connecting plate fragment, of plano-convex section, roughly broken at both ends across rivet holes, back obliquely angled. There are similarly spaced tooth sawing marks on both edges. L.26.5, W.13.2, T.2.4mm sf7377 (unstratified)

Indeterminate form

Teeth

5584 Broken at upper end. L.14.5, W.2, T.1.9mm 4182 sf1531 (P3b)

5585 Broken at upper end. L.19, W.3.7, T.1mm 4849 sf6310 (P4z)

Tooth plates

5586 Incomplete, square, both ends cut, one across rivet hole. L.13.4, W.13.4, T.2.4mm 4716 sf5378 (P6a)

5587 Fragment, lower edge broken across rivet hole, the other edges cut square, all teeth broken off. L.9.3, W.7.2, T.4mm 4680 sf9374 (P6a)

Decorated connecting plates

5588 Three fragments, all from plate ends, of plano-convex section, broken across rivet holes. Two are decorated with transverse incised lines. L.16.5, W.13.8, T.3.4mm 10196 sf6485 (P3b)

5589 Fragment, of subrectangular section, ends and edges roughly broken, one edge across rivet hole. Plate decorated with pairs of transverse incised lines. L.25, W.4, T.2.9mm 3362 sf4640 (P3c)

5590 Fragment, of rectangular section, back obliquely angled, tapering from one end which is roughly broken to other which has rivet hole close to it. The fragment is decorated with four pairs of transverse incised lines. L.44, W.11.4, T.1.9mm 3361 sf6086 (P3c) (*Fig.685*)

5591 Fragment, of plano-convex section, broken at both ends, decorated with two pairs of transverse incised lines. L.9.3, W.6.9, T.2mm 5384 sf6432 (P4d)

5592 Fragment, of plano-convex section, trapezoidal, cut away on three edges, the other broken away, decorated with transverse incised lines. L.7.5, W.5.1, T.1.8mm 4280 sf1150 (P4z)

5593 Fragment, of plano-convex section, irregularly shaped, broken laterally across rivet hole and at both ends. The fragment is decorated with pairs of transverse incised lines. L.36.5, W.6, T.3.4mm 7104 sf4408 (P4z)

5594 Fragment, of plano-convex section, back obliquely angled, both ends broken across rivet holes. The fragment is decorated with bands of two transverse incised lines. L.20.1, W.9.6, T.2.2mm 5540 sf7526 (P4z)

5595 Fragment, of plano-convex section, back obliquely angled, roughly broken at one end, other end cut square. There is a rivet hole close to one end, and the fragment is decorated with transverse incised lines. L.25, W.9.4, T.2mm 5422 sf7951 (P4z)

5596 Fragment, of plano-convex section, back obliquely angled, both ends broken, one across rivet hole. The fragment is decorated with transverse incised lines. L.10.9, W.8.3, T.2.4mm 3351 sf9405 (P4z)

5597 Fragment, of plano-convex section, broken laterally and transversely, decorated with incised transverse lines. L.9.8, W.5, T.3.6mm 3352 sf9943 (P6a)

5598 Fragment, of subrectangular section, back obliquely angled, tapering slightly from one end, both ends broken. The fragment is decorated with pairs of transverse incised lines. L.28, W.13, T.3.4mm 3161 sf2971 (P7a) (*Fig.685*)

5599 Fragment, of plano-convex section, back obliquely angled, broken at both ends across rivet holes. The fragment is decorated at one end with two pairs of transverse incised lines. L.30.1, W.15, T.3.4mm sf8053 (unstratified)

Undecorated connecting plates

5600 Fragment, of plano-convex section, back convex, roughly broken at one end, tapering to other end which has been cut square. There is a rivet hole close to the cut end. L.67.5, W.14.2, T.2.3mm 10180 sf5329 (P3a) (*Fig.685*)

5601 Two fragments, each of plano-convex section and broken at both ends, at one end across rivet holes. L.47.1, W.13.3, T.2.3mm 10196 sf9962 (P3b)

5602 Fragment, of plano-convex section, back obliquely angled, tapering from broken end to other which is cut square. There is a rivet hole close to cut end. L.40.5, W.11.9, T.2mm 3362 sf4520 (P3c) (*Fig.685*)

5603 Fragment, of plano-convex section, back obliquely angled, one end and one side cut, other end broken across rivet hole. There is a second rivet hole close to the cut end. L.27.6, W.14, T.2.4mm 3407 sf4864 (P4z)

5604 Fragment, of rectangular section, back obliquely angled, one end broken across rivet hole, tapering from broken end to other which is cut square. L.48.3, W.9.8, T.2.4mm 5420 sf6497 (P4z)

5605 Fragment, of plano-convex section, one edge broken across a rivet hole, both ends cut square. L.15.1, W.4.9, T.2.2mm 5507 sf9426 (P4z)

5606 Fragment, of plano-convex section, back convex, tapering from one end, both ends roughly broken. There is a single rivet hole near the lower edge close to one end. L.52.2, W.12.3, T.2.9mm 1237 sf1004 (P6a)

5607 Fragment, of plano-convex section, one end cut at oblique angle, the other broken across a rivet hole. There is a second rivet hole towards the cut end. L.60.8, W.8.7, T.2.4mm 3335 sf4369 (P6a)

5608 Fragment, of plano-convex section, irregularly shaped, one end and one edge roughly broken, other end cut across a rivet hole. L.32.3, W.12.5, T.2.9mm 2180 sf5220 (P6d)

Comb case

5609 Plate of subplano-convex section, subrectangular, tapering slightly to one end which is cut square, other with rounded corners. Close to the squared end is a slot formed by three interconnecting circular perforations; the other end has a perforation. The lower face is smooth, the upper face is decorated with an axial line of incised ring-and-dot motifs, and incised cross-hatching along both edges. L.101.3, W.20.8, T.6mm 9100 sf6996 (unstratified) (*Fig.686*)

Skates

5610 Made from a horse metapodial. Upswept and pointed toe at distal end, an axial heel hole drilled at the proximal end. A longitudinal facet cut runs the length of the skate on anterior face, and cancellous tissue is visible at the distal end. L.248.9, W.41, T.28mm 2459 sf7870 (P4b) (*Fig.688*)

5611 Made from a horse metatarsal. Upswept and pointed toe at distal end, large axial heel hole at proximal end. A longitudinal facet cut runs the length of the skate on the anterior face, and cancellous tissue is visible at the distal end. L.255.9, W.52.9, T.33mm 2459 sf8168 (P4b) (*Fig.688*)

Sword

5612 Pommel guard, subelliptical, with sides straight in the centre, the ends rounded and downswept as a result of angular facet cuts. There is an axial slot formed by interconnected perforations, with traces of a square plate around it on the upper face, which is worn smooth. L.72, W.24.5, T.8.5mm 2453 sf8047 (P3b) (*Fig.702*)

Antler

Pedicles

5613 Still attached to skull fragment, burr sawn off. L.78.5, W.75, T.32.3mm 4888 sf9562 (P3z) (*Fig.617*)

5614 Sawn off at base, sides knife-trimmed all round, the antler naturally lost. Also offcut of medullary tissue, subrectangular, of triangular section. Pedicle: L.48.4, W.46.6, T.29.5mm 5395 sf6252 (P4z) (*Fig.617*)

5615 Fragment, still attached to skull fragment, burr sawn off and two sides trimmed. Also three tooth plate trimmings, trapezoidal. Pedicle: L.43.3, W.29, T.26.9mm 1075 sf180 (P6a)

5616 Offcut, of rectangular section, subsemicircular, both faces sawn at two levels and the antler roughly broken off. The edges have been knife-trimmed all round. D.55.6, T.21.5mm 3342 sf4201 (P6a) (*Fig.617*)

5617 Offcut, incomplete, originally subdiscoidal, of irregular thickness, broken in half across a central perforation. One face has been cut flat and is worn, the other is cut and partially broken away. D.41.7, T.7.6mm 3342 sf4202 (P6a)

Burrs

5618 Slightly broken on one edge, two beams sawn off. L.78.4, W.58.8, T.53.2mm 5319 sf7865 (P3a) (*Fig.617*)

5619 Incomplete, broken transversely, top face sawn flat where beam has been removed. D.57.5, T.18.9mm 7070 sf6735 (P3b)

5620 Beam removed by horizontal cuts, with an oblique cut at one edge. D.65.5, T.20.4mm 5587 sf8675 (P3b) (*Fig.617*)

5621 Incomplete, oblique cut has removed beam and one end of burr, sides trimmed. Also offcut of burr, irregularly shaped, two sides cut. Burr: L.55.5, W.41.5, T.26.1mm 5587 sf8688 (P3b) (*Fig.617*)

5622 Offcut, three sides cut, broken across one face. Also offcut of beam, of irregular shape and section, sawn off at base, two offcuts of medullary tissue, irregularly shaped, offcut of strip of compact tissue, subrectangular, partially sawn and partially broken at one end. Burr: L.49.6, W.39.5, T.19.5mm 5587 sf8690 (P3b)

5623 Two trimmings. Also two offcuts of medullary tissue, of triangular section, offcut of compact tissue, rectangular and of subrectangular section, and two shavings. Largest burr trimming: L.25.6, W.12.7, T.5.9mm 5587 sf8692 (P3b)

5624 Offcut, beam removed by an oblique cut, rest of burr broken off. L.37, W.26, T.14.3mm 3360 sf8760 (P3b)

5625 Offcut, of subplano-convex section, subsemi-circular, approximately two-thirds roughly broken off, beam removed by transverse cut. The upper face is slightly convex, with knife-trimming close to the break and on sides. D.46.5, T.14.8mm 4851 sf6084 (P3c) (*Fig.617*)

5626 Offcut, sawn off at base. Also tine tip, sawn off at base, two trapezoidal tooth plate trimmings, one shaving, one trimming of strip of compact tissue, rectangular, and an offcut of split beam, irregularly shaped. Burr offcut: L.22, W.19.7, T.10.5mm 4888 sf5776 (P3z)

