THE PRODUCTS OF THE BLACKSMITH IN MID-LATE ANGLO-SAXON ENGLAND

By Patrick Ottaway

www.pjoarchaeology.co.uk

Part 1

Contents **page**

The notes (numbered in superscript) are to be found in Part 4

Acknowledgements

I would like to acknowledge the assistance of many colleagues and friends who have assisted me in my research on Anglo-Saxon iron objects. I owe particular thanks to Dr P. V. Addyman, who read and commented on a draft of this paper, and to Dr T. Dickinson, Dr I. H. Goodall, Dr R. A. Hall, Dr J. G. McDonnell and Dr K. Wiemer. I would also like to acknowledge permission to refer to objects in advance of publication from Professor M. Biddle and B. Kjølbye-Biddle (Repton excavations), R. Carr (Suffolk Archaeological Unit), M. J. Jones (City of Lincoln Archaeological Unit), T. Manby (Thwing excavations), K. McGowan (Passmore Edwards Museum), K. Qualmann (Winchester City Museum), A. Rogerson (Norfolk Archaeological Unit) and J. B. Whitwell (Humberside Archaeological Unit).

Introduction

An indication of the vital role of the blacksmith in Anglo-Saxon England[1] is to be found in the well-known passage of *Aelfric's Colloquy* in which the pupil speaking for the smith asserts his primacy amongst the secular crafts.[2]

> The 'Counsellor' answers: ... You, what do you give us in your smithy but iron sparks, and the noise of hammers beating and bellows blowing?
> The 'Carpenter' says: Which of you doesn't make use of my craft, when I make houses and various vessels and boats for you all?
> The 'Blacksmith' answers: Oh carpenter, why do you talk like that when you couldn't pierce even one hole without my craft?

In spite of this literary testimony, however, there has been little archaeological evidence for either the products or the working methods of the Anglo-Saxon blacksmith until the last twenty years or so, except in respect of the specialised branch of the craft involved with weapon production. This situation is largely the result of, on the one hand, a lack of excavation of settlement sites, and, on the other, the character of the artefacts from pagan graves and of the chance finds of all Anglo-Saxon periods made during building work, ploughing, river dredging and the like. Objects other than weapons, including tools and riding equipment, have been found both in graves and as chance finds, but they are relatively few

in number when compared to the large assemblages which have been recovered from settlements. The monastic site at Flixborough, for example, has produced c. 5000 objects and Anglo-Scandinavian contexts at 16-22 Coppergate, York c. 4500.[3]

The aim of this paper is to describe the principal products (including arrowheads, but excluding other weapons) of the blacksmith in the Middle and Late Anglo-Saxon periods, and provide a substantial, if not exhaustive, body of references in which well-stratified objects from recently excavated and/or published settlement sites figure prominently. These sites will include those of the Middle Anglo-Saxon period at Flixborough (N. Lincs.), Hamwic (Anglo-Saxon Southampton), Thwing (East Riding of Yorkshire) and York (Fishergate site).[4] The Late Anglo-Saxon sites referred to include Goltho, Repton, Thetford, Winchester and York (primarily 16-22 Coppergate).[5]

Before concluding this introductory section, it should also be noted that going hand in hand with the great increase in the numbers of objects recovered in recent years has been the emergence of new approaches to their investigation. Archaeologists who study iron artefacts owe a great debt to specialist conservators who have developed techniques for the X-radiography and cleaning of ironwork,[6] and to metallurgists who have developed techniques of physical examination.[7] As a result of three way co-operation there is now a considerable body of research data which will allow ironwork to make a significant contribution to the study of the economy and society of Anglo-Saxon England. Before looking at the objects themselves, however, it is necessary to summarise the nature of iron and the techniques with which it was worked.

The sources and properties of iron[8]

There are two principal forms of iron ore which were exploited in the Anglo-Saxon period. The carbonate ores (in which iron exists as ferrous carbonate - $FeCO_3$) are the most common and occur as nodules or sedimentary deposits. The nodules occur in the Wealden series and in the Coal Measures, and the principal sedimentary deposits occur along the Jurassic scarp in such areas as the Cleveland Hills, north Lincolnshire and Northamptonshire. The second form of ore is limonite, hydrated iron oxide, usually occurring as the crystalline oxide goethite ($Fe_2O_3.H_20$ or FeO.OH). Limonite is found in, for example, the Forest of Dean and also locally in the Northamptonshire sand ironstone. The latter has been shown to be the ore source for the extensive Late Anglo-Saxon and Norman ironworking in Stamford.[9] Bog ore, deposits of which resemble peat and are formed under wet conditions, may be found in moorland regions in the north and west of England. It has also been suggested that a local bog ore source was used to supply iron to Anglo-Saxon Thetford since the town is over 30km from the nearest ironstone outcrops.[10]

Iron in the Anglo-Saxon period was smelted in what is often known as the direct or bloomery process.[11] After roasting to remove excess water, the ore was heated at a temperature in excess of 800°C in a reducing atmosphere rich in carbon monoxide produced from charcoal. At c.1150° much of the slag would be removed by liquation, but the Anglo-Saxon furnace was not capable of generating sufficient heat to melt the iron and separate it from all impurities. The iron bloom produced by the direct process is, therefore, a heterogeneous object. While the slag content could, to some extent, be reduced by reheating and hammering, slag was not expelled completely and the presence of fine slag strings accounts for the slightly fibrous appearance of most Anglo-Saxon and other ancient iron objects.

Smelting could be undertaken in a covered pit known as a bowl furnace. Middle Anglo-Saxon examples have been found at Millbrook (Sussex) [12] and Ramsbury (Wiltshire).[13] The addition of a shaft above the pit made for greater efficiency as it allowed the ore more prolonged contact with the carbon monoxide and allowed a natural draught to supplement that produced by bellows. One of the Ramsbury furnaces appears to have had a low shaft and similar furnaces of Late Anglo-Saxon or early Norman date have been found at Stamford [14] and West Runton (Norfolk).[15]

The iron in the bloom usually existed in a relatively pure form known as ferrite which is a malleable and ductile metal. Iron can, however, exist in a number of structural forms depending on the presence of other elements including carbon which was used to form steel. Although difficult to define exactly, steel in the Anglo-Saxon period is usually considered to be iron with a minimum 0.5% carbon content.[16] The Anglo-Saxon blacksmith created steel by introducing carbon into ferritic iron in a process usually known as carburisation. This involved heating the iron, either as a strip, or, more rarely, as a completed object, over a long period in a carbon-rich environment. The carbon was gradually absorbed into the iron, but more would be absorbed in surface areas than in the core. The iron would, therefore, if in strip form, be folded and refolded to create a piece of homogeneous carbon content. This was rarely entirely successful, however, and a common form of early iron is the so-called piled structure with alternating bands of high and low carbon content.

