The Archaeology of York **The Small Finds** 17/11

Textile Production at 16–22 Coppergate

By Penelope Walton Rogers

The Archaeology of York

Volume 17: The Small Finds

General Editor: P.V. Addyman

First published by
Council for British Archaeology
Bowes Morrell House
111 Walmgate
York YO1 2UA

The Archaeology of York
Vol. 17: The Small Finds
Fasc. 11: Textile Production
at 16–22 Coppergate
936.2843

ISBN 1 872414 76 1

Textile Production at 16-22 Coppergate

By Penelope Walton Rogers

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

1997

Contents

List of Figures

List of Tables

Volume 17 Fascicule 11

Textile Production at 16–22 Coppergate

By Penelope Walton Rogers

with contributions by R.A. Hall, A.R. Hall and H.K. Kenward

Key words: Anglo-Saxon, Anglo-Scandinavian, cloth finishing, dyeing, fibre processing, medieval, needlework, spinning, tools, weaving, women artisans, wool trade, York

Introduction

While the volume on textiles from 16-22 Coppergate *(AY* 17/5) was being prepared, it became clear that the full story of textile production could not be told without reference to the quantity of textile implements, raw fibre and dyestuff which seemed to emerge from every corner of the site. Wool and flax were found in pits, red dye stained ground surfaces, and tools from every stage of production came from floors, pits, pathways and external surfaces. Clearly, the manufacture of textiles formed a significant part of life at Coppergate.

The present volume is therefore concerned with the tools and raw materials of textile production recovered from 16-22 Coppergate (Fig.777, **1**) during the 1976-81 excavation and the watching brief of 1981-3 (Fig. 777,**2**). It includes all material of this kind, Roman, Anglo-Scandinavian, medieval and post-medieval, although the bulk of the material comes from the 9th to 15th centuries.

Much of the raw data has already appeared, or is about to appear, in other parts of *The Archaeology of York:* flax and dyeplants in *A Y* 14/7 *Biological Evidence from Anglo-Scandinavian Deposits at 16-22 Coppergate* and those from medieval deposits in *AY* 14; wool in *AY 17/5 Textiles, Cordage and Raw Fibre from 16-22 Coppergate;* an iron sword-beater in *AY* 17/8 *The Anglian Helmet from 16-22 Coppergate;* other Anglo-Scandinavian iron tools in *AY* 17/6 *Anglo-Scandinavian Ironwork from 16-22 Coppergate;* bone and antler implements in A. MacGregor et al. *AY* 17/12; wooden ones in C.A. Morris, *AY* 17/13; Anglo-Scandinavian tools of other materials in A.J. Mainman and N.H.S. Rogers *AY* 17/14; medieval tools in iron and other materials in P. Ottaway and N.H.S. Rogers *AY* 17/15; and the textile products in *AY* 17/5. The reader is directed to the text and catalogues in these volumes for details of individual artefacts, although a select catalogue has been included here for ease of reference (pp.1832-43). A phase-by-phase list of artefacts, raw fibre and dyeplants, together with their primary place of publication, is given in the Concordance, pp.1844-56.

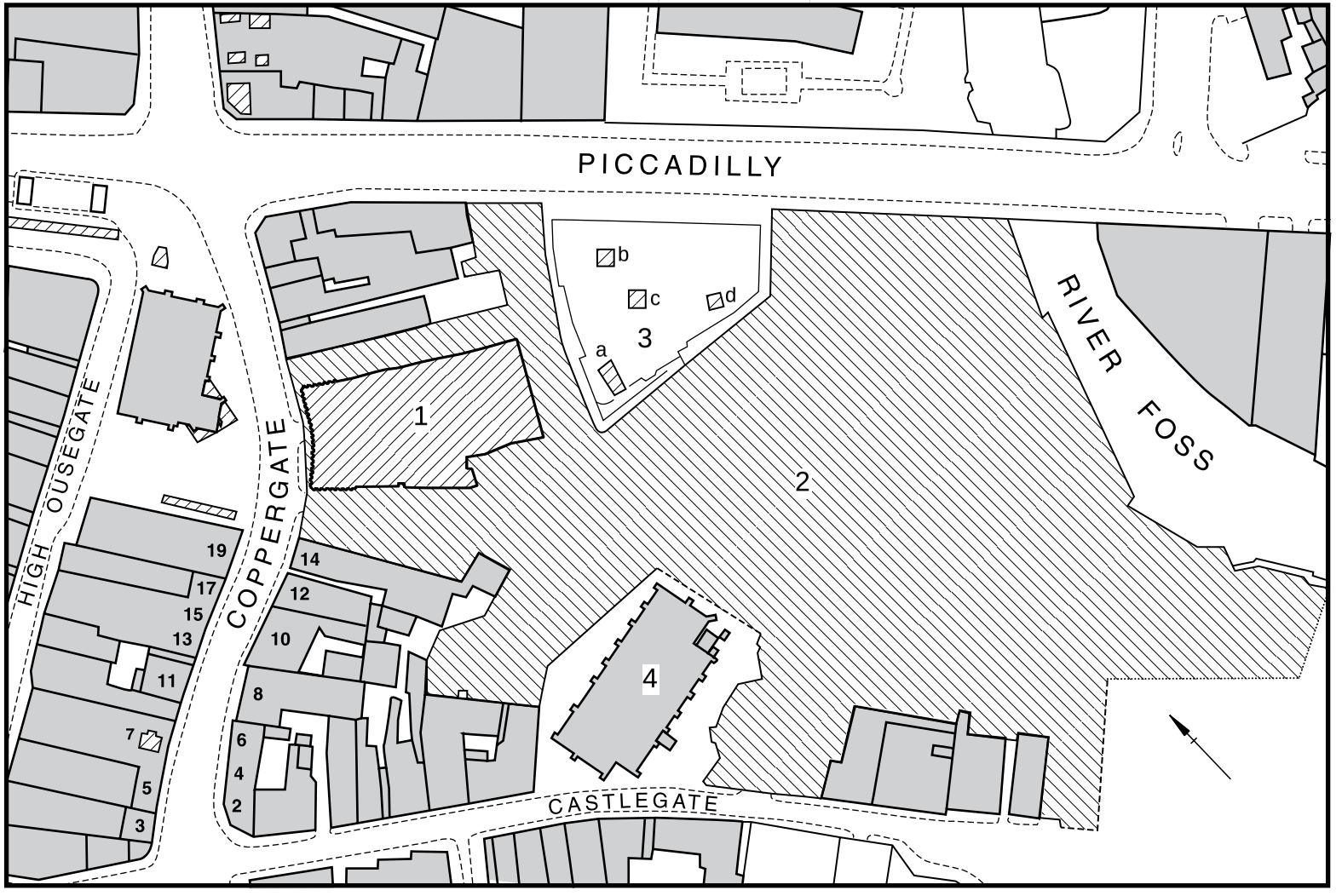


Fig. 777: Plan showing position of (1) 16–22 Coppergate; (2) Area of watching brief; (3) 5–7 Coppergate; (4) Lloyds Bank, 6–8 Pavement; (5) St Mary's Castlegate. (Based upon the 1982 Ordnance Survey 1:1250 National Grid Plans with the permission of the Controller of Her Majesty's Stationery Office, © Crown copyright. Scale 1:1250

The aim of the present work is to draw together this extensive range of material into a cohesive picture of textile production at Coppergate in the Anglo-Scandinavian and medieval periods. It will review briefly the evidence presented in the publications listed above, but will concentrate on how the tools were used and the raw materials processed. It will examine where textiles were made on the four Coppergate tenements, charting chronological developments over the 9th to 15th centuries. Finally, it will use the material as a base from which to discuss some broader themes concerning the history of textile production. The 9th to 13th centuries were times of change for the textile industry and sites such as Coppergate have much to add to our knowledge of how, in practical terms, these changes came about.

The Excavation at 16-22 Coppergate

By R.A. Hall

This study presents the first co-ordinated interpretation of a significant body of textile-making equipment and raw materials from a large-scale excavation in York. It takes forward a study which has hitherto been based around a small number of artefact types which are fairly frequently found in the city (for details of individual sites, see pp.1809-10). Only with the excavation of a deep and extensive sequence of well-stratified deposits at 16-22 Coppergate, however, has it been possible to recover a large and varied set of data, including organic materials, which spans much of the city's history from its founding in the Roman era to the late medieval period.

The data recovered has been attributed to six broad periods (Table 142); the evidence i presented here relates to the Roman and post-Roman centuries, and in particular the 9th–14th/15th centuries. During this time the site was sub-divided into four tenement plots which, in general, were more densely occupied as time passed. The data allows the scale and variety of textile making in the Anglo-Scandinavian and medieval city to be assessed in detail for the first time.

Site history and a summary (Figs. 777, 790)

The site lies on the spur of land between the Rivers Ouse and Foss and is bounded to the west by Coppergate, a street leading towards the only bridge across the Ouse in the medieval period, and to the east by the bank of the Foss.

The earliest occupation on the site, designated Period 1 (Table 142), was in the Roman era. At that time the legionary fortress lay 160m to the north-west; the immediate vicinity was certainly occupied by temples, and it probably also contained a variety of commercial establishments. Evidence for Roman buildings constructed of both timber and stone was recovered, but the functions of these structures could not be deduced. The site also contained a small late Roman cemetery. The admixtures of silt, clay and loam which characterised soil conditions associated with Period 1 did not permit the survival of any

Table 142 Summary of archaeological development at 16–22 Coppergate

Period	Date	Characteristics
1	late 1st-late 4th century or later	Roman timber and stone buildings; late Roman cemetery; Limited survival of organic remains*
2	5th – mid 9th century	Apparent desertion. Homogeneous loamy deposits which did not preserve organic materials
3	mid 9th – late 9th/ early 10th century	Rubbish disposal, suggesting occupation close by. Post/stake and wattle alignments, possibly boundaries. Organic materials preserved only in pit cuts.
4A	late 9th/early 10th century –c.930/5	Realignment of boundaries, suggesting that Coppergate was laid out by this period. Possible buildings at Coppergate frontage. Organic materials preserved mainly in pit cuts
4B	c.930/5–c.975	Four tenements distinguishable, with post and wattle buildings at Coppergate frontage. Evidence for iron-working and other trades on a commercial scale. Organic-rich deposits nearer to Coppergate; organic content thinning to zero towards River Foss
5A	c. 975	Near Coppergate frontage only. Layers between structures of Period 4B and 5B; probably mixture of dump deposits and soil from 5B semi-basements
5B	c. 975–early/mid 11th century	Perpetuation of boundaries. Introduction of 'sunken featured' structures in double row at street frontage. Organic-rich deposits as in Period 4B
5Cf	mid–later 11th century	Organic-rich deposits at street frontage, associated with buildings which survive only in Tenement D
5Cr	mid–later 11th century	Post-built structure sealed by earliest in a succession of dump deposits. Little organic material surviving
6	later 11th–16th century	No remains surviving at street frontage, but area to rear increasingly built up above later dump deposits. New methods of building and rubbish disposal, leading to reduction in organic content of deposits

*Bone and antler generally survived will in all periods even when preservation of other organic material was poor.

organic-based artefacts except the very fragmentary remains of some wooden coffins and items made of bone.

At the present stage of research there seems no reason to suppose that Romano-British activity continued here beyond the conventional date of c. AD 400 or shortly after, and

Fig.778 16-22 Coppergate, Roman structural remains sealed by clean grey loams, interpreted as Anglian desertion, with organic-rich Anglo-Scandinavian deposits above, looking north-east. Scale unit 0.1m

from then until the mid 9th century the site seems to have been unoccupied (period 2). This period was marked stratigraphically by the accumulation of up to 1m of grey silty clay loam soils (Fig.778); there was no evidence for structures, domestic or otherwise. All of the pottery in these layers was Roman with the exception of a small quantity of Anglo-Scandinavian sherds which are believed to be intrusive; the contexts from which they were recovered were adjacent either to upstanding baulks incorporating later material, or to later down-cutting features which may have been the source of obviously later sherds. Although, once again, soil conditions would not have preserved organic-based artefacts other than those made of bone, the dearth of other, more durable, artefactual evidence for contemporary activity indicated that this absence reflects accurately the site's apparent desertion at this time. A later 8th century helmet, found only 9m beyond the excavation's perimeter during construction work in 1982, lay within a wood-lined shaft. This was, perhaps, a mid-late Anglian well, and may possibly relate to a contemporary settlement nucleus, either on the ridge now represented by Nessgate/Castlegate, and/or around what may be an early ecclesiastical foundation at St Mary's, Castlegate (Fig. 777, *5)*. The final backfilling of the shaft is dated to the Anglo-Scandinavian period on the basis of a characteristic suite of accompanying palaeobiological remains (pp.870-81, *AY* 17/8); a sword-beater or weaving batten found with it is discussed on pp.882-8 *(AY* 17/8) and below pp.1753-5.

Fig. 779 The period 4B post and wattle buildings on Tenement C (foreground) and D at the street frontage (to the left of the picture), facing north-east

Above the clean grey loams which mark the four and a half centuries interpreted as Anglian desertion of the site, a band of dirtier grey silty clay loams was recognised, and into these was cut a series of features. One of the earliest of these features was a sequence of hearth/oven/kiln bases represented by a horizontal setting of re-used Roman tiles, perhaps used in glassworking. An archaeomagnetic determination of 860 ± 20 was obtained from these features. This is the single most precise indication of the date when this period of renewed use of the site began, although it allows no more than the approximation of 'mid-late 9th century'. It is not possible to determine whether a date of c.840, c.860 or c.880 is more likely, and therefore impossible to relate the inception of the period to either a definitely pre-Viking (i.e. pre-866) or post-Viking date with conviction. It does seem, however, that the assemblage of Anglian pottery from the site (just under 200 sherds) is best seen as in a direct typological and thus chronological succession with that from the Anglian occupation site at 46-54 Fishergate (Kemp AY 7/1; Mainman AY 16/6, 650-1) where occupation is thought to cease in the mid 9th century.

Apart from one porcupine sceat of c.720-40, found in an 11th century layer at the river end of the site, all of the nine other identifiable Anglian coins from the site are of 9th

century date (four of Eanred c.810-41; five of .Æthelred II 841-8, 844-8: *AY* 18/1, 51-3). All were found in contexts stratigraphically later than that with the archaeomagnetic determination of 860 ± 20. Such coins were certainly available for hoarding in the reign of Osberht, the last pre-Viking king of Northumbria, and they occur in coin hoards found in York which may be interpreted as a response to the Viking attack of 866. Such coins might even have continued in use in York until Viking kings began minting coins c.895.

The writer interprets this evidence as indicating that activity and settlement in this area, on anything but an occasional and sporadic basis, recommenced in the middle of the 9th century. There is no stratigraphic or artefactual evidence (for example, no stratified 8th century sceattas like those from 46-54 Fishergate *(AY* 7/1, 17) to indicate that there was protracted Anglian activity before that time.

Other features in this period included several pits containing domestic debris, and some pits also contained human skeletal remains; one of the skeletons had traces of textile adhering to it (pp.331-2, *AY* 17/5). The latest features of this period were a series of post-holes, some apparently forming alignments at an angle to the later tenement lines, and an accompanying cobble spread at the south-west of the area. It is conceivable that these features represent the remains of a building, although this is not certain. This entire horizon, Period 3, is dated c. AD 850-900 on the basis of a combination of archaeomagnetic and numismatic evidence; in later periods, dendrochronological data provide a greater level of chronological precision.

Sealing the post-holes, cobble spread and other features of Period 3 were deposits into which were inserted wattle alignments which anticipated the alignment of the subsequent tenements and structures, but which do not themselves form obviously coherent structures. These alignments and both their underlying and associated layers and features are assigned to Period 4A and dated c. AD 900-930/5. Characteristic of the layers of this period were dark grey silty clay loams, very similar to those of Period 3, but differentiated by the inclusion of patches of grey clay, brown ash, scatters of charcoal and occasional very small fragments and slivers of wood. These conditions, like those of Period 3, were not particularly conducive to the survival of organic artefacts.

The next phase on the site, Period 4B, is marked by the division of the area into four tenements, designated A-D (Fig.790, p.1704), and if the street Coppergate was not in being before it must have been laid out at this time. The tenements were defined by wattle fences, whose lines fluctuated only very slightly over the succeeding millennium; towards the River Foss end of the site, however, there was no trace of any continuation of the fences discovered nearer to Coppergate. Whether this should be attributed to the nature of the soil conditions in this area, or whether tenement divisions never extended this far, is not clear. Each tenement contained buildings of post and wattle construction, positioned with their gable-ends facing the street (Fig.779). All had been truncated towards their front by the subsequent widening of Coppergate; the greatest surviving length was 6-8m, and they averaged 44m in width. The buildings on Tenements A and B had been substantially disturbed by the digging of semi-basements for the Period 5B buildings, but those on

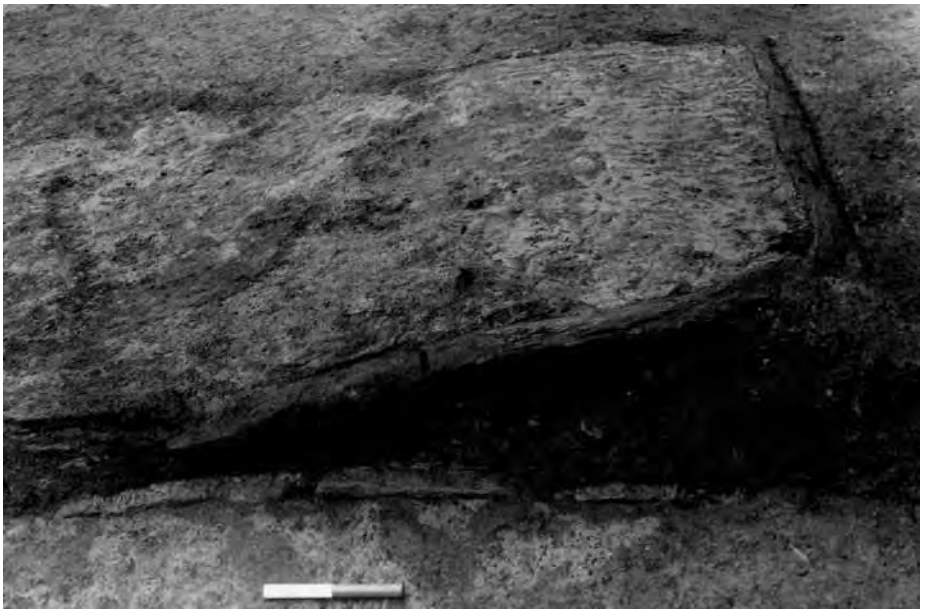


Fig.780 Clay hearth base with wooden surround, separated by an accumulation of deposits from an underlying hearth represented in the picture by sections of its stone surround (Tenement C). Scale unit 0.lm

Tenements C and D were very largely intact. The buildings had to be repaired or replaced frequently, for they were vulnerable to fire as well as to natural decay, but successive refurbishments varied little in their dimensions and position. Hearths were found on the long axes of the buildings in Tenements B, C and D; any trace in A was destroyed by later intrusion, and even in B only vestiges remained. In C and D the hearths measured up to 24 x 1. 3m and consisted of a clay base, sometimes resting on a stone slab underpinning, and surrounded by a revetment of horizontal timbers, limestone rubble or re-used Roman tiles. Discoloration of the clay base by burning was quite restricted, and the large size of the hearth appears to reflect a desire for a margin of safety for embers rather than the size of fire itself.

Only one rank of buildings stood in each tenement and their lengthy backyards were not built up but used for rubbish disposal and other ancillary functions. Although sometimes difficult to differentiate, the sequence of superimposed floor levels built up by gradual accumulation within each building (Fig.780), and their accompanying artefacts, allow the activities within each tenement to be followed with varying degrees of assurance. Metalworking seems to have been the predominant activity, with the manufacture of items in iron, copper alloy, lead alloy, silver and gold. A notable feature was the quantity of crucibles recovered with their important corroborative evidence for the range and variety of metalworking techniques *(A Y* 17/6; *A Y* 17/7). Occupation was evidently intensive,

Fig.781 Standing walls of Structure 5/6, Period 5B, looking east

generating organic-rich occupation deposits which accumulated rapidly, in particular in and around the buildings, and which accounted for a continual rise in ground level. Deposits which were rich in organic remains extended to approximately half-way down the excavated area in the direction of the River Foss. From this point their organic component lessened until, in the south-easternmost quarter of the excavation furthest from the Coppergate street frontage, organic materials other than bone/antler did not survive except in the fills of pits and other cuts.

In the later 10th century the remains of the latest phase of post and wattle structures at the street frontage were covered to a depth of up to 1m. This horizon, designated Period 5A, whim was not traced in the yard areas behind the buildings, is interpreted as resulting in part from the upcast in digging out the sunken structures of Period 5B, and partly as a deliberate dump of make-up or levelling material. It thus accumulated very quickly, probably within a period of weeks or months, and contained a mixture of material of c. 975 and before.

The dating of Period 5A is dependent on the dendrochronological analysis of timbers from the immediately succeeding plank-built semi-basement structures of Period 5B (Fig.781). These were erected at the Coppergate end of each tenement, sometimes in two closely spaced ranks; as in Period 4B, organic rich deposits were concentrated in the vicinity of these buildings, and the organic content of the deposits decreased riverwards. As in the

Fig.782 Foundation for a mid 11th century building on Tenement D, looking north-east. Scale unit 0.5m

buildings of Period 4B, successive layers and lenses of silty loam usually characterised the superimposed floors. Manufacturing continued at this period, although new trades were practised.

On Tenement D sufficient overlying stratification remained undisturbed to show that the latest of the Period 5B sunken buildings was eventually replaced by structures built at ground level (Fig.782). The chronology of these subsequent buildings is imprecise: they can be assigned only approximately to the mid 11th century. They and their associated stratification are designated as belonging to Period 5Cf. A series of approximately contemporary mid 11th century levels was also identified at the rear of the site, associated with and sealing a post-built structure, the latest timber of which has been dated through dendrochronology to 1014-54. These levels, which did not preserve their organic component, are designated Period 5Cr. They were themselves covered by a series of dumps of very dark grey silty clay loam interleaved with evidence for sporadic activity, and dated to the Norman period.

Within the Anglo-Scandinavian stratification there is clear evidence from coins and pottery for the displacement of objects from the context where they were originally deposited and their redeposition in later, often appreciably later, layers. The principal mechanism of this movement was the cutting of pits, wells and the like, and, more particularly, the digging out of the sunken element in the Period 5B buildings, which penetrated earlier

Fig.784 12th-12th/13th century post and wattle walled structure at rear of Tenement C, looking south-east. Scale unit 0.5m

levels and redistributed the soil removed from them (Fig.783). In the case of the precisely dated coins it can be seen that, in the Anglo-Scandinavian levels, coins sometimes occur in contexts dated 75-100 years later than their striking *(AY* 18/1, 24), although their wear patterns do not suggest circulation for this length of time and there is evidence that they were hoarded. Less precisely, but nonetheless clearly, study of the pottery from Anglo-Scandinavian levels has shown, for example, that sherds both of Roman wares and also of handmade middle Saxon type which are unlikely to have been produced after c. AD 850-900 are found residually throughout the era, another testimony to the redistribution of earlier material *(AY* 16/5, fig. 144).

At the Coppergate street frontage, no buildings survived later than those attributed to Period 5Cf. The earliest surviving building of Period 6 was a late 11th/12th century post and wattle structure incorporating a hearth at the rear of Tenement C (Fig.790, p.1706). It adjoined the only length of contemporaneous property boundary which could be identified. Other, probably structural, features attributed to this time include a hearth and a group of large posts at the excavated rear limit of Tenement A.

In the 12th-12th/13th century (Fig.790) the building at the rear of Tenement C was replaced with a series of superimposed post and wattle structures incorporating hearths/

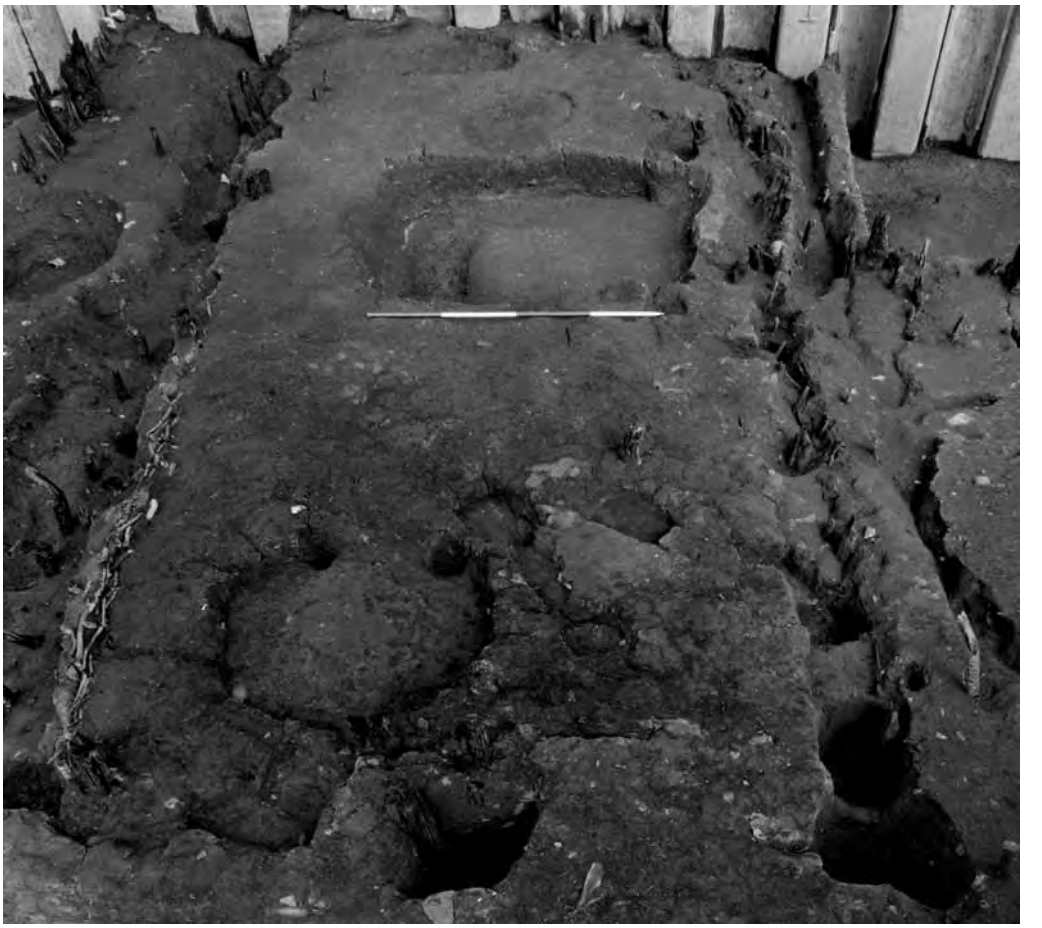


Fig. 784 12th – 12th/13th century post and wattle walled structure at rear of Tenement C, looking south-east. Scale unit 0.5m

ovens (Fig. 784). This complex, which stood within well-defined fenced property boundaries which could be traced towards the middle of the site, is tentatively interpreted as a bakery or malting house. The end of a post and wattle structure on the adjacent Tenement B was also recorded, as was a further set of possibly structural features, including hearths, at the rear limit of Tenement A. A very fragmentary possible structure, represented by a post alignment, was noted towards the front end of Tenement C.

The tenement plots were occupied more extensively in the 13th-13th/14th centuries, although the only evidence for buildings on Tenement A was, once more, from its rear,

Fig.785 13th-13th/14th century padstone structure at rear of Tenement B, with alleyway along Tenement B/C boundary, looking north-west. Scale unit 0.5m

where a series of post-holes and sill walls defined a structure (Fig.790, p.1706). Towards the rear of Tenement B a building was erected which had its principal uprights supported by padstones; alongside it a cobbled surface providing an access way replaced and extended over the fence line that had earlier separated Tenement B from Tenement C (Fig.785). A relatively long building, constructed on pile-cluster foundations, now stood on Tenement C; (Fig.786); it is unclear whether it extended to the riverside limit of excavation, or whether a separate structure occupied that part of the tenement plot. Meanwhile, at the riverward end of Tenement D, there is some evidence for a structure represented most tangibly by a line of posts to the north-east of a series of deposits

Fig.786 13th-13th/14th century building foundations from Tenement C consisting of pile clusters, cut by later intrusions, looking south-east. Scale unit 0.1m

which have the characteristic of internal floor deposits. It is the combination of these two sets of features which defines the structure shown on Fig.790. Towards the Coppergate end of the plot a stone-built structure with substantial horizontal timber foundations in parts may also have been erected within this period (Fig.787).

Fig.787 Walls and cobble foundation capping of possibly 13th-13th/14th century building towards the front of Tenement D, looking south-west. Scale unit 0.5m

Fig.788 14th-14th/15th century rubble sill and associated post-holes, together with the remains of an alleyway, near the rear of Tenement D, looking south-east. Scale unit 0.1m

A very similar layout of buildings was maintained into the 14th-14th/15th centuries, although most individual structures were rebuilt during this time (Fig.790). A new building, represented by post-holes now occupied the rear of Tenement A, and the Tenement B padstone building was also rebuilt. The long building on Tenement C continued in use initially but was then demolished; an alley surface was laid down between it and the building on Tenement D. Later, a ditch, redefining the Tenement C-D property boundary, was cut within the limits of the earlier long Tenement C building. Evidence for a contemporary .building over the rear of Tenement D was now unequivocal, with the construction of a rubble sill wall (Fig.788). The stone cellared building nearer the frontage may have remained in use.

Fig. 789 15th-15th/16th century stone structure on Tenement A, with parts of its cobbled floor already removed, looking north-west. Scale unit 0.1m

The latest coherent archaeological evidence is dated to the 15th-15th/16th century. A much more substantial, stone-built structure was now erected in the centre/rear of Tenement A (Fig.789); its full extent is not known. More recent disturbance has removed contemporary stratification from most of Tenement B, and there was no trace of any building within the undisturbed portion at the riverward end of this property. A new, relatively long building represented by rubble sill walls was built at the centre/front of Tenement C, and there were also robbed out traces of another, smaller structure nearer to the river, with a ditch defining the property boundary to one side and a wall to the other. The earlier Tenement D buildings continued in use at this time.

A series of dendrochronological and archaeomagnetic determinations provide a fairly precise chronology for a majority of the buildings; ceramic and numismatic data support and extend this information. Stratigraphic analyses undertaken on the Period 6 sequences since the publication of AY 17/5 have in some instances modified the dating presented there.

Although the number and size of these buildings varied throughout the later medieval and earlier post-medieval centuries, their intermittent presence sealed the deposits below and temporarily protected them from damage caused by intrusive pits. Furthermore, the introduction both of levelling deposits before the erection of some of the buildings, and of dump deposits which indicate the disposal of a quantity of rubbish in a single event, served to raise the ground level and offer some protective cloak or masking against erosion and disturbance. Conversely, changes in building techniques and materials, notably the increasing use of stone and then brick wall footings, and tiled roofs, contributed to a gradual diminution in the amount of organic debris being generated and deposited on the site during the later medieval period. From the 13th-13th/14th century onwards, access alleyways rather than fence lines sometimes marked the boundaries of tenement plots. Concomitantly, these stone surfaces also sealed underlying deposits, temporarily protecting them from intrusion and degradation. Nonetheless, the digging of wells, cess-pits and other features throughout the medieval and post-medieval centuries did bring some earlier material to the surface.

Recovery of evidence

The excavation, directed by this author, took the form of a continuous archaeological campaign of five years and four months during 1976-81. Resources were provided principally by the Ancient Monuments Inspectorate of the Department of the Environment (now English Heritage), the Manpower Services Commission, the British Academy and a host of private individuals and corporations.

Mid 10th century to late medieval deposits were investigated over the entire excavated area, which comprised c.1000m^2. Owing to a shortage of funding, the earliest levels, dating from the Roman period to the early/mid 10th century (i.e. up to and including what is described above as Period 4A), were not examined right across the c.1000m^2 open in the subsequent levels. Instead, a strip measuring approximately 20 x 7.5m across the Coppergate street frontage and a contiguous strip up to 12m wide and 37m long, running down the southern half of the site towards the River Foss, were excavated to natural soils (Fig.790, pp.1704-7).

Layers attributable to Periods 1 and 3 were recorded throughout these strips. A well-defined Period 2 horizon existed only in the street frontage strip; elsewhere, because of stratigraphic interruptions and an overall thinning of these earlier layers as they ran eastwards from the street frontage, Period 2 contexts could not be isolated with certainty. Therefore,

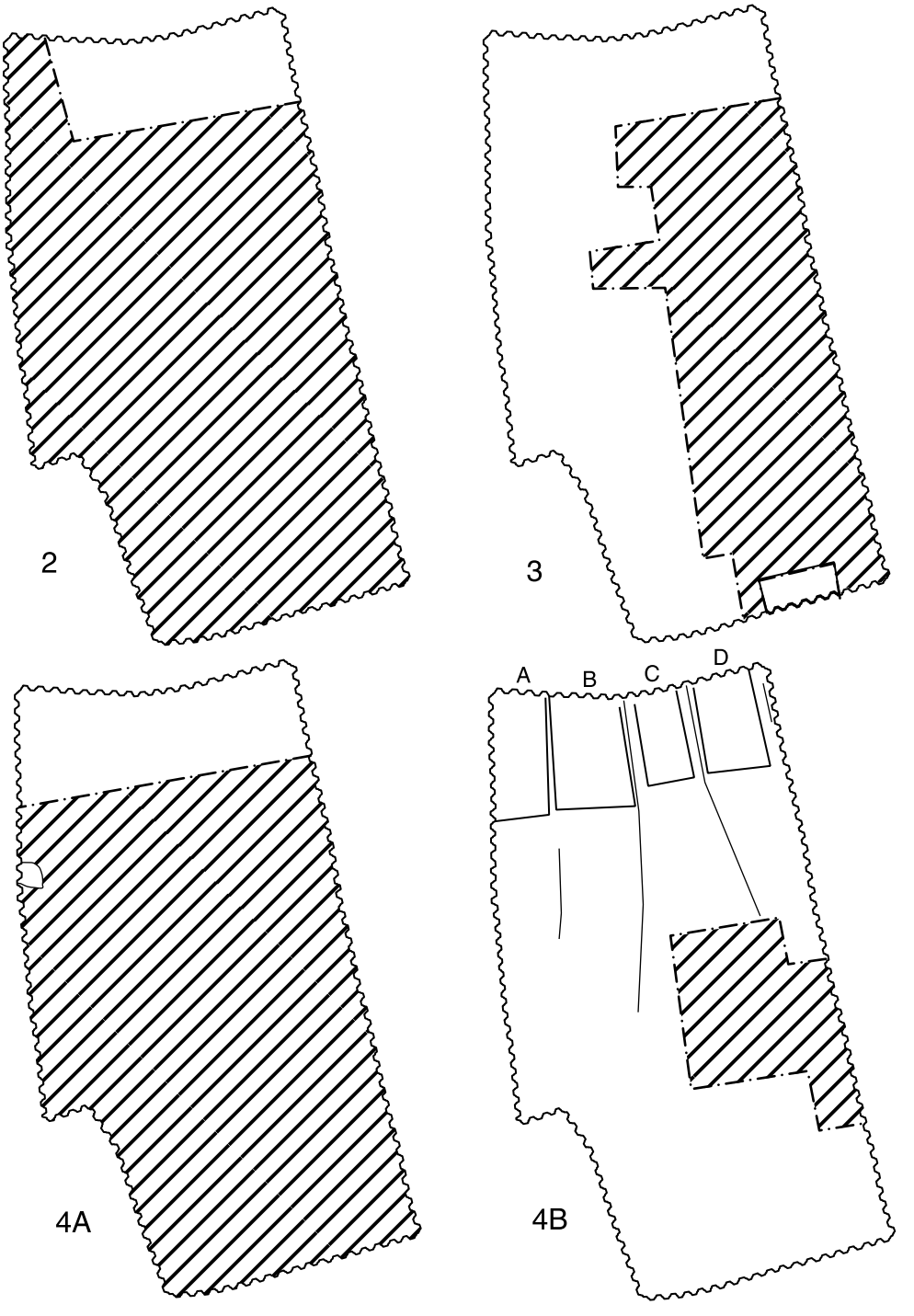
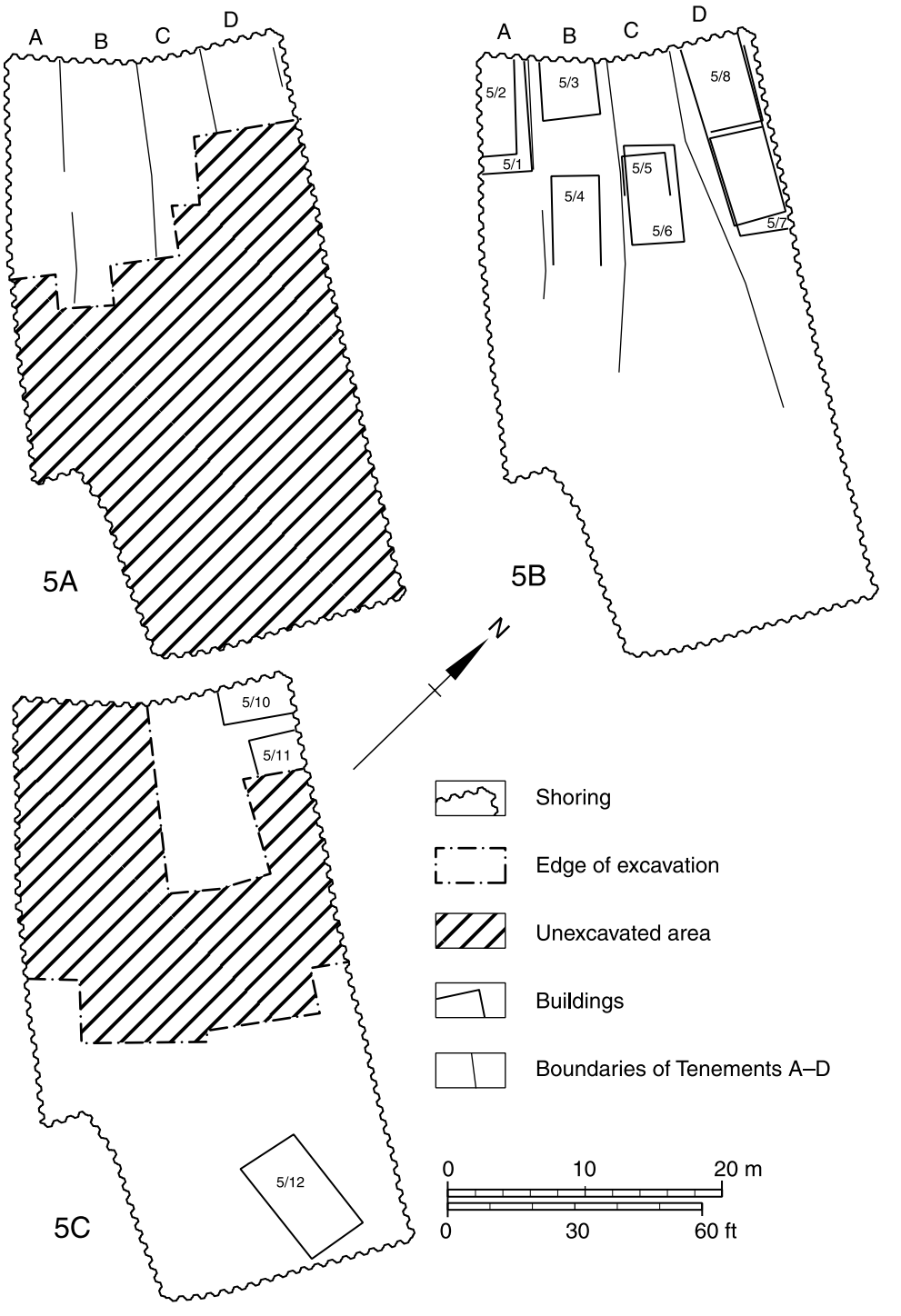
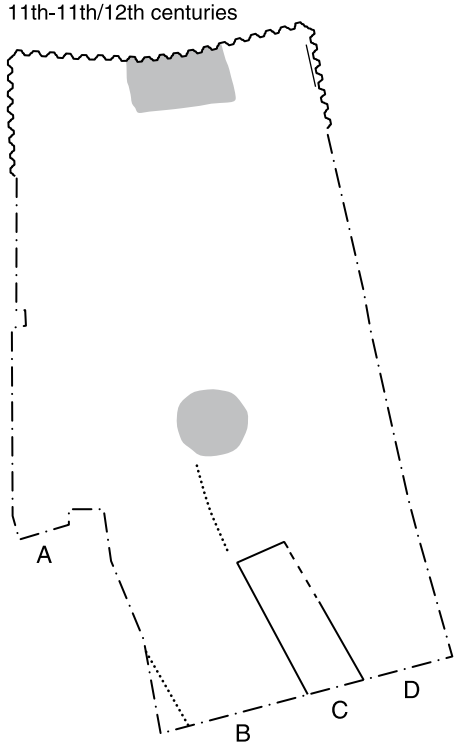


Fig. 790 (pp.1704–7) Plans of the site at 16–22 Coppergate showing the area of deposits excavated for each period. The variation is due either to restricted excavation or to the limited occurrence or survival of the relevant deposits.

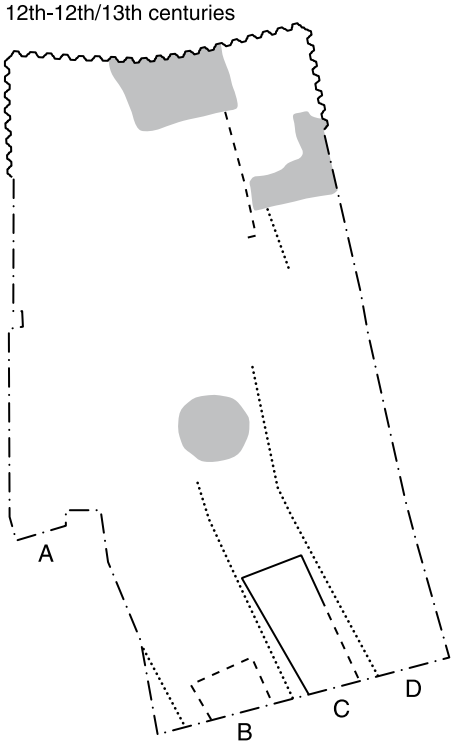
a (above and facing) Periods 2–5. Scale 1:500


A
B
C
D
5A
5B
5C
5/1
5/2
5/3
5/4
5/5
5/6
5/7
5/8
5/10
5/11
5/12
N
Shoring
Edge of excavation
Unexcavated area
Buildings
Boundaries of Tenements A–D
0
10
20 m
0
30
60 ft

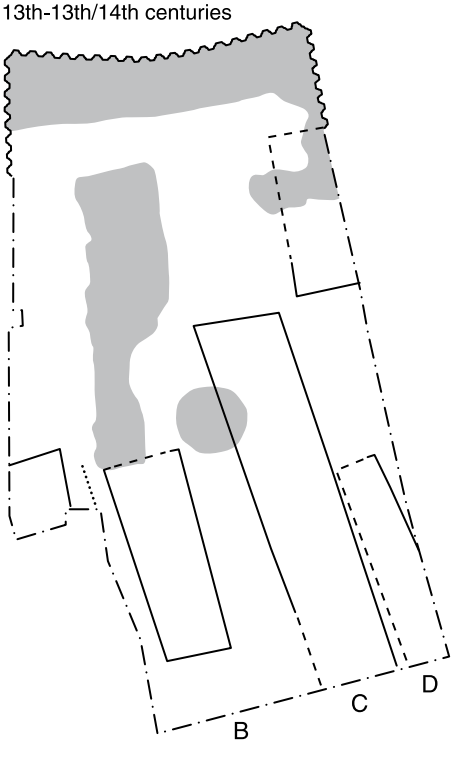
11th-11th/12th centuries



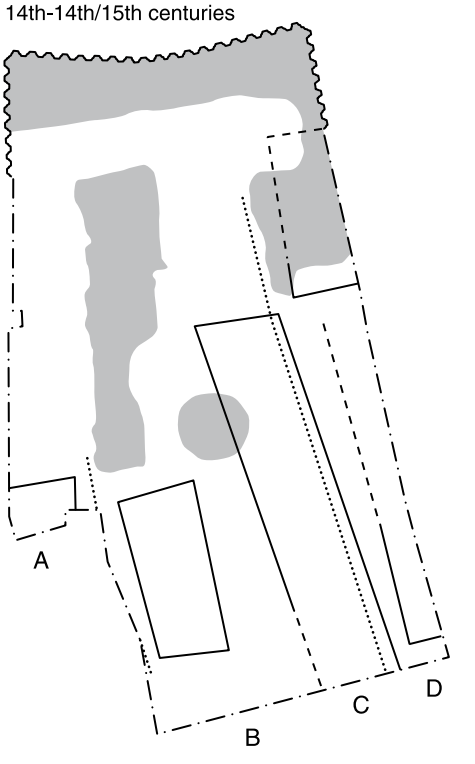
12th-12th/13th centuries



13th-13th/14th centuries



14th-14th/15th centuries



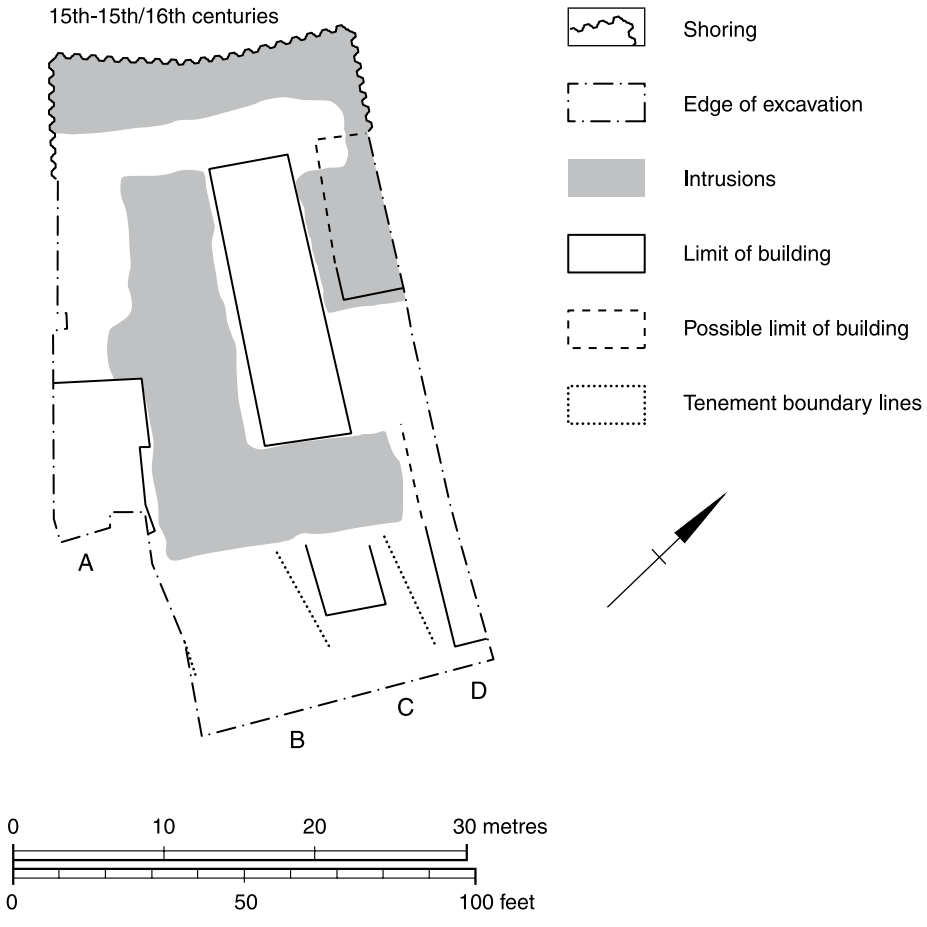


Fig. 790 (contd) b (facing and above) Period 6. Scale 1:500. The insertion of perimeter shoring after the removal of most Period 6 deposits slightly lessened the excavation area.

although some deposition of soil must have taken place throughout Period 2, remains of this period are shown as of limited extent. Similarly, the Period 4A horizon, while extending right across the frontage, could not be traced convincingly down the southern strip beyond a point where diagnostic features petered out. It is thus conceivable that a small amount of soil build-up which took place during Period 4A on that part of the southern strip to the east of the limit of identifiable 4A features has been subsumed into Period 4B, which was investigated over the entire excavated area.

For reasons outlined above (p.1695), the deposits designated as Period 5A were limited in extent to the front pan of the site. Deposits of Period 5B were traced across the entire area excavated. Deposits of Period 5Cf and 5Cr were limited to the front- and rear-most

portions of the excavation respectively, and no contemporary levels could be stratigraphically isolated in the central part of the excavation. Layers of Period 6, a designation that encompasses all deposits of the Anglo-Norman to post-medieval/early modem eras, covered the entire excavated area except where removed by more recent disturbances. As noted above, structures which could be attributed to Period 6 were not in evidence at the modem street frontage, but structures were found across the rest of the excavated area. Survival of these remains was affected in places by modem (19th and 20th century) disturbance, particularly that related to occupancy of part of the site by Cravens, the Victorian and later sweet factory.

These variations in the size of area excavated must be borne in mind in any chronological/ quantitative analysis of the artefactual evidence.

The characteristics of the demolition site that was handed over for investigation, notably the varying extent of modern intrusions, coupled with the logistics of excavation and the continual financial uncertainties, dictated the tactics employed throughout the excavation process. Anglo-Scandinavian deposits were revealed below modern cellars within a few days of excavation commencing, yet elsewhere on the site later medieval deposits were still being investigated two years later.

During the redevelopment of 1981-3 a continuous watching brief over an extended area, running down to the present edge of the River Foss (Fig. 777, 2, p.1688), was maintained , under the direction of N.F. Pearson. The results of this exercise are incorporated into the reports mentioned below.

The structures and strata recorded in the Coppergate excavations will be published in AY 6, 7, 8 and 10. Biological evidence from the Anglo-Scandinavian deposits has been published in AY 14/7, the Anglo-Scandinavian animal bones have been published in AY 15/3, and the Anglo-Scandinavian pottery has been published in AY 16/5. A series of artefact reports is being published in AY 17. The post-Roman coins and numismatica are included in AY 18/1. Roman coins will appear in AY 18/2. Once all the Anglo-Scandinavian structures, artefacts and environmental data have been studied and published, a synthesis of the entire assemblage will be produced.

The range and quality of the evidence

A total of 1,147 artefacts connected with textile production has been recovered from the excavation at 16-22 Coppergate. Two of these are from Roman levels, thirteen from post-medieval deposits and 44 lack a firm date, being unstratified or from the watching brief. Of the remaining objects, 1,006 are from levels dated to the 9th to 13th centuries and two-thirds of these belong to the Anglo-Scandinavian period, the mid 9th to mid 11th centuries. These figures do not include the 25 samples of raw wool, 120 textiles and 58 yarns and cords from Anglo-Scandinavian and medieval Coppergate (AY 17/5). Bioarchaeological samples from Anglo-Scandinavian deposits have also yielded quantities of evidence in the form of dyeplants, wool parasites, flax and teasels (AY 14/7);

some preliminary notes on the medieval samples have also been included here. The artefacts and archive are housed in the Yorkshire Museum, York, under the Museum and YAT accession codes 1976-81.7 and 1988.22.

As R.A. Hall has described in his introduction, the site was used from the mid 9th century onwards and frequent pit-digging and construction work would have churned up a certain amount of material from lower levels. The problem of how closely artefacts from 16-22 Coppergate can be tied to the date of the deposit from which they have come has therefore been addressed by Mainman (AY 16/5, 388-90). Within the present volume, especially in the section Chronology and Distribution, pp.1791-1820, every attempt has been made to distinguish between those artefacts which are from sealed, well-dated deposits and those which may be residual or intrusive.

The preservation of all types of material was excellent. Even small items such as iron needles were recovered and slick-stones of potash glass, a substance which can deteriorate rapidly during burial, were well represented. The only material which seems to be under represented in the collection is wood: for example, there are 236 spindle whorls but only five of the wooden spindles with which they would have been used. Since organic materials were in general well preserved, it seems likely that wooden artefacts were being discarded in a different way from other objects, perhaps being collected up for burning (J.A. Spriggs, pers. comm.).

Significance of the collection

Textile tools are ubiquitous in the archaeological record – most excavations will yield at least a couple of spindle whorls – and yet there have been relatively few large collections from one site. Two Anglo-Saxon villages at West Stow, Suffolk (West 1985), and Mucking, Essex (Hamerow 1993), have produced textile tools in numbers comparable with Coppergate; and middle Anglo-Saxon Flixborough, Lincs., and West Heslerton, N. Yorks., have more recently yielded large groups, still in the process of investigation. The medieval sites grouped together at Winchester, Hants. (Keene 1990), also make up a substantial collection *in toto*. Outside Britain, one especially large collection of textile equipment from Bryggen, the medieval docklands of Bergen, Norway, has been the subject of a thorough study by Øye (1988); and the work of Petersen (1951) on the tools in Norwegian graves has brought together comparable artefacts of the Merovingian and Viking Age.

Most of the remaining artefacts are thinly scattered through the archaeological literature. It has been difficult to see broad trends in such evidence, although there are some noteworthy small collections from 9th-11 th century Goltho, Lincs. (Beresford 1987), Lincoln, Lincs. (Mann 1982), Thetford, Norfolk (Rogerson and Dallas 1984), Northampton, Northants. (Williams 1979) and London (Pritchard 1991), and from medieval Beverley, E. Yorks. (Armstrong et al. 1991; Evans and Tomlinson 1992). Comparable material from Dublin, Eire, is as yet only partially published (Ó Riordáin 1971; Lang 1988). In York itself, finds from a number of sites (see pp.1809-10) show something of the extent of the textile industry

in the town, but the artefacts are too few in number, or were excavated too long ago, to support more serious conclusions.

Against this backdrop, the significance of the Coppergate collection becomes clear. It is the first to cover six centuries and thus to allow long-term changes in production to be observed. It is the first to include a sizeable collection dated to the 9th to 11th centuries. And it is the first to cover in any depth the transitional phase between the 9th and 12th centuries, when the rural textile industry moved into towns and slowly began to organise itself for trade. For York this was an especially significant time, as the town had a gild of weavers by 1165 and was one of the first to manufacture cloth worthy of export. One of the purposes of the present investigation was to look for early stirrings of commercial activity and the organisation of the crafts along gild lines. This, however, is for a later section of the work. The first task is to examine the full range of textile techniques represented at Coppergate.

The Processes of Textile Production

All the stages of textile manufacture are represented in the Coppergate material. As will be shown later in the volume (pp.1791-1820), the same tools were not always in use at the same time and the chronological ebb and flow of the textile crafts has some significance in understanding the site. For the present, however, the textile processes will be discussed in the order of production, from raw materials, through spinning, weaving, dyeing and finishing, to cutting and stitching.

While researching this section, it became clear that the technology of textile production has been poorly understood by archaeologists. Flax heckles have been confused with wool-combs, spindles with distaffs and unlikely objects identified as spindle whorls and loomweights. Within this part of the work, therefore, there has been some attempt to clarify the names and functions of tools and to establish, where possible, parameters for their identification.

Fig.791 Selection of wool staples from Anglo-Scandinavian levels at 16-22 Coppergate; from left to right, 1374*, Hairy fleece type;* 1376*, Hairy Medium;* 1378*, probably Medium;* 1377*, Generalised Medium. Length of* 1374 *90mm*

Raw materials (Table 143)

The raw materials being processed at Coppergate were wool and flax (Table 143). Hemp and nettle were also available locally *(AY* 14/7, 151-2), although the evidence for their exploitation is limited (p.312, *AY* 17/5). Silk textiles were being cut and stitched on site in the Anglo-Scandinavian period, but the silk would have been imported ready-woven (pp.313-14, 361-76, ibid.), or as yarn for braids (pp.381-2, ibid.).

Table 143 Raw materials and associated evidence from 16-22 Coppergate and the Watching Brief

*Number of contexts yeilding evidence (note that biological remains were recovered by a sampling strategy (see AY 14/7, pp.451–2) and are not directly comparable with the numbers of artefacts)
** Information not yet available

	Raw wool	Sheep parasites	Bale pins	Flax seeds	Flax seed-pods	Flax stem fragments
Period						
16–22 Coppergate						
Anglo-Scandinavian						
3	3	9	—	19	5	—
4A	—	5	—	4	5	—
4B	12	83	—	64	21	1
5A	2	28	—	22	7	—
5B	6	72	—	53	15	2
5C	—	11	—	20	2	—
Sub-total	(23)	(208)		(182)	(55)	(3)
Medieval						
6						
mid 11th –late 12th	1	**	—	**	**	**
end of 12th – late 13th	—	**	4	**	**	**
end of 13th – late 14th	—	**	6	**	**	**
end of 14th – late 15th	1	**	7	**	**	**
Sub-total	(2)		(17)			
Post-medieval						
6						
end of 15th – late 17th	—	**	1	**	**	**
Unstratified	—	—	—	—	—	—
Watching Brief	—	**	—	**	**	**
Total	25	208	18	182	55	3

Fig. 792 Aries the ram in the 'York' Psalter (Glasgow University Library, Department of Special Collections, MS Hunter 229), written and illustrated in northern England c.1170. The pointed wool staples suggest hairy wool of the sort found at Anglo-Scandinavian Coppergate

Wool

There seems to have been an abundant supply of sheep's wool at Coppergate from the 9th century onwards. There are 25 examples of raw wool from Anglo-Scandinavian and medieval phases, and quantities of parasites specific to sheep and their fleeces (Table 143). In addition, eighteen wooden pins of the type used to fasten commercial packs of wool have been recovered from medieval levels.

The raw wool has been described by Walton and Ryder (pp.301-11, *AY* 17/5) and is summarised here in Table 144. It has survived as matted clumps of fibre and as intact 'staples', the locks of wool into which a fleece naturally falls (Fig.791). Two of the earliest examples, 1256 and 1283, must have been intended for textile manufacture, as they have been dyed, but whether the others were so intended is open to question. Those with fibre roots present will have come from dead animals (Table 144) and may have been waste from slaughtering *(AY* 15/3, 159, 171-5) or leather tanning, or they may have fallen from sheepskins used for cloaks or bedding. Nevertheless, they illustrate the type and quality of wool available in the region.

Table 144 Raw wool from 16–22 Coppergate

The staple length in round brackets is from an incomplete staple
*Fleece types in square brackets have been identified by M. L. Ryder from shape of staple rather than from fibre diameter measurements
Note on pigment: White = 0–4% pigmented fibres; Off-white = 5–9% pigmented fibres; Grey or brown = 20–30% pigmented fibres; Black = 95–100% densely pigmented fibres; Pale brown = slight pigment on all; Grey skimlet = white underwool with long black hairs
Gen Medium = Generalised Medium

	Structure	Staple length (mm)	Fleece-type	Original wool colour	Notes
Period 3					
1254	intact staples	25	[Hairy]*	—	Lambswool
1255	intact staples	25	Hairy	White	Lambswool from dead animal
1256	matted fibres	—	—	—	Dyed with madder
Period 4B					
1283	incomplete staples	(8)	Medium	White	Dyed with madder
1284	intact staples	50	Hairy Medium	Pale brown	
1285	matted fibres and intact staples	50–60	Hairy	White	
1286	matted fibres and intact staples	20–50	Hairy	White	From dead animal
1287	intact staple	50	Hairy	White	
1288	matted fibres	—	Hairy	Off-white	Lambswool
1289	intact staples	100	Hairy Medium	Grey or black	
1290	matted fibres and intact staples	20–40	Hairy Medium	White	
1291	intact staples	(a) 20–50 (b) 90–130	Hairy Hairy	Pale brown Pale brown	Lambswool Adult
1292	intact staple	30–40	Hairy Medium	Pale brown	?Lambswool
1293	matted fibres and intact staples	–	(a) Hairy (b) Gen Medium	White Off-white	?Lambswool
1294	intact staples	(a) 30–40 (b) 90–100	Hairy Medium Gen Medium	White White	
Period 5A					
1361	intact staple	35–40	Hairy	White	Lambswool
1362	intact staples	15	Fine	White	Lambswool
Period 5B					
1373	intact staples	90	Hairy	Grey or brown	From dead animal
1374	intact staple	90	Hairy	White	Lambswool from dead animal
1375	intact staples	80–130	Hairy Medium	Grey skimlet	Lambswool
1376	intact staples	70	Hairy Medium	Grey or brown	From dead animal
1377	intact staple	30	Gen Medium	White	Lambswool from dead animal
1378	intact staple	50	[Medium]*	—	Adult
Period 6 11th/12th century					
1412	intact staples	50	Hairy Medium	White	Lambswool from dead animal
14th/15th century					
1413	intact staples	40	Shortwool (='Semifine')	White	From dead animal

Most of the raw wool from Anglo-Scandinavian levels falls into the coarse Hairy and Hairy Medium fleece-type categories. This is the kind of wool illustrated on a ram in the 12th century York Psalter (Fig.792) and the type still to be found in north-east England on Swaledale and Cheviot sheep. The better quality fleece-types, Generalised Medium, Medium and Fine, are also present at Coppergate, although in small numbers. A similar range of wools has been used to make the Anglo-Scandinavian textiles crable *13,AY* 17/5), which supports the view that most of them are locally made. Medieval levels (period 6) yielded only two examples of raw wool, but the wool in the textiles shows a change towards more Shortwool and Generalised Medium types in the post-Norman period. This improvement in the local Yorkshire wool is supported by documentary evidence, although it may have lasted only as long as demesne fanning (see below, pp.1829-30).

Since the original study of the Coppergate wools, similar work has been carried out on Viking Age collections from other parts of north-west Europe (Walton Rogers 1993, 1995 and forthcoming a and b). It can now be shown that the Hairy wools so common at Coppergate are typical of northerly parts, including north Britain, the Norse settlements at Greenland and Shetland, North Saxony and Frisia. The Hairy Medium wools are more widespread in north-west Europe and are common in southern England, along with other finer types of wool. Where the Coppergate and Anglo-Saxon collections seem to differ from the other wools is in the quantity of white wool. In the substantial collection from North Saxony and Frisia, for example, brown, grey and black wool made up three-quarters of the material dated to the 7th to l0th centuries (Walton Rogers 1995). At Coppergate only one-third of the Anglo-Scandinavian wool, whether raw or processed, was pigmented (and the medieval wools were all white). White wool is vital if the fibre is to be dyed and dyeing formed a significant part of textile production at Coppergate in the Anglo-Scandinavian period.

Those wools which are not from dead animals appear to have been shorn. The shearing was probably done outside York, on or near the sheep pasture. After shearing, the fleeces would have been sorted and packed, ready for transport into town.

Sheep parasites: keds and lice

The evidence for sheep parasites from Anglo-Scandinavian levels of 16-22 Coppergate has been described in *A Y* 14/7 and **H.K. Kenward**, Environmental Archaeology Unit, University of York, provides the following summary.

> Adults and puparia of the sheep ked Melophagus ovinus, a wingless parasitic fly, were present in a large number of the sub-samples from Anglo-Scandinavian deposits from 16-22 Coppergate examined for insect remains, and puparia were also noted from sub-samples examined for plant macrofossils (AY 14/7, fig. 194). M. ovinus is known to farmers as the sheep ked, sheep tick or sheep louse (the last two, of course, being misnomers so far as the entomologist is concerned). It is completely wingless in both sexes and the whole life history is passed within the fleece of its host (details of the animal's biology and of its effects on its host are given in AY 14/7, 775-6).

Fig. 793 Wooden pins used to fasten bales of wool, 6659-61, 6657-8, 6656. Length of 6656, 150mm

M. ovinus has been recognised from a variety of archaeological sites and contexts (ibid., 776-7). It is generally thought to have been introduced in wool and deposited as a result of fleece cleaning. The distribution of the remains at Coppergate is indicative of a cleaning method which caused direct deposition of both adults and puparia (or perhaps adults in puparia, the adults being released when puparia were broken during processing).