5627 Beam removed on two sides, which are both partially cut and partially broken. D.71.1, T.63.8mm 1282 sf1117 (P4z)

5628 Incomplete, with oblique cuts across two sides from removal of beam and part of burr. L.48.2, W.46.8, T.27.6mm 5395 sf9954 (P4z)

5629 Offcut, sawn off across three faces, other faces trimmed. L.33.7, W.25.4, T.16.5mm 5375 sf7318 (P6a)

5630 Incomplete, with two sawn faces. L.46.5, W.43.5, T.32mm 5000 sf5970 (unstratified)

5631 Incomplete, oblique cut has removed beam and part of burr, edges trimmed. L.45.2, W.36.7, T.18.7mm 9100 sf8650 (unstratified)

Crown offcuts

5632 Semi-oval section, sawn off at base, upper face and one side partially sawn and partially broken where tines removed. A crack runs longitudinally close to one side. L.46, W.39.4, T.35mm 4911 sf5813 (P3z) (*Fig.617*)

5633 Two offcuts, larger partially sawn and partially broken off at base and on two sides, smaller sawn off at base. L.33.5, W.31.2, T.24.7mm 4888 sf9956 (P3z)

5634 Sawn off at base, and three tines removed. One tine sawn off, the other two partially sawn and partially broken off. L.68.6, W.59.2, T.46.9mm 4234 sf1439 (P6a) (*Fig.617*)

5635 Removed from just below junction of three tines, partially sawn and partially broken off, one tine largely broken away, extreme tips of the remaining two broken. One tine has been heavily knife-trimmed along one edge. L.46.2, W.38mm; largest tine: D.21.6, L.119mm 4679 sf3796 (P6a) (*Fig.617*)

5636 Sawn off at base, one tine partially broken off, with incised lines running up from base along tines. Also tine, broken off at base, extreme tip partially sawn and partially broken off. Crown offcut: D.33.2, L.105.1mm 5261 sf8327 (P6a) (*Fig.617*)

Tines

5637 Tip, split, sawn off at base across perforation, convex face longitudinally faceted. L.16.4, W.8.7, T.4.7mm 3381 sf7452 (P3b)

5638 Tip, split in half longitudinally, sawn off at base. D.10.4, L.25.3mm 5715 sf8025 (P3b) (*Fig.618*)

5639 Offcut, split, sawn off at base, with facet cuts on one side. It has been burnt. Also two offcuts of strips of compact tissue, triangular and trapezoidal. Tine offcut: L.26.2, W.24.1, T.16.4mm 5715 sf8028 (P3b)

5640 Tip, unmodified, partially sawn and partially broken at base. D.8.3, L.12.2mm 1292 sf1775 (P3z) (*Fig.618*)

5641 Unmodified, sawn off at base, broken longitudinally from base along half its length. D.21.5, L.107.2mm 4923 sf6293 (P3z) (*Fig.618*)

5642 Tip, partially sawn and partially broken off at base, with short longitudinal facet cuts on two sides at base. D.12.2, L.41.3mm 4852 sf6648 (P3z)

5643 Tip, partially split, sawn off at base, and extreme tip also sawn off. D.17, L.41.5mm 2446 sf7585 (P4a) (*Fig.618*)

5644 Tip, sawn off at base, extreme tip partially sawn and partially broken off. D.20.6, L.66.9mm 1293 sf1340 (P4z) (*Fig.618*)

5645 Tip, unmodified, sawn off from crown at base and across another face. L.71.3, W.37.8, T.22.1mm 4299 sf1588 (P4z) (*Fig.618*)

5646 Tip, partially sawn and partially broken off at base, longitudinal facet cuts on two faces. D.15.5, L.45.3mm 7087 sf4179 (P4z)

5647 Tip, sawn and partially broken off at the base, notched just above, longitudinally faceted on two sides with V-sectioned groove through one facet, and incomplete groove, which has cracked, through other. The point is naturally worn to form a wedge-shaped tip. D.15.9, L.42.3mm 10164 sf5189 (P4z) (*Fig.618*)

5648 Quadrant, partially sawn and partially broken off at base, tip also sawn off. L.53.6, W.17.6, T.11.2mm 1075 sf212 (P6a) (*Fig.618*)

5649 Tine tip, split, in two adjoining fragments, sawn off at base, extreme tip broken off, with a longitudinal facet cut on one side. Also a tooth plate trimming fragment, subrectangular. Tine tip: L.37, W.14.1, T.3.9mm 4710 sf4601 (P6a)

5650 Tip, sawn and partially broken off at the base, extreme tip roughly broken off. Two sides have been cut flat and deep V-sectioned grooves running whole length of tine have been cut on these faces, linked on the base by a crack from one to other. L.86.7, W.25.3, T.23mm 4802 sf5739 (P6a) (*Fig.618*)

5651 Unmodified, partially sawn and partially broken off at base. D.38, L.132.8mm 5429 sf7402 (P6a) (*Fig.618*)

5652 Tip, unmodified, sawn off at base. D.13.3, L.36.6mm 5302 sf7486 (P6b) (*Fig.618*)

5653 Offcut of split tine, of rectangular section, subrectangular, both sides and ends cut. L.46.6, W.14.4, T.3.9mm 2015 sf4335 (P6c)

5654 Tip, sawn off at base, extreme tip also sawn off. D.22.5, L.39.5mm 4429 sf2535 (P7b)

Beam offcuts

5655 Offcut of split beam, of biconvex section, subrectangular with both ends sawn. L.43.7, W.15.7, T.7.3mm 3464 sf6534 (P3a) (*Fig.618*)

5656 Offcut of split beam, of semi-circular section, rectangular, with both ends cut. L.33.6, W.24.5, T.10.4mm 2453 sf7768 (P3b)

5657 Offcut of beam quadrant, partially sawn and partially broken at base, tine sawn off from upper end. L.73.5, W.41.8, T.29.4mm 1106 sf323 (P3z) (*Fig.618*)

5658 Three offcuts of beam quadrant, ends sawn, outer compact tissue stripped off leaving medullary tissue. Also offcut of compact tissue, of trapezoidal section, one end cut, and two offcuts of strips of compact tissue, rectangular. Largest beam offcut: L.34, W.33.4, T.22mm 5395 sf6263 (P4z) (*Fig.618*)

Medullary tissue offcuts

5659 Subtrapezoidal section, irregularly shaped. Also tine tip, unmodified, partially sawn and partially broken off at base. Medullary tissue offcut: L.48.8, W.34.4, T.17.6mm; tine: D.20.5, L.54.2mm 10168 sf5732 (P3b)

5660 Irregular section and shape, with scored lines. Also subrectangular offcut of strip of compact tissue, and nine shavings. Medullary tissue offcut: L.35.2, W.33.9, T.16.2mm 10196 sf9941 (P3b)

5661 Trapezoidal section, irregularly shaped with one side cut. L.34.3, W.24.5, T.25.7mm 4869 sf5731 (P3z) (*Fig.618*)

5662 Subsemi-circular, of rectangular section, broken across an off-centre perforation. D.50.8, T.6.5mm 3444 sf5081 (P4z)

5663 Subrectangular shape and section, all but one face having been cut. The offcut is partially burnt. L.42.2, W.39.5, T.22.3mm 5236 sf6083 (P4z)

5664 Subrectangular section, irregularly shaped with both ends and two sides sawn. Also split tine tip, sawn off at base, thirteen shavings, subrectangular offcut of strip of compact tissue, and six tooth plate trimmings, trapezoidal and rectangular. Medullary tissue offcut: L.41.2, W.40.8, T.19mm 5422 sf7955 (P4z)

5665 From beam, faceted, with all the compact outer tissue having been stripped off, one end broken away, the other bevelled from all faces. L.107, W.28.8, T.25.2mm 3226 sf3621 (P6a) (*Fig.618*)

5666 Rectangular section, subtrapezoidal, of irregular thickness, both ends and one side sawn, other side roughly broken. L.71.5, W.50.5, T.16.9mm 4710 sf4578 (P6a) (*Fig.618*)

5667 Trapezoidal section, rectangular. L.34, W.20, T.15.9mm 3352 sf4971 (P6a)

5668 Rectangular shape and section, with all sides cut. Also offcut of strip of compact tissue, subrectangular. Medullary tissue offcut: L.26.7, W.20.9, T.4.2mm 5261 sf7090 (P6a)

5669 Trapezoidal section, rectangular. Also offcut of tine tip, sawn at base and one side, offcut of split tine tip, base and extreme tip sawn, offcut of strip of compact tissue, subrectangular, of subplano-convex section, one end cut and one end broken. Medullary tissue offcut: L.26.5, W.21.2, T.11.1mm 5000 sf5852 (unstratified)

Compact tissue

5670 Offcut, of subplano-convex section, subrectangular, with longitudinal facet cuts on the upper face. It tapers from one end which has been partially cut and partially broken to the other which has two longitudinal cuts of differing length. L.53.7, W.15.7, T.5.9mm 3360 sf8696 (P3b) (*Fig.618*)

Shavings

5671 Three shavings. L.18.1, W.10.5, T.1.4mm 4661 sf8930 (P3z) (*Fig.618*)

Tooth plate blanks

5672 Incomplete, one end and part of one side broken. Also offcut of medullary tissue, of irregular shape and section, subrectangular tooth plate trimming, and two offcuts of split tine, irregularly shaped, cut at one end. Tooth plate blank: L.21.8, W.16.6, T.2.8mm 3415 sf5841 (P3a)

5673 Incomplete, broken laterally, both ends chamfered, thinning from upper to lower end. L.22.6, W.8.6, T.2.4mm 10139 sf4723 (P3c)

5674 Rectangular, all edges cut square. Also trapezoidal tooth plate trimming, and one shaving. Tooth plate blank: L.34.1, W.17.2, T.3.4mm 3463 sf6640 (P3z)

5675 Incomplete, broken laterally, thinning slightly to one end. Also subrectangular offcut of strip of compact tissue, one end cut. Tooth plate blank: L.37.8, W.11.1, T.2.7mm 4813 sf6810 (P3z)

