Chapter 5 Trade, Crafts and Services

During the post-excavation analysis, specialist contributors were asked to give particular consideration to aspects of their assemblages that could cast light on the nature of trade and crafts, and the way in which the project area was being used in the medieval and post-medieval periods. Not all assemblages provided sufficient suitable data for this study, but many did, and the most interesting aspects of these are presented below. The first part of this chapter looks at the evidence for goods that were used or consumed in the town but not necessarily produced there, including pottery, glass, timber, fish and the products of Reading's agricultural hinterland. This is followed by a review of evidence for the craft and other economic activities that were being carried out within the town or the project area, including cloth- and leather-working, clay pipe manufacture, the small-scale industries based in the area in the post-medieval period, fishing and stabling, and finally milling. A considerable proportion of the finds come from material dumped on the site to fill channels, stabilise revetments, raise the ground level or provide a firm base for construction. Much of this material is likely to have been brought from elsewhere in the town and in the absence of other indicators, such as the structural remains of craft working sites, we cannot reliably distinguish it from waste generated by activities on the excavated sites themselves. Nevertheless it reflects the range of traded goods and craft working within the town, and the way in which sources of supply developed and changed over time.

The full specialist reports and catalogues, from which these conclusions are drawn, can be found in Chapters 7-11, which are on the accompanying CD-ROM.

TRADED GOODS AND SOURCES OF SUPPLY

Jettons and trading tokens (Plate 5.1; Table 5.1)
Identifications by Martin Allen, discussion by Edmund Simons

A full list of all coins, tokens and jettons from the excavations, identified by Martin Allen, can be found in Chapter 9 (CD ROM). The medieval coins were all redeposited in later dump and make-up layers and add no useful information about the chronology or function of the sites. By contrast, concentrations of jettons on site 29 and site 12 may be associated with activities carried out there.

The jetton (from the French 'jeter' to throw) is a counter used in mechanical calculation on a counting table (counter or abacus), which worked in much the same way as the sliding bead type of abacus. The jettons were laid out on flat tables on either cloths (exchequer cloths) or on marked tables (counters). These were divided into rows usually representing thousands, hundreds, pounds (a sum of money used only in accounting), shillings and pence. The jettons were simply used as markers to represent units of money and/or goods and allowed for complex calculation without the use of complex Roman numerals. The increasing use of written calculation with Arabic numerals led to the decline and eventual abandonment of the abacus. The earliest jettons proper were used in the French royal household and often bear a symbol (rakes, cauldrons etc) relating to the department in which they were used. The earliest English jettons follow the French example and seem to have been exclusively for official use, and were minted by the royal moneyers using the same obverse (head) dies as silver coin. To prevent these early jettons being silvered and passed as coin each English jetton has a hole at its centre. Four of these early jettons were found at the Oracle, three at site 12 and one at site 29, but none of them in a contemporary context.

The use of jettons spread to other groups in society including monasteries, great families and merchants. During the 14th to 15th centuries jettons were manufactured in huge quantities in France and the Low Countries (particularly Tournai and Paris). These 'Jetons Banal' or Stock Jettons are well represented at the Oracle. Although they are superficially similar to French coin (usually bearing the arms of France on the obverse and a cross on the reverse) they had no intrinsic value and would have been purchased specifically for counting. Of the examples from the Oracle, three may be in near contemporary contexts in 15th-century deposits at site 12 associated with the demolition and reconstruction of building 7410/7411 (site sub-phase 1206b; see Table 5.1). The remaining ten French stock jettons were either clearly redeposited or unphased. However, three occurred in a group of four jettons and three coins associated with the later 16th-century demolition of building 7410/7411 and the subsequent reconstruction of a possible dyehouse on the site (site sub-phase 1208b; Table 5.1).

By 1500 Nuremberg had become one of the greatest trading centres in Europe and soon dominated jetton production. In England Nuremberg types remained in use until the eventual disappearance of jettons in the late 17th century. A surprising number of the Nuremberg jettons from Reading Oracle may be in approximately contem-

Table 5.1: Medieval and Tudor coins and jettons (E-English; F-French; N-Nuremberg)

Object (SF No.)	*Date*	*Context*	*Context type*	*Site sub-phase*
Site 12				
Halfpenny (1829)	1355-61	9576	makeup layer	1206b
Jetton, E (1825)	c 1350-1400	9557	soil dump	1206b
Jetton, F (1830)	14th-15th century	9574	dump	1206b
Jetton, F (1832)	15th century	9592	posthole fill	1206b
Jetton, F (1827)	15th century	9568	hearth or burnt layer	1206b
Penny (1798)	1300	9436	demolition layer	1208b
Penny (1810)	1279-1489	9475	metalled surface	1208b
Jetton, F? (1812)	?14th-15th century	9475	metalled surface	1208b
Sol coronat of Robert of Anjou (1806)	1309-43	9483	fill of construction cut	1208b
Jetton, E (1821)	c 1350-1400	9498	makeup layer	1208b
Jetton, F (1819)	15th century	9498	makeup layer	1208b
Jetton, F (1820)	15th century	9498	makeup layer	1208b
Jetton, N (1679)	1586-1635	8760	makeup layer	1209f
Jetton, N (1756)	1586-1635	8760	makeup layer	1209f
Jetton, N (1767)	1586-1635	8760	makeup layer	1209f
Jetton, F (0118)	?14th-15th century	0900	makeup layer	1210a
Halfpenny (0034)	1280-1544	0671	floor makeup	1210a
Penny (1766)	1279-1489	8814	makeup layer	unphased
Jetton, E (1600)	1280-1350	8500	makeup layer	unphased
Site 29				
Halfgroat (1068)	1351-c 1505	4545	cobbled surface	2907a
Jetton, N (1056)	16th century	5193	construction backfill	2908d
Jetton, N (0949)	16th-17th century	4532	in fill of tanning vat in pit 4515	2908d
Three halfpence (0882)	1561-82	4202	dump	2909a
Jetton, N (0879)	16th century	4202	dump	2909a
Jetton, E (1807)	1300-1310	3933	makeup	2909a
Jetton, N (0900)	1586-1635	4334	pit fill	2909a
Jetton, N (0903)	1586-1635	4338	pit fill	2909a
Jetton, N (0965)	c 1500-25	4507	metalled surface	2909a
Jetton, N (0996)	16th to early 17th century	4615	fill of tanning pit 4732	2909a
Penny (874)	1300-c 1311	4224	cellar infill	2909b
Penny (1131)	1279-1489	5304	construction debris	unphased
Jetton, F (1084)	15th century	5437	construction cut fill	unphased
Site 150				
Jetton, N (0700)	1586-1603	8300	revetment packing	15006a
Site 101				
Jetton, F (1312)	late 14th century	7007	construction layer	unphased, post-medieval
Jetton, N (1310)	16th to early 17th century	7109	dump in Back Brook	unphased
Site 300				
Jetton, F (2607)	c 1328-50?	13463	channel fill	3002a

porary contexts. Seven examples came from contexts associated with the backfilling of the 16th- to early 17th-century tanning pits on site 29 and the construction and earliest use of the Oracle workhouse (site sub-phases 2908d and 2909a; Table 5.1). One was found in the same context as an Elizabeth I threehalfpence of the period 1561-82. Three similar 'Rose and Orb' jettons were found together in a floor make-up layer from reconstruction works at building 7410/7411 in the late 17th or early 18th century (site 12, sub-phase 1209f; Table 5.1). It is not impossible that despite their age these jettons were still in use as either counters or gaming tokens at the time of loss.

The number of coins and jettons found in association with building 7410/7411 is very striking. The numerous coins and jettons in deposits of the late 15th, late 16th and early 18th century at this site

contrast markedly with the single coin and single jetton found in all other phases of all other areas of site 12 (site sub-phase 1210a; Table 5.1). This suggests that there was a real association between building 7410/7411 and activities including reckoning and accounting, although the possibility remains that the jettons could also have been used as counters in games and gambling. Both the groups from this site, and the 16th-century jettons from site 29, show that jettons were in use among people in the middle ranks of Reading society, and that such people may have used them for carrying out business-related calculations.

Three tradesmen's tokens (Plate 5.1)

Joan Dils has identified three of the tradesmen whose tokens were found during the excavations (Plate 5.1). Plate 5.1 No. 1 (Token 0501/0016), dated to 1666, was issued by Edward Bowland Snr, dyer, and found in deposits relating to the 20th-century demolition of the Yield Hall. By the time of his death in 1668 Bowland may have been retired, as his will records no dyehouse or other trade goods, although the total value of his inventory was £45 1s. Plate 5.1 Nos 2 and 3 were both found in dumps in the Back Brook. No. 2 (token 7109/1314, dated 1648-72) was issued by Clement Marlow, who was an apothecary and a freeman of the town. He was prosperous, having paid 5s in the hearth tax, and the value of his inventory when he died in 1672 was £187 12s $3^1/_2$d. His house had a best chamber, a low chamber, a new chamber, a passage, a herb loft, a meal loft, a garret and a jack chamber (or privy). In his shop were galley pots and glasses with syrop and distilled water, drugs, sugar, galls, spices and fruits. In his cellar were oil, logwood and other dyeing stuff, a hogshead of vinegar and some tobacco. He left 5s to the poor of Reading who can 'speak experimentally of the Lord Jesus'. No. 3 was issued by Thomas King, probably also an apothecary (token 7109/1302, dated 1666). King, like Marlow, paid on 5 hearths in the hearth tax and was presumably therefore also rather prosperous.

Medieval Pottery (Figs 5.1-5.6; Tables 5.2-5.4)

by Paul Blinkhorn

The pottery assemblage from Reading Oracle is one of the largest groups of medieval and later pottery ever excavated in Reading, and presents a major opportunity to enhance the understanding of pottery chronology, supply and use in the town (Table 5.2). The different medieval ceramic traditions represented at the site are discussed below in chronological sequence, and the full version of the medieval pottery report can be found in Chapter 7 on the CD-ROM.

Table 5.2: Medieval pottery occurrence by number and weight of sherds and EVE per phase

Project Phase	*Date Range (century)*	*No*	*Wt (g)*	*EVE*
2	mid 11th-mid 12th	396	7951	3.60
3	mid 12th -mid 13th	572	11995	8.36
4	mid 13th -late 14th	329	5266	3.78
5	15th	971	15862	14.14
6a*	1500-1540	1103	15202	14.98
	Total	3371	56276	44.86

*phase 6 groups dating to before the Post-Medieval Redware/Border ware horizon

Plate 5.1 Tokens

Fabrics

Early/middle Saxon hand-built wares, AD 450–850.
6 sherds, 98 g, EVE = 0.18 (all jars)

All the early/middle Saxon hand-built pottery was chaff-tempered. This is typical of the pottery found at sites of both early and middle Saxon date along virtually the whole length of the Thames Valley, including London (Blackmore 1988; 1989), Maidenhead (Blinkhorn 2002) and, to the west of Reading, at such places as Lechlade (Blinkhorn in archive). The vast majority of the pottery of this type comprises undecorated jars with simple globular forms and everted rims (Fig. 5.1 No. 1). Small quantities of early/middle Anglo-Saxon pottery have been noted before in Reading, mainly around the Abbey, including finds made during the 1960s excavation and at the Waterfront sites with the latter producing a total of 26 sherds; (Underwood 1997, table 16). A relatively large assemblage of 18 sherds (204 g) was also noted at excavations at Broad Street in Reading (Blinkhorn 2007a). There seems little doubt therefore that there was Anglo-Saxon activity in Reading, and the focus of this activity, if it still exists, would appear to be in the area previously occupied by the medieval abbey, although this may be simply a reflection of the activities of archaeologists rather than Anglo-Saxons. All the sherds found at the Oracle were undecorated, and thus cannot be dated other than to within the broad early/middle Saxon period (Myres 1977, 1).

F1: Local fine sandy ware, ?Late 11th–?14th century.
1058 sherds, 16,594 g, EVE = 10.44 (jars = 9.78, bowls = 0.66).

A range of fine sandy fabrics, similar to those noted at the Reading Waterfront excavations (Underwood 1997, 144). This assemblage comprises a typical range of earlier medieval vessel forms, with the vast majority of sherds from jars (Fig. 5.1 Nos 2-4), but with small quantities of bowls and a few jug sherds. No jug rims were noted, but jug body and base-sherds were present. Fragments of a number of tripod pitcher bases were noted, along with a long tubular spout likely to be from such a pot. Tripod pitchers are a typical component of early medieval pottery assemblages in southern central England, being well-attested from (for example) Oxford, where they appear to have been first used in the later years of the 11th century (Mellor 1994, 66). An unusual bowl with a pouring lip was also present (Fig. 5.1 No. 6), as were two spouted examples (Fig. 5.1 Nos 5 and 7) and a bunghole from a cistern. Cisterns are usually later medieval in date, and the presence of the sherd indicated that these sandy wares may still have been in use in the 14th century at least. It can be seen from Table 5.3 that the use of this pottery type was in sharp decline during the 14th century, and it was residual by the 15th, so the vessel is likely to date from the 14th century. Decoration was largely limited to vertical combing (57 sherds, 1223 g), although a single sherd was noted with combed wavy lines. A number of sherds (37 sherds, 944 g) had a green or orange glaze, with bowls, when thus treated, glazed internally.

Fine sandy wares such as these are found along a considerable length of the middle Thames Valley and its hinterland, and the problem of differentiating between the numerous different wares has been noted in the past (Mellor 1994, 84). For example, Mellor (ibid.) has identified at least four different quartz-tempered fabrics in southern Oxfordshire and its environs, with centres such as Henley-on-Thames and Maidenhead producing very similar quartz-tempered wares. Historical sources indicate that there were potters in Henley during the 13th and 14th centuries, and perhaps even Reading itself (ibid., 208, 210), and it is likely that other, non-documented sources in the hinterland of Reading await discovery. The medieval kiln at nearby Ashampstead is another possible source. Consequently, this fabric category should be regarded as a group of several similar traditions, rather than pottery from a single source; the separation of the different fabric types is simply beyond the scope of this project.

F2: Local coarse sandy ware, ?Late 11th–mid 13th century. 277 sherds, 3725 g, EVE = 1.58 (jars = 1.35, bowls = 0.08, jugs = 0.15).

A range of coarse sandy fabrics, similar to those noted at the Reading Waterfront excavations (Underwood 1997, 144). The range of vessels is broadly similar to that of F1, although there is no definite evidence for tripod pitchers. This may however simply be due to the rarity of such vessels. Decoration was again largely limited to vertical combing (45 sherds, 818 g). A total of 17 glazed sherds (164 g) were noted. As with F1, it is very likely that these coarser sand-tempered wares are from a number of different sources. The ware never exceeds 8% of the site assemblage at any time, and appears to have fallen from use by 1400.

F3: 'M40' type ware, ?Late 11th–14th century (Hinton 1973). 45 sherds, 913 g, EVE = 0.71 (all jars).

Hard, flint and limestone unglazed ware, with possible kiln sources at Camley Gardens near Maidenhead (Pike 1965) and Denham in Buckinghamshire (Mellor 1994, 86). Known at numerous sites in south Oxfordshire and Berkshire. Some vessels have distinctive vertical combing on the body. So-called due to it first being noted at sites excavated along the line of the M40 motorway. A substantial minority of the assemblage comprises sherds with vertical combing (14 sherds, 251 g), which is fairly typical of the products of this tradition. The ware is present in the earliest medieval phases, but appears to have gone into decline around the middle of the 13th century.

F101: Oxford ware, mid 8th–early 11th century (Mellor 1994, 37-44). 2 sherds, 182 g, EVE = 0.

This predominantly hand-made shelly ware is found at many sites in the Thames Valley from London to Gloucestershire, and to the north at places such as Worcester and Droitwich, where it is thought to be linked to the salt trade (ibid.). It is not possible to date vessels other than to within the life-span of the tradition, but the presence of the material at the Oracle could be indicative of middle Saxon activity. Recent work at Broad Street has yielded evidence of a presence in Reading during the middle Saxon period in the form of a sherd of Ipswich ware (Blinkhorn 2007a). Here, both sherds of F101 were redeposited in later contexts.

F102: Thetford-type ware, AD 900–1150 (Rogerson and Dallas 1984). 4 sherds, 37 g, EVE = 0.20 (all jars).

This East Anglian import is a rare find on sites in the Thames Valley. A few sherds are known from London (Vince 1985) and Oxford (Blinkhorn 2002b), but the material is generally rare in the region. Most of the sherds from London are from large storage jars with thumbed applied strips, and were probably used as containers for traded goods. The presence of such vessels in Reading shows that it was a place of sufficient importance at the time to attract long-distance trade, although the pottery seems likely to have arrived after a series of exchanges, with London being the most likely final point of departure. All the sherds at this site were redeposited in later medieval contexts.

F200: Cotswold-type ware, AD 975–1350 (Mellor 1994). 67 sherds, 1281 g, EVE = 0.70 (jars = 0.65, bowls = 0.05).

Oolitic limestone-tempered Cotswolds-type wares are extremely common finds at early medieval sites in Gloucestershire, and also western Oxfordshire, and occur in smaller quantities at sites to the north in Northamptonshire and Worcestershire. It is however, rare at sites in the Kennet Valley in Berkshire, with very little known from Newbury (Mepham 1997), perhaps due to competition from the local flint-tempered industries (ibid., figs 28-9). Its presence at this site suggests that the Thames Valley may have been more or less the southern limit of its distribution, a suggestion made in the past by Mellor (1994, 50). Another factor may be that it was simply uneconomic for the material to be traded beyond the town and up the Kennet.

This group is by far the largest assemblage of the material found in Reading, with reasonably large excavations elsewhere in the town yielding only 2 sherds at 90-93 Broad Street (Blinkhorn 2007a), and none at all from Market Way or the Waterfront sites. It is possible that the presence of this group of material may be evidence of the Oracle area being a point of entry for trade goods in the town in the early medieval period, with the pots arriving as containers for goods rather than moving as items for sale in their own right. Mellor (1994, 40) has suggested that the distribution of the ware was due to the fact that it was used in the transportation of salt, and there were medieval 'salt-ways' from Droitwich to Lechlade and Sodbury in the Cotswolds (Miller and Hatcher 1995, 77).

The material is present in small quantities throughout the medieval period, before declining during the later 14th or early 15th century.

F202: Newbury coarsewares, late 11th–early 15th century (Mepham 1997, 51-2). 223 sherds, 5517 g, EVE = 3.82 (jars = 3.53, bowls = 0.08, jugs = 0.21).

Flint, sand and shell tempered ware, probably manufactured in the Savernake Forest (ibid., 65). It has a wide distribution throughout Berkshire, northern Hampshire and Oxfordshire (ibid., fig. 29), and a small number of sherds are known from south Northants (Blinkhorn 2000a, 16). This assemblage is of some significance, as in the past the material was considered to be extremely rare in Reading (Mepham 1997), but both this site and recent excavations at Broad Street and Market Way have produced good groups. It was also noted at the Waterfront sites, as Underwood's fabric LSF (1997, 145), but only 61 sherds were present (ibid., table 16). It seems likely that Underwood's fabrics FL and FLS are from a similar, if not the same, source. These wares were also somewhat under-represented at the waterfront sites. At the Oracle, Newbury wares are present in quantity throughout the medieval period, but appear to be residual after 1400. The range of vessel types is typical of other finds of the material in the region, although the fragment of the possible fire-cover (Fig. 5.2 No. 8) is somewhat unusual.

F205: Stamford ware, AD 900–1150 (Kilmurry 1980). 1 sherd, 5 g, EVE = 0.

Fine, wheel-thrown sandy ware, often glazed, particularly from the late 10th century onwards. Stamford ware was widely traded throughout the British Isles, especially the trademark glazed pitchers, with finds of the ware in every county of England, and many in Scotland, Wales and Ireland. It is rare at sites in the Thames Valley and its hinterland, although relatively common in London (Vince 1985). A few sherds are known from Oxford (eg Blinkhorn 2002b), and others are known from Wallingford, Abingdon, Basingstoke and Silchester (Kilmurry 1980, fig. 32). As with the Thetford ware, it seems more likely that London was the final point of departure for the vessel found at this site. The sherd is from an unphased context.

F300: Medieval Oxford ware, AD 1075–1400 (Mellor 1994). 199 sherds, 4499 g, EVE = 3.02 (jars 0.11, pitchers = 2.91).

Sandy ware, range of vessels comprising mainly plain jars and glazed tripod pitchers, the latter often with incised and/or applied decoration (Fig. 5.2 Nos 11-15), with the former type usually comprising the bulk of assemblages of the ware in Oxford and its hinterland. For example, at Eynsham Abbey, just 21 of the 149 rimsherds in the fabric were from jugs, with 123 from jars (Blinkhorn 2003, 179). However, the pitchers seem to have been imported into Reading in quantity during the earliest medieval phases, with jars very rare, suggesting that the latter were travelling as pots in their own right rather than as containers for trade goods. At the Oracle, the ware is in decline by the end of the 13th century, perhaps due to competition from London ware.

F352: Brill/Boarstall ware, AD 1200–1600 (Mellor 1994). 4 sherds, 163 g, EVE = 0.

Fine, wheel-thrown sandy ware, with the earlier products of the industry typified by glazed jugs, with production sites at a small number of villages on the Oxfordshire/Buckinghamshire border. The ware has a wide distribution throughout the south midlands, and has been previously noted in small quantities from sites on the Reading Waterfront (Underwood 1997, 144 and table 16) and also at Broad Street. All the sherds from this site are redeposited in early post-medieval contexts. One of the late medieval 'Tudor Green' type mugs from this site is likely to be a product of this industry (see below), but from Ludgershall rather than Brill or Boarstall.

F358: Ashampstead ware, 12th–14th century (Mepham and Heaton 1995). 261 sherds, 5485 g, EVE = 1.11 (jars = 0.22, jugs = 0.89).

Sandy ware, the main products of the kiln being jars and highly decorated glazed jugs, the latter often having painted geometric slip designs (Fig. 5.3 Nos 17-21). A bowl with a long tubular spout was also noted at this site (Fig. 5.3 No. 16). It is thought that the kiln, which is located *c* 15 km to the west of Reading, was supplying the town with the bulk of the sandy wares found here. It is entirely possible that F1 (above) at this site may also be from the same source, as it seems likely that there was more than one kiln at Ashampstead (ibid., 41). Sandy wares such as this are very common throughout central southern England from the early medieval period onwards, and other sources, yet to be discovered, were making such pottery. The pattern at this site, with glazed jugs being more common than jars, is common for finds of such sandy wares, as is the case with Newbury 'C' ware, but at the Ashampstead kiln site, jars were in the majority (ibid.). The ware first appears at the Oracle at the end of Site Phase 2, and goes into decline at some point after the middle of the 13th century and before 1400.

F361: London ware c 1150–1350

(Pearce *et al*. 1985). 172 sherds, 4668 g, EVE = 2.62 (jars = 0.02, jugs = 2.42).

Sandy ware, common in small quantities throughout the Home Counties, and at more distant locations such as Exeter, King's Lynn, Ipswich, Northampton, Hereford, Gloucester and the east coast of Scotland (ibid., 6-7 and figs 4 and 5). Source unknown, but likely to be close to the City of London, where it occurs in extremely large quantities. The jug was by far the most common form, and these were often highly decorated, sometimes copying imported pottery from Northern France (eg. ibid., pl. 2).