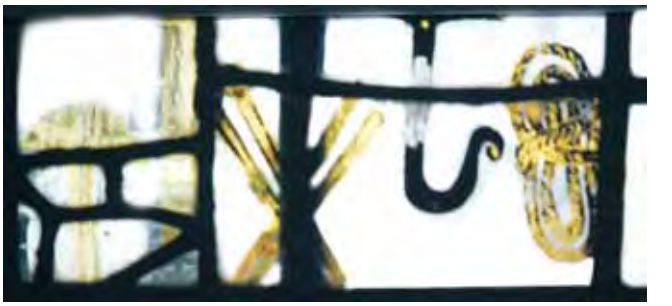


Fig.794 The tools of the medieval packman in a panel of 15th century stained glass at St Martin's Church, Bowness-upon-Windermere, Cumbria. Left, five bale pins for fastening the outer cover; centre, a wool-hook for handling the bales; right, a bundle of rope (reproduced with permission from Kendal Civic Society and Frank Peters Publishing)

The true sheep louse, Damalinia avis, was recorded most frequently from Period 4B deposits at Coppergate (for details, see ibid., 777). Like M. ovinus, it presumably arrived in fleeces.

The remains of these sheep parasites were concentrated particularly in deposits interpreted as floors, although small numbers occurred in other kinds of deposit, probably as a result of waste disposal and trampling.

The bioarchaeological samples from medieval levels (Period 6) are still in the process of study, but preliminary work has revealed M. *ovinus* on Tenements B, C and D in deposits ranging from the late 12th to the early 15th century (Garrott et al. 1996a, table 6).

Bale pins

Morris has identified eighteen whittled wooden pins, 90-275mm long, as bale pins (Fig.793) (Morris *AY* 17/13.). They are all from Period 6, from deposits ranging in date from the 12th/13th to the 16th century (Table 143, p.1712). Similar pins have been recovered from sites associated with the medieval wool trade, such as the 'Wool Quay' at Custom House, London (ibid.). Bale pins, or 'pack pricks' as they were known, are illustrated in several stained-glass windows in Cumbria, along with other tools of the medieval packman, such as wool-hooks and ropes (Fig.794; Satchell 1986, 25-31). They would have been used to fasten the outer wrapper of a bale of wool, especially the sort carried by packhorses (ibid., 28). Although wool must have been transported in the Anglo-Saxon period, there is no evidence for the use of bale pins before the 12th or 13th century.

The Coppergate bale pins come from a period when the local wool trade was at its height. The accounts of the Hull merchant, William de la Pole, for example, show fleeces being collected in North Yorkshire in 1337 and brought by cart and packhorse to York, where they were packaged in large canvas 'sarplers' ready for shipment by river to Hull and the Continent *(Gustus de* 1131/2 *saccis emptis in comitatU Ebor* in Fryde i 964, 17-18). A

Table 145 Fibre-processing tools from 16–22 Coppergate and the Watching Brief
*one wool-comb and one iron base-plate from a wool-comb

	Wool-combs	**Flax ripple**	**Flax pounders**	**Scutching blade**	**Iron spikes**
Period					
16–22 Coppergate					
Anglo-Scandinavian					
3	—	—	—	—	20
4A	—	—	—	—	7
4B	—	—	—	—	40
5A	—	—	—	—	16
5B	2*	—	1	1	73
5C	—	—	1	—	31
Sub-total	(2)	(—)	(2)	(1)	(187)
Medieval					
6					
mid 11th –late 12th	—	—	—	—	67
end of 12th – late 13th	—	—	—	—	107
end of 13th – late 14th	—	—	—	—	11
end of 14th – late 15th	—	1	—	—	10
Sub-total	(—)	(1)	(—)	(—)	(195)
Post-medieval					
6					
end of 15th–late 17th	—	—	—	—	5
Unstratified	—	—	—	—	10
Watching Brief	—	—	—	—	5
Total	2	1	2	1	402

sarpler contained a sack or more of wool, a sack being a medieval weight in the region of 364lb (165kg) (Salzman 1931, 61, 312-16; Lloyd 1972,92-3). In one consignment 113½ sacks were repackaged in this way and, at a time when an individual fleece weighed 1–2½lb (0.5-1kg) (Postles 1981), this represents an enormous number of fleeces. The Coppergate bale pins are likely to have come from packhorse bales being broken up or repackaged and their presence indicates a merchant, wool-brogger or wool-packer operating on the site.

Flax

Quantities of seeds and fragments of seed-pods from the flax plant, *Linum usitatissimum* L., were recovered from all phases of the Anglo-Scandinavian occupation. Since the seeds may have been used for food and linseed oil *(AY* 14/7,716,754) and the pods for cattle fodder (Plonka 1965, 8), they are not of themselves evidence for the use of the plant for textile manufacture. More significantly, stem fragments were also found, as A.R. Hall describes here:

> Flax stem fragments were recorded from perhaps three deposits of Anglo-Scandinavian date at 16-22 Coppergate. In one instance a concentration of stem fragments preserved by anoxic waterlogging and identified by P. Tomlinson as flax was noted *(AY* 14/7, 562, 773). This came from the fill of a Period 4B pit at the far south-eastern end of the identifiable extent of Tenement C (Fig.840, p.1796). A further, tentatively identified, concentration of 'waterlogged' flax stems came from a deposit associated with a Period 5B building on Tenement D, whilst there were charred stems, probably flax, within backfill deposits in Structure 5/5 on Tenement C, Period 5B (Fig.845, p.1804).
>
> These stem fragments may be scutching waste or 'shives' (German *Scheben* cr. Körber-Grohne 1967), resulting from the breaking of rened stems for the extraction of the fibre, indicating that this activity was part of the sequence of textile working at Coppergate.

Samples from Period 6 have not yet been examined in detail for plant remains, but spikes which are likely to be from flax heckles have been recovered from 12th/13th century deposits and there are also lengths of rope made from whole flax stems of the same date (1446, 1454, *AY* 17/5, 394). Rope was generally made from whatever stout, flexible fibre was available locally and the use of flax stems suggests an abundance of the plant in the neighbourhood.

Flax is a field crop which would have been harvested as the seed ripened, generally in July-August (Markham 1683, 128-30). The whole plant has to be pulled, then left to dry in stooks in the field, before being brought into town for processing (ibid.; Massingham 1943).

Fibre preparation (Table 145)

The tools from 16-22 Coppergate which have been used in the preparation of fibre are as follows: one wool-comb (2272, *AY* 17/6) and part of the binding plate from another (2273, ibid.), a flax ripple (6641), two flax pounders (6642-3) and a flax scutching tool, (6644) (for dates see Table 145). There are also 402 iron spikes (table 145), some of which will have fallen from wool-combs and some from flax heckles. In addition it is possible to reconstruct intermediate processes, such as washing and oiling of wool, which have left little tangible evidence.

The terms for fibre-processing tools have become confused in the archaeological literature. To clarify, wool would have been washed, oiled and prepared for spinning with a pair of wool-combs, or, from the 13th or 14th century, with brush-like tools called cards or carders. Flax

stems would have been 'rippled' to remove seed pods; soaked or 'retted'; dried; broken with a 'beetle' or pounder; scraped with a wooden scutching knife; then drawn through blocks of iron spikes, called heckles or hackles. The fact that wool-combs and flax heckles have similar iron teeth has caused confusion, but the processes are entirely different and within the craft literature the term 'heckle' is never applied to a wool-processing tool; nor is there any evidence that a wool-comb was ever used to prepare flax (for correct terminology, see Markham 1683; Baines 1979; 1989; Hoffmann 1991; and *O.E.D.* entries for *wool-comb, heckle* and *hackle)*.

Washing and oiling wool

Washing is essential if the wool is to be dyed before spinning. There was no evidence for plant detergents at Coppergate, but there was a deposit of what may have been a scouring material, a clay mineral related to fuller's earth, in a Period SA pit which also yielded dyeplants *(AY* 14/7, 577-8); or stale urine may have been used for the purpose. After washing, and perhaps dyeing, the wool would be re-oiled with some clear fat or grease. Markham recommends 'best Rape Oyl, or for want thereof, either well-clarified Goose-grease or Swines-grease' (Markham 1683, 126). There may have been a want of best rape oil at Coppergate (A.R. Hall, pers. comm.), but the animal fats would have been available *(AY* 15/3, 179, 194). The grease would have been warmed and worked into the clean wool by hand (Markham 1683,126).

The wool would next be processed so that the dense wool staple was opened out and the fibres arranged in an even floss.

Wool-combs

The wool-comb from Coppergate has been described by Ottaway (2273, p.538, *AY* 17/6). Briefly, it consists of a double row of iron teeth, set in a wooden base. The base is cased in iron and would originally have had a long wooden handle at right angles to the teeth (Fig. 795). A fragment of perforated iron plate of similar date (Period 5B) may be from the binding of another wool-comb (2272, p.539, ibid.).

Rectangular-headed two-row combs of this sort are well-known from 7th and 8th century England, when they appear to have taken over from the old Roman comb, with teeth and base all in one plane (pp.539-40, ibid.). Similar combs are known from northern France, The Netherlands and Denmark (ibid.; Ottaway and Rogers *AY* 17 in prep.), although Petersen could find only one in his survey of Norwegian graves (petersen 1951, 319-24). Instead, he found another type, which has one row of teeth set in a cylindrical head. Other examples of one-row combs are recorded from Viking graves of the Northern Isles (Hedges 1980, 282) and from Denmark (RoesdahlI977, 28-9), which seems to lie at the geographical overlap between the two types.

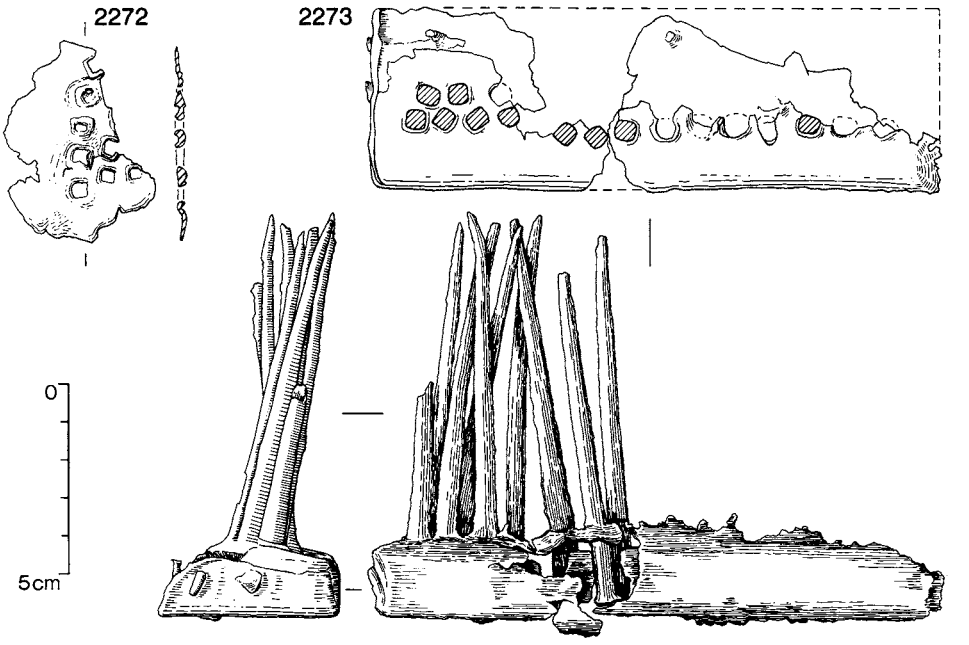


Fig.795 Binding plate 2272 and wool-comb 2273. Scale 1:2

How were wool-combs used? There are so many pictures of wool-combing, medieval and modem, that it has been easy to assume that Anglo-Saxon wool-combs were used in the manner depicted. The illustrations show combs used in pairs, one mounted on a stock with fibre hanging down vertically and the second held in the hand and pulled downwards through the fibre (Fig.796). In fact, these illustrations date from the 14th century or later, by which time the wool-comb had taken on a specialised role, following the arrival of wool-cards (Hoffinann 1974, 286, 382). Wool-cards were adopted for short-staple wools, while the wool-comb acquired longer teeth at this stage and developed into a tool solely for the processing of long-staple wools. The earlier, shorter-toothed combs of the type found at Coppergate may have been used for both processes. For short-staple wools, they are likely to have been held one in either hand and the fibre drawn from one comb to the other, in the manner of the later cards (Fig.797) (Hoffinann 1991, 23).

Flax processing tools (Fig. 798; Table 145)

Within the flax plant, the fibres run lengthways down the stem in a layer of fibre bundles situated between the inner woody core and the outer rind. To separate fibre from plant requires at least five processes, described below. The wooden tools used to convert the flax

Fig.796 Combing wool with one comb mounted in a stock

plant into fibre (Fig.798; for dates see Table 145, p.1718) have been identified by Morris, who has discussed them in relation to a number of similar artefacts from other parts of north-west Europe (Morris *AY* 17/13, pp. 2325–2337).

Rippling

A large, coarse-toothed wooden tool dated to the early 15th century (6641, Fig.798) has been identified as a flax ripple or rippler, from comparison with similar objects from medieval Bryggen (Bergen), Norway (Øye 1988,29-31). The wood is pine, which was not grown in England at this time, and the object may have arrived in the Norwegian or Baltic

Fig.797 Combing wool with a comb in either hand

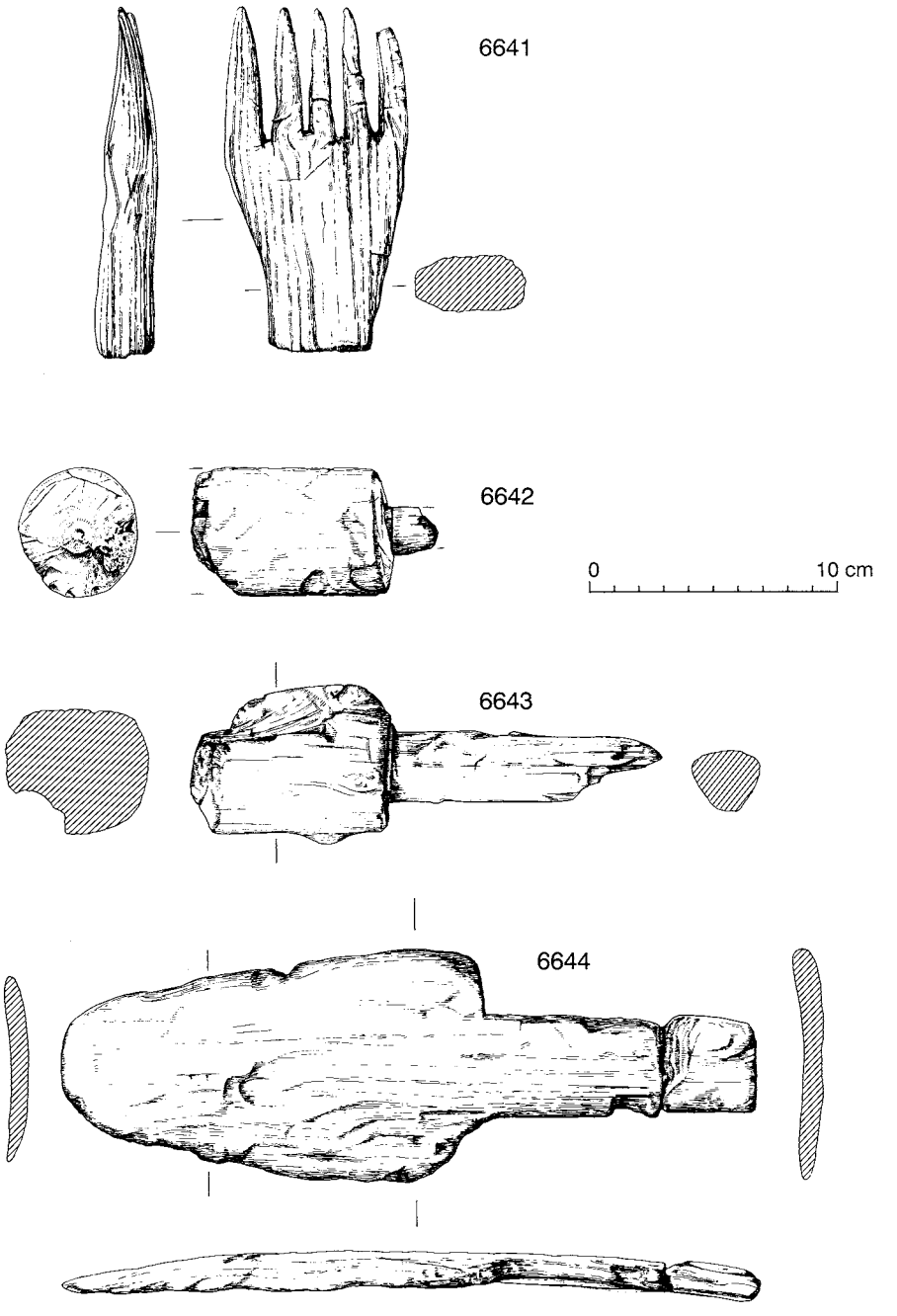


Fig. 798 Wooden tools for flax-processing: ripple, 6641*; pounders,* 6642 *and* 6643*; and scutching blade,* 6644. *Scale 1:3*

trade (see also p.1811). The shaft has sheared through, but originally it would have been mounted in a stand, so that the teeth were vertical or pointing diagonally away from the user. The head of the flax plant would have been drawn through the teeth, so that the seed-pods popped off. Ripples more commonly have iron teeth (Hoffmann 1991, 33; Heinrich 1992, 19-20) and some of the sturdier iron spikes described below may have come from similar tools.

Retting

The plant was next soaked or 'retted' in order to loosen the bond betWeen the woody parts and the fibre bundles. The flax could be laid out in the field for dew-retting, or immersed in a ditch, pond or running water for a couple of weeks (Baines 1989, 174-6; Heinrich 1992, 21-7). Any of the larger pits or gullies at Coppergate could have served this purpose -an old shallow well, for example, was re-used for retting at 7th/8th century Westbury, Bucks. (Ivens et al. 1995,71-8) -but there is no evidence at Coppergate for the more carefully devised retting ditches which have been found at late Anglo-Saxon St Aldates, Oxford, axon. (Durham 1977, 179-182,200-1), and 11th/12th century Eastgate, Beverley, E. Yorks. (Evans and Tomlinson 1992, 14-15, 229), nor for the elaborate pond-and-ditch systems used in Lancashire in the 12th and 13th centuries (Higham 1989). Since retting produces a particularly foul smell, it is possible that at Coppergate the proress was conducted further away from the buildings, perhaps closer to the River Foss, or the flax may have been placed in baskets and sunk in the river itself (Baines 1989, 175).

Breaking or 'beetling'

The retted plants were next dried in the open air or over a fire, so that the rotted core and rind became brittle and loose. The stems were then laid on a large stone and beaten with a long cylinder-headed wooden tool called a pounder or 'beetle', so that the brittle parts fractured and began to break away (Fig.799). Beetling is a vigorous task and causes considerable damage to the pounder. Examples *6642* (period 5B) and *6643* (period 5Cr), are the remains of two such pounders (Fig.798), which have both broken a few inches above the handle. Complete flax pounders nearly always show severe damage at the same point. The original length of the Coppergate pounders can be reconstructed from comparison with a similar example from the retting pit at Westbury, which is 340mm long (Ivens *et al.* 1995, 393,395), and another from 11th century Lund, Sweden, which is 355mm long (Nilsson 1976,249).

Scutching

Unwanted plant matter would still remain attached to the fibres. The stems were therefore held against a vertical board and a wooden scutching blade, such as *6644* (Fig.798), brought down on the flax with a stroke which would knock the waste from the fibre. Part

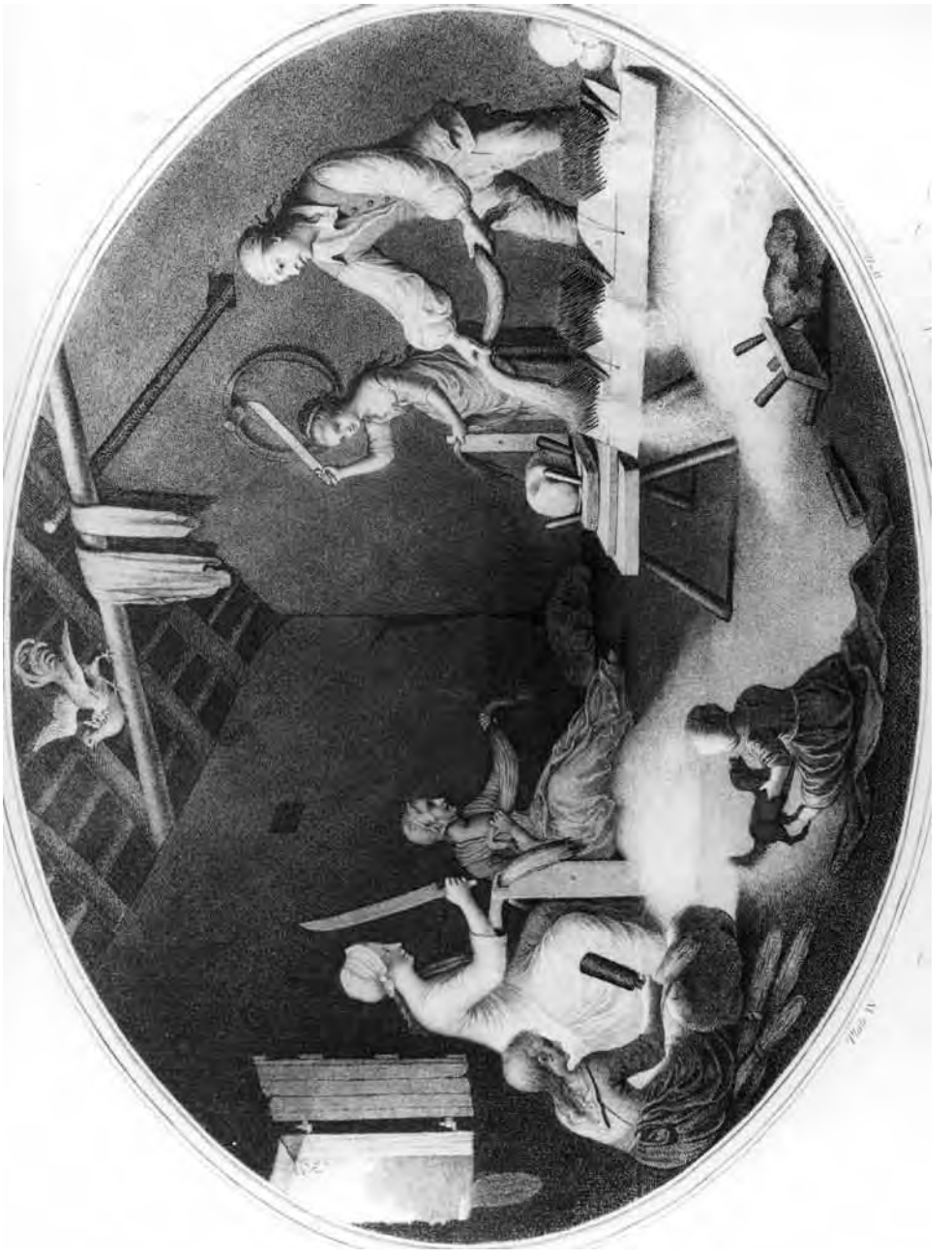


Fig. 799 Engraving by William Hincks, 1783, 'representing the common Method of Beetling, Scutching and Hackling the Flax' (reproduced with permission from Ulster Folk and Transport Museum). The scutching blades are long and move knife-like, but otherwise the tools and processes are the same as those at Anglo-Scandinavian Coppergate

of this waste is the 'shives' described by A.R. Hall (above, p.1719). The inside edge of the Coppergate blade has been severely worn, where it has struck against the board and fibre bundle. Post-medieval scutching blades are generally longer and narrower (Fig.799), but Morris lists others of the paddle-like form from Britain and the Continent *(AY* 17/13) and similar examples are still in use in Norway (Hoffmann 1991,47). The Coppergate blade has a smooth edge, as is usual for a tool intended for flax (ibid., 46-7; Baines 1979, 22–4). There are no examples of the serrated-edge tools used for hemp and nettle (Hoffinann 1991, 56--8).

Heckling

The fibres, now divorced from the rest of the plant, would still lie in bundles which would have to be separated. This would be done by drawing the fibres through successively finer sets of iron teeth each set being mounted vertically in a thick wooden block (Fig. 799). There are no complete heckles from Coppergate, although many of the iron spikes described below are comparable with flax heckle teeth. The fibre at this stage is known as 'flax line', a term which can be traced back to Old English *flexlinan* (see below, p.1823).

Iron spikes used in fibre processing (Figs.800-2; Table 145)

Iron spikes of the type found in large numbers at Coppergate are frequently identified as wool-comb teeth (pp.540-1, *AY* 17/6; Goodall 1993). In fact, where there is evidence for flax processing, it is likely that flax heckle spikes are also included in their number. Distinguishing between the two, however, is not easy.

The teeth in known wool-combs seem to be a standard size, 90-110mm long and 5-6mm diameter. The Norwegian teeth are longer, 100-130mm, presumably to allow for the greater depth embedded in the thick cylindrical head (Petersen 1951, 319). Most wool-comb teeth have a rounded or rounded rectangular cross-section and often have a slight curve towards the tip. The heads of Anglo-Saxon wool-combs always have an iron binding, as do some of the Norwegian combs.

The spikes used in flax heckles are much more variable. They may be short or long, thick or thin, although a single heckle will generally consist of a set of spikes of the same dimensions. Heckles used in present-day peasant communities have spikes ranging from 40mm to 200mm (Wild 1968). The spikes have to tear into the fibre and it is therefore essential that they are straight and sharp. Heckles rarely have an iron base-plate, the spikes in general rising straight from a wooden base.

Figure 800 compares some tentatively identified wool-comb teeth from Anglo-Scandinavian and medieval deposits with two teeth from the known wool-comb. Traces of the iron binding, which seems to be diagnostic of a wool-comb, could be identified in

Fig. 800 Iron spikes from the wool-comb, (far left) 2273 *compared with other probable wool-comb spikes: (left to right) two spikes from* 2273, 2342, 2358, 2281, 2343, 2299 *and* 6601. *Length of 2281, 111mm*

Fig. 801 Iron spikes, possibly from flax heckles, (left to right) 2364, 2415, 2416, 2433, 2301, 2278, 2421, 2307. *Length of* 2415, *93mm*

Fig.802 Longer iron spikes from medieval deposits (Period 6): (left to right) 6598, 6603, 6600; 6605, 6602, 6604; 6606-7, 6599. *Length of* 6599*, 180mm (scale 3:4)*

2358 and *6601* and perhaps also in *2281, 2299* and *2342*. Each spike has typical wool-comb dimensions, and a rounded or rounded rectangular cross-section.

Figure 801 shows some possible flax heckle spikes from Anglo-Scandinavian deposits. These have especially sharp tips and several have traces of wood reaching up to 30mm from

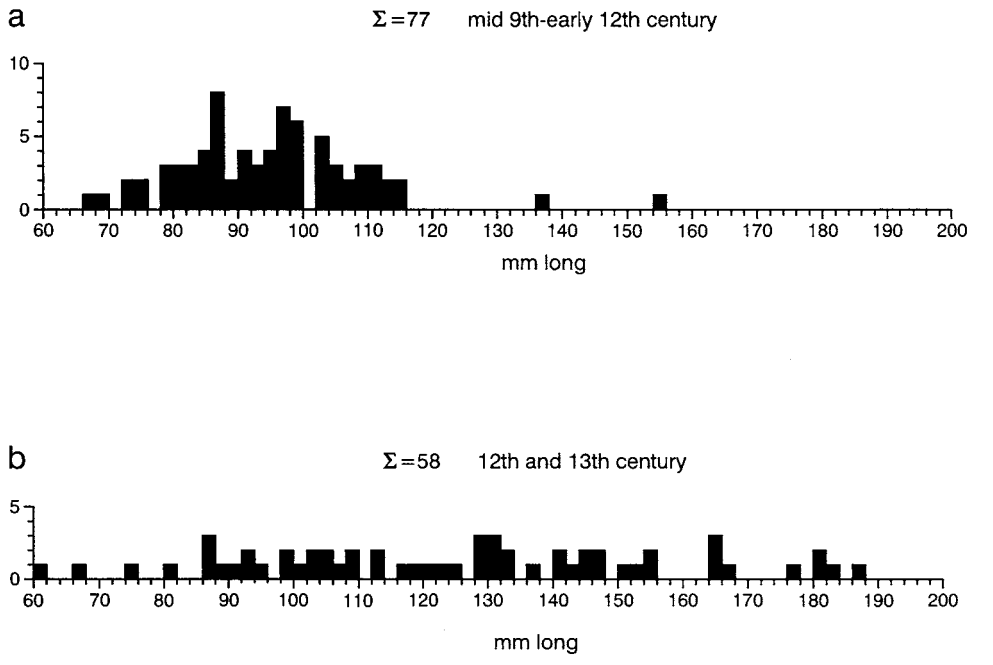


Fig. 803 Change of length in iron spikes with rounded and rounded rectangular cross-section through time; a, spikes from deposits dated mid-9th to early 12th century; and b, spikes from deposits dated 12th and 13th century

the blunt end, suggesting they have been embedded in a block thicker than the average wool-comb head. The spikes have rectangular or sometimes rounded rectangular cross-sections and vary in length from 70-103mm. Two incomplete medium-diameter spikes of this type, 2291 and 2293 (not illustrated), have mineralised plant remains diagonally across the lower half of the spike, presumably waste from heckling.

In the medieval (period 6) material from Coppergate, mere is a lengthening of the spikes with rounded and rounded rectangular cross-section (Fig.802) which seems to begin about AD 1200 (Fig.803). These longer spikes are up to 186mm long and bring to mind three wool-combs from early 16m century Pottergate, Norwich, Norfolk, which have teem 150-170mm long (Goodall 1993, 184). It has been noted above mat wool-comb teem lengthened on me arrival of wool-cards, but this is generally thought to have been a century later than the Coppergate evidence suggests (Hoffmann 1974, 382; Baines 1979, 35). At Beverley, which, like York, was a prominent cloth town, longer spikes have been noted at later 12th century Lurk Lane (Goodall 1991, 132-7, no.312), and at mid 12th to late 13th century Eastgate (Gooda111992, 151-3, nos.267, 270, 276, 282); at Eastgate there was

also a perforated iron plate, tentatively identified as the backing for a wool-card, from mid to late 12th century levels (ibid.). It is possible, then, that the arrival of wool-cards and long-toothed wool-combs should be pushed back rather earlier than previously thought. Iron spikes with rectangular cross-section remain much the same length in Period 6 as they were in the Anglo-Scandinavian period. It is possible that these represent the continuation of flax processing at Coppergate into the 13th or 14th century.

Because it is difficult to assign an exact function to most of these objects, they have been catalogued simply as 'fibre-processing spikes'. It may be noted, however, that when spikes from Period 4B were divided into those 90–110mm long with round or rounded rectangular cross-section (probable wool-comb teeth) and those 60–85mm long (probable flax heckle or ripple spikes), they showed different distributions across the site (see pp.1796-9; Table 151, p.1797). The spikes which were 90-110mm long and rectangular in cross-section were closest to the flax-tool distribution. It seems likely, therefore, that the use of length and cross-section as a general guide is a valid one, although there will be a certain amount of overlap between types.

Spinning (Table 146)

The 236 spindle whorls from Coppergate represent one of the largest collections ever recovered from a British site. Each of the whorls would have been used with a spindle, although only five spindles, or parts of spindles, have been found. Similarly, distaffs would have been used and yet only one has been recovered. This scarcity of equipment made from wood can be seen throughout the textile tool assemblage from Coppergate. It seems to reflect a different manner of disposal and does not affect the evidence of the whorls, that spinning was a commonly practised craft in all periods.

Whorls are used to weight the spindle and to keep up the momentum while spinning. They are wedged on the spindle, against the swollen pan of the shaft, and the most diagnostic feature is the diameter of the spindle hole. Iron Age and Roman whorls have small spindle holes, 4-8mm diameter (Bulleid 1926, 61, pls.26-7; Coles 1987, 156-68; Crummy 1983, 67; Poole 1984, 401; Ryder 1993,313), which fit the thin spindles from Roman Britain and the Continent (Wild 1970, 127-9). Late Anglo-Saxon and medieval whorls have larger spindle holes, 9-11 mm diameter, to fit the thicker spindles of similar date (Morris 1984, T58-89; Øye 1988, 35-6). Three Coppergate stone objects originally identified as large spindle whorls, sf8355, sf10065 and sf83 (1982.22) (sf8355 published in Roesdahl et al. 1981, 119), can now be dismissed, because their central holes, 145mm, 16.5mm and 13.5mm diameter, are outside the usual range: cenainly, a whorl with a spindle-hole diameter of 16.5mm would slide off any known spindle.

Spindles (Fig.804)

There are two almost complete wooden spindles from Coppergate, one from the 12th/13th century, *6649*, the other of uncertain date, but probably medieval, *6697*; and

Table 146 Spinning equipment from 16–2 Coppergate and the Watching Brief

*There is also a failed casting for a lead spindle whorl, unstratified

	Wooden distaff	Wooden spindles	Spindle whorls: potsherd	clay	stone
Period					
16–22 Coppergate					
Roman					
1	—	—	1	—	—
Anglo-Scandinavian					
3	—	1	2	—	7
4A	—	—		—	6
4B	1	1	2	—	38
5A	—	—	—	—	8
5B	—	1	—	—	18
5C	—	—	—	1	1
Sub-total	(1)	(3)	(4)	(1)	(78)
Medieval					
6					
mid 11th–late 12th	—	—	1	—	19
end of 12th–late 13th	—	1	1	2	31
end of 13th–late 14th	—	—	—	—	7
end of 14th–late 15th	—	—	1	—	4
Sub-total	(—)	(1)	(3)	(2)	(61)
Post-medieval					
6					
end of 15th–late 17th	—	—	—	—	2
Unstratified	—	—	—	—	7
Watching Brief	—	1	—	—	1
Total	1	5	8	3	149

Table 146 *(contd)*

Spindle whorls: lead alloy	bone	antler	Total	Spun wool yarn	Drive whorl	
						Period
						16–22 Coppergate
						Roman
1	—	—	2	—	—	1
						Anglo-Scandinavian
—	—	1	10	—	—	3
2		1	9	—	—	4A
10	17	1	68	2	—	4B
—	4		12	—	—	5A
—	14	1	33	—	—	5B
—	2		4	—	—	5C
(12)	(37)	(4)	(136)	(2)	(—)	Sub-total
						Medieval
						6
—	8	—	28	—	—	mid 11th–late 12th
—	—	2	36	10	—	end of 12th–late 13th
—	1	—	8	—	—	end of 13th–late 14th
—	3	—	8	—	—	end of 14th–late 15th
(—)	(12)	(2)	(80)	(10)	(—)	Sub-total
						Post-medieval
						6
—	1	—	3	—	1	end of 15th–late 17th
1*	5	—	13	1	—	Unstratified
	1	—	2	—	—	**Watching Brief**
14	56	6	236	13	1	Total

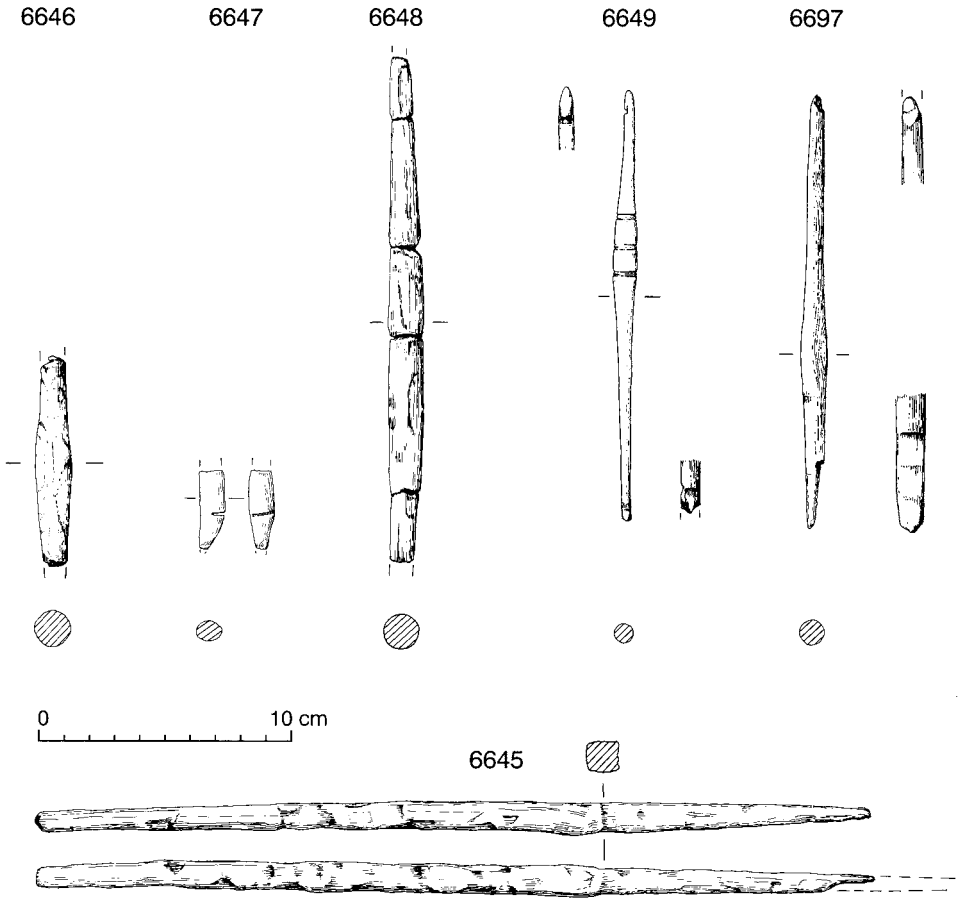


Fig. 804 Wooden spindles 6646–9, 6697*; and distaff* 6645. *Scale 1:3; enlargement of notches on spindles, 2:3*

fragments of three more, *6646* from Period 3, *6647* from Period 4B, and *6648* from Period 5B (Fig.804). The near-complete spindles are in the region of 170mm long (originally 180-185mm) and 9-10mm diameter at their thickest. The broken fragments are from heavier spindles, *6646* and *6648* being 14mm in diameter and *6647*10mm before it reaches the spindle's widest part.

Both *6649* and *6697* have a notch at either end and fragment *6647* has a crossways slot in a similar position. These notches and slots are to help anchor the yarn but they are not essential. Many spindles have smooth ends (Patterson 1957, 202) where the yarn would have been fastened by means of a double hitch. Two bone objects from Anglo-Scandinavian York, one from 6-8 Pavement, 208mm long *(510)* p.l00) *AY* 17/3) and the other from Clifford Street, 168mm long (Waterman 1959, 81, object 12.5) may be smooth-ended spindles.

Spindles from north-west Europe dating between the 4th and 15th centuries are 150mm to 350mm long and most are over 200mm (Morris 1984) T58-T89; Øye 1988, 35-6). Four of the York examples, including *6634* and *6685* from Coppergate, are at the shorter end of this range. Of course, the spindle does not just twist the yarn but also acts as a bobbin to carry the spun thread. The short York spindles would not carry much yarn unless that yarn were fine, but the three thicker spindle fragments from Anglo-Scandinavian Coppergate are probably from longer spindles and would accommodate thicker yarn.

Distaff (Fig.804)

While spinning it is useful) although not essential) to bind the fibre to a distaff, so that the raw fibre does not tangle with the twisting thread. The single example of a distaff from Coppergate, *6645*, is from Period 4B. It is a wooden rod with square cross-section, which tapers towards either end,the lower end being incomplete; at present it is 334mm long and the upper 200mm is roughly notched and corrugated. Almost identical objects were used as distaffs in Scotland in the 18th and 19th centuries, with carved ornamentation instead of notches on the upper section (Ross 1974) 18, 20): the notches and ornamentation were to keep the fibre from slipping once it was bound to the distaff. More neatly worked notches can be seen in distaffs from medieval Norway (Øye 1988) 34-5) although the Norwegian examples are short and sturdy and would have been hand-held. Taking the Scottish examples as a guide, the Coppergate distaff may be reconstructed as 370–390mm long. Slender distaffs of this length were generally tucked under the arm (Ross 1974) 14) but could also be hand-held (Fig.811a and c, pp.1746, 1748).

Potsherd spindle whorls (Fig.809)

There are eight spindle whorls made from Roman potsherds, the fabrics being samian and grey wares. Only one of the whorls) *6590,* comes from a Roman deposit (Period 1) but six of the others have the typically small Roman spindle hole, 5-7mm diameter) and are presumably Roman whorls redeposited. The seventh whorl, *6591* from Period 4B) has a spindle hole over 9mm diameter and may represent a Roman potsherd – in this instance the base of a 3rd century beaker – which has been picked up and made into a spindle whorl in the 10th century.

Stone spindle whorls (Figs.806-7)

The 149 stone spindle whorls from Anglo-Scandinavian and medieval deposits are made from the kinds of rock which make up much of the geology of the Yorkshire region, that is, limestone, chalk, sandstone, mudstone and siltstone (G.D. Gaunt in Ottaway and Rogers *AY* 17/15). Pebbles of the right size could be picked up in the hills or at the coast and brought back to York for shaping. Many of the whorls, especially the later spherical shapes, have been lathe-turned (e.g. Figs.806-7; *6536, 6537, 6570, 6572, 6574, 6577*) but some of the softer chalk whorls seem to have been cut and trimmed with a knife (e.g. Fig.806; *6540, 6545*) and some of the coarser-grained fabrics have been rough-cut and then ground to shape (e.g. Fig.807; *6555, 6559*). The spindle holes have been drilled, first from one side then the other, giving a slightly waisted shape. A few spindle holes are 7-8mm at their narrowest part and one is 12mm at its widest, but the rest are all within the range 9-11mm. Where the whorl has a flat face, the widest end of the spindle hole is at the flat side, which suggests that the whorl was put on the spindle with the flat face facing inwards (e.g. see Fig.811b and c, pp.1747-8).

The diversity of shapes has made the stone whorls difficult to categorise, but some general trends can be observed by counting the number of horizontal flat faces (Figs.806-7):

form A 1 *whorls* have one flat face and *form A2 whorls* have two flat faces, one substantially larger than the other. Form A therefore includes hemispherical, cup-shaped, hipped, shaved biconical (asymmetrical) and rounded conical;

form B whorls have two equal flat faces and include cylindrical, cylindrical with rounded sides ('doughnut'), shaved biconical (symmetrical) and disc-shaped whorls; and

form C *whorls* have no flat faces and include globular, spherical and rounded biconical forms.

These forms show a chronological distribution pattern (Fig.805). Form A whorls are a 9th and l0th century type, which declines through the 11th century, the small number from later (Period 6) deposits almost certainly being residual (see pp.1811-15). They seem to be directly derived from the local Anglian tradition. Forms Al and A2 were the main type in Anglian levels at 46-54 Fishergate, York (pp.1266-8, P. Walton Rogers in *AY* 17/9), and almost all of the 48 stone whorls from middle Anglo-Saxon Flixborough, Lincs., are form Al (Walton Rogers in prep.), as are the two stone whorls in 7th century burials at Castledyke, Lincs. (Foreman and Drinkall forthcoming). At Beverley there were problems with residual material, but there were more form A whorls at Lurk Lane, a site occupied from the 8th or 9th century (Foreman 1991, 107-13), than at Eastgate, which was not fully occupied until the later 11th (Foreman 1992, 123-4). The small group of whorls from Goltho, Lincs. (Beresford 1987, 194-5), also seems to follow the Coppergate pattern, with form A in the 9th to l0th centuries and form B in the 10th to early 12th. It is difficult, however, to extend the pattern out beyond the Yorkshire–north Lincolnshire region. The whorls from Anglo-Saxon settlements and cemeteries of southern and eastern England are very mixed and,

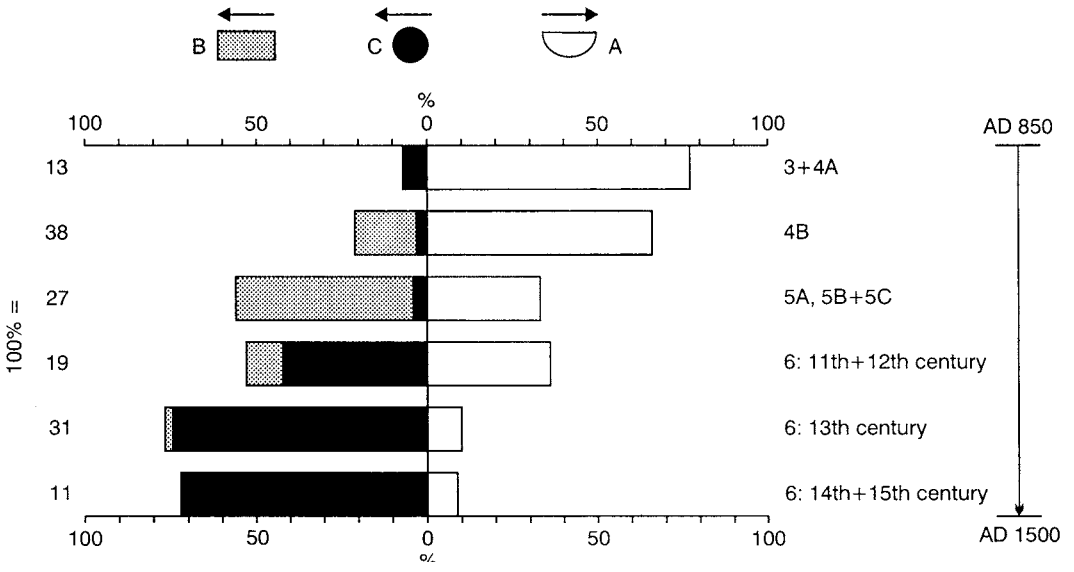


Fig. 805 Changes in stone spindle whorls over the 9th to 14th centuries. The Anglian form A declines after the late 10th century; form B is a mid 10th to mid 11th century type; and form C is the typical medieval form

although Form A whorls can be found in most late Anglo-Saxon collections, they do not have the 8th-10th century bias that is obvious in York (Mann 1982, 22-5; Rogerson and Dallas 1984, 111-12; Pritchard 1991, 165).

Form B seems to have been in use at Coppergate from the late 10th to the early 12th century. Where it came from immediately before its late 10th century appearance at Coppergate is as yet unclear. Cylindrical and disc-shaped whorls were common in the Iron Age and Roman period and have appeared in spindle whorl collections from Early Christian Ireland, Anglo-Saxon East Anglia, Viking Age Scandinavia and medieval Norway, but never in numbers which would suggest it was a dominant type. The Anglian village of West Heslerton, N. Yorks., however, has recently produced a number of whorls of flattened 'doughnut' shape, alongside the more usual form A whorls (C. Haughton, pers. comm.); and at Beverley form B whorls first appear in 8th century deposits, although, as at Coppergate, they are largely an 11th and early 12th century type (Foreman 1991; 1992). This may suggest that form B evolved locally. Form B whorls also seem to have been in use in north Lincolnshire and one of the more unusually shaped examples from Coppergate, *6556* (Fig.807), can be matched exactly with one from Goltho (Beresford 1987, 194-5, whorl no.7).

The rounder shapes of form C (Fig.807) represent the more typical medieval whorl of northern and eastern Britain. They may be compared with whorls from medieval Aberdeen,

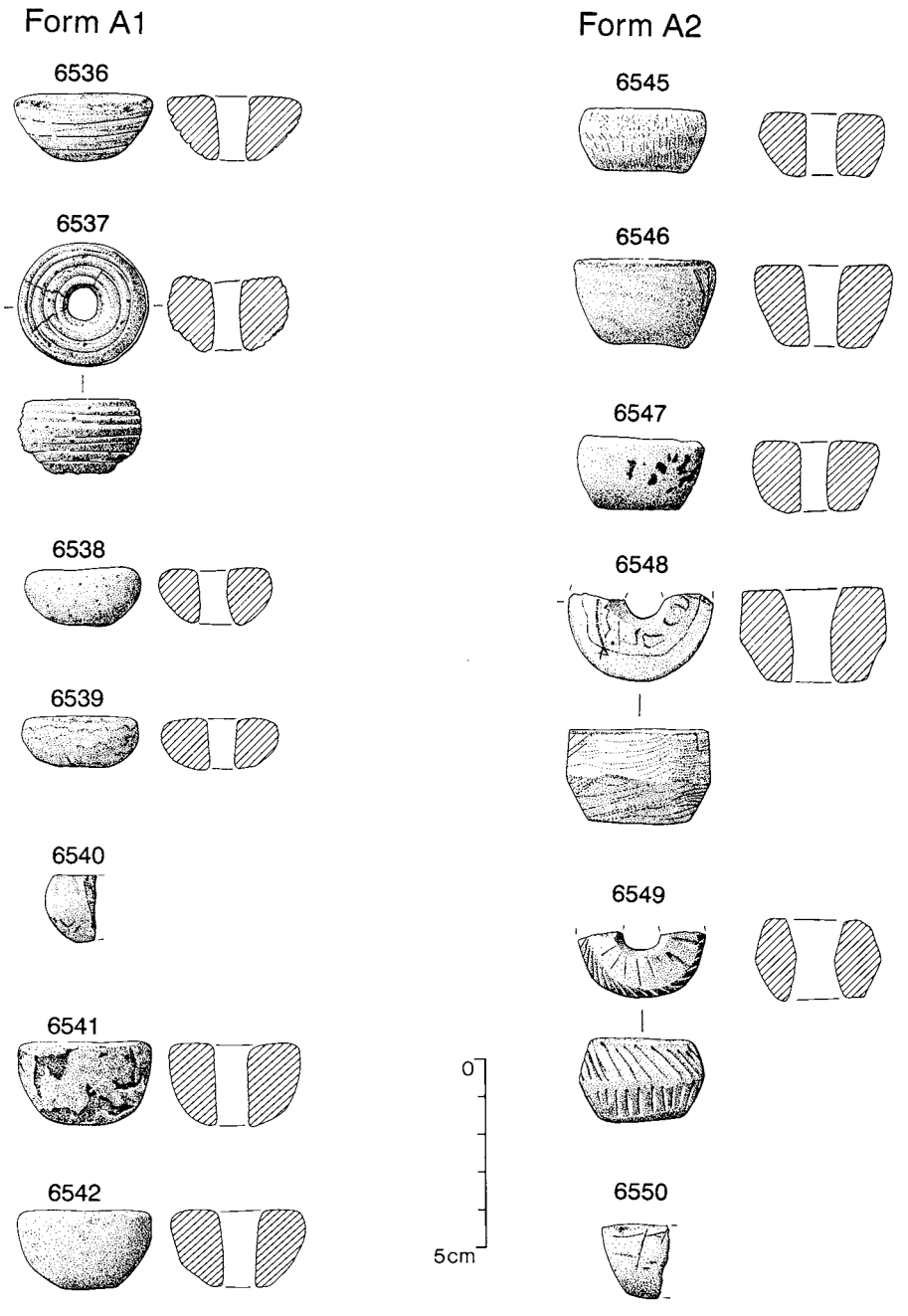


Fig. 806 Stone spindle whorls: formA1, 6536–42*; form A2,* 6545–50. *Scale 1:2*

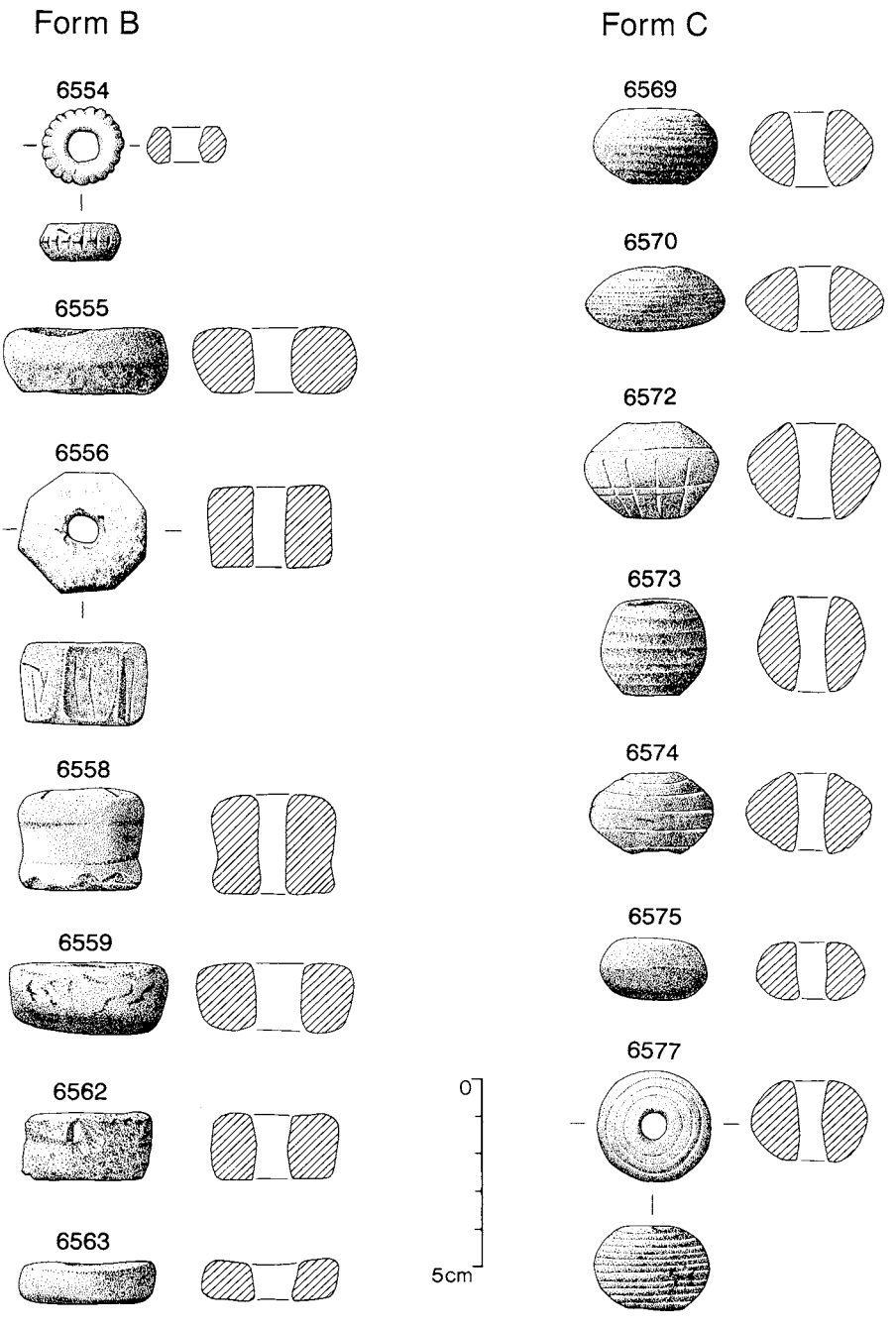


Fig. 807 Stone spindle whorls: form B, 6554–6, 6558–9, 6562–3*; and form C,* 6569–70, 6572–5, 6577. *Scale 1:2*

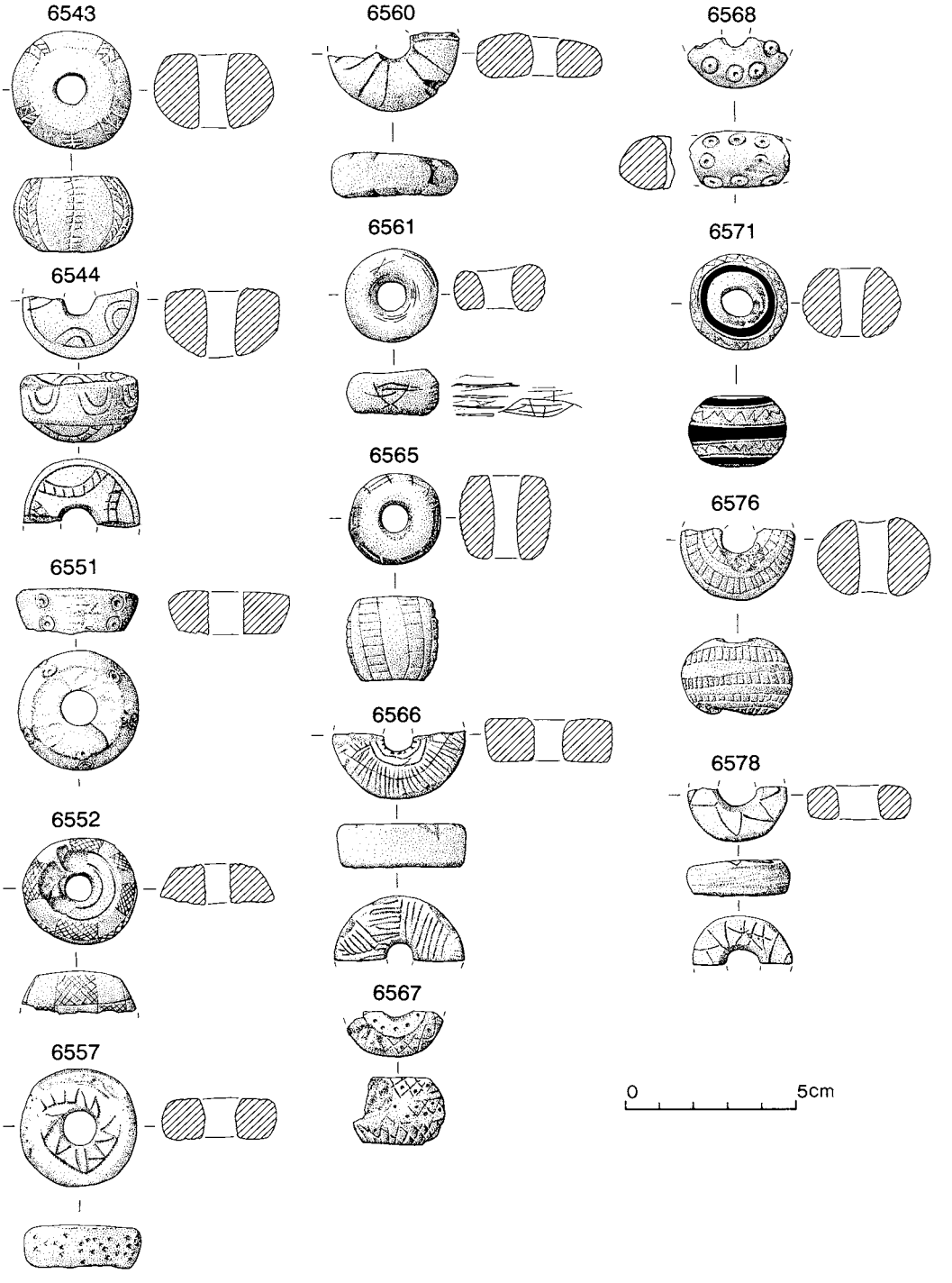


Fig. 808 Decorated stone spindle whorls, 6543–4, 6551–2, 6557, 6560–1, 6565–8, 6571 *(painted)*, 6576, 6578. *Scale 1:2*

Scotland (Trewin 1982), Durham, Co. Durham (Carver 1979, 25, 39), Beverley (Foreman in Evans and Tomlinson 1992, 124), Northampton (Oakley and Hall 1979, 286-9), King's Lynn, Norfolk (Clark and Carter 1977, 315-7), Bedford, Beds. (Baker et al. 1979) and Canterbury, Kent (Frere et al. 1982, 124-5) — although, curiously, the form is almost absent from medieval Winchester, Hants. (Woodland 1990).

Twenty-one of the stone whorls have simple incised decoration, in the form of ladders, herringbones, zig-zags, cross-hatching and ring-and-dot (Fig.808); one 12th/13th century whorl, *6571*, has bands of red paint; and six examples have deep ornamental rilling (e.g. *6537*, Fig.806). Ornamentation might be applied to any form from any period, but most incised decoration is on chalk, which is soft and easy to cut.

Rilled and ornamented spindle whorls can be traced back into the Anglian period (pp.1266-9, *AY* 17/9; Walton Rogers in prep.) and several of the Coppergate designs (e.g. *6544, 6553, 6554, 6578*) can be seen in bone and clay whorls from Merovingian and Carolingian Netherlands (Roes 1963, 29-32, pls.33-5; 1965, 52, pls.21-2, 31). Rilled whorls also occur in Viking Age Scandinavia, but Øye has pointed out how rare ornamentation in the form of hatching, cross-hatching and ring-and-dot is on Viking whorls (Øye 1988,52).

Clay spindle whorls (Fig.809)

Three cylindrical whorls have been made from fired clay, *6582* from Period 5C, and *6583* and *6584* (not illustrated) from 13th century deposits (period 6). There are a few clay whorls from Anglo-Saxon Mucking, Essex, one of which is cylindrical (Hamerow 1993, 65, fig.l06), but on the whole clay was little used between the end of the Iron Age and the arrival of 16th century stoneware whorls. Significantly, there are no examples in the Coppergate collection of the conical and sub-conical black clay whorls which are so common throughout Viking Age Scandinavia (Andersen et al. 1971, 225-8; Becker et al. 1979,133,207; Bender Jørgensen 1991, 64-6; Blomqvist and Mårtensson 1963,173,292; Petersen 1951,302-11).

Bone and antler spindle whorls (Fig.809)

Fifty-four of the 56 bone whorls have been chopped from the heads of animal femora, ttimmed with a knife and drilled (see Table 146, pp.1732-3, for dates). Only two, *6667* from Period 5B and *6668* (not illustrated) from Period 6, are cylindrical forms, cut through another part of the bone. Most of the bone whorls are from cattle, although four especially small examples, perhaps practice whorls for children, are from pig. Where the femur-head has come from an immature animal, the unfused parts of the bone are sometimes still in position, indicating that the whole was held together by gristle when it was discarded. Indeed, *6665* has tooth-marks and *6663* and *6664* seem to have been through the stomach of a dog *(T.P.* O'Connor, pers. comm.) (not illustrated), implying that the whorls had been little cleaned when the animal found them. There are also examples of mis-drilled holes

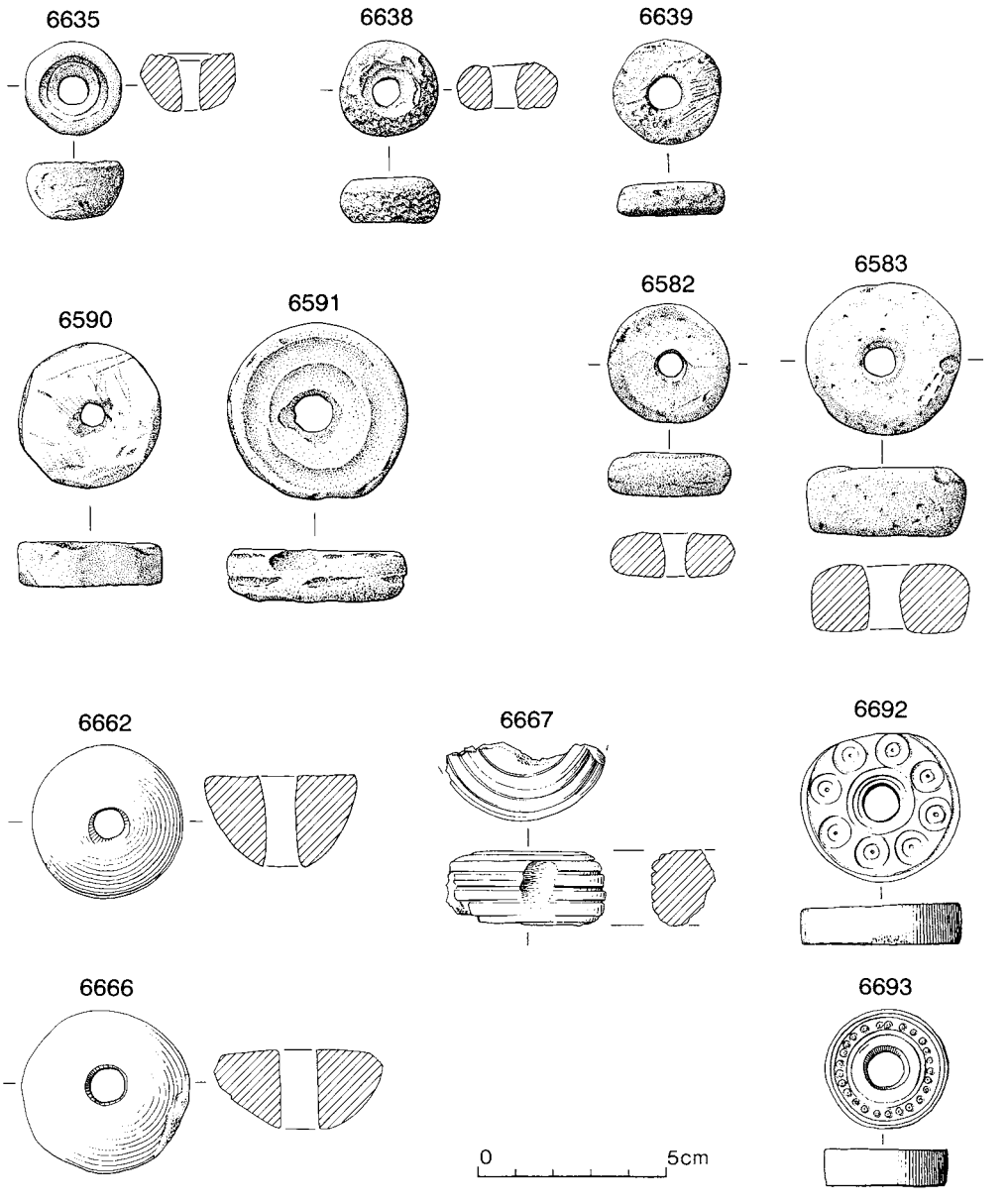


Fig. 809 Spindle whorls of other materials: fired clay, 6582–3*; pottery,* 6590–1*; lead alloy,* 6635, 6638–9*; bone,* 6662, 6666–7*; and antler,* 6692–3. *Scale 1:2*

and inexpert knife-cuts, which suggest that the whorls were being made at Coppergate, some being discarded mistakes.