5676 Incomplete, one corner broken off, opposite edge roughly broken across perforation. L.36.2, W.18.8, T.4.1mm 3391 sf6545 (P4z)

5677 Rectangular, all edges cut square. L.36, W.14.4, T.4mm 5525 sf7172 (P4z)

5678 Subrectangular, one end bevelled, other end cut square. Also two offcuts of strips of compact tissue, one trapezoidal with all sides cut, other irregularly shaped. Tooth plate blank: L.44.7, W.10.6, T.3.1mm 5532 sf7264 (P4z)

5679 Subrectangular, one side slightly damaged. Also trapezoidal tooth plate trimming and an offcut of compact tissue, of irregular shape and section. Tooth plate blank: L.32, W.14.4, T.3.5mm 5375 sf8333 (P6a)

Connecting plate blanks

5680 Incomplete and unfinished, of plano-convex section, subrectangular, tapering slightly from one end which is broken to other which has been cut square. There are longitudinal facets on the upper face. L.74.9, W.18.2, T.4.9mm 3360 sf8759 (P3b)

5681 Subplano-convex section, made from a split tine, rectangular, with one end sawn, other end broken, warped. Also four tooth plate trimmings, rectangular and trapezoidal. Connecting plate blank: L.77.5, W.17, T.5.2mm 3364 sf7510 (P3c)

5682 Incomplete, of subplano-convex section, tapering from one end which is cut square to other which is cut at an angle, back edge broken, lower edge uneven, perforation close to squared end. Also offcut of strip of compact tissue, irregularly shaped, offcut of split tine tip, sawn off at base, and six shavings. Connecting plate blank: L.55.9, W.15, T.3.7mm 5540 sf7834 (P4z)

5683 Rectangular shape and section, with one end cut and one end broken, warped. L.85.6, W.19.9, T.4.2mm 3283 sf4109 (P6a) (*Fig.620*)

Tooth plate trimmings

5684 Two trapezoidal trimmings. L.34.9, W.6.5, T.3.2mm 2458 sf8064 (P3b) (*Fig.620*)

5685 Two trimmings, trapezoidal and subrectangular. L.21, W.11.7, T.3.9mm 3360 sf8079 (P3b) (*Fig.620*)

5686 Two trimmings, triangular and trapezoidal. Also rectangular offcut of strip of compact tissue. Largest trimming: L.19.4, W.12.7, T.3.1mm 4792 sf6241 (P3z) (*Fig.620*)

Objects and tools

5687 Picker-cum-beater, incomplete, of subrectangular section, one end roughly broken off, tapering to a point at the other end. The surface is very smooth apart from some roughness at the tip. L.44.5, W.10.9, T.5.2mm 2403 sf6600 (P4b) (*Fig.626*)

5688 Incomplete, in two pieces, originally cylindrical, broken diametrically, tapering slightly from one end to other, both ends cut square. D.20, L.20.4, T.3.6mm 2403 sf6609 (P4b) (*Fig.622*)

5689 Tool with single prong, formed from a crown, the beam sawn off at base, one tine remains. The medullary tissue has been removed to form a longitudinal socket, and there are longitudinal facet cuts on two sides of the socket. D.44.9, L.72.2mm; tine: D.37.9, L.127.4mm 1895 sf7965 (P4b) (*Fig.622*)

5690 Made from a tine which has been partially sawn and partially broken off at the base, the extreme tip broken off. Part of a perforation survives just below the tip which contains an incomplete iron rivet, the perforation having been cut into by a large notch of V-shaped section. D.25.2, L.79.8mm 5557 sf8434 (P4z) (*Fig.622*)

5691 Incomplete, of subcircular section, broken transversely at one end, tapering to a point at the other. It has been decorated within a field defined by two pairs of circumferential incised lines. These enclose linked saltires of incised double lines. The remains of a similar design are just visible at the broken end. D.13.6, L.56.9mm 4767 sf5337 (P6a) (*Fig.622*)

5692 Made from a tine which has been sawn off at the base, with the sides at the tip facet cut, extreme tip broken off. D.20.5, L.64.8mm 2357 sf7849 (P6a)

5693 Made from a split tine tip which has been sawn off at the base, with one side longitudinally facet cut. There is a perforation towards the centre, and the flat face is decorated with three ring-and-dot motifs, with faint traces of a fourth. L.38.5, W.13.6, T.4.4mm 5375 sf8328 (P6a) (*Fig.622*)

5694 Made from a tine which has been sawn off at the base and extreme tip, with longitudinal facet cuts on all sides from the base, some cuts extending half the length, and one facet cut at the tip. L.82.1, W.13.6, T.12.9mm 9100 sf8655 (unstratified) (*Fig.622*)

Handles

5695 Socketed, made from a hollowed out tine tip which has been cut and partially broken away at the base, the tip partially cut and partially broken off. A longitudinal crack runs the entire length, and filing marks are visible all over. D.30.3, L.101.3mm 10259 sf9514 (P3a) (*Fig.634*)

5696 Socketed, made from a hollowed out tine tip which has been longitudinally facet cut on one side and both upper and lower edges to provide grip. The socket end of the handle has been sawn square. D.26.8, L.81.3mm 5073 sf3203 (P6c) (*Fig.634*)

Combs

Single-sided

5697 Incomplete, handled, made from a slotted tine. There is a drilled hole at the handle end of the slot, and two tooth plates survive, all teeth missing, five teeth per 10mm. Both plates have been broken transversely across rivet holes, one with an iron rivet in situ. The end of the handle is decorated with circumferential incised grooves, and one face is decorated along the slot with transverse and oblique incised lines; tooth cutting marks along the lower edge cut into the decoration. Handle: D.17, L.59.1mm; tooth plate: L.13, W.10.3, T.3mm 3415 sf4880 (P3a) (*Fig.679*)

5698 Incomplete, both back and lower edge convex, connecting plates of plano-convex section, and five tooth plates in situ, most teeth broken off, five teeth per 10mm, one complete and two incomplete iron rivets surviving. The decoration is identical on both sides, comprising bands of transverse incised lines, which at one end define a field containing a saltire of double lines. There are tooth sawing marks along the lower edge. L.78, W.15, T.15.4mm; tooth plate: L.31.8, W.15, T.3mm 10214 sf7081 (P3a) (*Figs.679, 681*)

5699 Incomplete, with convex back, connecting plates of plano-convex section broken at both ends across rivet holes, with two tooth plates riveted in situ, all teeth missing, six teeth per 10mm. There is incised decoration, identical on both sides, with a field at

each end defined by two longitudinal lines and containing a pattern of Z-shapes. The field between is defined by bands of four transverse lines containing Y-shaped motifs. There are t
edge. L.109.2, W.26.2, T.20.6mm; connecting plate: T.4.7mm; tooth plate: L.23.8, W.26.9, T.3.4mm 10034 sf6546 (P6a/b) (*Fig.679*)

End plates

5700 Fragment, broken transversely at outer end, and upper and lower edges also roughly broken. The outer end is slightly convex, and the remains of the teeth prove that they started in from the outer end, and were cut progressively longer. Also a rectangular tooth plate trimming, one edge partially cut and partially broken. End plate: L.28.7, W.9.7, T.3mm 10183 sf6042 (P3a)

5701 Incomplete, broken at the inner end across an iron rivet, all teeth missing. The back is sinuously curved, and the end of one connecting plate is still attached. Both faces are decorated above the connecting plate with ring-and-dot motifs linked by incised lines, and the connecting plate fragment has transverse incised lines. The teeth started some way in from the outer end and are cut progressively longer. L.38.9, W.29.3, T.10.7mm; rivet: L.9.8mm 3362 sf4518 (P3c) (*Fig.679*)

5702 Outer end slightly convex, the back slightly oblique, iron rivet close to one edge. The teeth start over half way in from the outer end, are cut progressively longer and are not quite straight, tips broken off. L.26.8, W.20, T.8.6mm 3367 sf9429 (P3c) (*Fig.679*)

5703 Incomplete, three teeth and the lower part of the outer end broken off. The outer end is slightly concave, with a hooked projection at the top, and the back is also concave. There is a rivet hole above the teeth, and a second countersunk hole close to the outer end. Both faces are decorated below the projection with three incised ring-and-dot motifs, and there is an incised saltire on the top of the back. The teeth start a short way in from the outer end, and are cut progressively longer. L.21.9, W.17, T.2.3mm 4943 sf6177 (P3z) (*Fig.679*)

5704 Incomplete, one corner broken away, the inner end broken transversely across a rivet hole, and all the teeth missing. The back is horizontal and both faces are decorated above and to the side of the connecting plates with interlaced ring-and-dot motifs; there are diagonal incised grooves on the top of the back. The teeth started some way in from the outer end, and were all of the same length. L.43.3, W.13, T.3.5mm 5279 sf4872 (P4z) (*Fig.679*)

5705 Fragment, the back and inner end roughly broken, all traces of the teeth broken away. L.29.3, W.10.7, T.2.5mm 4889 sf9432 (P4z)

5706 Incomplete, the outer end curving up to the back. Three teeth are missing, those surviving are cut progressively longer away from the outer end; they are very worn and of irregular length. L.25.6, W.24.2, T.3mm 4710 sf4530 (P6a) (*Fig.679*)

5707 Incomplete, in two fragments, roughly broken across the teeth. The back is convex and the outer end is slightly convex. The teeth begin some way in from the outer end and are cut progressively longer. Also fragment of tooth plate, with two teeth and iron rivet surviving, one tooth broken off at upper end. End plate: L.31.1, W.20.2, T.2.5mm 3352 sf6491 (P6a) (*Fig.679*)

5708 Incomplete, the inner end broken transversely across the rivet hole. The back is sinuously curved, the outer end slightly convex, and all traces of the teeth have been broken away. L.23, W.17.2, T.3.8mm 10077 sf8363 (P6a) (*Fig.679*)