After carburisation great care had to be taken to avoid the loss of carbon attendant on slow cooling and in a process known as quenching the iron was cooled rapidly in a fluid, usually water. An excessive carbon content also had to be avoided as it would produce a metal which was brittle. After quenching, therefore, iron might be gently reheated, or tempered, to produce metal of the optimum quality.

While steel was primarily used for making the cutting edges or striking faces of tools, it was also used in pattern-welding.[17] This involved combining the visual properties of iron strips with differing carbon contents by twisting and welding them together. Pattern-welding was used throughout the Anglo-Saxon period, initially for edged weapons, but by the Middle Anglo-Saxon period it was also employed in knives (Plate 1).

Plate 1 Pattern-welded knife from 16-22 Coppergate, York (photo courtesy of University of Aston, Birmingham)

Most smithing work took place when the iron was hot, but iron produced by the direct process could also be worked cold. It is clear, for example, that, on occasions, tools or weapons were resharpened by cold hammering.[18] Furthermore, much of the decorative relief work found on Anglo-Saxon objects was probably created with a punch, file or graving tool when the objects were cold.

Iron objects were decorated not only with relief work, but also with inlay and plating. The inlaying of iron with non-ferrous wire is known throughout the Anglo-Saxon era.[19] In the early period it was usually to be found on buckles, buckle-plates and other dress fittings. From the eighth century onwards inlay was also to be found on weapons, knives and stirrups. Inlay with iron is uncommon, but can be found occasionally on swords on which personal names or pseudo-names are spelt out.[20] Plating with copper alloy, often known as brazing, has its origins in the Romano-British period and continued to be used in the Anglo-Saxon primarily for bells and locks. Plating with tin or tin-lead alloy is not known in the Romano-British period and appears to be an innovation of the late seventh or eighth centuries. Tinning was especially popular for casket fittings, dress fittings and riding equipment.[21] In addition, there are a few examples of iron objects, notably stirrups, which are silver plated. A related decorative technique, also used occasionally on iron, was the application, by soldering, of sheets of non-ferrous metal bearing relief decoration.[22]

The presence of smelting slag at sites such as 16-22 Coppergate, York,[23] suggests that, on occasions, ore was transported a considerable distance for smelting, perhaps as ship's ballast. In order to avoid the cost of transporting the ore, however, it was, presumably, usual for iron to be smelted near the ore source after which the blooms would be made up into bars for supply to smiths. In Scandinavia numerous hoards of large iron bars have been found dating to the second half of the first millennium,[24] but Anglo-Saxon examples are rare. Thetford has, however, produced a bar, 330mm long, with distinctive flared ends, which resembles what is often known, from its occurrence in the eponymous hoard, as the 'Mästermyr type' (Fig. 1a).[25] Much more common in England are smaller pieces of bar iron and scrap, many of which are probably offcuts discarded during smithing (Fig. 1b). A very substantial body of such material comes from 16-22 Coppergate, York [26] where smithing was clearly taking place in the period 925-975.[27]

For discussion purposes the objects were classified as either bars, strips or plates. Strips (of which there were c. 440) were defined as '...having a maximum width to maximum thickness ratio of less than 4:1 and a relatively constant cross-section size and form for most of their length...' Ten objects were defined as bars as they were markedly more substantial than the strips, having a width to thickness product greater than 300mm². Some bars and strips have irregular surfaces due to hammering and many also have marks at their ends indicating that they had been severed by chisel or manual breakage from larger pieces. Metallographic examination [28] showed that the strips had a variety of structures including ferrite, steel and a piled structure. It may be suggested, therefore, that a specialised branch of the smith's craft in Anglo-Scandinavian York was the preparation of iron strips of different qualities which were then supplied to customers as required.

In addition to bars and strips, 16-22 Coppergate also produced c. 200 objects defined as plates: '...which usually have a maximum thickness of 6mm or less and a ratio of maximum width to thickness greater than 4:1'. Although some plates had one or more straight sides, many were of irregular shape. Some plates were probably manufacturing offcuts, but it is likely that many others were scrap resulting from the breaking up of redundant objects. It should be stressed that a large proportion of the iron used by Anglo-Saxon smiths would have been recycled rather than freshly smelted. Of particular value in this regard were objects with a steel component and this must explain why a relatively small number of bladed tools, apart from knives, are recovered on settlement sites. A number of the objects found at 16-22 Coppergate, including parts of swords, augers and axes, had probably been lost or discarded during recycling. In addition, there are two coin reverse dies from the site (fig. 1n), one existing as only the steel cap without its tang, which may also have been scrap rather than items discarded from a mint on the site itself.[29]

The smithy and the smith's tools

The character of the Anglo-Saxon smithy is not easy to determine as contemporary illustrations and excavated examples are equally scarce. While smithing slag and pieces of bar iron and scrap are frequently found on excavations, a smithing site cannot be securely identified unless the material is found in direct association with a suitable hearth. One would also expect to find large quantities of the very fine slag known as hammer scale which derives from welding. Sites which have produced good evidence for smithies include Six Dials, Hamwic,[30] Ramsbury,[31] Flaxengate, Lincoln,[32] and 16-22 Coppergate, York.[33]

The smithy buildings were often, it appears, little different from contemporary habitations. As far as hearths are concerned, the most distinctive come from within tenth-century buildings at York. They were rectangular in shape, measured up to 2.4m x 1.3m, and were composed of a thick deposit of clay surrounded by stones or Roman tiles. There may also have been some form of waist-level structure comparable to that depicted in the smithing scene from the Sigurd legend on the tenth - eleventh century stone cross at Halton (Lancashire) [34] and in a manuscript illustration showing Tubalcain the smith at work.[35] Although no good archaeological evidence has yet been found, the raised hearths of

medieval date, which are well known from archaeology and contemporary illustrations,[36] may have their origins in the Anglo-Saxon period.