There are six disc-shaped antler whorls, ranging in date from the 9th to the 12th/13th century (Table 146). The three earliest examples, from Periods 3, 4A and 4B, have been sawn through a beam or tine, and the three latest, from Periods 5B and 6, have been made from antler pedicle. The two from Period 6, *6692-3*, have been carefully finished and ornamented with incised ring-and-dot (Fig.809).

Bone whorls made from cattle femur-heads were used over a wide period of time, but seem to have been especially common in England in the late Anglo-Saxon and early Anglo-Norman period (e.g.Woodland 1990,217). Antler whorls were used in the Roman, Anglo-Saxon and medieval periods (MacGregor 1985,187; Williams et al. 1985,75-6), but were never as common as bone. The two ornamented examples from medieval Coppergate may be compared with five bone and antler disc-shaped whorls with ring-and-dot decoration from medieval Bergen (0ye 1988, 47-8). The diameter of the drilled holes in these artefacts is appropriate to spindle whorls, although similar objects, without the spindle hole, were also used as playing pieces (MacGregor 1985, 187).

Lead alloy spindle whorls (Fig.809)

The fourteen lead alloy spindle whorls have been cast in moulds, with a former for the spindle hole, and then tidied up with a knife (A.D. Hooley, pers. comm.). One of the whorls is disc-shaped and from the Roman period (Period 1) and two others, *6640* (disc-shaped) and *6636* (conical) from Period 4B, have 5-6mm spindle holes, which suggests they are Roman whorls redeposited (not illustrated). Similar whorls were made in Britain in the Iron Age and Roman period (Bulleid 1926,40-1; Wheeler 1930, 107ff). The other Coppergate lead whorls are from Periods 4A and 4B and have been made in the same forms A and B as the stone whorls of the same date (Fig.809, 6635, 6638-9). The presence of an imperfectly cast lead whorl, *6637* (unstratified) (not illustrated), and other lead working debris (pp.810–14, *AY* 17/7) suggests that these whorls were also being made at Coppergate.

Weights of spindle whorls

Weights were recorded for stone, clay and lead whorls, but not for bone and antler which are likely to have changed their weight during burial, through decay and mineralisation. Form A whorls – of whatever material – weighed 9g to 55g, with an outlier at 63g. Form B whorls were 10g to 55g, with one especially small example at 4g. Form C were between 15g and 32g. In other words, the range of weights in use in the medieval period (when form C whorls were current) was much narrower than in the Anglo-Scandinavian period (forms A and B).

Much has been made of the weights of whorls and the kind of yarn which can be spun with them. While it is true that heavy whorls are useful for plying threads and that light

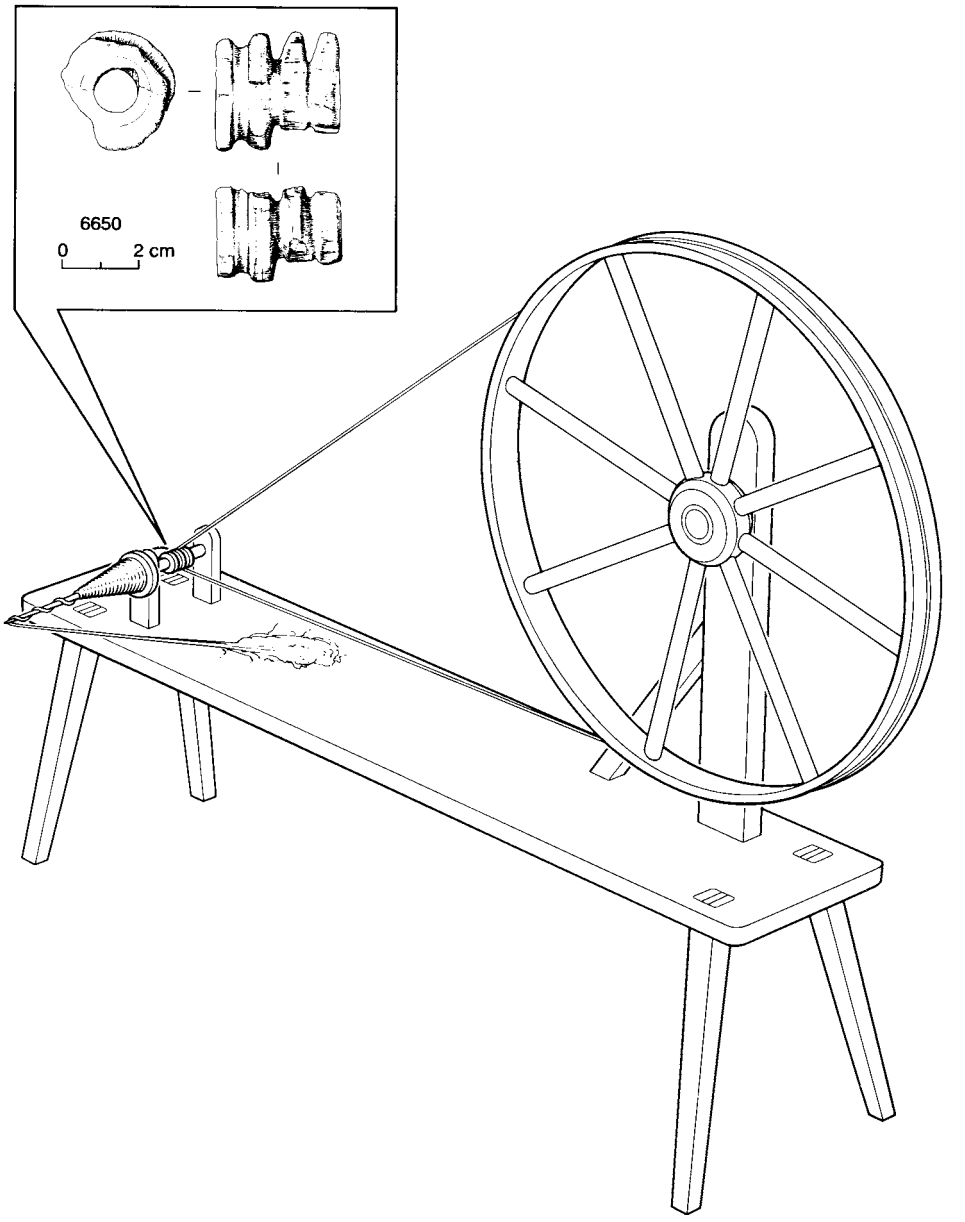


Fig. 810 Reconstruction of a spindle wheel with wooden drive-whorl, 6650*, inset (scale 1:2)*

whorls allow short fibres and fine yarns to be spun, it is dangerous to take the evidence too far. When spinning, much depends on the size and weight of the spindle, the way the yarn has been wound on, the skill of the spinster, the tradition in which she is working and, most especially, the technique she is using (see below). The weight of the whorl is only one factor among many.

The loss of heavy and light weights in the medieval period might reflect some change in spinning practice, but, given that it coincides with a change to more frequent lathe-turning, it is perhaps more likely that it represents greater standardisation in the manufacture of whorls.

Drive-whorl from a spindle wheel (Fig.810)

A cylindrical wooden object with three grooves *(6650)* has been identified by Morris as the whorl which drives the spindle in a spindle wheel. It comes from a 17th century deposit which included earlier material. The spindle wheel, also known as the great wheel or walk wheel, seems to have appeared in this country in the early 14th century (Baines 1979, 42-4, 54ff). The spindle was mounted horizontally on a stand, with the whorl connected via a drive-band to a large wheel which the spinner rotated. Constant use caused the drive-band to eat into the spindle whorl and for this reason whorls were often made with multiple grooves, so that the band could be transferred as a groove wore out (ibid., 58, 63). The Coppergate drive-whorl has one fresh and two worn grooves.

Spinning techniques (Fig.811)

When spinning with a spindle and whorl, the whorl is wedged on the shorter end of the spindle. The spun yarn is wrapped around the shank and then anchored by looping around the notch on whichever end is going to be uppermost when in use. The two complete Coppergate spindles, *6649* and *6697*, both have a notch at either end (Fig.804, p.1734), which means that they could be used either way up, with the whorl mounted at the top or the bottom (Fig.811).

Most manuscript illustrations of spinning are late medieval and show the spindle suspended with the whorl at the bottom, the rotation probably having been started with the hand ('drop-and-spin' or 'suspended spindle' spinning; Fig.811a). A top-loaded spindle is more usual in cultures where the rotation of the spindle is begun by rolling it down the hip (Fig.811b), or down the thigh and off the knee (Baines 1989, 19-23; Heinrich 1992, 179-80). The latter gives an anti-clockwise twist, while a clockwise twist comes more naturally to a right-handed person using drop-and-spin (Grenander Nyberg 1990, 75-8). The yarn from drop-and-spin is therefore generally Z-spun (clockwise twist) and from hip-spinning S-spun (anti-clockwise) (for Z and S yarns, see p.317,*AY* 17/5).

English wool textiles of the 9th to 15th centuries most commonly have a Z-spun warp and an S-spun weft. When the spindle wheel arrived in the early 14th century, documentary

Fig. 811 (pp. 1746–8) Spinning with spindle and whorl:

(a) drop-and-spin. Note the fibre mounted on a distaff resembling 6645

Fig. 811 (contd)

(b) hip-spinning

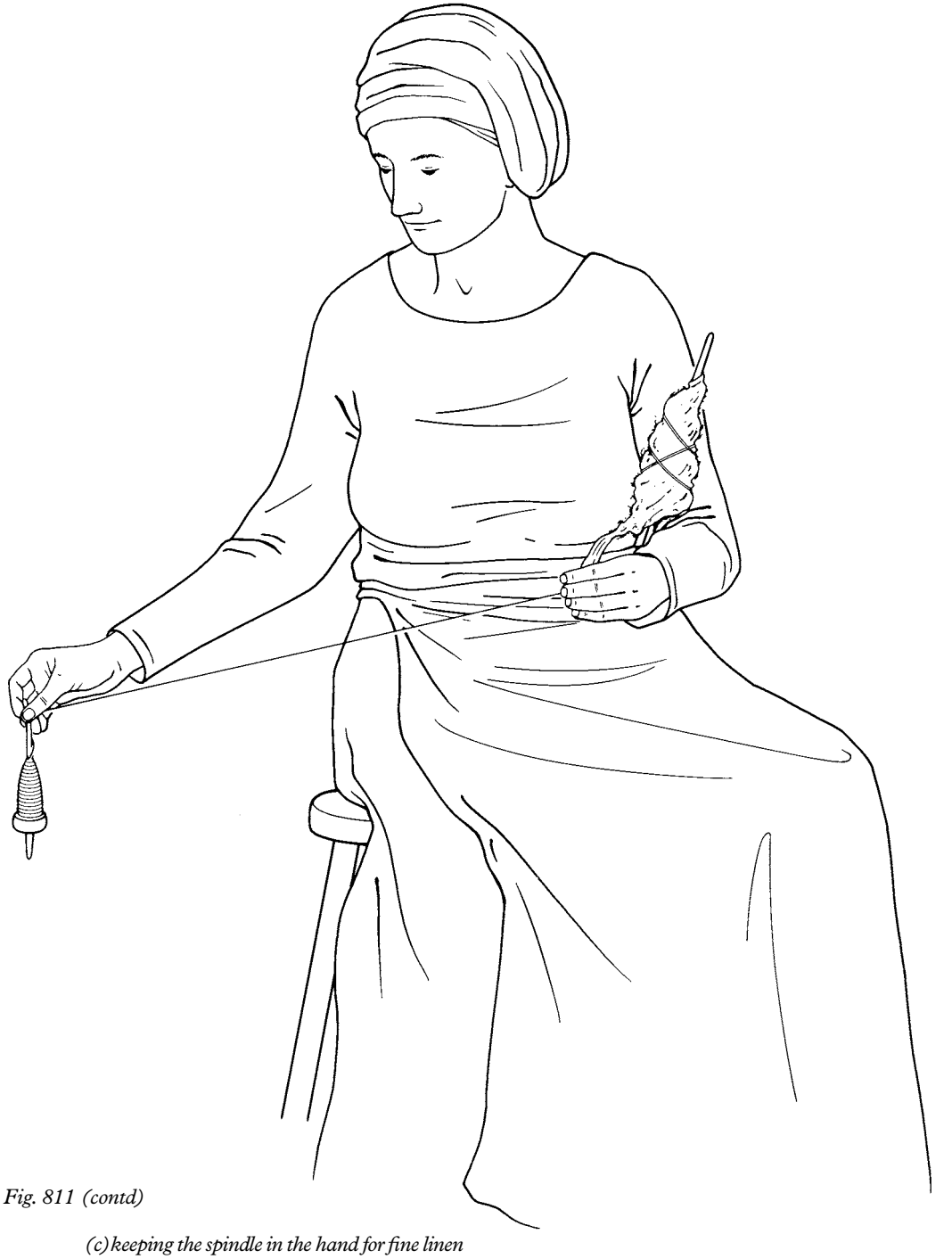


Fig. 811 (contd)

(c) keeping the spindle in the hand for fine linen

evidence shows that it was regarded as a tool suitable only for weft yarn and was often used for S-spinning (Baines 1979, 54). It can be tentatively concluded that, before the arrival of the spindle wheel, wool weft was generally spun with a top-loaded spindle, using hip-spinning (or a relative), and the warp was spun with a bottom-loaded spindle by drop-and-spin. The Coppergate spindles would be a reversible tool for either technique.

Linens in northern Europe were always made with Z-spun yarn in warp and weft (pp.345-59, *A Y* 17/5) and were probably spun with a bottom-loaded spindle by drop-and-spin. For an especially fine yarn, however, the spindle could be kept in the hand and continuously rotated between the fingers (Baines 1989, 23-5; Heinrich 1992, 38) (Fig.811c). No great weight is needed for this technique and light whorls such as 6554 (Fig.807, p.1739), at 4.3g in weight, may have been used in this way.

Yarn winding and warping

No tools associated with yarn winding have been recovered from any period at 16–22 Coppergate, although they must surely have existed. While it is possible to make a hank of yarn by winding it round the hand and elbow, as Hoffmann has remarked, this 'could only be practised by women who did not do much weaving' (Hoffmann 1974,291). It is likely that, after spinning, the yarn would be wound into hanks, for washing and storage, by means of a wooden reel. When the yarn was needed, the hank would be placed on a rotating wooden swift and wound off, into balls ready for warping, or straight on to the weft bobbin. Two reels and a swift were found at 9th century Oseberg, Norway (Grieg 1928, 187-91), and a *reol,* reel, and *gearnwindan,* swift, appear in a late Anglo-Saxon list of textile tools (see below, p.1823). When weaving was ready to begin, 'the yarn for the warp would be arranged on a warping frame of some sort, before being transferred to the loom. Again, no warping frame, or tools associated with warping, such as perforated paddles, have been recovered from the excavation.

Weaving (Table 147)

Three looms have been in use at Coppergate, the warp-weighted, the two-beam vertical and the horizontal treadle-operated. No wooden framework has survived, but the looms may be recognised from fragments of moving parts and hand-tools.

Warp-weighted loom (Fig.812)

The warp-weighted loom consists of two uprights joined together by a lower cross-beam, with an upper cloth beam set in crotches at the top. The warp is prepared with a woven starting band, which is bound to the cloth beam in such a way that the warp threads hang down. The warp is tensioned by attaching weights to the lower ends. The Anglo-Scandinavian textiles from Coppergate woven in the various forms of 2/2 twill were almost certainly

Table 147 Weaving equipment from 16–22 Coppergate and the Watching Brief

	Clay loom-weights	Iron sword-beater	Pin-beaters: cigar-shaped	flat, single-ended	long, single-ended	uncertain form	Total	Tapestry bobbins	Toothed weft-beaters	Heddle cradle	Heddle rod
Period:											
16–22 Coppergate											
Anglo-Scandinavian											
3	5	–	1	–	–	–	1	–	–	–	–
4A	1	–	–	1	–	–	1	–	–	–	–
4B	11	–	1	5	2	–	8	–	–	–	–
5A	2	–	–	2	1	1	4	–	–	–	–
5B	11	–	–	3	5	1	9	2	–	–	–
5C	1	–	–	–	–	–	–	–	–	–	–
Sub-total	(31)	(–)	(2)	(11)	(8)	(2)	(23)	(2)	(–)	(–)	(–)
Medieval											
6											
mid 11th–late 12th	1	–	–	1	1	–	2	–	–	1	–
end of 12th–late 13th	–	–	–	–	–	–	–	–	1	–	1
end of 13th–late 14th	1	–	–	–	–	–	–	–	1	–	–
end of 13th–late 14th	–	–	–	–	–	1	1	–	–	–	–
Sub-total	(2)	(–)	(–)	(1)	(1)	(1)	(3)	(–)	(2)	(1)	(1)
Post-medieval											
6											
end of 15th–late 17th	–	–	–	–	–	1	1	–	–	–	–
Unstratified	–	–	–	–	–	–	–	–	–	–	–
Watching Brief	–	1	–	–	–	–	–	–	–	–	–
Total	33	1	2	12	9	4	27	2	2	1	1

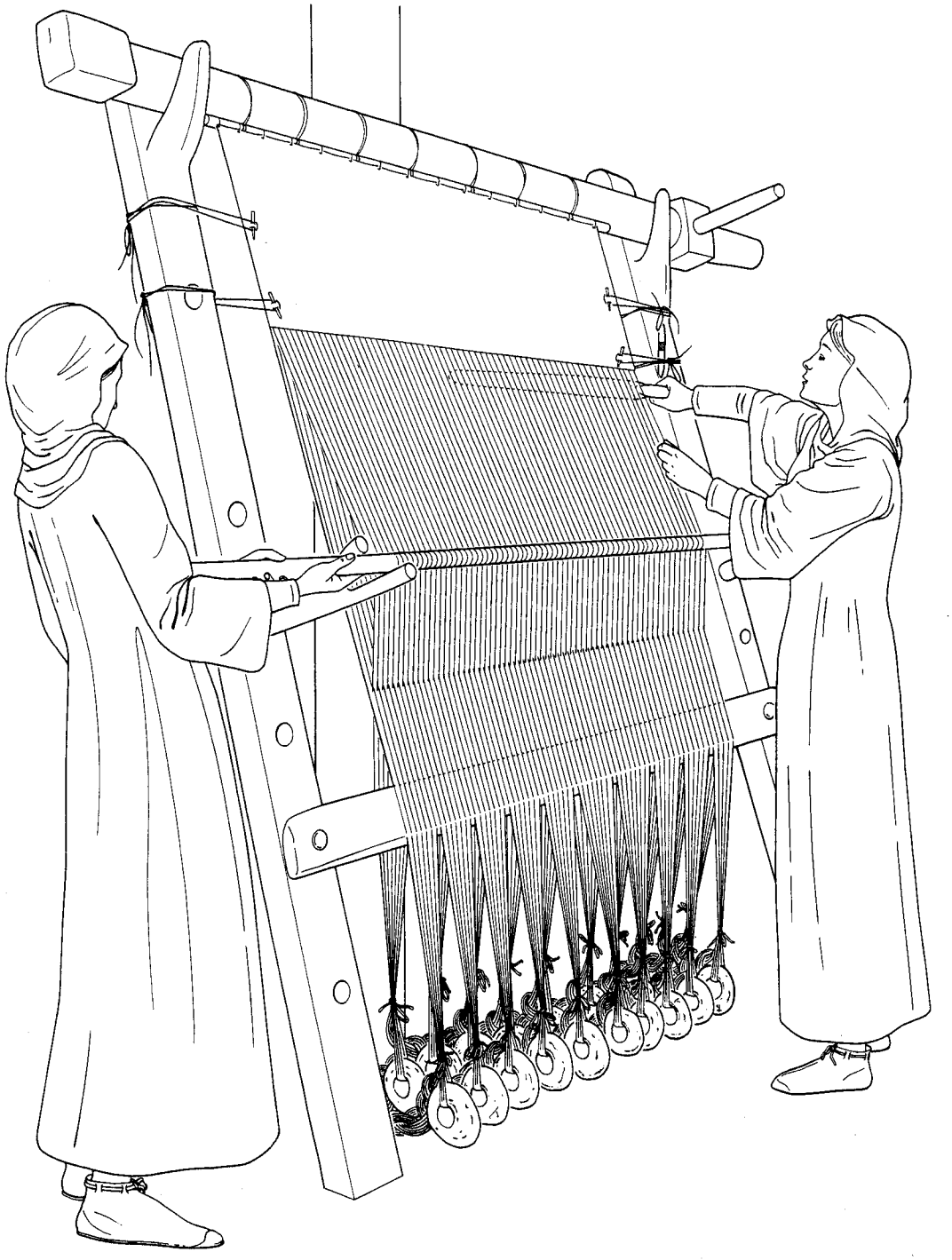


Fig. 812 Weaving with the warp-weighted loom; one weaver has just changed the position of the heddle rod and the other is now beating up with the sword-beater; the weft will next be inserted and the pin-beater will then be used to press home the weft. Note the pins by which the edges of the cloth are bound to the uprights

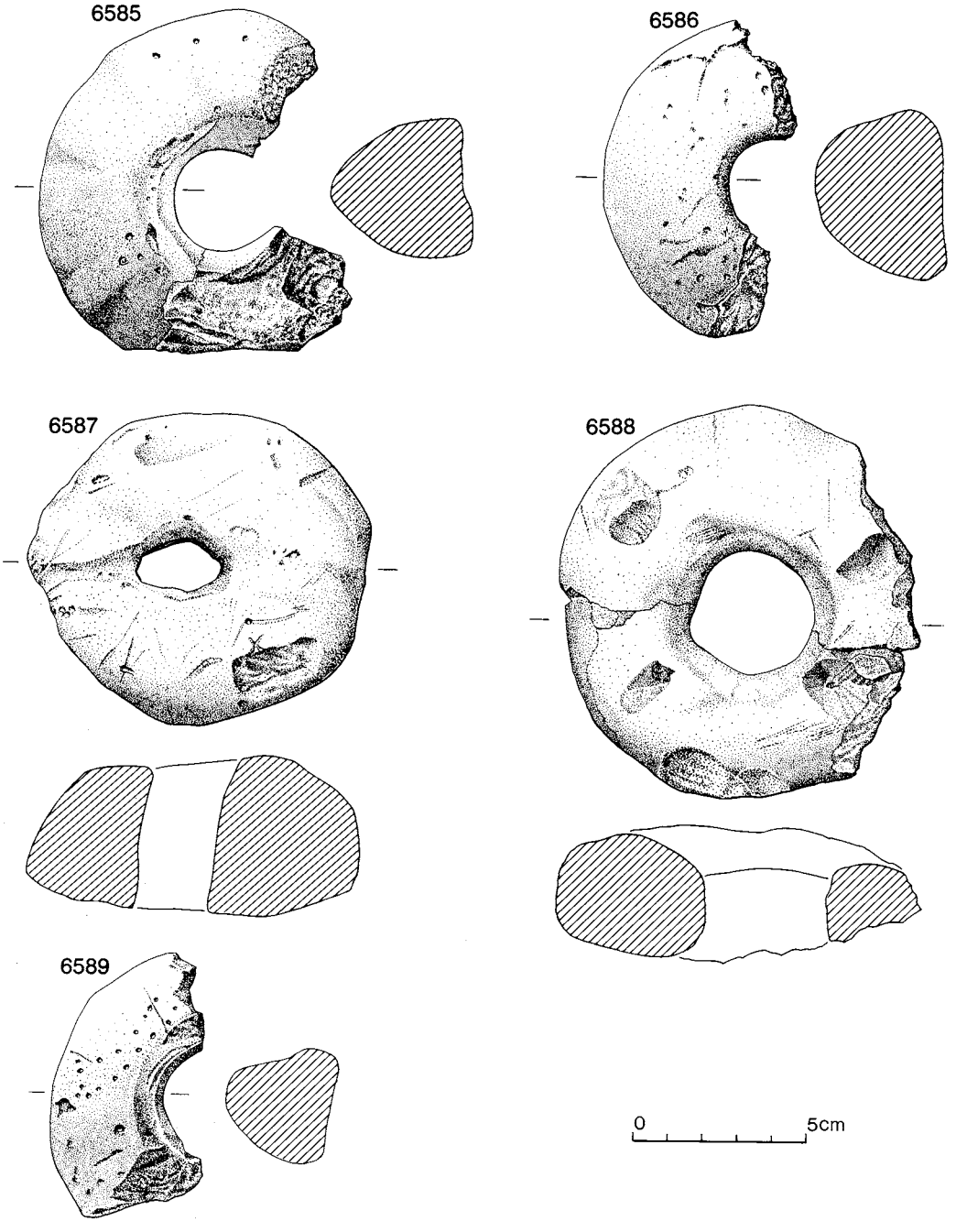


Fig. 813 Loomweights of baked clay, 6585–9. *Scale 1:2*

made on this loom (p.335, *AY* 17/5). The clay loomweights, the sword-beater and some of the pin-beaters would have been used with it (see below).

Loomweights (Fig.813)

There are 33 examples of baked clay loomweight, 31 from Anglo-Scandinavian levels (not 32 as reported on p.1269, *AY* 17/9). There are no examples ofunfired loomweights of the sort found in early and middle Anglo-Saxon settlements (Hamerow 1993, 68), although the damp Coppergate soils would almost certainly have preserved them if they had been there.

All the Coppergate weights are made from brick clay, which is available in the surrounding region (Dakyns et al. 1886), and they are the bun-shaped or 'intermediate' forms which are typical of the mid to late Anglo-Saxon period (Hurst 1959, 23–5; reconsidered by Holden 1976, 310–11 and Hedges 1980, 87–93). One, *6587*, has a groove where the fastening cord has rubbed against the clay; another, *6588*, has four holes punched into one face; and a third, *6589*, has finer marks pricked into the surface. Only one of the loomweights, *6587*, is complete and weighs 335g; a second, *6588*, is near complete, weighs 287g and was originally probably 330-340g; the others may be estimated at 320-550g. This represents the middle of the range for Anglo-Saxon loomweights, the full range being 100-1460g, although 150-550g is more usual (Hedges 1980; Hamerow 1993, 66–7). While there is no absolute correlation between weight of loomweight and quality of cloth, we may guess that weights such as these were used for the more ordinary types of fabric.

The warp-weighted loom had been in use in Britain since the Iron Age, if not before, and circular clay loomweights (annular, bun-shaped, or intermediate between the two) have been recovered in great numbers from early, middle and late Anglo-Saxon settlements: there are over 750 from a relatively short time-span at Flixborough, for example. The small collection from Coppergate probably represents the final stages of the use of the loom in towns. Indeed, the frequency with which the weights occur in association with residual 9th century pottery may indicate that the loom left the site during the early part of the 10th century (see p.1799) — although there is evidence to suggest that it continued in use outside the town (p.1269, *AY* 17/9). This may mean that the 2/2 twill weaves which continued to be used at Coppergate during the 10th century were not necessarily made there.

Sword-beater (Fig.814)

When weaving with the warp-weighted loom, the weft has to be beaten upwards (see Fig.812). The iron sword-beater recovered during the watching brief would have been used for this purpose (*4419*, pp.882-8, *AY* 17/8). The tool has a long, tapering iron blade with a socketed end and a wooden haft. Although it resembles an Anglo-Saxon spearhead, the blunt tip, riveted repair and other constructional details show that it was not intended for warfare (Walton 1989). It is a shorter-bladed version of a style of sword-beater which is well

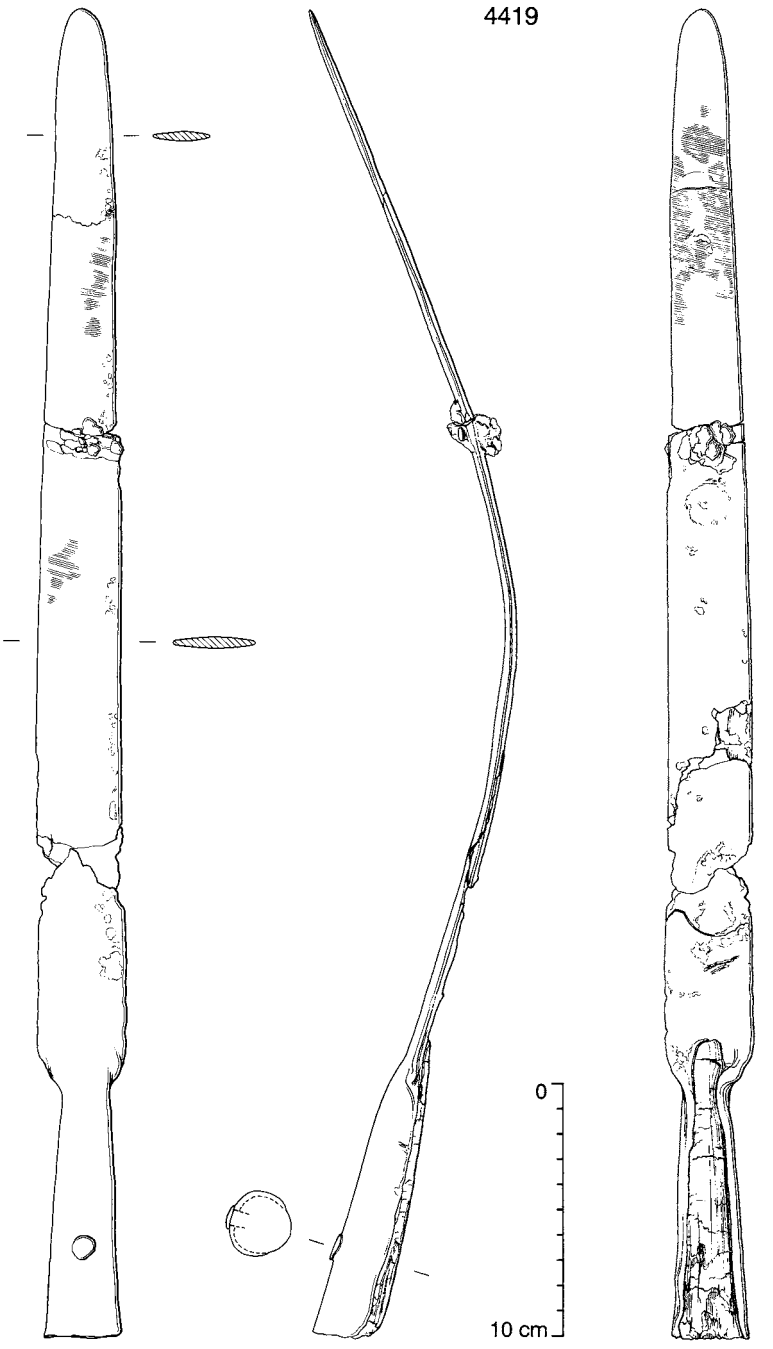


Fig. 814 Iron sword-beater blade, 4419*, with remains of wooden haft. Scale 1:3*

known from Norwegian graves (Petersen 1951, 285-95, 522; Hoffmann 1974, 279-82). Similar sword-beaters have almost certainly been missed in Anglo-Saxon graves, because of their resemblance to spears. For example, the iron blade identified as a spearhead in a woman's grave at Searby, Lincs. (Swanton 1973, 188-9), seems to be a 7th century ancestor of the Coppergate sword-beater; another has been identified in a 7th century woman's grave at Castledyke, Lincs. (Grave 17B, Foreman and Drinkall forthcoming). The Coppergate sword-beater was found in an Anglian pit which was backfilled in the early Anglo-Scandinavian period and the tool is most probably dated to the 9th century (p.881, AY17/8).

Pin-beaters (Fig.815)

The pin-beater is a multi-purpose weaver's hand-tool, used to strum across the warp to even out spacing, to pick out misplaced threads and to push the weft loosely into position before beating in more firmly with another tool (Hoffmann 1974, 135, 320, 419).

The 24 bone and three antler pin-beaters from 16-22 Coppergate may be divided into three types. The first is the cigar-shaped pin-beater, represented by one finished example, *6669* from Period 4B, and a rough-out for another, *6670* from Period 3 (Fig.815, top, p.1756). This type first appeared in the Roman period (Wild 1970,66, 134, 156) and was current through much of north-west Europe from the Migration period to the Viking Age (Hedges 1980,309-10; Andersen et al. 1971, 111; Graham-Campbell 1980, 21, 207). In England it is a relatively common artefact in early and middle Anglo-Saxon sites, such as Sutton Courtenay, Berks. (Leeds 1923, 157-68), and Maxey, Northants. (Addyman 1964, 64). There are a few late Anglo-Saxon examples (e.g: Addyman 1969, 87), but they are rare and the form seems to have disappeared entirely by the Norman Conquest. These pin-beaters have two working ends and often a band of incised marks around the middle, presumably as a grip for the fingers. They are evenly polished all over, from wear against the hand and against the threads of the loom. They are firmly associated with the warp-weighted loom and disappear from the archaeological record at much the same time as clay loomweights.

The second type of pin-beater is a much flatter form, with a pointed working end and a butt end which has been smoothed into oblique, rounded or chisel shapes, depending on the natural morphology of the section of bone being used. These pin-beaters may be polished all over, but the wear tends to concentrate in the middle of the shaft and at the pointed end. This is especially clear in the antler example, *6694* from Period 4B, where a row of incised Xs down either edge of the beater almost disappears towards the tip. The most worn examples have a waisted area towards the middle of the shaft and extra wear underneath the tip. When held in the hand with the butt against the palm, the waisted area comfortably fits the position of thumb and forefinger.

These flat pin-beaters first appear in the late 9th or early 10th century and are current until the 13th or 14th century (Brown 1990,227-31; MacGregor 1987, 189-91; Rogerson and Dallas 1984, 170-5; Mann 1982,25-6, 57; Oakley 1979a, 311-13); one example from

Fig. 815 Pin-beaters in bone and antler; above, double-ended cigar-shaped pin-beater 6669*, and rough-out* 6670*; middle, a selection of single-ended pin-beaters or 'picker-cum-beaters',* 6671-2, 6694 *(antler),* 6673-4*; below, a selection of longer single-ended pin-beaters,* 6695 *(antler),* 6677-8*, and rough-out* 6676*. Length of* 6670*, 142mm*

Lurk Lane, Beverley (Foreman 1991, 193, no.1137) may be as early as the early-mid 9th century, but there is doubt concerning the date of the deposit from which it came (Armstrong et al. 1991, 13). In the decorated examples from Thetford, Norfolk (Rogerson and Dallas 1984), Winchester (Brown 1990) and Northampton (Oakley 1979a), the design always starts at the butt end and generally reaches a third or halfway down the shaft. This tends to confirm that only the pointed end was intended for use. Brown (1990) has dubbed these tools 'picker-cum-beaters' and similar tools, called 'pick-ups', are still used today on two-beam looms for tapestry weaving. Their function is to pick out groups of warp threads and to give the weft a preliminary downwards beating, before using a toothed weft-beater (see Fig.816, p.1758).

The third type of pin-beater from Coppergate is generally longer than the others, up to 167mm in length; it is round or near-round in section and sometimes has a gentle lengthways curve (Fig.815, bottom). There is some doubt over the identification of the more slender and sharply pointed examples, such as *6695* from Period 4B, which are similar to dress pins, but the stouter forms with rounder tips, especially those from Period 5B, are more certain. In all these objects the wear is concentrated from mid-shaft downwards and the long butt end, which would no longer sit in the palm of the hand, is often roughly worked and unworn. Similar pin-beaters are known from 9th/10th century Winchester (Brown 1990, no.210), 10th–12th century Thetford (Rogerson and Dallas 1984, nos.50 and 56) and another example of uncertain date has been recorded at Bedern, York (sf1903, Walton Rogers in Ottaway and Rogers *A Y* 17/15.). Although less common than the flat type, their date range and wear patterns are similar and they are probably also associated with the two-beam vertical loom. They would have been gripped mid-shank and used to beat downwards, as illustrated on Roman funerary sculpture (see below, p.1759).

Needle-like tools

Two of the flat pin-beaters, *6687* and *6688* (not illustrated), have drilled holes at the butt end, probably for a thong or cord with which to hang up the tool. In present-day Palestine, weavers sometimes wrap the thong around the shank when in use, to give a better grip (Weir 1970, 21-3). Other bone needle-like objects from 16-22 Coppergate have been listed with needlework tools (Table 150, p.1779), although it is possible that some were used with the warp-weighted loom. A long needle capable of taking a thick cord is necessary to stitch the rod to which the warp-band is attached on to the cloth-beam; and similar needles were pinned into the selvedges and then bound to the loom uprights in order to prevent the fabric drawing inwards (Fig.8l2, p.1751) (Hoffinann 1974, 145).

Two-beam vertical loom (Fig.816)

The two-beam vertical loom consists of two uprights set in a stand, with an upper and lower beam which may be fixed or adjustable. In later tapestry looms there were cranks to

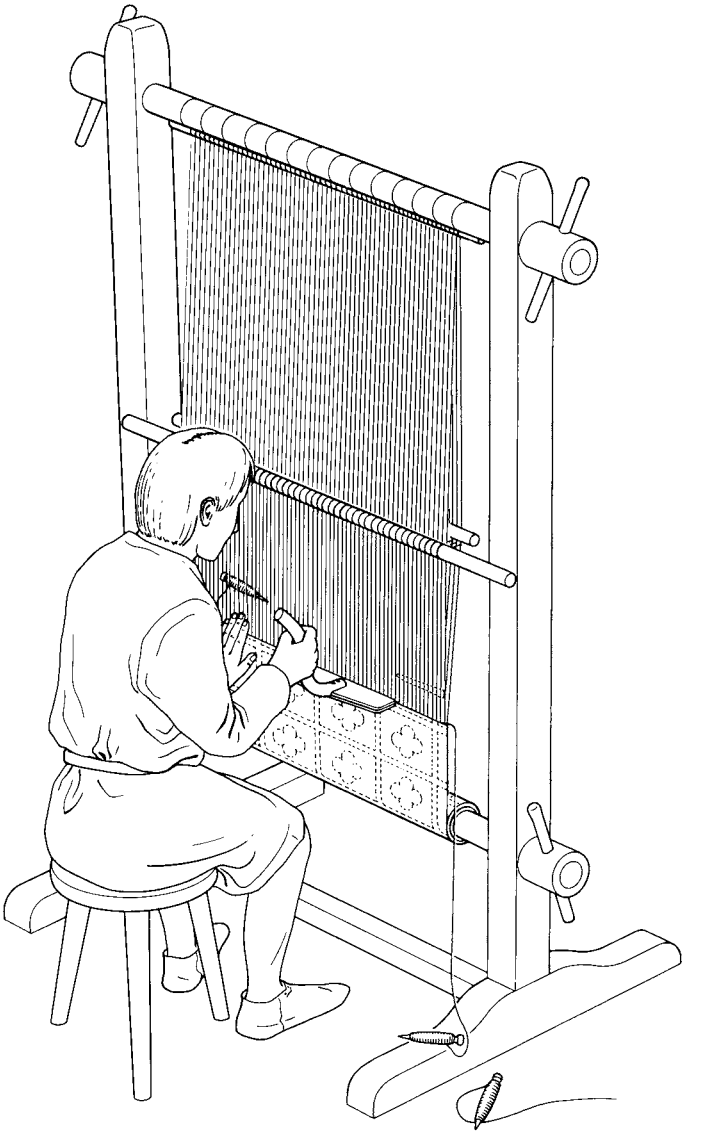


Fig. 816 Medieval tapestry weaving on the two-beam vertical loom. The weaver has already picked out a group of warp threads with the single-ended pin-beater and inserted a coloured weft mounted on a weft bobbin; he is now beating in with a toothed weft-beater

rotate the cross-beams, although at what date these were acquired is not clear. The warp is stretched between the two beams, either in a single plane or as a tubular warp. In both cases, the weaving is built up from the bottom and the weft is beaten in with a downwards

Fig.817 A vertical two-beam loom in the Eadwine Psalter, mid 12th century (Trinity College Library, Cambridge, MS R.17.1, f263; reproduced with permission from the Master and Fellows of Trinity College Cambridge). Note the weft-beater in the right hand of the kneeling figure

action. The tools from Coppergate associated with this loom are tapestry weft-bobbins, toothed weft-beaters and, as already described, single-ended pin-beaters.

This loom may have been used as a cloth loom in Iron Age Denmark, but to the Romans it was also a specialist tool for tapestry weaving (Wild 1970, 69-74; 1979, 125), which they brought with them as far as Gaul. A funerary sculpture from Baugy, central France, shows a woman weaver standing with the loom on her left, a spool of yarn in her left hand and a long single-ended pin-beater in her right hand, pointing diagonally downwards ready to beat home the weft (Ferdière 1984, 218-22,248, fig. 11). There is a second, similar sculpture from Baugy, without a loom, but the long pin-beater again grasped mid-shank and pointing downwards (ibid., fig. 10).

There is no direct evidence that this loom came as far as Roman Britain, nor is it clear whether it was known to the early Anglo-Saxons. The soumak and tapestry weaves in the Sutton Hoo ship burial, Suffolk, were probably made on the two-beam vertical loom, but not necessarily in England (Crowfoot 1983,428-42). The fine 2/1 twills which sometimes appear in 7th century Anglo-Saxon burials have also been tentatively associated with this loom (ibid., 440-2) and, significantly, 2/1 twill begins to become more common in the 10th

Fig. 818 Possible tapestry weft-bobbin, 6651 *(top), and a fragment,* 6652 *(centre), compared with a modern tapestry weft-bobbin (bottom). Length of* 6651, *94mm*

century, just as single-ended pin-beaters start to appear in urban sites. There is, however, no evidence for the two-beam vertical loom in early and middle Anglo-Saxon settlements and, if it was known in 7th century England, it is likely to have been a specialist tool used close to royal courts. Indeed the only archaeological find of a complete two-beam loom is from a royal context, a small example from the 9th century ship burial at Oseberg (Grieg 1928, 176-9; Hoffmann 1974, 330-1). The Oseberg loom was probably used for the fine soumak and tapestry work found in the Oseberg hanging. The same burial has also yielded a long, slender, toothed weft-beater (Grieg 1928, 194), a forerunner of the more sturdy toothed weft-beaters used on heavy medieval coverlets (see below).

If the single-ended pin-beaters (of either type) are taken as an indicator of the use of the two-beam vertical loom, their distribution is of some significance. The earliest are from France and suggest continued use of the loom in post-Roman times. There are at least four, possibly eight, from Brebières, a 6th and 7th century village close to the royal residence at Vitry-en-Artois (Demelon 1972), and there are twelve from Villiers-le-Sec, on the lands of the Abbey of Saint-Denis, of which two are as early as the 8th century (Anon 1988, 280ff). Another is known from 9th century Dorestad, The Netherlands (Roes 1965, 54, 57), although the earliest confidently identified from England are dated to the 9th/10th century (see above). Whether the loom arrived here direct from France or was already here and simply moved out of the royal domain and into the hands of urban weavers is a matter for debate. If it is correct to equate the 10th century 2/1 twills with the two-beam loom, then it was being used as a cloth loom as well as for tapestry. Several textiles woven in variants

of 2/1 twill were excavated from 10th and 11th century levels at 6-8 Pavement, York *(AY* 17/3), although none was recorded at Coppergate. Textiles woven in 2/1 twill have also been recorded in 10th century deposits at Winchester (Walton Rogers unpublished a), where the two-beam loom seems to have come into use in about AD 900 (Keene 1990, 203-8).

The two-beam vertical loom appears in an English manuscript, the Eadwine Psalter, dated to the mid 12th century (Fig.817, p.1759). This illustration, together with another depicting the same scene in a 9th century psalter from Utrecht, The Netherlands (Hoffmann 1974, 328, fig.135), seems to be derived from a late Roman or Byzantine original. The English illustrator, however, has placed the figures in Saxo-Norman dress and, although there are some errors introduced by copying, details such as the weft-beater are convincingly drawn.

Tapestry weft-bobbins (Fig.818)

A wooden peg-like object, 94mm long, *6651* from Period 5B, has been identified by Morris as a tapestry weft-bobbin or 'flute'. A wooden fragment with incised marks, *6652*, also Period 5B, may be part of a similar artefact. Weft yarn would have been wrapped around the rebated area and perhaps also the main shank, since a similar object from Arhus, Denmark, lacks the rebated section (Andersen et al. 1971, 111). When weaving tapestry, a different colour yarn would be loaded on each bobbin and the appropriate bobbin brought into use as the design required (see Fig.816, p.1758).

Toothed weft-beaters (Fig.819)

There is one toothed iron blade from a weft-beater, *6608* from early 13th century levels (Fig.819a), and a coarser-toothed example in wood, *6653* from a dump dated to the 13th/14th century (Fig.819c). The iron blade is rectangular, 175mm long, 40mm wide and 2mm thick, tinned, with teeth set at 50 per 10cm. Larger iron weft-beater blades, with sloping sides, are known from 12th century Winchester (Fig.819b) and 14th century Newbury, Berks. (Goodall 1990a, 234). A rectangular example from 13th-14th century Westbury, Bucks., is closer to the dimensions of the Coppergate iron example, at 167 x 36mm (Ivens et al. 1995, 365, 370). The teeth of the Winchester blade are set at 30 per 10cm, those of the Westbury example at 35 per 10cm, and it seems likely that the Coppergate beater, at 50 teeth per 10cm, was used on finer fabrics than the other two (the set of the Newbury example was not recorded).

Blades of this sort would have been mounted in a wooden frame, most probably with a dog-leg handle, as can be seen in the Eadwine Psalter (Fig.817, p.1759) and in present-day beaters from Iran (Shor and Shor 1952) and Turkey (ling Roth 1977, 128, 135) (although the modem ones have longer teeth to accommodate modem pile weaves). Toothed weft-beaters are generally associated with the two-beam vertical looms used for heavy tapestry-

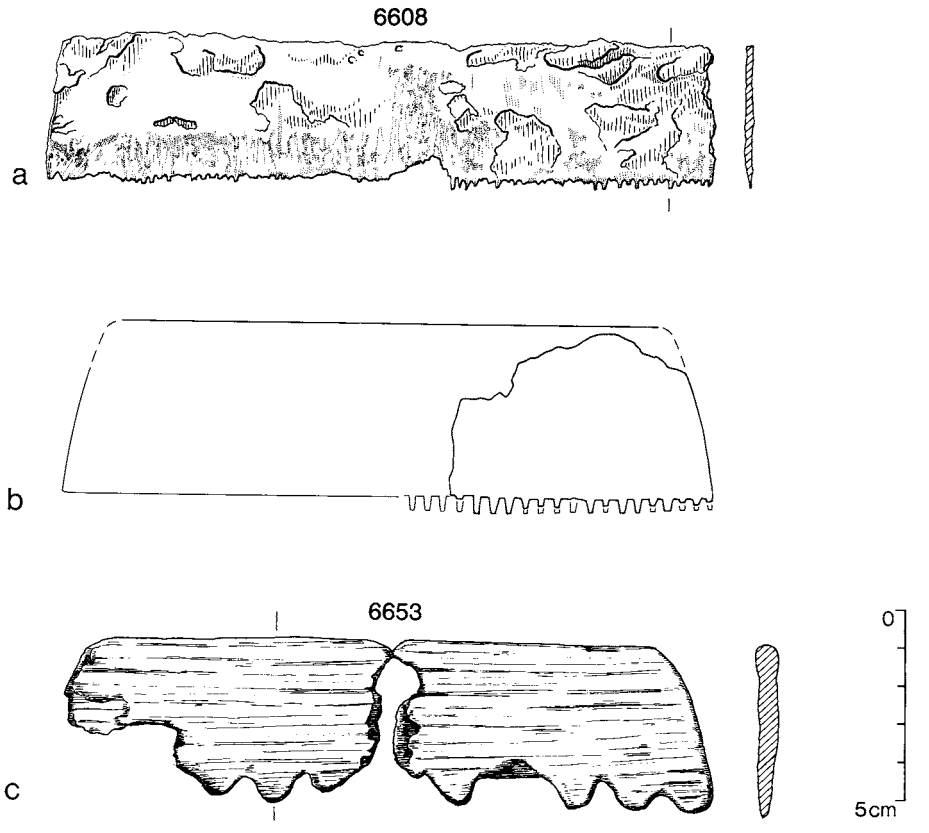


Fig. 819 Weft-beater blades; a, iron weft-beater blade, 6608*; b, compared with iron weft-beater blade from medieval Winchester (from Goodall in Biddle, 1990, 234; reproduced with permission from Oxford University Press); and c, possible wooden weft-beater blade,* 6653. *Scale 1:2*

woven rugs and coverlets and it is perhaps no coincidence that York, Winchester and Newbury were all prominent coverlet-weaving towns.

The coarse-toothed wooden object, *6653*, has similar dimensions to the iron weft-beater: 171mm long, 45mm wide, 5mm thick. Its sloping sides match the Winchester example, although the worn teeth are unusually widely spaced at c.8 per 10cm. A beater such as this could have been used to make coarse sacking of the sort recovered from the foundry at The Bedern, York, with thread-counts of 2 or 3 per cm (Walton Rogers in Ottaway and Rogers *AY* 17/15.). Sacking of this kind was current throughout north-west Europe in the medieval period and Crowfoot, Pritchard and Staniland have already suggested that such fabrics were made on the two-beam loom (Crowfoot et al. 1992,79).

Horizontal loom (Figs.820, 822)

The fully fledged horizontal loom, with treadles, reed for beating in the weft and shuttle to carry the weft yarn, seems to have arrived in north-west Europe in the 11th century. Written evidence places it in northern France at this time and archaeological finds show it spreading swiftly through the towns of northern Europe. Loom parts have been recovered from 11th century Hedeby, Schleswig, 11th and 12th century Gdansk and Oppeln (Opole), Poland, 12th century Sigtuna, Sweden, late 12th century Bergen, Norway, 12th/13th century Riga, Latvia, and 13th to 15th century Novgorod, Russia (summarised in Øye 1988, 73; and Grenander Nyberg 1994, 76-7). A single small pulley found in 10th century layers at Oppeln on the upper Oder (Kaminska and Nahlik 1960, 94) may indicate that the loom was already on its way into Europe at this stage (for its probable route, see Endrei 1961). No loom parts have previously been recovered from Britain, but the loom appears in an English manuscript of the mid 13th century (Fig.821).

There are two wooden objects from Coppergate which are likely to have come from the horizontal loom, a heddle cradle and a heddle rod.

Heddle cradle

The wooden object identified by Morris as a heddle cradle or 'shaft horse', *6654*, is from a deposit dated to the late 11th century. It is 219mm long, 55mm deep, 14mm thick and has three drilled holes (Fig.822). The two outer holes are broken and the central one has wear at the top of the inside edge. Morris sounds a note of caution concerning this object, as a wooden pivot can have a number of uses. Its size, shape, the position of the holes, and their wear are, however, exactly right for a heddle cradle.

A heddle cradle is the wooden pivot which is suspended by a cord, and often a pulley, from the overhead framework of the loom (Grenander Nyberg 1975, 36). Cords from the outer holes run down to the heddles, which control the rise and fall of the warp (cf. Fig.820). The heddles are attached below to treadles. As one treadle is depressed, one set of heddles falls, the cradle pivots and the opposite set of heddles rise: the warp thus separates into two planes and the weft can be passed between. The Coppergate cradle is well worn and seems to have broken as a result of too much pressure from below.

Heddle rod

An incomplete wooden rod, *6655*, 460mm long, 20mm diameter, with a knob-like terminal on the intact end (Fig.822), has been identified as a heddle rod, from comparison with similar objects from medieval Novgorod (Kolchin 1989,1, 116-17; 2, 363). It is from a deposit dated to the late 12th or early 13th century. Twine heddles, the loops through which the warp threads pass, would have been mounted between this rod and another parallel rod below. The upper rod would be suspended from the cradle and the lower attached to the treadle (cf. Fig.820).

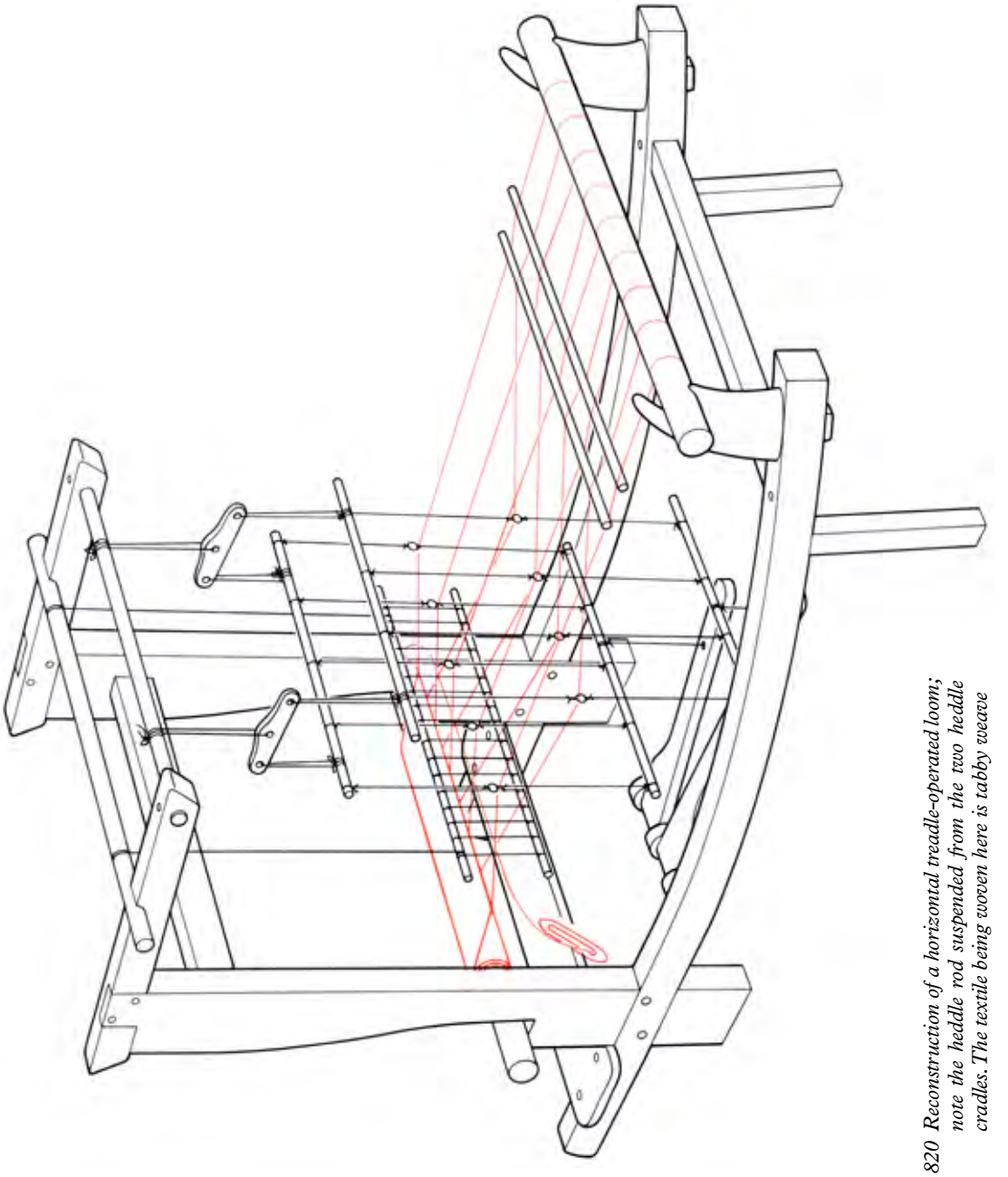


Fig. 820 Reconstruction of a horizontal treadle-operated loom; note the heddle rod suspended from the two heddle cradles. The textile being woven here is tabby weave

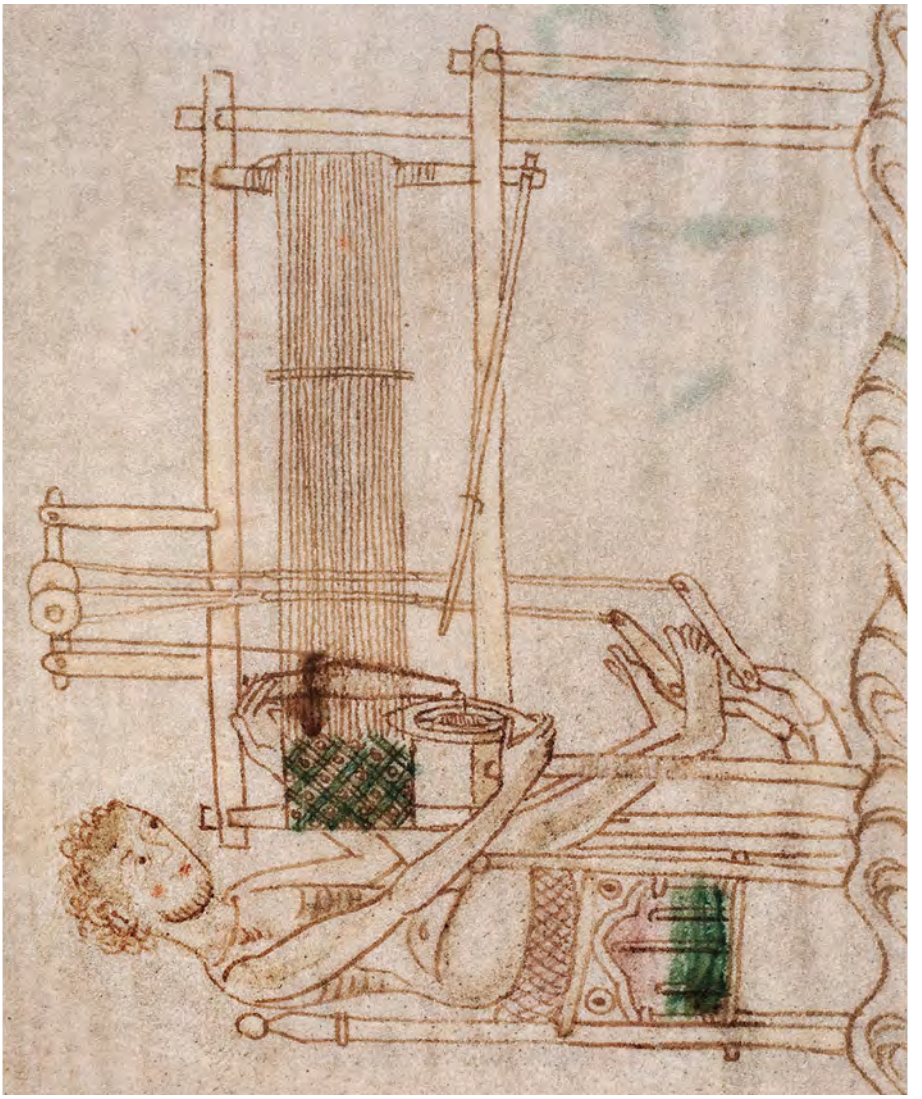


Fig. 821 A horizontal, treadle-operated loom from a mid 13th century manuscript (Trinity College Library, Cambridge, MS. 0.9.34,f.34; reproduced with permission from the Master and Fellows of Trinity College Cambridge); pulleys are used instead of heddle cradles in this loom, but the weave is also tabby (cf. Fig. 820)

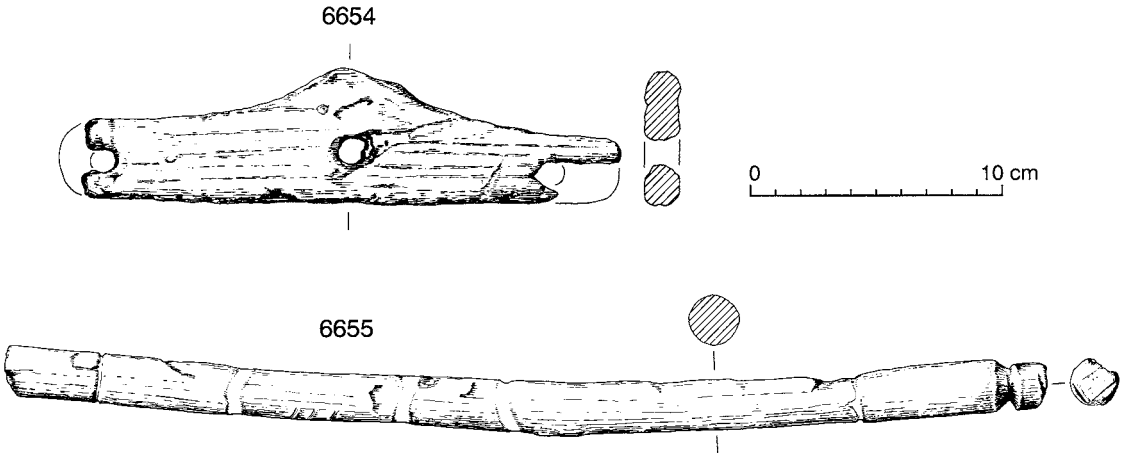


Fig.822 Wooden parts from horizontal looms: heddle cradle, 6654*; heddle rod,* 6655. *Scale 1:3*

There is evidence to suggest that the horizontal treadle loom was regarded as a linen loom when it first reached Europe (Grenander Nyberg 1994). How quickly it was modified for wool is not yet clear, but it is conceivable that the two-beam vertical loom, which remained in use alongside the horizontal loom, continued to be used for wool cloth for a few decades. By the time that written records become clear on the point, however, the two-beam vertical loom has become a tapestry and sacking loom, and the horizontal loom is the main tool for fast production of both wool and linen clothing fabrics.

The arrival of the horizontal loom is generally associated with the change from home weaving to more specialised workshop production (see p.1827). The evidence of the heddle cradle would suggest that this change had begun in York by the end of the 11th century.