A wide range of the decorated jugs occurred at the Oracle (Fig. 5.3 Nos 23-31), including copies of North French types (Fig. 5.3 Nos 24, 26 and 31). These can be dated to the first half of the 13th century. London ware was also present at Broad St, a site which also produced 'real' North French pottery as well as London copies. At the Oracle, a fragment of a roof-finial (Fig. 5.3 No. 22) was also noted. These objects were decorative additions to the ridges of roofs, this example being very similar to one from Lime Street in London (Pearce *et al*. 1985, Fig. 58 no. 441). It is also similar to large numbers of detachable, 'spinning top' types known from King's Lynn, a style which could have originated in France (Clarke and Carter 1977, fig. 136 nos. 3-5).

Very little London ware was noted at the Waterfront sites, leading Underwood to speculate that there was very little upstream traffic to Reading from the capital (ibid. 1997, 145), but this is clearly not the case here, where the material is plentiful. It forms a significant proportion of the pottery at the site during phases 3 and 4, but is residual by 1400.

F366: Hertfordshire glazed ware, 14th–15th century

(Jenner and Vince 1983). 3 sherds, 98 g, EVE = 0.

Sandy ware, the most distinctive vessel being glazed jugs, often with stamped decoration. Most finds are from London or the county of production. Previously unknown in Reading (ibid., fig. 9). All the sherds are from jugs, and occurred in unphased contexts.

F403: 'Tudor Green' ware, late 14th century–c 1550

(Pearce and Vince 1988, 79-81 and figs 126-7). 815 sherds, 4437 g, EVE = 8.17 (bowls = 2.18, jugs = 3.21, cups = 1.99, costrels = 0.68, chafing dish = 0.11).

Green-glazed, fine sandy whitewares produced in Surrey and northern Hampshire. Other sources are known, such as Ludgershall in Buckinghamshire (Blinkhorn 2002-3), where potters of the Brill/Boarstall tradition were making some 'Tudor Green' type vessels, particularly mugs, in the late 15th to early 16th century. At least one vessel of this type (Fig. 5.4 No. 33) at this site is a Ludgershall type. There is a wide range of late medieval vessel forms (Pearce and Vince 1988), often delicate and thin-walled, including jugs, costrels (portable flasks) and lobed cups (Fig. 5.4 Nos 32-5). Common throughout central southern England, and present at this site before 1400, carrying on into the post-medieval period.

F404: Cistercian ware, 1475–1700 (Brears 1971, 18-23). 123 sherds, 1494 g, EVE = 2.44 (all cups/tygs).

Hard, smooth, semi-stoneware fabric, usually brick-red, but can be paler or browner. Few visible inclusions, except for occasional quartz grains. A number of production sites known, mainly in the north and midlands (ibid.). Range of vessel forms somewhat specialised, and usually very thin-walled (c 2 mm), cups/tygs a speciality (Fig. 5.4 Nos 37-40). Rare white slip decoration, such as Figure 5.4 No. 37. The ware is present at the site before 1500, and plentiful in late medieval and early post-medieval contexts.

F420: Martincamp white ware, AD 1475–1550 (Ickowicz 1993). 4 sherds, 290 g, EVE = 0.

Very hard, beige, slightly sandy fabric. All the sherds are from the distinctive mammiform flasks (Fig. 5.4 No. 41) with most from a single vessel in an unphased context which also produced two costrels. The form is of Hurst's (1966) type I. The vessels were likely originally to have been contained in a wicker cover (Ickowicz 1993, 57), presumably to facilitate carrying and suspension. First occurs in the first half of the 16th century at the Oracle.

F456: Surrey Whiteware, mid 13th–mid 15th century (Pearce and Vince 1988). 1207 sherds, 21,431 g, EVE = 17.42 (jars = 9.02, bowls = 1.77, jugs = 5.07, costrels = 1.54).

A range of whitewares from several sources in Surrey, including Kingston and Cheam (Fig. 5.5 Nos 42-9). The range of vessel forms changes over time, but the earlier assemblages are dominated by glazed jugs, some with slipped, incised and plastic decoration (Fig. 5.5 Nos 42, 47 and 49). The ware is invariably found on sites of the period in Reading, and occurs on a large number of sites all over southern England (ibid., figs 2-4).

Fragments of two costrels (Fig. 5.6 No. 50) are particularly worthy of comment. These personal liquid containers, usually with suspension loops to allow the attachment of straps or cords to facilitate carriage, are a

well-attested medieval vessel, but are nevertheless relatively rare finds. These vessels may be unique examples of Surrey Whiteware types. Pearce and Vince (1988) did not record any finds of such vessels in their extensive review of Surrey Whitewares, other than later, 'Tudor Green' types. The ware arrived at the Oracle site before 1267, probably from the earliest years of the industry, and remained a major ware even at the end of the medieval period.

Other fabrics

The following numeric codes are used in tables for other wares:
F401: LMS. Late Medieval Sandy
F402: LMWFS. Late medieval well-fired sandy.
F405: RARN. Raeren Stoneware
F421: MCPST. Martincamp stoneware

Discussion

Project Phase 2, mid 11th to mid 12th century

The majority of contexts of this date contain wares such as local fine sandy ware (F1), local coarse sandy ware (F2), Cotswold-type ware (F200), Newbury coarsewares (F202) and Medieval Oxford ware (F300), with the only other fabric which may date to this period, Ashampstead ware (F358), being relatively rare, and only comprising 0.5% of the phase assemblage. The chronology and sources of the sandy fabrics F1 and F2 are not at this time fully understood, but they are typical of the earliest products of medieval pottery industries. In the south midlands, such wares generally came into production during the mid to late 11th century, and a similar chronology seems likely in these cases. Most of this pottery is likely to be relatively local. Fine sandy wares are found along a considerable length of the middle Thames Valley and its hinterland, and this fabric category should be regarded as a group of several similar traditions rather than pottery from a single source. Maureen Mellor (1994, 84) has identified at least four different quartz-tempered fabrics in southern Oxfordshire and its environs, with centres such as Henley-on Thames and Maidenhead producing very similar wares. Historical sources indicate that there were potters in Henley during the 13th and 14th centuries, and perhaps even Reading itself (ibid., 208, 210). It is likely that other sources in the hinterland of Reading await discovery, and the medieval kiln at Ashampstead is another possible source. The coarse sandy wares probably also originate from a number of different relatively local suppliers.

Wares from perhaps more distant sources, such as Cotswold-type ware (F200), Newbury coarsewares (F202) and Medieval Oxford ware (F300) make up 33.1% of the assemblage (by weight), a significant proportion (Table 5.3). Oolitic limestone-tempered Cotswolds-type wares are extremely common finds at early medieval sites in Gloucestershire, and also western Oxfordshire, and occur in smaller quantities at sites to the north in Northamptonshire and Worcestershire. It is however, rare at sites in the Kennet Valley in Berkshire, with very little known from Newbury (Mepham 1997), perhaps due to competition from the local flint-tempered industries (ibid., figs 28-9). Its presence at this site suggests that the Thames Valley may have been more or less the southern limit of its distribution, a suggestion made in the past by Mellor (1994, 50). Another factor may be that it was simply uneconomic for the material to be traded beyond the town and up the Kennet. This group is by far the largest assemblage of the material found in Reading, with reasonably large excavations in the town such as those at Market Way and Broad Street not yielding any finds of the ware, and it also appears to be absent at all of the Waterfront sites. It is possible that the presence of this group of material may be evidence of the Oracle area being a point of entry for trade goods in the town in the early medieval period, with the pots arriving as containers for goods rather than moving as items for sale in their own right. Mellor (1994, 40) has suggested that the distribution of the ware was due to the fact that it was used in the transportation of salt, and there were medieval 'salt-ways' from Droitwich to Lechlade and Sodbury in the Cotswolds (Miller and Hatcher 1995, 77).

Newbury coarsewares are a flint, sand and shell tempered tradition, probably manufactured in the Savernake Forest (Mepham 1997, 65). Newbury coarseware has a wide distribution throughout Berkshire, northern Hampshire and Oxfordshire (ibid., fig. 29), and a small number of sherds are known from south Northamptonshire (Blinkhorn 2000a, 16). This assemblage is of some significance, as in the past the material was considered to be extremely rare in Reading (Mepham 1997), but both this site and recent excavations at Broad Street and Market Way have produced good groups. It was also noted at the Waterfront sites, as Underwood's fabric LSF (1997, 145), but only 61 sherds were present (ibid., table 16). It seems likely that Underwood's fabrics FL and FLS are from a similar, if not the same, source. These wares were also somewhat under-represented at the waterfront sites. At the Oracle, Newbury wares are present in quantity throughout the medieval period, but appear to be residual after 1400. The range of vessel types is typical of other finds of the material in the region, although the fragment of the possible fire-cover (Fig. 5.2 No. 8) is somewhat unusual.

Medieval Oxford ware is another sandy ware, with a range of vessels comprising mainly plain jars and glazed tripod pitchers. The tripod pitchers often have incised and/or applied decoration (Fig. 5.2 Nos 11-15). The plain jars usually form the bulk of assemblages of the ware in Oxford and its hinterland. For example, at Eynsham Abbey, just 21 of the 149 rimsherds in the fabric were from jugs, with 123 from jars (Blinkhorn 2003, 179). However, the pitchers seem to have been imported into Reading

in quantity during the earliest medieval phases, with jars very rare, suggesting that the latter were travelling as pots in their own right rather than as containers for trade goods. At the Oracle, the ware is in decline by the end of the 13th century, perhaps due to competition from London ware.

The presence of the Ashampstead ware in this phase is worthy of comment. The excavation of the kiln site suggested that the material in Reading dated from 'at least' the late 12th to early 13th century (Mepham and Heaton 1995, 40), on the evidence from the Waterfront sites. Since then, Mellor (pers. comm.) has provenanced her Oxford fabric OXAG, Abingdon ware (1994, 71) to the Ashampstead kilns. She noted that the material became common during the early to mid 12th century in Oxford (ibid., 79), and the evidence from the Oracle appears to corroborate that dating.

Small quantities of 'M40' ware are also present in deposits of this date. This is a hard, flint and limestone unglazed ware, with possible kiln sources at Camley Gardens near Maidenhead (Pike 1965) and Denham in Buckinghamshire (Mellor 1994, 86). It is known at numerous sites in south Oxfordshire and Berkshire and some vessels have distinctive vertical combing on the body. The name arises from the fact that the ware was first noted at sites excavated along the line of the M40 motorway. The ware is present in the earliest medieval phases at the Oracle, but appears to have gone into decline around the middle of the 13th century.

Jugs are relatively rare in the Project Phase 2 assemblage, and are represented only by sherds from parts of vessels other than rims, with a number of fragments of highly-decorated Medieval Oxford ware F300 Oxford tripod pitchers noted. This pattern is generally typical of pottery assemblages of the earlier medieval period in the region.

Table 5.3: Medieval pottery occurrence per phase by fabric type, main fabrics only, expressed as a percentage of the phase total by weight (in g)

Phase	*2*	*3*	*4*	*5*	*6a*
F1	54.8%	27.8%	25.4%	4.3%	0.4%
F2	7.5%	5.0%	7.3%	1.6%	0.1%
F200	2.6%	2.6%	4.2%	1.4%	0
F202	15.6%	10.0%	12.6%	2.2%	0.2%
F300	14.9%	13.6%	5.2%	0.9%	0
F358	0.5%	19.6%	9.2%	4.8%	0.9%
F361	-	12.1%	15.5%	3.9%	0
F456	-	5.4%	14.7%	40.8%	29.7%
F403	-	-	1.0%	7.6%	5.1%
F405	-	-	-	10.7%	20.6%
F404	-	-	-	1.0%	5.8%
F401	-	-	-	6.8%	3.5%
F402	-	-	-	7.4%	28.3%
Total	7951g	11995g	5226g	15862g	9303

Project Phase 3, mid 12th to mid 13th century

Sandy wares (F1 and F2) still form a large proportion of the pottery consumed at the site, but now represent only 32.8% of the assemblage, with other wares from a variety of sources becoming more common (Table 5.3). The phase sees the arrival at the site of relatively large quantities of London-type Ware (F361), a sandy ware common in small quantities throughout the Home Counties, and at more distant locations such as Exeter, King's Lynn, Ipswich, Northampton, Hereford, Gloucester and the east coast of Scotland (Pearce *et al*. 1985., 6-7 and figs 4 and 5). Certain styles of this pottery, such as imitation North French ware and Rouen ware, are both distinctive and well-dated to the first half of the 13th century. London ware comprises 12.1% of the pottery from phase 3 contexts, which is very high when compared with other sites in Reading. The source is unconfirmed, but likely to be close to the City of London, where it occurs in extremely large quantities. The jug was by far the most common form, and these were often highly decorated, sometimes copying imported pottery from Northern France (eg. ibid., pl. 2). A wide range of the decorated jugs occurred at the Oracle (Fig. 5.3 Nos 23-31), including copies of North French types (Fig. 5.3 Nos 24, 26 and 31). London ware was also present at Broad St, a site which also produced 'real' North French pottery as well as London copies. At the Oracle, a fragment of a roof-finial (Fig. 5.3 No. 22) was also noted. These objects were decorative additions to the ridges of roofs, this example being very similar to one from Lime Street in London (Pearce *et al*. 1985, fig. 78 no. 441). It is also similar to large numbers of detachable, 'spinning top' types known from King's Lynn, a style which could have originated in France (Clarke and Carter 1977, fig. 136 nos. 3-5).

Pottery from the sources to the west (Cotswold and Newbury wares F200 and F202) was still being brought to the town. There is a small decline in the proportion of Newbury ware in Project Phase 3, but trade with these areas is not greatly diminished, as these two wares make up 12.6% of the assemblage. Oxford wares are also still common, comprising 13.6% of the pottery from this site phase and 'M40' ware is present, but in much smaller quantities. Surrey Whitewares (see below) were also noted in small quantities (5.4% of the phase assemblage) in this phase. Pearce and Vince (1988, 16) noted that the earliest ware groups in the City of London date to approximately 1230-50 and that the industry grew rapidly after 1260.

Ashampstead wares comprise a fairly large (19.6%) proportion of the pottery used during this phase. This is a sandy ware, the main products of the kiln being jars and highly decorated glazed jugs, the latter often having painted geometric slip designs (Fig. 5.3 Nos 17-21). Such vessels appear to have been at their most popular during the first half of the 13th century according to the evidence from

Netherton in Hampshire (Mellor 1994, 80). A bowl with a long tubular spout was also noted at the Oracle (Fig. 5.3 No. 16). It is thought that the kiln, which is located *c* 15 km to the west of Reading, was supplying the town with the bulk of the sandy wares found here. It is entirely possible that F1 (above) at this site may also be from the same source, as it seems likely that there was more than one kiln at Ashampstead (Mepham and Heaton 1995, 41). Sandy wares such as this are very common throughout central southern England from the early medieval period onwards, and other sources, yet to be discovered, were making such pottery. The pattern at this site, with glazed jugs being more common than jars, is common for finds of such sandy wares, as is the case with Newbury 'C' ware, but at the Ashampstead kiln site, jars were in the majority (ibid.). The ware first appears at the Oracle at the end of Project Phase 2, and goes into decline at some point after the middle of the 13th century and before 1400.

Jugs were used in considerably larger quantities during this phase (Table 5.4), and represent over a third of all the vessel types, with the rest of the assemblage comprising mainly jars, but bowls also increase their share. No other vessel types were noted, again a pattern which is typical of contemporary assemblages in the region.

Project Phase 4, mid 13th to late 14th century

The amount of pottery from this phase is somewhat smaller than the preceding phases, although this is a pattern that has been noted elsewhere in the region, in towns such as Abingdon. There may be several reasons for this. The 14th century was a time of economic decline coupled with epidemics such as the Black Death and adverse weather conditions resulting in poor harvests and famines.

Surrey Whitewares increase in popularity to form 14.7% of the assemblage. This tradition comprises a range of whitewares from several sources in Surrey, including Kingston and Cheam (Fig. 5.5 Nos 42-9). The range of vessel forms changes over time, but the earlier assemblages are dominated by glazed jugs, some with slipped, incised and plastic decoration (Fig. 5.5 Nos 42, 47 and 49). The ware is invariably found on sites of the period in Reading, and occurs on a large number of sites all over southern England (ibid., figs 2-4). Fragments of two costrels (Fig. 5.6 No. 50) are particularly worthy of comment. These personal liquid containers, usually with suspension loops to allow the attachment of straps or cords to facilitate carriage, are a well-attested medieval vessel, but are nevertheless relatively rare finds. These vessels may be unique examples of Surrey Whiteware types. The ware arrived at the Oracle site before 1267, probably from the earliest years of the industry, and remained a major ware even at the end of the medieval period.

London ware also increases, to 15.5%, although the latter industry all but ceases production by the end of the 14th century (Pearce *et al*. 1985, 20-1). The proportion of sandy coarsewares remains largely unchanged (32.7%), and the proportion of the Newbury and Cotswolds wares actually shows a slight increase (16.8%), at the expense of the Oxford and Ashampstead wares (5.2% and 9.2%), which decline fairly sharply during this time. In the case of F300 (Medieval Oxford ware), this corresponds with Mellor's (1994, 71) dating scheme for the industry, which goes into sharp decline after the mid 13th century, and appears to have ceased before 1300. Ashampstead wares appear to have lasted well into the 14th century (ibid., 80) from Mellor's consideration of the chronology of Abingdon ware. 'M40' ware is very rare, but still present in extremely small quantities. The so-called 'Tudor Green' wares from the Surrey-Hampshire border region appear in small quantities during this phase (1.0% of the assemblage). This ware appears in London during the late 14th century, in groups at Trig Lane dated to around 1380. Reliably dated finds of this period are rare otherwise, and so the finds of this material here at the Oracle are of some significance, and show that the material was being imported to Reading from very early in the life of the tradition. Vessel types are still limited entirely to jugs, jars and bowls, although the small quantities of Tudor Green wares are likely to be non-rim fragments of lobed cups.

Project Phase 5, 1400-1500

This phase sees the representation of the earlier medieval coarsewares (F1 and F2 = 5.9%; F200 = 1.4%; F202 2.2%) decline very sharply, along with the earlier glazed wares (F300 = 0.9%, F358 = 4.8% and F361 = 3.9%). All these industries were for all intents and purposes defunct by this time. The most common pottery type used at the site is Surrey

Table 5.4: Medieval pottery vessel occurrence per phase, expressed as a percentage per type of the phase assemblage (in EVE), all fabrics

Phase	*Jars*	*Bowls*	*Jugs*	*Mugs/Cups*	*Costrels*	*Dish*	*Vase*	*Lids*	*Unid.*	*Total EVE*
2	97.5%	2.5%	0	0	0	0	0	0	0	3.60
3	56.0%	6.3%	37.7%	0	0	0	0	0	0	8.36
4	45.0%	16.4%	38.6%	0	0	0	0	0	0	3.78
5	32.2%	14.5%	26.9%	22.1%	0	0.9%	2.8%	0	0.5%	14.14
6a	42.8%	7.1%	16.0%	22.1%	8.7%	0	0	0.5%	2.8%	1

Whiteware, comprising 40.8% of the assemblage. Other, new wares also become significant. Later medieval Redwares (from unknown, but probably London and local sources) form a significant proportion of the phase assemblage (14.2%). 'Tudor green' wares represent 7.6% of the assemblage. These green-glazed, fine sandy whitewares were produced in Surrey and northern Hampshire. Other sources are known, such as Ludgershall in Buckinghamshire (Blinkhorn in press c), where potters of the Brill/Boarstall tradition were making some 'Tudor Green' type vessels, particularly mugs, in the late 15th to early 16th century. At least one vessel at the Oracle is a Ludgershall type (Fig. 5.4 No. 33). There is a wide range of late medieval vessel forms (Pearce and Vince 1988), often delicate and thin-walled, including jugs, costrels and lobed cups (Fig. 5.4 Nos 32-5). 'Tudor Green' pottery is common throughout central southern England and was present at the Oracle before *c* 1400, carrying on into the post-medieval period. Cistercian ware, despite not generally coming into use before *c* 1475, comprises 1.0% of the assemblage. German Stonewares represent 10.7% of the assemblage. Other imports include small amounts of Martincamp-type flasks, sherds of south Netherlandish Maiolica, North French sandy wares, late medieval Saintonge ware, Low Countries Redwares and Iberian Micaceous Redwares. The number of sherds of imported material other than the late sandy wares is unusual for Reading at this time, and not a pattern noted at other contemporary sites such as Broad St. Some of these wares, such as the Rhenish Stonewares and Iberian Micaceous wares, were noted at the Reading Waterfront excavations, but others have never previously been noted in the town.

A much wider range of vessel types was noted, with mugs/cups forming nearly a quarter of the assemblage (Table 5.4), but rim sherds from a single dish and a Netherlandish vase were also noted . Body sherds were noted from at least six flasks, a large number of mugs and cups and also two pipkins. This is fairly typical of late medieval pottery assemblages in the region, but strongly tends towards vessels associated with the storage, transportation, serving and consumption of drink, with very little pottery related to the preparation, serving and consumption of food.

Project Phase 6(a), c 1500-1540

The range of pottery types in this phase is largely similar to that in phase 5, with imported wares, both continental and regional, comprising a large quantity of the assemblage. Residual medieval wares are present, but in small quantities (total = 1.6%). Late medieval sandy ware, F401, is in decline (3.5%), but late medieval well-fired sandy ware (F402) becomes very common, forming over 28% (by weight) of the pottery from this phase. Surrey Whiteware appears in decline (20.9%), as would be expected, but German Stonewares form nearly a fifth of the pottery, and Tudor Green and Cistercian wares each comprise over 5% of the assemblage, and nearly 11% in total. Small quantities of continental imports from a wide range of sources were also noted, including Beauvais Whiteware, Iberian Micaceous and Tin-glazed wares, Low Countries Redwares, Martincamp Stonewares, late medieval North French sandy wares and South Netherlands Maiolica.

Mugs/cups again form a very significant proportion of the assemblage (22.1%), and costrels are well represented (8.7%), along with a fragment of at least three lids. Jars actually increase as a proportion of the assemblage, although most are late medieval sandy wares rather than residual earlier medieval types. Bodysherds from two flasks and a pipkin were also noted.