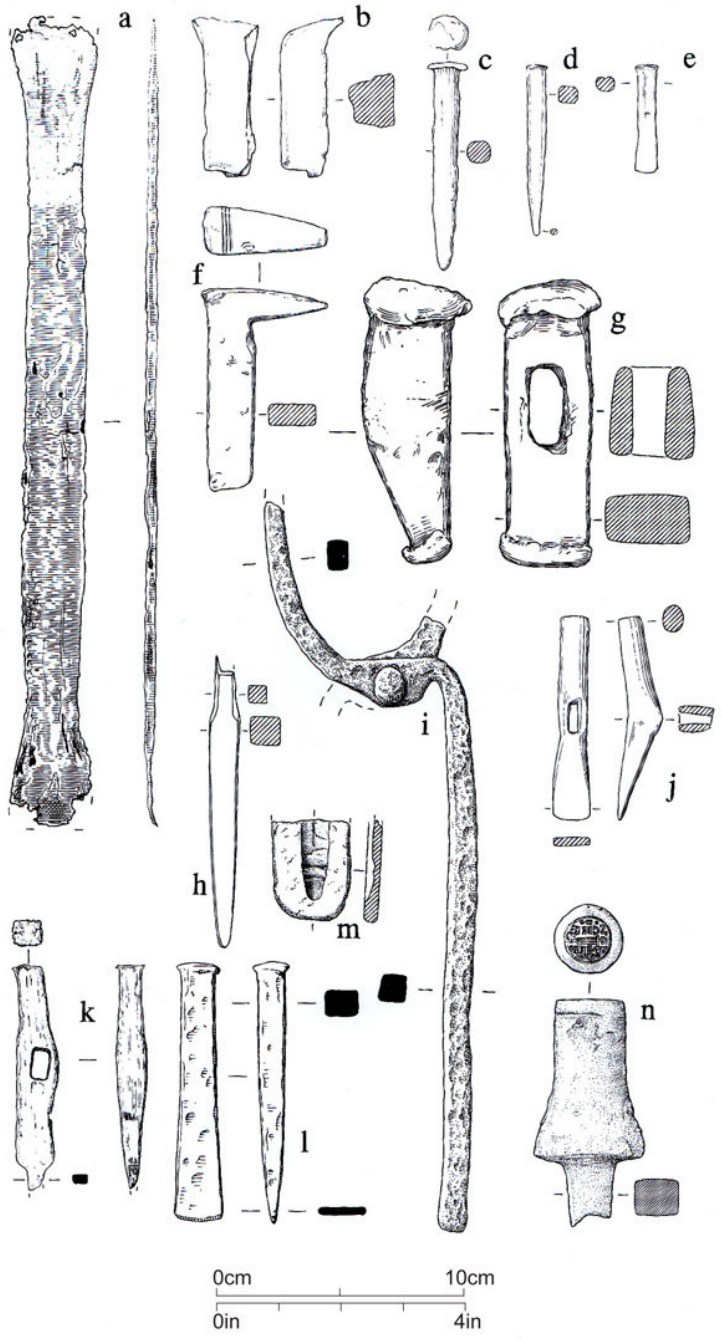

Fig.1 a-b bars (Thetford and York); c-e punches (York); f anvil (York); g smith's hammer (York); h smith's punch (York); i tongs (London); j hammer (York); k countersinking punch (Thetford); l chisel (Thetford); m mould (York); n coin die of St Peter Penny (York)

In addition to the hearth and bellows (also shown at Halton), another vital piece of smithy equipment was the anvil. A boulder would have served for forging large items, and a sarsen anvil was found at Ramsbury,[37] but other work required an iron anvil. It would have been fixed onto a wooden base as shown in another scene showing Tubalcain in the eleventh century Caedmon manuscript.[38] Examples of small iron anvils come from amongst the mid – late seventh century metalworking tools found in a grave at Tattershall Thorpe (Lincs.) [39] and from 16-22 Coppergate (Fig. 1f).[40] Both these objects are swaged; the former has two holes, perhaps used for making nails and the latter fine grooves, possibly used for making needles and pins.

Finds in Scandinavian graves [41] remain an important source of information on blacksmith's tools in northern Europe in the second half of the first millennium, although a few examples have been found in England. They include hand hammers weighing c.650g (Fig. 1g),[42] and punches with the characteristic pinched neck which allowed them to be gripped by rods or tongs while the smith worked with hot iron (Fig. 1h).[43] A specialised punch from Thetford, which had had a wooden handle to hold it steady, is thought to have been used for making the countersunk holes in horseshoes (Fig. 1k).[44]

A variety of tongs with hinged jaws are known including a very large pair, c.570mm long, from a group of objects, presumed to be Late Anglo-Saxon, recovered from the Thames in London. Another pair which is incomplete, but with a surviving length of 300mm came from an eleventh century deposit in London (Fig. 1i).[45] While these two pairs were probably used for hot iron, other, smaller tongs may have been used primarily in working non-ferrous metal. Complete examples come from Tattershall Thorpe (220mm long), Ramsbury (190mm), Flixborough (165mm) and Repton (105mm).[46]

Other tools used for working both iron and non-ferrous metals include small hammers (Fig. 1j).[47] Punches of various sizes (Fig. 1c-e) were used for piercing, chasing and other decorative work.[48] Surviving punch tips are either rounded or wedge-shaped, but from the impressions on other objects it is clear that other forms including a 'C' (Fig. 14a) and an 'O' existed.