Dyes and dyeing (Table 148)

Dyed wool, dyed textiles and quantities of raw dyestuff show that the dyer's craft was being practised at Coppergate through much of the Anglo-Scandinavian period. The dyestuffs recovered — woad, madder, greenweed and weld — are those which give good strong colours *(AY* 14/7, p.714, fig.196k) and which were to remain the commonly used commercial dyes for several centuries afterwards (Walton 1991,332-7). Many native wild plants will also yield some subtle shades of colour, but there is little evidence, historical or archaeological, for their exploitation in late Anglo-Saxon or medieval England.

Woad is a vat dye, requiring a process of fermentation and oxidation in order to achieve a blue-dyed cloth. The red dye from madder (Fig.823) and the yellow dyes from greenweed

Fig. 823 An illustration of the madder plant, Rubia tinctorum *L., from The Herbal of Apuleius Barbarus, c. AD 1100 (MS Bodley 130; reproduced with permission from The Bodleian Library, University of Oxford)*

and weld need instead a mordant such as alum (aluminium salts) in order to fix the colorant on the fibre. Alum would have been hard to find in England in the Anglo-Scandinavian period, but A.R. Hall has shown that the quantities of imported clubmoss recovered from the site were probably used as an alum substitute *(AY* 14/7, 771; and below).

A.R. Hall summarises work on the plants used in dyeing and mordanting here.

Remains of plants whose use in dyeing and mordanting seems incontrovertible were recorded from many of the deposits of Anglo-Scandinavian date at 16-22 Coppergate *(AY* 14/7, 767-73, fig.196). These plants are virtually absent in those post-Conquest deposits so far examined, although a detailed examination of this later material has yet to be undertaken. The Anglo-Scandinavian plant remains were sometimes present in considerable concentrations, which must represent disposal of waste from a dye-bath. Often, however, only a few fragments were recorded and here we must be dealing with material redistributed locally at or just after the time of disposal, or perhaps in some cases redeposited through later reworking of deposits.

Altogether four plant taxa were identified as likely to have been raw materials in dyeing. The first of these, madder *(Rubia tinctorum* L.), was observed and sampled during excavation as red-stained patches in some of the Anglo-Scandinavian deposits associated with the Period 4B post and wattle buildings. The fragments of root (the part of the plant in which the dye resides) were identified by their anatomy (Tomlinson 1985) and also spectrophotometrically, using techniques described by G.W. Taylor for extracts from textiles (pp.398–400, *AY* 17/5).

In many of the samples yielding madder root fragments there were also stem fragments of dyer's greenweed *(Genista tinctoria* L.), identified by the cell pattern of the

Table 148 Dyeplants from 16–22 Coppergate

Figures represent numbers of contexts yeilding evidence (note that all biological remains were recovered by a sampling strategy, see *AY* 14/7, pp.451–2
*Information not yet available

	Madder	**Woad**	**Dyer's greenweed**	**Clubmoss**	**Weld**
Period					
Anglo-Scandinavian					
3	17	3	5	13	2
4A	7	1	5	7	3
4B	121	28	93	118	14
5A	41	7	28	29	1
5B	46	16	52	66	2
5C	12	2	6	14	–
Sub-total	(244)	(57)	(189)	(247)	(22)
Medieval					
6	*	*	*	*	*

epidermis (Tomlinson 1985). Almost all parts of the greenweed plant were eventually identified, indicating whole plants to have been uprooted for dyeing. This contradicts the many literary sources which refer to the preferential use of the young shoots -though here we may be revealing a difference between ancient pragmatism and more recent folk mythology.

A third plant identified from these deposits was a clubmoss, *Diphasium complanatum* (L.) Rothm., remains of whose dichotomously branching stems were eventually easily recognised even as small fragments. Although not a dyeplant *per se,* there is abundant ethnographic evidence from Scandinavia (e.g. Heeg 1976) for the use of this plant as a mordant. It appears that some clubmosses are able to absorb aluminium – generally an element toxic to plants – and this must have been recognised by early dyers.

The last of the major dyeplants is woad *(Isatis tinctoria* L.), of which pod remains were recorded in a few contexts. There was also some less securely identified material thought to be remains of the vegetative parts (mainly leaves) actually used in dyeing. This evidence is discussed further by Tomlinson (1985) and, in the context of other recent records for the plant, by Hall (1992a).

Lastly, seeds of weld *(Reseda luteola* L.) were present in small numbers in some of the Anglo-Scandinavian deposits at 16-22 Coppergate (Table 148). This plant is a prolific seed-producer and also a species likely to occur naturally as a weed as part of the local urban flora, so its presence is not necessarily significant. Other plants could have been used at a time in their life cycle when no parts resistant to decay would have been preserved (most of the taxa were present as fruits or seeds), while lichens seem unlikely ever to be recognised from fossil remains.

The sources of the dyeplants are perhaps of some interest. Madder and woad might easily have been grown in the vicinity, especially if, as may have been the case, summers in the 10th and 11th centuries were a little warmer than today (Addyman et al. 1976, 226). Otherwise they are easily transported in a dried and partly processed form (as milled roots, in the case of madder, or partly fermented leaves, in the case of woad). The greenweed was almost certainly collected locally; it still grows in a few places in north and west Yorkshire where old and undisturbed pasture survives, but is likely to have declined considerably since the medieval period, as arable farming spread to areas formerly occupied by grassland and the grazing of sheep on pastures intensified. It is unlikely that *D. complanatum* ever grew abundantly (if at all) in the British Isles and this plant is perhaps the only one that was certainly brought to York from Scandinavia (where it is still quite common in areas of conifer forest) or from north Germany.

The most common dye in the plant record, madder, was also the most commonly identified in the textiles from Coppergate (Table 25, *A Y* 17/5). After the research of the textiles had been published (ibid.), further work established that late Anglo-Saxon London also drew on madder (Walton 1988a), while lichen purple predominated at Viking Dublin (ibid.) and early Norse Greenland (Walton Rogers 1993). Blue was common in Scandinavian cemeteries of the Viking Age, a deep blue-black being found in some of the finest fabrics, probably traded goods (Bender Jørgensen and Walton 1986; Walton 1988b; Walton unpublished). Natural black wool and other fleece colours had been used for textiles from north Saxony and Frisia (Walton Rogers 1995).

There is now written evidence to support the view that there were regional differences in the use of colour. Winric of Treves (fl.1068-97) in his poem *Conflictus Ovis et Lini (Zeitschrift für Deutschland Alterthum,* 1859, 215-38; for the identity of the poet, see Van der Vyver and Verlinden 1933) has the sheep describe the greens of Flanders, the undyed cloths of the Teutons, the 'beautiful black dye' of the Rhineland and the natural tawny-red wool of Suevia. Of Britain, the sheep says 'Not blood, not sun, not fire, glows as red as you, Britain, glow ruby in my coat' (author's translation). It seems, then, that Britain was known for her use of red dye by the 11th century, a fact confirmed by the archaeological evidence. In this, as in other aspects of textile production, Coppergate belongs in the Anglo-Saxon, rather than Scandinavian, craft tradition.

No vats or other utensils associated with dyeing were found at Coppergate, nor are there any of the madder-stained potsherds which have been identified at late Anglo-Saxon London (Taylor 1991) and Thetford (Rogerson and Dallas 1984, 167), late Anglo-Saxon and Anglo-Norman Winchester (Walton Rogers unpublished b) and medieval Norwich (Walton unpublished). These potsherds come from relatively small containers, which would have held at most 2 litres of dye liquor. If the dyeing at Coppergate was as large-scale as

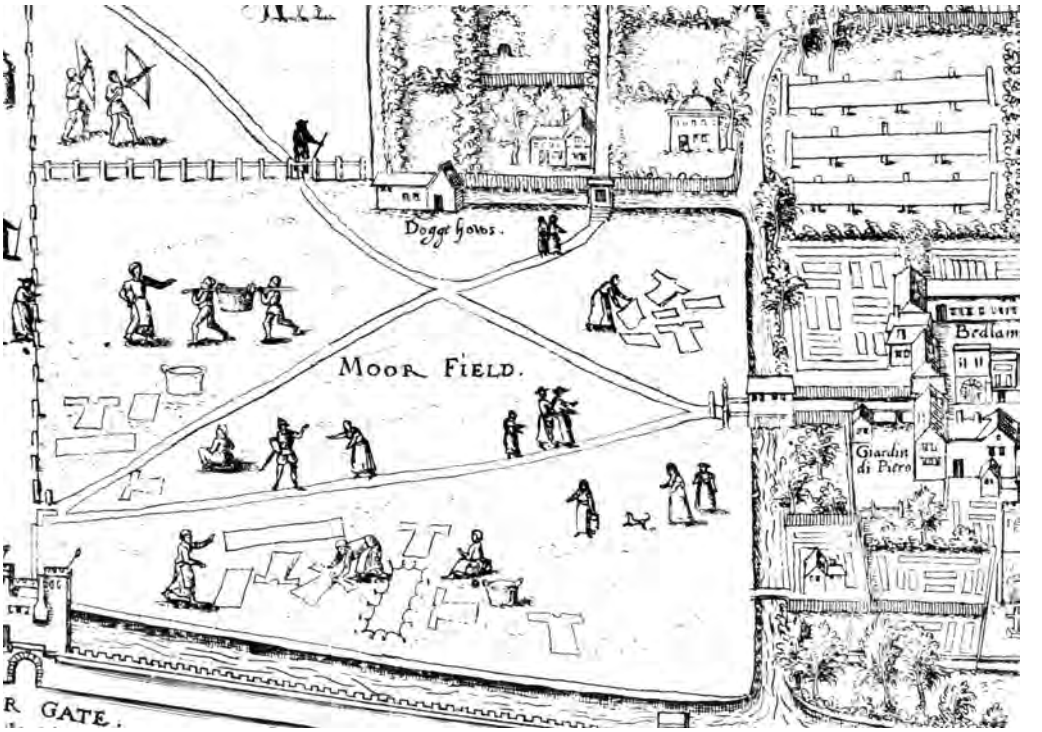


Fig.824 Linen cloth and clothing laid out to bleach in the sun; 16th century map of London (reproduced with permission from The Museum of London). Note also some cloth tenters at the top right

the dye residues suggest, the dyers would have used much larger vats and cauldrons, as illustrated in later manuscripts (Walton 1991, fig. 172).

The madder-dyed raw wool from Periods 3 and 4B (1256, 1283, *AY* 17/5) shows that dyes might be applied before spinning in the 9th and 10th centuries; certainly, the textiles of the period lack the close, almost matted appearance which cloth given prolonged treatment in the dye-bath generally has. In the medieval period, however, with the advent of fulling – a more regular practice (see below), the effect of the dye-bath on the finished cloth would matter less. By the 15th century, when the York dyers began to write down ordinances for their craft, they said they might dye at any stage, as 'wolles, clothe or games' *cYMB* 2,206).

Of course, not all cloth would have been dyed. linens might be boiled in a solution of wood ash (Heinrich 1992, 48-50), rinsed and pegged out flat in the nearest open space, until they bleached to a pure white (Fig.824). Wool textiles made from natural fleece colours were generally left undyed, although a single Anglo-Scandinavian textile from 6-8 Pavement, York, has proved to be a grey wool overdyed with madder (663, *AY* 17/3; p.404,

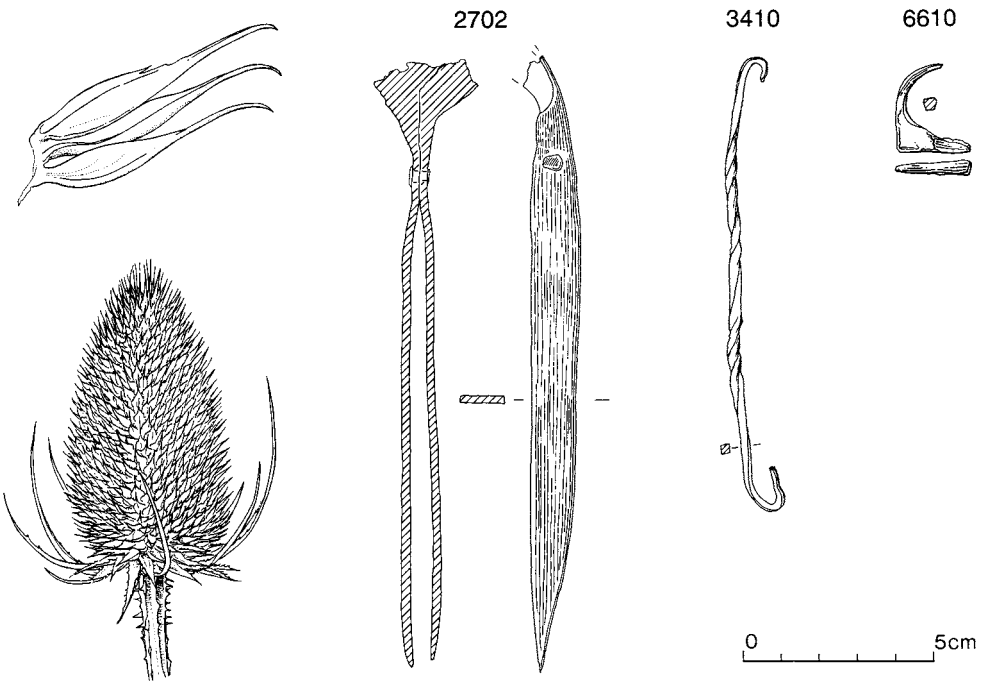


Fig. 825 Equipment for finishing cloth: hooked bract and mature head of modern fuller's teasel, Dipsacus sativus *(reproduced with permission from the editors of* Circaea*); iron shearboard hook* 3410; *iron tweezers,* 2702*; iron tenterhook,* 6610. *Scale 1:2*

AY 17/5). Silks may have been dyed here or in their country of origin and were sometimes left their natural straw colour (ibid.).

Finishing wool cloth

Wool cloth may be taken from the loom, washed and used straight away, or it may be 'soft-finished'. It can be fulled for a matted finish, or fulled, teaselled and sheared for a mcre dense, felt-like nap. The evidence for cloth-finishing at 16-22 Coppergate consists oftease5 and a shearboard hook from Period 3; and a pair of iron tweezers, possibly an adjunct to teaselling, from Period 4A (Table 149; Fig.825). These are representatives of a highly skilled craft and evidence as early as the 9th century is of especial significance (see p.1824).

The evidence for fulling is more doubtful, as the four iron tenterhooks from Period 6 may have been used for purposes other than stretching fulled cloth. The wool textiles themselves are perhaps the best witnesses to developments in finishing processes over the

Table 149 Equipment for finishing cloth from 16–22 Coppergate and the Watching Brief

*Number of contexts yeilding evidence (note that biological remains were recovered by a sampling strategy (see AY14/7, pp.451–2) and are not directly comparable with the numbers of artefacts)
**Information not yet available

	Teasels *	Shearboard hook	Tenterhooks	Slickstones:	
				glass	stone
Period:					
16–22 Coppergate					
Anglo-Scandinavian					
3	2	1	–	–	2
4A	–	–	–	2	1
4B	–	–	–	11	–
5A	–	–	–	3	–
5B	–	–	–	9	–
5C	–	–	–	–	–
Sub-total	(2)	(1)	(–)	(25)	(3)
Medieval					
6					
mid 11th–late 12th	**	–	–	5	–
end of 12th–late 13th	**	–	1	9	–
end of 13th–late 14th	**	–	3	1	–
end of 13th–late 14th	**	–	–	–	–
Sub-total		(–)	(4)	(15)	(–)
Post-medieval					
6					
end of 15th–late 17th	**		–		–
Unstratified	–		–		–
Watching Brief	**		–		–
Total		1	4	41	3

period under discussion. As fulling is the simpler task and preliminary to teaselling and shearing, it is described here first.

Fulling and tentering

Fulling is the deliberate shrinking and thickening of wool cloth. It mats the fabric and if taken to extremes gives it a rough, shaggy appearance. Only one textile fragment from Anglo-Scandinavian levels has this kind of finish, *1303*. It is a coarse twill and its dark warp, pale weft and matted surface identifies it as a Scandinavian product (pp.34D-l, *AY* 17/5). 1 For the matted effect, the cloth would have been thoroughly wetted and then worked by hand or trampled underfoot, until the fabric had the correct degree of felting. This process was being applied to textiles in Scandinavia as early as the 10th century; in some cases the surface of the fabric was also raised with some sort of tool, but the nap was never sheared back (Hagg 1984, 108-9, 121-6). In Anglo-Saxon textiles, on the other hand, there is no evidence for heavy fulling, except as a precursor to teaselling and shearing.

The effects of more moderate fulling can be seen in the textiles from Coppergate which are dated to the 14th and 15th centuries. By the 14th century much cloth was being fulled in water-driven fulling mills in West Yorkshire, although some fullers continued to work in York and they still had their gild in the 15th century (Heaton 1965,31). The only evidence that fullers may have been working at Coppergate lies in four iron tenterhooks.

Tenterhooks

After fulling, the wet cloth had to be stretched on a tenter-frame, the cloth being fixed to the tenter by means of iron hooks. Four iron tenterhooks, *6610* (Fig.825), *6609*, *6611–12* (Ottaway and Rogers *AY* 17/15, 2738-9) from 13th and 14th century deposits each have a sharp tip, which would have pierced the edge of the cloth, and a blunt end, for fixing in a rail or post. Tenterhooks were, however, also used to hang wall-hangings (Goodall 1990b, 235) and a fragment tentatively identified as tapestry, *1422*, was indeed recovered from medieval levels of the site. The number of hooks from 16-22 Coppergate is very small in comparison with the 86 from the Brooks area of Winchester (ibid., 234–9) and, without any supporting evidence such as tenter-posts, it is hard to be convinced that woven cloth was finished in any way at Coppergate during the medieval period.

Teaselling and shearing

A nap can be raised on wool cloth by brushing over the surface with teasels set in a frame. The cloth is then fixed to a padded bench with iron clips, known variously as havettes, habicks or shearboard hooks, and sheared with large iron cropping shears. The process is repeated several times on both faces for a finish resembling modem billiard cloth. No cropping shears have been found, but the shearboard hook and teasels are convincing evidence.

Teasels by A.R. Hall

Fragmentary remains of the flower heads and fruits of fuller's teasel, *Dipsacus sativus* (L.) Honckeny, were identified from three fills of a single feature in Period 3 (identified on the basis of other biological evidence as a cess-pit) (Fig.825). Fruits were present in two of the layers and receptacular bracts (the curved structures forming the 'teeth' of the teasel head) also in two, one layer having moderately abundant bracts and few fruits. A discussion of their identification is given by Hall (1992b). This species of teasel is unlikely to be native to Britain but its origins are obscure. Although Roman textile workers knew how to raise a nap, they do not appear to have used teasels for the purpose (Wild 1968, 141-2). D. *sativus* has also been identified from two adjacent sites at Beverley, both dated to the 12th century or thereabouts and both with abundant other evidence to suggest textile processing (Hall 1992b, 10-13; Evans and Tomlinson 1992). The native *Dipsacus fullonum* L. could never have been used as a substitute for D. *sativus;* its bracts are straight and smooth and do not draw fibres from textiles when passed across their surface.

Iron shearboard hook

The twisted iron rod with a hook at either end, *3410* (p.635, *AY* 17/6), is a shearboard hook, the twist giving it spring to allow it to hold the cloth taut (Fig.825). Later examples are generally shorter, made from copper alloy and lack the twist in the metal (Egan 1979), but there is a comparable example in iron from medieval Winchester (Goodall and Keene 1990, 239-40) and another in the Fries Museum in The Netherlands (Roes 1965, 16). Shearboard hooks and teaselled cloth are rare before the 12th century, but there is one other iron hook, non-twisted, from 10th century Goltho (Goodall 1987, 177-8), and another in copper alloy from Carolingian Dorestad (Roes 1965, 16).

Iron tweezers

There are four pairs of iron tweezers from Anglo-Scandinavian Coppergate (pp.550–1, *AY* 17/6). Three of these are small and were probably used in toiletry, but one, *2702* from Period 4A (Fig.825), is larger and similar to the tweezers used by 'burlers' to pick out teasel debris during teaselling and shearing (Beck 1886,36) — although, of course, they may have had other uses.

Anglo-Saxon teaselled cloth

Most of the textiles from Anglo-Scandinavian Coppergate have been left without any form of finish. In this they resemble the majority of textiles from Anglo-Saxon England, since napped (teaselled and sheared) cloth was not common until much later. A small number of napped fabrics have, however, been identified in Anglian cemeteries such as West Heslerton, N. Yorks. (Walton Rogers unpublished c), where they seem to have been used for cloaks. They tend to occur in graves well provided with artefacts, including silver (West Heslerton Grave 2BA 440) and ivory (Grave 2BA 907) and it is likely that, among Anglo-Saxons, they were regarded as relatively high status or good quality fabrics.

Finishing linens and laundering (Figs.826-7)

'The final stage of the finishing of linen is to flatten the yarns and close them together to produce a smooth surface and bring up the natural lustre of the fibre' (Baines 1989, 161). This was done by beating the wet linen with a club, mallet or flat wooden bat.

When linen was laundered it might be beaten again and then smoothed with the small hand-held tools commonly known as 'linen-smoothers'. There are a number of such smoothers in glass (Fig.826) from Anglo-Scandinavian and medieval Coppergate and also three objects from Periods 3 and 4A which may be early stone smoothers (Fig.827), used before glass was commonly available. Within the archaeological literature, these tools have also been called calenders, slick-stones and seam-smoothers (German *Glätterstein,* French *lissoir,* Norwegian *semglatter)*. 'Calender' should perhaps be reserved for the later mangle-like machine of that name (Beck 1886, 41; Kerridge 1985, 173; *D.E.D.* entries, *calender, calenderer),* but 'slick-stone' (Charleston 1990) or 'slicker' has good documentary support and a *slic* appears at the end of the list of cloth working tools in *Gerefa* (see below, p.1823).

It has been claimed that these tools were used as part of the finishing process for linen cloth, perhaps because enormous marble or glass balls were used for this purpose in the post-medieval linen industry (Baines 1989, 161-2). In Norway, however, where the small hand-held tools described here continued in use into the 18th century, their function was limited to smoothing garments, especially seams, after laundering (Heinrich 1992, 200). As will be shown (see below, p.1785), they would also be especially useful in constructing the flat seams used in linen garments in the Anglo-Scandinavian period.

Glass slick-stones or linen-smoothers

There are 41 fragments of glass slick-stones, ranging in date from the 10th to the 13th century (Table 149, p.1772). The original shape can be determined in about half of the collection, the remainder being small fragments, identified by the solid nature of the glass and by gently arcing flow-lines visible in fracture surfaces. Where the shape is preserved, it is circular and relatively flat or slightly domed, with a depression on the back containing the manufacturing scar (Figs.826-7). One 12th/13th century example, 6595, has a taller, domed profile and a deeply concave back (Fig.826). The diameter is generally 80-90mm, although the high-domed example is 70-75mm; the thickness varies from 23mm to 41mm. The smooth face tends to be duller than the rest and under the microscope it can be seen to have fine scratch marks on the surface (Fig.828a). These radiate out from the centre, as if the tool has been used in a back-and-forth, rather than round-and-round, action.

Some of these slick-stones are unusually well preserved. Their broken surfaces are a deep glossy black to the naked eye, which proves to be dark green if a bright light is shone through a fractured edge. Only one example, *6592* from Period 4B, is a pale transparent green (now with an iridescent layer of corrosion). Qualitative surface analysis by X-ray

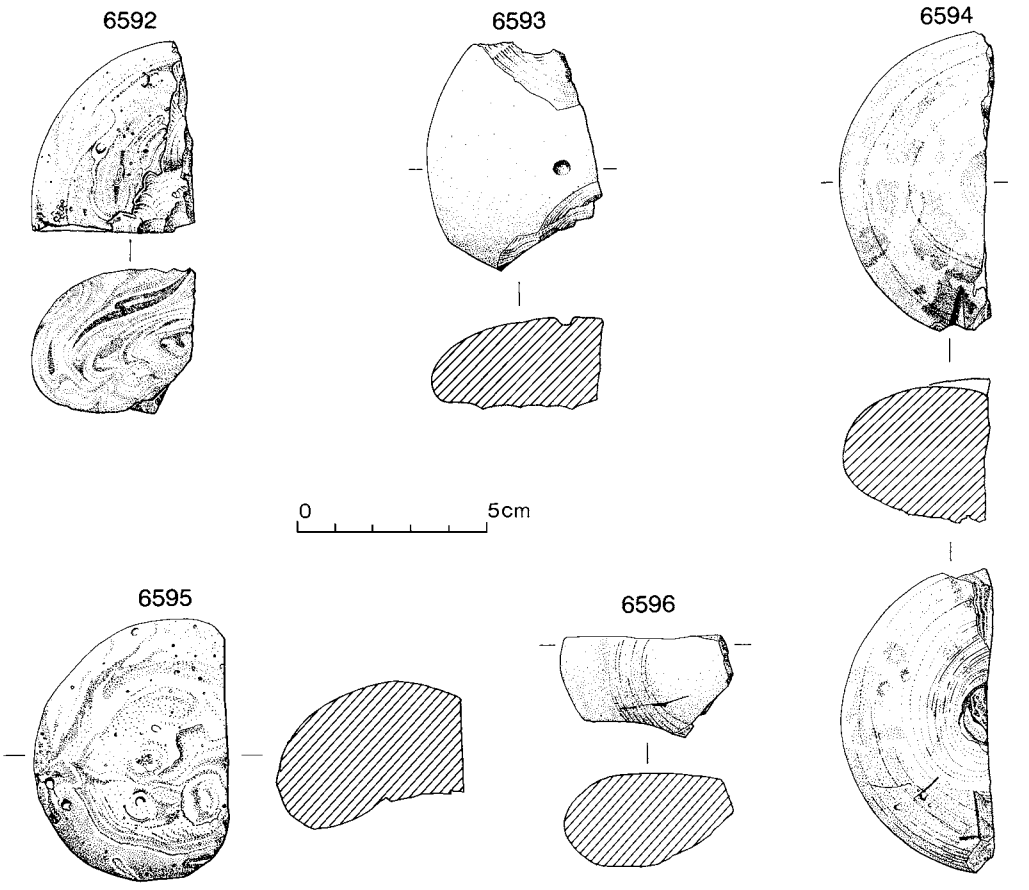


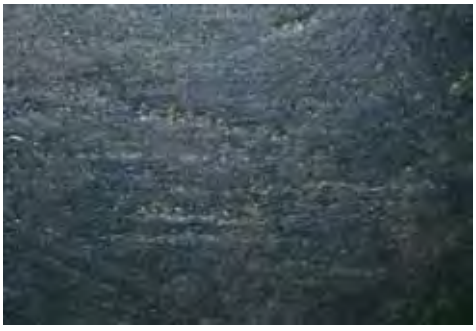
Fig. 826 Glass slick-stones, 6592-6. *Scale 1:2*

fluorescence, carried out by C. Mortimer, Ancient Monuments Laboratory (English Heritage), has shown mat several of me well-preserved examples have a high lead content (Mortimer 1995). This form of surface analysis can not differentiate between a true lead glass, containing only lead and silica, and a potash glass wim a high lead content, almough the state of preservation of some of me oilier slick-stones suggests mat mese at least are potash-based (ibid.). The black, or ramer dark green, can be accounted for by high levels of iron (ibid.).

Glass slick-stones or linen-smoothers were used in the Roman period (Wild 1970, 84-5), but disappeared as the Romans left northern Europe. They re-appeared along with potash

Fig. 827 Slick-stones: (left to right) of glass, 6596, 6595, 6593, 6592, 6597, 6594*; and of stone,* 6581, 6580, 6579. *Diameter of* 6579, *73mm*

glass and lead-glass trinkets at the end of the 9th century. A few 9th century examples are recorded from Norway (Petersen 1951, 328-9), Sweden (Arwidsson 1984, 199-202) and France (Ferdiere 1984, 227ff; Anon 1988,287-8), but by the 10th century they had come into more common use throughout north-west Europe (Petersen 1951; Arwidsson 1984; Ferdiere 1984; Anon 1988). In England there are similar slick-stones from late



a b

Fig. 828 Photomicrographs of fine scratches on: a, glass slick-stone 6597*; b, stone slick-stone* 6580. *Magnification x6.8*

Table 150 Cutting and stitching equipment from 16–22 Coppergate and the Watching Brief

	Iron shears	Needles: iron	copper alloy	bone	Needle-like objects	Bone thread-reels
Period:						
16–22 Coppergate						
Anglo-Scandinavian						
3	1	21	–	1	4	–
4A	1	9	2	–	2	–
4B	5	99	4	1	3	–
5A	1	25	–	–	1	–
5B	4	42	1	1	6	1
5C	–	20	–	–	1	–
Sub-total	(12)	(216)	(7)	(3)	(17)	(1)
Medieval						
6						
mid 11th–late 12th	2	24	2	–	–	–
end of 12th–late 13th	2	23	13	–	–	1
end of 13th–late 14th	–	3	–	–	–	1
end of 13th–late 14th	1	3	4	–	–	–
Sub-total	(5)	(53)	(19)	(–)	(–)	(2)
Post-medieval						
6						
end of 15th–late 17th	–	–	2	–	–	–
Unstratified	3	7	1	–	–	–
Watching Brief	–	–	–	–	–	–
Total	20	276	29	3	17	3

Anglo-Saxon Thetford (Rogerson and Dallas 1984, 116), London (Pritchard 1991, 173-4) and Winchester (Charleston 1990); from Anglo-Scandinavian York *(400,* pp.101-2, *AY* 17/3; Waterman 1959, 95-7); and from many sites of the 11th to 15th century (e.g. Oakley 1979b, 296-8; Charleston 1990; Margeson 1993,137-8).

Most examples are, as at Coppergate, black to the naked eye, with a few rare examples of pale transparent green. Most are circular and of similar dimensions to the Coppergate examples, although some blown-glass slick-stones have been recorded in different shapes (Arwidsson 1984, 199-202). They are generally thought to have been used with the whalebone boards carved with twin horse-heads which occur in Viking graves, but it is a curious fact that there is only one grave, Bj 854, Birka, Sweden (ibid.), where both slick-stone and smoothing board have been found together.

Slick-stones are a simple product for the glass-worker to make, being little more than a gather of molten glass rotated on a rod. Any laundress or needlewoman needing a smoother would not have had far to go, as there was a workshop using high-lead glass at Coppergate by Period 4B (pp.812-14, *AY* 17/7; *AY* 16/5, 469-71). By the 12th century there was another in Shambles (pp.224-5, *AY* 17/4).

Stone slick-stones

A circular stone object from Period 3, *6579*, has the same shape and dimensions as the glass slick-stones and a polished area towards the edge of one flat face (cf. Figs.826 and 827). Two other stones, *6580* from Period 3 and *6581* from Period 4A, are a different shape, but their black, glossy fabric is similar to that of the glass slick-stones and one, *6580*, has the same fine back-and-forth scratches on the surface (Fig.828b). Smooth flat pebbles, 50-60mm diameter and identified as slick-stones, have been found in Norwegian graves as early as the Merovingian period (Petersen 1951, 329); and in Viking graves of the Northern Isles (Grieg 1940, 171). Only one example has been recorded so far from Anglo-Saxon England, a round pebble very like *6579*, from Hamwic, Southampton (Addyman and Hill 1969, 74), but such objects are probably easily overlooked in occupation deposits. The Coppergate evidence suggests that the stone tools were ousted by glass slick-stones in the 10th century.

Cutting and stitching

An off-cut of unused silk tabby, *1347*, matches the fabric in a silk head-dress from 16-22 Coppergate (pp.360–3, *AY* 17/5) and in another from 5 Coppergate (651, pp.132-6, *AY* 17/3). It seems likely, therefore, that lengths of silk were being cut up and stitched on site. No doubt other types of clothing were being made at the same time. Many of the textile fragments from Coppergate included seams and hems (Figs. 168–9, *AY* 17/5); and loose lengths of thread, comparable with the sewing thread on the textiles, were also recovered (Tables 23 and 26, ibid.). The tools used for this cutting and stitching were iron shears and iron, copper alloy and bone needles (Table 150). Three bone bobbins or reels, which may have been used to carry sewing thread, are also included here.

Fig. 829 Iron shears, 2689, 2688, 6621, 2690, 6622. *Length of* 2689, *188mm*

Iron shears (Fig.829)

There are seventeen pairs of shears, or parts of shears, ranging in date from the 9th to the 15th centuries, and three undated fragments (548-50, *AY* 17/6; Ottaway and Rogers *AY* 17 in prep.). Where the bow has survived, it is the looped form, which is typical of the mid 9th century onwards (p.548, *AY* 17/6). The earliest examples, *2688-9*, have the least flared bows, reflecting their ancestry in the simple V-shaped bows of the early to middle Anglo-Saxon period. The blades of the shears have straight or CUtVed backs and the angle between the blade and the stem can vary in shape (Fig.829). The size of the blade varies considerably. The largest blades are 136 x 19mm (*2697* from Period 5B, ibid.) and 125 x 26mm *(6620* (not illustrated) from the 12th century, Period 6); the smallest are an asymmetrical pair, 6622, from the 15th century, where a 35mm blade, 7mm wide, faces another 11mm wide, the overall length of the shears being a diminutive 79mm (Fig. 829). Blades in the region of 50-60 x 12mm seem more usual.

Of course, shears would have had any number of uses, but the large ones are appropriate for cutting cloth and the small ones for cutting weaving yarn and sewing thread. Small sprung shears comparable with the smallest pair, *6622*, are still used today in the textile crafts and are sold under the name of 'weavers' snips'.

Iron needles (Fig.830)

Iron needles were being manufactured in the smithy on Tenement C in Period 4B and this will account for at least some of the needles deposited in this and subsequent periods (pp.512-14, 542-7, *AY* 17/6). Altogether there are 276 iron needles from 16-22 Coppergate (Table 150, p.1779), although exactly how many reached the hands of a seamster must remain unknown (see pp.1801-3).

There are two types of needle, one with a round eye which has been punched, the other with a long eye made by welding together the tips of a Y-shaped shaft (pp.542-7, ibid.). The round-eyed needles become increasingly common over the 10th to 11th centuries and have almost ousted the long-eyed needles by the medieval period. It is difficult to establish whether this is a general trend, as relatively few iron needles have been recovered from other sites, but the same two methods of manufacture were noted in twelve iron needles from 8th to 12th century Fishergate, York (pp.1271-2, *AY* 17/9); only punched eyes were recorded in the iron needles from medieval Eastgate, Beverley (Goodall 1992, 152-3).

The Anglo-Scandinavian iron needles from Coppergate are 23mm to 73mm long and 1mm to 5mm at their widest, the majority being 40-60mm long and 2-3mm wide. The medieval needles are similar, with the addition of four unusually long needles, 110-175mm long (*6614*, *6616-17*, *6619*; Fig.830). There is also a fragment of an especially fine needle, *6615*, from 12th century levels, comparable with two copper alloy needles of similar date.

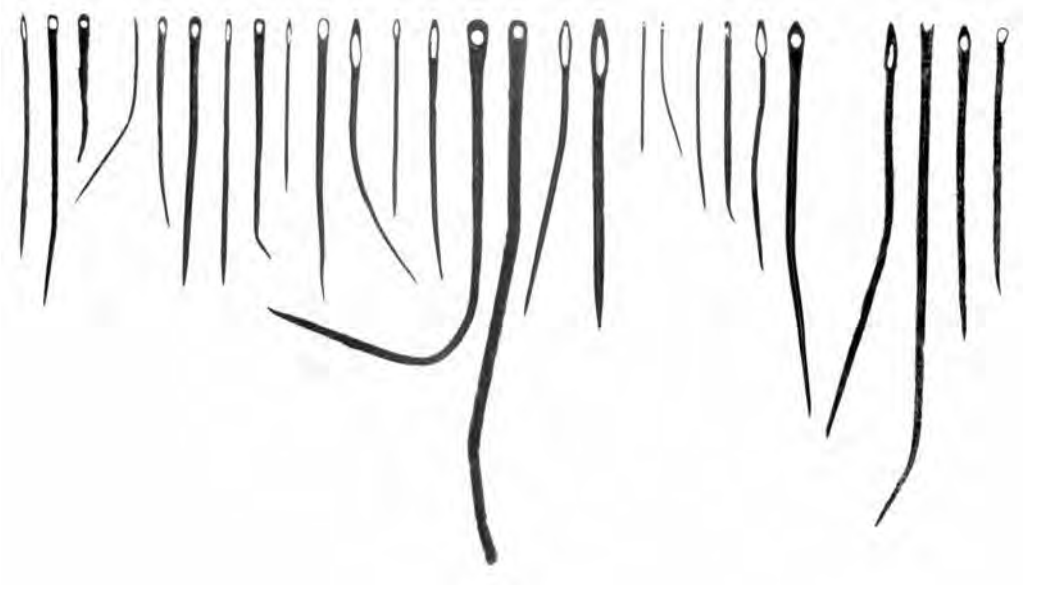


Fig.830 (left to right) Needles of iron, 2463, 2492, 6618, 6613, 2506, 2513, 2542, 2514, 2470, 2505, 2535, 2559, 2524,6614,6617,2591,2530, *and copper alloy,* 6626-7, 6633, 6624, 6630, 6628, 6631-2, 6629, 6625. *Length of 2530, 63mm*

Copper alloy needles (Fig.830)

Copper alloy needles are less common at Coppergate than iron, but make an increasing contribution in the medieval period (Table 150). They have been made in the same way as the iron needles, with round or long eyes. Again, the round eyes are more common in the later material, although eight of the twenty medieval needles are still long-eyed. The small collections of copper alloy needles from medieval Winchester (Biddle and Elmhirst 1990, 806,813-14) and Bryggen (Øye 1988, 104-6) include both round-eyed and long-eyed, with the round-eyed form predominating.

The copper alloy needles from Coppergate are a little longer and thinner than the iron, most being 50-80mm long and 2mm at their widest, with two medieval examples 138mm and 158mm. Two needles are unusual shapes, one, c.94mm long, *6623* from Period 4A, having a flattened leaf-shaped tip known as a bayonet point, and the other, c.l05mm long, *6632* from Period 6, a triangular cross-section. There are also two especially fine examples, dated to the late 12th or 13th centuries, *6626* (Fig.830) and *6627*. They are 27-28mm long and 0.8mm to 0.9mm at their widest and have blunt tips and tiny eyes. The function of the different needles will be described below.

Fig. 831 Bone needles, (left to right) 6680-2*; and bone needle-like objects,* 6686, 6685, 6683-4. *Length of* 6683,*106mm*

Bone needles and other needle-like objects (Fig.831)

There are twenty needle-like objects made from bone and antler, all from Anglo-Scandinavian levels, but only three, all of bone, can be confidently identified as needles, *6680-2* (Fig.816, near left). These three are 72-82mm long, 5.5-6.5mm at their widest and highly polished allover with obvious wear around the eye. They may have been used for darning in the pile on piled fabrics (pp.335-6, *AY* 17/5) or for the coarse wool repairs seen on, for example, the *nålebundet* sock (p.1787). The remaining objects are longer and thicker, with polish only at the tip and no wear around the eye. Some have flat-topped heads and incised marks above the eye and others have flared heads (Fig.831), both of which would prevent easy passage through cloth. Three have head and eye forms are typically Roman (A. MacGregor, pers. comm.), but the remainder are representatives of a class of object which is common through much of north-west Europe in the Viking Age and continues in Scandinavia into the medieval period. Many are likely to be dress pins of the sort which has a thong tie for looping over the tip of the pin, but functions suggested by oilier authors include hairpins, bodkins, awls, weft-bobbins, netting needles and needles for rush work. Some of the sturdier examples could also have been used to tension selvedges when weaving, as described above (p.1757).

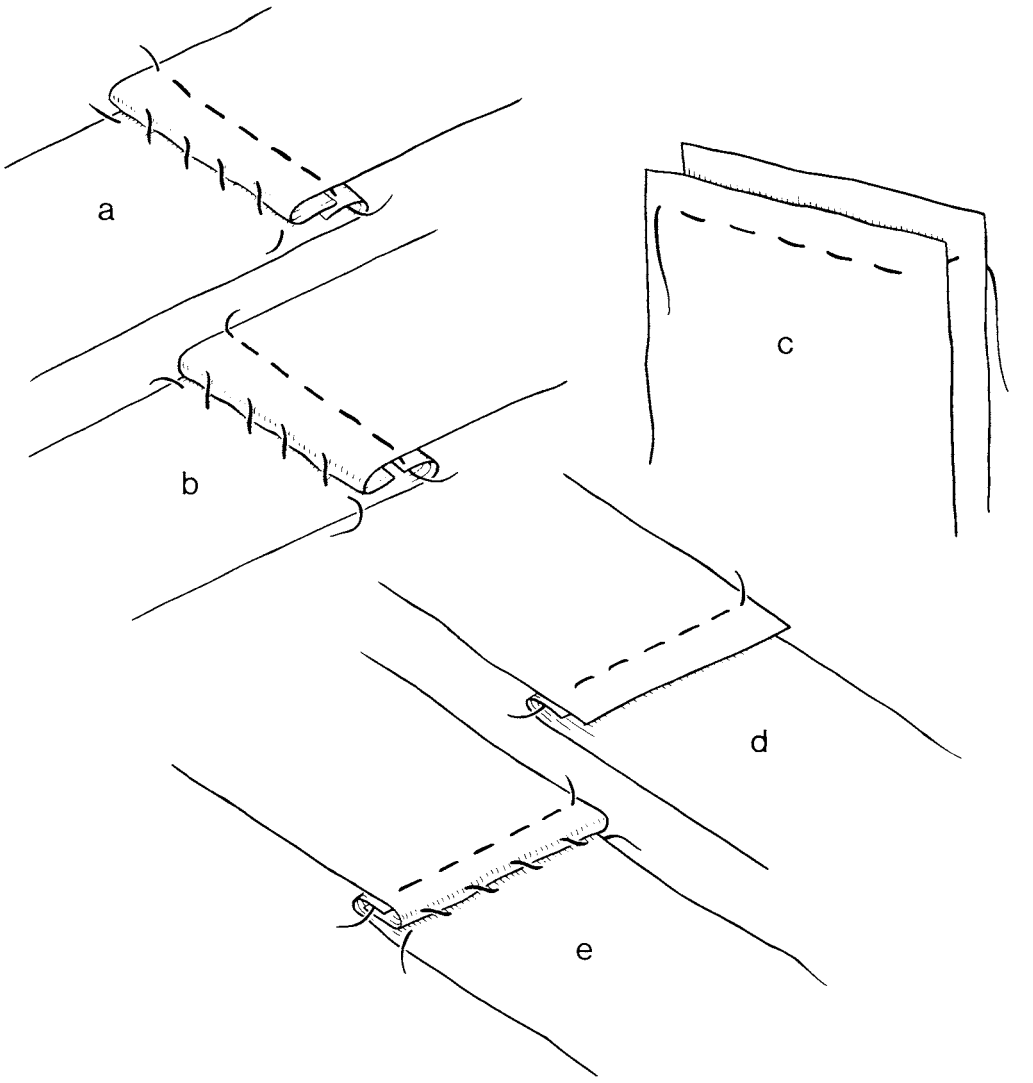


Fig. 832 Flat seams known as 'run-and-fell' in linen textiles from 16-22 Coppergate, (a) – (b). Their method of construction (c) – (e); the seam is stitched with a running stitch (c), pressed open and the seam wastage trimmed, then pressed to one side (d); the raw edge is turned under and hemmed. Pressing is essential and was probably done with slick-stones

Uses of needles

The needle with a triangular cross-section; *6632*, and the one with a bayonet point, *6623*, would have been used for leatherwork. Needles such as these still form part of a cordwainer's kit, although a longer form of the bayonet point is also used in upholstery. The six especially large iron and copper alloy needles from medieval levels could not have been used to sew clothing either, but may have been for stitching canvas 'sarplers' (see above, pp.1717–18) or to thread gathering cords through eyelets or hems. In contrast, the three very fine, blunt-tipped iron and copper alloy needles from 12th and 13th century levels must have been for exceptionally delicate work. Blunt tips are used on fabrics such as silk, where the needle has to part the filaments, rather than split them.

The rest of the needles represent a typical range of medium and coarse sewing needles (Rollins 1981,28-9). Such a collection could have been predicted from an examination of the seams and hems in the Coppergate Anglo-Scandinavian textiles (pp.404-9,*AY* 17/5). These were worked with sewing thread which in general matched the fabric being stitched, wool on wool, linen on linen and silk on silk. Most sewing thread was plied, although some silk was used singly. The larger needles could have been used for wool thread and the medium needles for linen, silk and the finer types of wool.

Wool fabrics were stitched in a variety of techniques, sometimes neatly executed, but often rather rough-and-ready. It is difficult to believe that the same hands could have stitched the linens which are all very competently made in a standardised fashion, with flat hems and the reversible flat seam known nowadays as 'run-and-fell' (Fig.832a-b). An essential part of constructing a run-and-fell seam (Fig.832c-e) is to press the seam open and then to press the seam wastage to one side — the seam will not hang properly otherwise — and it is very likely that the slick-stones were used for this purpose. The contrast between the wool and linen seams may indicate that the manufacture of linen garments was already a specialist craft. Silks have also been skilfully made at the first stage of manufacture, although repeated repairs have been worked with varying degrees of care.

No needlework was found on the medieval textiles, but evidence from elsewhere suggests that there was a change-over to the use of waxed linen thread on wool fabrics in the medieval period (Crowfoot et al. 1992, 151). This change coincides with the increase in fulled and teaselled fabrics, the rise in tailoring as a specialist craft and with the transition to round-eyed needles, although it would be difficult to explain the connection on technological grounds.

Beeswax

A small spherical ball of beeswax, *6696*, from 11th century deposits (late Period 5B), has a groove across one face and may have been used for waxing sewing thread *(AY* 14/7, 608, 766), although beeswax was also commonly used on bowstrings (Swanson 1989, 103).

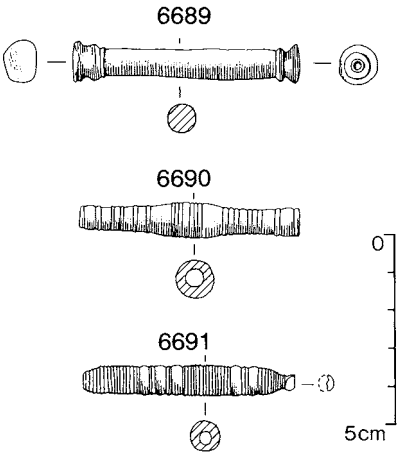


Fig.833 Bone reels perhaps for sewing thread, 6689-91. *Scale 1:2*

Bone reels for sewing thread (Fig.833)

There are three small lathe-turned bobbin-like objects, one from Period 5B, *6689*, and the others from Period 6, *6690-1,* dated to the 13th and 14th centuries respectively. They are 57-60mm long, 8-11mm diameter, and may be compared with a range of similar items from English and Scottish sites of the 12th to 14th centuries (MacGregor 1985, 183-5). The example from Period 5B (late 10th to early-mid 11th century) is therefore unusually early. These objects bear a resemblance to the type of needle-case which has sewing thread wrapped around the outside and *6690,* which is hollow, could have held one or two fine needles. Example *6689* is, however, solid and *6691* only hollow for part of its length. Such objects are, perhaps, thread-carriers, comparable with the modern cotton reel.

Other textile crafts

The Coppergate weavers seem to have concentrated on full-size, loom-woven cloth. Some smaller wares may have been produced at the same time, although the evidence is relatively slim.

Tablet weaving (Figs.834-5)

A single, small, almost square bone plate, 27 x 24mm, with a perforation at each chamfered corner, may have been intended as a tablet for braid-making (*6679*, Period 4B; Fig.834). It is unlikely, however, that it was ever put to use, as it has none of the distinctive wear-marks which weaving tablets generally have radiating from each perforation

Fig.834 Bone weaving tablet, 6679. *L. 27.0mm. Scale 2:1*

(MacGregor 1985, 191). If the damage on one side occurred during manufacture, this tablet was probably discarded as soon as it was made.

There is also a tablet-woven braid in silk and linen from Period 4B (Fig.835; pp.381-2, *AY* 17/5) and some gold thread which may have been brocaded into the surface of another from 5B (pp.314-15, ibid.). Horsehair, *1316*, which was sometimes used in patterned tablet braids (Nockert 1991, 13,83-6), was also recovered from a pit contemporary with the braid and the weaving tablet, although the hair was unused and may have been part of the general animal refuse of the site.

Tablet weaving was an established craft, practised with great skill and artistry in both England and Scandinavia (Crowfoot and Hawkes 1967; Crowfoot et al. 1992, 130-1; Nockert 1991). There is a set of tablet-weaving equipment, complete with part-worked braid, from the 9th century ship burial at Oseberg (Grieg 1928, 180-1), the Oseberg tablets being wooden and 40mm square. Most tablets are at least 30mm square (Roes 1963, 149-50; Wild 1970, 140-1; MacGregor 1985, 186, 191; Pritchard 1994), which suggests that the small Coppergate tablet was intended for especially delicate work.

Nålebinding

A much worn and repaired sock made by *nålebinding* was found in association with a typically Norse textile in a Period 4B pit (pp.341-5, *AY* 17/5). *Nålebinding is* a Scandinavian technique and one for which there is no evidence in Anglo-Saxon England. It is generally worked in a thick, plied yarn, with a large, blunt-tipped needle, often of bone (Hald 1980, 285ff; Nordland 1961, figs.12-18). The three bone needles from Coppergate could have

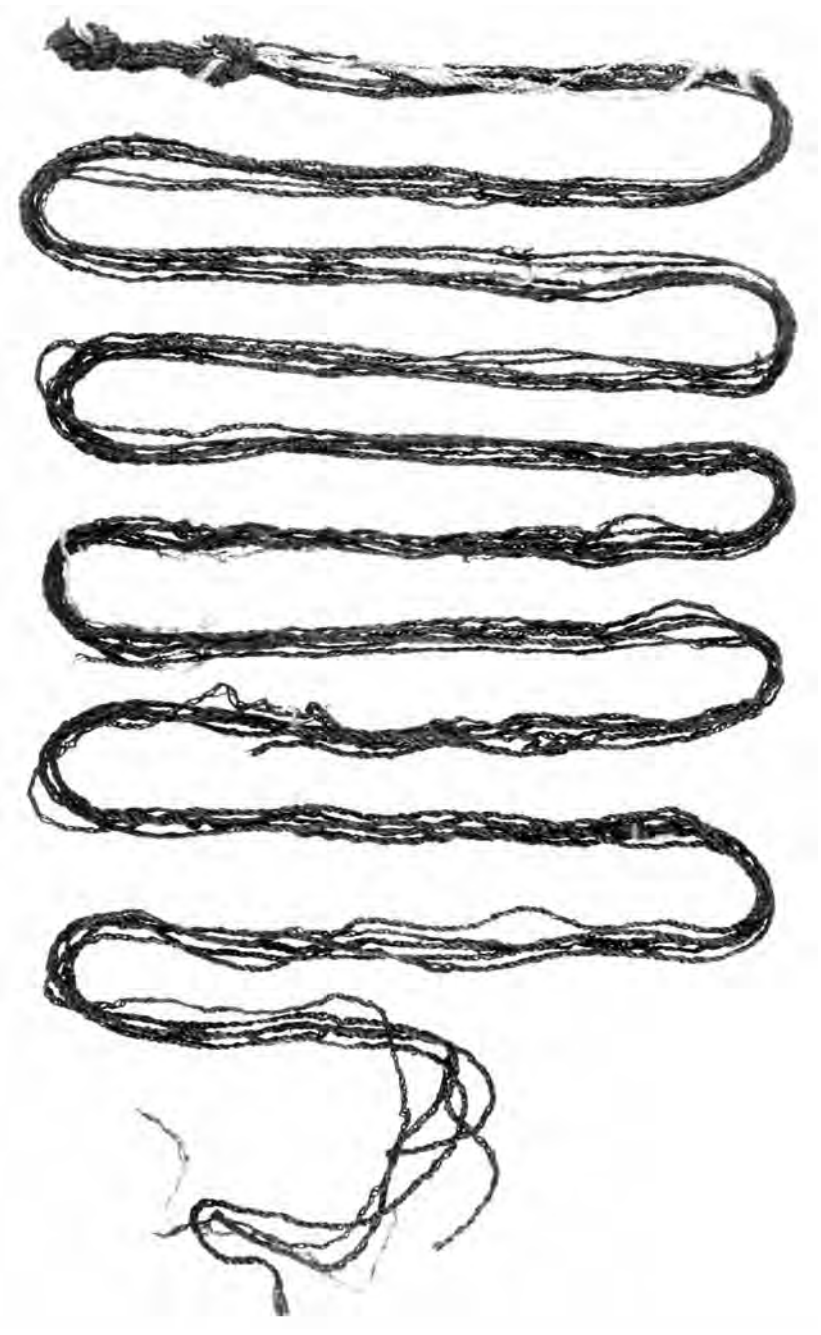


Fig. 835 Remains of narrow tablet-woven braid in silk and linen, 1340. *Total length 1.47m*

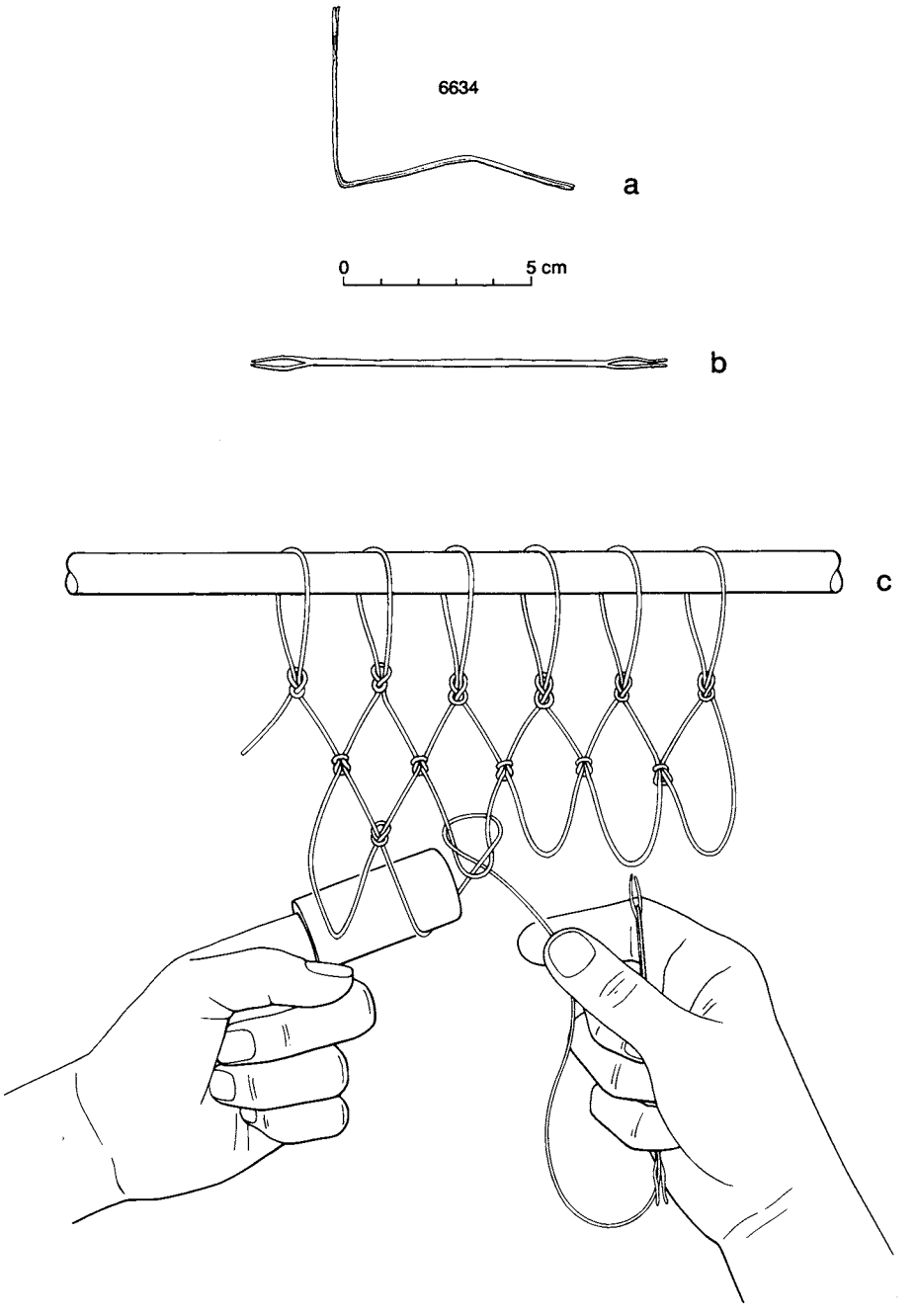


Fig. 836 Copper alloy netting needle: a, 6634*; b, reconstructed; c, knotted mesh being made with a netting needle. The mesh has been drawn larger than life to show the technique. Length of* 6634*, 111mm*

been used for this purpose, but, on the whole, it seems more likely that sock and textile arrived on a Scandinavian visitor.

Netting (Fig.836)

A small copper alloy netting needle, *6634*, was recovered from late 14th or early 15th century levels (Period 6). It is 111mm long and made from drawn wire which has been split at either end (Fig.836a-b). Needles of this sort were used in the production of knotted silk haimets, which were especially fashionable for women in the 13th and 14th centuries (Crowfoot et al. 1992, 145-50). The yarn would have been wrapped lengthways between the forked ends and the needle used to work a mesh with sheet-bend knots (Fig.836c). Several similar netting needles dated to the late 14th and early 15th centuries have been found in London (Crowfoot et al. 1992, 147) and also some examples of hairnets. No haimets have been found in York, but plied silk yarn suitable for netting, *1456 (AY* 17/5), was found in the same group of deposits as the netting needle.

So-called lucets

There are fourteen two-pronged bone objects of the type sometimes identified as lucets for braid-making from Anglo-Scandinavian and medieval levels at Coppergate (A.G. MacGregor et al: *AY* 17 in prep.). These are the nasal bones of cattle, which have been chopped or broken from the skull (S. O'Connor, pers. comm.). They have little sign of any modification and there is no wear around the prongs to suggest use in braid-making. Two worked antler objects have also been identified as lucets, one a carved Y-shaped tine, st9931, and the other a flat object, sf7408, with two short points and a rough-out for an interlace design cut into one face (Roesdahl et al. 1981, 119, 122).

Almost any two-pronged object can be used as a lucet to produce a square-section braid (Hald 1970, 42-3), but in the absence of any lucet-worked braids from Anglo-Saxon, Anglo-Scandinavian or medieval England, there must be some doubt about the identity of these objects. They are rather different from the cylindrical 'twisting-bones' from Sweden with which they are sometimes compared (Blomqvist and Mårtensson 1963, 57, 174; Graham-Campbell 1980, 22). The cattle nasal bones may be merely waste from butchery, but the Y-shaped tine and the object with two short prongs have obviously been shaped for a particular function. These last two artefacts have parallels in the British Iron Age and one from Meare Village East, Somerset, much like the short-pronged tool from Coppergate, has been called a 'tool to inscribe pottery' (Coles 1987,92,100). At any rate, the use of any of these tools in the textile crafts is far from proven.

Chronology and Distribution

Having examined the processes of production, the next step is to set the textile crafts in their archaeological background. Distribution plots have been constructed, in order to investigate where the separate sub-crafts were practised on the site and to examine how they compare with other industries. In addition, some attempt has been made to place the Coppergate material in its regional context, although here the patchy nature of the evidence from other sites has caused problems. Much work needs to be done before the origins of the Yorkshire textile industry are fully understood.

Period 1, late 1st–late 4th century or later

The only Roman textile tools recovered from 16-22 Coppergate were spindle whorls for drop-spindle spinning. Two were found in sealed Roman layers and eight, redeposited, in later levels. Spindle-spinning is a portable craft and later historical evidence suggests that spindle and whorl were carried about in much the way that our grandmothers carried their knitting, ready for a convenient moment. Since the area of the excavation lay near the fortress, in a part of the town occupied by temples, commercial establishments and a small cemetery (p.1689), the spindle whorls are most likely to have been dropped by women passing through. Indeed, most of the small number of textile tools from Roman York come from the opposite side of the River Ouse, in the *colonia* or civil settlement (RCHMY 1, 82, 143; Wild 1970, 134; and unpublished data).

Period 2, 5th–mid 9th century

There are no textile-related artefacts securely dated to the Anglian period, when the site was largely unoccupied. A weaver's sword-beater was found in an Anglian pit outside the area of the main excavation, alongside the 8dl century helmet, but both sword-beater and helmet are likely to have arrived in the pit when it was back-filled in the early Anglo-Scandinavian period (p.881, *AY* 17/8).

Evidence for Anglian occupation of the old Roman town is limited to a thin scattering of pottery, stonework and metal artefacts, none of which has any bearing on textile manufacture (*AY* 8/1, 5-7; *AY* 16/5, 390-9; Waterman 1959, 60-1). For full-scale cloth production it is necessary to go to the large Anglian village at West Heslerton, 40km (25 miles) north-east of York, or the smaller community at Flixborough, Lincs., 48km (30 miles) south-east (Fig. 837), both of which have yielded quantities of textile tools, especially loomweights (Walton Rogers unpublished c). York seems to have been, rather, an ecclesiastical and administrative centre, although by the 8th century there was a trading settlement, or *wic,* a little way down-river from the Roman town. Part of this *wic* has been excavated at 46-54 Fishergate (Fig.849, pp.1808-9) and a small number of artefacts there suggest that textiles were being made, using tools similar to those at Flixborough (1265-73, *AY* 17/9).

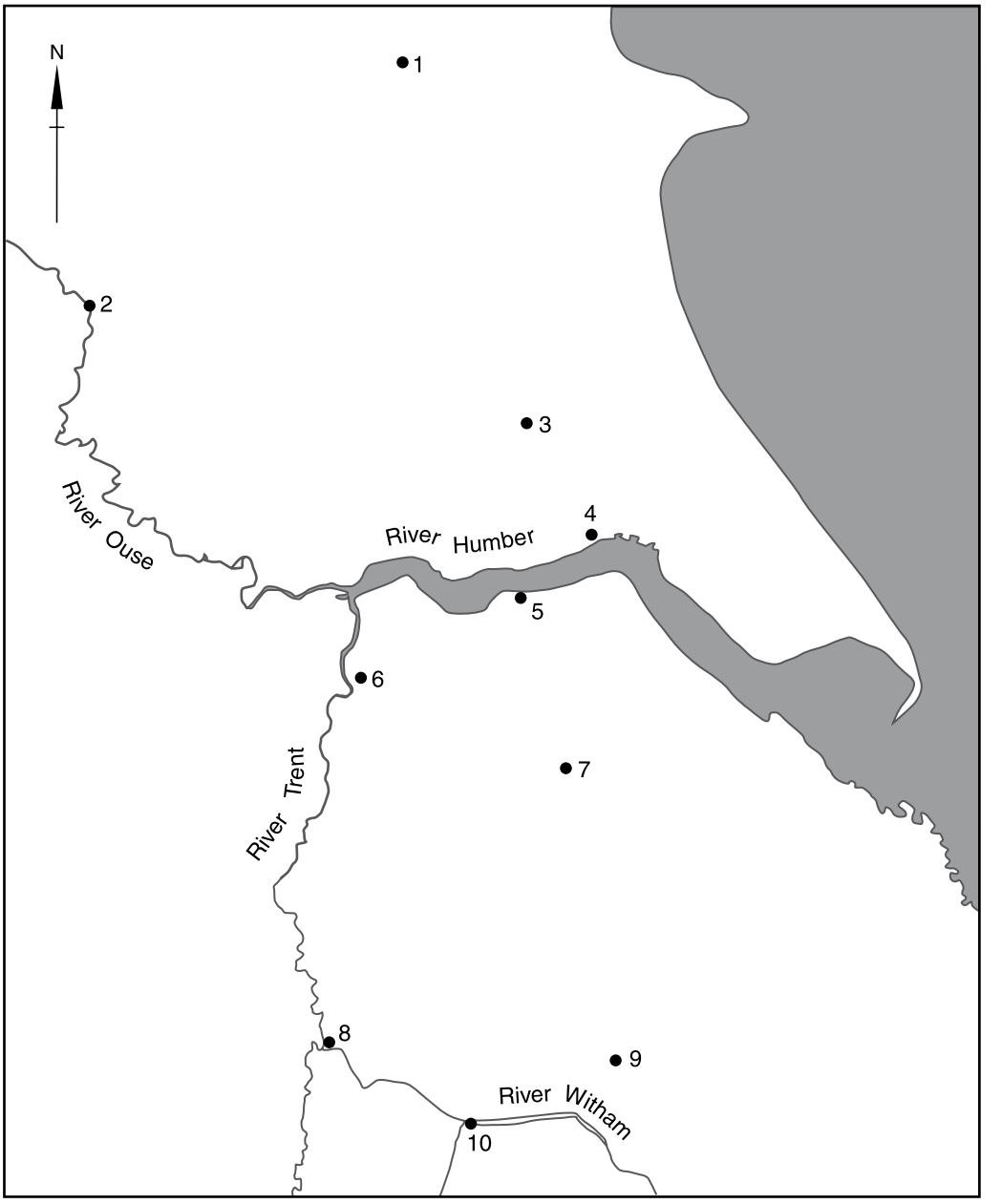


Fig. 837 Sites in the Yorkshire-Lincolnshire region mentioned in the text:

1	*West Heslerton*	*6*	*Flixborough*
2	*York*	*7*	*Searby*
3	*Beverley*	*8*	*Torksey*
4	*Hull*	*9*	*Goltho*
5	*Castledyke*	*10*	*Lincoln*

Period 3, mid 9th–late 9th/early 10th century

The area of the Coppergate excavation began to be re-occupied in the mid 9th century. The stratigraphic, ceramic *(AY* 16/5,489) and biological evidence *(AY* 14/7, 528-9, 664, 702) suggests that human activity was largely in the north-west half of the site, although any associated buildings must either pave left no clearly identifiable traces, or have lain outside the area of excavation. How far this re-occupation of the site is connected with the Scandinavian incursions, which led up to the capture of York in AD 866, is unknown, but it is clear that the later 9th century marked the start of a long period of Scandinavian influeoce in the town.