Illustrations

Figure 5.1

1 Early/middle Saxon hand-built ware: **Rimsherd from jar**, uniform dark grey-brown fabric. Ctx 7292. Ph 3
2 Local fine sandy ware: **Rim and upper body of jar with vertical combing**. Grey fabric with darker surfaces. Outer surface heavily sooted. Ctx 6806, Ph. 2.
3 Local fine sandy ware : **Rimsherd from large jar.** Grey fabric with browner surfaces. Ctx 7292, Ph. 3.
4 Local fine sandy ware: **Base and lower body of combed jar**. Grey fabric with darker inner surface, outer surface has lighter grey and reddish-brown patches and is sooted. Ctx 6806, Ph. 2.
5 Local fine sandy ware: **Full profile of spouted bowl**. Light grey fabric with darker surfaces, patchy internal green glaze, stabbed decoration on rim. Inner surface thickly limescaled, outer sooted. Ctx 11048, unphased.
6 Local fine sandy ware: **Rim from lipped bowl**. Uniform dark grey fabric, sooting on outer surface. Ctx 5719, unphased.
7 Local fine sandy ware: **Rim and spout from bowl.** Light grey fabric with darker surfaces. Ctx 611, Ph. 10

Figure 5.2

8 Newbury coarseware: **Base from open vessel with applied strips**. Dark grey fabric with browner surfaces. Vessels such as this, with applied decoration on what would normally be the base, are usually thought to be curfews, or fire-covers. However, this vessel has internal limescaling and external sooting, suggesting that it was used for heating liquids, whereas curfews are usually burnt and sooted on the interior. Ctx 12491, unphased.
9 Newbury coarseware: **Rim and neck from jug rim with incised decoration**. Light grey fabric with orange outer surface. Ctx 2815, unphased.
10 Newbury coarseware: **Rim from very large jar**. Grey fabric with pale orange surfaces. Abraded. Ctx 11362, Ph. 2.
11 Medieval Oxford ware: **Complete rim and upper handle from highly decorated jug**. Grey fabric with

orange-brown surfaces, Patchy, dull green glaze over white slip decoration which appears yellow under the glaze. Ctx 7113, Ph. 3.

12 Medieval Oxford ware: **Base and lower body from slip-decorated tripod pitcher**. Orange fabric with grey core, outer surface has geometric painted design in white slip, appearing yellow under the patchy green glaze. Ctx 6115, Ph. 3.

13 Medieval Oxford ware: **Neck, rim and long tubular spout from ?tripod pitcher**. Grey fabric with light orange surfaces. Horizontal painted slip stripes appearing yellow under the dull orange-green glaze. Context 6102, Ph. 4.

14 Medieval Oxford ware: **Tripod pitcher base**. Pale grey fabric with dark surfaces. Whole of outer surface has even covering of pale green glaze. Each foot has a single stab-mark in the centre of the base. Ctx 11388, Ph. 3.

15 Medieval Oxford ware: **Body from decorated ?tripod pitcher**. Grey fabric with buff surfaces, uniform dull green glaze over the whole of the outer surface. Ctxs 6494 and 6497, both Ph. 3.

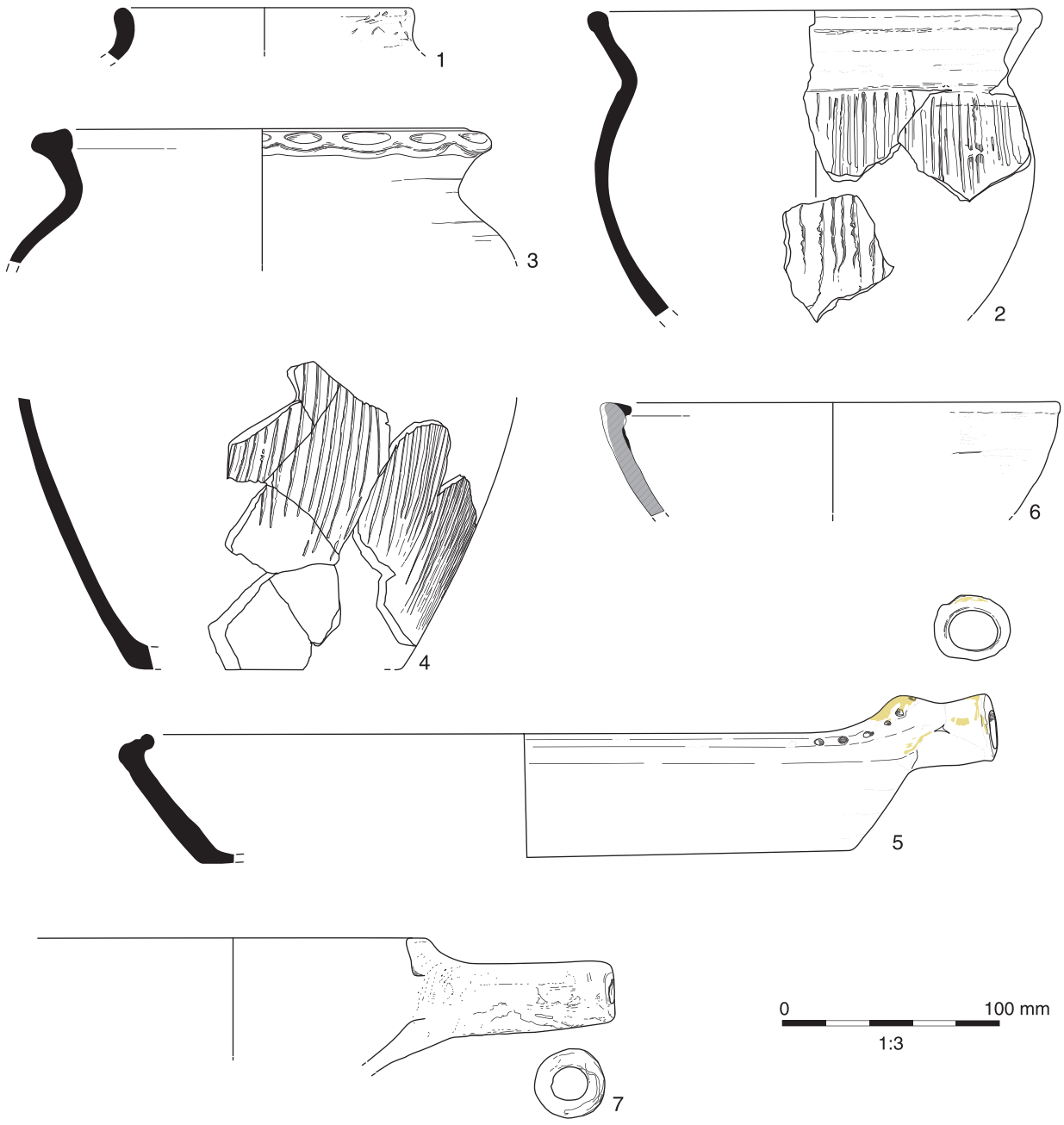

Fig. 5.1 Medieval pottery: early/mid Saxon (No.1) and local fine sandy wares (Nos 2-7)

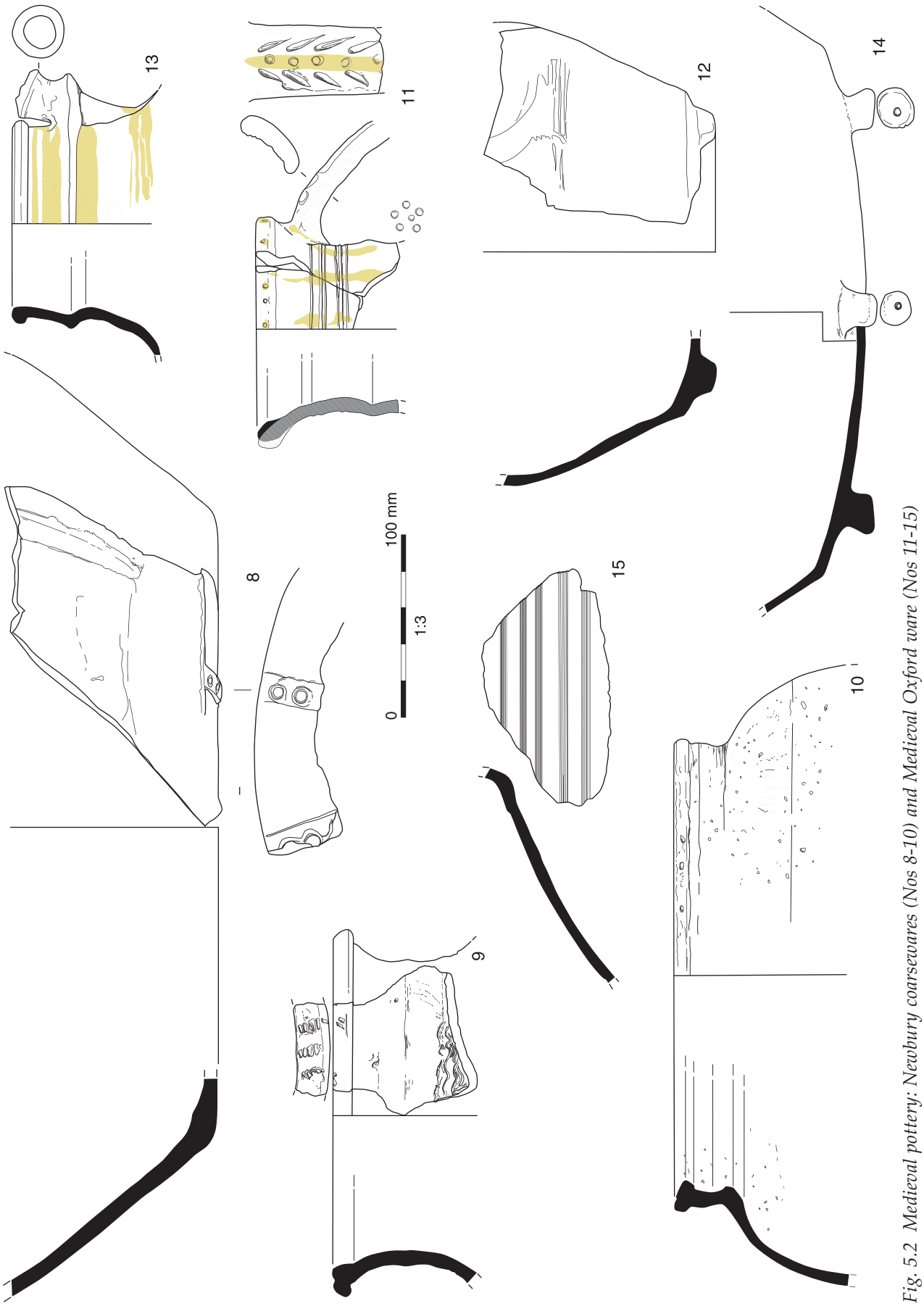

Fig. 5.2 Medieval pottery: Newbury coarsewares (Nos 8-10) and Medieval Oxford ware (Nos 11-15)

Figure 5.3

16 Ashampstead ware: **Bowl rim with long tubular spout**. Pale grey fabric with orange surfaces. Outer surface sooted under spout, traces of a thin green glaze on the inner surfaces. Spout shows no sign of internal wear, suggesting it was not used as a skillet. Ctx 5743, Ph. 4.

17 Ashampstead ware: **Upper body and neck from highly decorated jug**. Brick red fabric, outer surface painted with horizontal slip lines alternating red and yellow, yellow slip dots, glossy clear glaze appearing orange-green over the body clay. Handle fragment has yellow slip stripes only. Ctxs 5134 (Ph. 6) and 6054 (unphased).

18 Ashampstead ware: **Bodysherd from jug**. Grey fabric with orange-red surfaces. Arches and cordons in a white slip, appearing yellow under the thin green glaze. Ctx 6425, unphased.

19 Ashampstead ware: **Bodysherd from jug**. Grey fabric with orange-red surfaces. Geometric painted slip design, the uppermost line in a red clay, the rest white. Thin green glaze over all. Ctx 6425, unphased.

20 Ashampstead ware: **Rim and handle from jug**. Pale orange fabric with browner surfaces. Horizontal stripes of cream-coloured slip. Poor-quality, partly unvitrified green glaze on body around handle. Ctx 11293, Ph. 3.

21 Ashampstead ware: **Base from jug**. Orange-red fabric with brown outer surface. Vertical stripes of cream-coloured slip, thin and patchy green glaze on upper part of outer surface of sherd. Ctx 11293, Ph. 3.

22 London ware: **Fragment of spherical roof finial**. Grey fabric with orange surfaces, glossy copper-speckled green glaze on outer surface. Ctx 9622, Ph. 5.

23 London ware): **Base and body of early jug**. Brick-red fabric with thin white slip over the upper body, covered in a dull green copper-spotted glaze. Slip appears yellow under the glaze. Ctx 2046, unphased.

24 London ware: **Body sherd from imitation North French-style jug**. Grey fabric with brick red surfaces. Outer surface is covered in a white slip, with thin applied strips in the same clay, the whole covered with a pale yellowish-green, copper-spotted glaze. Ctx 6102, Ph. 5.

25 London ware: **Bodysherd from highly decorated jug**. Grey fabric with orange surfaces, applied scales and strip in a white firing clay. Outer surface covered in a thick, glossy glaze which appears dark green over the body clay and pale green over the decoration. Ctx 6005, Ph. 3.

26 London ware: **Bodysherd from imitation Rouen style jug**. Dark grey fabric with browner surfaces, rouletted applied strip in a white-firing clay, appearing yellow under the glaze. Area inside the strip has a reddish-brown slip. Glaze appears dark green over the body clay. Ctx 5933, Ph. 4.

27 London ware: **Bodysherd from highly decorated jug**. Orange-red fabric, outer surface covered in a thin white slip which has been cut and stamped, giving a partial sgraffito effect. Patchy, thin clear glaze with sparse copper-spotting. Ctx 5721, unphased.

28 London ware: **Two non-joining bodysherds from the same highly decorated jug**. Orange fabric with a grey core. Outer surface is covered with white slip with wheel stamps, and the whole covered with a bright green, copper-streaked glaze. Ctxs 5068 (unphased) and 6165 (Ph. 4).

29 London ware: Jug rim. **Brick red fabric with greyer core**. Two horizontal yellow slip cordons, copper speckled glaze appearing orange over the body clay over all. Ctx 5792, Ph. 3.

30 London ware: **Body sherd from jug**. Brick red fabric with a grey core, white slip over outer surface, with red slip stripes over. Spots of clear glaze over all. Ctx 6006, Ph. 3.

31 London ware: **Body sherd from imitation North French jug**. Brick red fabric with greyer core, white slip over outer surface, applied strips in the same clay. Bright green, copper-streaked glaze over all. Ctx 5134, Ph. 6.

Figure 5.4

32 'Tudor Green' ware: **Straight-sided handled bowl**. White fabric with glossy, copper-streaked glaze on inner surfaces and top of handle and outer body. Lower body and base-pad burnt and sooted, but may have been post-depositional. Ctxs 9507 and 9511, both unphased.

33 'Tudor Green' ware: **Mug, Ludgershall type**. Buff-pink fabric with browner surfaces. Pale green, copper-spotted glaze over the whole of the inner surface and the outer upper body and handle. Ctx 8772, unphased.

34 'Tudor Green' ware: **Fragment of double dish**. White fabric with patches of bright green glaze on all surfaces. Ctx 8306, Ph. 7.

35 'Tudor Green' ware: **Near-complete costrel**. Pale grey fabric with buff surfaces, large patch of glossy, yellow-green glaze on upper side of body. Ctx 8682, unphased.

36 Cistercian ware: **Large cup**. Slightly underfired brick-red fabric with dark grey-brown surfaces, glossy dark brown glaze on inner surface and outer rim. Ctx 9507, unphased.

37 Cistercian ware: **Cup with applied slip decoration**. Hard, brick-red fabric with glossy dark brown glaze on both surfaces. Applied dots of white slip on outer surface, appearing yellow through the glaze. Ctx 8802, Ph. 5.

38 Cistercian ware: **Two-handled cup**. Brick-red fabric with a thin grey core, chestnut-brown glaze over all except the outer base-pad. Ctx 8682, unphased.

39 Cistercian ware: **Cup**. Orange fabric with dark, mottled green and brown glaze over all except the outer base pad. Ctx 8750, Ph. 6.

40 Cistercian ware: **Rim from cup**. Purple fabric, applied white slip pad on outer surface, appearing yellow under the glossy brown glaze. Ctx 8738, Ph. 5.

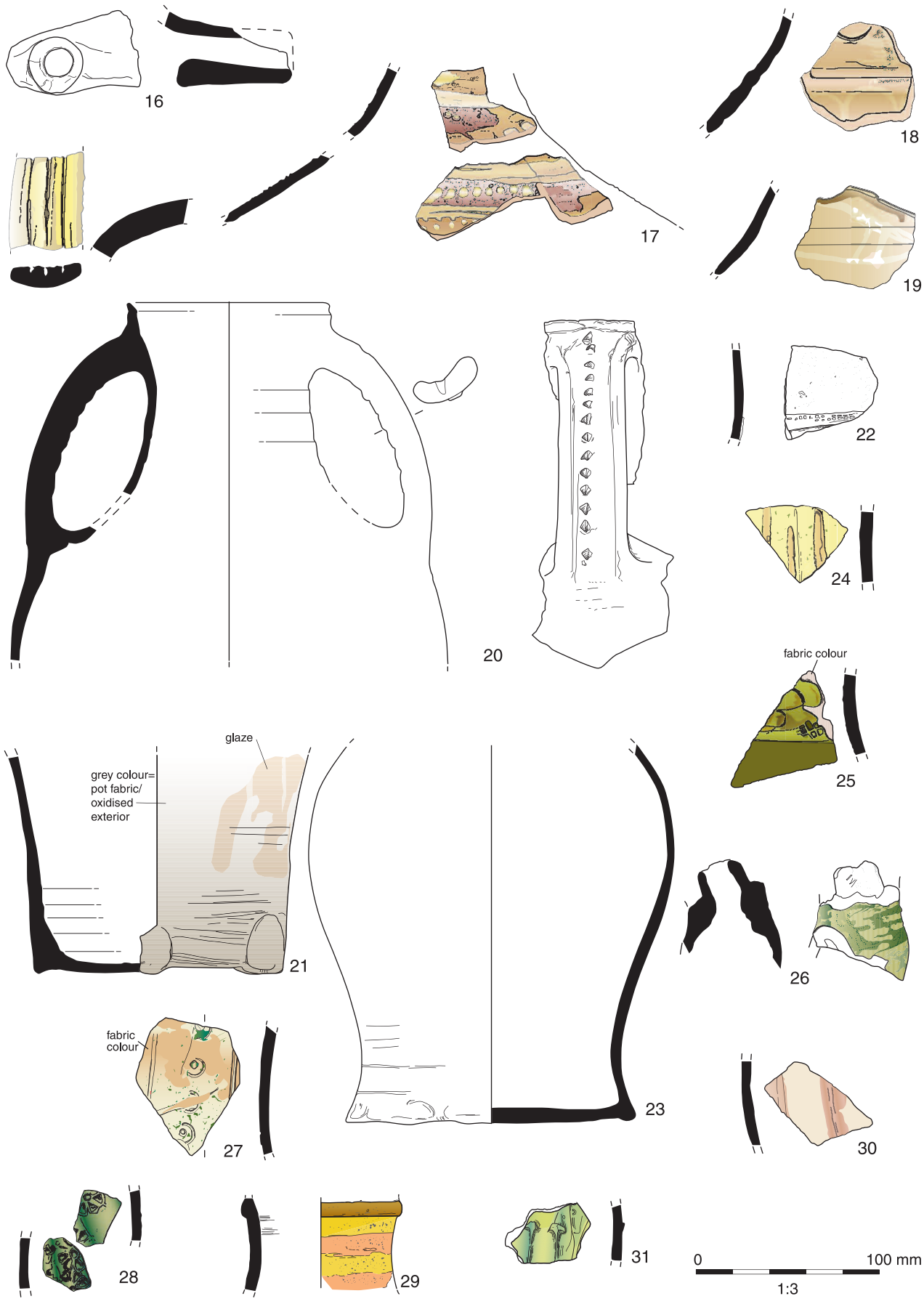

Fig. 5.3 Medieval pottery: Ashampstead ware (Nos 16-21) and London ware (Nos 22-31)

41 Martincamp white ware: **Fragments of a mammiform flask**. Buff fabric, with beige outer surface, single small patch of orange-brown glaze on one of the outer faces. Ctx 8682, unphased.

Figure 5.5

42 Surrey Whiteware: **Fragment of highly decorated jug**. Pale grey fabric with darker surfaces. Outer surface has applied strips and dots in the body clay, with a single splash of brown slip. Outer surface covered in a glossy green, copper-speckled glaze. Ctx 9769, Ph. 4.

43 Surrey Whiteware: **Base and bunghole from cistern**. White fabric with grey-buff surfaces, small splashes of glossy green glaze on outer surface. Ctx 9692, unphased.

44 Surrey Whiteware: **Rim, handle and upper body of jug**. Uniform grey fabric, glossy variegated green and orange glaze on outer body above lower handle terminal, no glaze behind handle. Ctx 9090, Ph. 5.

45 Surrey Whiteware: **Skillet handle**. Uniform pale grey fabric. Ctx 9183, Ph. 5.

46 Surrey Whiteware: **Rim and handle of jar/cistern**. Pale grey fabric with pale buff surfaces. Ctx 9416, Ph. 6.

Fig. 5.4 Medieval pottery: 'Tudor Green' ware (Nos 32-35), Cistercian ware (Nos 36-40) and Martincamp white ware (No.41)

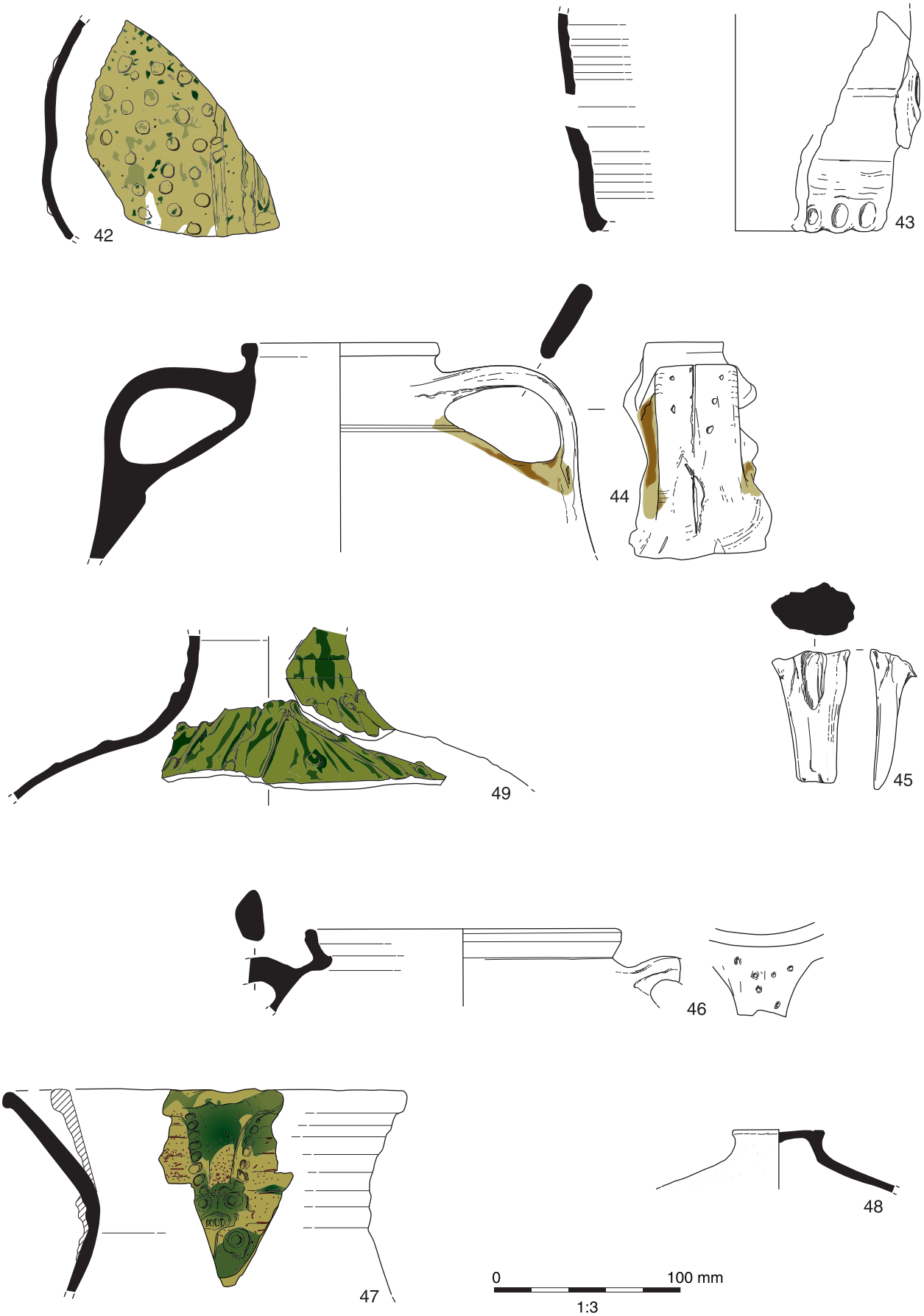

Fig. 5.5 Medieval pottery: Surrey whiteware (Nos 42-49)

47 Surrey Whiteware: **Rim and spout of highly-decorated jug**. Stabbed decoration with small modelled face at base of spout. Pale grey fabric with darker surfaces, bright green, copper-streaked glaze on outer surface. Ctx 5179, unphased.
48 Surrey Whiteware: **Lid**. Pale orange fabric with light grey surfaces. Ctx 8396, unphased.
49 Surrey Whiteware: **Neck and shoulders from highly decorated jug**. White fabric with glossy green copper-streaked glaze, large pool of glaze on inner surface. Ctx 6115, Ph. 3.