A specialised form of punch, already referred to above, is the coin die (Fig. 1n). In addition to the York examples, a reverse die of Aethelred II (978-1016) comes from Flaxengate, Lincoln and another of Cnut (1030-35) was found unstratified in London.[49] Creation of the pattern of the die faces would itself have required a range of specialised punch tip forms. Metallographic examination of the York dies shows that the design was punched into their faces while the metal was in the soft ferritic form; subsequently the caps were hardened by carburisation.[50]

Chisels were probably used for cutting up plates or sheets of iron and other metals (Fig. 1l).[51] Metalworking files include a large tanged example, 230mm long, from Thetford.[52] Smaller examples, also tanged, include one from Beverley which is unusual in having cross-cut teeth on one face.[53] One of a pair of files from 16-22 Coppergate, York (Plate 2) [54] had copper alloy in the teeth which suggests a use in finishing objects after their removal from the mould. Metallographic examination of the second York file showed that it had been manufactured in the same way as the coin dies in that the teeth had been cut before carburisation while the iron was soft.[55]

Clippers would have been used for cutting up sheets of non-ferrous metal and examples come from the Tattershall Thorpe hoard and 16-22 Coppergate (Fig. 2a).[56] Tattershall Thorpe also produced a draw-plate for wire, existing as a tanged bar c.114mm in length with five holes of various diameters, and a probable soldering lamp.[57] 16-22 Coppergate produced two probable soldering lamps[58], small boat-shaped objects in which a wick could be fed from a tallow reservoir. Another find from Coppergate was a unique iron mould used for making non-ferrous strap-ends with animal head terminals (Fig.1m).[59]

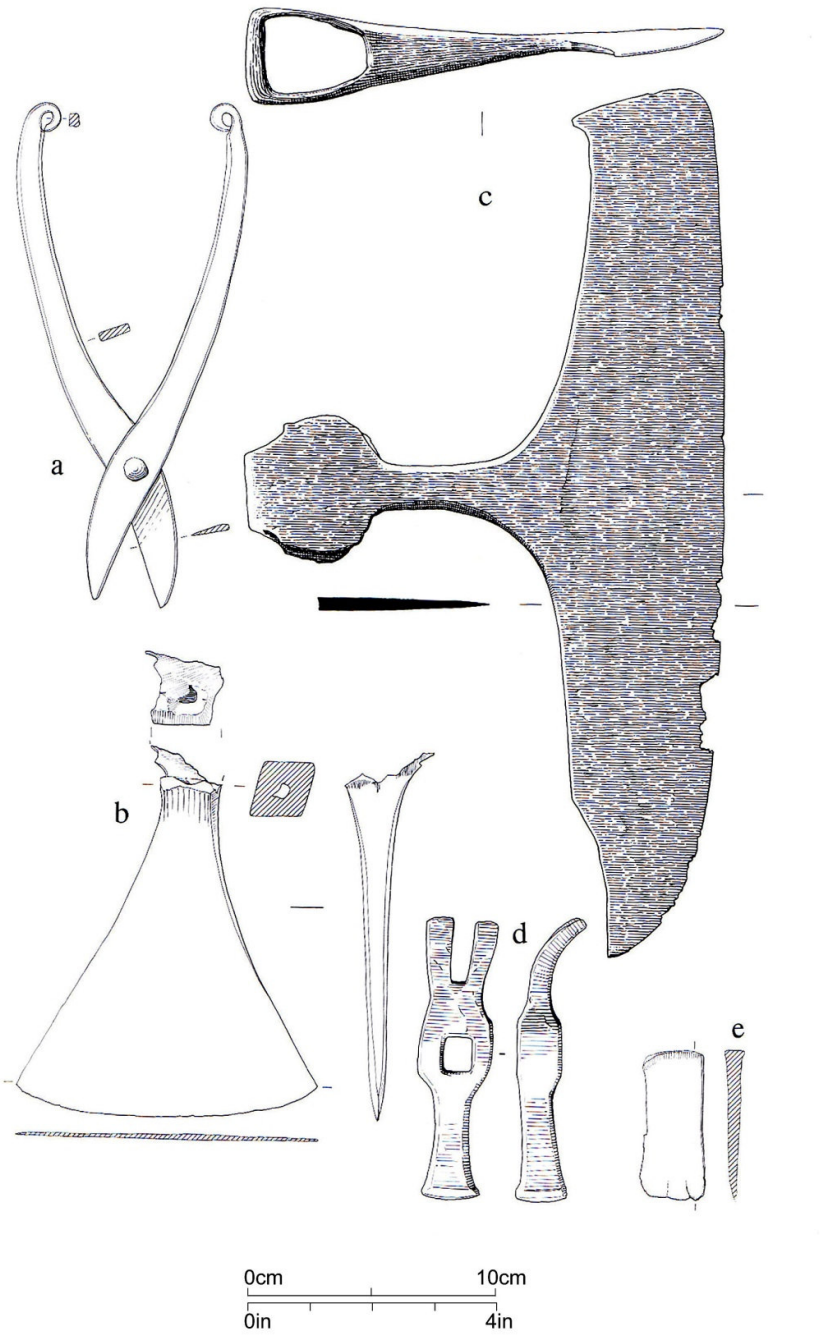

Fig.2 a clippers (York); b axe (York); c T-shaped axe (Winchester); d claw hammer (Goltho); e wedge (York)

Plate 2 Metalworker's file (top) and carpenter's rasp from 16-22 Coppergate, York. File L.66mm, rasp L.88mm. (Photo © York Archaeological Trust)

Craftworker's tools

In addition to tools for metalworking, numerous examples of tools used in other crafts have been found in recent years and it is now possible to confirm and even extend the well-known list to be found in the *Discriminating Reeve* or *Gerefa*, a tenth - eleventh century estate memorandum.[60]

Any survey of Anglo-Saxon woodworking tools [61] should be prefaced by noting a remarkable hoard found in a pair of lead tubs at Flixborough in 1994. The contents included five axes, two adzes (Plates 3-5), three spoon augers and a shave. Unfortunately the hoard was not found in a stratified context, but in a watching brief during mineral extraction. A Middle Anglo-Saxon date may, however, be presumed in view of the form of the objects and the proximity of the find spot to the excavation site.[62]

An indispensable tool of the carpenter and woodworker was the axe of which there are numerous Anglo-Saxon examples, although very few come from stratified contexts.[63] There has, moreover, been little work on classification since the typology published by Wheeler in 1927.[64] With the exception of the early Anglo-Saxon francisca or throwing axe, which was probably used exclusively as a weapon, and the carpenter's T-shaped axe, most other axes are likely to have been used for a number of purposes.