A fully fledged textile industry seems to have swung into action as soon as the site was re-occupied. Although the quantity of material recovered is relatively small (Fig.839, p.1795), a complete cross-section of the textile crafts is represented. Dyed raw wool and dyeplants; flax; fibre-processing spikes; a spindle and spindle whorls; loomweights and a rough-out for a cigar-shaped pin-beater (the sword-beater probably also belongs to this phase); teasels and a shearboard hook; stone slick-stones; needles and shears were all recovered from Period 3 (Fig.838). In short, all the processes of production, which take raw flax and wool and make it into finished cloth and garments, were being practised on or near the site in the first 40 or 50 years of the Anglo-Scandinavian occupation.

This textile industry is clearly Anglian or Anglo-Saxon in origin. Most of the tools from Period 3 could be set down at 8th century Fishergate, York, or Flixborough without arousing any comment. Only the finishing and dyeing evidence is new, although this must be owirig to the better preservation of organic material, such as dyeplants and teasels, at Coppergate. Certainly, textiles from local Anglo-Saxon cemeteries such as West Heslerton show that finishing and dyeing were already, to a limited extent, part of the Anglian inheritance.

This is no makeshift industry. Spinning and weaving skills may have been commonplace (see pp.1821-2), but the finishing of cloth with teasels and shears is a craft that requires considerable experience and one which would have been practised by relatively few in the 9th century (see p.1775). Dyeing also needs a settled environment and access to a range of raw materials. The character of this 9th century industry will be re-examined later in the volume (p.1824).

The distribution plot for Period 3 (Fig.839) shows the material spread broadly over the site, but a little more concentrated in the north-west half, as might be expected from the pottery and biological evidence. Weaving, however, may have been practised at the opposite, River Foss, end, for reasons which will be explained in the discussion of the Period 4B material (pp.1797-1803). A thin spread of dyeplants (illustrated in *AY* 14/7, 712, fig.196j) were probably brought in by wind-blow or trampling, from an area immediately outside the boundaries of the excavation (ibid., 529).

Fig. 838 Textile equipment and textiles from Period 3 (AD 850–900). Teasels and madder root have been replaced by modern representatives

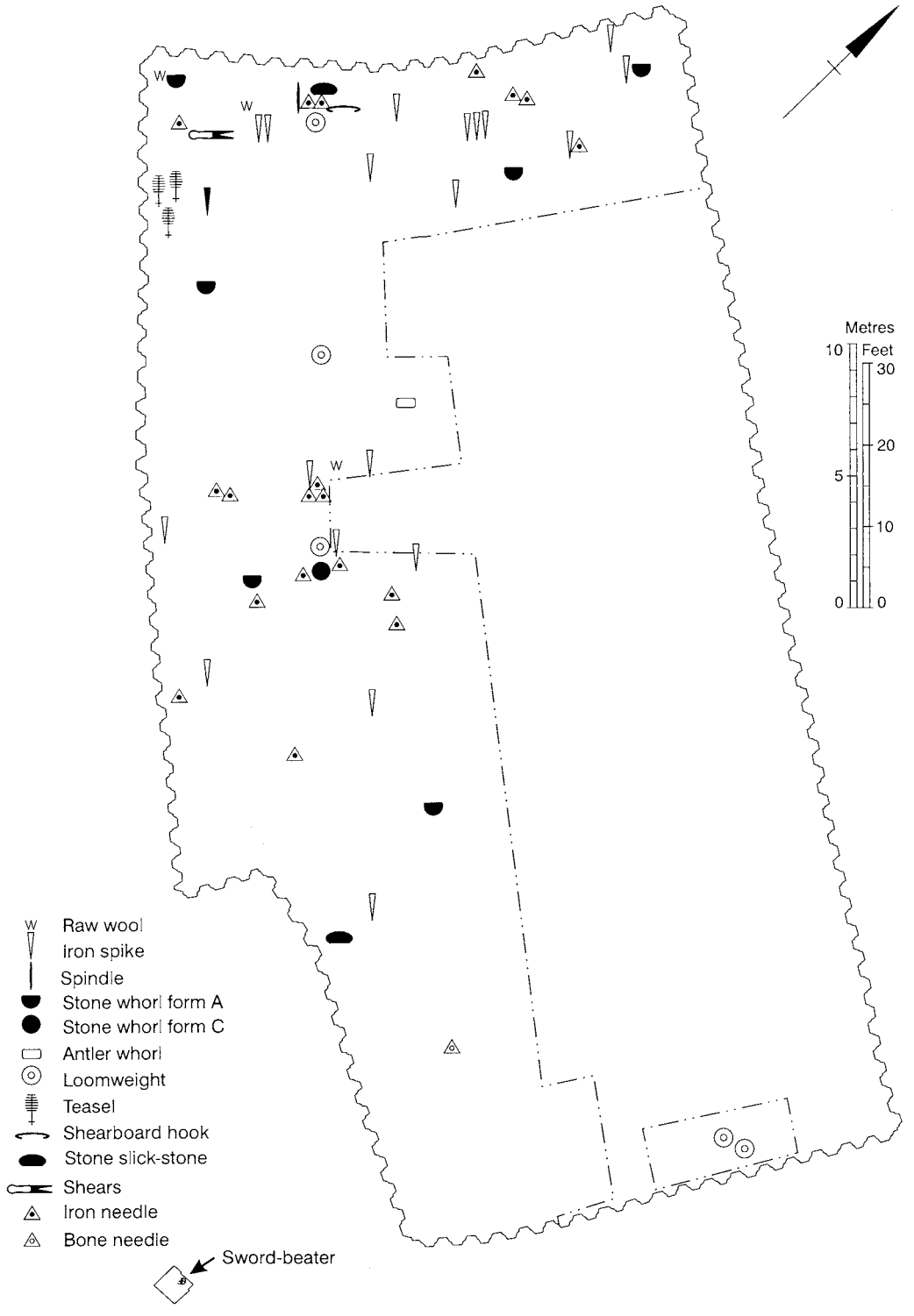


Fig. 839 Textile production evidence from Period 3: distribution plot of raw wool and artefacts; for the distribution of dyestuffs, see AY*14/7, 702. Cigar-shaped pin-beater,* 6670*, is not included on this plot. For additional key see Fig. 790, p.1705*

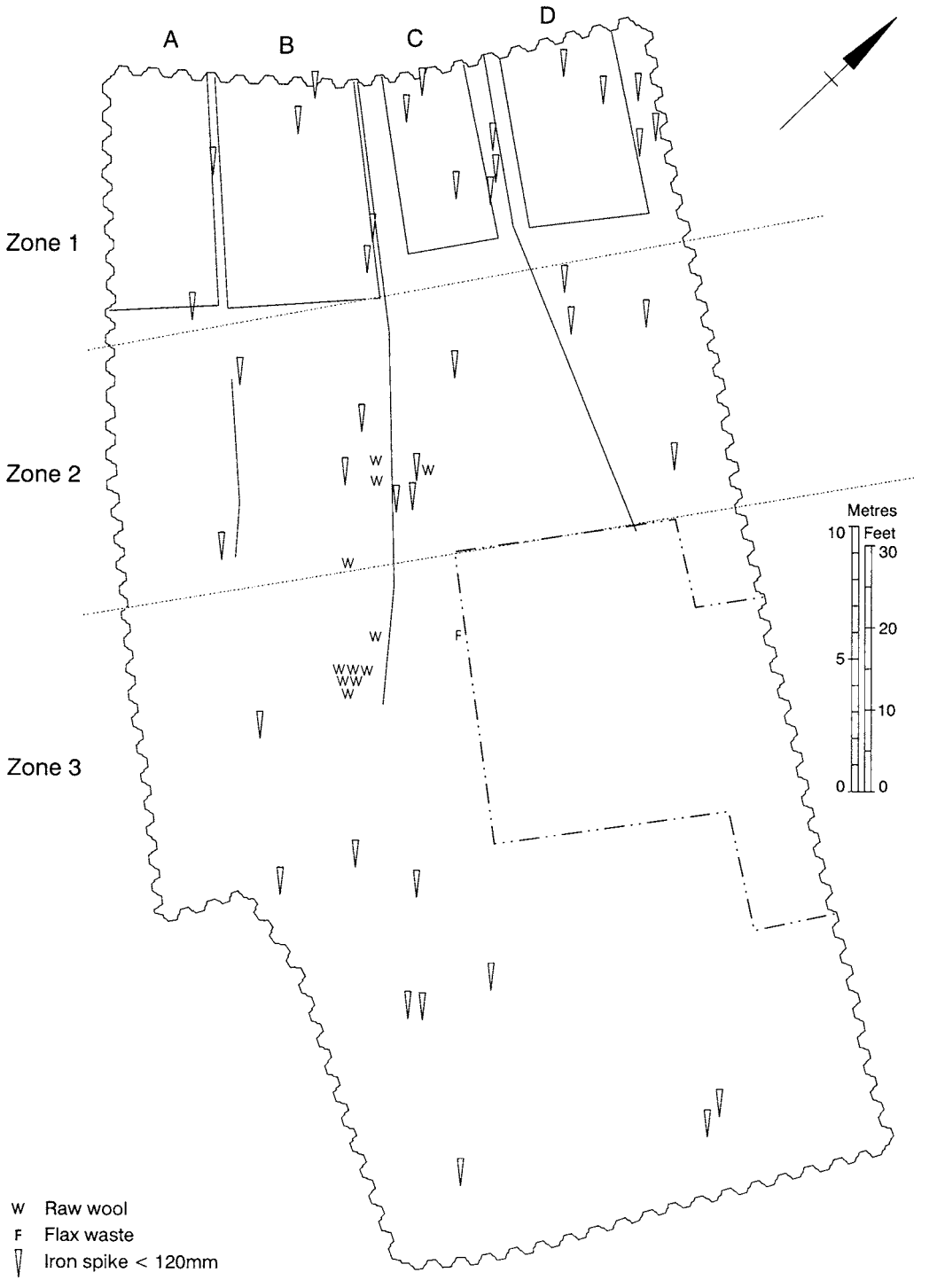


Fig. 840 Fibre processing in Period 4B: raw wool, flax waste and iron spikes. For additional key see Fig. 790, p.1705

Period 4A, late 9th/early 10th century-c.930/5

In the early 10th century there was a re-orientation of properties at Coppergate, to an alignment at right-angles to the street. The evidence of the pottery suggests an intensification of activity at this time *(AY* 16/5, 489) and industrial crafts had begun to find a footing. The spread of textile equipment, however, seems to be much as before (not illustrated). The number of sub-crafts may even have contracted, as teaselling may have been lost from the repertoire at this stage.

Period 4B, c.930/5-c.975

As R.A. Hall has described in his introduction, Period 4B saw the division of the site into four tenements (labelled A, B, C, D), their boundaries defined by wattle fences. Post and wattle buildings were set up at the street end of each tenement and the street itself must have been in existence by this stage. The extensive industrial activity of this period includes iron-smithing, non-ferrous metalworking (gold, silver, copper and lead), amber working, wood-turning and glass manufacture. These crafts concentrate in, but are not limited to, individual tenements *(AY* 16/5; 17/6; 17/7). The evidence from Tenement A in Period 4B is slight, due to interference from later structures.

The distribution plots for textile equipment show iron spikes for fibre processing widely scattered over the site (Fig.840). Later historical evidence suggests that flax was generally processed outdoors or in a large barn, whereas wool-combing was more an indoor craft. To see whether this was true of Coppergate, the site was divided into three zones (Fig.840) and the spikes from each zone examined in detail (Table 151). The spikes resembling the

Table 151 Fibre-processing spikes from Period 4B as shown in Fig. 840

W = 90–110mm long, rounded or rectangular cross-section
Fa = 60–85mm long, all cross-sections
Fb = 90–110mm long, rectangular cross-section

	W	Fa	Fb	Indeterminate	Total
Zone 1	9	4	0	4	17
Zone 2	5	3	3	1	12
Zone 3	0	8	1	0	10
Not on plot	0	0	0	1	1
Total	14	15	4	6	40

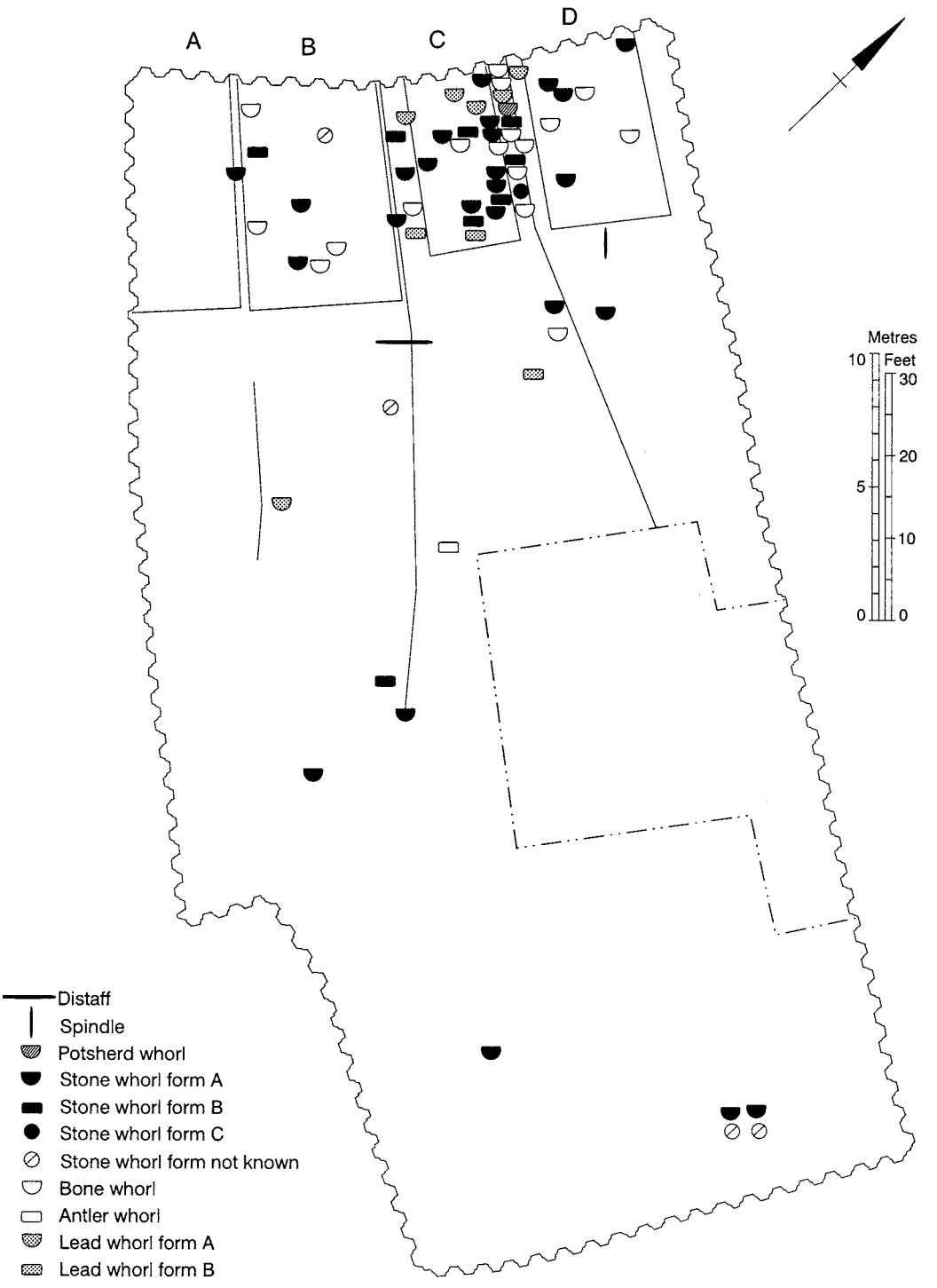


Fig. 841 Spinning equipment from Period 4B: a wooden distaff and spindle, and spindle whorls of potsherd, stone, bone, antler and lead. For additional key see Fig. 790, p.1705

teeth in known wool-combs (90-110mm long and rounded or rounded rectangular cross-section) did indeed prove to cluster in and around the buildings and taper off towards the back of the site. Sheep parasites, perhaps debris from the processing of wool, follow a similar distribution pattern *(AY* 14/7,699,704), although much of the raw wool itself comes from in and around backyard pits (pits 32431, 37089), where the wool may have been used for latrine wipes. The spikes more likely to be from flax heckles, especially those 60-85mm long (pp.1727-31), occur in all zones, but are most common at the rear of the site, where some flax waste was also recovered *(AY* 14/7, 562). This, then, explains the widespread distribution of fibre-processing spikes in all periods at Coppergate, the plots for indoor wool-comb teeth having overlapped with outdoor flax heckle spikes.

Spinning more obviously concentrates in and around the buildings (Fig.841). The cluster of spindle whorls around the building on Tenement C may be artificially inflated by some bone whorls which were discarded during manufacture (pp.1741-3) and by lead whorls, which congregate suspiciously close to an area of lead working (p.812, *AY* 17/7), but the remaining whorls of stone and bone are often well worn and are spread evenly through the buildings on Tenements B, C and D. They are supported by a distaff on Tenement B and a spindle on Tenement D.

The evidence for weaving is less straightforward and requires a brief digression. The total number of loomweights from the site is very small (33 altogether), compared with the many hundreds recovered at West Heslerton and Flixborough. Several of the examples from Period 4B and later are abraded pieces found in association with residual 9th century pottery (mainly Handmade Types 1 and 2, *AY* 16/5, 396-8, 515). It is possible, then, that the loomweights from 10th and 11th century levels are in fact 9th century material redeposited.

Loomweights, cigar-shaped pin-beaters and the sword-beater are representatives of the warp-weighted loom, while single-ended pin-beaters belong with the two-beam vertical loom (pp.1755-7). A distribution plot for these objects, as recovered from Periods 3, 4B and 5B (limited areas could be excavated to 4A, 5A and 5C levels) (Fig.842), shows a contrast between loomweights and sword-beater at the Foss end of the site and single-ended pin-beaters at the street end. Loomweights are heavy objects which are unlikely to have been dispersed far from where they were used.

The conclusion which best fits the evidence is that the warp-weighted loom was in action just outside the southern boundary of the excavation during the 9th century, but fell from favour during me early part of the 10th. Its place was taken by the two-beam vertical loom with single-ended pin-beaters and this form of weaving was probably practised in or near the buildings at the street end of the site. The two-beam loom may have first appeared in Period 4A, but became established in Period 4B, when six single-ended pin-beaters were recovered from Tenements B, C and D, with a rough-out for a seventh from the backyard of Tenement B. This changeover between looms can be matched at Winchester, where Keene has argued from the absence of loomweights, the presence of single-ended pin-beaters and some very convincing historical evidence, that the two-beam loom took over in the late

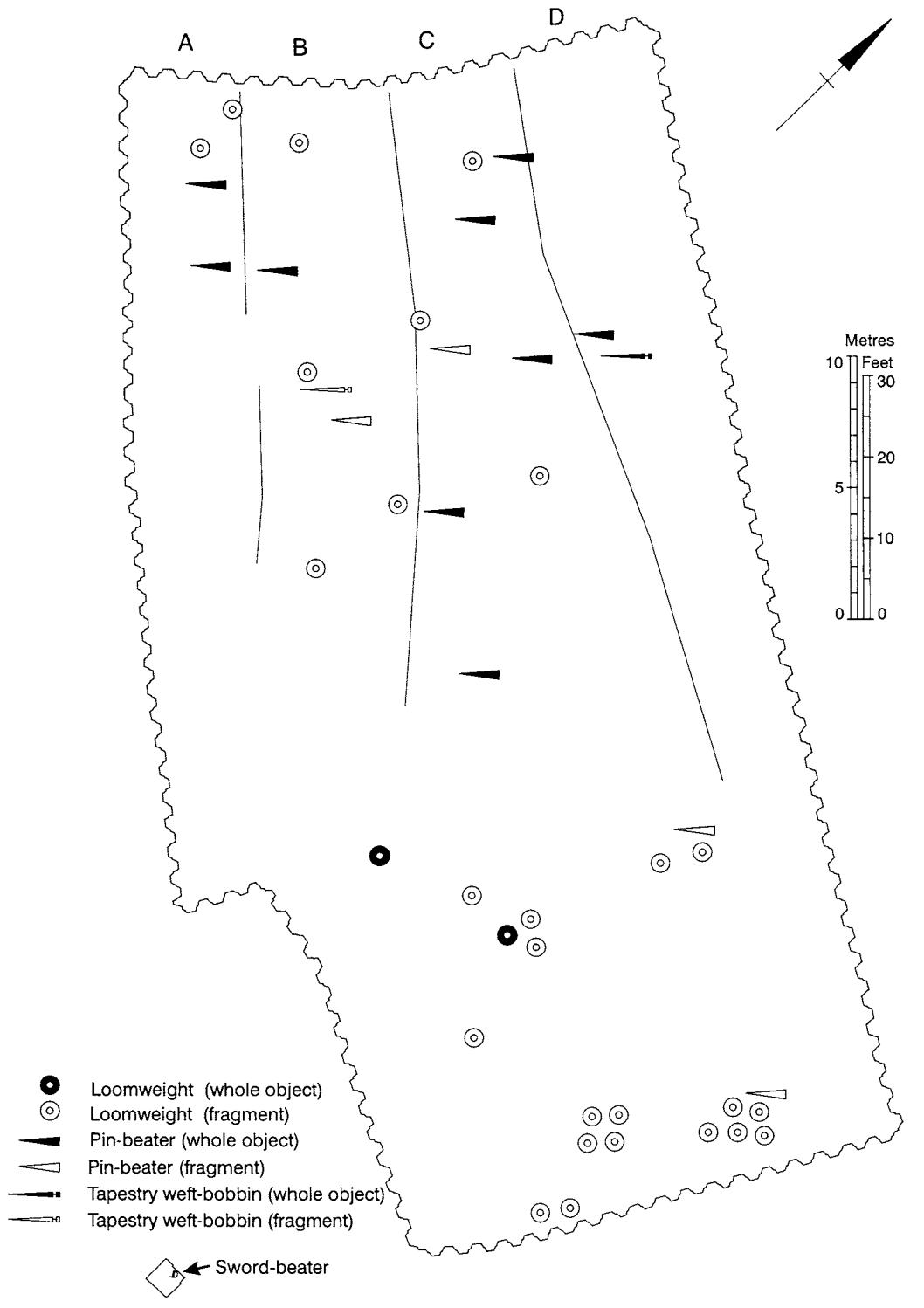


Fig. 842 Weaving equipment from Periods 3, 4B and 5B: clay loomweights, single-ended bone and antler pin-beaters, and wooden tapestry weft-bobbins. Half-made pin-beaters have not been included. For additional key see Fig. 790, pp. 1704-5

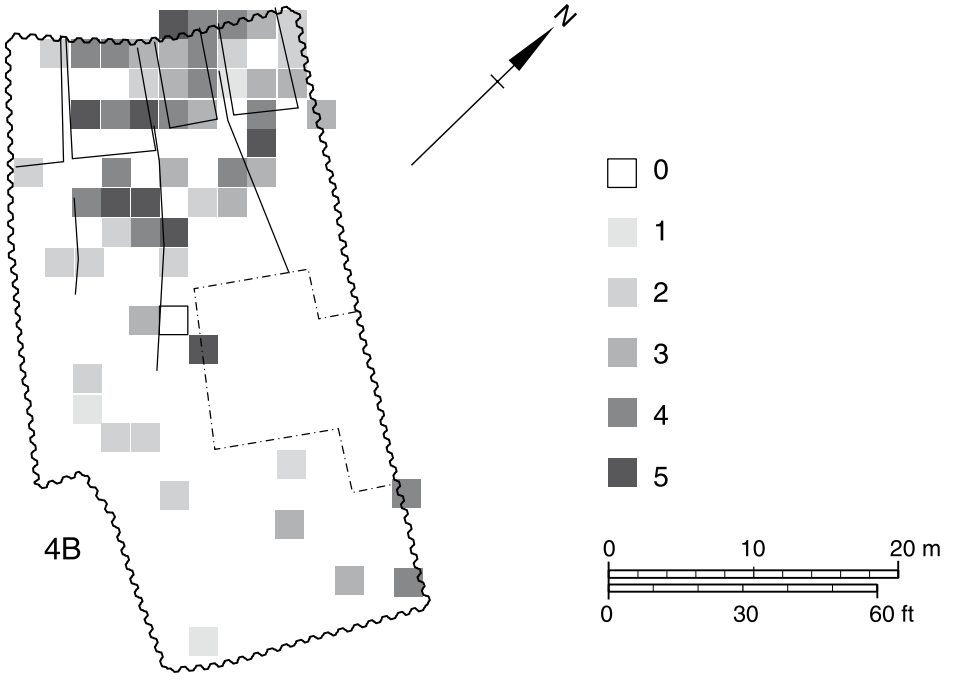


Fig. 843 Dyeplants from Period 4B. The figures in the key are derived from 'abundance indicator values' (for details see AY*14/7, 710-3). Squares represent sampled areas on a 2m grid. No samples were examined from the blank areas. Key: 0—0; 1—1–5; 2—6–10; 3—11–15; 4—16–20; 5—>20*

9th or early 10th century, although the warp-weighted loom continued in use outside the town until the 11th century (Keene 1990,203-8).

To return to Period 4B, the finishing of wool cloth with teasels must have disappeared by this stage. No teasels or shearboard hooks have been recorded, although organic materials *(AY* 14/7, 540-71) and iron artefacts *(AY* 17/6) were recovered in quantity from this period. Dyeing, however, was by now a well established craft. Remains of dyeplants, including madder, clubmoss, greenweed and woad, were found in dense concentrations, suggesting waste from dye-baths. The best evidence comes from in and around the buildings, although material was also recovered from the backyard area (Fig.843).

Tools for making and maintaining garments, that is, shears, needles and slick-stones, were recovered from Tenements B, C and D (Fig.844). Iron needles concentrate in the building on Tenement C, which is where they were almost certainly being made (pp.465, 512-3,547, *AY* 17/6), but the presence of an unused off-cut of silk in the same building suggests that fabrics were also being cut, and presumably stitched, there. Wool and silk

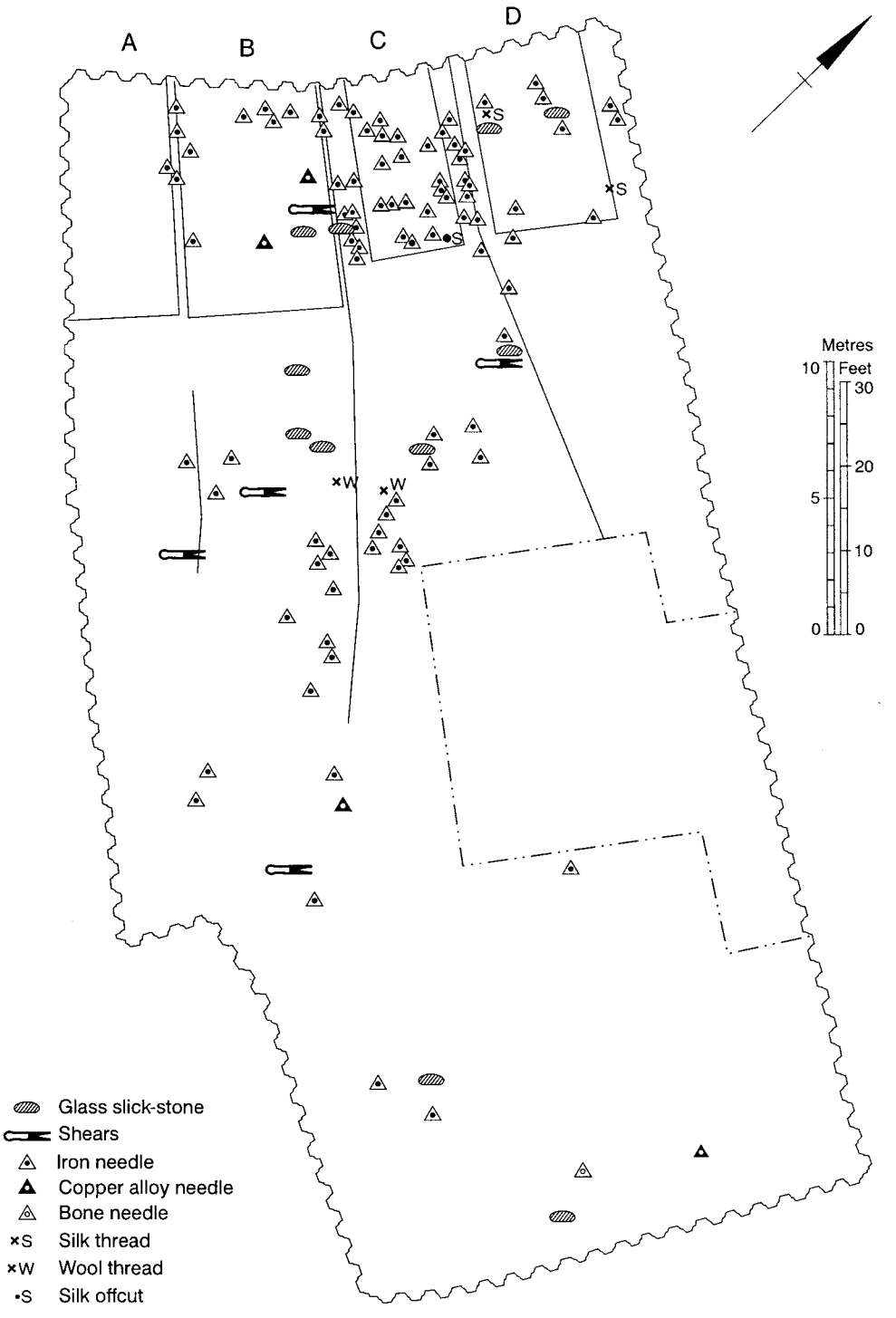


Fig. 844 Cutting, smoothing and stitching in Period 4B: glass slick-stones, iron shears, needles of iron, copper alloy and bone, threads of silk and wool, and a silk offcut. For additional key see Fig. 790, p. 1705

plied yarns, comparable with the thread used to stitch garments (pp.392, 409, *AY* 17/5), were also found on Tenements B, C and D.

Some of the iron needles seem to cluster in the backyard area of Tenements B and C (Fig.844), but this area included deposits which probably represent sweepings from house floors *(AY* 14/7, 551, 664). There is therefore no reason to see needlework as anything other than an indoor craft. Smoothing, however, may have been carried out outside, perhaps as part of the laundering process: of the 44 stone and glass slick-stones from the site, less than one-quarter were found inside buildings. Many of these slick-stones are well away from the main glass-working area on Tenement D and are likely to have been lost or discarded during use rather than manufacture.

To summarise, the evidence for Period 4B suggests textile and garment production in the buildings on Tenements B, C and D, with some processes, such as flax preparation and laundering, being carried out outdoors. When allowance is made for tools which are likely to have been discarded during their manufacture, the remaining material shows the textile crafts spread evenly through the tenements, in contrast with the industrial crafts, which tend to concentrate on one, or sometimes two, tenements. A Scandinavian presence can be seen at this stage in a worn and repaired *nålebundet* sock *1309* and a Norse textile *1303,* but the tools of textile production remain typically Anglo-Saxon.

Period 5A, c.975

Much of the material from Period 5A comes from dumps formed when the Period 5B buildings were being built in c.975. The textile-related artefacts are similar to those of Period 4B, except for the almost exclusive use of spindle whorls of cylindrical form B. Also from this period is a silk head-dress, from Tenement D (pp.374-5, 1372, *AY* 17/5), which in technical terms matches the silk off-cut from Period 4B, a second 10th century head-dress from 5 Coppergate (pp.132-6, *AY* 17/3) and a third, of similar date, from Saltergate, Lincoln (ibid.; Walton 1993, 5-6).

Period 5B, c.975-early/mid 11th century

During Period 5B the wattle buildings of Period 4B were replaced by more solid structures and a second rank of buildings appeared on Tenements B, C and D (Fig.790, p.1705). Industrial activity of several kinds continued and high-lead glass manufacture seems to have overtaken metalworking on Tenement D *(AY* 16/5, 472-5). Unfortunately the end of this phase saw a considerable amount of dumping of material within buildings (ibid., 500-6), so that the distribution plots for this period are not an entirely reliable guide to the location of the textile crafts (Figs.845-8).

Nevertheless, it is clear that spinning, weaving and dyeing continued as before (Figs. 846- 7) and that there was a new emphasis on fibre processing. The rise in fibre-processing spikes, from 40 in Period 4B to 73 in 5B, cannot be matched in any other artefact (compare

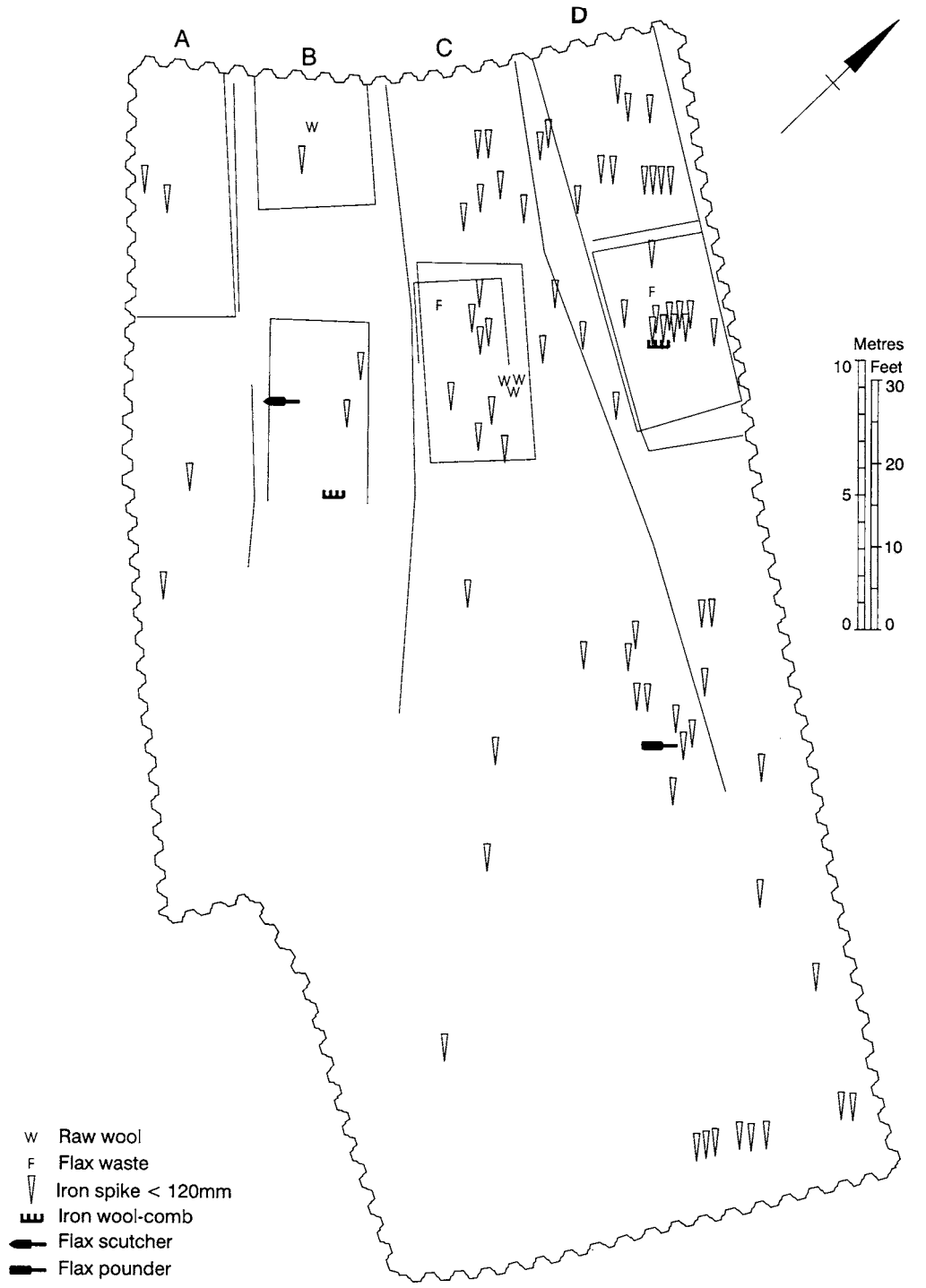


Fig. 845 Fibre processing in Period 5B: raw wool, flax waste, iron spikes, iron wool-combs, wooden flax-pounder and wooden flax scutching blade. Note that the positions of the flax are approximate, the exact find-spots not having been recorded. For additional key see Fig. 790, p.1705

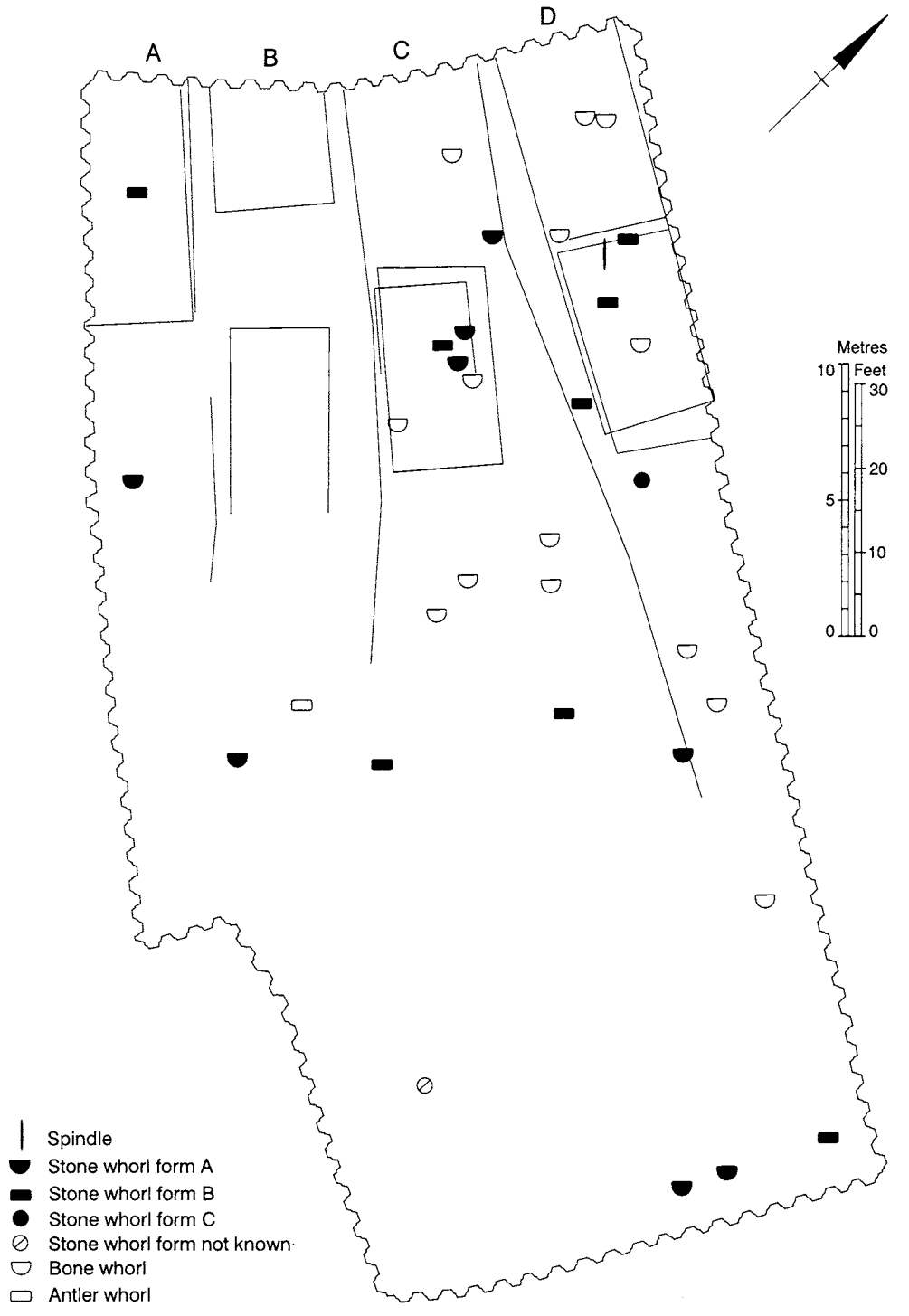


Fig. 846 Spinning in Period 5B: wooden spindle and spindle whorls of stone, bone and antler. For additional key see Fig. 790, p.1705

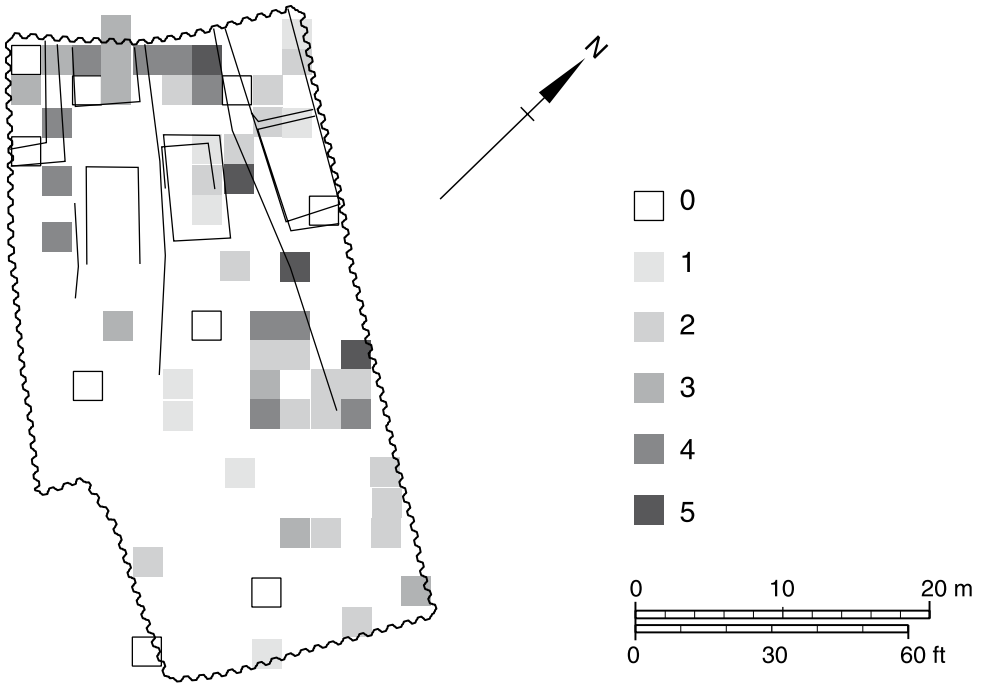


Fig. 847 Dyeplants from Period 5B. The figures in the key are derived from 'abundance indicator values' (for details see AY*14/7, 710-3). Squares represent sampled areas on a 2m grid. No samples were examined from the blank areas. Key: 0—0; 1—1–5; 2—6–10; 3—11–15; 4—16–20; 5—>20*

the figures in Tables 145-50). As already described, it is difficult to distinguish between teeth from wool-combs and spikes from flax heckles, but a group of sharp straight spikes, tentatively identified as flax heckle teeth (*2364*, *2402, 2410, 2415*) proved to cluster convincingly near a wooden flax pounder at the rear of Tenement C (Fig.845). The wool-combs and the flax scutching blade, however, may not have been used in the buildings in which they were found, as they formed part of dumped midden-like deposits.

The two-beam loom evidently remained in use in Period 5B, judging from the evidence of the pin-beaters, and two tapestry bobbins suggest that the loom was being used for patterned hangings or coverlets. There would have been no shortage of coloured wools for this craft, as dyeing was still being practised, probably on all four tenements (Fig.847). In previous periods, the dye-bath seems to have been emptied straight on to the outdoor ground surface, but in this phase a gully may have been used to drain off dye effluent from the building on Tenement A (context 2181: *AY* 14/7,591-2,750).

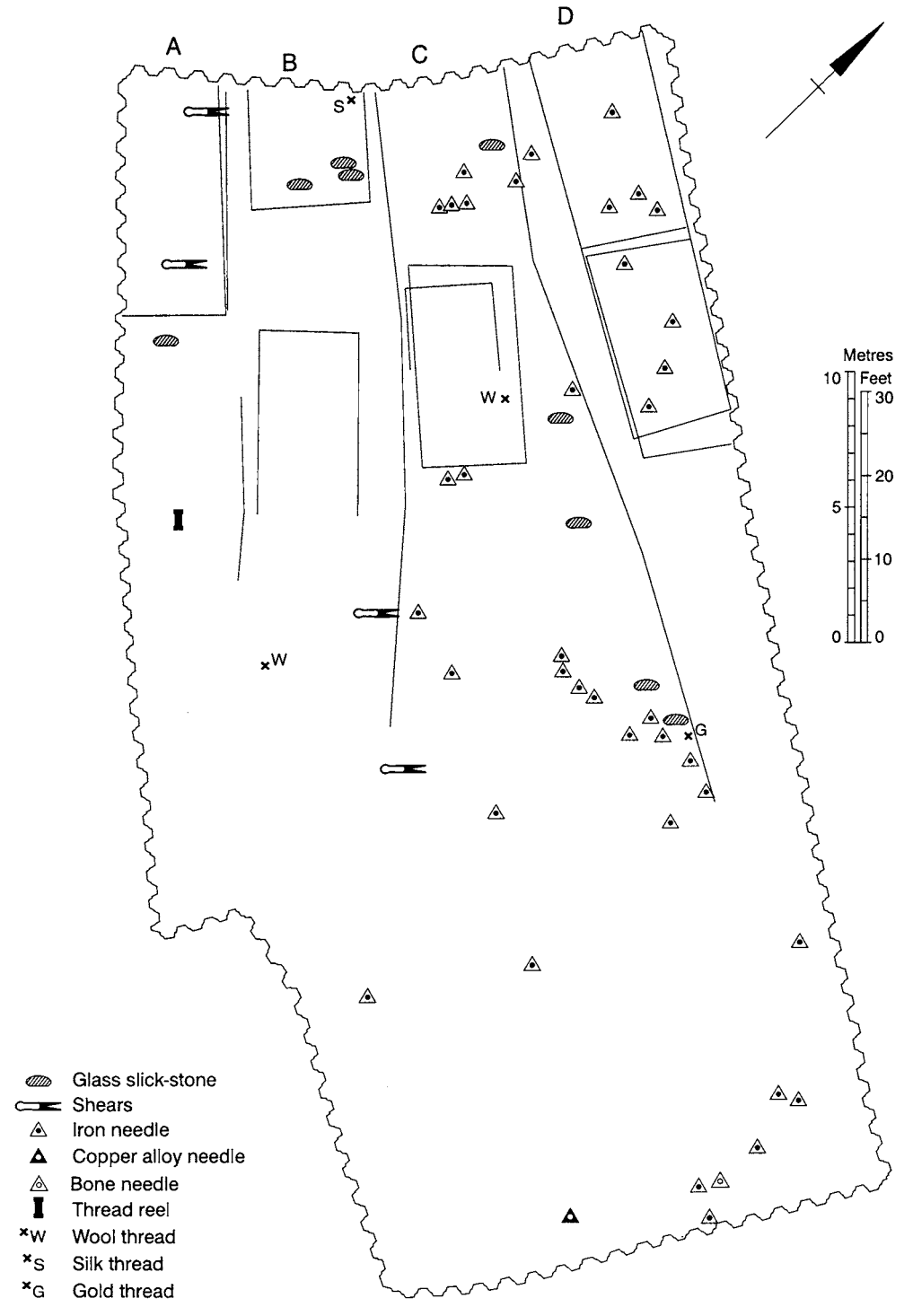


Fig. 848 Cutting, smoothing and stitching in Period 5B: glass slick-stones, iron shears, needles of iron, copper alloy and bone, bone thread reel and sewing thread in wool, silk and gold. For additional key see Fig. 790, p.1705


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
0 100 200 metres
0 300 600 feet

Other textile tools, including shears, glass slick-stones and needles of iron and copper alloy were now more broadly scattered across the site (Fig.848), probably as a result of repeated dumping and pit-digging. The evidence for needlework includes an early bone thread reel, *6689*, a lump of beeswax possibly for waxing thread, *6696* (ibid., 608, 766), and some gold thread, *1410,* which may have come from embroidery or braiding.

Period 5C, mid-later 11th century

Strata that can be attributed to this period were identified in restricted areas at the front and rear of the site. These layers included so much dumped material (*AY* 16/5, 509-10) that it is difficult to draw any satisfactory conclusions concerning textile production from the distribution plots (not illustrated). Fibre preparation seems to have continued to playa significant role (Table 145, p.1718), but the concentration of dye residues has diminished *(AY* 14/7,713) and may by now reflect redeposited material.

Textile equipment from other sites in Anglo-Scandinavian York

Coppergate lay in the heart of the Anglo-Scandinavian town, close to the main east-west road and the Ouse river crossing (Fig.849). Several other sites in the area have yielded Anglo-Scandinavian remains, although only one of these, at Clifford Street (Fig.849, 13) (Waterman 1959), has produced any extensive evidence for textile production. At Hungate (Fig.849, 6) there was a single stone spindle whorl and a clay loomweight, the loomweight being from early levels and possibly pre-Anglo-Scandinavian (Richardson 1961, 84-5); seeds of flax and weld were also found, although not abundantly (Godwin and Bachem 1961, 109-13). Four clay loomweights were found in the precincts of the castle, near Clifford's Tower (Fig. 849, 19), the form of two of them suggesting an early, possibly Anglian, date

Fig. 849 (facing) York excavations mentioned in the text, shown together with the Roman fortress and the medieval walls in outline:

1. The Bedern and Foundry
2. 9 Blake St
3. King's Square
4. 34 Shambles
5. 6-8 Pavement
6. Hungate
7. All Saints Pavement
8. 5 Coppergate
9. Nessgate
10. 16-22 Coppergate
11. Coppergate Watching Brief
12. 22 Piccadilly
13. 5-13 Clifford St
14. 5 Rougier St
15. 24-30 Tanner Row
16. 1-9 Micklegate
17. St Mary Bishophill Junior
18. 17-21 Piccadilly
19. Eye of York
20. 46-54 Fishergate

(Grove 1939); and a stone spindle whorl was found in Anglo-Scandinavian deposits at King's Square (Fig.849, 3) (Wenham 1971, 168). At 6-8 Pavement (1972.21, 1974.21; Fig.849, 5), there were four spindle whorls (two bone, one stone, and one Roman potsherd), a bone spindle, a fragment of clay loomweight, a fragment of glass slick-stone and four iron spikes (p.l00, *AY* 17/3), but, as at Hungate, leather working seems to have been the more significant craft. Remains of greenweed, clubmoss and madder have been found in a recent re-examination of the 6-8 Pavement soil samples, although not in the concentrations in which they occur at 16-22 Coppergate (Fig.849, 10) (A.R. Hall, pers. comm.); small amounts of dyeplants have also been found at 22 Piccadilly (1987.22; Fig.849, 12) (Carron et al. 1995) and in bore-holes at All Saints, Pavement (Fig.849, 7) (Carron et al. 1996b); and greenweed has been identified in quantity in some Anglo-Scandinavian deposits at 1-9 Micklegate (1988-9.17; Fig. 849, 16), on the far side of the Ouse *(AY* 14/7,772), although other evidence for textile production on that side of the river is scant.

The Clifford Street excavation took place in 1884, long before the study of botanical remains such as dyeplants was an established part of archaeology. The textile tools, however, are much like those from Coppergate (Waterman 1959). They include spindle whorls of stone, bone, lead, clay (ibid., items 20.1-16) and jet (21.2), a bone spindle with an incised design of interlace and cross-hatching (12.5), single-ended bone pin-beaters (14.26, 14.37-8; Waterman notes another pin-beater (14.27) from Nessgate (Fig.849, 9), and glass slick-stones (22.36-7); no loomweights appear to have been recorded (ibid., 102). Most of the material seems to be from 11th century levels (ibid., 68) and some of the globular spindle whorls (form C) are likely to be post-Conquest, although form A and B whorls are the more common. More significantly, there is a single example of the sub-conical clay whorls which are so typical of Scandinavia in the Viking Age (20.6). This is the only convincing example of a Scandinavian textile tool from Anglo-Scandinavian York.

Period 6, later 11th-17th century

York suffered at the hands of the Normans in the period 1067–9, but the town was eventually to recover and to re-establish itself as a mercantile centre and administrative capital for the north of England. At Coppergate medieval levels have been disturbed by repeated rebuilding, pit-digging and by Victorian cellars at the street end of the site; frequent attempts to level up the ground surface with land-fill dumps will also have introduced extraneous material. Distribution plots for Period 6 must therefore be used with care, as they are bound to include some early material, redeposited.

This disturbance of medieval stratigraphy is common in York and probably accounts for the scarcity of securely dated medieval textile tools from the city. The nearest comparable evidence is from Beverley, which, like York, was a royal borough and a prominent medieval cloth town (Evans and Tomlinson 1992). On the other hand, from the 12th century onwards written sources provide a valuable record of York's textile industry and the role of the town's merchants in the wool trade.

Since Period 6 represents some six centuries of occupation, it is easiest to follow each of the sub-crafts through the whole period, before summarising general trends.

Fibre processing

During the Norman period there was extensive dumping at the river end of the site in order to raise the level of the land. Almost all of the 46 fibre-processing spikes dated to the 11th and 11th/ 12th centuries were retrieved from this dumped deposit, along with spindle whorls, needles and glass slick-stones. In the early 12th century, however, fibre-processing spikes re-appear in association with occupation activity and the preparation of fibres for spinning can be shown to have continued vigorously (Table 145, p.1718). The spikes are widely distributed in the 12th century plot (Fig.850), the blank area at the street end of the site being due to disturbance by modern cellars. The 13th century plot (Fig.851) seems to show a greater concentration on Tenements C and D, although some of the spikes on C come from another land-fill dump.

The fibres being processed were probably still both wool and flax. One of the 12th/13th century spikes from Tenement B *(6601)* has the remains of a wool-comb's iron baseplate and the long spikes which became established at the end of the 12th century may be from a new form of wool-comb (pp.1729-31). Some of the shorter spikes and spikes with square cross-section are more likely to represent flax heckles. Indeed, although York was best known for its wool products, the production of linen fabrics was probably an established industry in the town. There is archaeological evidence for flax-spinning at medieval Bedern (Walton Rogers in Ottaway and Rogers *AY* 17/15) and during the course of the 15th and early 16th century linen weavers slowly established their independence from first the tapiters (Swanson 1989, 37) and then the woollen weavers, so that they could finally form their own gild in 1518 *(YCR,* 3,47,65).

The evidence for fibre processing falls off dramatically towards the end of the 13th century (Table 145). A tool for rippling flax was recovered from a 15th century deposit on Tenement B, but the pine from which it is made did not grow in England, and its shape is very like Norwegian ripples (pp.1722-5). Since there is better evidence for trade than for crafts at the site in the 14th and 15th centuries (see below), it is possible that the broken ripple represents discarded merchandise.

Spinning

Spinning continued without interruption through Norman and later phases. The spinners were now mainly using round, lathe-turned stone whorls, form C, to weight their spindles (see pp.1737-41), although one cylindrical form B whorl, *6564* (not illustrated), is reliably dated to the late 11th or early 12th century. Two ornamented antler whorls and two clay whorls also appear to be authentically medieval. Form A whorls, on the other hand, are nearly all from disturbed parts of the site and are almost certainly residual, as are many of the bone whorls.

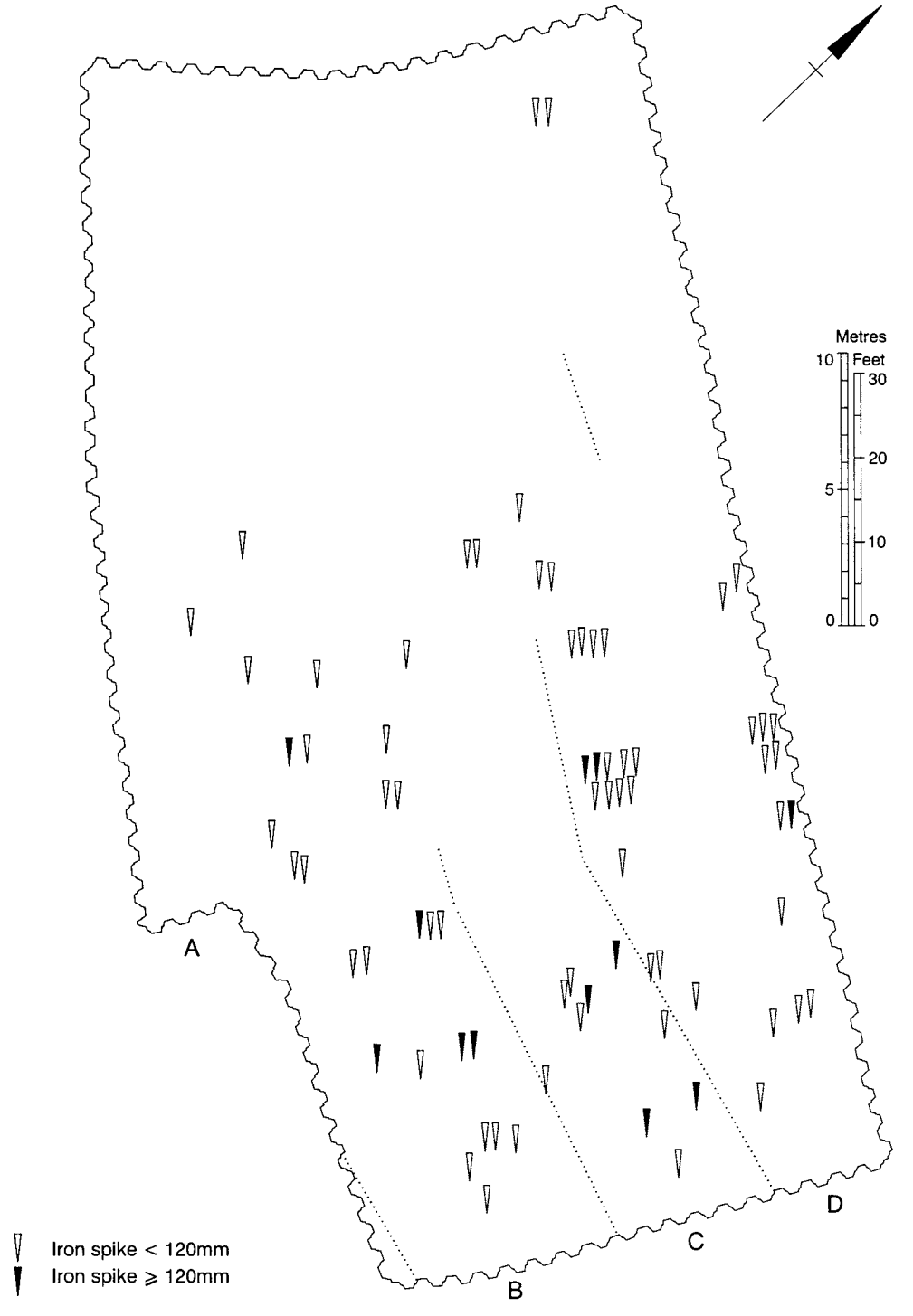


Fig. 850 Fibre processing in the 12th century. The long spikes are mostly dated to the end of the 12th century. For additional key see Fig. 790, p.1707

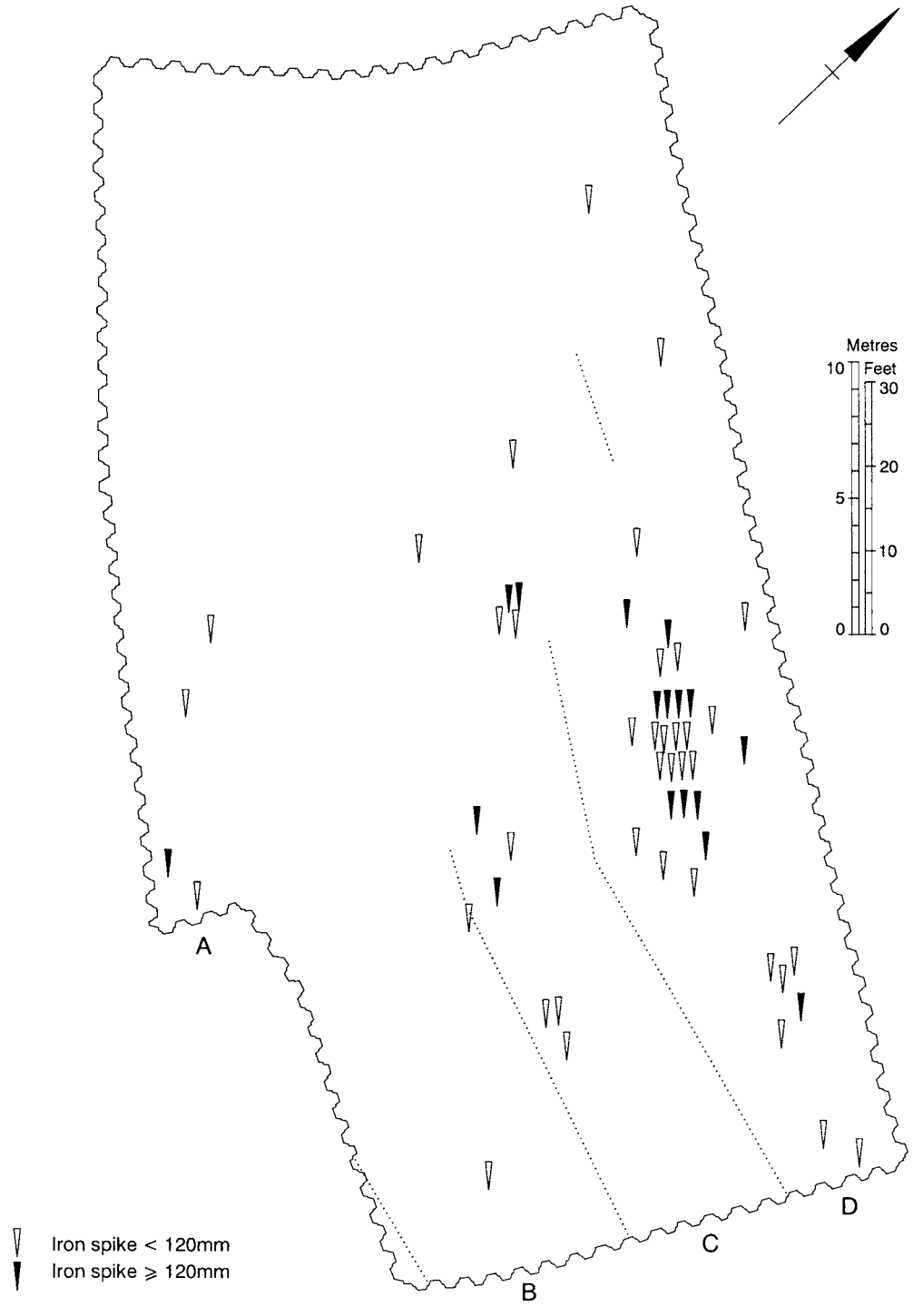


Fig. 851 Fibre processing in the 13th century. For additional key see Fig. 790, p.1707

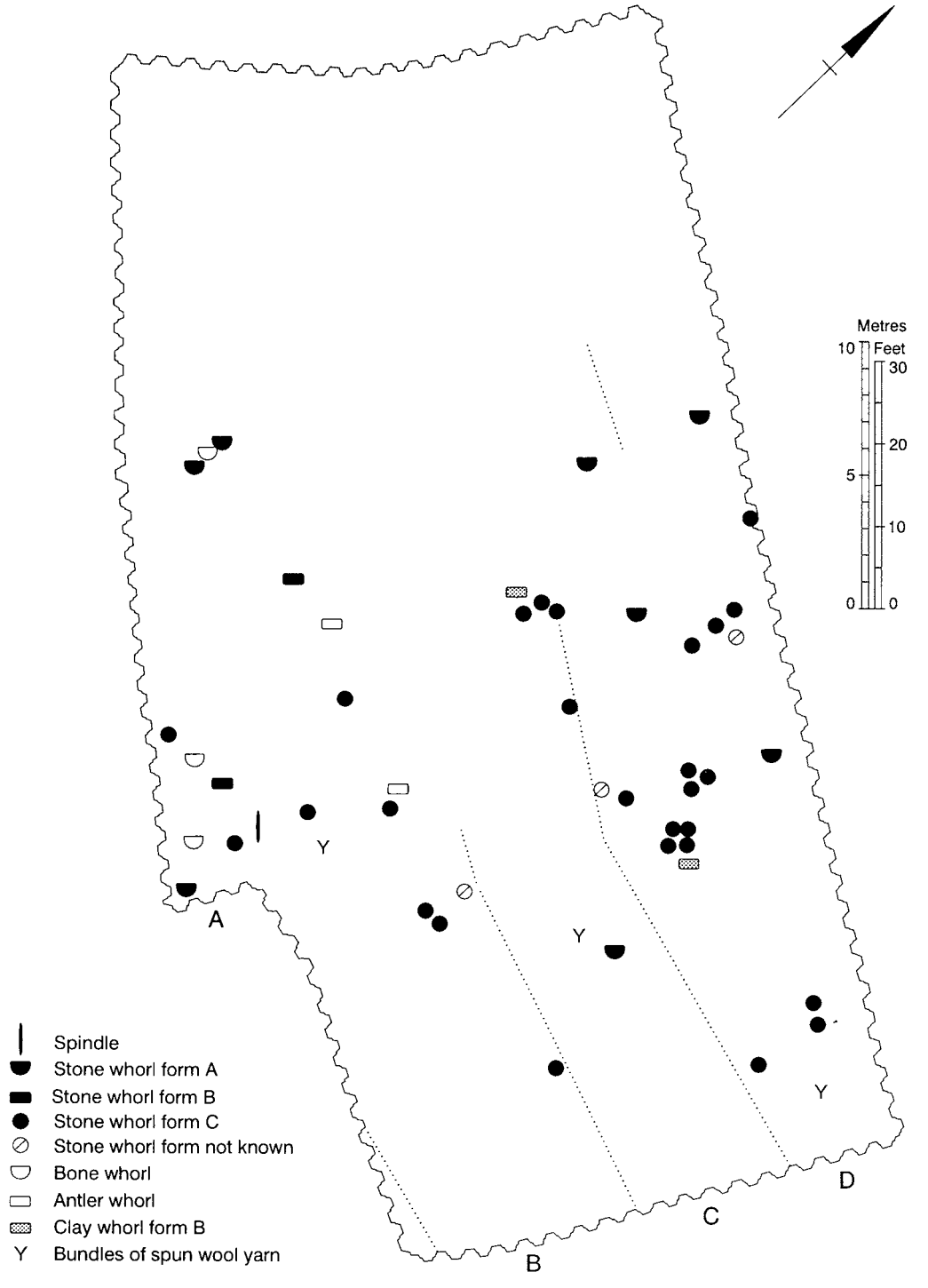


Fig. 852 Spinning in the 12th and 13th centuries: wooden spindle, spindle whorls of stone, bone, antler and clay, and spun wool yarn. For additional key see Fig. 790, p.1707

The proven medieval whorls are distributed across the middle and rear of the site (Fig.852). Ten of the whorls come from deposits which could be associated with the use of the series of new buildings which were appearing further down the tenement plots; the remainder come from dumps and levelling deposits (pp.1706-7). The number of whorls dwindles in the 14th century, which may reflect the arrival of the spindle wheel in the early 14th century, followed by the true spinning wheel in the late 15th. The drive-whorl from a spindle wheel was recovered from a 17th century dump on Tenement D, but this was a secondary deposit and the object had probably been in use at an earlier date.