Tooth plates

5709 Incomplete, all seven teeth broken off. The back is convex, and the teeth were cut progressively longer from one end, four teeth per 10mm. Also offcut, subrectangular, of rectangular section, one end and sides cut. Tooth plate: L.23.5, W.19, T.2.6mm 4915 sf5897 (P2)

5710 Incomplete, five teeth broken off. The back is convex and is bevelled from both sides; the edge is decorated on both sides with short oblique parallel incised lines, in opposite directions on each side. Six teeth survive, nine per 10mm. L.36.7, W.12.1, T.3mm 10180 sf8947 (P3a) (*Fig.682*)

5711 Incomplete, only one tooth of four survives, back obliquely angled. There is a rivet hole at one end and another in the upper corner on the opposite end, estimated five teeth per 10mm. L.22.9, W.9.1, T.2.6mm 10213 sf7747 (P3b) (*Fig.682*)

5712 Incomplete, in two adjoining fragments, all teeth broken off, one end roughly broken across a rivet hole, and part of the back broken off. Originally eleven teeth, seven per 10mm. L.17.2, W.14.4, T.2.9mm 5715 sf8385 (P3b)

5713 Incomplete, broken away at both ends, all teeth lost, six per 10mm. L.15.6, W.13, T.4mm 10196 sf9942 (P3b)

5714 Incomplete, seven teeth broken off, back obliquely angled. Two teeth survive, five per 10mm. L.27.5, W.17.2, T.2.8mm 4847 sf6059 (P3c)

5715 Fragment, broken transversely across the rivet hole at one end, the other end also broken away. Fragments of two teeth remain, estimated four per 10mm. L.26.3, W.7.1, T.2.9mm 1106 sf327 (P3z)

5716 Incomplete, with slightly convex back. The plate is decorated on both faces, with a central transverse band of interlocking ring-and-dot motifs on one face, and with a single ring-and-dot motif on other. All ten teeth have been broken off, five per 10mm. L.36.9, W.19, T.3.3mm 4669 sf6236 (P3z) (*Fig.679*)

5717 Incomplete, five teeth broken off, back obliquely angled. Parts of three teeth survive, five per 10mm. L.23.5, W.17.3, T.2.4mm 3463 sf6642 (P3z)

5718 Incomplete, obliquely angled back with a narrow groove on each face. There are two rivet holes on one edge. All eleven teeth are partially broken off, seven per 10mm. L.28.3, W.16.6, T.3.7mm 2386 sf6830 (P4b) (*Fig.679*)

5719 Fragment, all the teeth broken away, six per 10mm. L.17.7, W.14, T.2.6mm 1144 sf800 (P4z)

5720 Incomplete, with fragment broken away at rivet hole, and four teeth broken off. The back is obliquely angled and eleven teeth survive, six per 10mm. L.33, W.22.5, T.3.7mm 1258 sf1048 (P4z) (*Fig.682*)

5721 Incomplete, all the teeth broken away, with an iron rivet surviving at one end and rivet hole at other, back obliquely angled. Estimated six teeth per 10mm. L.14.2, W.11.6, T.2mm; rivet: L.7.4mm 1282 sf1174 (P4z)

5722 Incomplete, all teeth and one corner broken off, six teeth per 10mm. L.13.4, W.18.3, T.2.9mm 5397 sf7521 (P4z)

5723 Incomplete, all teeth broken off. The back is convex and its top is decorated with incised cross-hatching. There were originally eleven teeth, seven per 10mm. L.20.9, W.17.2, T.2.6mm 4716 sf5760 (P6a) (*Fig.682*)

5724 Incomplete, with all teeth broken off, back obliquely angled. Originally seven teeth, five per 10mm. L.16.5, W.15.4, T.4.1mm 10056 sf8845 (P6a)

5725 Incomplete, broken across a rivet hole at one end, back slightly convex. Parts of two teeth survive, the rest are broken off, four per 10mm. L.29.1, W.12, T.3.4mm 3234 sf9412 (P6a)

5726 Incomplete, one corner broken across a rivet hole, four teeth broken off, back obliquely angled. There were originally eight teeth, five per 10mm. L.32.4, W.18.8, T.2.3mm 10138 sf8432 (P6a/b)

Connecting plates

5727 Two fragments, from same comb, of plano-convex section, with horizontal back, lower edge slightly convex and with tooth sawing marks. Both fragments are broken at one end across a rivet hole, the larger has two further rivet holes, and its surviving end is cut straight. Both fragments are decorated with a field defined by double longitudinal incised lines filled with a pattern of linked semi-ring-and-dot motifs, with adjacent bands of transverse lines. L.73.6, W.12.3, T.3.5mm 2458 sf8065 (P3b) (*Fig.682*)

5728 Fragment, of plano-convex section, back convex, both ends roughly broken away, one end across a rivet hole. The fragment is decorated with interlinked ring-and-dot motifs at one end and in the centre, both cut through by rivet holes, and with an irregular pattern of incised oblique and transverse lines. L.54.6, W.15.6, T.4.4mm 5530 sf7249 (P3c) (*Fig.679*)

5729 Fragment, of plano-convex section, broken at one end across a rivet hole, back obliquely angled. There are tooth sawing marks along the lower edge and the plate is decorated all over with incised cross-hatching. L.9.7, W.8.1, T.3.3mm 5530 sf7758 (P3c)

5730 Fragment, with two tooth plates (lacking teeth) attached by iron rivet. The connecting plate is of plano-convex section, one end broken, the back is slightly convex, and there is a second rivet hole. There are tooth cutting marks along the lower edge, and the plate is decorated at the surviving end with cross-hatching, transverse lines and a saltire. L.31.2, W.13.1, T.5.1mm 3463 sf5125 (P3z) (*Fig.682*)

5731 Fragment, of plano-convex section, both ends broken across rivet holes, back obliquely angled. There are regular tooth cutting marks along the lower edge, and the plate is decorated with two incised longitudinal lines along each edge. L.31.1, W.11.5, T.4.2mm 5376 sf9428 (P4b) (*Fig.682*)

5732 Fragment, of plano-convex section, broken through a rivet hole at each end, the back also roughly broken away. There are regular tooth cutting marks along the lower edge, and the fragment is decorated with four transverse incised lines which converge close to the back and then split into two bands of three lines. L.23.3, W.11.2, T.4.1mm 1293 sf1572 (P4z) (*Fig.682*)

5733 Fragment, of plano-convex section, tapering from one broken end to the other which is broken across a rivet hole; back obliquely angled. There are tooth cutting marks along the lower edge, and the plate is decorated with bands of three transverse incised lines alternating along back and median axis. L.30.5, W.13.4, T.3.8mm 5348 sf6015 (P4z)

5734 Fragment, of plano-convex section, broken at both ends through rivet holes, tapering from one end, back convex. There are tooth sawing marks along the lower edge, and the plate is decorated with pairs of longitudinal incised lines and two transverse incised lines at broader end. L.45.6, W.13, T.5.7mm 1075 sf931 (P6a) (*Fig.682*)

5735 Fragment, of plano-convex section, roughly broken at both ends, at one end across a rivet hole, back obliquely angled. There are irregular tooth sawing marks along one edge, and the plate is decorated with incised saltires at one end. L.33, W.12.9, T.4.1mm 3104 sf1371 (P6a) (*Fig.682*)

5736 Fragment, of plano-convex section, broken at both ends across rivet holes, back slightly concave. There are regular and well-spaced tooth cutting marks on the lower edge, and the plate has a central field of decoration outlined by incised horizontal lines and filled with thick parallel diagonal lines which have been cut by fainter longitudinal lines. L.29.7, W.15, T.4.6mm 5261 sf5967 (P6a) (*Fig.682*)

5737 Fragment, of plano-convex section, with tooth plate riveted in situ, all teeth broken away. The plate is broken at both ends across rivet holes, and has an obliquely angled back. There are tooth sawing marks along the lower edge, and the plate is decorated with longitudinal incised lines along each edge. Close to one end there are incised chevrons along the median axis. L.50.6, W.15.7, T.9.8mm; tooth plate: L.13.8, W.14.5, T.3.4mm 5640 sf7708 (P6a) (*Fig.682*)

5738 Fragment, of subplano-convex section, tapering from one end, both ends broken, one across surviving iron rivet, back convex. The plate is decorated with three groups of four transverse incised lines. L.28.8, W.17, T.3.6mm; rivet: L.13mm 2293 sf5529 (P6a/b) (*Fig.682*)

Double-sided

5739 Incomplete, in five fragments. There are two connecting plates with tooth plates riveted in, some rivets surviving, all teeth broken off, the connecting plates rectangular and of plano-convex section, with tooth sawing marks on both edges on one plate only, six teeth per 10mm on each side. Also an incomplete end plate, broken transversely across a rivet hole, outer end rounded at edges. Most of the teeth are broken off, start some way in from the outer end and are cut progressively longer. Also a fragment of connecting plate with tooth sawing marks, both ends broken, one across a rivet, and a fragment of tooth plate, all teeth broken off. Largest fragment: L.53.4, W.13.3, T.10.4mm; end plate: L.33, W.15.5, T.3.2mm 7109 sf5928 (P3b) (*Fig.683*)

End plate

5740 With iron rivet, one tooth broken off. The teeth are of equal size on each side, marked out by scribed lines which start just in from the outer end, and are cut progressively longer, six teeth per 10mm on both sides. The area between the outer end and the teeth is decorated on both faces with an incised ellipse containing a pattern of elongated S-shapes. L.37.1, W.27.5, T.2.4mm; rivet: L.10.2mm 4710 sf4381 (P6a) (*Figs.683–4*)

Tooth plates

5741 Incomplete, unequal numbers of teeth per side, regularly spaced and cut straight, five and seven teeth per 10mm. Also two teeth, broken off at upper end. Tooth plate: L.40, W.15.1, T.2.9mm; tooth: L.13.2, W.2.4, T.1.2mm 4182 sf1526 (P3b) (*Fig.683*)

5742 Incomplete, teeth broken off, regularly cut, equally spaced, and same size on each side, six per 10mm. L.15.5, W.13.4, T.3mm 7109 sf6331 (P3b)