Axe blades widen to a greater or lesser extent away from the handle socket to a slightly convex cutting edge, and the faces are usually asymmetrical. In some cases the blade only widens a little; the ratio of height to width may be as much as 3:1 and the front of the blade may be virtually perpendicular. In other cases the blade widens considerably and the ratio of height to width approaches 1:1 (Fig. 2b). On these objects the sides may become markedly concave and, on occasions, the side nearest the handle has a shoulder at about its mid-point after which it drops straight to the cutting edge.[65] An axe's socket may be simply formed by looping over the head of the blade, but it is sometimes thickened and given a flat surface to enable it to be either used as a hammer or to receive hammer blows. There are, however, no Middle or Late Anglo-Saxon examples of the 'axe-hammers' with elongated heads known from pagan graves.[66]

It is likely that the narrower axes were primarily carpenter's tools used for tree felling, and for cutting and splitting timbers. Contemporary illustrations imply, however, that the wider axes were used for carpentry, the slaughtering of beasts and as weapons of war.[67] Amongst good examples of weapons are, presumably, two axes found in the Thames, which

have brass socket collars, one with Ringerike style ornament, and an axe from Coventry which is inlaid with copper alloy.[68]

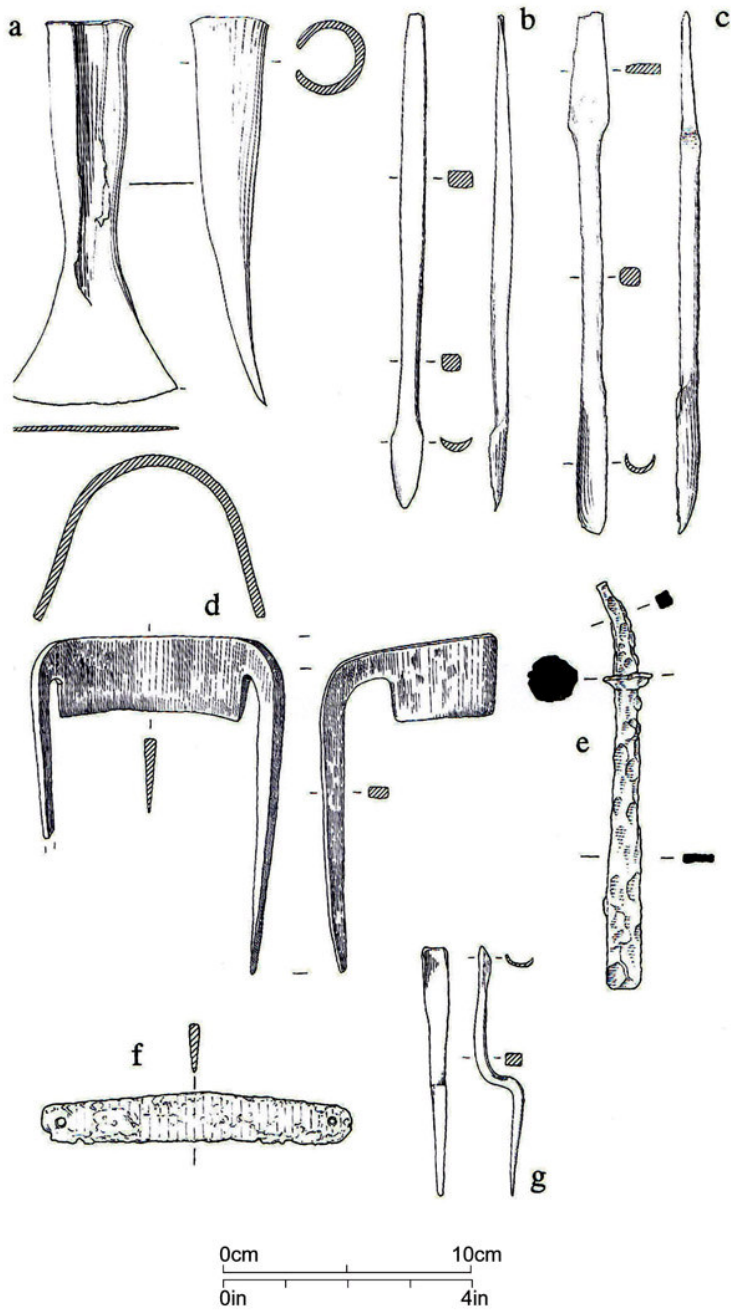

Fig.3 a socketed chisel (York); b-c spoon augers (York); d shave (York); e turner's chisel (Brandon); f draw knife (Thwing); g gouge (York)

The T-shaped axe is distinctive in having a short neck below the socket and an elongated blade set parallel to the handle (Fig. 2c).[69] That it was primarily used in carpentry is shown in manuscript illustrations and the Bayeux Tapestry.[70] The blades often had an

asymmetrical cross-section which allowed the efficient trimming of timbers.[71] The origins of the T-shaped axe are unclear, although an example said to be of the 'pagan period' comes from Hauxton (Cambs.).[72] The narrowest and most elongated blades appear, however, to belong to the Late Anglo-Saxon period.

Plate 3 Carpenter's adze from the Flixborough tool hoard – L.175mm (© Humber Archaeology Partnership)

Timber might also be trimmed and otherwise shaped with an adze, the blade of which had its wider faces at 90° to the long axis of the handle (Plates 3-4). As in the case of the axe, there are examples with relatively narrow blades and others with T-shaped blades.[73] The socketed chisel, or slice, with its slightly curved and flared blade was another tool probably used for trimming timbers (Fig. 3a). The form of the handle is, however, unknown, and may have been either straight or L-shaped.[74]

In a period when large saws were unknown, timber had to be split to form boards and planks, and this required the use of wedges. A few iron examples are known (Fig. 2e),[75] although smaller specimens may also have been used to secure tool handles, as is shown by that found with a T-shaped axe from London.[76] Metallographic examination of a wedge from York showed it to be made of high quality steel.[77]

The burring of the heads of axes and adzes shows that they may have been used as hammers, but there are also two eleventh century claw hammers from Goltho which are specialist carpentry tools used for removing nails from timber (Fig. 2d).[78]

Plate 4 T-shaped adze from the Flixborough tool hoard – W.190mm (Photo © Humber Archaeology Partnership)

Boring or enlarging holes in wood was undertaken with a spoon auger (Fig. 3b-c). The handles were probably of a simple transverse form, although the Bayeux Tapestry shows a handle which could be braced against the chest.[79] A wide variety of spoon auger sizes are known with lengths, for example, ranging from c. 150mm to c. 350mm. No doubt a carpenter would have had a set, as is shown by the three found in the Flixborough hoard and the six in the Mästermyr tool chest.[80]