Weaving

One of the most significant items from the medieval levels is the wooden heddle cradle, which is part of a horizontal treadle-operated loom. This came from a late 11th century deposit close to the front of Tenement B and a century or so later a heddle rod from the same type of loom was deposited in a pit on the same tenement (Fig.853). It has been shown above (pp.1763-6) that the horizontal loom spread through the towns of north-west Europe during the 11th and 12th centuries and York was evidently in the forefront of this new technology.

There seems to have been another type of weaver in action on Tenement A in the 12th/13th century (Fig.853). The iron weft-beater blade, *6608,* and the bone bodkin-like pin-beater, *6675* (not illustrated), would have been used with the two-beam loom for the production of tapestry-woven rugs, hangings and coverlets (the pin-beater on Tenement C is from a secondary deposit and may be residual). The artisans using such tools were known as tapiters and an example of the tapiter's craft, a fragment of tapestry (*1422*), was found in a 15th century pit on Tenement C.

Finishing

Cloth-finishing was probably no longer being carried out at 16-22 Coppergate. The biological samples from Period 6 are still in the process of investigation, but no teasels have been detected as yet (A.R. Hall, pers. comm.) and no shearboard hooks or cloth shears have been found among the ironwork (P. Ottaway, pers. comm.). The small number of tenter-hooks from Tenements A and D are more likely to represent hooks for tapestries and other wall-hangings (see p.1773).

Dyeing

The scarcity of dyeplants from Period 5C suggests that dyeing may have departed from the site in the 11th century and no dye residues have been identified as yet in the Period 6 biological samples (A.R. Hall, pers. comm.). One insubstantial building to the rear of Tenement D enclosed a rectangular hearth and had a plank-lined drain resembling those in

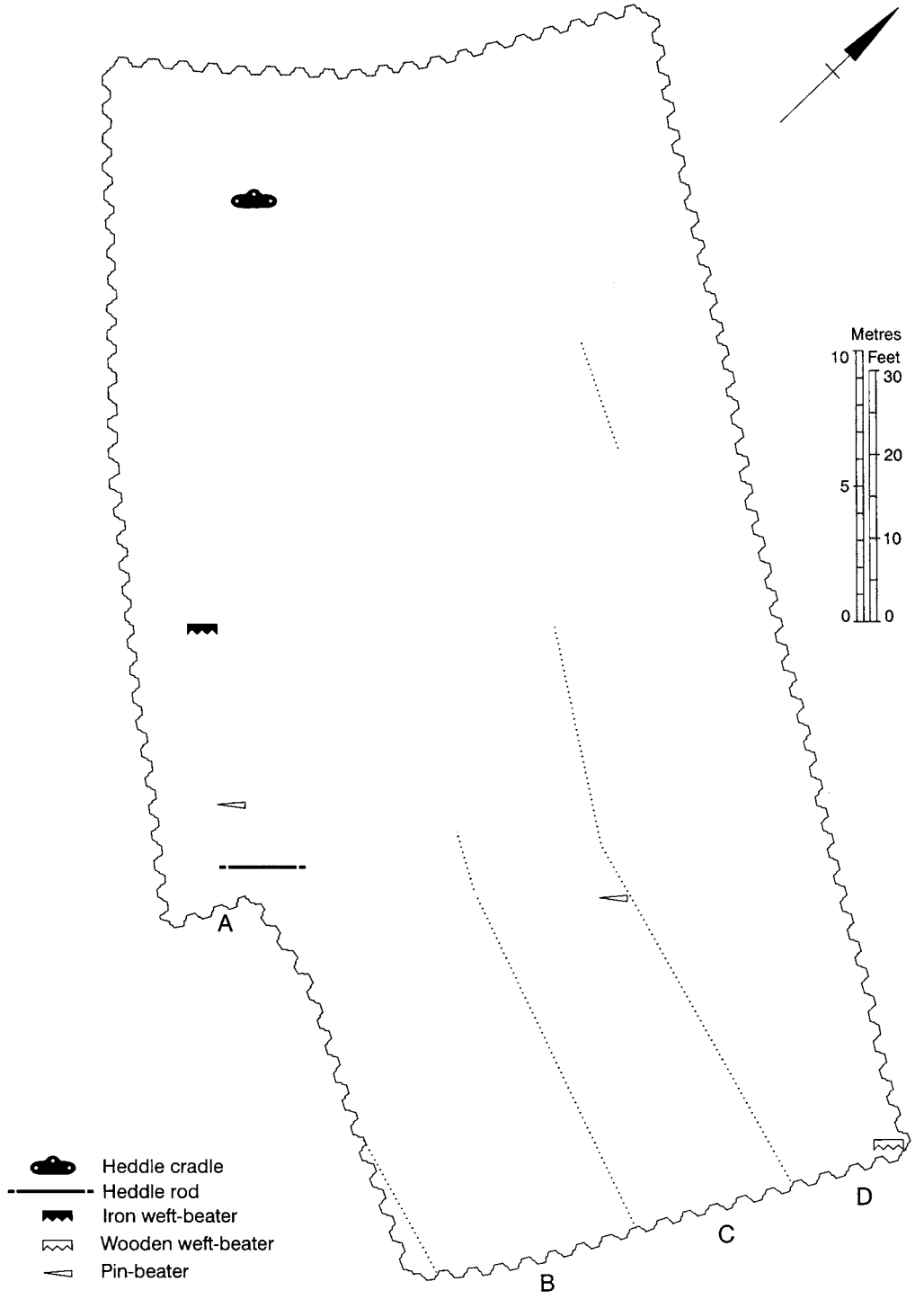


Fig. 853 Weaving in the late 11th to early 13th centuries: wooden heddle cradle and heddle rod, weft-beater blades of iron and wood, and bone pin-beaters. For additional key see Fig. 790, p.1707

the medieval dye-works at Eastgate, Beverley (Evans and Tomlinson 1992, 192, 282-6), but, again, no dye residues have been noted in a preliminary examination of pit fills associated with the building (A.R Hall, pers. comm.). While there is no real evidence for dyeing at medieval Coppergate, two sites to the south-east have produced evidence for the use of woad. There were woad residues, bran (to help fermentation) and calcareous material (to make the dye soluble), together with some greenweed and weld, in a 14th/15th century well fill at 22 Piccadilly (Carron et al. 1995); and woad and calcareous material in a pit at 17-21 Piccadilly (1990-1.29) (Hall 1995, 37).

Making garments

The evidence for needlework in the early Norman period, like fibre processing, comes from levelling dumps towards the rear of the site. In the 12th and 13th centuries, again broadly following the distribution panern of fibre processing, needles, shears and slick-stones are more widely spread over the site (Fig.854). The evidence for needlework diminishes, along with most of the evidence for the textile crafts, at the start of the 14th century, but a small netting needle (*6634*) dated to the 14th/15th century has been recovered from the rear of Tenement C, close to some silk thread (*1457*, *AY* 17/5) of the sort often used in hairnet-making.

Wool trade

Evidence for a trade in wool comes in the form of wooden pins from wool bales. These are all from the river end of the site (Fig.855). They seem to shift from Tenement B in the 12th/13th century (four examples), to Tenement D in the 13th/14th century (two examples plus one residual in a 16th century deposit), back to B in the 14th century (four examples) and then to Tenement C in the late 14th century and 15th century (seven examples). Most come from midden-like dumps, but the four from 14th century, Tenement B, seem to be related to the use of a large timber-framed building there (K. Hunter-Mann, pers. comm.).

It has already been described, how wool was collected in York, repackaged into large canvas containers and shipped down-river to Hull and the Continent (pp.1717-18). It is possible, then, that the river end of the site was used for the storage and repackaging of wool (and perhaps other merchandise). If this is the case then some of the other objects in the vicinity take on new meaning. Some 'fell' wool (1413, *AY* 17/5) on Tenement C is contemporary with the bale pins found there. The tool believed to have been used in the production of sacking (*6653*) (see pp.1761-2) comes from the same 14th century group of deposits as the two bale pins on Tenement D. Twined and plaited ropes and tightly twisted cords resembling modem string were also recovered from pits and cuts at this end of the site (pp.289, 291, 393-7, *AY* 17/5). All of these are appropriate to the repackaging of merchandise, especially wool (Fig.794, p.1717).

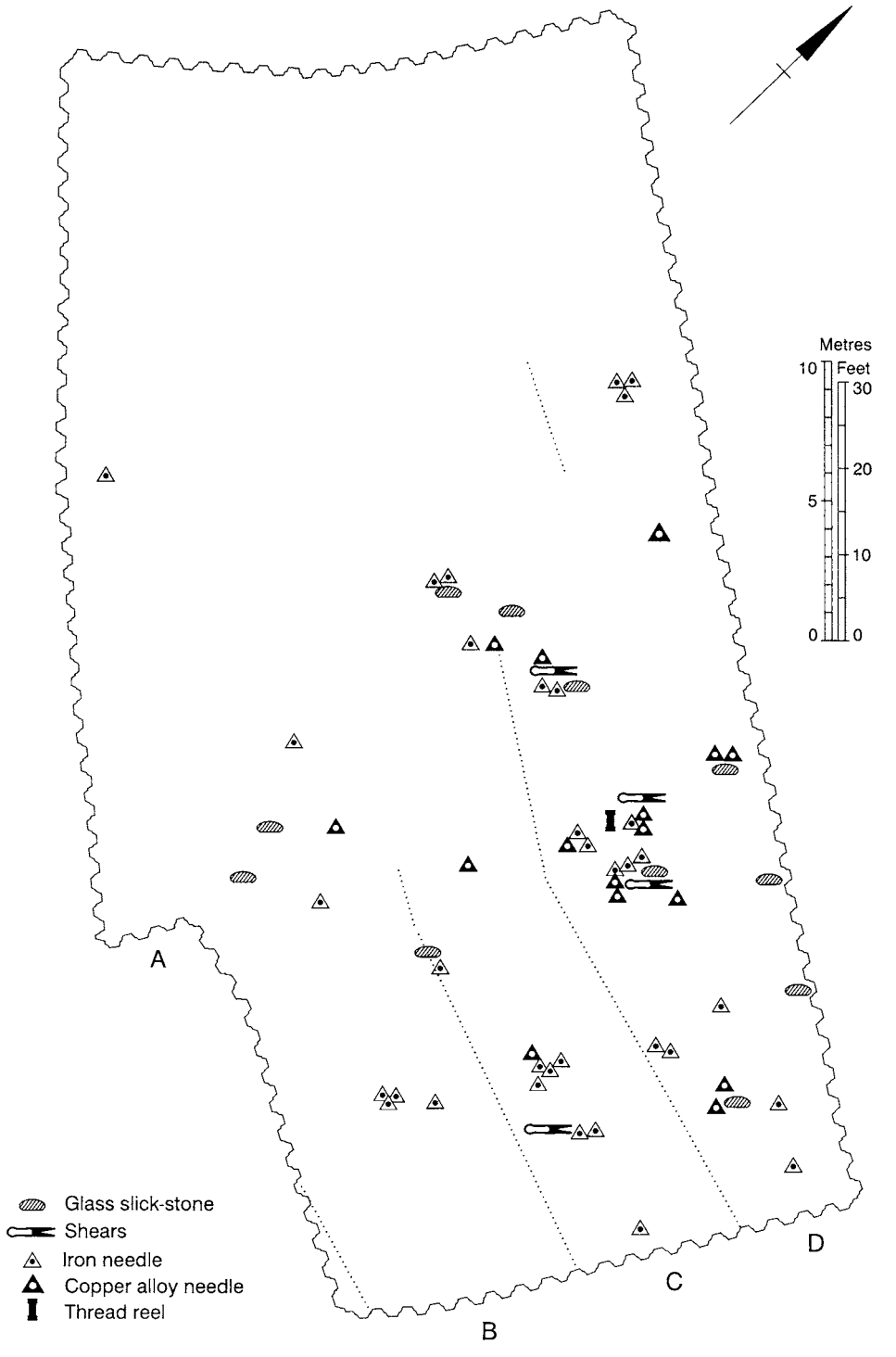


Fig. 854 Cutting, smoothing and stitching in the 12th and 13th centuries: glass slick-stones, iron shears, needles of iron and copper alloy, and a bone thread reel. For additional key see Fig. 790, p.1707

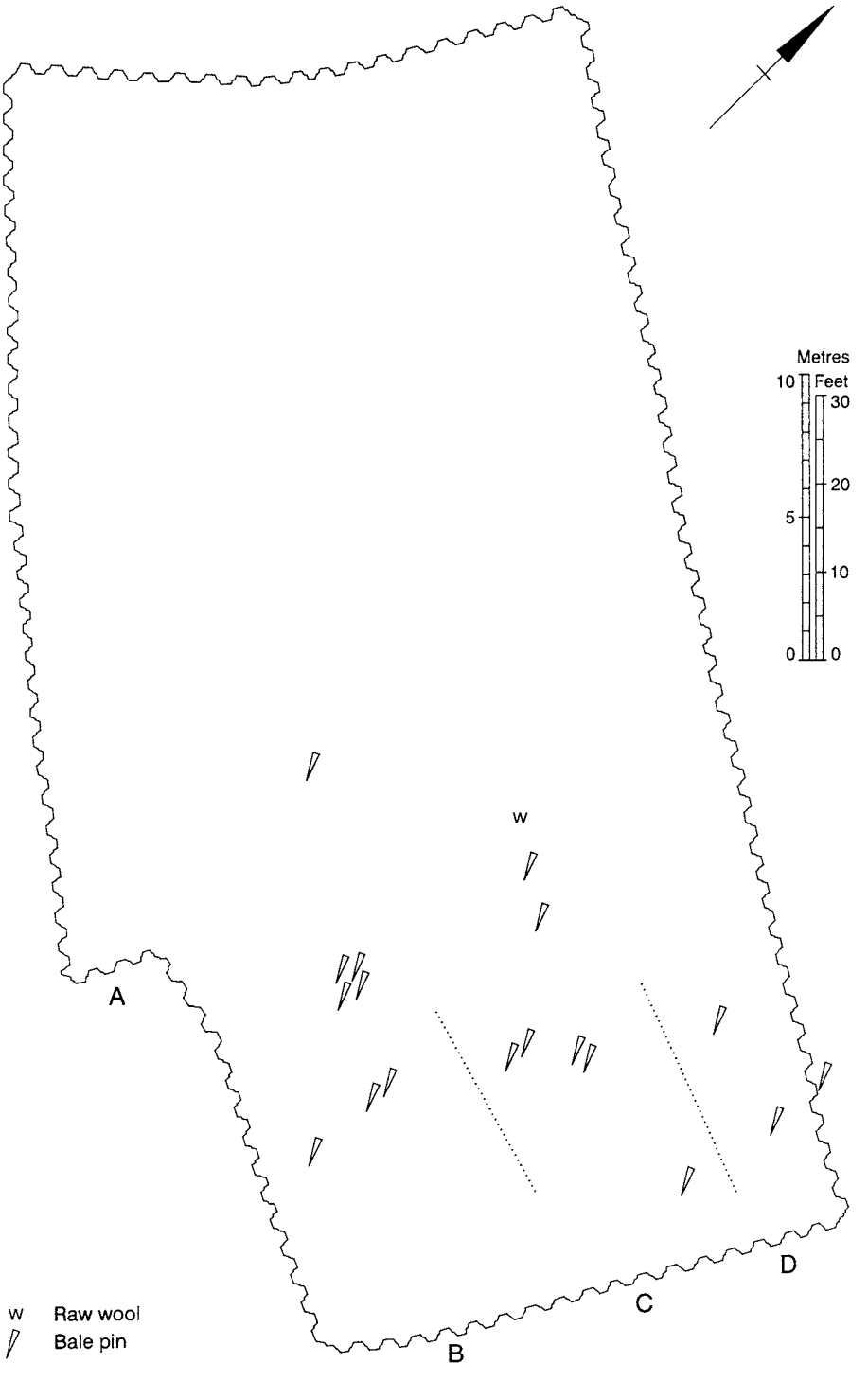


Fig. 855 Wool and bale pins from the late 12th to the 16th century. For additional key see Fig. 790, p.1707

Summary of the Period 6 material

The 11th to 15th centuries seem to have witnessed a sea-change on these four Coppergate tenements, from 'workshop' crafts to commerce. Websters and tapiters were at work on Tenements A and B until the 12th or early 13th century, but evidence for the other medieval textile trades recorded in the town is lacking. It is difficult to prove archaeologically that crafts are absent from a site, but at Coppergate the gap left by the textile workshop tools is comfortably filled by the evidence for the wool trade.

Behind this shift from crafts to trade lies a steady background of fibre processing, spinning and needlework, which seem to have been practised on all tenements until the start of the 14th century. It will be shown below (p.1829) that these were regarded as domestic tasks, to be carried out by the women and servants of the household. Such work would have been done in the homes of artisan and merchant alike.

Coppergate in a Wider Context

The picture that has emerged is of a local, rural Anglo-Saxon textile industry moving into the town (or, rather, the outskirts of the old administrative centre) in the mid 9th century. Over the following centuries, this industry changed and evolved, taking up new technology as soon as it became available. As time passed, individual sub-crafts disappear from the site until, by the end of the 13th century, only yarn production and needlework remained. A trade in raw wool seems to have taken over from textile production at this stage.

What lay behind these changes? This final section of the work will examine some of the broader questions raised by the archaeological evidence.

Anglo-Saxon artisans in an Anglo-Scandinavian town

The Vikings ruled York for almost a century and their influence lasted until the Norman Conquest. Many artefacts from the excavation at 16-22 Coppergate demonstrate a Scandinavian presence: there are hones of Norwegian schist; objects of Norwegian or Shetland soapstone (for the mis-identification of one as a spindle whorl, see p.1731); a sock in *nålebinding* technique; metalwork and stone sculpture in Scandinavian art styles; and names of Scandinavian moneyers on coins, a coin die and on lead trial pieces (Roesdahl et al. 1981).

There is, however, no comparable evidence in the textile tools. Some tools such as slick-stones and flax pounders remained much the same throughout north-west Europe, but the Coppergate spindle whorls are regional types which clearly belong in the local north Anglian tradition. The flat-headed, two-row wool-combs are also typical of Anglo-Saxon England and the Continent, even if some did eventually reach Norway and Denmark; and the single-ended pin-beaters are likely to have come to England from France. The spear-shaped form of sword-beater may have ultimately derived from Norway, but the form had already reached the local Anglians by the 7th century. The use of red dyes has also proved to be typically Anglo-Saxon. Most tellingly, there are at Coppergate none of the black clay conical whorls which are so common throughout Scandinavia.

It may be useful to consider who were the textile producers at this time. Tools such as sword-beaters, pin-beaters and spindle whorls often appear in Anglo-Saxon women's graves of the 6th and 7th centuries. With the arrival of Christianity, burial with grave-goods decreased, but in Norway and the Northern Isles women continued to be buried with their textile tools well into the Viking Age (Løken 1987, 56-8). Written evidence supports the view that textile production was seen as a woman's job. Charlemagne, for example, insisted

that his daughters 'learn to spin and weave wool, use the distaff and spindle, and acquire every womanly accomplishment' (Thorpe 1970, 59). The capitularies also show cloth being made on the imperial estates by women, some of whom worked together in *genicia/gynaecea* or 'women's workshops' (Loyn and Percival 1975, 69-70, 84). In Anglo-Saxon England the evidence of wills and charters suggests that on large estates the mistress of the house was responsible for the production of clothing and furnishings, with the aid of female slaves (Fell 1984, 41-6). As a final example, in Njal's Saga, twelve women (Valkyries) arrive in a woman's bower and weave up a battle on a warp-weighted loom *(Darraðarljóð*, translated in Magnusson and Palsson 1960, 349-51).

This does not mean that men were excluded from the textile crafts. A man buried at Harrold, Beds., had a flax heckle (or possibly wool-combs) with him (Eagles and Evison 1970, 39-46) and a male fuller is mentioned in a will written in about AD 1000 (Fell 1984, 97). It suggests, rather, that in the 10th century mind a textile worker was stereotypically female; and that the textile work-force was predominantly, although not exclusively, female.

If Scandinavian women were also textile-producers, how many of them came to England? Burials of Scandinavian women are well represented in the Northern Isles and Ireland, but are rare in England (although identifiable male burials are hardly common). Eirik Bloodaxe's wife, Gunnhild, seems to have accompanied Eirik to York *(Egil's Saga,* Pálsson and Edwards 1976, 152ff), but this followed his banishment from Norway and may not have been typical. Research into burial practice in Norway has shown a rise in women's status in the Viking Age and the appearance of traditionally male craft tools in women's graves, which argues that women were generally left to run the farms and workshops while their menfolk were away (Dommasnes 1987).

No brooches of the sort which distinguish Scandinavian women's dress of the 8th to later 10th century — large oval ('tortoise'), equal-armed and trefoil brooches — have been found in York. There is a clay mould for a trefoil brooch from 9 Blake Street (sf448), but its ornament has Anglo-Saxon influence (MacGregor 1978,42-3; Roesdahl et al. 1981, 118) and it would be hard to prove it was intended for a Scandinavian wearer. Most cloak fasteners from the city, and from Yorkshire as a whole, are ringed pins and Irish penannular brooches of the sort worn by Scandinavian men (ibid., 75, 104, 126); or the disc brooches (ibid., 40, 104-6) which were worn by Anglo-Saxons of both sexes (Owen-Crocker 1986, 91, 117-18, 133, 151). One woman buried at St Mary Bishophill Junior, York (1980.12), in the early 10th century wore a Scandinavian style of armlet, but she had no brooches of any sort *(AY8/1,* 10,24; Roesdahl et al. 1981, 109).

It would be impossible to prove an absence of Scandinavian women in York, since some may have changed their style of dress after arriving in England; and poorer women, especially slaves, may not have used metal brooches. If, however, it is accepted that the Scandinavians coming into York in the 9th and l0th centuries were *predominantly* men, then their impact must have been greatest on the crafts which were traditionally theirs, such as metalworking (Loken 1987, 56). Textile production would have remained in the hands of Anglo-Saxon women.

Organisation of production: rural to urban

Coppergate offers the chance to examine how these women organised their craft in practical terms and whether they modified their manner of working when they moved from the countryside into the town.

In Anglo-Saxon villages of the 5th to 8th centuries, such as West Stow, Suffolk (West 1985, 138-40, 181-4), and Mucking, Essex (Hamerow 1993, 17-19), evidence for textile production concentrates in ancillary huts ('Sunken-Featured Buildings' or *Grubenhäuser)* and is largely absent from the main halls. The chronological and spatial distribution of loomweights suggests that only a few huts were used for weaving at anyone time, but the larger huts, such as that at Upton, Northants., could house at least two looms (Jackson et al. 1970, 214). Given that the warp-weighted loom might be over 2m broad at this date (Hoffmann 1974,280-1; Hedges 1980,83, 106) and that the early sword-beaters were very short (Chadwick 1958, 12-13, 30-5; Millard et al. 1969, 17-22), it seems likely that one loom would require several women. Such weavers were probably coming together to make cloth for the extended family group, using flax and wool brought in from the farmland outside the village. These rural settlements have yielded substantially more evidence for weaving than the 7th/8th century trading centres, or *wics,* where cloth production was probably a relatively minor support industry.

In succeeding centuries, as large manorial estates began to emerge (Bassett 1989, 19-21), raw materials were brought to the manor's workshops to be made into cloth in a more controlled environment. In the late 10th or early 11th century text, *Be gesceadwisan gerefan* (Liebermann 1903, 453-5) — which was probably written by Wulfstan, Archbishop of York (Whitelock 1963, 12) — the estate's reeve is advised to 'plant madder, sow flax, and woad seed as well' and to supply the workshops with 'many flax-processing tools, flax line [raw fibre], spindle, reel, swift, loom uprights, heddle rods, press [or cloth-beam?], comb [toothed weft-beater], temple, weft, warp, wool-comb, cross-beam, beater, crank-stick, sheath, seam-pins, shears, needle, slick-stone' (author's translation). This covers all the processes of production and suggests that the estate was expected to be self-sufficient in textiles. It has been noted above that the mistress of the house supervised slaves in this textile work, but it is possible that their products were supplemented by wives of men working on the estate. Such an arrangement can be seen on royal and monastic estates of 9th century France, where, as well as workshop serfs, there were women outworkers who received wool and flax from the steward and then returned it to him as cloth, as part of their service to the estate (Loyn and Percival 1975; Power 1937, 17-31, 182-5; Anon 1988, 275).

The archaeological evidence for manorial workshops in England is slight. At Goltho, Lincs., there is a defended manor house where over 30 textile tools have been recovered (Beresford 1987, 35, 177-95). Beresford has identified a large secondary building as a weaving shed (ibid., 55-9, 68), although few of the textile tools seem to be associated with the building. At 15.6m to 19m long and 4.5m wide, it is much bigger than any of the village weaving huts, but there is evidence from Germany (Zimmermann 1982, 118)

and Denmark (Bender Jørgensen 1986, 355) that the buildings which housed looms were becoming larger by this time. One of the textile tools from Goltho is a 10th century iron shearboard hook (Goodall 1987, 177-8), which indicates that napped (teaselled and sheared) cloth was being produced.

The 9th century material from Coppergate (Period 3) follows the typical rural pattern, with weaving separated off from other activities. Such an arrangement might also be expected of a manorial workshop and the evidence for the production of napped cloth during Period 3 does suggest a high-class establishment (see pp.1774-5); the iron sword-beater may also have had connotations of status (Chadwick 1958). Unfortunately, the siting of buildings in this period is not certain and there is no external evidence, except perhaps the Anglian helmet (p.1170, *AY* 17/8), to show that there was a high-status establishment in the vicinity. For the present this matter must remain unresolved.

By the mid 10th century the picture is much clearer. It has been demonstrated that the buildings erected in Period 4B housed wool-combing, spinning, weaving, dyeing and needlework, with flax processing and laundering in the backyard area. The material is evenly distributed across the tenements and the presence of fences along the boundaries of the plots suggests that these are separate households rather than communal workshops. This represents a substantial change from the early settlements and, so far as one can tell, from manorial workshops.

The move into tenements with well-maintained boundaries coincides with the arrival of the two-beam vertical loom. This must have been adopted in manorial workshops at about the same time, as single-ended pin-beaters were represented at 10th century Goltho; and the description in *Gerefa,* with a weaving comb (toothed weft-beater) and no loomweights, implies a two-beam loom. The two-beam loom was probably used for relatively narrow fabrics at this stage. Drawings of the period show that it was a metre or so across (Fig.817, p.1759; Hoffmann 1974, 329, fig.136) and on the lands of Saint-Denis, Villiers-le-Sec, where the two-beam loom seems to have been in use, fabrics of standard widths, 0.88m and 1. 33m, were produced (Anon 1988,276). It is possible that where the warp-weighted loom remained in use, this, too, was becoming narrower (Hoffmann 1974, 281), while sword-beaters were certainly much longer than formerly (ibid.). It seems, then, that the period under discussion saw a general move towards looms which were more manageable for one person. This would have benefited women living in smaller households.

Scale of production

In assessing the scale of textile production at Coppergate, it is important not to be misled by the quantity of the material. The site as a whole has yielded a huge number of objects and Table 152 shows that, whether one counts numbers of artefacts or numbers of deposits yielding artefacts, textile tools represent a relatively small proportion of the whole. Textile production was important, but not the most significant activity on the site. The even spread of textile equipment laterally across the tenements (pp.1797-1803) is

Table 152 Textile equipment in relation to other material from 16–22 Coppergate

Dyeplants and teasels have not been included as these were collected by sampling and cannot be counted in the same way as textile tools

Period	3	4A	4B	5A	5B	5C	6
Textile tools as % of total number of artefacts per period	3.7	7.3	6.9	5.7	6.3	7.7	8.2
Contexts yielding textile tools as % of total number of contexts per period	2.5	2.9	2.9	4.0	2.6	6.4	4.1

matched vertically through the layers of each period and clusters of artefacts in individual deposits are rare before the 11th century (later Period 5B).

This pattern of small-scale but regular deposition of artefacts is that to be expected from a common domestic occupation. The fact that textile tools have been recovered from almost all York sites of Anglo-Scandinavian date confirms that the craft was widely practised. On the other hand, the quantity of material from 16-22 Coppergate is considerably more than at other sites, except perhaps for Clifford Street. This is not just a matter of preservation. The conditions at 6–8 Pavement were similar to those at Coppergate, but if trenches of the Pavement size and depth (pp.67-72, AY 17/3) had been sunk anywhere along the street frontage at 16-22 Coppergate, they would have yielded substantially more than the ten textile tools (3.9% of total) that were in fact recovered. Numerical comparisons between sites are always risky, but one explanation of the evidence may be that more cloth was being produced at Coppergate than elsewhere.

Textile trade in the Anglo-Scandinavian period

The Coppergate textile makers would have had to obtain their raw materials from outside the town, flax from the Vale of York and wool from the Wolds 19km (12 miles) to the east, or the slopes of the Pennines 13km (8 miles) to the west *(AY* 15/3,199). Dyeplants may have been grown locally, although madder was also being traded out of northern France at this time (p.400, *AY* 17/5). The clubmoss used in mordanting must have been brought in from Scandinavia or north Germany and the silks being cut and stitched on the site would have come from even further afield. If so much was coming in to the tenements, it is hard to believe that none was going out. There would have been ample opportunity for trade, as this area was already part of the commercial zone of the town. The later name

for the area, 'Market Shire', almost certainly originates before Domesday (Benson 1911, 61) and the medieval market which was held a few steps away in Pavement was probably already in existence in the Anglo-Scandinavian period (Radley 1971, 39).

The position of such small-scale domestic producers in the economic system may become clearer from an examination of the broader evidence for a trade in textiles. The European surveys of Bender Jørgensen have shown that textiles may be divided into broad regional groups, using technical features such as weave and spin (Bender Jørgensen 1986; 1992). Recent research has shown that when the raw materials in the textiles are analysed, smaller sub-divisions begin to appear. Thus, the wool textiles of Anglo-Saxon England are technically like those of north Germany and The Netherlands (e.g. 'Hessens/Elisenhof-type twills'; ibid. 1986,176-80,360-1), but the Anglo-Saxon examples are more commonly red (Walton 1988a) and the continental ones black (Walton Rogers 1995). Examination of the wool also indicates regional variation (Table 14, *AY* 17/S) and there are cultural differences in the way the wool is processed: the Norse, for example, had an idiosyncratic method of choosing and preparing wool for their coarser fabrics (Walton Rogers 1993; forthcoming a; and b). Furthermore, some weave patterns, such as the small diamond weaves in Yorkshire (Walton 1990, 63-4; Walton Rogers unpublished c), were limited to a relatively small district. It seems that, the closer we look at textiles from urban and rural sites of this date, the more regionalised and local most of them become. If they were traded, it can only have been over short distances.

Such fabrics represent roughly two-thirds of textiles from sites such as Coppergate. There remains a further one-third which is likely to have been exchanged over greater distances. Silks, for example, would have been imported, most probably by Scandinavians operating the trade route along the Russian rivers to the silk road (p.419, *AY* 17/S). A linen honeycomb weave from the Rhineland may have travelled to York alongside wine and quernstones (p.417, ibid.). Piled weaves were also exchanged at this time, although the response of the York weavers seems to have been to make a needle-worked copy of the woven original (p.336, ibid.). Other obviously alien objects, such as the very worn *nålebundet* sock, are more likely to have arrived on the owner rather than in a merchant's pack.

The large rectangles of wool cloth which men wore as cloaks at this time were also articles of trade. Charlemagne, in a letter to King Offa of Mercia (AD 796), requests 'that with regard to the length of cloaks, you may order them to be as they used to come to us in old times' (Haddan and Stubbs 1878, 49S-8) and elsewhere he tries to prevent Frisians charging the same price for short striped Gallic cloaks as for the larger Old Frankish style (Notker *De Carolo Magno,* Loyn and Percival 1975, 22). Frisians also seem to have been trading cloth to and from the monastic houses of Charlemagne's empire, where tithes of wool, flax and cloth were taken in and any excess sold on (Pounds 1973, 213-14, 285). Records held at the monastery of Fulda, Germany, for example, show that in AD 830 Frisian landowners were contributing between 40 and 220 cloths each to monastic houses (Hagg 1994, 83). It must be emphasised, however, that the amount entering trade was only the surplus (Pounds 1973,214).

There are many areas of this subject which deserve further investigation, but the general picture seems to be of a broad lower tier of home-made goods, some of which may have been exchanged at local markets; and an upper tier of exotic, specialist and best quality fabrics exchanged over longer distances. There is nothing in the Coppergate evidence to suggest that the weavers here were producing anything other than standard types of fabric and, if they contributed to trade, it would have been to the lower tier. They were, however, familiar with foreign goods, copying them in some cases, and in the case of silk may have been involved in its redistribution in the form of head-dresses.

Craft specialisation beginning in the 11th century

The evidence from Coppergate has been sumrnarised chronologically in Fig.856. This shows that the finishing of cloth with teasels and shears had disappeared in Period 4A (early 10th century), and there is no further evidence for this craft at Coppergate, even though teaselled and sheared cloth was increasingly common in medieval England. The other textile crafts continued together until Period 5C (the mid 11th century), but by the start of Period 6 dyeing had also left the site. By this stage weaving was probably also much reduced and limited to two tenements, in one of which the new horizontal loom was in action.

Historians have already marked the 11th century as a period of transition from domestic weaving to workshop production in the towns of north-west Europe (sumrnarised by Hoffmann 1974, 258-65). There were economic and social factors which brought this about, but the arrival of new technology in the form of the treadle loom must have played a significant role. The ability to produce long pieces of cloth at a much faster rate now allowed weavers to specialise in their craft (see pp.1763-6). Rashi of Troyes (Rabbi Solomon Izhaqi, 1040-1105), writing in the transitional period, noted the difference between 'the loom used by women' which has 'a rod that goes up and down' and 'the loom of weavers who weave by foot' (Carus-Wilson 1969, 165; Hoffmann 1974,260). Whether the 'rod which goes up and down' refers to the sword-beater of the warp-weighted loom or the single-ended pin-beater of the two-beam vertical, it is clear that those who 'weave by foot' are using the treadle loom, and there has been a gender shift from female to male. If the identification of the heddle cradle is correct, then the new loom had arrived in Coppergate by the late 11th century.

Before long these urban weavers were banding together in craft gilds. York weavers appeared in the Pipe Roll of 1164 (11 Henry II, 46) and again as a gild in 1165 (12 Henry II, 36), when the fee they paid to the Crown was second only to that of the London weavers (Heaton 1965,3). They were making dyed and striped cloth and during the 13th century their products were exported to Italy and Spain (Chorley 1988, 3; Miller and Hatcher 1995, 108). Dyers and fullers, now predominantly men, were also able to set up as independent artisans (Heaton 1965, 5-7).

Thus, what had been widely practised women's crafts in the Anglo-Scandinavian period were now limited to the households of specialist artisans. Where these artisans were living and working eventually becomes clear in the later 14th century. Poll tax returns of 1377

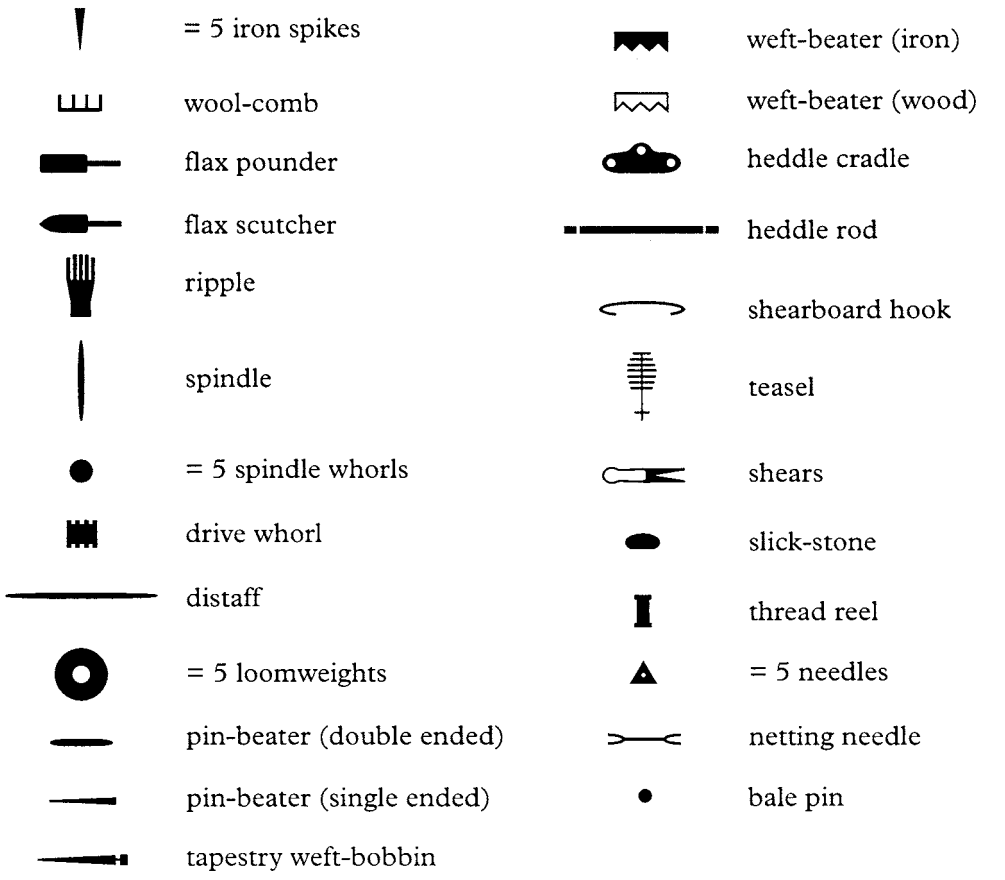
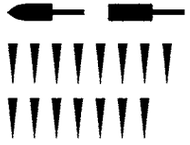
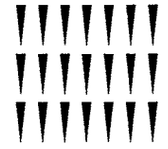
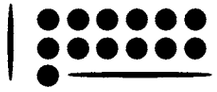
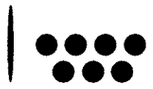
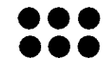
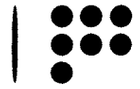
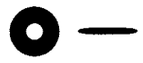
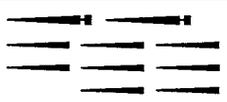
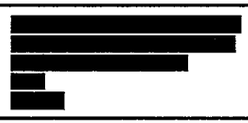
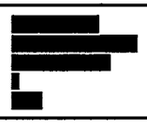


Fig. 856 (above and facing) Key and summary of the evidence for textile production and trade in raw wool from 16–22 Coppergate. Note for Period 6: 6i=11th-11th/12th century, 6ii= 12th-12th/13th century, 6iii=13th-13th/14th century, 6iv= 14th-14th/15th century, 6v= 15th-15th/16th century

Sub-craft	3	4A	4B	5A	5B	5C	6i	6ii	6iii	6iv	6v
Fibre-processing											
Spinning											
Weaving: warp-weighted											
two-beam vertical											
horizontal treadle loom											
Dyeing Madder Clubmoss Greenweed Weld Woad											
Finishing											
Cutting, smoothing and stitching											
Wool trade											

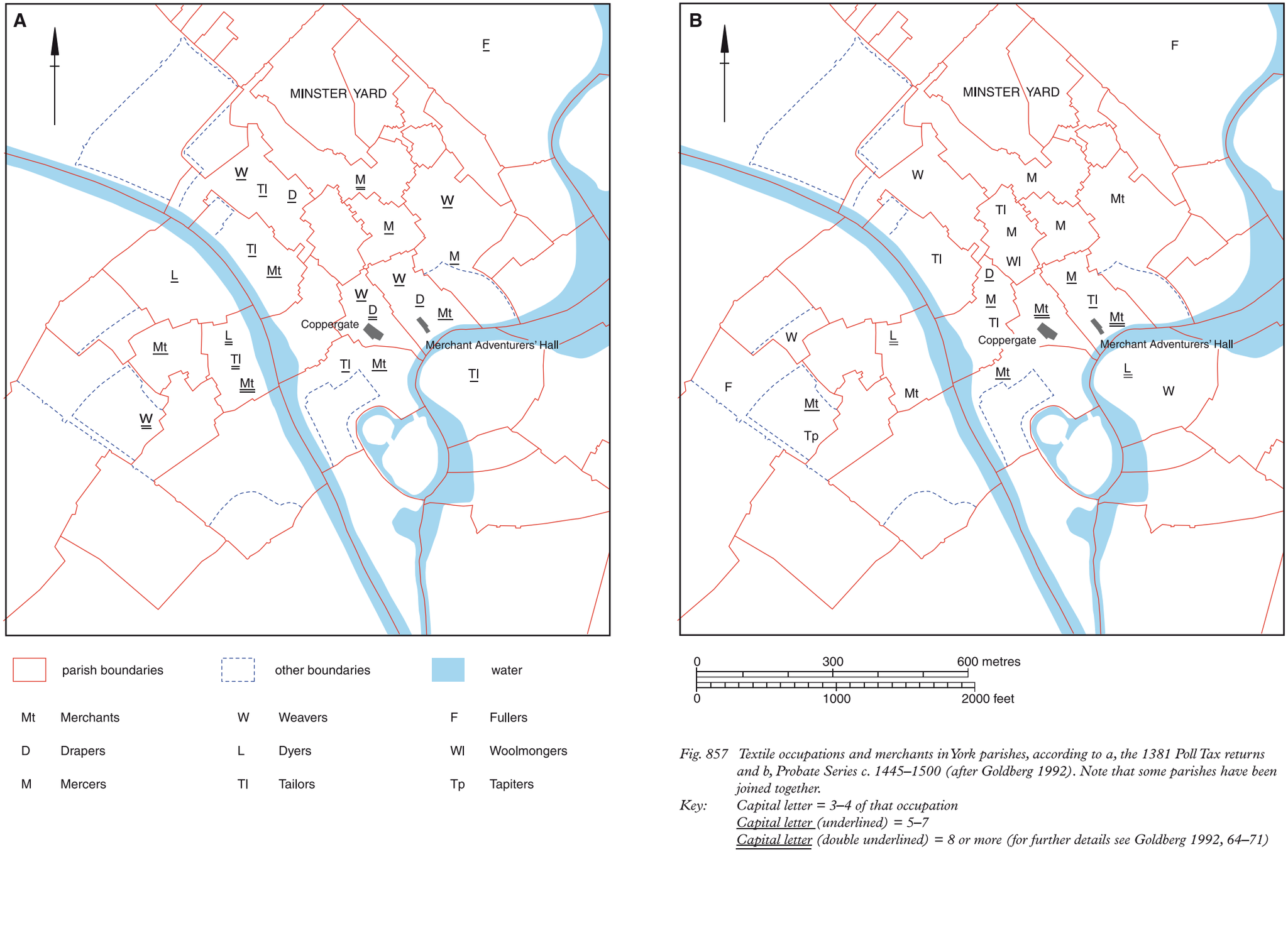


Fig. 857 *Textile occupations and merchants in York parishes, according to a, the 1381 Poll Tax returns and b, Probate Series c. 1445–1500 (after Goldberg 1992). Note that some parishes have been joined together.*

Key: *Capital letter = 3–4 of that occupation*
Capital letter (underlined) = 5–7
Capital letter (double underlined) = 8 or more (for further details see Goldberg 1992, 64–71)

(Leggett 1971) and 1381 (Fig.857a; Bartlett 1953) and probate evidence of the 15th century (Fig.857b; Goldberg 1992, 64-71) show dyers resident in riverside parishes where they had easy access to water. Fullers also needed water, but were placed in outlying districts such as Layerthorpe. Weavers were less site-dependent and websters and an occasional tapiter are recorded in the parish of All Saints, Pavement, in which Coppergate stands (Bartlett 1953). On the whole, however, this district seems to have been increasingly an area of commercial activity (see below).

Some of the textile crafts were now a mixture of domestic and paid work. Men and women following the trade of 'kempster' (wool-comber) occasionally appear in the poll tax returns (Bartlett 1953, 13) and other documents; and poor women spinners were remembered in the wills of the entrepreneurs who employed them; but fibre preparation and spinning were also part-time activities for many women, some of whom were producing yarn for their own use (Goldberg 1986, 29; Swanson 1989, 30-2). Gervase Markham's instructions to the 17th century *English Housewife*, to prepare and spin wool and flax, but to send out to have the material dyed, woven, fulled and sheared (Markham 1683, 122-40), were equally applicable in the 12th and 13th centuries. Flax preparation in particular was to remain in the domestic realm until the later 17th century (Evans 1985, 26). When it came to making up garments, the skills of tailors, seamsters and shepsters (dressmakers) were also available in the town, but much needlework would still be done at home.

To summarise, the falling away of sub-crafts from the Coppergate site in the medieval period seems to reflect specialist artisans moving to more convenient sites and perhaps a~o being squeezed out by mercantile activity. The numerous fibre-processing spikes, spindle whorls and needles which are spread widely over the tenements at Coppergate in Period 6 may still, however, be the products of domestic work.

The wool trade

The local wools in the 9th to 11th centuries seem to have been mainly hairy 'carpet' and 'tweed' wools of the sort still to be found in the hills and dales of Yorkshire (above, pp.1713-15; pp.301-11, *AY* 17/5). When the Cistercians arrived in the 12th century, however, they brought in new stock for their own use (Trow-Smith 1957, 111) and the administrators of large lay sheep farms may have done the same (Waites 1977). Improved stock and good husbandry techniques led to localised improvements in wool. This is reflected in 13th and 14th century price-lists, which show a considerable range of prices for Yorkshire wool, with the best quality fleeces ranking sixth in the country (Munro 1978; 1979). The wool in York textiles of this period is also of a better quality than formerly (p.308, *AY* 17/5). In the 15th century, however, following a shift from demesne to peasant farming, the best wools of Yorkshire disappeared from the price-lists and the county slipped back to, at best, seventeenth place (Munro 1979).

Fleeces from the enormous monastic flocks were generally sorted and packed at so:urce and then exported by foreign merchants (Uoyd 1977; Ryder 1983, 449-52). English merchants collected fleeces from the smaller producers until the 14th century, when they

managed to wrest the bulk of the trade from foreign hands (Lloyd 1977, 24, 65, 128, 299; Power 1933, 39-40). York was a natural collecting point for wool and between 1326 and 1369 it was intermittently one of the staple towns, through which all wool for export had to pass (Lloyd 1977, 115-43). The activities of Hull merchant William de la Pole, bringing wool from the dales to York for repackaging and shipment to Hull, have already been described (above, pp.1717-18; Fryde 1964). York merchants were also heavily involved in the trade (Fryde 1966; Waites 1977), and repackaging of wool seems to have been a full-time job, six 'wolpakers' being registered for poll tax in 1381 (Bartlett 1953, 13). In the 15th century, however, this trade declined, as the export of raw wool was overtaken by the export of wool cloth (Carus-Wilson and Coleman 1963,122-3,138-9).

The bale-pins from Coppergate cover the late 12th to early 15th century, the period when Yorkshire wool was at its best and the wool trade in full flight. The site lies in an area which had been a centre of commercial activity for several centuries, but which in the 14th and 15th centuries was becoming more exclusively a merchants' quarter (Fig.857; Goldberg 1992, 69-70). In 1356 the merchants moved their gild hall to nearby Fossgate, where they also had a quay (Palliser 1984, 106). The full range of the excavated Period 6 material from 16-22 Coppergate is still to be reviewed, but the evidence presented in this volume does at least confirm the mercantile activity of this area of the town and an engagement in the wool trade.

Conclusion

The site at 16-22 Coppergate was densely occupied for many centuries and has presented archaeologists with a vast array of artefacts and extremely complex stratigraphy. The analysis of this data has inevitably taken time. Since completion of the excavation, the artefacts have been grouped together by material for publication and the site's stratigraphy steadily unravelled, so that it is now possible to produce volumes of synthesis in individual subject areas, such as the present work. Eventually, as R.A. Hall has described in his chapter on the excavation, a full review of all aspects of the site will be possible.

The study of textile production in the Anglo-Saxon and medieval periods has in many ways reached a similar stage of development. Over the last few decades, steady collection of data has made it possible to see the chronological and geographical distribution of individual textile tools; and the study of textiles themselves has kept pace, so that the effect of changing technology on the finished goods can be observed. We have now reached the point where, for individual sites, it is possible to draw together this information into a fuller picture of how the textile crafts were practised in one place. Material from Winchester has already been published in this way and Coppergate presents another example. These sites are, however, only pieces of a larger jig-saw. As more sites are published in this integrated manner, they will eventually coalesce into a broader picture of textile production and help us to understand better how the industry fitted into the country's economy and society as a whole.

This is an exciting phase for researchers, but it is vital that we move forward with care. Many of the ideas put forward in this volume — the role of Anglo-Saxon women as textile producers within the Anglo-Scandinavian Danelaw, the adoption of the two-beam vertical loom as a cloth loom and the shift of production from estate workshops to urban households — are still relatively new and need to be checked against future archaeological and historical research. Whether or not these theories stand the test of time, one thing is clear. Such a large collection of material, from reliably dated archaeological deposits, must form part of any future discussion of the changing role of the textile industry over the 9th to 13th centuries.

Select Catalogue

This catalogue includes all items illustrated in this volume, or mentioned individually in the text. For catalogue entries of other artefacts, see the publications listed in the Concordance (pp.1844–56). The catalogue numbers follow consecutively those on p.1673, *AY* 17/10. Each entry ends with the small find number, prefixed sf, preceded by context number. If a catalogue entry incorporates more than one item or fragment, the dimensions given relate to the largest item. Unless stated otherwise, objects are complete. Entries for objects attributed to Period 6 are followed by a code denoting Tenement (A–D), Period (6), phase and sequence.