5743 Incomplete, several teeth broken off, teeth equally spaced and regularly cut at angles, six per 10mm on each side. L.20.7, W.21.8, T.1.8mm 3367 sf7428 (P3c)

5744 Incomplete, teeth broken off, regularly spaced and cut, six per 10mm on each side. L.21, W.12.8, T.3.7mm 3463 sf6410 (P3z)

5745 Incomplete, several teeth broken off. The teeth are equally spaced and regularly cut, six per 10mm on each side, and are bevelled from one face to the tips. L.32.2, W.15.2, T.2.1mm 10153 sf7159 (P3z)

5746 Incomplete, broken transversely across a rivet hole on one edge. The teeth are regularly cut and spaced, four and five teeth per 10mm. L.28, W.13.7, T.4.8mm 4849 sf6112 (P4z) (*Fig.683*)

5747 Incomplete, broken transversely across rivet hole at one edge, all teeth broken off, six per 10mm on one side, uncertain on other. L.14.6, W.13.7, T.2.3mm 4889 sf6302 (P4z)

5748 Incomplete, one edge broken off, originally with six and three teeth. The teeth are cut regularly, though broader on one side than the other, three and five teeth per 10mm. L.27, W.13.8, T.3.9mm 3351 sf8779 (P4z)

5749 Incomplete, teeth broken off, equally spaced and regularly cut, five to six per 10mm. L.19, W.13.4, T.3mm 3342 sf8439 (P6a)

5750 Incomplete, one edge broken across a rivet hole. The teeth are regularly cut and equally spaced, five per 10mm. L.25.4, W.13.4, T.3mm 9100 sf8651 (unstratified)

Connecting plates

5751 Fragment, of plano-convex section, roughly broken at both ends, one end across a rivet hole. One edge is horizontal, the other slightly convex, and there is a surviving iron rivet. There are tooth cutting marks along both edges, more widely spaced on one side than the other, and the plate is decorated with bands of four transverse incised lines to one side of the rivet. L.57, W.14.2, T.5mm; rivet: L.14.5mm 5715 sf8030 (P3b) (*Fig.683*)

5752 Fragment, of plano-convex section, tapering towards one end, both ends sawn, back slightly obliquely angled. There are tooth sawing marks on both edges, and the fragment is decorated at one end with two transverse incised lines, and at other end with transverse incised lines and cross-hatching. A rivet hole perforates the decoration. L.23.5, W.11.5, T.4.4mm 10239 sf5243 (P4z) (*Fig.683*)

Indeterminate form

Teeth

5753 Broken off at upper end. L.11.6, W.3.2, T.1.3mm 5591 sf9602 (P3c)

5754 Broken off at upper end. L.18.2, W.3, T.1.7mm 1228 sf9601 (P3z)

5755 Broken off at upper end. L.15.3, W.3.3, T.1mm 5346 sf6598 (P4d)

5756 Broken at both ends. L.18.3, W.3.9, T.1.1mm 4876 sf6366 (P4z)

5757 Broken off at upper end. L.13.5, W.2.8, T.1.5mm 4961 sf9406 (P4z)

Tooth plates

5758 Fragment, trapezoidal, all sides broken, traces of teeth on one edge. L.12.2, W.5.7, T.2.6mm 10124 sf7016 (P4z)

5759 Fragment, one end broken across rivet hole, lower edge also broken away. L.12.5, W.8.3, T.2.4mm 4889 sf9408 (P4z)

5760 Fragment, the upper edge and one side roughly broken, all teeth broken off. L.13.8, W.7.2, T.4.9mm 4959 sf9421 (P4z)

Decorated connecting plates

5761 Fragment, of plano-convex section, one end broken across rivet hole, other end partially cut and partially broken, one edge broken away. The plate is decorated with transverse incised lines. L.9.1, W.7.5, T.3mm 10213 sf9028 (P3b)

5762 Fragment, of plano-convex section, back obliquely angled, one end partially cut and partially broken immediately adjacent to a rivet hole, other end cut square. There is a second small perforation near to the rivet hole, and the plate is decorated all over with incised cross-hatched lines. L.13.3, W.8.8, T.3.4mm 1106 sf1772 (P3z)

5763 Two fragments from same comb, of plano-convex section, ends roughly broken, both decorated with pairs of transverse incised lines. L.10.1, W.9.9, T.2.8mm 1940 sf9424 (P3z)

5764 Four fragments, joining to form two incomplete plates, of plano-convex section, each with ends broken, back convex. One fragment retains an iron rivet, and all are decorated with diagonal bands of two incised lines. L.55.9, W.14, T.4.4mm 5376 sf7778 (P4b)

5765 Two fragments from same comb, of plano-convex section, larger broken laterally close to rivet hole, with both ends cut, smaller broken across rivet hole and laterally. Both are decorated with incised transverse lines at one end and oblique lines abutting these. L.18.2, W.10.6, T.3.7mm 1240 sf928 (P4z)

5766 Fragment, of plano-convex section, tapering from one broken end to the other which is broken across a rivet hole, back obliquely angled. The plate has been decorated with incised transverse lines and ring-and-dot motifs, but incised cross-hatching has been superimposed over the transverse lines. There are also three transverse lines contemporary with the cross-hatching. L.37.8, W.11.4, T.4.3mm 3407 sf4878 (P4z) (*Fig.685*)

5767 Fragment, of plano-convex section, broken along both edges, on one edge across rivet hole, and broken transversely at one end; surviving end has been partially cut square and partially broken. There are tooth sawing marks on one edge, and the plate is decorated with incised transverse lines. L.14.9, W.9.2, T.3.8mm 4775 sf6453 (P4z)

5768 Fragment, of plano-convex section, broken transversely through rivet holes at both ends, also broken longitudinally along one edge. There are tooth cutting marks along the surviving edge, and the plate is decorated with pairs of transverse incised lines. L.39.5, W.11, T.5.3mm 10099 sf6984 (P4z)

5769 Fragment, of plano-convex section, one end broken through a rivet hole, tapering to other end which is cut square. The plate is decorated with transverse incised lines at one end, with two longitudinal incised lines at right-angles. L.8.5, W.8.4, T.2.4mm 3470 sf7069 (P4z)

5770 Fragment, of plano-convex section, both ends and one edge broken away. The plate is decorated with transverse incised lines at one end. L.32.2, W.9, T.3.8mm 1287 sf8925 (P4z)

5771 Fragment, of plano-convex section, tapering from one end, both ends broken across rivet holes, back obliquely angled. A small tapering perforation has been drilled from the underside close to one end. The plate is decorated with bands of six transverse incised lines. L.30.4, W.10.6, T.3mm 4802 sf5590 (P6a)

5772 Fragment, of plano-convex section, both ends and one edge roughly broken. The plate is decorated with ring-and-dot motifs and transverse incised lines. L.24.9, W.13.2, T.3.3mm 4710 sf9430 (P6a)

5773 Fragment, of plano-convex section, roughly broken at both ends, one end possibly through a rivet hole. The back is concave, and the plate is decorated with a panel defined by pairs of longitudinal and transverse incised lines enclosing five ring-and-dot motifs, the central motif larger than those around it. L.31.8, W.20.4, T.4mm 10140 sf4607 (P6a/b) (*Fig.685*)

5774 Fragment, of plano-convex section, roughly broken at both ends, at one end across a rivet hole. The plate is decorated with a longitudinal incised line along each edge, incised interlinked lozenges of double lines, and a series of small transverse notches along the median axis close to the rivet hole. L.48.5, W.9, T.3.6mm 2169 sf7157 (P6a/b) (*Fig.685*)

5775 Fragment, of plano-convex section, tapering to one end, both ends broken across rivet holes, back obliquely angled. The plate is decorated with cross-hatched bands of four deeply incised lines. L.28.5, W.12.3, T.3.3mm 10000 sf5515 (unstratified) (*Fig.685*)

Undecorated connecting plates

5776 Fragment, of rectangular section, subtrapezoidal, broken on one edge across a rivet hole. L.11.2, W.10.9, T.3mm 3384 sf7150 (P3a)

5777 Fragment, of plano-convex section, broken at one end across a rivet hole in which part of the iron rivet survives, other end cut square. L.16.8, W.10.4, T.4.3mm; rivet: L.13.3mm 5715 sf8707 (P3b)

5778 Fragment, of plano-convex section, one edge and both ends broken, one end across rivet hole. There are tooth sawing marks along one edge. L.32.8, W.10.8, T.4.7mm 5715 sf8765 (P3b)

5779 Fragment, of plano-convex section, one end cut across a rivet hole, other roughly broken. L.15.6, W.13.2, T.3.7mm 3360 sf9423 (P3b)

5780 Fragment, of plano-convex section, irregularly shaped, tapering slightly from one end to other, both ends broken across rivet holes, upper edge also broken. There are irregularly spaced tooth sawing marks along the lower edge. L.25.9, W.11.6, T.3.9mm 3444 sf5082 (P4z)

5781 Fragment, of plano-convex section, one end roughly broken, other cut square, back obliquely angled. L.20.5, W.13.1, T.3.8mm 4299 sf8936 (P4z)

5782 Fragment, of plano-convex section, trapezoidal with rivet hole. L.21.3, W.14, T.4.4mm 4802 sf5503 (P6a)

5783 Fragment, of plano-convex section, roughly broken at one end, other end cut square, back obliquely angled. There is a rivet hole close to one end. L.29, W.14.7, T.3.9mm 5640 sf7709 (P6a)

Comb case

5784 End plate, incomplete, broken away at inner end through a circular and a rectangular perforation. The outer end is vertical in the centre but is angled in above and below, the lower part widening out again, the upper part curving up and out to form projecting spur; the back is convex. The plate is decorated with two ring-and-dot motifs on each side. L.26.1, W.10.9, T.2.7mm 3391 sf5756 (P4z) (*Fig.686*)