Another important item in the carpenter's kit was the shave which has a curved blade at each end of which is a tang for a wooden handle (Fig. 3d).[81] The shave was primarily used for making the staves used in buckets and other vessels. A drawknife was used in a similar way to a shave for such tasks as rounding and chamfering, but has a flat blade. Examples from Ramsbury and Sandtun (Kent) have a tang at each end.[82] There are also a number of blades known from Anglo-Saxon contexts which are pierced at each end (Fig. 3f), presumably for attachment to handles, although none has survived. The function of these blades remains uncertain, but they seem most likely to have been a form of drawknife.[83]

Chisels and gouges were required for a number of carpentry tasks including the making of mortices, rebates, and other joints in wooden objects and structural timbers. Chisels have already been noted as metalworking tools,[84] but could also have been used for woodworking. In addition, examples of chisels with elongated tangs, including one from a Middle Anglo-Saxon context at Hamwic and another, probably of the same date, from Brandon (Suffolk; Fig. 3e) are of a specialised form used in the turning of wooden vessels.[85] A socketed gouge comes from a hoard of iron objects from Crayke (N. Yorks) and two small tanged gouges come from York (Fig. 3g).[86]

The finishing of timber objects might be effected with a form of file with widely set teeth often known as a rasp of which there are a few examples (Plate 2),[87] but the only Anglo-Saxon plane known comes from a sixth century grave at Sarre (Kent).[88]

The tools of the stonemason are much less well known than those of the woodworker. There is, however, an example from Thetford (probably eleventh century) of a mason's punch with the characteristic feathered shank to prevent it jumping when hammered into stone (Fig. 4a).[89] Another punch with an expanded head, thought to have been used for rough dressing of masonry, comes from Winchester (Fig. 4b).[90] Probable picks used for trimming millstones have also been identified and would have been set in a wooden handle known today as a thrift (Fig. 4e).[91]

Leatherworking tools from Anglo-Saxon contexts include the slicker which was used for cleaning hides. It exists as a flat blade, sometimes serrated, with a projecting tang for a wooden handle at each end (Fig. 4f).[92] That the half moon-shaped, or lunette knife, well known in later times, was used to cut leather in the Anglo-Saxon period is shown by an example from Flixborough.[93] The finishing of leather involved the use of a tanged tool known as a creaser with either one or two arms ending in a short blade (Fig. 4g).[94] The blade, or blades, were heated and then run along the edge of the leather to compress it and prevent fraying. In the process a margin defined by a dark line, or lines, was created which might be considered decorative.[95]

The stitch-holes in leather were made by an awl, but although numerous awls have been found in Anglo-Saxon contexts, many of them could have been used for piercing tasks in other crafts. There are, however, examples of awls with arms of diamond-shaped cross-section which were specially adapted to pierce leather without splitting it (Fig. 4i-j).[96]

Just as each stage in leatherworking required iron tools, so did each stage in the production of wool textiles. Mid - Late Anglo-Saxon shears are usually c.100 - 250mm in length and the larger pairs were probably used for sheep shearing (Fig. 4c-d).[97] Smaller shears were probably used in sewing and needlework, and also for personal toilet. Early Anglo-Saxon shears have simple U-shaped bows, but from the seventh century onwards the bows became slightly looped (Fig. 4c). In addition, two examples of double-looped shears come from Thetford (Fig.4d).[98] Shears blades are similar in form to those of contemporary knives [99] and usually have backs which are straight before curving in to the tip, although they occasionally have the distinctive angle-back form.

In preparing wool for spinning foreign matter was removed and the fibres were aligned by combing.[100] The Anglo-Saxon wool comb consisted of a wooden board, attached to a handle, from which there projected two rows, staggered, each of c.12 - 16 iron teeth secured by an iron binding sheet (Fig. 4h). A number of comb teeth were found at Shakenoak Farm which are thought to be Early Anglo-Saxon,[101] but the earliest complete wool combs recorded are probably a pair from a seventh century grave at Lechlade (Glos.).[102] A number of other combs are known from Middle and Late Anglo-Saxon contexts including one from York with wool fibres still attached.[103] Individual teeth are common finds from contexts of the seventh century onwards. They are usually c. 70-110mm long and may be distinguished from nail shanks by having pointed rather than wedge-shaped tips.

The preparation of flax for spinning would also have required iron teeth similar to those found in wool combs, but documented practice in recent times suggests that they would have been set in a board fixed to a table or similar item rather than set in a portable comb.[104]

The process of combing wool involved passing it from one comb to the other, but in order to do this effectively the teeth had to be heated and the wool greased.[105] The pair of Middle Anglo-Saxon combs from Wicken Bonhunt was found with a most unusual elongated ladle (Fig. 5b).[106] Iron vessels are rare in Anglo-Saxon contexts [107] and were usually used for hot oil or fat. It is suggested, therefore, that the ladle was used for greasing wool during combing.