Abbreviations: L. = length; W. = width; T. = thickness; D. = diameter; H. = height; Hole D. = diameter of spindle hole; Wt. = weight

Finds from 16–22 Coppergate

Stone

Spindle whorls

Catalogue by P. Walton Rogers
Material identification by G.D. Gaunt

Note: Where whorls are incomplete, measurement of the incomplete dimension is given in brackets. In these cases an estimated original weight has been added after the present weight

Form A1

6536 Almost complete. Truncated hemispherical shape, with four encircling incised lines. Mudstone, medium to dark grey, micromicaceous, slightly fissile, silty; probably Coal Measures, but could be Millstone Grit. D.33.7, T.14.7, Hole D.10.6mm, Wt.20.4g 27422 sf9732 (P4A) (*Fig.806*)

6537 Hemispherical shape with deep rilling around circumference and around hole. Chalk, greyish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.33.0, T.19.6, Hole D.9.8mm, Wt.24.8g 20427 sf6995 (P4B) (*Fig.806*)

6538 Hemispherical shape; undecorated. Chalk, white, very fine-grained; Chalk Group. D.30.0, T.14.7, Hole D.10.0mm, Wt.14.8g 22679 sf7945 (P4B) (*Fig.806*)

6539 Flattened hemispherical shape; undecorated. Chalk, white to pinkish fawn (?burnt) very fine-grained; Chalk Group. D.30.2, T.12.6, Hole D.9.7mm, Wt.14.5g 22911 sf8104 (P4B) (*Fig.806*)

6540 Fragment only. Truncated spherical; undecorated. Chalk, white, very fine-grained; Chalk Group. L.26.8, T.19.8mm, Wt.[6.1 est.18]g 22800 sf8340 (P4B) (*Fig.806*)

6541 Hemispherical shape; undecorated. Chalk, pale greyish fawn, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.36.8, T.22.0, Hole D.9.9mm, Wt.33.3g 22815 sf8360 (P4B) (*Fig.806*)

6542 Hemispherical. Limestone, pale grey, fine-grained, silty, with few thin calcite veins, few small casts and moulds of shell debris and a few minute calcite shell fragments, including paired shells, possibly ostracods; 'granular' limestone, provenance uncertain. D.34.7, T.18.9, Hole D.10.7mm, Wt.28.0g 19390 sf8884 (P4B) (*Fig.806*)

6543 Shaved spherical shape; decorated with five vertical zones of incised lines, one ladder and four herringbone design; brown surface discoloration. Chalk, white, very fine-grained; Chalk Group. D.34.3, T.21.7, Hole D.10.0mm, Wt.30.0g 5231 sf1312 (C6c6, D6a7; early 12th century) (P6) (*Fig.808*)

6544 Fragment only. Hemispherical shape with vertical-sided upper half; decorated with curving incised lines on all faces; brown surface discoloration. Chalk, white, very fine-grained; Chalk Group. D.33.3, T.20.0mm, Wt.[14.1, est.28]g 9572 sf2092 (D6a9; early 12th century) (P6) (*Fig.808*)

Form A2

6545 Rounded truncated cone shape; undecorated. Chalk, white, very fine-grained; Chalk Group. D.33.1, T.16.6, Hole D.9.0mm, Wt.27.4g 22845 sf8037 (P4B) (*Fig.806*)

6546 Rounded truncated cone shape; undecorated. Limestone, pale brownish grey, fine- to medium-grained, with moderately sorted sub-angular to rounded grains; 'granular' limestone, provenance uncertain. D.35.4, T.21.5, Hole D.9.4mm, Wt.33.9g 22713 sf7884 (P4B) (*Fig.806*)

6547 Rounded truncated cone shape; undecorated. Limestone, pale grey, fine- to medium-grained, with moderately sorted sub-angular to rounded grains; 'granular limestone', provenance uncertain. D.33.1, T.17.6, Hole D.8.9mm, Wt.23.1g 25450 sf8638 (P4B) (*Fig.806*)

6548 Fragment only. Asymmetrical, truncated biconical; tooling marks on sides; decorated on bottom with two roughly incised encircling lines, filled with diagonals. Chalk, white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.37.7, T.24.7mm, Wt.[23.3, est.47]g 22309 sf7526 (P5A) (*Fig.806*)

6549 Fragment only. Asymmetrical, truncated biconical; all faces decorated with incised oblique and vertical lines. Chalk, white, fine-grained, with few scattered small ?quartz grains, spicules and foraminifera; Chalk Group, probably Ferriby Chalk Formation. D.32.0, T.20.5, Wt.[11.6, est.29]g 7232 sf1291 (P5B) (*Fig.806*)

6550 Fragment only. Rounded truncated conical; undecorated. Chalk, white, very fine-grained; Chalk Group. D.25.4, T.18.9mm, Wt.[9.0, est.18]g 3537 sf4852 (A6c4; 12th century) (P6) (*Fig.806*)

6551 Truncated hemispherical shape; decorated with incised ring-and-dot, arranged in vertical pairs. Mudstone, dark grey, slightly fissile, silty, with numerous minute (c.0.2mm), pale to medium brown sub-angular to sub-rounded masses; probably Lower Palaeozoic or Upper Carboniferous. D.34.6, T.12.0, Hole D.10.2mm Wt.20.0g 1106 sf104 (D6y1; 13th century) (P6) (*Fig.808*)

Form A1/A2 or B

6552 Fragment only. One flat face, with curving sides (original shape not clear); sides decorated with fields of incised cross-hatching; two encircling grooves around spindle hole; form A1/2 or B. Limestone, pale grey with pale brown mottling, fine-grained, almost entirely dolomite, with pseudo-septarian ?dessication cracks on split surface; probably Lower Magnesian Limestone but could be Upper Magnesian Limestone. D.31.6, T.[11.3]mm, Wt.[14.1, est.?]g 19390 sf9049 (P4B) (*Fig.808*)

6553 Fragment only. One flat face with curving sides, possibly hemispherical originally; decorated with incised ring-and-dot, in a row around sides; form A1/2 or B. Siltstone, medium grey, micaceous, slightly fissile; probably Coal Measures but could be Millstone Grit. D.35.7, T.[7.6]mm, Wt.[12.2]g 19390 sf9108 (P4B)

Form B

6554 Shallow, rounded cylindrical shape with vertical rilling. Chalk, white, very fine-grained; Chalk Group. D.21.9, T.9.0, Hole D.9.3mm, Wt.42.7g 25350 sf8558 (P4B) (*Fig.807*)

6555 Irregular, rounded cylindrical shape; undecorated. Chalk, white, very fine-grained; Chalk Group. D.42.7, T.16.5, Hole D.12.0mm, Wt.30.4g 23700 sf7793 (P4B) (*Fig.807*)

6556 Cylindrical with octagonal cross-section; undecorated. Limestone or chalk, greyish white, fine- to medium-grained, comprising closely packed sub-angular to sub-rounded grains with slight intergranular porosity; probably 'granular' limestone of uncertain provenance but could be abnormally coarse-grained chalk from Ferriby Chalk Formation of Chalk Group. D.30.5, T.20.5, Hole D.9.1mm, Wt.29.3g 22415 sf7678 (P4B) (*Fig.807*)

6557 Rounded cylindrical shape; appears to be light brown with white coating; incised zig-zag decoration on both flat faces. Chalk, very fine-grained; Chalk Group. D.33.9, T.12.1, Hole D.10.8mm, Wt.15.9g 15173 sf4199 (P5A) (*Fig.808*)

6558 Uneven cylindrical shape; incised lines radiating from upper and lower faces. Chalk, white, very fine-grained, with foraminifera; Chalk group. D.35.2, T.25.0, Hole D.9.6mm, Wt.30.0g 18536 sf7043 (P5A) (*Fig.*807)

6559 Almost complete. Irregular cylindrical shape; undecorated. Limestone, pale brownish grey with slightly pinkish tinge in places (?burnt), fine-grained, microcellular dolomitic; upper part of Lower Magnesian Limestone. D.40.7, T.17.7, Hole D.12.8, Wt.32.8g 18536 sf7044 (P5A) (*Fig.807*)

6560 Fragment only. Shallow rounded cylindrical shape; incised lines radiating from spindle hole, top and bottom. Chalk, white, very fine-grained; Chalk Group. L.36.5, T.12.7 mm, Wt.[9.6, est.21]g 20181 sf7060 (P5A) (*Fig.808*)

6561 Shallow cylindrical shape, with rounded sides; three groups of incised lines around circumference (symbols, or chance scratches?). Off-white with light brown coating. Chalk, white, very fine-grained; Chalk Group. D.28.3, T.12.6, Hole D.10.4mm, Wt.9.6g 14922 sf6960 (P5A) (*Fig.808*)

6562 Almost complete. Cylindrical shape; undecorated; chipped. Chalk, very fine-

grained; Chalk Group. D.37.1, T.17.8, Hole D.11.0mm, Wt.28.5g 1092 sf318 (P5B) (*Fig.807*)

6563 Irregular shallow cylindrical shape; undecorated. Chalk, white, very fine-grained; Chalk Group. D.35.8, T.10.4, Hole D.11.2mm, Wt.15.9g 15663 sf4569 (P5B) (*Fig.807*)

6564 Fragment only. Truncated biconical shape; incised zig-zag decoration in two zones. Chalk, white, very fine-grained; Chalk Group. L.33.9, T.19.8mm, Wt.[14.0, est.31]g 2901 sf681 (A6z1; 11th/12th century) (P6)

6565 Rounded cylindrical or shaved spherical shape; decorated with incised ladder decoration in six vertical zones. Chalk, white, very fine-grained, with scattered foraminifera; Chalk Group. D.26.9, T.24.1, Hole D.9.5mm, Wt.20.2g 3493 sf3080 (A6c1; 12th century) (P6) (*Fig.808*)

6566 Frament only. Shallow cylindrical; top and bottom decorated with fields of parallel incised lines. Chalk, white, very fine-grained; Chalk Group. D.36.9, T.12.1mm, Wt.[11.6, est.23]g u/s sf2368 (*Fig.808*)

Form B/C

6567 Fragment only. Faceted, sub-spherical shape, with incised decoration of zones of dots, diamonds, zig-zags and cross-hatching; appears to have been re-used, as second hole has been drilled crossways to first. Chalk, white, very fine-grained; Chalk Group. L.26.2, T.18.8mm, Wt.[5.4, est.16]g 3543 sf3339 (P5Cr) (*Fig.808*)

Form C

6568 Fragment only, decorated with incised ring-and-dot, arranged irregularly over surface. Chalk, white, very fine-grained; Chalk Group. L.28.7, T.20.0mm, Wt.[7.3, est.22]g 5975 sf3209 (C6c6; early 12th century) (P6) (*Fig.808*)

6569 Flattened globular shape; undecorated; grey-brown surface discoloration. Chalk, greyish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.32.6, T.19.5, Hole D.10.0mm, Wt.24.7g 5484 sf1720 (C6e1, D6a16; 12th/13th century) (P6) (*Fig.807*)

6570 Incomplete. Shallow, rounded biconical shape; lathe marks. Chalk, brownish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.35.9, T.17.4mm, Wt.[18.1, est.24]g 5442 sf2268 (C6e5; 12th/13th century) (P6) (*Fig.807*)

6571 Globular shape, decorated with three encircling bands of red paint and incised zig-zags between painted bands; central hole has been drilled and then re-drilled. Limestone, pale grey, fine-grained, substantially dolomitic; probably Lower Magnesian Limestone but could be Upper Magnesian Limestone. D.27.1, T.20.0, Hole D.9.6mm, Wt.18.2g 12496 sf3197 (D6a24; 12th/13th century) (P6) (*Fig.808*)

6572 Almost complete. Rounded biconical shape; decorated with incised grid-lines. Chalk, brownish white, fine-grained, with some ?microbioclastic grains; Chalk Group, probably Ferriby Chalk Formation. D.34.7, T.25.1, Hole D.11.2mm, Wt.32.2g 13902 sf4884 (B6c3; 12th/13th century) (P6) (*Fig.807*)

6573 Spherical; lathe marks. Chalk, brownish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.28.0, T.24.7, Hole D.10.2mm, Wt.23.3g 13902 sf5114 (B6c3; 12th/13th century) (P6) (*Fig.807*)

6574 Rounded biconical; encircling incised lines, probably lathe marks. Chalk, greyish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.32.1, T.20.1, Hole D.9.6mm, Wt.23.2g 4620 sf1268 (C6e9; 13th century) (P6) (*Fig.807*)

6575 Flattened globular shape; undecorated. Chalk, greyish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.28.6, T.14.4, Hole D.9.0mm, Wt.15.4g. 9224 sf3003 (C6e9; 13th century) (P6) (*Fig.807*)

6576 Fragment only. Globular shape; decorated with incised lines arranged in five encircling bands of ladder design. Chalk, white with grey (?burnt) patches, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. L.30.0, T.22.2mm, Wt.[14.0, est.28]g 9224 sf1331 (C6e9; late 13th century) (P6) (*Fig.808*)

6577 Globular shape; lathe marks. Chalk, greyish white, fine-grained; Chalk Group, possibly Ferriby Chalk Formation. D.29.5, T.20.4, Hole D.9.8mm, Wt.22.0g 3258 sf1418 (A6g1; 13th/14th century) (P6) (*Fig.807*)

Undetermined form

6578 Fragment only. Shallow cylindrical shape with incised zig-zag top and bottom. Chalk, white, very fine-grained; Chalk Group. D.29.2, T.10.0mm, Wt.[4.8, est.10]g u/s sf12944 (*Fig.808*)

Slick-stones

Catalogue by P. Walton Rogers

Material identification by G.D. Gaunt

6579 Naturally formed, flat, almost round pebble, with area of artificial polish on one face, towards outer edge. Sandstone, fine–medium-grained. D.64–73, T.20mm 28239 sf10185 (P3) (*Fig.827*)

6580 Fragment of naturally glossy black stone, of irregular shape. Fine back-and-forth scratches on two faces. Possibly indurated mudstone or siltstone, or volcanic rock. L.53, W.21, T.21mm 31072 sf11010 (P3) (*Figs.827–8*)

6581 Possible slick-stone. Fragment of naturally glossy black stone, similar to sf11010. L.56, W.43, T.20mm 31161 sf11072 (P4A) (*Fig.827*)

Fired clay

Spindle whorls

Catalogue by P. Walton Rogers
Material identification by G.D. Gaunt

Form A/B

6582 Irregular, shallow cylindrical; one face slightly rounded; undecorated; form B (or A1). Fired clay, sandy, with abundant small quartz grains, few small mica grains, few small voids, few fragments ?coal (or charcoal) and few small plant fragments. D.32.0, T.11.0, Hole D.8.2mm, Wt.12.3g 21075 sf7025 (P5Cr) (*Fig.809*)

Form B

6583 Cylindrical with rounded sides; undecorated. Fired clay, very sandy and with voids. D.41.2, T.17.0, Hole D.10.9mm, Wt.32.8g 9252 sf1097 (D6e1; 13th century) (P6) (*Fig.809*)

6584 Irregular, shallow cylindrical (or thick disc); undecorated. Fired clay, sandy. D.38.1, T.10.2, Hole D.10.9mm, Wt.16.6g 4620 sf1137 (C6e9; 13th century) (P6)

Loomweights

Catalogue by P. Walton Rogers

Note: All loomweights are made from baked/fired brick clay, and they are all circular, i.e. bun-shaped, annular or intermediate between the two

Abbreviations for loomweight measurements:

D. = diameter of whole object, as viewed from above; T. = thickness of ring, as viewed from above; H. = depth of ring, as viewed from side; L. and W. represent incomplete dimensions. Estimated weights are probably correct to within 20g for smaller loomweights and to within 50g for larger loomweights

6585 Two fragments conjoining; bun-shaped, D-section. Central hole larger on one side than other. D.100, T.35, H.40mm, Larger fragment: Wt.166g (est. original Wt.320g) 20459 sf7000/7003 (P4B) (*Fig.813*)

6586 Fragment, intermediate between bun-shaped and annular. D-section. L.90, T.36, H.48mm, Wt.154g (est. original Wt.500–550g) 19644 sf12676 (P4B) (*Fig.813*)

6587 Bun-shaped, but irregular; D-section. Hole off-centre. Worn groove from attachment cord. D.84–90mm, T.31–35, H.40–45mm, Wt.335g, Central hole D.21mm 24500 sf8291 (P4B) (*Fig.813*)

6588 Almost complete, intermediate between bun-shaped and annular; rounded section. Four impressed circular marks on one face. D.110, T.39, H.30–37mm, Wt.287g (est. original Wt.330–340g), Central hole D.35mm 20387 sf6723 (P5B) (*Fig.813*)

6589 Fragment, wedge-shaped cross-section with internal lip. Prick-marks in form of angular B on one face. L.75, T.31, H.32mm, Wt.73g (est. original Wt.300g) 9070 sf958 (D6e7; 13th/14th century) (P6) (*Fig.813*)

Pottery

Spindle whorls

Catalogue by P. Walton Rogers
Fabric identification by B. Hartley

Note: All spindle whorls are cut to disc shape and central hole cut or drilled; L. and W. measurements are incomplete dimensions

6590 Thick sherd of samian ware; East Gaulish, second half of 2nd century. D.38.5, T.9.4, Hole D.5.1mm, Wt.9.0g 31745 sf12247 (P1) (*Fig.809*)

6591 Foot-ring and base from beaker of dark grey fabric; broken edges rubbed smooth; mid 3rd century or later. D.46.0, T.9.3–10.8, Hole D.9.4mm, Wt.27.8g 22560 sf7861 (P4B) (*Fig.809*)

Glass

Slick-stones

Catalogue by P. Walton Rogers
XRF analyses by C. Mortimer, Ancient Monuments Laboratory (English Heritage)

Note: The terms used to describe glass slick-stones are as follows: 'front' = smooth working face; 'back' = face with manufacturing scar, covered by hand when in use; 'side' = outer edge of slick-stone; 'marbled' = smooth, mottled surface, well-preserved; 'milky weathering' = off-white patches on surface

6592 Fragment, roughly one-quarter, bun-shaped. Includes curved side and concave back with part of manufacturing scar. Pale transparent green with iridescent surfaces; opaque green-white impurities towards centre. Original diameter probably 80–90mm. XRF surface analysis showed no detectable lead. L.58, W.43, T.41mm 22789 sf7990 (P4B) (*Figs.826–7*)

6593 Fragment, bun-shaped. Black; original front surface dull, with fine criss-cross scratches;

fracture surfaces highly reflective; well preserved. XRF surface analysis indicates high-lead glass. L.59, W.43, T.26mm 34663 sf13121 (P4B) (*Figs.826–7*)

6594 Fragment, roughly half, bun-shaped, including curved side and flat back face with part of manufacturing scar. Irregular front face. Marbled brown-black with patches of milky weathering. Original diameter c.80mm. L.76, W.39, T.38mm 22962 sf8177 (P4B) (*Figs.826–7*)

6595 Fragment, more than half, of slightly domed slick-stone. Includes manufacturing scar on back and domed front face. Crescent-shaped marks in front surface. Black with milky weathering crust. L.67, W.49, T.38, Est. original D.70–75mm 13465 sf3672 (B6c1; 12th/13th century) (P6) (*Figs.826–7*)

6596 Fragment of bun-shaped slick-stone, including curved side and flat front face. Black with milky streaks. Original diameter c.80–90mm. L.44, W.23, T.25mm 13466 sf3510 (B6c3; 12th/13th century) (P6) (*Figs.826–7*)

6597 Fragment, roughly one-third, bun-shaped. Manufacturing scar on back; on front fine scratch lines radiating from centre. Marbled brown-black, decaying to brown crystalline. L.61, W.29, T.23mm 12843 sf3687 (D6a23; 12th/13th century) (P6) (*Figs.827–8*)

Iron

Wool-combs

Catalogue by P. Ottaway

2272 Incomplete binding sheet from wool-comb. There are eight rectangular holes punched through it from either side. L.51, W.39; Holes: W.4mm 8530 sf2322 (P5B) (*Fig.795*) (See also *AY* 17/6)

2273 Two pieces of the head of a wool-comb in a somewhat fragmentary condition: a) a piece of iron sheet which was originally wrapped around a wooden board and secured by two iron nails; eight iron teeth project from one side of it in two rows; the teeth are rounded or rounded rectangular in cross-section and have stepped heads. Spikes: L. c.105; Nails: L.16 and 24mm; b) a piece of iron sheet originally wrapped around the wooden board fixed by a nail; two teeth project from it but partial holes in the sheet provide evidence for seven more in the same row. Approx. size of head: L.170, W.46, T.23mm. Two other teeth belong to the comb but are now detached; they are rounded rectangular in cross-section and have stepped heads. L.105, T.5mm 29263 sf10786 (P5B) (*Figs.795, 800*) (See also *AY* 17/6)

Fibre-processing spikes

Catalogued by P. Ottaway

The Anglo-Scandinavian spikes appear in *AY* 17/6 under comb teeth

2278 Rounded cross-section. L.79, T.5mm 25990 sf10685 (P3) (*Fig.801*) (See also *AY* 17/6)

2281 Rounded cross-section; stepped head. L.111, T.5mm 30547 sf11775 (P3) (*Fig.800*) (See also *AY* 17/6)

2291 Rectangular cross-section; stepped head; lower part missing. L.98, T.7mm 32265 sf12900 (P3)

2293 Rectangular cross-section; stepped head. L.103, T.8mm 32675 sf15130 (P3)

2299 Rounded cross-section becoming rectangular towards tip; stepped head; tip missing. L.94, T.5mm 30153 sf10616 (P4A) (*Fig.800*) (See also *AY* 17/6)

2301 Rectangular cross-section. L.70, T.4.5mm 25994 sf10238 (P4A) (*Fig.801*) (See also *AY* 17/6)

2307 Rounded cross-section; flattened towards head which is stepped. L.81, T.5mm 20618 sf8397 (P4B) (*Fig.801*) (See also *AY* 17/6)

2342 Rounded cross-section; stepped head. L.103, T.5mm 22087 sf7262 (P5A) (*Fig.800*) (See also *AY* 17/6)

2343 Rounded cross-section; stepped head. L.97, T.6mm 22368 sf7904 (P5A) (*Fig.800*) (See also *AY* 17/6)

2358 Rounded cross-section; stepped head with wood remains around it. L.99, T.7mm 7262 sf1032 (P5B) (*Fig.800*) (See also *AY* 17/6)

2364 Rounded cross-section; stepped head. L.71, T.6mm 6347 sf5417 (P5B) (*Fig.801*) (See also *AY* 17/6)

2415 Rectangular cross-section; head badly corroded but was probably stepped. L. c.93mm 21653 sf9342 (P5B) (*Fig.801*) (See also *AY* 17/6)

2416 Rectangular cross-section; stepped head. L.94, T.5mm 29263 sf10563 (P5B) (*Fig.801*) (See also *AY* 17/6)

2421 Rectangular cross-section; head badly corroded. L.81, T.7mm 29263 sf11056 (P5B) (*Fig.801*) (See also *AY* 17/6)

2433 Rounded cross-section; head missing. L.71, T.5mm 3625 sf9866 (P4/5) (*Fig.801*) (See also *AY* 17/6)

6598 Rounded cross-section, stepped head. L.137, W.5mm 18331 sf4854 (B6a5, C6c3; 11th/12th century) (P6) (*Fig.802*)

6599 Rounded cross-section, stepped head. L.180, W.6mm 9330 sf1861 (D6a25–26; 12th/13th century) (P6) (*Fig.802*)

6600 Rounded cross-section, flattened head. L.142, W.7mm 11507 sf2754 (B6c6; 12th/13th century) (P6) (*Fig.802*)

6601 Sub-rectangular cross-section. Immediately below the head there is a fragment of binding plate around it. L.99, W.7mm 11726 sf3448 (B6c1; 12th/13th century) (P6) (*Fig.800*)

6602 Rounded cross-section. L.164, W.7mm 15040 sf3751 (B6c5; 12th/13th century) (P6) (*Fig.802*)

6603 Rounded cross-section. L.131, W.5mm 9248 sf1072 (D6c1; early 13th century) (P6) (*Fig.802*)

6604 Rounded cross-section. L.145, W.6mm 9122 sf1045 (D6e1; 13th century) (P6) (*Fig.802*)

6605 Rounded cross-section. L.166, W.6mm 4620 sf1194 (C6e9; 13th century) (P6) (*Fig.802*)

6606 Rounded cross-section, upper 22mm slightly flattened. L.186, W.8mm 9224 sf1322 (C6e9; 13th century) (P6) (*Fig.802*)

6607 Rounded cross-section, stepped head. L.181, W.8mm 9224 sf1410 (C6e9; 13th century) (P6) (*Fig.802*)

Toothed weft-beater blade

Catalogue by P. Ottaway

6608 Exists as a plate which widens slightly from one side to the other, the latter is serrated with teeth c.2mm long, c.5 per cm. Traces of plating show all over one face and in a band 13mm wide along the serrated side on the other. L.175, W.40, T.2mm 3407 sf2593 (A6e1; early 13th century) (P6) (*Fig.819*)

Tenterhooks

Catalogue by P. Ottaway

6609 Flattened at corner. Arms: L.51 and 29, W.13, T.6mm 12368 sf3188 (D6e3; 13th/14th century) (P6)

6610 One arm incomplete, flattened at corner. Arms: L.19 and 23, T.2mm 9058 sf884 (D6e8; 13th/14th century) (P6) (*Fig.825*)

6611 Arms: L.38 and 13, T.4mm 12147 sf2892 (D6e7; early 14th century) (P6)

6612 Arms: L.33 and 17, T.5mm 3083 sf15232 (A6i2; 14th/15th century) (P6)

Shearboard hook

Catalogue by P. Ottaway

See *AY* 17/6 under spirally twisted strips

3410 Spirally twisted strip, curved over at each end into two short tapering tips. L.120, T.3mm 31382 sf11341 (P3) (*Fig.825*) (See also *AY* 17/6)

Needles

Catalogue by P. Ottaway

2463 Y-eyed. L.41, W.2mm 3667 sf8910 (P3) (*Fig.830*) (See also *AY* 17/6)

2470 Y-eyed. L.35, W.1mm 32785 sf13659 (P3) (*Fig.830*) (See also *AY* 17/6)

2492 Head has round top; punched oval eye. L.59, W.3mm sf8446 (P4B) (*Fig.830*) (See also *AY* 17/6)

2505 Head has round top; punched oval eye. L.58, W.3.5mm 28967 sf12443 (P4B) (*Fig.830*) (See also *AY* 17/6)

2506 Head has round top; punched oval eye. L.44, W.2.5mm 32113 sf12590 (P4B) (*Fig.830*) (See also *AY* 17/6)

2513 Head has rounded top; punched oval eye. L.55, W.3mm 35117 sf13514 (P4B) (*Fig.830*) (See also *AY* 17/6)

2514 Head has rounded top; punched oval eye. L.49, W.3mm 35293 sf13765 (P4B) (*Fig.830*) (See also *AY* 17/6)

2524 Y-eyed. L.53, W.2.5mm 22867 sf8074 (P4B) (*Fig.830*) (See also *AY* 17/6)

2530 Y-eyed. L.63, W.4mm 22807 sf9247 (P4B) (*Fig.830*) (See also *AY* 17/6)

2535 Y-eyed; shank slightly curved. L.56, W.3mm 28962 sf12239 (P4B) (*Fig.830*) (See also *AY* 17/6)

2542 Y-eyed. L.54, W.2mm 35674 sf14160 (P4B) (*Fig.830*) (See also *AY* 17/6)

2559 Y-eyed. L.40, W.2mm 27493 sf9905 (P5A) (*Fig.830*) (See also *AY* 17/6)

2591 Y-eyed. L61, W.3mm 21962 sf10010 (P5B) (*Fig.830*) (See also *AY* 17/6)

6613 Punched eye, head incomplete. L.40, W.1mm 17322 sf4715 (C6c6; early 12th century) (P6) (*Fig.830*)

6614 Punched eye, head has rounded top. L.106, W.5mm 17627 sf5000 (C6c6; early 12th century) (P6) (*Fig.830*)

6615 Incomplete shank. L.16mm 18256 sf11421 (B6a7; early 12th century) (P6)

6616 Punched eye, head incomplete. L.115, W.3mm 16790 sf4417 (C6d14; late 12th century) (P6)

6617 Punched eye, head has flattened triangular top, tip missing. L.109, W.4mm 9224 sf1367 (C6e9; 13th century) (P6) (*Fig.830*)

6618 Punched eye, head has a rounded top. L.31, W.3mm 18172 sf4806 (B6c1; 12th/13th century) (P6) (*Fig.830*)

6619 Head has rounded top. L.167, W.5mm 13690 sf3575 (B6c4; 12th/13th century) (P6)

Shears

Catalogue by P. Ottaway

2688 Stems rounded in cross-section and curve inwards slightly from the bow and from the blade tops; blade shoulders are slightly concave, backs are convex, cutting edges are straight. L.175; Blade: L.66, W.12; Stem: T.5; Bow: W.25, T.8mm 27486 sf9876 (P3) (*Fig.829*) (See also *AY* 17/6)

2689 One arm missing. Stem rounded in cross-section; blade shoulder stepped, back straight before curving inwards to tip, cutting edge roughly straight. L.188; Blade: L.85, W.17; Stem: T.6; Bow: W.30, T.12mm 30000 sf10258 (P4A) (*Fig.829*) (See also *AY* 17/6)

2690 One arm largely missing. Stem rounded in cross-section; blade shoulder has a double step, back straight before curving inwards to tip, cutting edge roughly straight. L.129; Blade: L.58, W.11; Stem: T.5; Bow: W.19, T.11mm 31434 sf11327 (P4B) (*Fig.829*) (See also *AY* 17/6)

2697 Blade. Shoulder form indeterminate owing to corrosion, back slightly convex, cutting edge curves outwards towards tip which is missing. L.136, W.19, T.5mm 18962 sf5824 (5B)

6620 Blade and stub of stem. Blade bent at 90° near tip. Shoulder roughly concave; back slightly convex to a point c.22mm from the tip and then slopes inwards to it. Tip rounded. L.138; Blade: L.125, W.26mm 5415 sf1616 (C6c6, D6a7; middle 12th century) (P6)

6621 Bow looped. Stems have a rounded cross-section. Blade shoulders have a U-shaped notch in the centre; backs slightly convex, cutting edges straight. X-radiograph shows a butt-weld between back and cutting edge on one blade. L.158; Bow: W.35; Stem: W.6; Blades: L.75, W.16mm 9224 sf1387 (C6e9; 13th century) (P6) (*Fig.829*)

6622 In two pieces and badly corroded. Bow looped and has a flattened triangular cross-section. Stems have a rounded cross-section. Blade shoulders concave with an additional cusp. Neither blade is complete, but the back of one appears to be straight before curving in at the tip. L.80; Bow: W.17, T.7; Stem: W.4; Blade: L.35, W.35mm 10394 sf2603 (C6g13; 15th century) (P6) (*Fig.829*)

Tweezers

Catalogue by P. Ottaway

2702 Arms are flat strips which narrow to pointed tips, riveted and crudely welded together at the head; a flattened possibly bowl-like feature then develops but is incomplete. L.160, W. (across arms) 9; Arms: L.120, W.13, T.2; 'Bowl': L. c.17, W.27mm 27291 sf9842 (P4A) (*Fig.825*) (See also *AY* 17/6)

Copper alloy

Needles

Catalogue by Dr C. Caple, Durham University

Analysis of *6625* by Dr J. Bayley, Ancient Monuments Laboratory (English Heritage)

6623 Virturally complete. Large heavy rod, probably cast with a circular hole drilled through the upper part of the shaft as the eye. Shaft has oval section, flares near the point to form a rectangular section leaf shape. L.93.5, D.3.0mm 30352 sf11553 (P4A)

6624 Virtually complete. Grooves punched in the front and back of the upper shaft forming a long narrow eye. The top of the shaft is flattened, oval section. L.41mm; Section: D.0.8–1.0mm 19390 sf8751 (P4B) (*Fig.830*)

6625 Circular punched or drilled eye. Shaft has sub-rounded section tapering to tip. Brass (i.e. copper-zinc alloy) with a trace of lead. D.1.7, L.54.3mm 24119 sf8119 (P4B) (*Fig.830*)

6626 Small, made from narrow-gauge wire, eye is a small circular hole, drilled? through the shaft. Circular section. D.0.8, L.27mm 9305 sf1678 (D6a24; 12th/13th century) (P6) (*Fig.830*)

6627 Small, made from narrow-gauge wire. Eye is a small circular hole, drilled? through the shaft. Top of shaft is rounded, circular section. D.0.8, L.28.0mm 5484 sf1739 (C6e1, D6a16; 12th/13th century) (P6) (*Fig.830*)

6628 Upper shaft flattened and widened with a large circular eye. Possibly cast into this shape. Shaft top pointed, sub-rounded section. D.2.2, L.80.5mm 5484 sf2030 (C6e1, D6a16; 12th/13th century) (P6) (*Fig.830*)

6629 Upper shaft flattened and widened, oval-shaped eye punched or drilled through. Rounded top to shaft, sub-rounded section, tapering. D.2.0, L.65mm 5348 sf1944 (C6e1, D6a16; 12th/13th century) (P6) (*Fig.830*)

6630 Grooves punched in the front and back of the upper shaft forming a long narrow eye. Shaft top flat, circular section. D.0.9, L.51mm 5064 sf933 (C6e9; mid 13th century) (P6) (*Fig.830*)

6631 Grooves punched on front and back of the upper shaft forming long narrow eye. Shaft top flat, circular section. D.2.0, L.86mm 9057 sf901 (C6e11, D6e3; mid 13th century) (P6) (*Fig.830*)

6632 Incomplete, top broken off through eye. Probably had grooves punched in the front and back of the shaft forming a long narrow eye. The upper shaft has an oval section, the lower part of the shaft is triangular in section. D.2.5, L.104.0mm 10333 sf2554 (B6g13, C6g15; 16th century) (P6) (*Fig.830*)

6633 Incomplete, top broken off through the eye. Originally the top flattened with grooves punched into the front and back to form a long narrow eye. Shaft section circular. D.0.8, L.38mm u/s sf6941 (*Fig.830*)

Netting needle

6634 Drawn wire, split at either end. Shaft is circular in cross-section, split ends are hemispherical in cross-section. D.1.0,

L.111mm 10464, sf2575 (C6g7; 14th/15th century) (P6) (*Fig.836*)

Lead alloy

Spindle whorls

Catalogue by P. Walton Rogers and A.D. Hooley

Form A

6635 Tapering hemispherical, with concave upper face. Cast, with former for spindle hole. Vertical and horizontal scratches on sides. D.25.0, T.14.1, Hole D.8.4mm, Wt.39.5g 22523 sf7762 (P4B) (*Fig.809*)

6636 Conical. Cast, with former for spindle hole. Spindle hole faceted and tapering. Form A1. D.20.6, T.15.0, Hole D.5.6–6.8mm, Wt.27.0g 28236 sf10847 (P4B)

6637 Failed casting for spindle whorl. Irregular flattened hemispherical shape; spindle hole does not penetrate full depth. Form A1. D.18.2–21.0, T.7.7, Wt.14.9g u/s sf9052

Form B

6638 Cylindrical with rounded sides ('doughnut'). Cast, probably with former for spindle hole. D.24.3, T.11.0, Hole D.8.8mm, Wt.42.1g 35137 sf13738 (P4B) (*Fig.809*)

6639 Thick disc or shallow cylindrical. Cast, with former for spindle hole. D.27.5, T.18.6, Hole D.8.0mm, Wt.44.5g 22867 sf8070 (P4B) (*Fig.809*)

6640 Disc-shaped. Cast, spindle hole gouged. Form ?B. D.16.6–17.3, T.3.6, Hole D.5.5mm, Wt.6.2g 23557 sf7687 (P4B)

Wood

Catalogue by C. Morris

Species identification by A.R. Hall

Ripple

6641 Pine, radially split board; thick, rounded rectangular shaft, possibly broken; functional end expands from shaft to five pointed teeth 56mm long, one tip broken; teeth taper to point in cross-section. L.142, W.75, T.21mm 12159 sf2805 (C6e9; mid 13th century) (P6) (*Fig.798*)

Flax pounders

6642 Willow, carved roundwood; cylindrical head with circular cross-section; fragment of all-in-one? handle projecting from centre of one end of head. L.99, D.51mm 21512 sf9057 (P5B) (*Fig.798*)

6643 Alder, carved roundwood; small roughly cylindrical head with subcircular cross-section; all-in-one handle projects from side of one end of head. L.188, D.59 × 55mm 20191 sf6282 (P5Cr) (*Fig.798*)

Scutching knife

6644 Oak, rounded, wide flat blade; shoulders originally perpendicular to handle, one very worn; all-in-one flat rectangular handle, now broken, with unknown length missing; end of handle survives. L.243, W.92, T.9mm 8750 sf1901 (P5B) (*Fig.798*)

Distaff

6645 Elder, square cross-section rod tapering in both directions from maximum width; one end pointed; other end broken; edges are compressed in places as if bound. L.334, W.12, T.12mm 36241 sf13808 (P4B) (*Fig.804*)

Spindles

6646 Oak spindle fragment; double-ended; both ends broken; tapers in both directions from maximum diameter; made from split section, not roundwood. L.82mm, D.14mm 31101 sf11021 (P3) (*Fig.804*)

6647 Oak, charred spindle fragment; probably double-ended; circular cross-section; originally rounded pointed end, broken at tip; neatly incised slit 4mm deep 20mm from original end. L.30mm, D.10mm 1363 sf1627 (P4B) (*Fig.804*)

6648 Ash spindle, five fragments; made from radially split section; double-ended; circular cross-section; tapers in both directions from approximately central maximum diameter to flat blunt ends. L.201mm, D.14mm 21886 sf9827/sf9834 (P5B) (*Fig.804*)

6649 Rosaceae lathe-turned spindle; double-ended; lower end has rounded point with incised slit 10mm from tip; other end broken with trace of V-sectioned notch cut into side; tapers in both directions from maximum diameter 2/5 of way down length; three pairs of decorative grooves. L.172, D.10mm 15026 sf3702 (B6c8; 12th/13th century) (P6) (*Fig.804*)

Drive-whorl

6650 Poplar?/alder lathe-turned drive-whorl for spindle wheel, spindle-turned; circular cross-section; augered hole 11mm diameter through central axis; three deeply turned grooves; broken. L.31, D.32mm 10033 sf2440 (D6k1; 17th century) (P6)

Weft-bobbins

6651 Yew, lathe-turned, circular cross-section; flat head end with rebate 2mm deep; waisted; tapers to rounded point. L.94mm, D.13mm. 21845 sf9786 (P5B) (*Fig.818*)

6652 Elm, broken, carved cylindrical head with incised cross on side; rebate 2mm deep; second cylindrical section below rebate; shaft below this is circular in cross-section but broken. L.35, D.15mm 8132 sf1034 (P5B) (*Fig.818*)

Toothed weft-beater blade

6653 Oak, serrated, broken in two fragments across central circular shafthole(?) D.10mm; originally 11 pointed teeth W.12mm, now worn and broken. L.171, W.45, T.5mm 12018 sf2798 (D6e9; 13th/14th century) (P6) (*Fig.819*)

Heddle cradle

6654 Oak, rectangular; rounded projection from centre of one long side; perforated by 3 circular holes 10mm diameter, one at each end and other below projection; latter hole is worn on upper edge and one of others is broken. L.219, W.55, T.14mm. 13147 sf3509 (B6u1; later 11th–early 13th century) (P6) (*Fig.822*)

Heddle rod

6655 Alder roundwood, circular cross-section; symmetrical; at each end, flat cylindrical knob separated from rod by deep v-sectioned groove; one knob missing; shallower groove 63mm inside deep groove at each end. L.429, D.20mm. 15026 sf3719 (B6c8; 12th/13th century) (P6) (*Fig.822*)

Bale pins

6656 Elder; incomplete with broken point, tapering straight shaft; made from split billets not roundwood; approximately circular cross-section; whittled. L.150, D.7mm 13902 sf5174 (B6c3; 12th/13th century) (P6) (*Fig.793*)

6657 Yew; complete, tapering straight shaft; made from split billets not roundwood; approximately circular cross-section; whittled. L.134, D.5mm 12125 sf2796 (D6e7; 13th/14th century) (P6) (*Fig.793*)

6658 Yew; complete, tapering straight shaft; made from split billets not roundwood; approximately circular cross-section; whittled. L.125, D.6mm 12126 sf2830 (D6e9; 13th/14th century) (P6) (*Fig.793*)

6659 Yew; incomplete with no head but rectangular shape, tapering straight shaft; made from split billets not roundwood; whittled. L.113, D.7mm 10511 sf2566 (C6g8; 14th/15th century) (P6) (*Fig.793*)

6660 Yew; incomplete with no head but rectangular shape, tapering straight shaft; made from split billets not roundwood; whittled. L.130, D.9mm 10557 sf2584 (C6g6; 14th/15th century) (P6) (*Fig.793*)

6661 Yew; complete, tapering straight shaft; made from split billets not roundwood; approximately circular cross-section; whittled. L.113, D.6mm 10093 sf2732 (D6m1; 14th/15th century) (P6) (*Fig.793*)

Bone

Spindle whorls

Catalogue by P. Walton Rogers

Material identification by T.P. O'Connor

6662 Made from an unfused cattle femur caput, now separated into two pieces along fusion line; chopped during butchery and rough edges trimmed. Spindle hole drilled. D.41.8, T.23.4mm, Hole D.10.8mm 20749 sf7152 (P4B) (*Fig.809*)

6663 Made from an unfused cattle femur caput, rough edges trimmed; loss of surface, possibly due to being eaten by a dog after manufacture into a whorl. D.37.3, T.29.1, Hole D.10.7mm 22713, sf7881 (P4B)

6664 Two fragments only; made from an unfused cattle femur caput; probably surface eroded having been eaten by a dog. Spindle hole is slightly oblique. D.36.4, T.20.0mm 22713, sf7882 (P4B)

6665 Made from an unfused cattle left femur caput, chopped during butchery (several attempts), slight trimming of rough edges; tooth-marks; separated into two pieces along fusion line. Spindle hole drilled then trimmed at lower end. D.37.4, T.29.1, Hole D.10.4mm 22714, sf7901 (P4B) (*Fig.810*)

6666 Made from a cattle femur caput (fusing not visible), chopped during butchery, edges trimmed; bottom cut flat before hole cut. Spindle hole cut or drilled. D.43.6, T.20.7, Hole D.10.2mm 23648 sf7919 (P4B) (*Fig.809*)

6667 Fragment only, made from a ?cattle bone, possibly a section through the articular end of a long bone. Corners rounded and top, bottom and sides decorated with deeply incised lines around circumference. L.41.5, T.19.7mm 27513 sf10508 (P5B) (*Fig.809*)

6668 Fragment only, made from a section through the distal end of a cattle humerus. Spindle hole ?drilled. D.43.0, T.15.9mm 3403 sf1978 (A6c3; 12th century) (P6)

Pin-beaters

Catalogue by J. Parsons

Material identification by S. O'Connor

Type 1

6669 Flattened ovoid section, both ends are pointed; the body is decorated in the middle by a band of incised cross-hatched lines bounded on each side by a single incised circumferential line and polished by wear. D.10.1, L.108.0mm 30002 sf10306 (P4B) (*Fig.815*)

6670 Rough-out, of irregular section, both ends roughly cut to a point; the body faceted longitudinally. D.12.9, L.142.0mm 33114 sf12838 (P3) (*Fig.815*)

Type 2

6671 Flattened sub-rectangular section, one end pointed, the other end chisel-shaped with the upper edge cut away obliquely; the body is polished by wear with an area above the point considerably flattened by wear. L.109.3, W.12.3mm 20747 sf12698 (P4B) (*Fig.815*)

6672 Flattened sub-rectangular section, one end knife trimmed to a point, the other chisel-shaped with the upper edge concave; the body is polished by wear, with an area above the point partially flattened by wear. L.118.8, W.13.3mm 32189 sf12745 (P4B) (*Fig.815*)

6673 Flat section, one end pointed, the other end cut square; the body polished by wear. D.10.3, L.118.3mm 1473 sf1174 (P5B) (*Fig.815*)

6674 Flattened ovoid section, one end pointed, the other expanded and notched on both edges to form a head which was worn flat from both faces; the body polished by wear. L.122.4, W.14.1mm 20345 sf6839 (P5B) (*Fig.815*)

6675 Probably made from cattle tibia or metatarsal, highly polished on both surfaces. Broken perforation at the blunt end. L.82.0, W.14.0, T.7.0mm 3493 sf3485 (A6c1; 12th century) (P6)

Type 3

6676 Rough-out, of irregular section, one end roughly cut to a point, the other cut square; the body faceted longitudinally D.16.2, L.168.0mm 22166, sf7456 (P5A) (*Fig.815*)

6677 Ovoid section, one end pointed, the other cut away obliquely; the body polished by wear. D.10.1, L.147.8mm 15131 sf4051 (P5B) (*Fig.815*)

6678 Ovoid section, one end pointed, the other slightly flattened and expanded with a convex upper end. There is a single drilled indentation on one face near the blunt end; the body polished by wear. D.10.1, L.167.0mm 5976 sf2958 (C6c6; early 12th century) (P6) (*Fig.815*)

Weaving tablet

Catalogue by J. Parsons

Material identification by S. O'Connor

6679 Rectangular flat plate, with a perforation at each rounded corner. There is a fragment broken away on one side. L.27.0, W.24.0mm 25340 sf8476 (P4B) (*Fig.834*)

Needles

Catalogue by J. Parsons

Material identification by S. O'Connor

6680 Upper end rounded with a perforation; shank of subcircular section which tapers to a point. D.5.4, L.73.6mm 26581 sf8845 (P3) (*Fig.831*)

6681 Similar to *6680*. D.6.3, L.82.6mm 19644 sf12499 (P4B) (*Fig.831*)

6682 Upper end slightly flattened with a perforation; the shank of sub-circular section which tapers to a point. D.6.8, L.71.7mm 19320 sf6910 (P5B) (*Fig.831*)

Needle-like objects

6683 Made from large long bone, species uncertain. Upper end triangular in shape with central perforation, sawn off and tapered. L.106.0, W.13.0, T.3.5mm 31061 sf11470 (P3) (*Fig.831*)

6684 Upper end slightly expanded with a perforation, the upper edge is rounded; the shank is of sub-circular section which tapers to a point. L.85.9, W.7.5mm 30352 sf11630 (P4A) (*Fig.831*)

6685 Upper end perforated and decorated around the circumference with cross-hatched single incised lines enclosed at both ends by a single incised line. There is also a circumferential incised line above the perforation. The shank of ovoid section tapers to a point. D.7.1, L.96.5mm 32189 sf12748 (P4B) (*Fig.831*)

6686 Upper end slightly flattened with a perforation; decorated below the perforation with transverse parallel incised lines; on the edge and above the perforation on one face there are oblique parallel incised lines, the other face with three transverse parallel incised lines above the perforation. Shank of oval section tapers to a point. D.6.8, L.96.9mm 25630 sf9318 (P4B) (*Fig.831*)

6687 Made from a long bone, of flattened ovoid section, one end pointed, the other cut obliquely from both edges and with a perforation; the body polished by wear L.132.3, W.12.9mm 2078 sf4853 (P5A)

6688 Flattened ovoid section, one end pointed, the other slightly flattened with a perfora-

tion; the body polished by wear. L.147.0, W.10.7mm 14704 sf5627 (P5B)

Thread reels

Catalogue by J. Parsons

Material identification by S. O'Connor

6689 Turned rod of circular section; both ends with moulded terminals decorated by bands around the circumference, one end with a small axial hole; the shaft expanded slightly near the middle. L.59.8, W.10.9mm 8700 sf1938 (P5B) (*Fig.833*)

6690 Turned rod of circular section, with an axial perforation its entire length. There are moulded terminals at both ends; the shaft is expanded in the middle and decorated with bands of incised lines around its circumference. D.9.6, L.57.3mm 9224 sf1336 (C6e9; 13th century) (P6) (*Fig.833*)

6691 Incomplete, with an axial perforation stopping short of one end, which is rounded and expands to form a finial, the other end is roughly broken away; the shaft is decorated around its circumference by bands of incised lines. D.7.9, L.56.5mm 11883 sf3077 (B6f3; early 14th century) (P6) (*Fig.833*)

Antler

Spindle whorls

Catalogue by P. Walton Rogers

Material identification by S. O'Connor

6692 Made from an antler pedicle; decorated on one face with circular zone of incised ring-and-dot pattern, and incised line around outer edge. D.43.4, T.10.8, Hole D.10.5mm 11304, sf2700 (B6c7; 12th/13th century) (P6) (*Fig.809*)

6693 Made from an antler pedicle; decorated on one face with circular zone of incised ring-and-dot pattern limited by inner and outer circles. D.32.0, T.10.5, Hole D.12.0mm 11789 sf3041 (B6c4; 12th/13th century) (P6) (*Fig.809*)

Pin-beaters

Catalogue by J. Parsons

Material identification by S. O'Connor

Type 2

6694 Flat section, one end pointed, the other end worn into a chisel shape; the body is decorated on both edges by single line diagonal crosses and is polished by wear. L.110.7, W.12.3mm 32742 sf13624 (P4B) (*Fig.815*)

Type 3

6695 Circular section, one end pointed, the other cut square; the body polished by wear. D.8.4, L.155.0mm 25860 sf9768 (P4B) (*Fig.815*)

Raw fibre and textiles

Catalogue by P. Walton Rogers

Fibre identification by P. Walton Rogers

Dye identification by G.W. Taylor

Wool fibres

1256 About 6g of matted dark brown fibres; dyed with madder. 26977 sf10156 (P3) (See also *AY* 17/5)

1283 Three staples, 8mm long, red. Medium fleece type; dyed with madder. 32570 pit fill, sf13405 (P4B) (See also *AY* 17/5)

1374 Single staple, 90mm long, Hairy fleece type. Fibre tips and roots present. 1473 sf407 (P5B) (*Fig.791*) (See also *AY* 17/5)

1376 Several mid brown staples, c.70mm long, Hairy Medium fleece type. Fibre roots present. 1473 sf417 (P5B) (*Fig.791*) (See also *AY* 17/5)

1377 Single staple, 30mm long, Generalised Medium fleece type. Fibre roots present. 1473 sf407 (P5B) (*Fig.791*) (See also *AY* 17/5)

1378 Dark brown wool staple, 50mm long with little or no crimp. Too decayed to identify fleece type; M.L. Ryder suggests Medium. 15530 sf4378 (P5B) (*Fig.791*) (See also *AY* 17/5)

Wool textile

1303 Fragment, 140 × 60mm, of 2/2 chevron twill, with dark combed warp and lighter non-combed weft, and selvedge. Wa/10–11/Z/0.7 × We/6–7/S1.1. Warp hairy fleece type, naturally pigmented, weft hairy medium fleece type, not pigmented. No dye detected. The softer weft has become heavily matted in places. The side of the fragment opposite the selvedge has been cut. There are two overstitiches, possibly part of a hem at right-angles to the selvedge: sewing yarn plied wool, S2Z, D.1.8mm 32725 sf13524 (P4B)

1309 Ankle sock worked from plied (S2Z) wool yarn in *nålebinding* technique. 260mm long from toe to heel; circumference at ankle 325mm and at broadest part of foot 270mm. A narrow band at the ankle has been dyed with madder; no dye detected in the rest of the sock. Remains of stitching in plied Z2S

wool yarn, 1.5mm diam., outlines a rectangular shape around the ball of the foot. 32725 sf13517 (P4B) (See also *AY* 17/5)

Linen textile

1336 Two fragments, 55 × 45mm and 55 × 35mm, of carbonised honeycomb weave, 15/Z/0.8 × 15/Z/0.8. Yarn smooth and even. Fibre, flax. One piece stitched to *1334* (*AY* 17/5). 19737 (4B) (for sf number see pp.350, 435–6, *AY* 17/5)

Silk textiles

1347 Off-cut, rectangle, 120 × 50mm, of brown tabby, with a selvedge on one side and three cut edges. Wa/24/Z/0.2 × We/34/I/0.4. Selvedge, 16mm wide, reinforced with, from outside edge, 17 paired, 1 single, 21 paired warp threads. Dyed with indigotin. 25270 (floor), sf8324 (P4B) (See also *AY* 17/5)

1372 Head-dress, 0.59 × 0.18m, golden brown tabby, Wa/24–25/Z/0.1–0.3 × We/19–20/I/0.35, with reinforced selvedge, 11mm wide, consisting of ?40 paired warp threads; hems. Not tested for dyes. Sewing thread, silk, S-twist, 0.4mm diam. 22976 pit fill, sf8129 (P5A) (See also *AY* 17/5)

Mixed fibre textiles

1340 Remains of a silk and linen tablet-woven braid. Eight loosely 3-plied yarns, S and Z twist, 1.47m long, tied together at one end with two knots. Irregularities in yarn, and black material between cords, indicate that this was originally a tablet-woven braid, approx. 5mm wide, worked on four-holed tablets, each tablet threaded with three silk and one ?plant fibre warp thread. Some yarns dyed with madder, others with madder plus ?indigotin. 35448 sf14025 (P4B) (*Fig.835*) (See also *AY* 17/5)

1422 A strip, 50mm long, 8mm wide, consisting of 16 parallel wool threads, S-spun, 0.8mm diam. These are crimped in such a way as to indicate that they were once part of tabby weave, ?weft-faced. No crossways threads are now visible apart from a few decayed plant fibres. Original thread-count probably 4 vegetable × 20 wool per cm. The wool yarn is dark brown but there is also a darker, almost black, thread of the same type found in association with the others. Dyed with madder and dark thread with indigotin. ?Tapestry. 10903 sf2677 (C6g14; 15th century: note revised date) (P6) (See also *AY* 17/5)

Gold

1410 Five short lengths of gold thread, 0.20–0.25mm diam. 21265 sf8489 (P5B) (See also *AY* 17/5)

Beeswax

6696 Spherical ball of yellow-orange wax, identified by Kenward and Hall as beeswax (*AY* 14/7, 608, 766). A shallow groove is visible in surface on one side (other apparent grooves proved to be folds in the wax). D.18–19mm 29263 sf15666 (5B)

Finds from The Watching Brief

Iron

Sword-beater

Catalogue by D. Tweddle

4419 Long tapering blade of flattened ovoid section; shallow shoulders at junction with socket. Socket split with remains of wooden handle (Pomoideae) still in position, held in place by a single nail. Broken into three pieces: 1 (socket and fragment of blade) L.202.4, W. (blade) 35.5, T. (blade) 5.8, D. (socket) 30.1, T. (metal of socket) 3mm; 2 (blade fragment) L.184, W.33.4, T. (blade) 5.7, T. (concretion) 19.2mm; 3 (blade tip) L.174.4, W.29.5, T. (blade) 4.5, T. (concretion) 9.8mm 1777 sf157 (P4B) (*Fig.814*) (See also *AY* 17/8)

Wood

Spindle

Catalogue by C. Morris

Species identification by A.R. Hall

6697 Yew; double-ended; made from split section; broken at both ends, but one end has traces of V-section notch cut into side; tapers in both directions away from maximum diameter. L.169mm, D.10mm u/s sf72 (*Fig.804*)

Concordance

The concordance is a period-by-period list of all the material on which this volume has been based. It includes cross-reference to the publications in which the reader will find catalogue entries and more detailed discussion of individual items. References to Microfiche page numbers are in bold type.

16–22 Coppergate

Period 1

Spinning

Potsherd spindle whorl, *6590*
Lead alloy spindle whorl, sf12475

Period 2

No textile-related artefacts

Period 3

Raw fibre

Raw wool, *1254–6* (*AY* 17/5, 308–11, 432)
Sheep parasites, *Melophagus ovinus* and/or *Damalinia ovis*, from contexts 20523, 27555, 27868, 28033, 28541, 28557, 31595, 32265, 34814 (*AY* 14/7, 775–7)
Flax, *Linum usitatissimum*, capsules from contexts 20523, 26715, 27194, 27868, 34815 (*AY* 14/7, 773)

Fibre processing

Iron spikes, *2274–83*, *2285–7*, *2289–93* (Note: *2284* recategorised as a wire and *2288* as a nail) (*AY* 17/6, 540–1, **2:B11–12**); and sfs13474, 15796

Spinning

Wooden spindle, *6646* (Morris *AY* 17/–)
Stone spindle whorls, sfs8645, 9078, 12008, 12706, 13202, 13640, 13905 (Mainman and Rogers *AY* 17/–)
Potsherd spindle whorls, sfs12361, 13436 (Mainman and Rogers *AY* 17/–)
Antler spindle whorl, sf13453 (MacGregor et al. *AY* 17/–)

Weaving

Baked clay loomweights, sfs11011, 12957, 13277, 14186, 14540 (Mainman and Rogers *AY* 17/–)
Bone pin-beater (rough-out), *6670* (MacGregor et al. *AY* 17/–)

Dyeing

Madder, *Rubia tinctorum* from contexts 19739, 20523, 25990, 26016, 27194, 27272, 27868, 28033, 30629, 30642, 30842, 30925, 30936, 33094, 34789, 34815, 34882
Woad, *Isatis tinctoria*, from contexts 26016 (pods), 26715 (pods), 34882 (vegetative fragments)

Stem fragments from dyer's greenweed, *Genista tinctoria*, from contexts 20523, 27272, 27868, 28033 (stem and pod), 30954
Clubmoss, *Diphasium complanatum*, from contexts 20523, 26016, 26715, 27194, 27272, 28033, 30710, 30826, 30954, 33094, 34789, 34814, 34815
Weld, *Reseda luteola*, from contexts 26476, 26732
Note: all published in *AY* 14/7, 515–16, 529, 767–73

Cloth finishing

Teasels, *Dipsacus sativus*, from contexts 26718, 26721 (*AY* 14/7, 516, 774–5)
Iron shearboard hook, *3410* (*AY* 17/6, 634–5, **2:E14**)
Stone slick-stones, *6579–80* (Mainman and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *2688* (*AY* 17/6, 548–50, **2:C5**)
Iron needles, *2459–72*, *2610–16* (*AY* 17/6, 542-8, **2:C1, 2:C4, 3:D2**)
Part-made iron needles, *2680–1* (*AY* 17/6, 542–8, **2:C5**)
Bone needle, *6680* (MacGregor et al. *AY* 17/–)
Bone and antler needle-like objects, *6683*, sfs9531, 13792, 14485 (MacGregor et al. *AY* 17/–)

Products

Wool textiles, *1257–68* (*AY* 17/5, 318–41, 432–3)
Wool cords, *1269–70* (*AY* 17/5, 392–4, 433)
Linen textiles, *1272–3* (*AY* 17/5, 345–9, 433)

Period 4A

Raw fibre

No raw wool (but some human hair and calf hair)
Sheep parasites, *Melophagus ovinus* and/or *Damalinia ovis*, from contexts 25996, 30039, 30192, 30194, 30352 (*AY* 14/7, 534, 775–7)
Flax capsules from contexts 25232, 25987, 27234, 30192, 30352 (*AY* 14/7, 773)

Fibre processing

Iron spikes, *2295–301* (*AY* 17/6, 540–1, **2:B12**)

Spinning

Stone spindle whorls, *6536*, sfs8833, 8877, 10600, 11034, 11475 (Mainman and Rogers *AY* 17/–)
Lead alloy spindle whorls, sfs10516, 11742 (Mainman and Rogers *AY* 17/–)
Antler spindle whorl, sf11321 (MacGregor et al. *AY* 17/–)

Weaving

Baked clay loomweight, sf8875 (Mainman and Rogers *AY* 17/–)
Bone pin-beater, sf9918 (MacGregor et al. *AY* 17/–)

Dyeing

Madder, *Rubia tinctorum*, from contexts 25232, 25987, 27943, 30039, 30194, 30352, 31167
Woad, *Isatis tinctoria*, pods from context 30192
Dyer's greenweed, *Genista tinctoria*, stem fragments from contexts 25987, 27943, 30192, 30194, 30352

Clubmoss, *Diphasium complanatum*, from contexts 25232, 25987, 26635, 27943, 30192, 30194, 30352
Weld, *Reseda luteola*, from contexts 25232, 27234, 31315
Note: all published in *AY* 14/7, 535, 537, 767–73

Cloth finishing

Stone slick-stones, *6581* (Mainman and Rogers *AY* 17/–)
Glass slick-stones, sfs11035, 13666 (Mainman and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *2689* (*AY* 17/6, 548–50, **2:C5–6**)
Iron needles, *2473–9*, *2618–19* (*AY* 17/6, 542–8, **2:C1–2, 2:C4**)
Copper alloy needles, *6623*, sf10521 (Mainman and Rogers *AY* 17/–)
Bone needle-like objects, *6684*, sf8980 (MacGregor et al. *AY* 17/–)

Products

Wool cords, *1274–6* (*AY* 17/5, 392–4, 433–4)
Linen textile, *1279* (*AY* 17/5, 345–59, 434)
Silk yarn, *1280* (*AY* 17/5, 345–59, 434)
Silk textiles, *1281–2* (*AY* 17/5, 345–59, 434)

Period 4B

Raw fibre

Raw wool, *1283–94* (*AY* 17/5, 308–11, 434)
Horse-tail hair, *1316* (*AY* 17/5, 311, 435)
Sheep parasites, *Melophagus ovinus* and/or *Damalinia ovis*, from contexts 8856, 15636, 15685, 15686, 15712, 15891, 15897, 1962619738, 20799, 20982, 22259, 22420, 22421, 22444, 22452, 22462, 22490, 22523, 22524, 22574, 22636, 22655, 22659, 22670, 22679, 22713, 22746, 22747, 22748, 22808, 22859, 22868, 22890, 22896, 22943, 22983, 23066, 23093, 23095, 23163, 23200, 23248, 23267, 23288, 23307, 23341, 23346, 23350, 23437, 23455, 23531, 23603, 23720, 23749, 23908, 24561, 25065, 25084, 25103, 25104, 25110, 25257, 25285, 25371, 25391, 25500, 25598, 25923, 26012, 26249, 26256, 27017, 27018, 27203, 27852, 29736, 32185, 34284, 34289, 34290, 34397, 34412 (*AY* 14/7, 549, 726, 775–7)
Flax, *Linum ustitatissimum*, capsules from contexts 21457, 22462, 22524, 22983, 23163, 23248, 23341, 23350, 23437, 23455, 23749, 23843, 25881, 26249, 26949, 26957, 27203, 27503, 34289, 34412, 34413, and stems from context 32185 (fill of pit 32190) (*AY* 14/7, 562–3, 773)

Fibre preparation

Iron spikes, *2302–41* (*AY* 17/6, 540–1, **2:B12–13**)

Spinning

Wooden distaff, *6645* (Morris *AY* 17/–)
Wooden spindle, *6647* (Morris *AY* 17/–)
Stone spindle whorls, *6537–42*, *6545–7*, *6552–6*, sfs7553, 7619, 7738, 7785, 7942, 7950, 7988, 8023, 8085, 8329, 8449, 8484, 8586, 9059, 9153, 9510, 9514, 9654, 9784, 10037/10054, 10401, 12368, 13950, 13977 (Mainman and Rogers *AY* 17/–)
Bone spindle whorls, *6662–6*, sfs7690, 7786, 7805, 7852, 8036, 8175, 8371, 8501, 8588, 9529, 13105, 13529 (MacGregor et al. *AY* 17/–)
Antler spindle whorl, sf12540 (MacGregor et al. *AY* 17/–)

Lead alloy spindle whorls, *6635–6, 6639–40*, sfs7873, 8048, 8406, 8485, 8585, 13738 (Mainman and Rogers *AY* 17/–)
Potsherd spindle whorls, *6591*, sf9223 (Mainman and Rogers *AY* 17/–)
Wool yarn, *1310–11* (*AY* 17/5, 435)

Weaving

Baked clay loomweights, *6585–7*, sfs7092, 7796, 8215, 10026, 12781, 12782, 13174, 14541 (Mainman and Rogers *AY* 17/–)
Bone pin-beaters, *6669, 6671–2*, sfs10047, 13118, 14100 (MacGregor et al. *AY* 17/–)
Antler pin-beaters, *6694–5* (MacGregor et al. *AY* 17/–)

Dyeing

Madder, *Rubia tinctorum*, from contexts 15650, 15686, 15708, 15761, 15897, 18529, 19626, 19738, 20982, 21451, 21457, 22259, 22391, 22420, 22421, 22444, 22452, 22462, 22490, 22523, 22524, 22574, 22595, 22636, 22655, 22659, 22670, 22679, 22713, 22745, 22746, 22748, 22767, 22785, 22797, 22808, 22859, 22868, 22890, 22893, 22896, 22909, 22943, 22958, 23062, 23066, 23093, 23163, 23200, 23248, 23267, 23288, 23307, 23341, 23346, 23350, 23437, 23455, 23531, 23603, 23720, 23749, 23753, 23843, 24064, 25065, 25065, 25084, 25103, 25104, 25110, 25257, 25285, 25340, 25371, 25380, 25391, 25466, 25500, 25598, 25748, 25750, 25923, 25934, 26012, 26949, 26957, 27017, 27203, 27503, 27504, 28987, 29222, 29528, 29736, 29835, 29844, 31424, 32026, 32185, 32243, 32252, 32725, 34289, 34290, 34291, 34292, 34377, 34412, 34413, 34424, 34483, 35086, 35323, 35519, 35673, 35674, 35675, 35677, 35678, 35679
Woad, *Isatis tinctoria*, pods from contexts 15708, 15761, 15897, 19626, 19738, 22524, 22574, 22745, 22746, 22808, 22868 (pod and vegetative fragments), 23753, 25065, 25084, 25104, 25285, 25371, 25500, 25750, 26249, 26992, 27503, 27504, 28987, 32243 (pod and vegetative fragments), 34292, 34413, 34424
Stem fragments from dyer's greenweed, *Genista tinctoria*, from contexts 15650, 15686, 15708, 15761, 15897, 18529, 19626, 19738, 20982, 22259, 22391, 22420, 22421, 22444, 22462, 22523, 22524, 22574, 22655, 22659, 22713, 22767, 22797, 22808, 22868, 22893, 22896, 22909, 22943, 22958, 23062, 23066, 23093, 23163, 23200, 23248, 23267, 23288, 23307, 23341, 23346, 23350, 23437, 23455, 23531, 23603, 23720, 23749, 23753, 23843, 24064, 25065, 25084, 25104, 25110, 25257, 25285, 25340, 25371, 25380, 25391, 25598, 25748, 25750, 25934, 26012, 26949, 26957, 27017, 27503, 27504, 28987, 29222, 29736, 29835, 29844, 31424, 32185, 32189, 32243, 32252, 32725, 34289, 34290, 34292, 34412, 34413, 34483, 35086, 35323, 35519, 35673, 35678
Clubmoss, *Diphasium complanatum*, from contexts 15650, 15686, 15708, 15761, 15897, 18529, 19626, 19738, 20982, 21458, 22259, 22391, 22420, 22421, 22444, 22452, 22462, 22490, 22523, 22524, 22574, 22595, 22636, 22655, 22659, 22670, 22679, 22713, 22714, 22745, 22746, 22747, 22748, 22767, 22797, 22808, 22848, 22859, 22868, 22890, 22893, 22896, 22909, 22943, 22983, 23062, 23066, 23093, 23163, 23200, 23248, 23267, 23288, 23307, 23341, 23346, 23350, 23437, 23455, 23531, 23603, 23720, 23749, 23753, 23843, 24064, 25065, 25084, 25103, 25104, 25110, 25257, 25285, 25340, 25371, 25380, 25391, 25466, 25500, 25598, 25748, 25750, 25923, 25934, 26949, 26957, 27018, 27203, 27503, 27504, 28987, 29222, 29528, 29736, 29835, 29844, 31424, 32026, 32185, 32189, 32243, 32252, 34289, 34290, 34291, 34292, 34377, 34412, 34413, 34424, 34483, 35086, 35323, 35519, 35673, 35674, 35675, 35677
Weld, *Reseda luteola*, from contexts 15650, 15761, 20982, 22421, 22462, 22670, 23062, 23066, 23163, 23200, 23248, 23753, 25103, 25923
Note: all published in *AY* 14/7, 545ff, 767–73

Cloth finishing

Glass slick-stones, *6592–4*, sfs7040, 8106, 9310, 12527, 12937, 12982, 13387, 13851 (Mainman and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *2690–4* (*AY* 17/6, 548–50, **2:C6, 3:D3**)
Iron needles, *2480–544, 2620–53* (*AY* 17/6, 542–8, **2:C2–5, 3:D2**)

Part-made iron needles, *2682–5* (*AY* 17/6, 542–8, **2:C5**)
Copper alloy needles *6624–5*, sfs7489, 8829 (Mainman and Rogers *AY* 17/–)
Bone needle, *6681* (MacGregor et al. *AY* 17/–)
Bone needle-like objects, *6685–6*, sf7582 (MacGregor et al. *AY* 17/–)

Braiding

Bone weaving tablet, *6679* (MacGregor et al. *AY* 17/–)

Products

Wool textiles, *1295–1308* (*AY* 17/5, 318–41, 434–5)
Nålebundet sock, *1309* (*AY* 17/5, 341–5, 435)
Wool cord and threads, *1312–15* (*AY* 17/5, 393–7, 435)
Linen textiles, *1317–36*, *1338–9* (*AY* 17/5, 345–59, 435–7)
Plant-fibre cord, *1337* (*AY* 17/5, 393–7, 436)
Silk and linen braid, *1340* (*AY* 17/5, 381–2, 436)
Silk yarn, *1357–8* (*AY* 17/5, 360–81, 434, 437)
Silk textile, *1341–56* (*AY* 17/5, 360–81, 437)
Textiles of uncertain fibre, *1359–60* (*AY* 17/5, 437)

Period 5A

Raw fibre

Raw wool, *1361–2* (*AY* 17/5, 308–11, 438)
Sheep parasites, *Melophagus ovinus* and/or *Damalinia ovis*, from contexts 8175, 8282, 8453, 8523, 8799, 8845, 14928, 20190, 20746, 20808, 20877, 20968, 20969, 20970, 22052, 22089, 22090, 22154, 22209, 22266, 22267, 22270, 22309, 22382, 23000, 26958, 31271, 31300 (*AY* 14/7, 775–7)
Flax, *Linum usitatissimum*, capsules from contexts 20808, 20877, 20970, 20990, 23000, 26953, 27807 (*AY* 14/7, 573, 773)

Fibre preparation

Iron spikes, *2342–57* (*AY* 17/6, 540–1, **2:B13**)

Spinning

Stone spindle whorls, *6548*, *6557–61*, sfs7538, 9379 (Mainman and Rogers *AY* 17/–)
Bone spindle whorls, sfs222, 1273, 7005, 7254 (MacGregor et al. *AY* 17/–)

Weaving

Baked clay loomweights, sfs4878, 7107 (Mainman and Rogers *AY* 17/–)
Bone and antler pin-beaters, *6676*, *6687*, sfs7008, 9329 (MacGregor et al. *AY* 17/–)

Dyeing

Madder, *Rubia tinctorum*, from contexts 8243, 8453, 14874, 14883, 14928, 18594, 20062, 20105, 20186, 20746, 20808, 20877, 20970, 20990, 22044, 22052, 22089, 22090, 22104, 22110, 22122, 22154, 22179, 22209, 22256, 22266, 22267, 22270, 22309, 22358, 22360, 22368, 22376, 22382, 22384, 22412, 23000, 26953, 31271, 31300, 31302
Woad, *Isatis tinctoria*, from contexts 20808, 22044, 22122, 22154, 22209, 22309, 22368 (and vegetative fragments)
Stem fragments of dyer's greenweed, *Genista tinctoria*, from contexts 20808, 20877, 20970, 20990, 22044, 22052, 22089, 22090, 22104, 22154, 22179, 22256, 22266, 22267, 22270, 22309, 22358, 22360, 22368,

22376,22376, 22382, 22412, 23000, 26953, 31271, 31300, 31302
Clubmoss, *Diphasium complanatum*, from contexts 20808, 20877, 20970, 20990, 22044, 22052, 22089, 22090, 22104, 22110, 22122, 22209, 22256, 22266, 22267, 22270, 22309, 22358, 22360, 22368, 22376, 22376, 22382, 22384, 22412, 23000, 26953, 31271, 31300
Weld, *Reseda luteola*, from context 14928
Note: all published in *AY* 14/7, 573ff, 767–73

Cloth finishing

Glass slick-stones, sfs6360, 6757, 7561 (Mainman and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *2695* (*AY* 17/6, 548–50, **2:C6**)
Iron needles, *2545–64*, *2654–8* (*AY* 17/6, 542–8, **2:C3, 2:C5**)
Bone needle-like object, sf2327 (MacGregor et al. *AY* 17/–)