Figure 5.6
50 Surrey Whiteware: **Fragment of costrel**. Pale grey fabric with buff surfaces, glossy, yellow-green glaze with copper-spotting in upper body and neck and rim. Ctx 8682, unphased.
51 Surrey Whiteware: **Fragment of small rounded jug**. Pale grey fabric with browner surfaces, glossy, copper-spotter glaze on both surfaces. Applied dots of body clay. Ctx 8749, Ph. 3.
52 Surrey Whiteware: **Rim and upper body of large jar/cistern**. Pale orange fabric with buff surfaces, patch of thin green glaze on the shoulder. Ctx 8682, unphased.
53 Surrey Whiteware: **Rim and shoulder of jar**. Grey fabric with buff surfaces, pool of glossy, apple green glaze on outer surface, partially covering vertical stripes of red slip. Ctx 8881 (Ph. 6) and 8895 (Ph. 5).

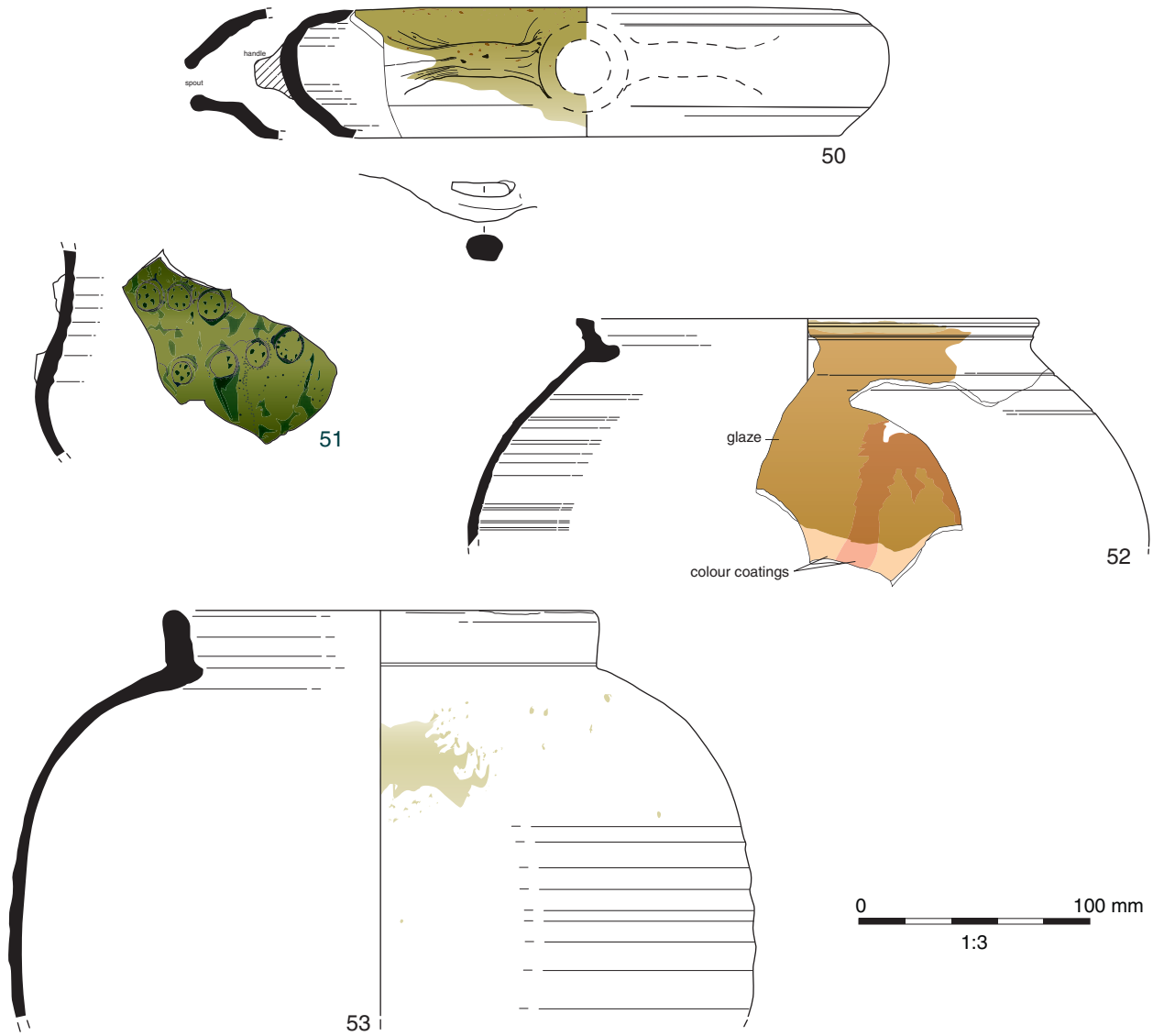

Fig. 5.6 Medieval pottery: Surrey whiteware (Nos 50-53)

Post-medieval pottery (Figures 5.7-5.10; Table 5.5)

by Duncan H Brown and Robert Thomson

The beginning of the post-medieval period is open to discussion, but in pottery terms, and in the context of the Oracle, it is marked by the appearance of post-medieval redware in the second quarter of the 16th century. The assemblage considered here therefore comprises all material made after *c* 1540 and derived from contexts phased as mid-16th century or later. It numbers 3,966 sherds, with a total weight of 100,782 grams and a rim percent of 8,708. A few imported types are present, mainly Frechen stoneware and Chinese porcelain, but the assemblage is dominated by English types, and much of that derives from local sources. Table 5.5 lists the main ware types present, and shows the quantities in each site phase.

Post-medieval redware is the most common ware type, accounting for 34% of the total weight. The ware was ubiquitous in the south of England from the mid-16th century onwards, and seems to have been produced at many different centres. The main suppliers to London were apparently in Essex, although there were also many pottery-makers in Sussex, Surrey and Hampshire. It is likely that most of the post-medieval redware at the Oracle was supplied to Reading from local Berkshire sources, and there is evidence for production at Inkpen four miles to the west of Newbury, and at Ashton Keynes on the Berkshire Downs (Vince *et al* 1997). The Kennet valley is a likely area for potteries to have been established, and the river Kennet would have facilitated the transport of their products to Reading. Vessel types include jars, jugs and bowls (Fig. 5.9 No. 12), paint pots, pipkins and mugs (Fig. 5.9 No 13) and tankards, porringers, dripping pans, costrels, chafing dishes, a drug jar, a candlestick, a fuming pot and an alembic. Jugs do not seem to be as common as jars and are generally undecorated. There is a greater variety of bowls, including handled bowls, bushel pans and pancheons, and there are also modified bowls in the form of colanders. Late post-medieval redware is distinguished by its hard fired fabric and shiny glaze. A complete jar with holes in the base (Fig. 5.9 No 14) was found set into a brick floor on Site 12, and may have been used for drainage. Four similar pots were also found in the fill of a well (Fig. 5.9 No 15).

Surrey/Hampshire Border ware is the next most common type. Among the vessel types are jars, pipkins, tripod pipkins, jugs, bowls, handled bowls, colanders, chamber pots, chafing dishes, a porringer, dishes, plates, mugs (Fig. 5.10 No 17), a cup, a candlestick, a fuming pot and a lid. This was produced at potteries around Farnham, close enough for Reading to have been a natural market.

The remaining ware types are present in comparatively small quantities. Most are well known post-medieval types. The brown, manganese, and black-glazed earthenware mainly takes the form of mugs, while the slipware occurs as dishes or bowls. Midlands and Staffordshire slipped and plain earthenware also occurs, together with a variety of post-medieval earthenware fabrics of uncertain, but probably local, origin (Fig. 5.10 No 18). Among the less well-represented post-medieval wares are a few sherds from the Verwood potteries in Dorset and slipped redwares (Fig. 5.9 No 16).

Most of the tinglazed ware is English, although the earlier types may be Dutch. It is mostly plain white or pale blue, although there are a few polychrome pieces (Fig. 5.10 Nos 19-20). Bowls, dishes and plates are the most common forms, and there are also chamber pots, ointment jars and drug jars. English stoneware is common in the latest phases, especially in the form of bottles (Fig. 5.10 No. 21), jars and tankards. Two jar fragments bear the names of Reading tradesmen (Fig. 5.10 Nos 22-23). The 19th-century phases produced increasing quantities of refined earthenware, including plain and transfer-printed types.

Among the imported wares Frechen stoneware is the most common, and there are a few pieces of Chinese porcelain and Westerwald stoneware. More unusual are fragments of French, possibly Beauvais, whiteware and Ligurian tinglazed ware (Fig. 5.10 No. 24).

A site by site discussion may be found on the accompanying CD, but it may be worth considering Site 29 here as it produced 76% of the post-medieval assemblage. Phase 2909a is associated with backfill prior to the construction of the Oracle Workhouse. Post-medieval redware and Surrey border ware are the most common types, together with some Frechen stoneware. The range of vessel types includes jars, pipkins, bowls, dishes, jugs and mugs, and there are also fragments of a colander, a candlestick and a fuming pot. There is very little tinglazed ware, evidence perhaps of relatively low economic status. It is possible that the pottery dumped here was not derived directly from on-site domestic activity, but rather comprises material brought in from elsewhere.

Phase 2909b, which relates to the infilling of cellars in the primary phase of the workhouse, is the most productive of the whole site. There are a few pieces of refined earthenware that suggest a date later than 1710 but these may be intrusive and the bulk of the material conforms to the suggested phase dates. The quantity of it reflects the fact that many of these deposits are dumps and fills, although these were made during occupation of the workhouse, and may therefore be representative of the range of pottery used therein. There is relatively little tinglazed ware or porcelain and the small quantities of those more refined types are perhaps indicative of the economic condition of the workhouse. There is a heavy reliance on the cheaper kinds of pottery, and this is what one might expect of such an establishment.

Table 5.5 shows the quantities of the most common ware types in each project phase, while Table 7.19 (see CD) shows the range of vessel types.

Table 5.5: Post-medieval pottery, quantities of major wares by project phase, by weight (g), sherd count and rim percentages

Ware code	*Project phase date range*	*6 1500-1600*	*7 1600-1680*	*8 1680-1750*	*9 1750-1850*	*10a 1850-1900*	*10b 1900+*	*Totals*
Post-medieval redware	RP	198	411	1290	178	509	10	2596
	Weight	3703	4846	17541	2462	5165	330	34047
	Count	108	232	722	96	223	9	1390
Late Post-medieval redware	RP			170	129	310	31	640
	Weight			7050	2392	12886	290	22618
	Count			68	42	136	8	254
Surrey/Hants Border ware	RP	85	410	952	69	259	53	1828
	Weight	602	4075	8295	646	1638	211	15467
	Count	25	151	473	37	111	14	811
Post-medieval brown-glazed	RP	0	20	11	10	23	7	71
	Weight	122	157	367	150	246	13	1055
	Count	7	7	21	6	14	1	56
Post-medieval manganese-glazed	RP	0	0	58	11	0	4	73
	Weight	18	64	727	36	33	12	890
	Count	2	3	46	3	4	2	60
Post-medieval black-glazed	RP		29	15	15	0		59
	Weight		85	113	71	19		288
	Count		6	9	1	1		17
Slipware	RP	0	11	81	73	71		236
	Weight	54	134	1581	795	541		3105
	Count	2	5	44	16	11		78
Tinglazed	RP	18	28	143	128	21	0	338
	Weight	37	147	738	911	442	32	2307
	Count	10	14	80	75	48	3	230
English stoneware	RP	0	20	41	46	591	55	753
	Weight	21	118	413	974	2254	934	4714
	Count	2	9	36	55	73	3	178
Refined earthenware	RP	6	19	3	121	874	28	1051
	Weight	10	62	28	1318	4505	523	6446
	Count	3	10	6	123	274	19	435
Frechen stoneware	RP	67	137	80	4	100		388
	Weight	793	1498	591	41	495		3418
	Count	34	75	35	4	11		159
Westerwald stoneware	RP	0		66	15	42		123
	Weight	7		203	77	138		425
	Count	1		9	3	4		17
Chinese porcelain	RP		3	0	6	3	0	12
	Weight		8	4	19	196	60	287
	Count		1	2	6	9	1	19
Totals	RP	568	1088	2716	805	2803	188	8168
	Weight	12618	11194	30400	9892	28558	2405	95067
	Count	271	513	1474	467	919	60	3704

The most diagnostic and plentiful ware types are included, while rare types, such as most of the imported wares, are not. This allows a clearer understanding of the overall pattern and identifies the wares that best inform our understanding of the whole assemblage. Post-medieval redware is a consistent presence throughout, and is also the most common product of all. The later variant is, as it should be, confined to the later phases. There are indications that the production of post-medieval redware declined rapidly c.1900, as it is a much-reduced presence in Project Phase 10b. Surrey/Hampshire border ware is the next most common product, and occurs mainly in Project Phases 7 and 8. Most of the ware types are distributed according to their established date ranges.

A pattern can thus be discerned that shows how post-medieval Reading, or at least this part of it, drew primarily on local sources for pottery supplies. Frechen stoneware is well represented in Project Phases 6, 7 and 8, but once glass was in ready supply, at the end of the 17th century, the use of imported stoneware jugs tailed off. This is the time when Westerwald stoneware was imported, but this type is rare here. So too is Chinese porcelain, the only other imported product that occurs in any meaningful quantity. The quantities of Chinese porcelain increase through each phase, which is possibly related to a gradual decline in its value as it became more accessible to a wider variety of people.

English imports, primarily tinglazed wares and those from Staffordshire and elsewhere in the Midlands, are also rare prior to the industrial period, although this changes with the advent of mass-produced stoneware and refined earthenware, in Project Phases 9 and 10. Post-medieval redware and Surrey/Hampshire Border ware are the most common types in Phases 6, 7, and 8 and this demonstrates a need for pottery, albeit of a humble kind. Indeed, Table 7.19 (see CD) shows how food preparation, storage, eating and drinking are all represented among the vessel forms. The relatively low quantities of tinglazed ware and an overall lack of slip-decorated earthenware may reflect a low economic status, where function was more important than presentation. It is clear that there was little, if any, requirement for the most highly decorated or expensive types available. With the industrialisation of pottery production, and the improvement of means of distribution, firstly by canal, then railway, non-local English products appear more frequently, and English stoneware and refined earthenware both comprise a significant proportion of the later assemblage. By this time such products were relatively cheap as well as easily available. Table 7.19 (see CD) shows that there is still an emphasis on jars, jugs and bowls in Project Phases 9 and 10, but there are also tea-wares and increased quantities of plates, both of which were most commonly made in refined earthenware.

An important question is just how representative this assemblage may be of on-site ceramic consumption. Many of the deposits are dumps or back-fills, and may be derived from a source some way away from the main areas of activity. Closed groups of material directly derived from domestic activity are rare. Pits, wells and cellars are usually the most productive types of feature in this respect, and as the area developed throughout the post-medieval period, these became increasingly rare. Few other post-medieval assemblages from Reading have been analysed so fully, however, and it is therefore difficult to know what it truly represents as an indicator of levels of demand and sources of supply. The assemblages from Reading waterfront seem to have slightly greater quantities of non-local earthenware, slipware, tinglazed ware and porcelain (Underwood, 1997, Table 16), but it is also debatable how much of this material is derived from on-site domestic activity. The overall picture from the Oracle site, however, is of an area of the town where the cheapest and most freely available forms of pottery were commonly consumed. In terms of pottery use, a fairly prosaic range of functions is indicated, and there is little evidence to show that pottery was required for show or for special occasions.

Illustrations

Figure 5.7

1 Surrey Whiteware: **Rim of bowl**. Grey fabric with internal greenish-clear glaze. Knife-trimmed external surface. Sooty residues may have accrued post-breakage. Contest 4772, Ph. 7
2 Late medieval sandy ware: **Complete profile of a bowl**. Unglazed, sandy, well-fired, red throughout with dark red surfaces. Internal sooting. Ctx 8855, Ph. 5
3 Late medieval sandy ware: **Top part of a jar**. Unglazed, red sandy fabric, with splashes of blue paint inside and out. Ctx 8855, Ph. 5
4 Late medieval well-fired sandy ware: **Complete profile of a bowl**. unglazed, sandy, red-brown fabric with some large clay pellet inclusions. External knife-trimming. Ctx 8677, Ph. 5
5 North French Whiteware: **Top part of a jar**. Unglazed, well-fired, white smooth fabric, possibly Beauvais, Ctx 9053, Ph. 6

Figure 5.8

6 Low Countries Redware: **Complete profile of a skillet or bowl**. Internal clear glaze, appearing greenish in parts, concentrated in the base with splashes further up the wall. No evidence for a handle, although this is likely given the presence of alip. Ctx 9507, not phased
7 Low Countries Redware: **Top part of a mug**. Internal and external clear glaze, heavily ribbed. Ctx 9047, Ph. 5
8 Raeren stoneware: **Complete profile of a mug**. Grey-brown salt glaze. Ctx 8616, Ph. 5
9 Raeren stoneware: **Complete profile of a mug**. Grey-brown salt glaze. Ctx 8682, not phased.

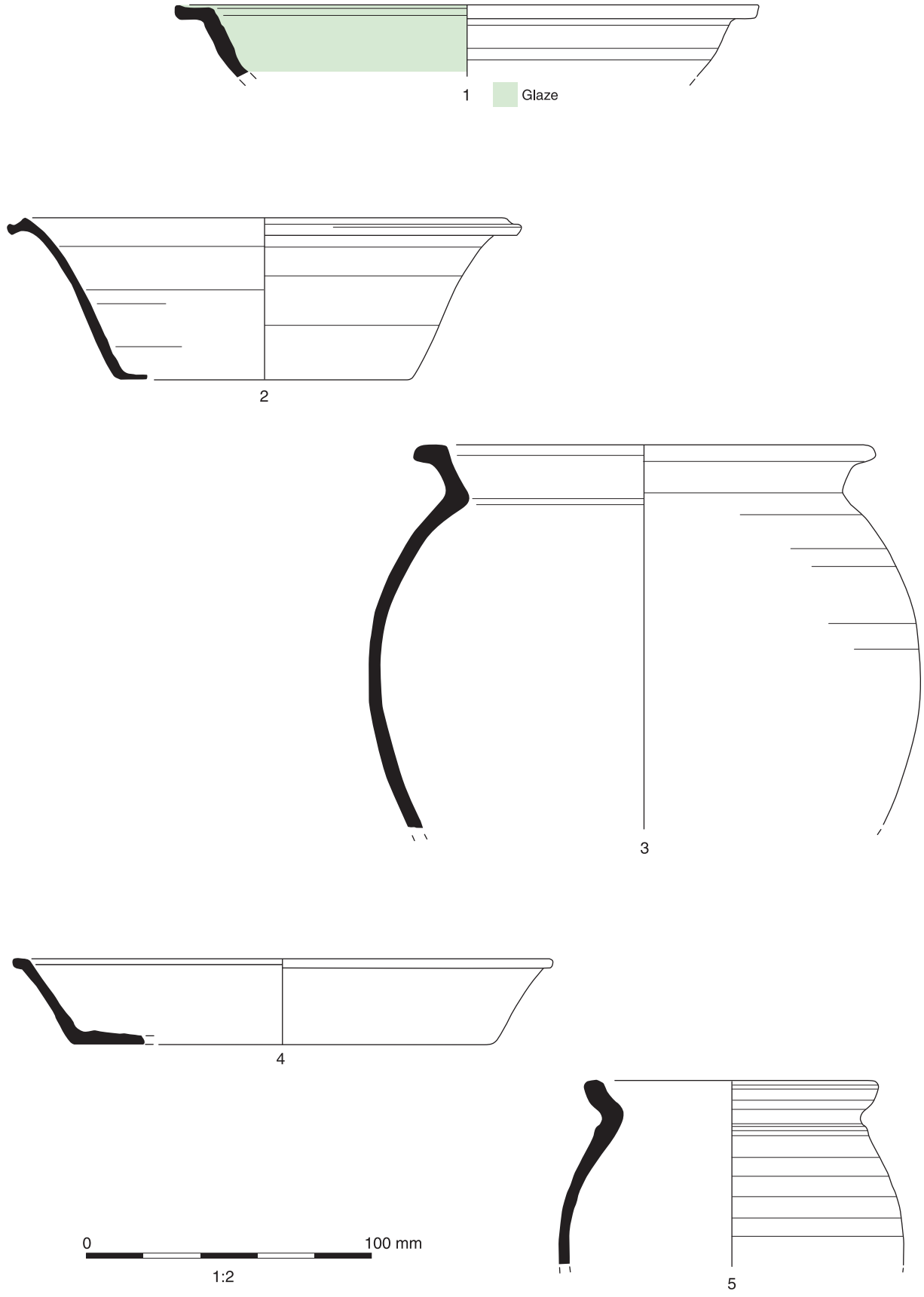

Fig. 5.7 Post-medieval pottery (Nos 1-5)