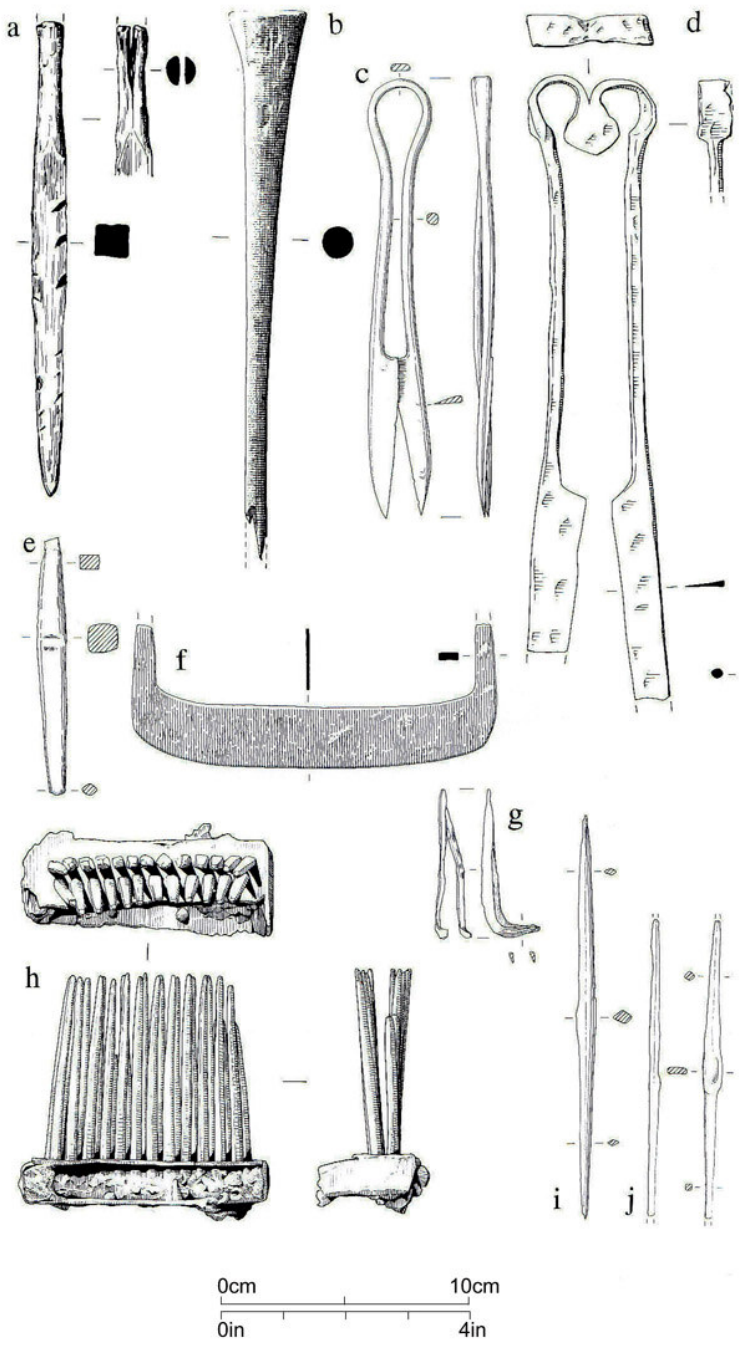

Fig.4 a-b stonemason's punches (Thetford and Winchester); c-d shears (York); e stonemason's pick (York); f slicker (Winchester); g creaser (York); h wool comb (Wicken Bonhunt); i-j leatherworker's awls (York)

Weaving on the vertical loom current during the Anglo-Saxon period required an object variously known as a weaving sword, sword beater, or weaving batten to ensure that the weft threads lay close together. While often made of wood or bone, weaving swords

were, on occasions, made of iron and a few examples, some of which are pattern-welded, have been found in pagan graves.[108] There are also two Middle Anglo-Saxon weaving swords, resembling spearheads, one from Barking Abbey and the other from York (Fig. 5a).[109] The former has a tubular iron handle and the latter a wooden handle set in a socket. The York object was found buried with the late eighth century Anglo-Saxon helmet at 16-22 Coppergate. No iron weaving swords have been found in Late Anglo-Saxon contexts.

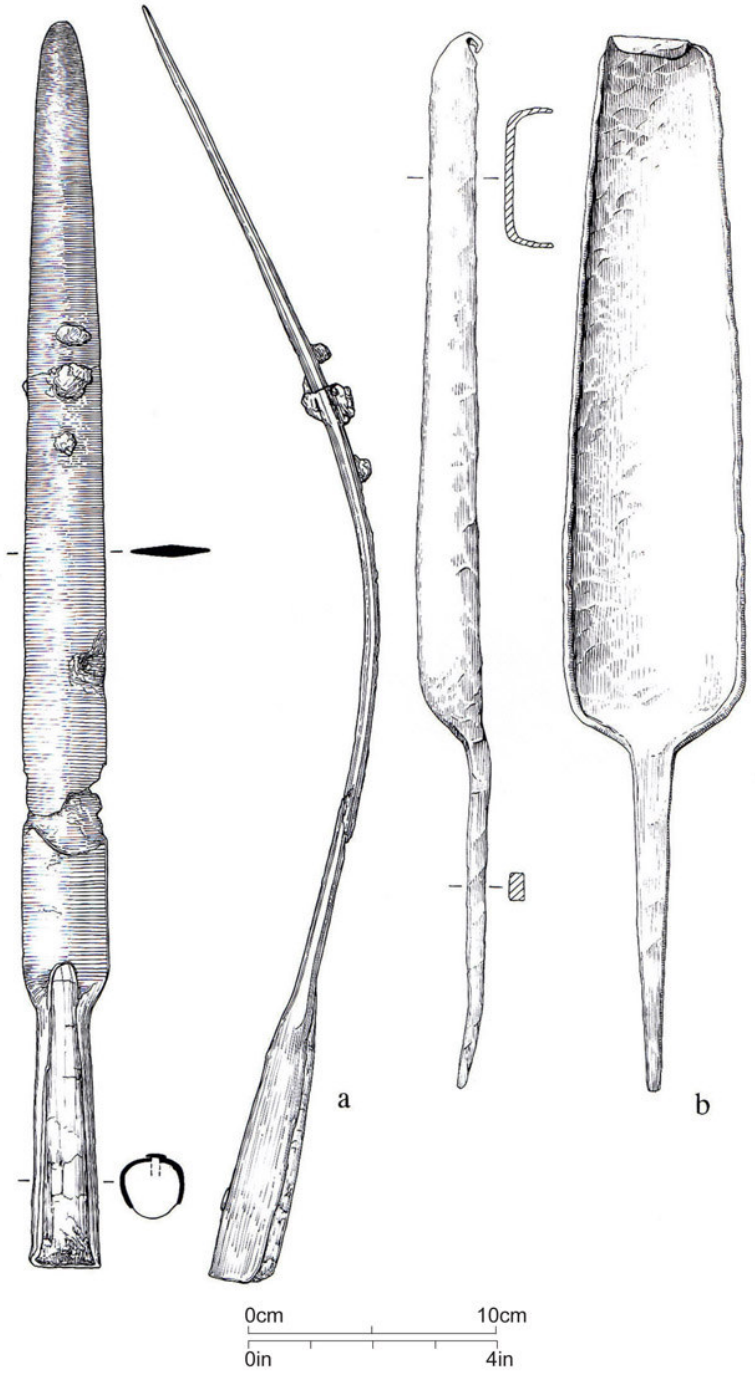

Fig.5 a weaving sword (York); b ladle (Wicken Bonhunt)