Products

Linen textiles, *1363–9* (*AY* 17/5, 345–359, 438)
Plant-fibre cord, *1370* (*AY* 17/5, 393–7, 438)
Silk textiles, *1371–2* (*AY* 17/5, 360–381, 438)

Period 5B

Raw fibre

Raw wool, *1373–8* (*AY* 17/5, 308–11, 438)
Sheep parasites, *Melophagus ovinus* and/or *Damalinia ovis*, from contexts 1089, 2467, 2473, 2474, 2476, 2477, 5651, 5673, 6434, 6471, 6536, 6879, 7019, 7204, 7216, 7232, 7251, 7252, 7257, 7258, 7260, 7444, 7467, 7488, 7553, 7672, 7688, 8524, 8526, 8730, 9275, 9721, 9779, 14296, 14297, 14432, 14534, 14541, 14543, 14545, 14581, 14778, 15179, 15192, 15361, 15426, 15456, 15467, 15470, 15471, 15526, 15530, 15557, 15559, 15560, 15561, 15579, 15581, 15583, 15622, 15745, 19451, 20234, 20441, 20670, 21252, 21478, 21674, 22103, 22107, 29576, 29577 (*AY* 14/7, 595–6, 735, 775–7)
Flax, *Linum usitatissimum*, capsules from contexts 2141, 2934, 6416, 6879, 14669, 14898, 15526, 15561, 15579, 19451, 20234, 20289, 22102, 26015, 29101; flax stems from contexts 6528, 29465; and *Linum catharticum* capsules from context 1404 (*AY* 14/7, 593, 601, 613, 760, 773)

Fibre preparation

Iron wool-comb, *2273*, and iron wool-comb plate, *2272* (*AY* 17/6, 538–40, **2:B11**)
Wooden flax pounder, *6642* (Morris *AY* 17/–)
Wooden scutching blade, *6644* (Morris *AY* 17/–)
Iron spikes, *2358–403*, *2405–30* and *2432* (*AY* 17/6, 540–1, **2:B13–C1**)
[*2404* is a gimlet-tip; *2431* originally published as Period 5B has been re-allocated to Period 6 (12th century)]

Spinning

Wooden spindle, *6648* (Morris *AY* 17/–)
Stone spindle whorls, *6549*, *6562–3*, sfs669, 1000, 1554, 1732, 3010, 4180, 5307, 6202, 6327, 6669, 6838, 7029, 8609, 9168, 9235 (Mainman and Rogers *AY* 17/–)
Bone spindle whorls, *6667*, sfs441, 1562, 1781, 1940, 2274, 3842, 3860, 4285, 5066, 5119, 5280, 9268, 11582 (MacGregor et al. *AY* 17/–)
Antler spindle whorl, sf8443 (MacGregor et al. *AY* 17/–)

Weaving

Baked clay loomweights, *6588*, sfs4646, 6764, 6793, 6797, 6917, 7093, 7209, 8304, 10016, 11524 (Mainman and Rogers *AY* 17/–)
Bone pin-beaters, *6673–4, 6677, 6688*, sfs1618, 1810, 6641, 7094, 9475 (MacGregor et al. *AY* 17/–)
Wooden tapestry weft-bobbins, *6651–2* (Morris *AY* 17/–)

Dyeing

Madder, *Rubia tinctorum*, from contexts 1386, 2141, 2934, 6434, 6444, 6471, 6472, 6531, 6532, 6535, 6536, 6866, 7204, 7556, 14297, 14434, 14469, 14778, 14898, 14941, 15526, 15557, 15559, 15561, 15608, 15628, 15745, 18021, 19313, 19620, 19622, 19623, 20234, 20670, 21197, 21252, 21463, 21464, 21510, 21674, 21747, 21766, 21854, 22102, 22103, 22107
Woad, *Isatis tinctoria*, from contexts 6434, 6472, 6531, 6535, 14434, 14669, 14941, 15628, 15745, 19313, 21197, 21204, 21252, 21680, 22103, 26015
Stem fragments from dyer's greenweed, *Genista tinctoria*, from contexts 1386, 2141, 2467, 2934, 5673, 6416, 6434, 6437, 6444, 6471, 6472, 6531, 6532, 6535, 6536, 6866, 6947, 14434, 14669, 14898, 14941, 15526, 15557, 15561, 15608, 15628, 19307, 19313, 19448, 19620, 19622, 19623, 20234, 20289, 20441, 20670, 21197, 21204, 21252, 21381, 21404, 21463, 21464, 21510, 21674, 21680, 21747, 21766, 21854, 22102, 22103, 22107
Clubmoss, *Diphasium complanatum*, from contexts 2141, 2467, 2934, 5673, 6433, 6434, 6437, 6444, 6471, 6472, 6531, 6532, 6535, 6536, 6866, 6879, 6947, 7204, 7258, 7556, 14297, 14434, 14529, 14669, 14778, 14898, 14941, 14973, 15526, 15557, 15559, 15561, 15608, 15628, 15745, 18021, 19307, 19313, 19353, 19448, 19451, 19457, 19620, 19622, 19623, 20234, 20289, 20441, 20670, 21197, 21204, 21252, 21381, 21404, 21463, 21464, 21510, 21674, 21680, 21747, 21766, 21854, 22102, 22103, 22107, 26015
Weld, *Reseda luteola*, from contexts 19457, 20670
Note: all published in *AY* 14/7, 591ff, 767–73

Cloth finishing

Glass slick-stones, sfs1537, 1787, 4302, 4431, 4434, 5116, 9109, 15698, 16231 (Mainman and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *2696–9* (*AY* 17/6, 548–50, **2:C6**)
Iron needles, *2565–93, 2659, 2661–72* (*AY* 17/6, 542–8, **2:C3, 2:C5**)
[*2660* re-allocated to Period 6, 11th/12th century]
Part-made iron needle, *2686* (*AY* 17/6, 542–8, **2:C5**)
Copper alloy needle, sf6898 (Mainman and Rogers *AY* 17/–)
Bone needle, *6682* (MacGregor et al. *AY* 17/–)
Bone needle-like objects, sfs3608, 3663, 4581, 4670, 6600, 10213 (MacGregor et al. *AY* 17/–)
Bone thread reel, *6689* (MacGregor et al. *AY* 17/–)
Beeswax, *6696*, catalogue entry only in this volume

Products

Wool textiles, *1380–2* (*AY* 17/5, 318–41, 438)
Wool cords, *1383–5* (*AY* 17/5, 392–4, 438)
Linen textiles, *1388–1404* (*AY* 17/5, 345–9, 439)
Plant-fibre cordage, *1405–6* (*AY* 17/5, 393–7, 439)
Silk ribbon, *1407* (*AY* 17/5, 360–81, 439)
Silk reliquary pouch, *1408* (*AY* 17/5, 377–81, 440)

Silk yarn, *1409* (*AY* 17/5, 360–81, 440)
Gold thread, *1410* (*AY* 17/5, 315, 440)

Period 5C

Raw fibre

No raw wool
Sheep parasites, *Melophagus ovinus* and/or *Damalinia ovis*, from contexts 6909, 6926, 16877, 19255, 19267, 19272, 19283, 19288, 20178, 20294, 21141 (*AY* 14/7, 775–7)
Flax, *Linum usitatissimum*, capsules from contexts 6795, 20179 (*AY* 14/7, 773)

Fibre preparation

Iron spikes, *2435–58* (*AY* 17/6, 540–1, **2:C1**); and sfs5656, 5755, 5759, 5831, 5858, 5939, 6101 (Mainman and Rogers *AY* 17/–)
Wooden flax pounder, *6643* (Morris *AY* 17/–)

Spinning

Stone spindle whorl, *6567* (Mainman and Rogers *AY* 17/–)
Bone spindle whorls, sfs3632, 7232 (MacGregor et al. *AY* 17/–)
Fired clay spindle whorl, *6582* (Mainman and Rogers *AY* 17/–)

Weaving

Baked clay loomweight, sf14539 (Mainman and Rogers *AY* 17/–)

Dyeing

Madder, *Rubia tinctorum*, from contexts 6570, 6795, 6909, 6926, 19247, 19255, 19271, 19288, 20286, 20294, 21088, 21141
Woad, *Isatis tinctoria*, pods from contexts 6903, 20286
Stem fragments from dyer's greenweed, *Genista tinctoria*, from contexts 6795 (leaves), 6909, 19247, 20231, 20286, 20294
Clubmoss, *Diphasium complanatum*, from contexts 6570, 6903, 6909, 6926, 7862, 15311, 19255, 19268, 19269, 19288, 20286, 20294, 21088, 21141
Note: all published in *AY* 14/7, 767–73

Cloth finishing

None

Cutting and stitching

Iron needles, *2595–606*, *2673–9* (*AY* 17/6, 542–8, **2:C4–5**); and sf5788
Part-made iron needle, *2687* (*AY* 17/6, 542–8, **2:C5**)
Bone needle-like object, sf5891 (MacGregor et al. *AY* 17/–)

Products

None

Period 6

Note: the Period 6 bioarchaeological results not available at time of going to press

Mid 11th century–late 12th century

Raw fibre

Raw wool, *1412* (*AY* 17/5, 301–11, 440)

Fibre preparation

Iron spikes, *2431* (published as Period 5B in *AY* 17/6) *6598*, sfs1445, 1726, 1883, 1893, 1902, 2924, 3302, 4083, 4327, 4492, 4603, 4763, 4877, 4903, 4909, 5296, 5304, 5355, 5393, 5414, 5473, 5587, 5593, 5696, 5702, 5825, 5894, 5921, 6114, 6168, 6435, 6590, 6654, 6696, 6874, 7229, 7234, 14445, 14611, 14732, 14733, 14782, 14800, 14803, 14805, 14818, 14880, 15137, 15151, 15179, 15182, 15184, 15188, 15189, 15195, 15196, 15209, 15221, 15223, 15224, 15230, 15304, 15395, 15798, 16107, 16259 (Ottaway and Rogers *AY* 17/–)

Spinning

Stone spindle whorls, *6543–4, 6550, 6564–5, 6568*, sfs83, 1236, 2193, 3336, 3379, 3519, 4572, 4898, 5195, 5297, 5416, 5546, 5588 (Ottaway and Rogers *AY* 17/–)
Bone spindle whorls, *6668*, sfs66, 445, 2534, 4823, 4847, 5606, 6157 (MacGregor et al. *AY* 17/–)
Potsherd spindle whorl, sf4955 (Ottaway and Rogers *AY* 17/–)(late 11th–13th century)

Weaving

Wooden heddle cradle, *6654* (Morris *AY* 17/–)
Baked clay loom weight, sf1905 (Ottaway and Rogers *AY* 17/–)
Bone pin-beaters, *6675, 6678* (MacGregor et al. *AY* 17/–)

Cloth finishing

Glass slick-stones, sfs1673, 1890, 2311, 4880, 5703 (Ottaway and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *6620*, sf5578 (Ottaway and Rogers *AY* 17/–)
Iron needles, *2660* (*AY* 17/6 as Period 5B), *6613–16*, sfs64, 1675, 1725, 3316, 4666, 4787, 4807, 4915, 5067, 5117, 5147, 5220, 5428, 5439, 5487, 5509, 5547, 5690, 5727, 5998
Copper alloy needles, sfs1877, 4414

Products

Wool textiles, *1414, 1421* (*AY* 17/5, 383–91, 440)
Wool cord, *1442* (late 11th–13th century) (*AY* 17/5, 441)
Textile imprint on lead, *1458* (*AY* 17/5, 442)
Plant-fibre cordage, *1448–50, 1452* (*AY* 17/5, 393–7, 441–2)

End of 12th to late 13th century

Raw fibre

Wooden bale pins, *6656*, sfs5165, 5167, 5168 (Morris *AY* 17/–)

Fibre processing

Iron spikes, *6599–607*, sfs758, 862, 865, 969, 971, 981, 1002, 1022, 1029, 1128, 1146, 1214, 1330, 1362, 1412, 1450, 1457, 1488, 1489, 1491, 1506, 1511, 1514, 1522, 1533, 1553, 1644, 1660, 1677, 1776, 1815, 1953, 1961, 2267, 2332, 2392, 2757, 2769, 2770, 2774, 2931, 2966, 2969, 3066, 3068, 3155, 3167, 3242, 3260, 3310, 3592, 3636, 3698, 3703, 3711, 3743, 3749, 3780, 3823, 3824, 3844, 3933, 4132, 4150, 4749, 4756, 4769, 4883, 5006, 5120, 6159, 6984, 14655, 14694, 14722, 14748, 14777, 14784, 14835, 14876, 14878, 14889, 14899, 14891, 14895, 14899, 14938, 14939, 15008, 15012, 15014, 15015, 15016, 15150, 15227, 15267, 15350, 15851 (Ottaway and Rogers *AY* 17/–)

Spinning

Wooden spindle, *6649* (Morris *AY* 17/–)
Stone spindle whorls, *6551, 6569, 6570, 6571, 6572, 6573, 6574, 6575, 6576*, sfs935, 1223, 1269, 1346, 1581, 1615, 1658, 1707, 1719, 1857, 1919, 2010, 2238, 2280, 2319, 2901, 3070, 3309, 3503, 3601, 3691, 18955 (Ottaway and Rogers *AY* 17/–)
Antler spindle whorls, *6692, 6693* (MacGregor et al. *AY* 17/–)
Potsherd spindle whorl, sf1057 (Ottaway and Rogers *AY* 17/–)
Fired clay spindle whorls, *6583–4* (Ottaway and Rogers *AY* 17/–)
Wool yarn, *1424–33* (*AY* 17/5, 441)

Weaving

Wooden heddle rod, *6655* (Morris *AY* 17/–)
Iron weft-beater blade, *6608* (Ottaway and Rogers *AY* 17/–)

Cloth finishing

Glass slick-stones, *6595–7*, sfs1487, 1843, 2061, 2071, 3356, 3828 (Mainman and Rogers *AY* 17/–)
Iron tenterhook, *6609* (Ottaway and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *6621*, sf1713 (Ottaway and Rogers *AY* 17/–)
Iron needles, *6617–19*, sfs1012, 1454, 1529, 1635, 1779, 1805, 2028, 2072, 2125, 2130, 2313, 2605, 2984, 2993, 3276, 3819, 4057, 4114, 4260, 6203 (Ottaway and Rogers *AY* 17/–)
Copper alloy needles, *6626–31*, sfs970, 1068, 1430, 2117, 2258, 3125, 3145 (Ottaway and Rogers *AY* 17/–)
Bone thread reel, *6690* (MacGregor et al. *AY* 17/–)

Products

Wool cords, *1434–41* (*AY* 17/5, 392–4, 441)
Linen textiles, *1443–5* (*AY* 17/5, 383–91, 441)
Plant-fibre cordage, *1446–7, 1451, 1454–5* (*AY* 17/5, 393–7, 441–2)

End of 13th to late 14th century

Raw fibre

Wooden bale pins, *6657–8*, sfs2663, 3036, 3107, 3152 (Morris *AY* 17/–)

Fibre processing

Iron spikes, sfs365, 819, 2955, 14824, 14600, 14865, 15103, 15111, 15278, 15317, 15527 (Ottaway and Rogers *AY* 17/–)

Spinning

Stone spindle whorls, *6577*, sfs378, 836, 990, 2784, 2941, 3058 (Ottaway and Rogers *AY* 17/–)
Bone spindle whorl, sf364 (MacGregor et al. *AY* 17/–)

Weaving

Wooden weft-beater blade, *6653* (Ottaway and Rogers *AY* 17/–)
Baked clay loomweight, *6589* (Ottaway and Rogers *AY* 17/–)

Cloth finishing

Glass slick-stone, sf2078 (Mainman and Rogers *AY* 17/–)
Iron tenterhooks, *6610–12* (Ottaway and Rogers *AY* 17/–)

Cutting and stitching

Iron needles, sfs988, 2744, 15119 (Ottaway and Rogers *AY* 17/–)
Bone thread reel, *6691* (MacGregor et al. *AY* 17/–)
Silk yarn, *1456* (*AY* 17/5, 442)

End of 14th to late 15th century

Raw fibre

Raw wool, *1413* (*AY* 17/5, 301–11, 440)
Wooden bale pins, *6659–60*, sfs644, 810, 2543, 2590, 2658 (Morris *AY* 17/–)

Fibre processing

Wooden flax ripple, *6641* (Morris *AY* 17/–)
Iron spikes, sfs581, 2551, 2627, 2783, 15214, 15234, 15287, 15300, 15414, 15508 (Ottaway and Rogers *AY* 17/–)

Spinning

Stone spindle whorls, sfs769, 2624, 3558, 4768 (Ottaway and Rogers *AY* 17/–)
Potsherd spindle whorl, sf2808 (Ottaway and Rogers *AY* 17/–)
Bone spindle whorls, sfs2903, 3116, 4004 (MacGregor et al. *AY* 17/–)

Weaving

Bone pin-beater, sf2633 (MacGregor et al. *AY* 17/–)

Cutting and stitching

Iron shears, *6622* (Ottaway and Rogers *AY* 17/–)
Iron needles, sfs666, 2480, 2483 (Ottaway and Rogers *AY* 17/–)
Copper alloy needles, *6632*, sfs399, 2589, 2870 (Ottaway and Rogers *AY* 17/–)

Other crafts

Copper alloy netting needle, *6634* (Ottaway and Rogers *AY* 17/–)
Silk cord/yarn, *1457* (*AY* 17/5, 442)

Products

Wool textiles, *1416–20, 1422* (*AY* 17/5, 383–91, 440)

End of 15th to late 17th century

Raw fibre

Wooden bale pin, *6661* (Morris *AY* 17/–)

Fibre processing

Iron spikes, sfs345, 753, 15183, 15190, 15246 (Ottaway and Rogers *AY* 17/–)

Spinning

Stone spindle whorls, sfs176, 237 (Ottaway and Rogers *AY* 17/–)
Bone spindle whorl, sf184 (MacGregor et al. *AY* 17/–)
Wooden drive-whorl, *6650* (Morris *AY* 17/–)

Weaving

Bone pin-beater, sf626 (MacGregor et al. *AY* 17/–)

Cutting and stitching

Copper alloy needles, sfs2436, 2759 (Ottaway and Rogers *AY* 17/–)

Modern

Iron shears, sf3082 (Ottaway and Rogers *AY* 17/–)
30 unfinished pins, sf2536 (Ottaway and Rogers *AY* 17/–)

Unstratified

Fibre preparation

Iron spikes, sfs40, 617, 3118, 3651, 6091, 6574, 8713, 9061, 14792, 15356 (Ottaway and Rogers *AY* 17/–)

Spinning

Stone spindle whorls, *6566, 6578*, sfs282, 3057, 4344, 4616, 9315 (Ottaway and Rogers *AY* 17/–)
Bone spindle whorls, sfs2904, 3051, 3072, 5077, 7640 (MacGregor et al. *AY* 17/–)

Lead alloy spindle whorls, *6637* (half-made), sf6017 (Ottaway and Rogers *AY* 17/–)
Wool yarn, *1423* (*AY* 17/5, 441)

Finishing

Glass slick-stone, sf4430 (Mainman and Rogers *AY* 17/–)

Cutting and stitching

Iron shears, *2700* (*AY* 17/6, 548–50, **2:C6**); sfs715, 3412 (Ottaway and Rogers *AY* 17/–)
Iron needles, *2607–9* (*AY* 17/6, 542–8, **2:C4**); sfs221, 5333, 6156, 7146 (Ottaway and Rogers *AY* 17/–)
Copper alloy needle, *6633*, sf1341 (Ottaway and Rogers *AY* 17/–)

Products

Wool textile, *1415* (*AY* 17/5, 383–91, 440)
Plant-fibre cordage, *1453* (*AY* 17/5, 393–7, 441–2)

Watching Brief, 1982.22

Fibre processing

Iron spikes, sfs30, 41, 99, 256, 258 (Ottaway and Rogers *AY* 17/–)

Spinning

Wooden spindle, *6697* (Morris *AY* 17/–)
Stone spindle whorl, sf83 (Ottaway and Rogers *AY* 17/–)
Bone spindle whorl, sf3 (MacGregor et al. *AY* 17/–)

Weaving

Iron sword-beater, *4419* (*AY* 17/8, 882–8)

Products

Textile on sword-beater, *1459* (*AY* 17/5, 442)
Wool textiles, *1460, 1463* (*AY* 17/5, 335–6, 391, 442)
Wool cord, *1461* (*AY* 17/5, 442)
Linen textile, *1462, 1464* (*AY* 17/5, 345–59, 442)

Acknowledgements

York Archaeological Trust and the author wish to express their thanks to all those who have helped in the preparation of this volume.

The excavation at 16-22 Coppergate was directed by R.A. Hall, with supervision by David T. Evans (1976–81), Shahed Power (1976–8), Mick Humphreys (1976–7) and Ian Lawton (1978–81). Post-excavation work is under the overall direction of R.A. Hall.

Information concerning the Trust's artefacts has been kindly provided by Dr C. Caple (University of Durham), Dr H.E.M. Cool, Dr G.D. Gaunt, A.D. Hooley, Julie Jones, Dr Arthur MacGregor, Dr A.J. Mainman, Dr Carole Morris, Dr Catherine Mortimer (English Heritage), Sonia O'Connor, Dr T.P. O'Connor (University of Bradford), Dr P. Ottaway, J. Parsons and J.A. Spriggs. The author is also grateful to the following for generously providing information concerning unpublished material from outside York: Jane Cowgill and Jen Mann (City of Lincoln Archaeology Unit), Christine Haughton and Dominic Powlesland (West Heslerton Project), Julie Lovett (Canterbury Archaeology Trust) and Gail Drinkall, Dr Christopher Loveluck, Martin Foreman and Gareth Watkins (Humber Archaeology Partnership).

The author would also like to thank the colleagues with whom she has discussed the ideas contained in this volume, especially Elisabeth Crowfoot, Dr G. Grenander Nyberg, Philippa Henry, Frances Pritchard and Dr J.P. Wild. Sincere thanks also to those who have provided comments on the text, namely, Dr Peter Addyman, Dr A.R. Hall, Dr R.A. Hall, Kurt Hunter-Mann, Dr A.J. Mainman, Professor D.M. Palliser, Dr G.W. Taylor and Dr Dominic Tweddle.

Thanks are expressed to Christine McDonnell and the Trust Finds Department staff, especially Bev Shaw, who supeIVised the transport of artefacts for study. The project has been managed at the Trust by Dr A.J. Mainman and Wendy Sherlock, with support in the early stages from Dr H.E.M. Cool. At Textile Research Associates, clerical assistance was provided by Patricia Greenwood, Sandie d'Souza and Susan Reynard. Further support was given by Peter Gardner, Dr Allan Hall, Bruce Lamden, Tom Srahan, Sara Stancliffe and Gillie Winkless.

The principal illustrator was Simon Chew who prepared the maps and reconstructions for publication. Paula White prepared the distribution plans for publication and drew the stone, clay and pottery spindle whorls, the loomweights and the glass slick-stones. The wooden artefacts were drawn by Kate Biggs, and the bone spindle whorls were drawn by Charlotte Bentley, Trevor Pearson and Glenys Boyles. Glenys Boyles subsequently prepared all the artefact drawings for publication. The plant specimens in Fig.824 were drawn by M.J. Hill. The site photographs were taken by M.S. Duffy and the artefacts were photographed by Simon I. Hill, FRPS (Scirebroc). A number of institutions and individuals are gratefully acknowledged for granting permission to reproduce plates: Fig.792, Glasgow University

library, Department of Special Collections; Fig.794, copyright J.E. Satchell; Fig.799, Ulster Folk and Transport Museum; Figs.817 and 821, Master and Fellows of Trinity College Cambridge; Fig.819b, Oxford University Press; Fig.823, The Bodleian Library, University of Oxford; and Fig.824, The Museum of London.

The summary was translated into French by Charlene Sheil-Small and into German by Mrs K. Aberg. This volume has been edited by Wendy Sherlock, who also prepared the text for publication. The project has been funded and the volume published with the assistance of a generous subvention by English Heritage.

Digital edition produced by Lesley Collett, January–February 2011

Summary

This volume is intended as a companion to the volume on the textile products from the same site, published in 1989 *(AY* 17/5). A total of 1,147 artefacts connected with textile production were recovered from the excavation at 16-22 Coppergate together with raw fibres, dyestuffs, teasels and other biological evidence. Of these, 1,006 of the artefacts are dated to the 9th-13th centuries and two-thirds of these belong to the Anglo-Scandinavian period.

All the processes of production are represented: raw flax and wool are present, as are tools for preparing fibre; spinning with distaff, spindle-and-whorl and spindle wheel; weaving with the warp-weighted loom, the two-beam vertical loom and the horizontal treadle loom; there are also dyeplants for dyeing; tools for finishing wool cloth and smoothing linen; and for cutting and stitching garments.

Flax processing, wool-combing, spinning and needlework seem to have been practised on all four tenements through all phases from the 9th to the 13th century. The warp-weighted loom may not have been in use much after c. AD 900. Its place was taken by the two-beam vertical loom, used for tapestry and probably also cloth. The horizontal loom arrived in the 11th century and took over as a clothloom, but the two-beam vertical loom continued as a tool for heavy tapestries and coverlets. There is no evidence for soft-finishing of cloth after the early 10th century. Dyeing is well represented in the 9th-l0th centuries, but seems to disappear from the site during the course of the 11th century. The evidence for weaving is spread over all four tenements until the later 11th century, when it becomes limited to two, the horizontal loom on one and the tapestry loom on the other.

The 9th–11th centuries saw a strong Scandinavian presence in York, but the textile tools and dyes are more typical of the native Anglo-Saxons. It is suggested that the Vikings coming into York were predominantly men and that textile production remained in the hands of Anglo-Saxon women. All the textile crafts (apart from teaselling and shearing) were practised on all the tenements until the mid 11th century and it is likely that they represent a common domestic occupation. From the 11th century onwards, however, certain sub-crafts disappeared from the site and others became limited to individual tenements, which may reflect growing specialisation and the arrival of gild artisans. Only yarn production and needlework remained as domestic crafts. As the evidence for textile production subsided, evidence for commercial activity, including a trade in raw wool, took over, especially in the 14th and 15th centuries.

Resume

Ce volume va de pair avec le volume sur les produits textiles découverts sur le même site, publié en 1989 *(AY* 17/5). En tout, 1147 pièces se rattachant à la production des textiles ont été récupérées lors des fouilles au 16-22 Coppergate, ainsi que des fibres brutes, teintures, chardons et autres indices biologiques. 1006 de ces pièces ont été datées entre le 9ème et le 13ème siècle et deux tiers de celles-ci appartiennent à la periode anglo-scandinave.

Tous les procédés de fabrication sont représentvs: lin brut et laine brute ainsi que des outils de préparation de la fibre; filage à la quenouille, au fuseau et fusaiole et au rouet; tissage sur metier a pesons, sur metier vertical a deux barres, sur metier horizontal a marches; il y a aussi des plantes tinctoriales pour la teinture; des outils de finissage des tissus de laine et de lissage de la toile de lin; ainsi que des outils de coupe et de couture des vêtements.

Il semble que l'on ait réalisé l'ennoblissement du lin, le peignage de la laine, le filage et les travaux d'aiguille dans les quatre propriétés pendant toutes les phases du 9ème au 13ème siècle. Il se peut que le métier à pesons n'ait guère été utilisé après l'an 900 environ. Il céda la place au métier vertical à deux barres, utilisé pour les tapisseries et probablement pour le tissu aussi. Le métier horizontal arriva au 11ème siècle et prit la relève en tant que métier à tissu mais le métier vertical à deux barres continua à être utilisé pour les tapisseries et couvre-lits épais. Il n'y a pas d'indices de finissage du tissu après le début du 10ème siècle. La teinture est bien représentée au 9ème et au 10ème siècle mais semble disparaître du site pendant le 11ème siècle. Les indices de tissage sont répandus dans les quatre propriétés jusqu'à la fin du 11ème siècle, époque à laquelle ils se limitent à deux propriétés, le métier horizontal dans l'une et le métier a tapisserie dans l'autre.

La periode du 9ème au 11ème siècle vit une importante présence scandinave à York mais les outils et teintures du textile sont plus typiques des habitants anglo-saxons. On suggère que les Vikings qui arrivèrent à York étaient pour la plupart des hommes et que la production des textiles était restée entre les mains des femmes anglo-saxonnes. Tous les métiers du textile (hormis le cardage et la tonte) étaient exercés dans toutes les propriétés jusqu'au milieu du 11ème siècle et il est vraisemblable qu'ils representent un travail ménager courant. Néanmoins, à partir du 11ème siecle, certains sous-métiers disparurent du site et d'autres se limitèrent à certaines propriétés, ce qui reflète peut-être la croissance de la spécialisation et l'arrivée d'artisans appartenant à des guildes. Seuls la production de fil et les travaux d'aiguilles resterent au nombre des arts ménagers. Les indices de production de textile diminuèrent et cédèrent la place aux indices d'activités commerciales, y compris le commerce de la laine brute, particulièrement au 14ème et au 15ème siècle.

Zusammenfassung

Dieser Band ist gedacht als Begleitband zu dem Bericht, der die Textilherstellung auf dem gleichen Ausgrabungsort behandelt und 1989 als *AY* 17/5 erschienen ist. Eine Gesamtzahl van 1147 Artifakten, die mit Textilherstellung in Verbindung stehen, wurden aus der Ausgrabung in 16-22 Coppergate sichergestellt, hinzu kamen auch Rohfasern, Färberstoffe, Karden und weitere biologische Befunde. Van den Artifakten datieren 1006 in den Zeitraum zwischen dem neunten und dreizehnten Jahrhundert und zweidrittel von ihnen gehörten in die anglo-skandinavische Zeit. Alle Herstellungsverfahren sind vertreren: Rohflachs und Wolle sind vorhanden, sowie Werkzeuge zur Faserbearbeitung; Spinnen mit Spinnrocken, mit Spindel und Wirtel sowie mit dem Handspinnrad ist belegt, Weben auf dem senkrechten Gewichtswebstuhl, dem aufrechtstehenden Webstuhl mit Querholz und mit dem Trittwebstuhl ist nachgewiesen; daneben fanden sich Färberpflanzen für die Färberei; Werkzeuge für die Fertigverarbeitung van Wolltuchen und zum Glätten van Leinen sowie zum Zuschneiden und Niihen van Kleidungsstücken sind ebenfalls unter den Funden.

Flachsverarbeitung, Wollkämmen, Spinnen und Nadelarbeiten scheinen auf den vier Parzellen während aller Siedlungsphasen in der Zeit vom neunten bis in das dreizehnte Jahrhundert hin betrieben worden zu sein. Der Gebrauch des senkrechten Gewichtswebstuhles hörte nach circa 900 n. Chr. mehr order weniger auf. Dieser Webstuhltyp wird dann durch den aufrechtstehenden Webstuhl mit Querholz ersetzt, der zur Herstellung von Wandteppichen und auch van Tuchen benutzt wurde. Der horizontale Webstuhl tritt im elften Jahrhundert auf und übernimmt die Rolle des Tuchwebstuhles, während der aufrechtstehende Webstuhl mit Querholz weiterbin zur Herstellung van schwere Wandteppichen und Bettdecken benutzt wurde. Es gibt keine Befunde dafiir, daß Ausrüstung von Tuchen nach dem Anfang des zehnten Jahrhunderts betrieben wurde.

Tuchfärberei ist im neunten his zehnten Jahrhundert gut vertreten, während sie im Laufe des elften Jahrhunderts van der Grabungsstelle zu verschwinden scheint. Befunde für Weberei sind über alle vier parzellen verteilt, his sie im ausgehenden elften Jahrhundert auf nur zwei der Parzellen beschränkt sind, wobei die eine den horizontalen Webstuhl und die andere den Webstuhl für Wandbehiinge aufweist.

In der Zeit zwischen dem neunten und elften Jahrhundert scheint York eine hohe Anzahl van skandinavischen Einwohner gehabt zu haben, jedoch sind die Werkzeuge für Textilherstellung und Färberei weiterbin typisch für die ansässigen Angelsachsen. Es wird deshalb angenommen, daß die Wikinger, die nach York kamen zum großen Teil Männer waren, und daß die Textilherstellung weiterbin hauptsächlich in den Händen der angelsächsischen Frauen verblieb. Alle Tätigkeiten der Textilgewerbe (abgesehen vom Karden und Scheren) wurden auf allen Parzellen bis in die Mitte des elften Jahrhunderts hin betrieben und es ist höchstwahrscheinlich, daß dies auf eine häusliche Besiedlung hinweist. Vom elften Jahrhundert an verschwinden jedoch gewisse Gewerbezweige von der Grabungsstelle ebenso werden andere Gewerbetätigkeiten auf vereinzelte Parzellen

beschränkt. Hier kann sich erne wachsende Spezialisierung und der Beginn van Zünften wiederspiegeln. Nur die Herstellung van Garnen und die Nadelarbeit verbleiben als ein häusliches Gewerbe. Als die Befunde für Textilherstellung geringer werden, werden sie durch Befunde für kommerzielle Aktivität einschließlich des Handels mit Rohwolle ersetzt. Dies trifft besonders für das vierzehnte und fünfzehnte Jahrhundert zu.

Abbreviations

LAMAS	London and Middlesex Archaeological Society
NESAT	North European Symposium on Archaeological Textiles
SS	Surtees Society
TRA	Textile Research Associates
YCR	*York City Records*
YAJ	*Yorkshire Archaeological Journal*
YASRS	*Yorkshire Archaeological Society Record Series*

Bibliography

Addyman, P.V., 1964. 'A Dark-Age settlement at Maxey, Northants', *Medieval Archaeol.* **8**, 20–73

—— 1969. 'Late Saxon settlement in the St Neots area', *Proc. Cambridge Antiq. Soc.* **62**, 59–93

Addyman, P.V., Hood, J.S.R., Kenward, H.K., MacGregor, A. and Williams, D., 1976. 'Palaeoclimate in urban environmental archaeology at York, England: problems and potential', *World Archaeol.*, **8**/2, 220–33

Addyman, P.V. and Hill, D., 1969. 'Saxon Southampton: a review of the evidence; Part 2: industry, trade and everyday life', *Proc. Hampshire Field Club* **26**, 61–96

Andersen, H.H., Crabb, P.J. and Madsen, H.J., 1971. *Århus Søndervold: en Byarkeologisk Undersøgelse*, Jysk Arkeologisk Selskabs Skrifter **9** (Århus)

Anon., 1988. *Un Village au Temps de Charlemagne: Moines et Paysans de l'Abbaye de Saint-Denis du VIIe Siècle à l'An Mil* (Paris)

Armstrong, P., Tomlinson, D. and Evans, D.H., 1991. *Excavations at Lurk Lane, Beverley, 1979–82*, Sheffield Excavation Reports **1**

Arwidsson, G., 1984. 'Glättsteine und Glättbretter', *Birka 11/1: Systematische Analysen der Gräberfunde* (Stockholm)

AY. Addyman, P.V. (ed.). *The Archaeology of York*
- **7** *Anglian York (AD 410–876):*
  - 1 R.L. Kemp 1996. *Anglian Settlement at 46–54 Fishergate*
- **8** *Anglo-Scandinavian York (AD 876–1066):*
  - 1 J. Moulden and D. Tweddle 1986. *Anglo-Scandinavian Settlement South-West of the Ouse*
- **14** *The Past Environment:*
  - 7 H.K. Kenward and A.R. Hall 1995. *Biological Evidence from Anglo-Scandinavian Deposits at 16–22 Coppergate*
- **15** *The Animal Bones:*
  - 3 T.P. O'Connor, 1989. *Bones from Anglo-Scandinavian Levels at 16–22 Coppergate*
- **16** *The Pottery:*
  - 5 A.J. Mainman, 1990. *Anglo-Scandinavian Pottery from 16–22 Coppergate*
  - 6 —— 1993. *Pottery from 46–54 Fishergate*
- **17** *The Small Finds:*
  - 3 A. MacGregor, 1982. *Anglo-Scandinavian Finds from Lloyds Bank, Pavement, and Other Sites*
  - 4 D. Tweddle, 1986. *Finds from Parliament Street and Other Sites in the City Centre*
  - 5 P. Walton, 1989. *Textiles, Cordage and Raw Fibre from 16–22 Coppergate*
  - 6 P. Ottaway, 1992. *Anglo-Scandinavian Ironwork from 16–22 Coppergate*
  - 7 J. Bayley, 1992. *Anglo-Scandinavian Non-Ferrous Metalworking from 16–22 Coppergate*
  - 8 D. Tweddle, 1992. *The Anglian Helmet from 16–22 Coppergate*
  - 9 N.S.H. Rogers, 1993. *Anglian and Other Finds from 46–54 Fishergate*
  - – C.A. Morris, in prep. Craft, Industry and Everyday Life in Anglo-Scandinavian and Medieval York: Wood and Woodworking
  - – P. Ottaway and N.H.S. Rogers, in prep. Craft, Industry and Everyday Life in Anglo-Scandinavian and Medieval York: Medieval Finds
  - – A. MacGregor et al., in prep. Craft, Industry and Everyday Life in Anglo-Scandinavian and Medieval York: Bone, Antler, Ivory and Horn
  - – A.J. Mainman and N.H.S. Rogers, in prep. Craft, Industry and Everyday Life in Anglo-Scandinavian and Medieval York: Anglo-Scandinavian Finds
- **18** *The Coins*
  - 1 E.J.E. Pirie, 1986. *Post-Roman Coins from York Excavations 1971–81*

Baines, P., 1979. *Spinning Wheels: Spinning and Spinners* (London)

—— 1989. *Linen Hand Spinning and Weaving* (London)

Baker, D., Baker, E., Hassall, J. and Simco, A., 1979. 'Excavations in Bedford 1967–1977', *Bedfordshire Archaeol. J.* **13**

Bartlett, N., 1953. 'The lay poll tax returns for the City of York in 1381', *East Riding Trans* (offprints only issued)

Bassett, S., 1989. 'In search of the origins of Anglo-Saxon kingdoms' in S. Bassett (ed.), *The Origins*

of Anglo-Saxon Kingdoms, Studies in Early History of Britain (Leicester)
Beck, S.W., 1886. *The Draper's Dictionary* (London)
Becker, C.J., Bender Jørgensen, L., Hvass, S., Nielsen, L.C., Skov, T. and Stoumann, I., 1979. 'Viking Age settlements in western and central Jutland', *Acta Archaeologica* **50**, 89–208
Bender Jørgensen, L., 1986. *Forhistoriske textiler i Skandinavien: Prehistoric Scandinavian Textiles* Nordiske Fortidsminder Serie B **19** (Copenhagen)
—— 1991. 'The textiles and textile implements', *Ribe Excavations, 1970–76* **3**, 59–78
—— 1992. *North European Textiles until AD 1000* (Århus)
Bender Jørgensen, L. and Walton, P. 1986. 'Dyes and fleece types in prehistoric textiles from Scandinavia and Germany', *J. Danish Archaeol.* **5**, 177–88
Benson, G., 1911. *York: from its Origin to the End of the 11th Century* (York)
Beresford, G., 1987. *Goltho: The Development of an Early Medieval Manor c.850–1150* (London)
Bertelsen, R., Lillehammer, A. and Næss, J-R. (eds), 1987. *Were They All Men?: An Examination of Sex Roles in Prehistoric Society* (Stavanger)
Biddle, M., 1990. *Object and Economy in Medieval Winchester*, Winchester Studies 7 (2 vols) (Oxford)
Biddle, M. and Elmhirst, L., 1990. 'Sewing equipment' in Biddle 1990, **1**, 804–815
Blomqvist, R. and Mårtensson, A.W., 1963. *Thulegrävningen 1961*, Archaeologica Lundensia **2**
Brown, D., 1990. 'Weaving tools' in Biddle 1990, **1**, 225–30
Bulleid, A., 1926. *The Lake-Villages of Somerset* (London)
Carrott, J., Dobney, K., Hall, A.R., Issitt, M., Jaques, D., Kenward, H., Large, F., Miles, A. and Shaw, T., 1995. 'Assessment of biological remains from excavations at 22 Piccadilly (ABC Cinema) York (YAT/YM site code 1987.21), *Reports from the Environmental Archaeology Unit, York* 95/53
Carrott, J., Hall, A., Issitt, M., Kenward, H. and Large, F., 1996a. 'Plant and invertebrate remains from post-Conquest deposits at 16–22 Coppergate, York (site code 1976–81.7): assessment of bioarchaeological potential and draft project design', *Reports from the Environmental Archaeology Unit, York* 96/9
—— 1996b. 'Assessment of plant and invertebrate remains from excavations associated with renovations at All Saints Church, Pavement, York (site code 95.47) *Reports from the Environmental Archaeology Unit, York* 96/47
Carus-Wilson, E., 1969. 'Haberget: a medieval textile conundrum', *Medieval Archaeol.* **13**, 148–66
Carus-Wilson, E. and Coleman, O., 1963. *England's Export Trade 1275–1547* (Oxford)
Carver, M.O.H., 1979. 'Three Saxo-Norman tenements in Durham City', *Medieval Archaeol.* **23**, 36–9
Chadwick, S.E., 1958. 'The Anglo-Saxon cemetery at Finglesham, Kent', *Medieval Archaeol.* **2**, 1–71
Charleston, R.J., 1990. 'Slick-stones (linen-smoothers)' in Biddle 1990, **1**, 240–2
Chorley, P., 1988. 'English cloth exports during the thirteenth and fourteenth centuries: the continental evidence', *Historical Research* **61**/144, 1–10
Clarke, H., and Carter, A., 1977. *Excavations at King's Lynn 1963–1970*, Soc. Medieval Archaeol. Monogr. Ser. 7 (London)
Coles, J., 1987. *Meare Village East*, Somerset Levels Paper **13**
Crowfoot, E., 1983. 'The textiles' in R. Bruce-Mitford, *The Sutton Hoo Ship Burial* **3**/1 (London), 409–79
Crowfoot, E. and Hawkes, S.C., 1967. 'Early Anglo-Saxon gold braids', *Medieval Archaeol.* **11**, 42–86, 209–10
Crowfoot, E., Pritchard, F. and Staniland, K., 1992. *Textiles and Clothing c.1150–c.1450*, Medieval Finds from Excavations in London **4** (London)
Crummy, N., 1983. 'Spindle whorls' in N. Crummy, *The Roman Small Finds from Excavations in Colchester 1971–9*', Colchester Archaeology Report **2**, 67
Dakyns, J.R., Fox-Strangways, C. and Cameron, A.G., 1886. *Memoirs of the Geological Survey. The Geology of the County between York and Hull* (London)
Demelon, P., 1972. *Le Village Mérovingien de Brebières (VIe–VIIe siècle)* (Arras)
Dommasnes, L.H., 1987. 'Male/female roles and ranks in Late Iron Age Norway' in Bertelsen, Lillehamer and Næss 1987, 65–77
Durham, B., 1977. 'Archaeological investigations in St Aldates, Oxford', *Oxoniensia* **42**, 83–203
Eagles, B.N. and Evison, V.I., 1970. 'Excavations at Harrold, Bedfordshire, 1951–3', *Bedfordshire Archaeol. J.* **5**, 17–55
Egan, G., 1979. 'A shearman's hook from London', *Trans. London Middlesex Soc.* **30**, 190–2
Endrei, W., 1961. 'Der Trittwebstuhl im frühmittelalterlichen Europa', *Acta Historica* **8**, 107–36
Evans, D.H. and Tomlinson, D.G., 1992. *Excavations at 33–35 Eastgate, Beverley, 1983–86*, Sheffield Excavation Reports **3**
Evans, N., 1985. *The East Anglian Linen Industry* (Aldershot)
Fell, C., 1984. *Women in Anglo-Saxon England* (London)
Ferdière, A., 1984. 'Le travail du textile en Région Centre de l'Age du Fer au Haut Moyen Age', *Revue Archéologique du Centre de la France* **23**/2, 209–75
Foreman, M., 1991. 'Stone objects' in Armstrong, Tomlinson and Evans 1991, 106–13
—— 1992. 'Stone objects' in Evans and Tomlinson 1992, 122–32
Foreman, M. and Drinkall, G., forthcoming. *The Anglo-Saxon Cemetery at Castledyke, North Lincolnshire*
Frere, S.S., Stow, S. and Bennett, P., 1982. 'Excavations on the Roman and medieval defences of Canterbury', *Archaeol. Canterbury* **2**
Fryde, E.B., 1964. *The Wool Accounts of William de la Pole*, St Anthony's Hall Publications **25**
—— 1966. *Some Business Transactions of York Merchants*, Borthwick Paper **29** (York)
Godwin, H. and Bachem, K., 1959. 'Plant material' in Richardson 1959, 109–13
Goldberg, P.J.P., 1986. 'Female labour, service and marriage in the late medieval urban north' *Northern History* **22**, 18–38

—— 1992. *Women, Work and Life Cycle in a Medieval Economy: Women in York and Yorkshire c.1300–1520* (Oxford)
Goodall, I., 1987. 'Objects of iron' in Beresford 1987, 177–87
—— 1990a. 'Weaving comb' in Biddle 1990, **1**, 234
—— 1990b. 'Tenter hooks' in Biddle 1990, **1**, 234–9
—— 1991. 'The ironwork' in Armstrong, Tomlinson and Evans 1991, 132–7
—— 1992. 'The iron objects' in Evans and Tomlinson 1992, 151ff
—— 1993. 'Iron textile-manufacturing tools' in Margeson 1993
Goodall, I. and Keene, D., 1990. 'Harbicks' in Biddle 1990, **1**, 239–40
Graham-Campbell, J., 1980. *Viking Artefacts: A Select Catalogue* (London)
Grenander Nyberg, G., 1975. *Lanthemmens Vävstolar,* Nordiska Museets Handlingar **84**
—— 1990. 'Spinning implements of the Viking Age from Elisenhof in the light of ethnological studies' in Walton and Wild (eds) 1990, 73–84
—— 1994. 'Looms for linen', *Laborativ Arkeologi (Journal of Nordic Archaeological Science)* **7**, 75–7
Grieg, S., 1928. 'Kvindearbeidet' in A.W. Brøgger and H. Schetelig (eds), *Osebergfundet* **2** (Oslo), 173–98
—— 1940. 'Viking antiquities in Scotland' in H. Shetelig (ed.), *Viking Antiquities in Great Britain and Ireland* **2** (Oslo)
Grove, L.R.A., 1939. 'An Anglo-Saxon loom-weight from York Castle', *YAJ* **34**
Haddan, A.W. and Stubbs, W., 1869–78. *Councils and Ecclesiastical Documents relating to Great Britain and Ireland* **1–3**
Hägg, I., 1984. 'Die Textilfunde aus dem Hafen von Haithabu', *Ausgrabungen in Haithabu* **20** (Neumünster)
—— 1994. 'Friesisches Tuch' in Jaaks and Tidow (eds), 1994
Hald, M., 1970. *Flettede Baand og Snore* (Denmark)
—— 1980. *Ancient Danish Textiles from Bogs and Burials* (Copenhagen)
Hall, A.R., 1992a. 'Archaeological records of woad (*Isatis tinctoria* L.) from medieval England and Ireland', *Beiträge zur Waidtagang* (Arnstadt), 21–2, figs.1–2
—— 1992b. 'The last teasel factory in Britain and some observations on teasel (*Dipsacus fullonum* L. and *D. sativus* (L.) Honckeny) remains from archaeological deposits', *Circaea, the Journal of the Association for Environmental Archaeology* **9**/1, 9–15
—— 1995. 'Archaeological evidence for woad *Isatis tinctoria* L., from medieval England and Ireland' in H. Kroll and R. Pasternak, *Res Archaeobotanica: 9th Symposium IWGP* (Kiel), 33–8
Hamerow, H., 1993. *Excavations at Mucking, 2: The Anglo-Saxon Settlement,* English Heritage Archaeol. Rep. **21** (London)
Heaton, H., 1965 (2nd edn). *Yorkshire Woollen and Worsted Industries* (Oxford)
Hedges, J.W., 1980. (unpublished) *Textiles and Textile Production in Dark Age Britain,* M.Phil. thesis, University of Southampton
Heinrich, L., 1992. *The Magic of Linen: Flax Seed to Woven Cloth* (Victoria, B.C., Canada)
Higham, M.C., 1989. 'Some evidence for 12th- and 13th-century linen and woollen textile processing', *Medieval Archaeol.* **33**, 38–52
Hoffmann, M., 1974 (1st edn 1964). *The Warp-Weighted Loom* (Oslo)
—— 1991. *Fra Fiber til Tøy* (Landbruksforlaget, Norway)
Holden, E.W., 1976. 'Excavations at Old Erringham, Shoreham, West Sussex, Part 1: A Saxon weaving hut', *Sussex Archaeol. Collec.* **114**, 306–21
Hurst, J.G., 1959. 'Middle Saxon pottery' in G.C. Dunning, J.G. Hurst, J.N.L. Myers and F. Tischler (eds.), 'Anglo-Saxon pottery: a symposium', *Medieval Archaeol.* **3**, 23–5
Høeg, O.A., 1976. *Planter og Tradisjon* (Oslo)
Ivens, R., Bushby, P. and Shepherd, N., 1995. *Tattenhoe and Westbury: Two Deserted Medieval Settlements in Milton Keynes,* Bucks. Archaeol. Soc. Monogr. Ser. **8**
Jaaks, G. and Tidow, K. (eds), 1994. *NESAT V: Textilsymposium Neumünster, 4–7.5.1993* (Neumünster)
Jackson, D.A., Harding, D.W. and Myres, S.A., 1970. 'The Iron Age and Anglo-Saxon site at Upton, Northants', *Antiq. J.* **49**, 202–21
Kaminska, J., and Nahlik, A., 1960. 'L'Etudes sur l'industrie textile du haut moyen âge en Pologne', *Archeologia Polona* **3**, 89–119
Keene, D., 1990. 'The textile industry' in Biddle 1990, **1**, 200–4
Kerridge, E., 1985. *Textile Manufactures in Early Modern England* (Manchester)
Kolchin, B.A., 1989. *Wooden Artefacts from Medieval Novgorod* (2 vols), Brit. Archaeol. Rep. Int. Ser. **S495** (Oxford)
Körber-Grohne, U., 1967. 'Charakteristik rezenter Bastfasern von Lein, Nessel und Hanf', *Geobotanische Untersuchungen auf der Feddersen Wierde,* 161ff
Lang, J.T., 1988. *Viking-Age Decorated Wood* (Dublin)
Leeds, E.T., 1923. 'A Saxon village at Sutton Courtenay, Berkshire', *Archaeologia* **73**, 147–92
Leggett, J.I., 1971. 'The 1371 poll tax return for the City of York', *YAJ* **43**, 128–46
Liebermann, F., 1903. *Die Gesetze der Angelsachsen* **1**
Ling Roth, H., 1977. *Studies in Primitive Looms* (Bedford)
Lloyd, T.H., 1972. 'The medieval wool-sack: a study in economic history', *Textile History* **3**, 92–9
—— 1977. *The English Wool Trade in the Middle Ages* (Cambridge)
Loyn, H.R. and Percival, J., 1975. *The Reign of Charlemagne: Documents on Carolingian Government and Administration,* Documents of Medieval History **2** (London)
Løken, T., 1987. 'The correlation between the shape of grave monuments and sex in the Iron Age, based on material from Østfold and Vestfold' in Bertelsen, Lillehammer and Næss 1987, 53–64
MacGregor, A., 1978. 'Industry and commerce in Anglo-Scandinavian York' in R.A. Hall (ed.), *Viking Age York and the North,* Counc. Brit. Archaeol. Res. Rep. **27**, 37–57

—— 1985. *Bone, Antler, Ivory and Horn* (London)
—— 1987. 'Objects of bone and antler' in Beresford 1987, 188–93
Magnusson, M. and Pálsson, H., 1960. *Njal's Saga* (Harmondsworth)
Mann, J.E., 1982. 'Early medieval finds from Flaxengate, 1: Objects of antler, bone, stone, horn, ivory, amber and jet', *The Archaeology of Lincoln* 17/1, 22–57
Margeson, S., 1993. *Norwich Households: Medieval and Post-Medieval Finds from Norwich Survey Excavations 1971–78*, E. Anglian Archaeol. Rep. **58** (Gressenhall)
Markham, G., 1683 (1st edn 1648). *The English Housewife* (London)
Massingham, H.J., 1943. 'The Wiltshire Flax-Mill', *The Geographical Magazine* 1/3, 369–79
Millard, L., Jarman, S. and Chadwick Hawkes, S., 1969. 'Anglo-Saxon burials near the Lord of the Manor, Ramsgate', *Archaeol. Cantiana* **84**, 9–30
Miller, E. and Hatcher, J., 1995. *Medieval England: Towns, Commerce and Crafts, 1086–1348* (London)
Morris, C.A., 1984. (unpublished) *Anglo-Saxon and Medieval Woodworking Crafts: the Manufacture and Use of Utilitarian and Domestic Wooden Artefacts in the British Isles, AD 400–1500*, Ph.D. thesis, University of Cambridge
Mortimer, C., 1995. 'Glass linen-smoothers from 16–22 Coppergate, York', *Ancient Monuments Laboratory Report* 22/95
Munro, J.H., 1978. 'Wool-price schedules and the qualities of English wools in the later middle ages c.1270–1499', *Textile History* **9**, 118–69
—— 1979. 'The 1357 wool-price schedule and the decline of Yorkshire wool values', *Textile History* **10**, 211–19
Murray, J.C., 1982. *Excavations in the Medieval Burgh of Aberdeen 1973–81*, Soc. Antiq. Scot. Monogr. Ser. **2**
Nilsson, T., 1976. 'Något om hushållet och dess inventarium' in A.W. Mårtensson (ed.), *Uppgrävt-förflutet för PKBanken i Lund*, Archaeol. Lundensia 7 (Lund), 233–50
Nockert, M., 1991. *The Högom Find and Other Migration Period Textiles and Costumes in Scandinavia*, Archaeology and Environment **9**, Högom Part 2 (Umeå)
Nordland, O., 1961. *Primitive Scandinavian Textile in Knotless Netting* (Oslo)
Oakley, G.E., 1979a. 'The worked bone' in Williams 1979, 308–18
—— 1979b. 'The glass' in Williams 1979, 296–8
Oakley, G.E. and Hall, A.D., 1979. 'The spindle whorls' in Williams 1979, 286–9
O.E.D. The Oxford English Dictionary (2nd edn), 1989
Ó Riordáin, B., 1971. 'Excavations at High Street and Winetavern Street, Dublin', *Medieval Archaeol.* **13**, 73–85
Owen-Crocker, G.R., 1986. *Dress in Anglo-Saxon England* (Manchester)
Palliser, D.M., 1984. 'York's west bank: medieval suburb or urban nucleus?' in P.V. Addyman and V.E. Black (eds), *Archaeological Papers from York Presented to M.W. Barley*, 101–8 (York)
Pálsson, H. and Edwards, P., 1976. *Egil's Saga* (Harmondsworth)
Patterson, R., 1957. 'Spinning and weaving' in C. Singer, E.J., Holmyard, A.R., Hall and T.I. Williams (eds), *A History of Technology* **2**, 190–220
Petersen, J., 1951. *Vikingstiden Redskaper* (Oslo)
Pipe Rolls. (Publications of the Pipe Roll Society, 1884–)
Plonka, F., 1965. 'Domesticated flax', *CIBA Review* **1965/2**, 3–9
Poole, C., 1984. 'Objects of baked clay' in B. Cunliffe, *Danebury: an Iron Age Hillfort in Hampshire, 2, The Excavations 1969–78: The Finds*, Counc. Brit. Archaeol. Res. Rep. **52**, 398–402
Postles, D., 1981. 'Fleece weights and the wool supply, c.1250–c.1350', *Textile History* **12**, 93–103
Pounds, N.J.G., 1973. *An Historical Geography of Europe 450 BC–AD 1330* (Cambridge)
Power, E., 1933. 'The wool trade in the 15th century' in E. Power and M.M. Postan, *Studies in English Trade in the 15th century* (London), 39–90
—— 1937. *Medieval People* (Harmondsworth)
Pritchard, F., 1991. 'Small finds' in A.G. Vince (ed.), *Aspects of Saxon and Norman London 2: Finds and Environmental Evidence*, London and Middlesex Archaeol. Soc. Spec. Pap. **12**, 120–278
—— 1994. 'Weaving tablets from Roman London' in Jaaks and Tidow (eds) 1994, 157–161
Radley, J., 1971. 'Economic aspects of Anglo-Danish York', *Medieval Archaeol.* **15**, 37–57
RCHMY. Royal Commission on Historical Monuments (England), 1962. *An Inventory of the Historical Monuments in the City of York* **1**: *Eburacum, Roman York* (HMSO, London)
Richardson, K.M., 1959. 'Excavations in Hungate, York', *Archaeol. J.* **116**, 51–114
Roes, A., 1963. *Bone and Antler Objects from the Frisian Terp-Mounds* (Haarlem)
—— 1965. *Vondsten van Dorestad*, Archaeologica Traiectina 7 (Groningen)
Roesdahl, E., 1977. *Fyrkat, en Jysk Vikingeborg 2: Oldsagerne og Gravpladsen* (Copenhagen)
Roesdahl, E., Graham-Campbell, J., Connor, P. and Pearson, K. (eds), 1981. *The Vikings in England* (London)
Rogerson, A. and Dallas, C., 1984. *Excavations in Thetford, 1948–59 and 1973–80*, E. Anglian Archaeol. Rep. **22** (Gressenhall)
Rollins, J.G., 1981. *Needlemaking*, Shire Album **71** (Princes Risborough)
Ross, A., 1895 (reprinted 1974). *Scottish Home Industries* (Glasgow)
Ryder, M.L., 1983. *Sheep and Man* (London)
—— 1993. 'Wool at Danebury: a speculation using evidence from elsewhere', *Oxford J. Archaeol.* **12**/3, 310–19
Salzman, L.F., 1931. *English Trade in the Middle Ages* (Oxford)
Satchell, J., 1986. *The Kendal Weaver* (Kendal)
Sellers, M., 1974. 'Textile industries', *Victoria History of the County of Yorkshire* **2** (London), 406–29
Shor, J. and Shor, F., 1952. 'We dwelt in Kashgai tents', *National Geographic Magazine* **101**/6, 805–32
Swanson, H., 1989. *Medieval Artisans* (Oxford)

Swanton, M.J., 1973. *The Spearheads of the Anglo-Saxon Settlements* (London)
Taylor, G.W., 1991. 'Dyepots — method of analysis' in A. Vince (ed.), *Aspects of Saxo-Norman London 2: Finds and Environmental Evidence*, LAMAS Special Paper **12**, 169–70
Thorpe, L. (transl.), 1970. *Einhard the Frank: The Life of Charlemagne* (London)
Tomlinson, P., 1985. 'Use of vegetative remains in the identification of dyeplants from waterlogged 9th–10th century AD deposits at York', *J. Archaeol. Sci.* **12**, 269–83
Trewin, N.H., 1982. 'Stone objects' in Murray 1982, 184–5
Trow-Smith, R., 1957. *A History of British Livestock Husbandry to 1700* (London)
Van der Vyver, A. and Verlinden, C., 1933. 'L'Auteur à la portée du Conflictus Ovis et Lini', *Revue de Philologie et D'Histoire* **12**, 59–81
Waites, B., 1977. 'Pastoral farming on the Duchy of Lancaster's estate in the fourteenth and fifteenth centuries', *YAJ* **49**, 77–86
Walton, P., 1988a. 'Dyes of the Viking Age: a summary of recent work', *Dyes in History and Archaeology* (formerly *Dyes on Historical and Archaeological Textiles*) **7**, 14–20
—— 1988b. 'Dyes and wools in Iron Age textiles from Norway and Denmark', *J. Danish Archaeol.* **7**, 144–58
—— 1989. 'A weapon of war or a tool of peace — an iron blade from 16–22 Coppergate', *Interim* **14**/3 38–43
—— 1990. 'Textile production at Coppergate, York: Anglo-Saxon or Viking?' in Walton and Wild (eds) 1990, 61–72
—— 1991. 'Textiles' in J. Blair and N. Ramsay, *English Medieval Industries* (London), 319–54
—— 1993. *Textiles from the City of Lincoln, 1972–1989*, Archive of City of Lincoln Archaeology Unit
—— unpublished. TRA report on dye on potsherds from Norwich, on behalf of P. Murphy, University of East Anglia, 22 April 1985
Walton, P. and Wild, J.P. (eds), 1990. *NESAT III: Textiles in Northern Archaeology* (London)
Walton Rogers, P., 1993. 'Dyes and wools in Norse textiles from Ø17A' in C.L. Vebaek, *Narsaq — a Norse landnáma farm*, Meddelelser om Grønland, Man and Society **18**, 56–8
—— 1995. 'The raw materials of textiles from northern Germany and The Netherlands', *Probleme der Küstenforschung im südlichen Nordseegebiet* **23**, 389–400 (Oldenburg)
—— forthcoming a. 'The raw materials of the textiles from Gården-under-Sandet, Ameralla Fjord (Western Settlement), Greenland' in E. Østergård in prep.
—— forthcoming b. 'Textile, yarn and fibre from the Biggins, Papa Stour, Shetland' in B. Crawford in prep.
—— in prep. Textile equipment from Flixborough, North Lincolnshire
—— unpublished a. 'Textiles from The Brooks, Winchester', TRA Report, 5 January 1996
—— unpublished b. 'Tests for dye on potsherds from The Brooks, Winchester', TRA Report, 15 February 1996
—— unpublished c. 'Textile and dress from the Anglo-Saxon cemetery at West Heslerton, North Yorkshire', TRA Report, 20 March 1993, to English Heritage
Waterman, D.M., 1959. 'Late Saxon, Viking and early medieval finds from York', *Archaeologia* **97**, 59–105
Weir, S., 1970. *Spinning and Weaving in Palestine* (London)
Wenham, L.P., 1971. 'Discoveries in King's Square, York, 1963', *YAJ* **42**, 165–8
West, S., 1985 (2 vols). *West Stow, the Anglo-Saxon Village*, E. Anglian Archaeol. Rep. **24** (Gressenhall)
Wheeler, R.E.M., 1930. *London in Roman Times*, London Museum Catalogue **3**
Whitelock, D., 1963 (1st edn 1939). *Sermo Lupi ad Anglos* (London)
Wild, J.P., 1968. 'The Roman flax-hackle (*aena*)', *Museum Helveticum* **25**, 139–42
—— 1970. *Textile Manufacture in the Northern Roman Provinces* (Cambridge)
—— 1979. 'Roman and native in textile technology' in B.C. Burnham and H.B. Johnson, *Invasion and Response, the Case for Roman Britain*, Brit. Archaeol. Rep. Brit. Ser. **73**, 123–31
Williams, J.H., 1979. *St Peter's Street Northampton: Excavations 1973–1976* (Northampton)
Williams, J.H., Shaw, M. and Denham, V., 1985. *Middle Saxon Palaces at Northampton* (Northampton)
Woodland, M., 1990. 'Spindle whorls' in Biddle 1990, **1**, 216–25
YCR. Raine, A. (ed.), 1942. *York Civic Records* **3**, *YASRS* **106**
YMB. Sellers, M. (ed.), 1911 and 1914. *York Memorandum Book* **1**, **2**, *SS* **120**, **125**
Zeitschrift für Deutschland Alterthum, 1859. **11** (Berlin)
Zimmermann, W.H., 1982. 'Archäologische Befunde frühmittelalterliche Webhäuser' in L. Bender Jørgensen and K. Tidow, *Textilsymposium Neumünster* (Neumünster), 109–34
Øye, I., 1988. 'Textile equipment and its working environment, Bryggen in Bergen c.1150–1500', *The Bryggen Papers, Main Series* **2** (Oslo)

Index

By Margaret Brooks

The figures and tables are indicated by page numbers in *italics*. Tables are shown with *(Table)* after the page number. Places are in York unless otherwise indicated. The term *passim* indicates references scattered through the text. The following abbreviations have also been used in this index: C - century; f - facing.