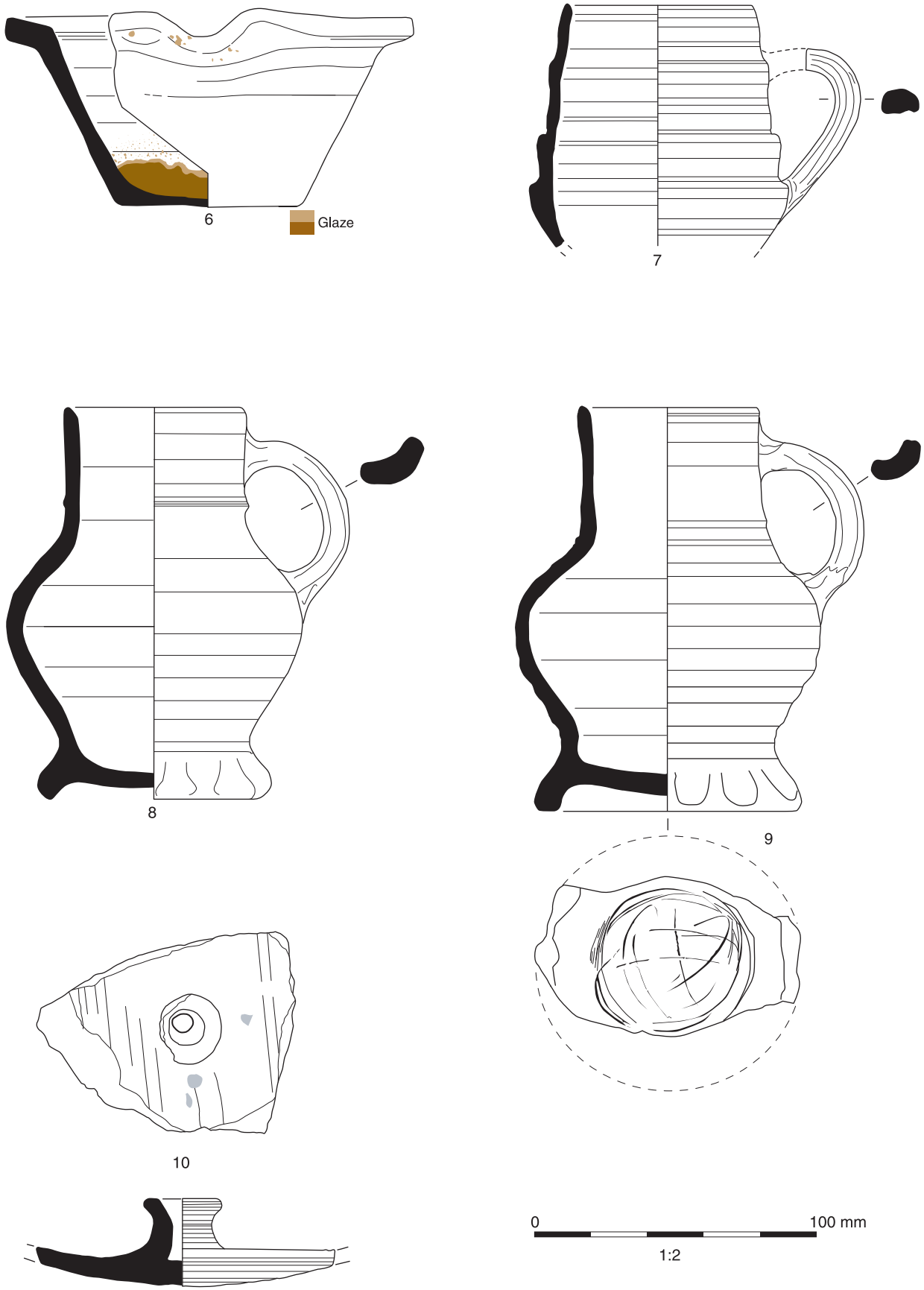

Fig. 5.8 Post-medieval pottery (Nos 6-10)

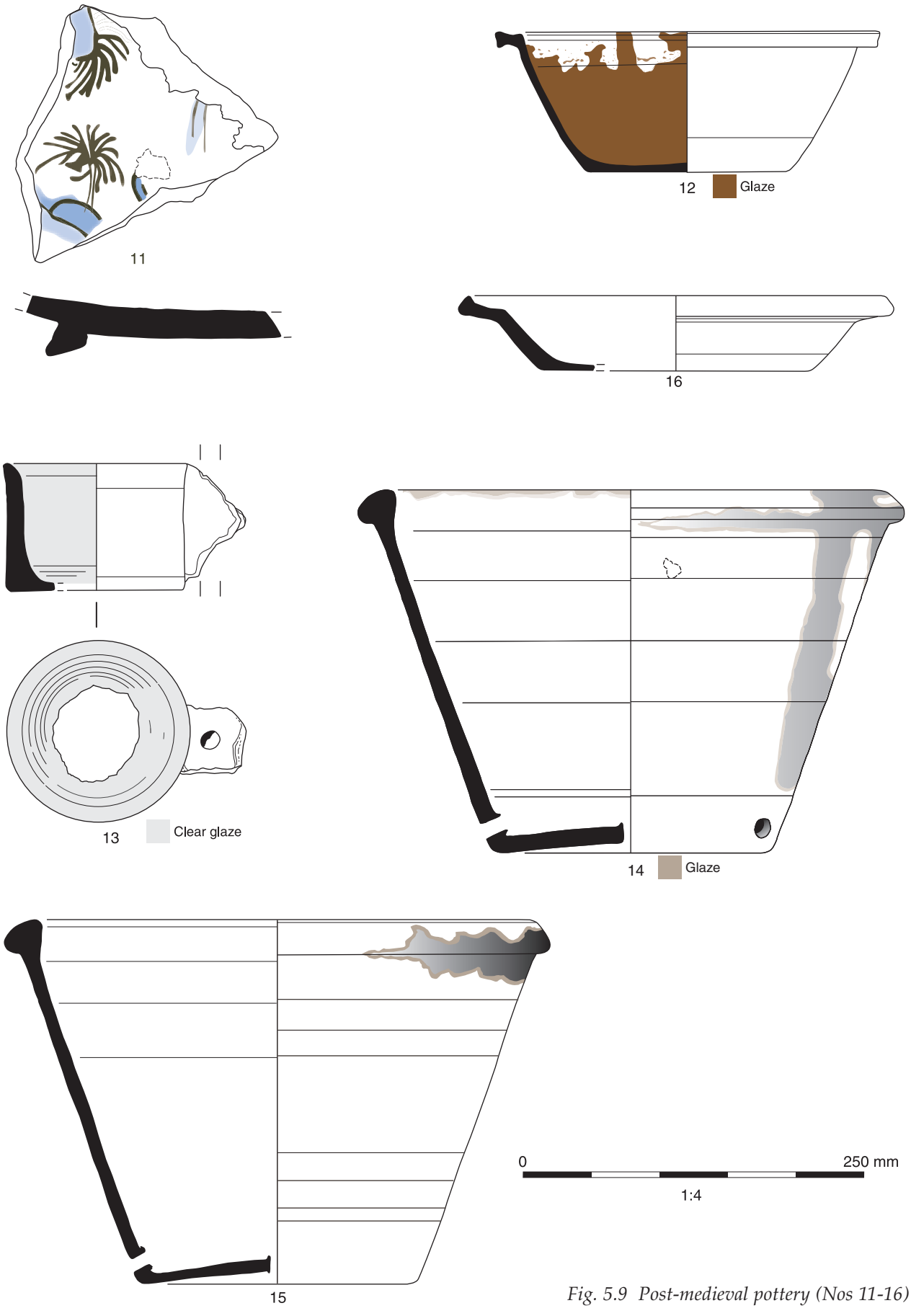

Fig. 5.9 Post-medieval pottery (Nos 11-16)


17
18
Glaze
19
20
4
JOHN H FULLER
Grocer Oil & Colorman
51 & 52 Minster St
READING
22
BLACKING BOTTLE
15
J. B. D.
21
0
250 mm
1:4
24
J OLIVER
ne&Spirit Merch t
READING
23
Glaze

10 Iberian Whiteware: **Lid fragment**. Unglazed. Ctx 5646, Ph. 7

Figure 5.9

11 Iberian tinglazed ware: **Dish base fragment**. Decorated with blue and manganese paint, possibly with a tree motif. The sherd is badly abraded. Ctx 5169, Ph. 8

12 Post-medieval redware: **Complete profile of bowl**. Internal clear glaze that appears brown over deep red surfaces, glaze mainly confined to the base with runs towards the rim indicating that the vessel was fired upside-down. Ctx 4486, Ph. 8

13 Post-medieval redware: **Double-handled cup**. Internal clear glaze. One of a pair of joined pierced flat handles survives and there is a scar where the other handle was attached. The base has been knocked out. Ctx 7114, not phased.

14 Late Post-medieval redware: **Complete profile of draining vessel**. Pierced in the centre of the base and in three places above the base. Patches of external black/dark brown glaze. Found set into brick floor. Ctx 647, Ph. 10

15 Late Post-medieval redware: **Complete profile of garden pot or draining vessel**. Pierced in the centre of the base and in three places above the base. Patches of external black/dark brown glaze. Ctx 8675, Ph. 6

16 Slipped post-medieval redware: **Complete profile of a dish**. Internal clear glaze with white slip decoration. Ctx 4171, Ph. 8

Figure 5.10

17 Surrey Border ware; **Base of a mug**. Decorated with vertical lines from a five-toothed comb. Slightly mottled brown glaze inside and out. Ctx 4572, Ph. 7

18 Post-medieval earthenware: **Complete profile of a bowl.** Fine, sandy pink fabric with a grey core. Internal yellow-orange glaze. Sooting or scorch-marks on the external surface. Ctx 5201, not phased

19 English tinglazed ware: **Complete profile of a small drug jar**. English tinglazed ware. Pedestal base with blue and orange painted decoration. Ctx 8051, Ph. 8

20 English tinglazed ware: **Complete profile of a drug jar**. Blue, orange and purple decoration. Ctx 4647, not phased.

21 English stoneware: **Complete blacking bottle.** Stamped 'BLACKING BOTTLE/15/J.B.D.' Ctx 11391, Ph. 10

22 English stoneware: **Rim and shoulder fragment of a jar.** Stamped '4/...OHN H FULLER/...ocer Oil and Colorman/51 & 52 Minster St/READING/.' Ctx 8301, Ph. 11

23 English stoneware: **Rim and shoulder fragment of a jar**. Stamped 'J OLIVER/...e & Spirit Merch t...EADING.' Ctx 3824, Ph. 10

24 Ligurian maiolica: **Base of a dish**. Painted with a floral motif in white, dark blue, orange and yellow on a pale blue background. Ctx 4991, Ph. 6

Fig. 5.10 (opposite) Post-medieval pottery (Nos 17-24)

Glass vessels (Figures 5.11-5.13)

by Hugh Willmott

Introduction

Glass can be a good indicator of patterns of trade and exchange. It is more chronologically sensitive than many ceramic types and most vessels (with the exception of bottles) can be assumed to have had very short life spans. Stylistically too, glass can easily be identified and it is known to have been made in far fewer locations, facilitating any discussion on provenance and trade. There are, however, certain caveats concerning any conclusions drawn from the glass assemblage. Although, when compared with other similar glass assemblages, this might be considered a large one, the number of vessels is still low when contrasted with other find groups, such as ceramics and clay pipes. Consequently statistically the data must be treated with caution. Likewise glass is prone to a high degree of fragmentation and decay in archaeological environments, resulting in the amount recovered even in meticulous excavation being rather less than that originally deposited. Furthermore certain glasses, such as those made with a potash alkali, are more likely to suffer severe weathering and total decomposition, compared with those made with a soda flux, leading to an over representation of the more durable glasses in the archaeological record.

Glass as an indicator of trade and exchange

Three broad categories of glass can be identified that help in this discussion: glass produced relatively locally to Reading, glass produced in national urban centres, and glass imported from continental Europe. Each of these categories has different implications for the level and complexity of trade and exchange networks in operation around Reading.

Perhaps the hardest group to identify positively are those glasses produced locally. In the absence of specific archaeological research into the glass industry in the Reading region, it is not known where the nearest source might have been. However, it is increasingly apparent that utilitarian potash glasses were produced in a variety of locations in southern England, usually in woodland areas. Such glasses, which include simple pedestal beakers and flasks, are present in the assemblages from site 12 and site 29. Utilitarian potash glass vessels found at site 12 comprise three urinals (Fig. 5.11 Nos GL2-4) used to inspect urine for medical divination, and three flasks (Fig. 5.11 No. GL6 is the push-in from a flask base). These types of vessel are amongst the commonest survivals from the medieval period, and these examples are most likely to be of 14th- and 15th-century date. Rather later are the fragments of six pedestal beakers found at site 29 (Fig. 5.12 Nos GL51 and 52), all but one decorated with optic-blown wrythen ribbing.

Pedestal beakers are common finds on domestic sites during the later 16th and early 17th centuries (Wilmott 2002, 45-6). They are a typical English product, frequently occurring on contemporary furnace sites such as Hutton and Rosedale, N Yorks (Charleston 1972, 146-8) and Kimmeridge, Dorset (Crossley 1987, 359). A more unusual potash glass find from site 29 is the spout from a small spouted jug (Fig. 5.13 No. GL76), which probably dates from the early 17th century. Four flasks from site 29 (Nos GL 56-9) are made in a green glass and are probably of 16th-century date. Figure 5.12 No. GL 56 is an oval flask decorated with heavy optic-blown wrythen ribs. Flasks of this kind were found in the barber-surgeon's chest on the *Mary Rose*, which sank in 1545.

English glass produced in specific specialised urban centres is easier to identify. By the later 17th century the nature of production had changed, with most glass production occurring in large-scale glasshouses based within towns. Centres such as London, Bristol and Newcastle became established at this time, supplying not only their wider hinterlands but also providing for export. Whilst there is no documented industry in 17th- or early 18th-century Reading, vessels such as wine bottles, phials and some of the stemmed drinking vessels are English products, and were probably made in London. Considerable numbers of late 17th- to early 18th-century onion and mallet wine bottles were found on site 12, many from a cellar at the Yield Hall that was backfilled in the late 18th century (Fig. 5.11 Nos GL20-22; Plate 3.27). These were used at a time when wine was not stored for long periods in the bottle. The practice of ageing wine had become popular by the mid 18th century, and straighter-sided vessels that could be laid on their side were developed. A number of the later 18th-century squat cylindrical wine bottles were recovered from later contexts, and a range of wine bottles were recovered at site 29 (see Willmott, Chapter 9 on the CD-ROM). Phials were popular household items used for medicines, unguents and lotions, and a minimum of 12 were recovered from contexts associated with the occupation of the Oracle workhouse. Several fragments of a wine glass with a moulded pedestal or 'Silesian' stem (Fig. 5.11 No. GL10) were found at site 12, and date from the early 18th century.

Perhaps the most significant categories are the imported vessels. The most exceptional finds were six fragments from a clear glass goblet with mould-blown fins around its bowl (Fig. 5.11 No. GL1). Finned goblets are found on the continent in late 13th- and early 14th-century contexts, but are considerably rarer in England, where this is the first known example in colourless glass. It was probably made in southern France and is similar to an example from Avignon (see Willmott, Chapter 9 CD-ROM for further discussion). It was found with rubbish and refuse used to raise the ground level of site 12 following major channel realignment in the early 16th century, and may have been brought from the abbey following its dissolution. Otherwise, imported glass vessels only occur in any significant number at site 29 and almost all belong to the *façon de Venise* tradition of the 16th and early 17th centuries. *Façon de Venise* glass is a generic term to describe an almost pan-European style of vessels and decorative techniques. Many of these styles probably originated in Venice, but were rapidly copied by other production centres. One fragment from site 29 (Fig. 5.12 No. GL60) is quite plain, and is a very fine rim from a goblet of 16th-century date. There are at least three tankards, two cylindrical beakers and two goblets from site 29 that are made in a highly decorative and colourful *filigrana* glass, forms and decoration typical of the Antwerp and Amsterdam industries of this period. The most complete and diagnostic fragments come from the body and rim of a bellied tankard decorated with vertical bands of alternating blue and white glass (Fig. 5.12 No. GL61-63) in the style known as *vetro a fili* (see Willmott, Chapter 9 CD-ROM for a discussion of *façon de Venise* decorative techniques). Bellied tankards are quite a rare form dating to the first half of the 16th century and another fragment (Fig. 5.13 No. GL68) is from a different tankard decorated with alternating opaque white *vetro a fili* glass and canes of coloured glass twisted into a tight spiral in the technique known as *vetro a retorti*. Two fragments (see Fig. 5.13 No. GL64) come from late 16th- or early 17th-century cylindrical beakers decorated with opaque white *vetro a fili*, and two further fragments (not illustrated) come from goblets with white *vetro a retorti* decoration, typical of the first half of the 17th century. Similar vessels have been found on a number of domestic sites, particularly in London. Two rim fragments from cylindrical tankards made in brown glass with white thread decoration (see Fig. 5.13 No. GL70) date to the late 17th century and may have been produced in England.

Whilst it is hard to draw firm conclusions from a single category of material culture, the glass does give an indication of the standing of Reading in its regional and national context. In many ways the assemblages are typical for a midlands or southern English town. Typically such urban assemblages are predominantly post-medieval in date, with glass first occurring in any quantity during the late 16th and early 17th centuries. *Façon de Venise* glass is not particularly rare, but it is nevertheless an indicator of the presence of people with the means to acquire fashionable imported luxury goods. Glass, such as here at Reading, typically continues to be found in 18th-century contexts, before becoming scarcer in the 19th century, probably as a result of changes of practice in rubbish disposal and site excavation biases. As such, the Reading assemblages, with their mix of local and imported Low Country vessels, are directly comparable to others from towns such as Northampton, Coventry, Winchester and Oxford.

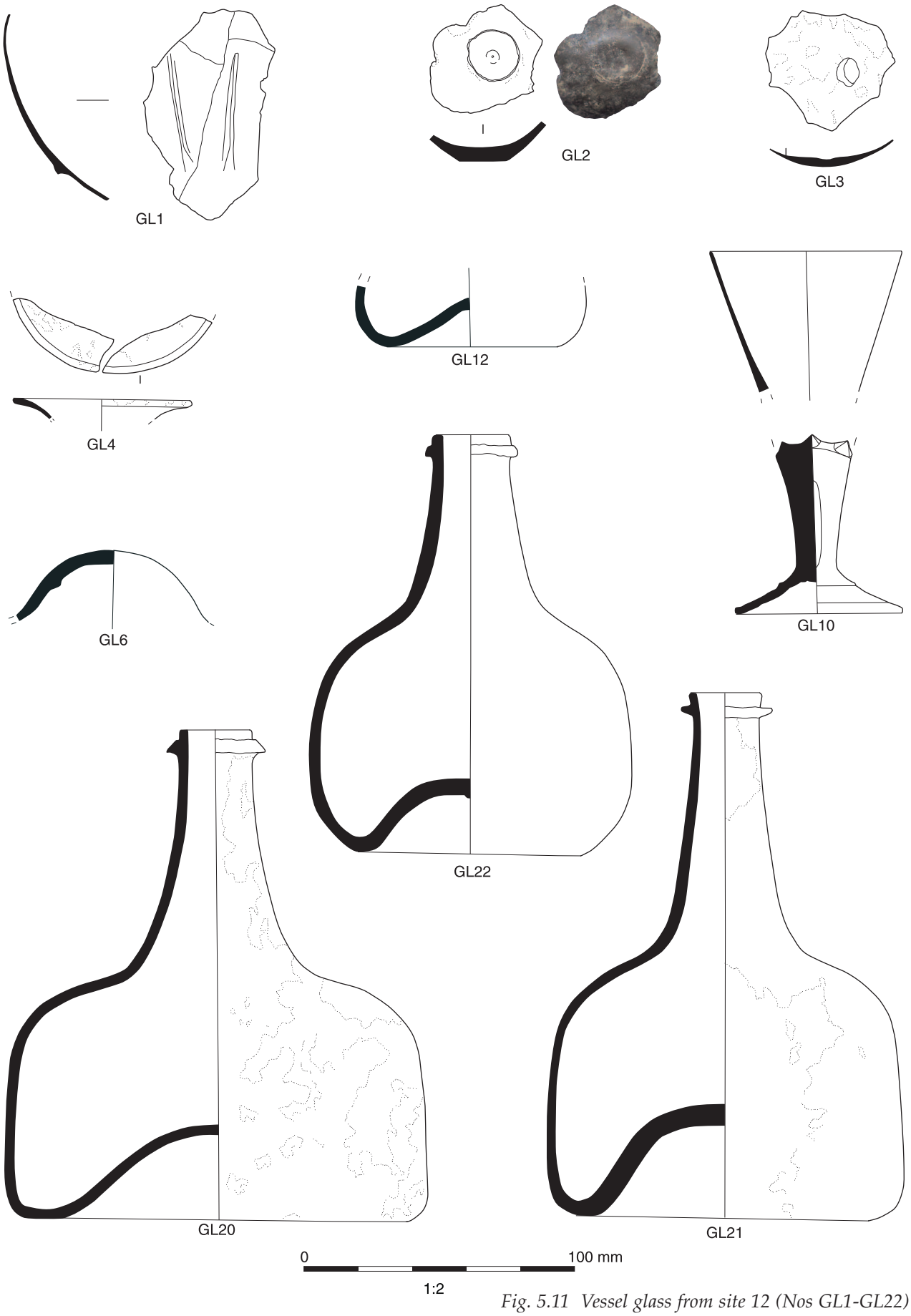

Fig. 5.11 Vessel glass from site 12 (Nos GL1-GL22)

What are absent are any imports from further afield. There are no identifiable Italian glass imports, nor any from Northern Germany or Bohemia, although German pottery and jettons (counters) were clearly reaching the town. This is consistent with the pattern of glass imports found in other regional towns, with such imports usually being restricted to London, or coastal mercantile centres like Southampton. The small but significant amount of residual medieval glass from site 12 is of note. Medieval glass is relatively rare in provincial urban contexts, and usually only found in association with high status secular and ecclesiastical establishments. Furthermore, given the extent that medieval glass is prone to decay and devitrification, it would seem to suggest that it derived from a site in the near vicinity. Had it been brought in from further away as part of material for levelling and land reclamation in this area it is unlikely to have survived.

Catalogue of illustrated glass vessels

Site 12

Figure 5.11

GL1 **Bowl from stemmed goblet**. 6 fragments. Decorated with two remaining vertical pinched 'fins'. Clear glass with heavy weathering. Late 13th-early 14th century. Ctx 8655, final phase 1207a (1500-1530).

GL2 **Urinal**. 2 fragments of convex base from a urinal. Green potash glass with very heavy weathering. 13th-15th century. Ctx 613, final phase 1209d (1660-1700).

GL3 **Urinal**. 1 fragment of convex base from a urinal. Green potash glass with quite heavy weathering. 13th-15th century. Ctx 564, final phase 1210a (1700-1750).

GL4 **Urinal**. 2 fragments of everted rim with an up-turned edge from a urinal. Green potash glass with heavy weathering. Rim diameter 75mm. 13th-15th century. Ctx 564, final phase 1210a (1700-1750)

GL6 **Flask**. 3 fragments of basal push-in from a large spherical flask. Green potash glass with very heavy weathering. 15th-early 16th century. Ctx 894, final phase 1207a (1500-1530).