Counter

5785 Subdiscoidal, both faces sawn, part of the circumference knife-trimmed. D.33.3, T.9.2mm 3407 sf5016 (P4z) (*Fig.687*)

Textiles, sheepskin and raw fibre

5786 Sheepskin fragments, skin poorly preserved but fibres intact. Fibres straight and staples pointed, present staple length 30mm. Remains of some fibre tips present but most fibre ends badly abraded. Hairy medium fleece type. Largest fragment: L.110, W.77mm 2480 sf7978 (P3a)

5787 Wool fibres, individual fibres 15–20mm long, fibre roots and tips present, lambswool from dead animal. Some coarse hairs present but too few fibres to identify fleece type. Wt.0.02g 2414 sf7984 (P4a)

5788 Textile fragment in 2/1 twill, 4/Z/1.5–2.0 × 3–4/S/1.5–2.0 per 10mm. No dye detected, too poorly preserved for fleece type identification. L.35, W.30mm 2480 sf7979 (P3a)

Addendum

The following item was found adjacent to the Redfearn's Glass Factory at the end of the 19th century:

5789 Gold ear-ring, 9th–11th century, of circular section, tapering towards ends. D.26mm, Wt.10g (*Fig.670*)

Uncatalogued Roman and Saxon vessel glass by period and context (numbers of fragments tabulated in text; see Table 119)

Period 2: 3494, 4271, 10224

Period 3a: 3384, 3455, 5319, 5504, 10180, 10183, 10208, 10214, 10259

Period 3b: 2457, 3348, 3360, 4866, 5554, 5575, 5587, 5727, 10196, 10215, 10246

Period 3c: 3361, 3364, 3377, 4847, 5530, 5591, 10139, 10260

Period 3z: 1106, 1133, 1172, 1186, 3421, 3451, 3463, 4792, 4869, 4918, 10052, 10153

Period 4b: 1837, 1865, 2405, 5376, 5389, 6434

Period 4d: 5373, 5384

Period 4z: 1070, 1293, 3376, 3391, 4299, 4712, 4775, 4777, 4849, 5279, 5348, 5420, 5422, 5424, 5525, 5540, 5606, 7075, 10094, 10141

Period 6a: 1237, 2259, 2429, 3179, 3269, 3327, 3334, 3342, 3352, 4234, 4710, 4790, 4905, 5375, 5521, 10076–7

Period 6b: 4611, 5305, 5312

Period 6a/b: 2327, 5238, 5403, 5551, 10004, 10034, 10085, 10140

Period 6c: 3169, 4163, 5282

Period 6z: 1052, 7065

Unstratified: 1000

Uncatalogued nails by period and context (numbers of fragments tabulated in text; see Table 123)

Period 2: 1071, 1245, 4209, 10022, 10228

Period 3a: 3384, 3415, 3420, 3455, 3464, 4880, 5764, 5781, 10180, 10183, 10211, 10214, 10226, 10259

Period 3b: 2501, 3137, 3326, 3348, 3360, 3397–8, 4182, 4866, 5554, 5573, 5575, 5687, 5715, 7070, 7097, 7110, 10168, 10196, 10242

Period 3c: 3349, 3354, 3362, 3377–8, 4847, 4851, 4879, 5446, 5519, 5591

Period 3z: 1098, 1106, 1133–4, 1166–7, 1202–3, 1259, 1292, 1348, 1932, 1936, 1944, 3424, 4273, 4661, 4669, 4711, 4845, 4848, 4852, 4869, 4888, 4911, 10020, 10130, 10153, 10194

Period 4a: 2266, 5441, 6452

Period 4b: 1846, 1865, 1885, 2386, 2403, 2405, 2413, 2417, 2438, 2459, 2461, 5376, 5386, 5389, 5433, 5705, 6401, 6404, 6454

Period 4c: 1864, 6392

Period 4d: 1729, 1863, 2367, 2371, 2373, 5346, 5373, 5387, 5526, 6292, 6320, 6326

Period 4z: 1069–70, 1076, 1144, 1150, 1229, 1235, 1239, 1244, 1253, 1255, 1258, 1262, 1282, 1287, 1293, 1300, 1570, 3351, 3388, 3391, 3403, 3407, 3470, 3559, 4174, 4204, 4239, 4242, 4280, 4350, 4849, 4876, 4889, 4900, 4961, 5201, 5207, 5236, 5274, 5279, 5348, 5352, 5393, 5395, 5397, 5424, 5431, 5540, 5606, 6150, 6181, 6191, 6247, 6464, 7063, 7073, 7119, 7171, 7177, 10035, 10094, 10099, 10124, 10141, 10144, 10149, 10157, 10164, 10175, 10178, 10239

Provenances

Finds were recovered from contexts on the site as follows; context numbers are given in Roman characters, catalogue numbers in italics.

1000: *5063*; 1016: *5436*; 1055: *4639, 4999*; 1056: *5321*; 1070: *4638*; 1072: *5340*; 1073: *4637, 4988*; 1075: *4673, 4807, 5346, 5405, 5615, 5648, 5734*; 1080: *4628*; 1090: *4683, 4989, 5116*; 1105: *4621, 4717, 4764, 5103, 5519*; 1106: *4571, 4748, 4796, 4820, 4837, 5548, 5657, 5715, 5762*; 1110: *4452, 4790, 4811*; 1113: *4831*; 1115: *4622, 4733, 5302*; 1133: *4634*; 1143: *4555, 4802, 5298, 5304, 5423, 5430*; 1144: *5280, 5719*; 1147: *4801*; 1148: *4786*; 1150: *4800*; 1163: *4554, 5184, 5442*; 1166: *4423*; 1167: *4739, 4795*; 1176: *4762*; 1184: *4763*; 1203: *5077, 5544*; 1207: *5212*; 1211: *5556*; 1217: *4785*; 1228: *5213, 5754*; 1229: *4749*; 1231: *4442, 4890–1, 4977, 4994, 5172, 5214, 5226, 5237, 5447*; 1234: *4726, 4803, 5309, 5522*; 1236: *5440*; 1237: *4607, 5606*; 1238: *5480*; 1240: *5765*; 1245: *4828*; 1248: *5085, 5456*; 1253: *4569, 4962, 5083, 5447, 5476, 5488*; 1254: *5253*; 1255: *4510–11, 4894, 4929, 5084, 5180, 5205, 5256, 5457, 5552*; 1257: *4624, 5209*; 1258: *4597, 4640, 4644, 4936, 4976, 5254, 5551, 5720*; 1259: *4868–9, 4918, 4955–6, 5200*; 1262: *4570*; 1265: *4623*; 1273: *4990, 5001*; 1280: *4797*; 1282: *4768, 4892, 5127–9, 5220, 5255, 5260, 5458, 5627, 5721*; 1287: *4740, 5311, 5770*; 1292: *4574, 4671, 5442, 5576, 5640*; 1293: *5130–2, 5420, 5444, 5644, 5732*; 1296: *4829*; 1300: *5181, 5324*; 1302: *5282, 5472*; 1305: *5295*; 1311: *4509*; 1314: *5442*; 1346: *4838, 5545*; 1348: *4798*; 1349: *5442*; 1386: *4609*; 1448: *5410*; 1514: *5387*; 1570: *5315, 5341*; 1574: *5271–5*; 1584: *4538*; 1587: *4901*; 1598: *4430*; 1663: *5418*; 1727: *4815*; 1729: *5287*; 1739: *4888, 5252, 5395*; 1763: *4678*; 1820: *4945*; 1831: *5066*; 1833: *5126*; 1837: *4959*; 1850: *5123*; 1865: *4633, 4940, 4946, 5120, 5170*; 1882: *5121*; 1895: *4505, 4632, 4883, 5286, 5393, 5689*; 1896: *5122*; 1926: *4872, 4973, 5186, 5392*; 1932: *4651, 4874, 4944, 5210, 5223*; 1940: *5153, 5455, 5580, 5763*; 1942: *4765, 4935, 5196*; 1944: *4799, 5002*

2000: *5322*; 2015: *5653*; 2061: *4543*; 2083: *5095*; 2147: *5563*; 2156: *5365*; 2169: *5774*; 2180: *5608*; 2205: *5562*; 2217: *5238*; 2218: *5355*; 2262: *5125, 5231*; 2263: *4880*; 2266: *4593–4, 4920–2, 5027, 5154, 5278, 5284, 5473*; 2267: *4477, 4580, 4857, 4860, 4943, 5490, 5574*; 2293: *5738*; 2296: *5559*; 2304: *4818*; 2305: *4451*; 2325: *5403*; 2331: *4993, 5265*; 2343: *4676*; 2357: *5692*; 2359: *5251*; 2364: *5266–70*; 2367: *5264*; 2370: *5157*; 2381: *4542, 5320*; 2386: *4652, 4881, 4923, 5156, 5285, 5339, 5360, 5429, 5718*; 2403: *4440, 4950, 5028, 5117, 5155, 5428, 5687–8*; 2410: *4882*; 2413: *4958, 4992, 5003, 5081, 5433*; 2414: *5787*; 2417: *5029–30, 5412*; 2420: *5369*; 2431: *5031, 5351*; 2438: *4595, 4710, 5032, 5187, 5357*; 2439: *5250*; 2446: *4592, 5065, 5643*; 2453: *4583, 4677, 5074, 5149, 5166, 5178, 5506, 5612, 5656*; 2455: *5219*; 2457: *5517*; 2458: *5019, 5229, 5234, 5469, 5518, 5684, 5727*; 2459: *5004, 5014, 5033, 5119, 5610–11*; 2469: *4884*; 2472: *5374,* *5474*; 2480: *4462, 4939, 4942, 5531, 5786, 5788*; 2501: *5038, 5044, 5113, 5537*; 2505: *4823, 5217*

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Unstratified: *4435, 4544, 4611, 4631, 5583, 5599*

Concordance of Period 3 pits, ditches and building and the fills which produced finds