After fulling, cloth was stretched over a cropping board and the nap was then raised, probably with a teasel. The cloth was held in place by a harbick, a strip with a hook at each end. An example from Goltho was tinned to prevent the iron staining the cloth (Fig. 6a).[110] Shears would be used once more for trimming the nap and any foreign matter was removed by tweezers (Fig. 6b). A number of iron examples are known, although smaller specimens were probably used for personal toilet.[111] Finally, the sewing and embroidery of textiles employed needles of either iron or copper alloy. One hundred and fifty iron needles were found at 16-22 Coppergate, York and ranged in length from 23mm - 73mm.[112] The eyes were formed either by flattening and punching the needle head to create a round eye (Fig. 6c), or by splitting the head and drawing out the two sides to create an elliptical eye (Fig. 6d).

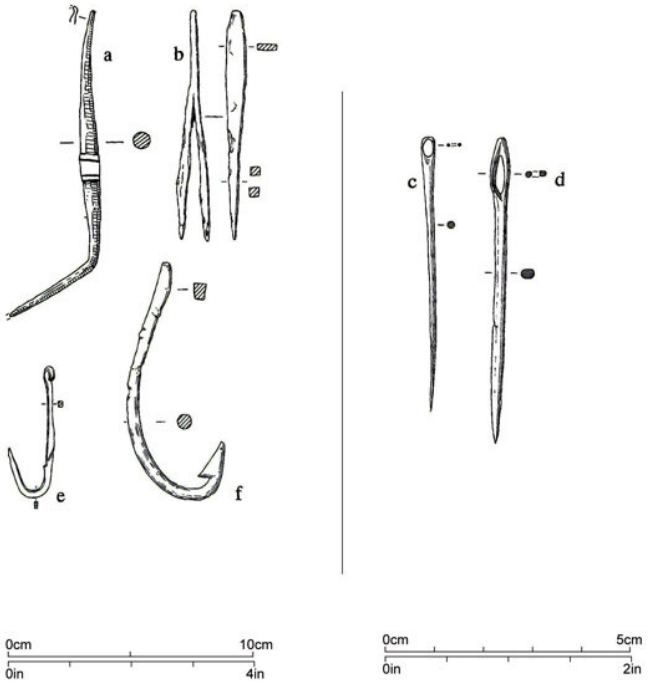

Fig.6 a harbick (Goltho); b tweezers (York); c-d needles (York); f-g fish hooks (York)

Agricultural and fishing tools

Of all the groups of tools known from Anglo-Saxon England, it is those used in agriculture which are the least commonly found, perhaps because ironwork was more assiduously recycled in rural communities than elsewhere. A few plough shares are known (Fig. 7b) which would have been used in a plough which also had an iron coulter, of which there are no known examples.[113] Scythe blades were found in the Hurbuck hoard,[114] and sickle blades were found in Viking burials at Hesket and Ormside.[115]

The Flixborough hoard produced a socketed bill hook, 260mm long (Plate 5), which would have been used for trimming trees, hedges or vines as is shown in an early eleventh century calendar in the British Library.[116] There are also a few smaller tanged objects with curved blades variously described as pruning, reaping or weed hooks.[117]

Plate 5 Billhook from the Flixborough tool hoard – L.263mm (Photo © Humber Archaeology Partnership)

Wooden spades were used for digging and, on occasions, as is also shown in the British Library calendar and other illustrated manuscripts, the tips were sheathed with iron to prevent splitting (Fig. 7a).[118] Iron pitchforks are represented only by a single stout prong from York.[119]

Harvesting the land was complemented by harvesting the rivers and seas. A number of fish hooks are known, ranging from examples c. 25mm long (Fig. 6e), suitable for catching small fresh water species, to large examples, up to c. 80mm long, some with barbed tips (Fig. 6f), more suitable for catching large sea fish. A group of sixteen small hooks from Flixborough were mostly 15 – 25mm long and were probably set in some sort of wooden lure rather than used on the end of a line.[120]

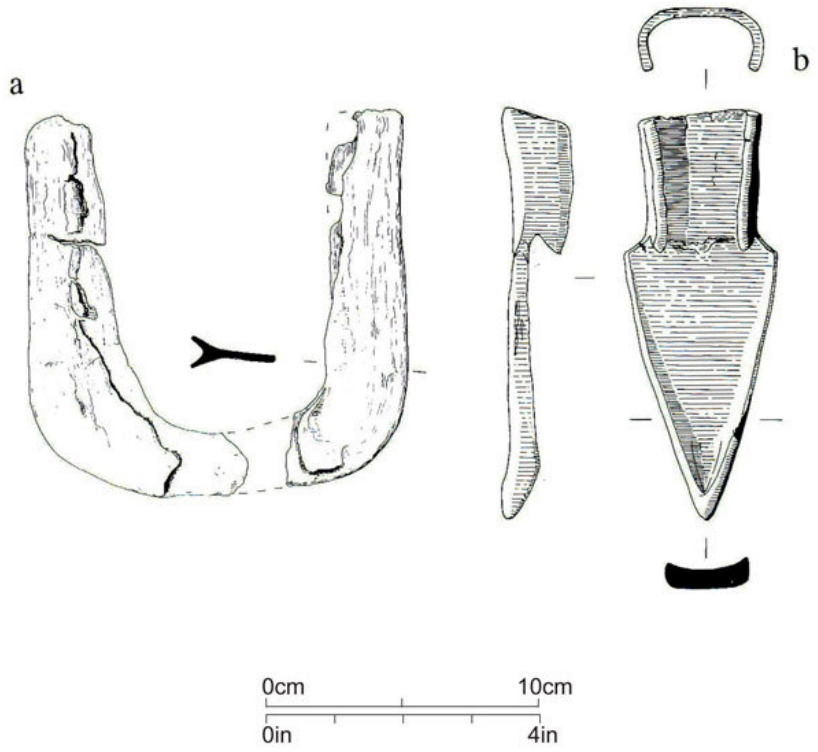

Fig.7 a spade iron (Thetford); b plough share (Thetford)