GL10 **Wine glass**. 9 fragments of flaring base with under-folded edge, moulded stem and trumpet-shaped bowl from a wine glass. The stem is square-moulded in section with decorative diamonds on the shoulder. Clear lead glass with no weathering. Base diameter 65mm, rim diameter 70mm. Early 18th century. Ctx 8565, final phase 1209c (1600-1650).

GL12 **Decanter/bottle**. 3 fragments of pushed-in base from an oval decanter/bottle. Clear tinted glass with light weathering. Base diameter uncertain. 18th century. Ctx 502, final phase 1210a (1700-1750).

GL20 **Wine bottle**. 2 fragments of complete profile from an onion/mallet wine bottle. Green glass with quite heavy weathering. Base diameter 112mm, rim diameter 25mm, height 185mm. Late 17th-early 18th century. Ctx 952, final phase 1211 (1750-1800).

GL21 **Wine bottle**. 15 fragments of complete profile from a mallet wine bottle. Green glass with heavy weathering. Base diameter 102mm, rim diameter 23mm, height 203mm. Late 17th-early 18th century. Ctx 952, final phase 1211 (1750-1800).

GL22 **Wine bottle**. 14 fragments of complete profile from a small onion/mallet wine bottle. Green glass with quite heavy weathering. Base diameter 78mm, rim diameter 25mm, height 140mm. Late 17th-early 18th century. Ctx 952, final phase 1211 (1750-1800).

Site 29

Figure 5.12

GL49 ***Pasglas***. 1fragment possibly of a convex zoomorphic head-shaped knop from an octagonal pasglas. Blue potash glass with heavy weathering. Late 15th century? Ctx 5463, final phase 2908c (1558-1628)

GL51 **Pedestal beaker**. 1 fragment of rim from a pedestal beaker decorated with optic-blown wrythen ribbing. Blue/green glass with very little weathering. Rim diameter 80mm. Late 16th-early 17th century. Ctx 4488, final phase 2909a (1627-1680).

GL52 **Pedestal beaker**. 1 fragment of rim, from a pedestal beaker decorated with optic-blown wrythen ribbing. Green glass with heavy weathering. Rim diameter 80mm. 16th century. Ctx 4484, final phase 2908c (*c* 1566).

GL56 **Flask**. 1 fragment of rim, neck and shoulder from a small oval flask. Decorated with heavy optic-blown wrythen ribbing. Green clear glass with virtually no weathering. Early-mid 16th century. Ctx 4484, final phase 2908c (*c* 1566).

GL60 **Goblet**. 1 fragment of slightly everted rim from a goblet. Clear glass with medium weathering. Rim diameter 90mm. 16th–early 17th century. Ctx 4654, final phase 2908e (1628).

GL61 **Bellied tankard**. 10 fragments of body from a bellied tankard. Decorated with vertical bands of alternating opaque white and blue vetro a fili. Early to mid 16th century. Ctx 5519, final phase 2908a (1520-1628).

GL 62 **Bellied tankard**. 2 fragments of vertical rim and body from a bellied tankard. Decorated with vertical bands of alternating opaque white and blue vetro a fili. Rim diameter uncertain. Early to mid 16th century. Ctx 4617, final phase 2908e (1628).

GL63 **Bellied tankard**. 1 fragment of body from a bellied tankard. Decorated with vertical bands of alternating opaque white and blue vetro a fili. Early to mid 16th century. Ctx 4673, final phase 2908e (1628).

Figure 5.13

GL64 **Cylindrical beaker**. 1 fragment of vertical body possibly from a cylindrical beaker. Decorated with vertical bands of opaque white vetro a fili.

Fig. 5.12 Vessel glass from site 29 (Nos GL49-GL63)

Fig. 5.13 Vessel glass from site 29 (Nos GL64-GL76)

Late 16th-early 17th century. Ctx 4965, final phase 2908c (1558-1628).

GL68 **Bellied tankard**. 1 fragment of pedestal base probably from a bellied tankard. Decorated with alternating bands of opaque white vetro a fili and retorti. Base diameter 70mm. Early to mid 16th century. Ctx 4564, final phase 2909a (1627-1680).

GL70 **Goblet**. 1 fragment of vertical rim from a goblet. Decorated with one remaining opaque white vertical prominent trail. Rim diameter 90mm. Mid 17th century. Ctx 3896, final phase 2910a (1850-1998).

GL71 **Possible tankard**. 2 fragments of vertical rim from a possible tankard. Brown glass decorated with horizontal prominent opaque white trails. Rim diameter 75mm. Late 17th-early 18th century. Ctx 3945, final phase 2910a (1850-1998).

GL73 **Small flask**, or **possibly a sand glass**. 2 fragments of low pushed-in base from a small flask or possibly a sand glass. Clear green tinted glass with medium weathering. Base diameter 32mm. Late 17th century? Ctx 4370, final phase 2909a (1627-1680).

GL76 **Spouted jug**. 2 fragments of spout from a spouted jug. Green glass with extreme weathering. Early 17th century. Ctx 4502, final phase 2909b, (1680-1750).

Timber

by Dan Miles

A major dendrochronological study was carried out on timbers recovered during the excavations, which can be found in full in Chapter 11 on the CD-ROM.

Historic Woodland Management in Berkshire and Oxfordshire

In the early medieval period, much of the country was covered by forests which, despite the nomenclature, was more of a varied landscape of open glades and rides interspersed with pockets of dense woodlands, preserved principally for the purposes of keeping deer. Royal forests local to Reading were of course Windsor Forest, the northern parts of which were disafforested in 1227, and Pamber Forest, which was not disafforested until 1614, by which time the woods had been sold (Grant 1991).

During the medieval period, the most common form of woodland management was coppice with standards. The underwood was composed of small young growth of fast-growing species including beech, maple, elm, ash, alder, and hazel which were regularly coppiced about every ten years for such things as wattle and billets (Rackham 1976). Interspersed throughout the woodland were standards, tall timber trees left to mature for eventual building timber. This type of woodland was protected from the time of Henry VIII when in 1543 an Act was passed requiring 12 standards or store oaks should be left on each acre of copse or underwood felled at 24 years' growth (Forbes 1904).

During the late 16th and early 17th centuries timber began to become scarce, and in 1662 John Evelyn promoted the plantation system of woodlands. He advocated the growing of oaks in nurseries and the planting of saplings in plantations which might be managed both as traditional coppices as well as for building timber on the selection system. In the Chilterns, coppices were almost entirely superseded by the growing of plantations of beech together with oak on the selection system. During the post-medieval period up to the early 19th century, local woodlands in Mapledurham were beech coppice with oak and beech standards. By the first quarter of the 20th century the selection system was considered inferior to the compartment system of plantations following a major study of over 1500 trees on the Mapledurham Estate which even as late as 1920 comprised about 430 acres of mixed woodlands, half of which were pure beech (Wood 1920).

Interpretation of dendrochronological results

What is significant about the change of woodland management over the past millennium is that it can sometimes be reflected in the dendrochronological record. Trees grown in woodlands or forests which were not greatly interfered with by man, such as might be found in a Royal forest or woodland controlled by the Abbey, are more likely to match better both between the trees in the same woodland as well as with the reference chronologies. The other extreme is represented by the medieval practice of woodland management where individual trees are selectively felled periodically, often affecting the remaining neighbouring trees. Here, intensive woodland management generally results in poor cross-matching of samples. It is not until the 17th and 18th centuries, presumably resulting from the increased use of the plantation system with less periodic intervention, that trees again match each other exceptionally well.

A major question hoped to be answered from the dendrochronology is where did the timber originate. Until the Dissolution, it is quite likely that timber would have been provided by the extensive estates belonging to Reading Abbey, given that the buildings within the Oracle site were their property. Interests along the Kennet valley included Calcot, Burghfield, Bucklebury, Thatcham, and Greenham. Further north, on the south side of the Thames, were Tilehurst, Purley, Pangbourne, Basildon, Blewbury, and Cholsey. The abbot of Reading also had a country residence at Bere Court, near Pangbourne, and possibly another seat at Bucklebury (Man 1816). Certainly, timber must have been transported from somewhere, as there would be very few, if any, trees within an urban area suitable for building. Until the 18th and 19th centuries, when roads

became more passable, the best method of transporting heavy loads such as timber was by water. Mapledurham being so close to Reading meant that timber could easily have been barged downstream a couple of miles, or could equally easily have been carted into the town across Caversham bridge. This meant that the hundreds of acres of woodlands on the Thames escarpment at Mapledurham had a ready and accessible market throughout the whole period of the Oracle period of development. Other woodlands further upstream of Reading along the Thames valley which might have provided timber include Hardwick, Woodcote, Whitchurch, Goring, and South Stoke.

Reading is also especially well placed by being situated where the River Kennet merges into the Thames. Thus not only was the Upper Thames a likely source for timber, but so too was the whole of the Kennet valley from Reading to Newbury. There was a major wharf at Aldermaston where timber and billets were transported from quite early on, as well as Bucklebury. Other sources of timber along the Kennet included the Royal Forest of Pamber on the south side, as well as Englefield, Bradfield, and Lower Padworth on the north (Preece pers comm).

Geologically, Reading is situated on the border between two different types of soils. The land on the north side of the River Thames in south Oxfordshire is the southern-most extent of the Chiltern Hills, from Reading to the Goring Gap. Here the underlying rock is almost invariably chalk, but the surface soils range from sand to clay. On the south side of the Thames lies the Kennet valley and here the soil is quite different – more river gravels, silts, and loams.

Looking at the dendrochronological evidence resulting from this study, the 22 samples spanning most of the 12th and 13th centuries matched each other exceptionally well, despite having felling periods spanning some 30 years. This strongly suggests that these timbers originated from one or more areas of woodland which was not overly managed, but were instead allowed to grow naturally, thus better reflecting the common climatic signal. Interestingly, the best individual sites with which these timbers matched were from Aston Tirrold and York Farm, West Hagbourne, both near to Cholsey. It also matched very well with the site master from the Reading Waterfront excavations (Groves *et al* 1999) which suggests that both sites probably obtained timber from the same sources, or at least Abbey-owned sources.

In contrast, the later medieval/early post-medieval material all exhibited poor inter-site cross-matching, with most of the samples initially dating individually. This suggests that the timbers used in these construction phases were from diverse, typically managed woodlands. The late medieval material matched best with chronologies up the Thames valley towards Oxford, with Mapledurham chronologies the best represented.

Conversely, the early post-medieval material up to about 1611 produced excellent matches with a number of chronologies along, or south of, the Kennet towards Newbury. Here the two best matches with regional chronologies were with Shaw House and Greenham Mill, both near Newbury and both with *t*-values over 10.

The 18th-century material included several beeches, which proved reasonably successful in dating, there being a good degree of cross-matching with the oak. Although the beech sequences clearly matched the oak, this does not necessarily mean that they have come from the same woodlands, as indeed beech often matches oak quite well (Tyers pers comm). However, in the Mapledurham and neighbouring Hardwick woodlands, the oak and beech are mixed, resulting in tall straight oaks. The best six matches were from reference material from Mapledurham, suggesting strongly that most of the oak as well as beech timbers may well have originated from this local wooded estate.

This is supported by a documentary reference showing that the beech coppice was an important woodland product, as well as building timber, often exported as far as London. A reference dated 1573 from the accounts of riverman Thomas West of Wallingford states: "I find Master Browne and Master Shergent did cawes me to carry 20 loads of talle woode and 10 loades of billetes frome John Melsaides of Mapledorme (Mapledurham) unto the 3 Cranes [Wharf] in London..." (Prior 1981, 87). Given the trade in timber from Mapledurham to London, there is no reason to doubt that Mapledurham was a logical and convenient source of timber for the growing town of Reading.

All this strongly indicates that the timber used in the various phases of the Oracle site has originated from local sources, as would be expected. The earliest material growing in the 12th and 13th century probably originated on the chalk uplands. Given the excellent matches with chronologies from Mapledurham, only three miles to the north-west of Reading, it is suggested that the middle Thames valley around Reading was the most likely source of the timber during the mid-to-late medieval as well as 18th-century periods. Conversely, the material felled about 1611 produced equally strong matches with chronologies from the Newbury area, and as these were significantly better than with contemporary Mapledurham chronologies, this suggests that the Kennet river valley might be the more likely source of the early 17th-century felled timber.

However, this sort of dendro-provenancing is fraught with difficulties over such a small geographical area (Bridge 2000; 2012). Indeed, it is simply the availability, or absence, of local reference chronologies during the various chronological periods which have led to the above conclusions. For instance, over a dozen 18th-century chronologies have been developed from the long-running research project into the parish of

Mapledurham, only a few miles distant from Reading, which might account for the exceptional matches with the 18th century. Other intensive dendrochronological research in south Oxfordshire and Oxford City over the past fifteen years has provided an excellent collection of regional chronologies for the southern end of the Chilterns, contrasting with the dendrochronological black hole of Berkshire where very few buildings dated, unlike its neighbours Hampshire and Oxfordshire. Another aspect to consider is that one would expect better matches with the more replicated, longer, chronologies, even if they are further afield, making additional difficulties when dendro-provenancing by *t*-values alone.

Animal, bird, fish and plant resources

Animal, bird and fish bone by Naomi Sykes, plants by Ruth Pelling

A large animal bone assemblage was collected during the excavations, but its interpretation, as with many such urban assemblages, is not straightforward. Detailed analysis was carried out on the assemblages from sites 29 and 12, and it was clear that the bones resulted from a variety of different activities in the area. Much of the material is industrial in character, and reflects the selection of animals and body parts for craft working (see below), rather than the diet of the inhabitants of the area. On site 29, this kind of evidence is present from as early as Project Phase 2 and 3, with goat horncores and a skinned horse bone present in the Phase 2 latrine pits, and worked antler and a skinned cat skull present in deposits of Project Phase 3.

As an urban centre, Reading would have relied largely upon animals and animal-based raw material supplied from outside the town. Presence of foetal and neonatal pig remains indicate that some pigs were bred within the town, and a piggery in the area is mentioned in lease of 1515 (see Chapter 4, above). There is no evidence to suggest that cattle, sheep or goats were raised on-site and these must, therefore have been imported from the rural hinterland. In all probability livestock were moved on-the-hoof, although the presence of large numbers of cattle scapulae, humeri and radii in the seemingly more 'domestic' deposits (Project Phases 7 and 8, site 29) may be evidence for the importation of pre-butchered forelimbs. Certainly shoulders of venison appear to have been brought into the town: anatomical data for fallow deer show an over-representation of forelimb bones compared to those of the hind limbs. These data are interesting as they contrast with the patterns noted on most medieval and post-medieval sites, where scapulae and humeri tend to be absent whilst hind limb elements, especially foot bones, are particularly well represented (for instance Albarella and Davis 1996, Griffith *et al*. 1983). These patterns have been linked to the hunting rituals introduced after the Norman Conquest (Sykes 2001), whereby cervid carcasses were processed in a formulaic manner, with certain body parts being given to particular people: according to documentary evidence, haunches were reserved for the lord with the shoulders being awarded to the huntsmen and forester (Cummins 1988). From the zooarchaeological record it is clear that hind limbs were, indeed, sent preferentially to high-status sites but the fate of the shoulders has been less easy to determine. It seems possible that whilst the haunches were retained for aristocratic consumption, shoulders of venision were sold on at market. The idea that game from rural estates was taken to market may also explain the presence of the rabbit and hare within the Oracle assemblage. Other resources supplied to Reading must include marine fish. The cod, ling and haddock bones probably represented stored fish, since few cranial bones were recovered: it has been demonstrated repeatedly that bones of the head are removed during processing and that stored fish is signified by the over-representation of appendicular bones and caudal vertebrae (Barrett 1997; Locker 2000). By contrast, body part evidence for the Pleuronectids shows all parts of the skeleton to be represented, suggesting that flatfish were eaten fresh, and were probably brought into the town by boat.

In addition to local or even regional exchange, the presence of goat horncores and the absence of any associated post-cranial bones, may even hint at international trade (Tables 5.6-5.7). Unequal representation of goat skeletal elements is often noted in English medieval assemblages and recent research (Albarella 2003) has suggested that goat skins, with their horns attached, were being imported to this country from mainland Europe.

The greater bulk of the plant remains from sites 29, 12 and 28 consist of dumped material interpreted as stable waste. Several indicator groups of stable waste as suggested by Kenward and Hall (1997) were present, notably compressed straw, bracken and twigs, legume waste, cereals, hay-meadow and grassland plants and house fly pupae. Such material would include animal feed as well as bedding and may be composed of the waste from cereal or pulse processing prior to consumption by humans, as well as fodder crops grown specifically for the animals. Animal dung potentially introduces further habitat groups, particularly of grazed grassland floras. The stable waste was probably cleared out periodically and allowed to rot in the damp or wet ditches and pits, sufficiently so that it may even have been colonised by some of the numerous ruderal weeds represented in the samples. The nest of grass snake eggs in test pit 149 would suggest that stable waste or similar had been allowed to sit and rot for some time creating a warm, damp composting environment in the ditch.

Table 5.6: Skeletal representation data, by phase, for caprines from Site 29

Site 29	*Phase 2*		*Phase 3*		*Phase 4*		*Phase 5*		*Phase 6*		*Phase 7*		*Phase 8*		*Phase 9*		*Phase 10a*	
	NISP	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*	*NISP*	*MNI*
Horn Core					2	1	2	2	58	22	28	12	2	1				
Mandible	14	6	1	1	2	1	6	2	138	36	25	10	36	9			2	2
Atlas									2		2	2	2	1	1	1		
Axis									3		2	2	3	3				
Scapula	6	4	1		2	1	1	1	34	13	17	9	13	7				
Humerus					2	1	3	2	31	13	15	8	19	8				
Radius	5	3	3	2	1	1	8	4	40	20	29	15	22	13	1	1	1	1
Ulna	2	1							9	7	7	3	6	4				
Metacarpal	4	3	2	2	2	1	9	5	61	31	38	13	12	5			2	1
Pelvis	7	3	1				2	2	42	15	12	4	16	5				
Femur	3	3	1		2	2	5	2	24	12	15	6	21	10			1	1
Tibia	7	4	5	2	2	1	6	3	54	17	20	8	24	8			1	1
Astragalus			1						2	2	3	2						
Calcaneum									5	3	2	1	4	3	1	1		
Metatarsal	3	3			1	1	10	6	51	27	34	14	22	12	1	1		
Phalanx 1	1	1			1	1	1	1	5	1	15	2	1	1			1	1
Phalanx 2					1	1					2	1						
Phalanx 3											2	1						

*Table 5.7: Skeletal representation data (NISP and MNI) for a) cattle and b) caprines from selected features on site 29. * = goat.*

a)	Phase 2				Phase 2-3				Phase 6					
	Occupation		pit 11060		pit 11047		Construction		Dump		Pit		Tanning Vat	
Cattle	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI
Horn Core	1	1	1	1			4	2	15	5	7	1	44	8
Mandible	1	1	6	3	4	2			15	4	6	2	47	10
Atlas									3	1	1	1	3	1
Axis					1	1			1	1				
Scapula	3	2	1	1			1	1	12	5	12	3	18	8
Humerus			1	1			3	2	10	3	8	3	10	4
Radius	4	2	1	1			1	1	8	4	6	2	8	3
Ulna	3	2			1	1			4	4	2	1	2	2
Metacarpal	4	4	1	1			2	1	6	4	10	2	10	4
Pelvis	1	1	3	1			1	1	13	7	10	4	13	4
Femur	2	1	1	1			2	1	17	4	9	3	16	4
Tibia	1	1			1	1	1	1	15	5	10	5	20	6
Astragalus									2	2	1	1	2	1
Calcaneum									3	2	2	2	5	3
Metatarsal	4	4	3	2			2	2	8	4	2	2	11	4
Phalanx 1	1	1							7	1	3	1	6	1
Phalanx 2													4	1
Phalanx 3									4	1	2	1	2	1

b)	Phase 2				Phase 2-3		Phase 2-4		Phase 6							
	Occupation		pit 11060		pit 11047		pit 11332		Construction		Dump		Pit		Tanning Vat	
Caprine	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI
Horn Core			2*	2	2*	2			1	1	10	7	7	3	39	17
Mandible	2	1	10	4	2	1	12	4	17	7	82	20	4	2	9	3
Atlas																
Axis											1	1				
Scapula	2	1	3	2	2	2			1	1	7	5	2	1	19	10
Humerus									2	2	8	5	4	2	10	5
Radius	1	1	3	2	1	1	1	1	4	3	12	9	7	3	12	7
Ulna			2	1					2	2	3	2			3	2
Metacarpal	2	2			1	1	1	1	1	1	14	11	17	9	18	10
Pelvis	1	1	2	1					1	1	9	4	8	2	20	7
Femur	1	1			1	1			1	1	9	5	6	4	4	2
Tibia	2	1	1	1	1	1			3	2	16	5	9	2	19	7
Astragalus															2	2
Calcaneum													1	1	4	2
Metatarsal	2	2			2	1			1	1	11	6	9	6	18	8
Phalanx 1							1	1			1	1	2	1	1	1
Phalanx 2																
Phalanx 3																

A range of economic plants are present, which provide a useful guide to the crops and wild plant resources used by the townspeople as well as providing clues as to the soils and habitat types exploited. Crop plants include rivet wheat and bread type wheat, barley, oats and rye, pulses and brassicas (cabbage, turnip, mustard and so on). The two wheats probably had slightly different although complementary uses. Bread wheat has a higher gluten content and makes better bread. Rivet wheat, however, has a longer straw and was therefore traditionally commonly used for thatching, as well as for other activities such as malting mats. Oats and barley may have been used for malting, as well as for fodder and human food. Rye, like rivet wheat, also produces a useful long straw, and is used for flour. A range of cultivated and wild fruits and nuts are represented including blackberry, wild/alpine strawberry, fig, grape, sloe, bullace, cherry, hazel and walnut. With the exception of fig all are likely to have been locally produced, and all have been recorded from contemporary deposits at Reading Abbey (Carruthers 1997) where they may have been cultivated in the abbey gardens. Fig can

be cultivated in England, although it will not produce fertile seeds, and it is usually considered to be imported. Reading Abbey produced both grape pollen and wood from 14th- to 16th-century deposits (Carruthers 1997), and a vineyard on the islands between the Kennet channels is mentioned in 14th-century documents (see Chapter 4, above). Walnut was a late introduction into Britain, but is known from at least the 11th century, for example in Norwich (Murphy 1988). The occurrence of hops may suggest brewing activity, which is also supported by charred malted grain, although hops do grow freely as a weed of ruderal habitats or scrubland. Flax and hemp may have been cultivated for fibre. Some of the more robust fruit pips are likely to have derived from sewage, although the absence of bran in the deposits suggests sewage is not a major component.