Context	Type of deposit	Location of deposit
Period 3a		
2480	Fill in pit 2481	Pit group 4
2494	Fill in pit 2481	Pit group 4
3385	Fill in pit 3402	Pit group 3
3415	Fill in pit 3452	Pit group 3
3434	Fill in pit 3452	Pit group 3
3440	Fill in pit/SFB 3466	North of structure 1
3446	Fill in pit/SFB 3466	North of structure 1
3449	Primary use of pit/SFB 3466	North of structure 1
3455	Primary use of pit/SFB 3466	North of structure 1
3464	Primary use of pit/SFB 3466	North of structure 1
4866	Fill in pit 4871	Pit group 2
4870	Fill in pit 4873	Pit group 2
4880	Fill in pit 4884	Pit group 2
5306	Fill in ditch cut 5854	East boundary ditch
5319	Fill in ditch cut 5320	East boundary ditch
5764	Fill in pit 5765	Pit group 5
5781	Fill in ditch cut 5320	East boundary ditch
10180	Fill in pit 10210	Pit group 1
10211	Fill in pit 10202	Pit group 1
10226	Fill in pit 10202	Pit group 1
10234	Fill in pit 10202	Pit group 1

Context	Type of deposit	Location of deposit
Period 3b		
2501	Fill in pit 2502	Pit group 4
2267	Fill in pit 2268	Part of northern fence/palisade
2453	Fill in pit 2454	Part of northern fence/palisade
2505	Fill in pit 2506	Part of northern fence/palisade
3410	Charcoal in top of pit/SFB 3466	North of structure 1
5575	Fill in pit 5576	Pit group 6
5687	Fill in pit 5688	Part of northern fence/palisade
5715	Fill in pit 5716	Part of northern fence/palisade
10168	Secondary use in pit 10202	Pit group 1
Period 3c		
3337	Fill in boundary ditch cut 3338/3363	Central part of site
3349	Fill in boundary ditch cut 3338/3363	Central part of site
3354	Fill in pit 3374	Pit group 8
3361	Fill in boundary ditch cut 3338/3363	Central part of site
3362	Fill in boundary ditch cut 3338/3363	Central part of site
3364	Fill in pit 3372	Pit group 8
3367	Fill in pit 3375	Pit group 8
3377	Fill in boundary ditch cut 3338/3363	Central part of site
3378	Fill in pit 3379	Pit group 8
4847	Fill in pit 4868	Pit group 7
4851	Fill in pit 4854	Pit group 7
4879	Fill in pit 4887	Pit group 7
5446	Fill in pit 5425	Pit group 10
5447	Fill in pit 5425	Pit group 10
5519	Fill in pit 5520	Pit group 9
5530	Fill in pit 5531	Pit group 9
5571	Fill in pit 5572	Pit group 9
5591	Fill in pit 5592	Pit group 9
10139	Fill in pit 10281	Pit group 7
Period 3z		
1073	Fill in ditch cut 1093	Possible drain in southern part of site
1090	Fill in pit 1142	Pit group 16
1098	Fill in pit 1142	Pit group 16
1101	Fill in pit 1142	Pit group 16
1105	Fill in pit 1142	Pit group 16
1106	Fill in pit 1142	Pit group 16
1127	Fill in ditch cut 1227	South-east of pit group 17
1133	Fill in pit 1142	Pit group 16
1134	Fill in pit 1142	Pit group 16
1162	Fill in pit 1212	Pit group 16
1163	Fill in pit 1206	Pit group 16
1166	Fill in pit 1206	Pit group 16
1167	Fill in pit 1206	Pit group 16
1172	Fill in pit 1206	Pit group 16
1174	Fill in pit 1206	Pit group 16
1176	Fill in pit 1183	Pit group 17
1184	Fill in pit 1187	Pit group 17
1185	Fill in pit 1187	Pit group 17
1186	Fill in pit 1187	Pit group 17
1189	Fill in ditch cut 1190	Between pit groups 16 and 17
1191	Fill in ditch cut 1190	Between pit groups 16 and 17
1202	Fill in pit 1212	Pit group 16
1203	Fill in pit 1212	Pit group 16
1205	Fill in pit 1212	Pit group 16
1207	Fill in pit 1212	Pit group 16
1228	Fill in ditch cut 1227	South-east of pit group 17

Context	Type of deposit	Location of deposit
Period 3z *(contd)*		
1259	Fill in ditch cut 1294	Part of roadside ditch
1265	Fill in pit 1278	Pit group 18
1270	Fill in pit 1278	Pit group 18
1273	Fill in pit 1279	Pit group 18
1292	Fill in ditch cut 1294	East of pit group 19
1298	Fill in pit 1299	Pit group 18
1302	Fill in pit 1303	Pit group 18
1305	Fill in pit 1299	Pit group 18
1307	Fill in pit 1299	Pit group 18
1308	Fill in pit 1299	Pit group 18
1346	Fill in ditch cut 1347	Southern part of site
1348	Fill in pit 1349	Pit group 19
1926	Fill in pit 1927	Pit group 15
1932	Fill in pit 1933	Pit group 21
1936	Fill in pit 1937	Part of southern fence/palisade
1938	Fill in pit 1939	Pit group 15
1940	Fill in pit 1941	Part of southern fence/palisade
1942	Fill in pit 1943	Pit group 21
1944	Fill in pit 1946	Part of southern fence/palisade
3421	Fill in pit 3430	Pit group 13
3424	Fill in pit 3432	Pit group 12
3463	Fill in pit 3576	Pit group 13
3468	Fill in pit 3476	Pit group 12
3482	Fill in pit 3488	Pit group 12
4255	Fill in pit 4243	Pit group 20
4333	Fill in pit 4334/4264	Pit group 14
4661	Fill in pit 4956	Pit group 14
4669	Fill in pit 4956	Pit group 14
4784	Fill in pit 4786	Pit group 12
4788	Fill in pit 4801	Pit group 12
4792	Fill in pit 4812	Pit group 12
4793	Fill in pit 4812	Pit group 12
4813	Fill in pit 4815	Pit group 12
4848	Fill in pit 4922	Pit group 14
4852	Fill in pit 4853	Pit group 11
4869	Fill in pit 4886/4272	Pit group 14
4888	Fill in pit 4922	Pit group 14
4897	Fill in pit 4922	Pit group 14
4901	Fill in pit 4922	Pit group 14
4911	Fill of pit 4951/4302	Pit group 14
4913/4711	Fill of pit 4951/4302	Pit group 14
4914	Fill of pit 4951/4302	Pit group 14
4921	Fill in pit 4922	Pit group 14
4943	Fill in pit 4951/4302	Pit group 14
6436	Fill in ditch cut 6437	West of pit group 21
6438	Fill in pit 6441	Pit group 21
6465	Fill in pit 6482	Part of southern fence/palisade
6491	Fill in pit 6492	Pit group 21
6497	Fill in pit 6498	Pit group 15
10153	Fill in pit 10160	Pit group 11
10161	Fill in pit 10160	Pit group 11

Acknowledgements

York Archaeological Trust and the author wish to express their thanks to all who have co-operated in the compilation of this fascicule, particularly the specialists who have contributed reports: R.L. Kemp, K.M. Buckingham, Dr J.G. McDonnell (University of Bradford), Dr J. Bayley (Ancient Monuments Laboratory), Dr G.D. Gaunt, P. Walton Rogers, K. Wiemer (Department of Materials Science and Metallurgy, University of Cambridge), Dr P.J. Ottaway, Dr D. Tweddle, Dr J.R. Hunter (University of Bradford), C.M. Jackson (University of Sheffield), Dr H.E.M. Cool and S. Rees. Thanks are also due to S. O'Connor for her bone and antler identifications, to Dr A. Hall who looked at wood remains, to K. Dobney who supplied information on the bones used to make pins, and to M. Read who identified the jet. Dr J.R. Hunter and C.M. Jackson wish to express their thanks to Dr H.E.M. Cool and Dr S.E. Warren for their helpful advice during the preparation of the glass report.

Discussions with colleagues were particularly informative and stimulating; these include R. Kemp, P. Graves, D. Hooley, Dr A. Mainman, Dr T. O'Connor, Dr D. Tweddle, Dr H. Cool and Dr A. Jones. Consultation in advance of publication of Dr P. Ottaway's fascicule on the Anglo-Scandinavian ironwork from 16–22 Coppergate, and A. MacGregor's on the bone and antler from the same site was greatly appreciated, as was discussion with both authors. The chance to consult Dr I. Goodall's unpublished thesis on medieval ironwork is also gratefully acknowledged.

Access to unpublished material from Hamwic and Ipswich was generously allowed, and the author is grateful for the assistance of K. Wardley and J. Newman during her visits to Southampton and Ipswich respectively. Thanks are also due to I. Riddler for discussion of his work on the bone and antler artefacts from Southampton, and to K. Leahy for information concerning finds from Lindsey and the site at Flixborough.

York Archaeological Trust is very grateful to the successive owners of the site at 46–54 Fishergate, particularly Redfearn National Glass plc and Costain Homes (North-Eastern) Limited, for permission to excavate the site. Funding for the excavation was provided by English Heritage, the City of York and Costain Homes (North-Eastern) Limited. The entire post-excavation project was funded by English Heritage.

The author is grateful to the Fishergate team, including R. Kemp, who directed the excavations, site supervisors J. Lilley and M. Whyman, and post-excavation assistant K. Jones. Without their enthusiastic co-operation the work presented here would have been much the poorer.

Conservation of the artefacts was undertaken by J. Spriggs, S. O'Connor, S. Rees, J. Jones, K. Buckingham, E. Paterson, I. Panter and students and volunteers attached to the Conservation Department during the period 1985–91.

Finds administration was in the hands of B. Shaw, G. Woolrich and K. Adams, all supervised by C. McDonnell.

Figures for the fascicule were drawn by C. Bentley, G. Boyles, K. Guffogg, K. Leach and P. Marshall. All figures were subsequently prepared for publication by K. Leach. All photographs were taken by S. Hill or T. Bunney, apart from Figs.630–2 which were supplied by K. Wiemer and Fig.670b which was supplied by Christie, Manson and Woods Ltd.