The arable weeds in the deposits are generally limited to large-seeded varieties or those that form seed heads, such as *Anthemis cotula* and the poppies. These species are hard to separate from the cereal grain by sieving or winnowing, so are most likely to enter an urban environment where the cereals might be expected to be fully processed. The few weeds do suggest that cereals were cultivated on a range of soils. *Chrysanthemum segetum* (corn marigold) is characteristic of acid soils, *Anthemis cotula* tends to favour heavy soils, while occasional weeds of lighter well-drained soils are present, including *Papaver rhoeas/dubium* (field/long-headed poppy) and *Raphanus raphanistrum* (wild radish). It is likely therefore that the arable crops represented in the samples have come from a wide range of soils and geographical locations. Several of the ruderals may have derived from arable habitats, although such species are common colonisers of nitrogen-rich urban environments.

THE CRAFTS OF READING

Clothmaking

by Ruth Shaffrey

(with contributions by Leigh Allen, Joan Dils, Penelope Walton-Rogers)

Introduction

Clothmaking was the principal industry in Reading in the medieval period, and employed the largest number of craftsmen (Dils 1980, 14). The traditional product of Reading was the broadcloth (ibid.). The Oracle excavations included within their study area the Oracle workhouse, the dyehouse near Bridge Street and both the fulling mills of St Giles and Minster Mill. In the event, the limited evidence from the excavations is perhaps disappointing for a trade known to have been so abundant in the area. Nevertheless, some structural, artefactual and environmental evidence was recovered, and is reviewed below.

Archaeological and documentary background

Documentary references to the cloth industry are frequent because of the significance of the industry to the town (see Chapter 4). Both St Giles Mill and Minster Mill (both owned by the abbey) were used, amongst other things, for the fulling of cloth. This is referred to in a charter of *c* 1260-1290 for St Giles Mill, and by the Dissolution, when both mills were granted to William Grey, Minster Mill also included a fulling mill. A land grant of 1204-1220 mentions a tenter yard (for stretching cloth after fulling), located on an island on the floodplain near the gildhall, and there seems also to have been a dyehouse in the area. By the 17th century, the Minster Mill was also associated with a dyehouse (as described in a taxation roll of *c* 1604-1610). Cloth was produced in Minster Street, and the documentary evidence suggests that the site of the Oracle may have been a clothier's works in the 16th century. The records do not name this site precisely but it was owned by William Bye, who we know also owned a dyehouse and was a wealthy clothier. From the survey it seems that Bye's house was the one sold by William Kendrick to the Corporation for the foundation of the Oracle workhouse in 1628. The workhouse itself was originally intended to provide work for the poor in the manufacture of cloth, but in the event this proved unprofitable as the clothmaking industry went into decline.

The Oracle excavations

Evidence for the different aspects of the cloth industry was identified in the excavations of the Oracle floodplain zone. It includes (in addition to the fulling mills themselves), the excavated remains of a small early 17th-century dyehouse in the west of the area (site 78), the 17th-century Oracle workhouse, and a possible dyehouse on site 12. Alongside the structural evidence are a number of finds that add to our understanding of the cloth industry in Reading.

Structural remains

During the later 16th century, very clear and well-preserved features of an industrial nature were constructed on site 12 (Building 7410 Project Phase 6), comprising a timber frame or platform, with associated hearths and a working platform (see Chapter 2, above, site 12, Project Phase 6). As is so often the case, the interpretation of these structures remains uncertain because of a complete lack of associated artefactual evidence. However, the possibility remains that this could also have been a dyehouse, and a dyehouse is attested in this general area by 16th-century and earlier documentary records (see Chapter 4, above).

The principal structural evidence for the cloth industry is of 17th-century date, in the form of a small dyehouse located at the western limits of the investigated area and south-west of the Oracle workhouse. Here, Test Pit 78 exposed the remains of

a post-medieval dyehouse constructed in the early 17th century (Fig. 3.2; Plate 3.18), which probably continued in operation until the start of the 18th century. It consisted of two roughly square pits positioned 4.5 m apart and linked by a linear E-W channel (8048) formed by a hollowed-out oak timber. Each would have contained a vat, which in turn held the liquids needed for the dyeing process. One pit fed into the other and the second pit had a drain back towards the Minster Mill stream. A lead strainer was found *in situ* in the channel (Fig. 5.32 No. 5). The timber channel was dendrochronologically dated to 1611-1612 and found to have been felled from the same tree as four timbers from structures at St Giles' Mill, suggesting a possible link in ownership. The structures of the dyehouse are described in detail in Chapter 3, and it was ideally located on the floodplain with easy access to the water required from the Minster Mill stream just to the north.

The artefactual and environmental evidence

Unfortunately, despite the structural remains excavated for the cloth industry, very few artefacts were found that can be directly associated. Amongst these are a heckle tooth (wool comb) from a Phase 8 context at site 29, which is very likely to be residual, six thimbles (mostly on or near the Yield Hall, 8856, 9090, 8555, 564, 501) and several pairs of shears and scissors. Very large quantities of copper alloy pins were found, which are likely to have been used in tailoring, sewing and upholstery. Most of these are, however, from post-medieval contexts and are more likely to reflect contemporary small-scale manufacturing than the remnants of the town's medieval cloth industry

Two possible fibre crops were represented amongst the waterlogged plant remains: flax (*Linum usitatissimum*) and hemp (*Cannabis sativum*). Seeds of flax were identified in seven samples and were particularly numerous in contexts 8852 and slightly less so in context 9003, both from site 12 (Project Phases 4 and 5). While these samples contained large quantities of cereal processing waste and probably stable litter, it is possible that the seeds were included in fibre processing waste that was fed to animals. A single seed of hemp was identified from sample 1544 from St Giles Mill. *Cannabis* seeds have been recovered in small numbers from a number of medieval sites, including York (Kenward & Hall 1995), and from Reading Abbey (Carruthers 1997) although the fibre is rarely found and the seeds could have been present as a source of oil or chicken feed. Documentary evidence suggests that both flax and hemp were cultivated as a garden crop in the medieval period (Steane 1985, 214, 264; Tusser 1580) and this small scale production is perhaps reflected in the fact that both are frequently found in small quantities in medieval urban deposits.

No definite dye plants were recovered from the samples, although the ruderal weed *Reseda luteola* (weld or dyers rocket), a seed of which was recovered from site 12, does produce a yellow dye used in textile manufacture as its common name suggests. The value of wool was reflected in the age of the sheep in the animal bone assemblage. When sheep are valued more for wool than for meat, farmers tend to maintain animals for several years in order to gain the greatest number of wool clips before selling them on for mutton. A focus on wool production may explain the apparently high frequency of castrate males within the assemblage, since wethers yield a higher quality fleece than either ewes or rams (Trow-Smith 1957, 149).

Textiles

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Textiles were recovered in small numbers from Project Phases 4 and 6 at site 12, Project Phase 7 at site 101 and Project Phase 8 at site 150. They mostly represent the middle range of clothing fabric, but there is also a knitted item and a large and unusually well-preserved piece of sacking.

The earliest textiles are offcuts left over from cutting out garment pieces, SF1727-8, Project Phase 4. These were recovered from an early fill of an industrial-type pit at site 12, possibly a tanners' layaway pit (fill 8852 of pit 8742). There are snippets from four different wool fabrics, each with rows of stitch holes which indicate that the tailor was reworking old garments. Two of the pieces, SF1727a and b, lie in a double layer with matching rows of stitch-holes, which suggests that one textile has been the lining, cuff or collar for the other. Although all four are similar weights of fabric, with Z-spun yarn in warp and weft, they have been made in two different weaves, from different types of wool, with different degrees of soft-finishing (Table 9.15). The archaeological context, Project Phase 4, places them in the period from the mid 13th to the late 14th century, but the presence of tabby weave puts them in the latter half of this time-span. A well-dated sequence of textiles from London has demonstrated that tabby took over from 2/1 twill during the course of the 14th century, while 2/2 twill remained steadily in the background (Crowfoot *et al*. 1992, 27, 44-9), and a similar development can be seen in collections from other towns (author's unpublished data for Winchester, Coventry, York and Beverley). The Project Phase 4 tailoring offcuts are therefore most likely to belong in the mid to late 14th century.

Textiles of this sort would be well within the capacity of Reading cloth-workers. The town had its own wool textile industry by the beginning of the 13th century (Miller and Hatcher 1995, 118) and a fulling mill, where clothes could be soft-finished is mentoned in 13th- and 16th-century documents concerning the parish of St Giles. Clothiers were numerous in Reading municipal records, beginning in 1432 (Lipson 1921, 247) and they may have formed part of a 'gild merchant' of earlier centuries (Cunningam 1922, 225). Dyes imported through

Southampton were brought to Reading by the London grocers (Thrupp 1933, 276) and these are likely to have included madder, the common medieval red dye imported from the Low Countries and obtained from the roots of the plant *Rubia tinctorum* L. This is the dye identified in three of the offcuts, in one instance combined with a tannin-based brown dye (Table 9.15).

If the Project Phase 4 textiles are indeed locally made, then analysis of the wool suggests that the town was drawing on raw materials from outside Berkshire. In the four different fabrics there are five of the seven possible fleece-types, namely Fine, Fine/Generalised Medium, Generalised Medium, Medium and Semi-Fine (Table 9.16). Medieval flocks were more variable than they are today, but even so it is unlikely that there was such a wide range of wool types together in one area. The only fleece-types absent from the collection are the Hairy and Hairy Medium wools which represent the hill and mountain sheep of upland Britain. Records of the 16th century show fleeces from as far away as Dorset being brought into Berkshire to supplement local supplies (Bowden 1962, 50-1, 60-3) and the Project Phase 4 textiles would suggest that this trade had already begun in the 14th century, assuming that the cloth itself was not brought in ready-made. A bale pin, unfortunately unstratified, was found on site 12. Pins of this type were used to secure wool sacks and are common finds on medieval sites associated with the transhipment of wool (Walton Rogers 1997, 1716-8).

The fragments of coarse knitting from Project Phase 6 (c 1500-1600) at site 12 have been stretched very hard widthways, a feature which has been seen in later knitted stockings (Walton Rogers 2006, 172). The yarn is plied and made from a Hairy Medium fleece type, comparable with wool from hill breeds such as the Radnor and the Cheviot. The craft of knitting became established in England in the 15th century and was widespread, especially in poor rural districts, by the 16th century, when it was used to make hats, petticoats, gloves and sleeves as well as stockings (Walton Rogers 2002, 2745-7; Rutt 1987, 58-66; Hartley and Ingilby 1978, 6-10).

The large pieces of coarse open-weave textile from Project Phase 7 (c 1600-1680) of site 101, SF 1327, represent a rare survival of sackcloth made from a plant fibre. The textile has been woven in narrow pieces, with 260 mm between selvedges, and two fragments have been stitched together edge-to-edge with a plied sewing thread. The fibre does not seem to be one of the standard British fibres, such as flax or hemp, and it has features sometimes seen in Indian and south-east Asian fibres (see technical report in archive). Unfortunately, despite an extensive search, it has not been possible to find an exact match. Surviving examples of medieval and post-medieval sackcloth are mostly made from animal hair or coarse wool (Walton 1988), although they too are made in widths of less than a metre. There is a goat-hair piece from early 17th-century Southwark, for example, which has a loom width of 830 mm (Crowfoot *et al*. 1992, 78). It is likely that there was a greater use of plant fibres for sackcloth than the archaeological record shows. Two poorly preserved plant-fibre examples were found on the site of a 14th-century foundry at York (Walton Rogers 2002, 2881, 2884) and there was another in the late medieval barbican ditch at Oxford Castle (Crowfoot 1976, 274). These, like the Reading example, make use of paired single yarns, where the hair/wool sackcloth has plied yarn. Plant fibres are particularly susceptible to fungal attack when left in damp aerated conditions, but the sacking from site 101 came from a tank with continuously flowing water, Ctx 7182, and it would appear that being kept consistently wet has allowed the fibre to survive in good condition. Such a large piece of sacking may have been connected with the transport of goods to and from the site when the area was being re-developed.

The worn fragments of a fulled wool cloth woven in tabby from S-spun yarn, SF 2000a, from the foundations of the rebuilt Minster Mill (site 150, Project Phase 8, *c* 1680-1750) represent another standard clothing fabric. Textiles of this sort were common from the 16th century onwards and this medium-fine example probably comes from a light-weight coat or heavy dress (Walton 1981, 1983). Alongside it was a small piece of a flat blue-dyed wool braid, 15 mm wide, worked in simple diagonal plaiting, probably by the 'fingerloop' technique, SF2000b. Narrow braids of this construction were used in the medieval period for garment laces and purse strings (Crowfoot *et al*. 1992, 138-140), but this wider, later example is more likely to have been a decorative border on a garment, or a ribbon trim (Brooke 1937, 136, 150).

Tanning and leather working

by Ruth Shaffrey and Quita Mould

(with contributions by Leigh Allen, Joan Dils, Ruth Pelling, Ian Scott, Naomi Sykes and Penelope Walton Rogers)

Introduction

Leather was a very significant material in medieval and post medieval town life, being used for all manner of objects from clothing, particularly shoes, to horse harness and luxury items such as purses. The leather industry naturally subdivided into two very distinct groups of activity, those who prepared the animal hides and turned them into leather (the tanners, curriers and tawyers) and those who used the prepared leather to make objects (the shoe-makers, saddlers etc). The tanners took the raw animal hides (usually cattle) from the butcher and subjected them to a lengthy set of procedures that transformed them into workable leather. The animal hides were first cleaned, usually by soaking in

running water and were then allowed to rot slightly so the hair could be easily removed, either by piling somewhere warm and sprinkling with urine or soaking in pits containing wood ash or lime (Cherry 1991, 295). During these pre-tanning processes, the hides were scraped, soaked and washed in order to get them thoroughly cleaned and prepared for the tanning itself; this involved the use of foul substances such as dung, fermenting barley or rye and urine (Cherry 1991, 296).

The hides were then soaked in tanning solutions of oak bark and water of increasing strength before being placed between layers of oak bark in layaway pits and left to steep in tanning liquor, usually for about 12 months depending on the thickness of the hides (ibid.). Finally, when the hides were fully tanned, they were rinsed, smoothed and dried out. The currier was then responsible for working the raw processed leather into a more usable material of the appropriate thickness, softness and flexibility depending on the end product the leather was intended for (Thomson 1981, 167).

The tawyer processed the skins of other, smaller, animals such as goat using the alum tawing process. After cleaning the skins were placed in large tubs and treated with a mixture of alum, salt, fatty materials and flour (Thomson 1981, 171). Once the hides and skins had been prepared by the tanners and curriers or the tawyers it was sold to the leather workers who made it in to the everyday objects required.

Evidence for the initial processing was excavated in the form of probable tanneries. Evidence for the manufacture of leather goods (from the raw material) was also produced in abundance because of the waterlogged, and therefore anaerobic conditions of the floodplain, which allowed excellent preservation of the leather. Leather objects and off cuts were found dating to both the medieval and post-medieval periods and provide evidence of several different trades including shoemaking and horse harness manufacture. All the leather recovered was vegetable tanned by the heavy leather trades of tanning and currying as mineral and oil tanned leather produced by the light leather trades does not survive damp burial conditions.

Documentary and archaeological background

Documentary evidence indicates that the tanners worked in the parishes of either St Giles's or St Mary's (Dils 1980, 16), the boundary of which ran along the Minster Mill stream, and it was therefore likely that evidence for them would be found in the Oracle excavation area. The few historic references to the tanning industry include a deed dated *c* AD1240 (BRO R/AT/12) which refers to a tannery in Minster Street on the northern boundary of the excavated area, while documents of the 16th century include three inventories for tanners from St Mary's Parish. In addition, Peyton's map of 1919 reveals a Tanne Lock near the southern end of Seven Bridges, just to the west of the excavation area, and although it was described as a fishery in 1545 (Hawkes and Fasham 1997, 184), its name suggests the presence of the tanning industry there. This indication of tanning to the west of the Oracle was supported by discoveries of hide processing pits and samples of animal hair of mid 18th- to early 19th-century date (Hawkes and Fasham 1997, 52) during the excavations carried out by Wessex Archaeology at Bridge Street East.

With the exception of the Bridge Street East evidence, previous archaeological evidence that might relate to tanning in Reading has largely been in the form of dumps of horn cores and deposits of waste leather and has not been directly connected to any manufacturing or processing sites (Hawkes and Fasham 1997, 193). Dumps such as these were found at the Abbey Wharf site to the east of the Oracle excavations. The evidence indicates the widespread existence of either tanning or the disposal of tanning refuse or that of related trades along the route of the Kennet right through Reading from Seven Bridges in the west to the abbey in the east.

While the evidence indicates that tanning was carried out in the parishes of St Giles's and St Mary's, most of the leather goods manufacture was carried out in St Lawrence's parish, in particular the shoemaking which occurred in 'Shoemakers Row' situated on the eastern side of what is currently known as Market Place. The first documentary reference for this dates to 1134 (Kerrane 1997, 142 and Coates 1802, 450) and during the 16th century, the 'book of regulations of the tanners and leather seller company' (1550 and 1570) dictated that shoes and boots must be made in Shoemakers Row (Kerrane 1997 142). It is therefore unlikely during the medieval and early post medieval periods at least, that much, if any, actual manufacture of shoes occurred on the floodplain. Previous archaeological evidence for leather working in Reading has mostly been for shoemaking and cobbling, a substantial assemblage of which was produced from Abbey Wharf with a further small assemblage from Fobney Street of probable domestic rubbish. These excavations produced shoes varying in date from the early 14th to the 19th century (Mould 1997). In addition to shoes, straps from harness, a knife sheath and a carding comb were also found at Abbey Wharf (Mould 1997, 118) but these only provide evidence of their use, not of their manufacture.

Other leather trades are more likely to have been located near to or on the edges of the floodplain, for example the glovers, who are known to have worked in St Mary's parish (Dils 1980, 16); they used the softer tawed leathers which would not have survived. Later, restrictions to where shoemakers could operate either did not apply or were not rigidly enforced as there is at least one reference to a 'messuage and tenement' on the south side of Minster St occupied by Ravenscroft, a shoemaker (in a deed for 1801).

Tanning and leather processing

The structural remains of two tanneries were identified during the Oracle excavations (Chapter 2, above), the earlier under the Yield Hall on site 12 dating to the 13th to 15th centuries and the later and more formalised under the Oracle workhouse on site 29 of the 16th century and early 17th century. Evidence of leather processing (tanning and currying) was also provided by artefactual evidence.

A series of large pits were found on site 12 under the Yield Hall. These were probably constructed during the mid 13th century (although the precise construction date is unknown) and are best interpreted as layaway pits for the soaking of hides, a process which could take anywhere between one and three years (Thomson 1981, 166). Both goat and calf hair were found within the fills of these pits (Walton Rogers, Chapter 9, below). Since hair would have been removed from hides before they were 'laidaway', this may simply be debris dumped from elsewhere. The long 'layaway' process was not used by whitawyers and the presence of this hair may suggest that goat and calf skins were being vegetable tanned here. This would have contravened the strict distinction in craft and process between vegetable tanning of cattle hide and tawying of soft leather (see above) but evidence from elsewhere suggests that this was not uncommon (see below). The pits were located approximately midway between the Minster Mill channel to the north and the Back Brook to the south. A channel linking the Minster Mill channel to the Back Brook lay just to the east of the pits and would have been very useful for the washing of the hides which took place during the pre-tanning preparation process (Thomson 1981, 162). At the time the layaway pits were initially constructed there is no indication that this land was specifically reclaimed and the land would probably still have been very marginal. Regular flooding in the area would have made the pits very difficult to use, however, and it is possible that the channel management occurring at the same time was sufficient to prevent frequent flooding episodes. The evidence indicates a fairly intensive use of the land which would have been difficult if flooding were occurring annually. All the pits were substantial in size, up to 12 x 4 m, and underwent recutting as part of their ongoing management. At least one of the pits (they were not all fully excavated) was carefully revetted around the edges with a mixture of wattle and wooden fencing and chalk packing (see Chapter 2 for detailed description) and all were found to have contained standing water which could easily have been taken off the channel which ran alongside them. The numerous concentrations of caprine metapodia (sheep and goat feet) may also suggest hide processing, but could just represent butchery waste.

The pits continued to be used throughout the 14th century and into the early 15th century, but it is not clear whether they were used continuously during this time. At least one pit continued to be used while the remainder were being infilled; this was not filled until the last quarter of the 15th century. It is possible that there was a gradual decrease in the scale of the industry or a phased movement to another location. The use of these pits occurred at a time when the abbey had control over the water channels. The positioning of the tanning pits to the south of the Minster Mill stream, and downstream of the mill itself, would have ensured that the industry did not interfere with the operation of the mill, and offensive liquids from the tanning process would have been discharged into the Back Brook and not affected the Minster or Abbey Mills or the abbey itself.

During the early post medieval period (Project Phase 6), a complex of pits was created on site 29, just to the south of Minster Street (Fig. 2.10, Plates 2.17, 2.20). The complex, which is described in Chapter 2, above, was in use from the 16th to early 17th century with the main phase of expansion after 1558 and it was out of use by 1628 when the Oracle workhouse was constructed. Although the documentary evidence indicates that this may have been a clothier's works, the archaeological parallels between this and tanneries excavated elsewhere, particularly at The Green, Northampton (Shaw 1996), are compelling. Excavations at The Green uncovered the remains of tanneries dating to the periods *c* 1470-1550 and *c* 1550-1700. The earlier phase, located within the western area of the trench, comprised two groups of circular and rectangular pits set in rows within an open-sided building and its yard to the east. A group of large rectangular pits in the eastern half of the trench was in use during the later phase. The circular pits were lined with clay, and some also contained surviving remains of wood and groove marks within the clay linings suggesting that wooden tubs or possibly the bottom half of barrels had been set into them. Evidence suggested that the rectangular pits had been lined with wooden planks. In considering the interpretation of this site, which remains the most extensive example yet published in this country, Shaw reviewed evidence for possible tannery sites elsewhere, including two very extensive examples of tanneries from Bruges (ibid. 114). At Bruges, two neighbouring tanneries that came into use in the later medieval period comprised 80 circular pits lined with wooden tubs, associated with thousands of horn cores, leather off-cuts, bark and tanners' tools. Shaw concluded (ibid.) that the combination of rectangular and circular watertight pits of a fairly standard size in association with organic matter, oak bark, wood fragments or chips and leather off-cuts would appear to be a reasonably good indication of tanning especially on sites where horn cores or sheep foot bones were associated. Since his review, in addition to the sites that form part of the Oracle excavations, further evidence for tanning pits of this kind has been recovered locally at

Abingdon (Pine and Taylor 2006, 57-60) and King Stable St, Eton (Blinkhorn and Pugh 2000, 13-15). Analysis of chemical residues within the pit fills at The Green, and the distribution of animal bone residues, led Shaw to the conclusion that pits within these small tanneries could be used for multiple stages of the tanning process, and there was no correspondence between the stage of the process and pit shape. The final tanning of the prepared hides was probably carried out in only one pit, or in a small number of pits, with the strength of the tanning liquor being gradually increased, rather than the hides being moved from one pit to another. It was also clear that a variety of skins were being vegetable tanned at The Green, and that the distinction between the tanning process for cattle hides and the tawying process for other skins was not being adhered to. Shaw suggests it is unlikely that high quality leather was being produced in this way, and it may not have been until later that the better processes described in 18th-century manuals and encyclopaedias were widely adopted (ibid., 119-20).