The summary was translated into French by C. Sheil-Small and into German by K. Aberg. The fascicule has been under the editorial supervision of F. Mee who also prepared the text for publication using Ventura software. It is published with the assistance of a generous subvention by English Heritage.

Summary

This report discusses approximately 3350 artefacts relating to Roman activity, and to Anglian and 11th–12th century occupation at 46–54 Fishergate. Roman activity on the site seems to have been limited to agricultural use and the Roman finds may, therefore, represent midden material rather than occupation debris. The first main period of occupation was Anglian and there are several items of late 7th century date, suggesting that this settlement may have begun before AD 700. Anglian occupation came to an end in the mid 9th century and the site was abandoned until c. AD 1000. Evidence for the 11th century resettlement is limited to a number of pits and a single structure, but later in the century a cemetery, possibly with an associated sequence of church buildings, occupied part of the site.

Only a few Roman finds were recovered from the site. The Anglian assemblage, on the other hand, is extensive and provides evidence for a variety of crafts being carried out on site. These include bone and antler working, ironworking and non-ferrous metalworking. Wood and leather working as well as textile production are indicated by the survival of their diagnostic tools rather than by the materials themselves, which, with the exception of a few textile fragments and fibres, did not survive deposition. Lava quernstones imported from the Rhineland, and vessel glass from northern France or the Rhineland, as well as significant amounts of imported pottery (*AY* 16/6) and numismatic evidence (*AY* 18), all suggest that the site might have played a special role in international trade.

Material from the 11th–12th century re-occupation includes many residual Anglian finds, but also provides evidence for further contemporary craft and domestic activity. Evidence for international contact is much more limited.

The Anglian assemblage from 46–54 Fishergate is of considerable interest as it represents the first large group of finds from well-stratified, datable, contexts in York. Comparison with assemblages from other contemporary sites in the region, and with centres for international trade elsewhere in the country, helps to establish the role and status of Anglian York.

Résumé

Ce rapport traite d'environ 3350 objets façonnés relatifs à l'activité romaine et à l'occupation anglienne du site de 46–54 Fishergate ainsi qu'à son occupation au 11ème–12ème siècle. L'activité romaine sur le site semble s'être limitée à l'agriculture et il se peut donc que les découvertes romaines représentent des déchets plutôt que des débris d'occupation. L'époque anglienne était la première période principale d'occupation et il y avait plusieurs articles datant de la fin du 7ème siècle, ce qui suggère que l'occupation du site aurait pu commencer avant 700. L'occupation anglienne prit fin au milieu du 9ème siècle et le site fut abandonné jusqu'à l'an 1000 environ. La documentation du repeuplement du 11ème siècle se limite à quelques fosses et à une seule structure, mais un cimetière, peut-être avec une série associée de bâtiments religieux, occupa une partie du site plus tard pendant le 11ème siècle.

On n'a trouvé que quelques découvertes romaines sur le site. Par contre, l'ensemble anglien est considérable et documente la pratique de divers artisanats sur le site. Ceux-ci comprennent le travail de l'os et des andouillers ainsi que le travail du fer et des métaux non-ferreux. Le travail du bois et du cuir ainsi que la production textile sont attestés par les vestiges de leurs outils caractéristiques; à l'exception de quelques fragments et fibres textiles, il ne reste rien des matériaux eux-mêmes qui on été enterrés longtemps. Des meules en lave, importées de Rhénanie, et des vaisseaux en verre de France septentrionale ou de Rhénanie ainsi que des quantités considérables de céramique importée (*AY* 16/6) et de documentation numismatique (*AY* 18) suggèrent tous que le site aurait pu jouer un rôle spécial dans le cadre du commerce international.

Le matériel de la réoccupation du 11ème–12ème siècle comprend de nombreuses découvertes angliennes résiduelles et documente aussi d'autres activités artisanales et ménagères contemporaines. Il y a bien moins de données quant aux contacts internationaux.

L'ensemble anglien de 46–54 Fishergate est extrêmement intéressant, car il représente le premier grand groupe de découvertes provenant de contextes bien stratifiés et datables à York. La comparaison avec les ensembles venant d'autres sites contemporains de la région et avec des centres de commerce international dans d'autres parties du pays aide à établir le rôle et la position de York à l'époque anglienne.

Zusammenfassung

Dieser Bericht diskutiert die ungefähr 3350 Artifakte, die mit der römischen Nutzung von 46–54 Fishergate sowie dessen Besiedlung in anglischer Zeit und während des elften bis zwölften Jahrhunderts in Verbindung stehen. Die römische Aktivität auf der Fundstelle scheint sich auf ihre landwirtschaftliche Nutzung beschränkt zu haben und die römischen Funde können daher eher aus Abfallhalden denn aus Siedlungsschichten stammen. Die erste Siedlungsphase stammt aus der anglischen Zeit; es liegen einige Funde aus dem ausgehenden siebten Jahrhundert vor, die annehmen lassen, daß die Siedlunganfänge vor 700 n.Chr. liegen. Die anglische Besiedlung endete in der Mitte des neunten Jahrhunderts und die Fundstelle wurde bis ungefähr 1000 n.Chr. aufgegeben. Der Befund für eine Neubesiedlung im elften Jahrhundert ist auf eine Anzahl von Gruben und eine bauliche Anlage beschränkt. Jedoch nahm später im gleichen Jahrhundert ein Friedhof, der möglicherweise mit einer Folge von kirchlichen Bauten in Verbindung stand, einen Teil des Areals ein.

Die Fundstelle ergab nur wenige römische Funde. Die anglische Fundansammlung ist jedoch umfangreich und liefert den Befund für eine Anzahl von Handwerken, die an diesem Platz ausgeübt wurden. Zu ihnen gehörten Knochen-und Geweihverarbeitung sowie Eisen-und Nichteisenmetallverarbeitung. Holz-und Lederverarbeitung sowie Textilherstellung werden mehr durch die Erhaltung ihrer charakteristischen Werkzeuge angezeigt als durch die Materialien selbst, die mit Ausnahme einiger Textilreste und Fasern die Ablagerung nicht überstanden haben. Aus dem Rheinland eingeführte, aus Lava gefertigte Handmühlensteine, Gefäßglas aus Nordfrankreich oder dem Rheinland sowie eine beträchtliche Menge an eingeführter Keramik (*AY* 16/6) und der Münzbefund (*AY* 18) weisen alle darauf hin, daß diese Örtlichkeit eine wichtige Rolle im internationalen Handel gespielt hat.

Das Fundmaterial aus der Phase der Neubesiedlung im elften bis zwölften Jahrhundert enthielt viele Restfunde aus der anglischen Zeit, aber bietet auch Befunde für zeitgenössische Handwerkstätigkeit und häusliche Betätigung. Die Hinweise auf internationale Beziehungen sind jedoch viel geringer.

Die anglische Fundansammlung aus 46–54 Fishergate ist von besonderem Interesse, da sie die erste umfangreiche Befundgruppe bildet, die aus gut stratifizierten, datierbaren Zusammenhängen in York stammt. Vergleiche mit Ansammlungen aus gleichzeitigen Fundstellen in der Umgebung und mit internationalen Handelszentren anderswo in England erlauben es, die Rolle und den Status Yorks in anglischer Zeit festzustellen.

Metallography of the Knives: Glossary

Ferrite (body-centred cubic alpha iron): The stable phase of pure iron at ambient temperature which may contain up to 0·02% carbon and small amounts of alloying elements. Over long periods of time, e.g. prolonged burial, some compounds may precipitate out of solution. Ferrite exists as polyhedral grains, the shape and size of which are affected by heat treatments, hot and cold working, and the presence of minor elements.

Cementite (orthorhombic iron carbide, Fe_3C): A hard, brittle compound of iron and carbon which may take a variety of forms but most often exists as wavy plates in pearlite and as grain boundary films in very low-carbon iron, or as distinct white particles in quenched hypereutectoid steels.

Pearlite: A lamellar structure of alternating layers of cementite plates and ferrite having an overall eutectoid composition (0·8% carbon) which forms in slow-cooled steels. The fineness of the structure depends on the rate of cooling.

Austenite (face-centred cubic gamma iron): The stable phase of iron and carbon (to a maximum of 2%) and other alloying elements at elevated temperature. The temperature of transformation from fully austenitic to ferritic depends on the carbon content (730–900°C). Slow cooling from above the transformation temperature will produce ferrite and pearlite, while a rapid quench will produce martensite. A very rapid quench of high-carbon steel will result in a fraction of soft, non-magnetic retained austenite and martensite at ambient temperature.

Martensite: A strong, hard, brittle phase which results when austenite is cooled at a rate fast enough to prevent the diffusion of carbon out of the iron as its solubility declines with decreasing temperature; essentially a supersaturated solution of carbon in alpha iron. It is acicular in appearance and is meta-stable at ambient temperature. Steel must contain a minimum of 0·3% carbon for recognisable martensite to form. A maximum hardness is reached in martensitic steels containing 0·7% carbon. Martensite is usually gently heated (tempered) to improve its toughness.

Bainite: A phase which forms when austenite is cooled at an intermediate rate. Upper bainite forms between 350 and 500°C and may sometimes be distinguished optically by a characteristic 'feathery' appearance. Lower bainite forms below 350°C and has a structure resembling that of tempered martensite. Bainite cannot be resolved under an optical microscope and appears as a dark mass of needles or acicular blocks.

Spheroidised carbide: Structure consisting of spherical particles of iron carbide in a matrix of ferrite. Prolonged heating of a steel which contains pearlite or quenched structures (martensite etc.) at a temperature just below that at which austenite begins to form (723°C), usually around 650–700°C, will produce spheroidised carbide and result in a considerable softening of the steel.

Widmanstätten: Refers to the shape of structures occurring in steels which have been heated well into the austenitic range (900–1000°C) and then cooled at an intermediate rate. Ferrite or cementite forms (nucleates) preferentially at grain boundaries and grows along certain crystal planes to produce a spiky, mesh-like arrangement of needles or plates.

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