The industrial complex at Oracle site 29 may have seen mixed use over its hundred years of operation, possibly leading to its identification as a clothier's in its final years. Although no direct evidence links the probable medieval tanning pits at site 12 with the tannery under the Oracle, it is of interest that the formalised tannery came into being shortly after the earlier pits went out of use. Environmental analysis of samples from these pits identified mineralised seeds of edible fruits usually associated with cess pits, or with the urine used in the tanning process.

Studies of the zooarchaeological material from tanneries (see Shaw 1996) have demonstrated that tanning waste tends to be highly characteristic, with assemblages consisting predominantly of cattle and caprine horn-cores and/or foot bones (metapodia and phalanges), with fewer meat-bearing elements being present (Serjeantson 1989, Harman 1993, Sykes n.d). The reason for this skeletal patterning is that animal hides were sent to the tanner with the feet and head, or at least the frontal part of the skull, attached to the skin. Why horns and feet should have been left attached has been the subject of some debate but the most probable explanation is that these elements were valued commodities in their own right. Foot bones would have been attractive to the tanner because they are the source of neatsfoot oil, the finest of animal fats, often used for dressing leather (Serjeantson 1989, 141). Horns would not have been used by the tanners but would have been sold to the horners, who often worked in association with tanners (see below).

The Phase 6 material from site 29 does, to a large extent, conform to the pattern expected of a tanning assemblage: Table 5.6 shows that the caprines are represented by an abundance of metapodia, mandibles and horn cores. Anatomical frequency data for cattle, however, show large numbers of prime meat bones, an under-representation of metapodia and a virtual absence of phalanges, skeletal patterning more suggestive of domestic rubbish than industrial waste (see Sykes, Chapter 10, Table 10.11b). Composition of the tanning vat material (Table 5.7) is a little more typical, with horn cores being well represented, but there is still an unexpectedly large number of scapulae in both the cattle and caprine assemblages. It may be that the area witnessed dumping from both industrial and domestic sources but, if the material derived exclusively from the tannery, an explanation for the over-representation of upper limb bones may lie with the butchery evidence (Chapter 10). It was noted that most of the cattle bone from this phase had been butchered in a standardised way, the majority having been cleaved to expose the marrow cavity. Since few metapodia were present in the assemblage, the tanners would not have had access to a ready source of neatsfoot oil and may, instead, have extracted marrow fat and bone grease as a substitute. The chopped bones could have been boiled to release these oils and it seems possible that the industrial hearths identified on the site were employed in this process. The vegetable tanning process does not use marrow, but it would be used in oil tanning.

By the 16th century it was a legal requirement that leather dressing was undertaken by specialist curriers (Thomson 1981, 166). Rare evidence of the work of the currier was recovered from the south bank of the Kennet where a group of flesh shavings was found amongst other primary waste in a deposit (12554) likely to be of post-medieval date. Currying waste has also been recognised at York where a group of mid 10th-century date and another of late 14th/early 15th-century date were found at 16-22 Coppergate (Mould, Carlisle and Cameron 2003, 3254 and fig 1588).

Another discrepancy between the zooarchaeological and historical evidence is demonstrated by taxa represented within the assemblage. Both cattle and sheep are well represented in the Oracle assemblages but, according to the legislation of the time, the hides were required to be sent to different craftsmen, the tanner and tawyer respectively (Serjeantson 1989, Albarella 2003). It is probable that the waste from a number of related industries was simply being dumped together.

In addition to structural evidence for tanning and the evidence provided by animal hair (above), leather preparation on the floodplain was also suggested by the recovery of dumps of horn core (removed from the hides by the tanners along with other unusable parts until the 15th century). Tanners were required to remove the horn cores themselves, a process which may have led to a build up of waste on site (Thomson 1981, 162) and possibly to legislation regarding their disposal. In Northampton for example, the tanners were required to clear these deposits out once a year (ibid.) and a similar pattern of disposal is indicated

by the large deposits of horn cores recovered in Reading. From the 15th century, as the tanner sold leather to the currier by weight, it became more common for waste parts to be removed later when the currier sold the finished leather to the shoemaker or other leather worker (Roy Thomson pers. comm.). The discovery of large dumps of horn cores is nevertheless indicative of leather processing and of the work of horners. During the Oracle excavations, dumps of horn cores were found in late 16th- to early 17th-century pits on site 12 under the Yield Hall and in a late 16th-century dump in the edge of the Minster Mill channel just to the south of the post-medieval site 29 tannery.

Deposits of primary waste leather, also characteristic of leather processing, were found in 30 contexts during the excavations, principally concentrated into five leather dumps dating to the mid 14th century (St Giles Mill) through to the 15th and early 16th century (under the Yield Hall on site 12). This material comprises unusable parts of the skin or hide such as bellyskin, udders and areas around the head, legs and hide edges that were trimmed off during leather processing. Occasional pieces of primary waste leather still retaining hair were also found in the same late 15th/early 16th-century deposits on site 12 and are certainly waste from the initial tanning process. This waste may have been thrown away by the tanners or the leather sellers.

Leatherworking (Figs 5.14-5.25)
by Quita Mould

Most of the evidence for leatherworking at the Oracle comes from dumps of secondary waste leather – the discarded pieces left over from the cutting and trimming of pattern pieces during the manufacture of various types of leather goods. During the Oracle excavations, secondary waste was recovered from 35 contexts, a single piece dating to before the mid 12th century, but the majority dating from the mid 13th through to the early 16th century (Project Phases 4, 5 and 6).

Intersectional cutting pieces of waste leather characteristic of shoemaking were found in five contexts dating from the mid 13th-14th century through to the early 18th century. Though only found in small quantities within each context much of the other secondary waste with which they were found is also likely to be waste from shoemaking. The largest group was found in a large 15th- to early 16th-century dump on site 12 (8510). Several pieces of secondary waste leather with a length of hide edge present were recovered from 15th-, 16th- and 18th-century contexts suggesting that the shoemakers were sufficiently wealthy to buy entire hides rather than smaller cut pieces from the leather seller.

While a proportion of the shoes probably represent smallscale everyday disposal of domestic rubbish it is clear that the majority of the shoe leather recovered from 15th- and 16th-century deposits was cobbling waste: 65% of the shoe soles from this period had been repaired, and some had been repaired on more than one occasion. Small dumps of cobbling waste were found in 13th- to 14th-century deposits at St Giles Mill as part of the ground reclamation near London Street and 15th- and 16th-century channel deposits on site 12. These dumps of cobbling waste, apparently the clearance of waste accumulated in workshops over a number of years, included old shoes cut up to salvage reusable leather, discarded soles and repairs, and trimmings and off-cuts produced when cutting out new repair pieces and other shoe parts. The cobbler refurbished old shoes by replacing worn soles and repairs and remodelling and repairing the uppers. At least 36 separate soles and 101 clump repairs were found that had been discarded during this process of refurbishment. At least 41 shoe components had been deliberately cut up to salvage reusable leather before being thrown away. A large early 16th-century forepart clump repair (SF78) found in 16th-century ditch fill 1139 (10104c) had a series of parallel slashes suggesting it had been used as a cutting platform on a work bench by a leatherworker, probably a cobbler.

Many shoes, particularly those of turnshoe construction (see below), wore through quickly and clump repairs were often added at the tread (forepart) and seat (heel area). At least five soles of medieval or Tudor date had been repaired twice in the same area before being finally thrown away and two had been repaired three times. On one occasion the entire sole of an early 16th-century welted shoe (SF3056) had been covered with a single, large repair. Repairs to shoe uppers were also noted. An ankle boot (SF3018) had stitching from a semi-circular patch positioned over the side seam just above the lasting margin.

In addition to repairing heavily worn shoes it was the practice for cobblers to buy old shoes, remove the worn out soles and re-last the uppers onto a new sole for resale. By the 16th century the cobblers were kept so busy repairing shoes that a separate branch of the trade developed to undertake this particular activity known as 'translating'. The remodelling or 'translating' of old shoes can be seen in the cobbling debris from Reading where at least three shoes had their uppers cut away from their soles, two of turnshoe construction (SF63, 3040) the other of turn-welted construction (Fig. 5.21 No. 11).

All the later, Victorian shoes were very heavily worn. Eight of the twelve shoes with well preserved bottom units had repairs to the sole attached with iron hobnails. The degree of wear is perhaps best exemplified by a Balmoral boot (SF3123) that had three repairs to the forepart (tread) of the sole nailed one above the other and an iron boot iron nailed to the heel. Repairs to upper seams were also noted (SF3113). At least one shoe, a front-lacing Derby boot (SF3118) had the upper part of the boot leg cut off, presumably to salvage re-usable leather, before it had been thrown away.

The quantity of straps and strap strengtheners found provides evidence of the harness maker on

site 12 in pre Yield Hall contexts. The number of strap pieces in the 15th- (8395) and early 16th-century (8502/8510) leather dumps suggests clearance of an accumulation of old, broken harness from workshops engaged in refurbishing worn harness and making new. The recovery of an unused strap strengthener (Fig. 5.23 No. 20) indicates that straps were certainly being made or repaired locally. Similarly, the recovery of various cut-down panels of stitched leather and lengths of seam may suggest the refurbishment of saddles or leather upholstery was being undertaken.

This evidence for a tradition of some forms of leatherworking in the area of the Yield Hall is added to by the finds of four leatherworking awls in 15th-, 16th- and 18th- to 19th-century deposits along with a pair of shears in a 15th-century deposit. At least one of the 16th-century finds was directly related to the Yield Hall as was a single coarse thimble, probably used for sewing leather (L Allen, Chapter 9) and most likely to have been associated with activity in the mid 17th-century phase of the building. These finds suggest that leatherworking, either horse harness as in previous phases or one of the soft leather trades such as purse or glove-making, was occurring here.

In addition, there is some indication of the presence of leatherworkers on the south side of the floodplain where two needles used by upholsterers or saddlers were found (unphased) and three pairs of shears which may have been associated with leather working (phases 4, 10a and unphased).

Shoe construction methods are shown in simplified form in Figure 5.14. Figures 5.15-5.18 illustrate the types of shoes recovered during the excavations, and Figures 5.19-5.25 illustrate the best examples of the excavated shoes and other items of leatherwork. A fuller explanation of technical vocabulary can be found in the complete leather report in Chapter 9 on the CD-ROM.

The majority of the footwear dates to the 15th century (probably the second half of the period) and the earlier 16th century, and the styles of at least 34 individual shoes of this date could be recognised. Small groups of footwear were also found in later post-medieval deposits in which at least seven different shoe styles were represented.

During the medieval period shoes were made by the turnshoe method, so called because the shoe sole and upper were sewn together and then turned inside out so that the seam lay on the inside of the shoe and was protected from wear. A strip of leather called a rand was often inserted into the seam (Fig. 5.14 No. 1). The thin soles wore through quickly and were frequently repaired with patches known as clumps. During the later 15th century the turnshoe construction was sometimes modified by the addition of a second sole sewn to a wide rand to make the shoe more hard-wearing, an adaptation known as the turn-welt construction (Fig. 5.14 No. 2). This developed into the welted construction whereby the shoe upper and a bottom unit, comprising a sole (insole) and an outer sole (tread shoe), were joined together with two separate seams to a wide strip known as a welt (Fig. 5.14 No. 3). Thicker leathers could now be used for both the upper and the sole. Shoes made in each of these three constructions have been found at Reading in the same dump deposits, although, as elsewhere, the turn-welted shoes are very much in the minority. A method of joining the shoe components together with metal rivets was devised at the beginning of the 19th century but did not come into wider use until the middle of the century. Two shoes

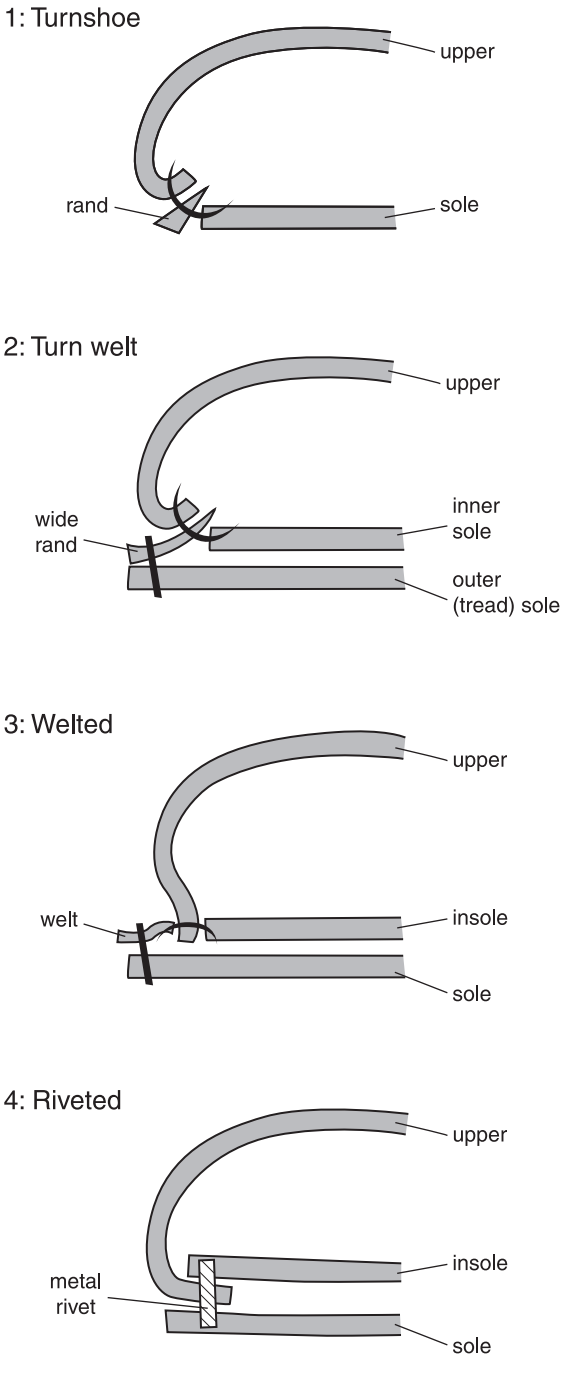


Fig. 5.14 Leather: Shoe construction methods

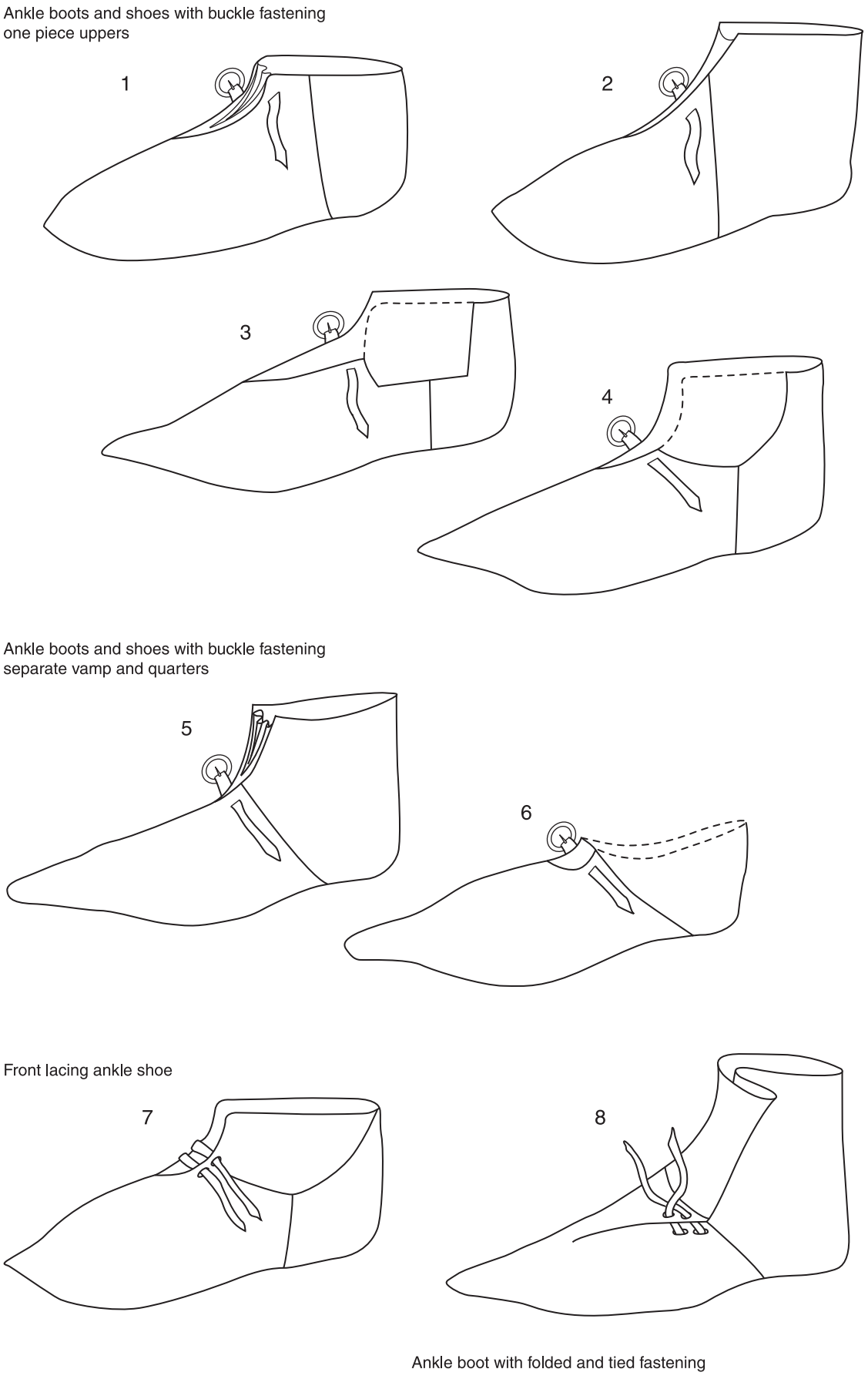
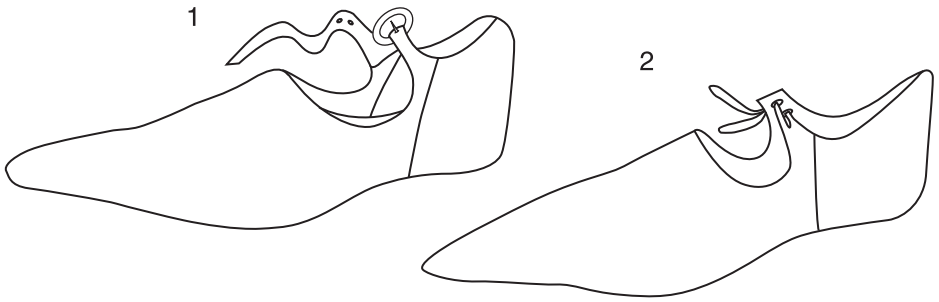
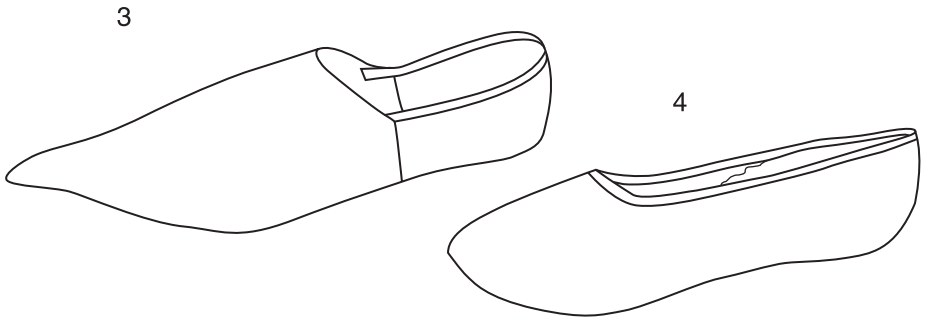


Fig. 5.15 Leather: Later medieval shoe types

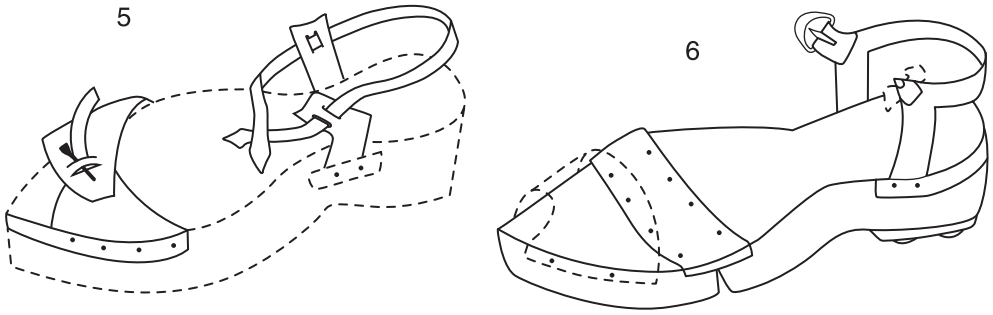
shoes fastening with buckle and strap across the instep

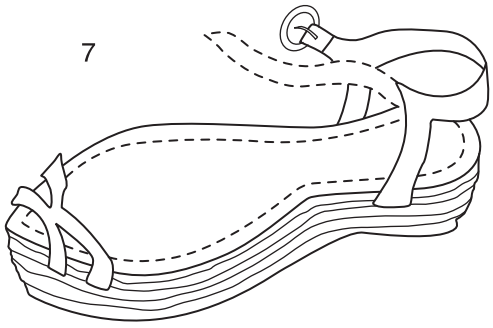


Slip on shoes



Pattens





Sandal

Fig. 5.16 Leather: Later medieval shoe types continued

of riveted construction using a single row of small copper alloy nails, likely to be of brass, were found during the excavations (Fig. 5.14 No. 4).

Later medieval footwear (Figs 5.15-5.16)

The later medieval footwear was of turnshoe construction, with the exception of a single shoe (Fig. 5.21 No. 11) of turn-welted construction. The shoe soles had pointed toes and narrow waists; those in small children's sizes had oval toes. Some of the shoes had fashionable extended toes curving slightly outwards, the longest measuring 45 mm in length. Four examples had their toes stuffed with moss. No examples of the extremes of high fashion as exemplified by the exaggerated long 'poulaine' toes were found, however, suggesting that the footwear was for the most part practical working wear. Six shoe soles with extended pointed toes had not been repaired before being discarded, which may suggest that a small proportion of the shoes came from a more well-to-do sector of the community. At least 18 buckled ankle boots were found with uppers made from a single piece of leather joined with a single seam (style as in Fig. 5.15 Nos 1-4). They fastened at the instep with a strap and a small circular iron buckle, and some were finished with a topband. The majority were made of bovine leather, but of the 14 that could be identified, 2 examples of sheep/goatskin were noted, and three had a heel stiffener or a tongue made of sheep/goat skin or calfskin. The ankle boots were found in children's and adult sizes (see catalogue). Most were found in 15th-century and later 15th- to earlier 16th-century deposits.

A number of shoes with the same fastening made with a different cutting pattern with separate vamp and quarters were found in similarly dated contexts (style as in Fig. 5.15 Nos 5 and 6). A front-lacing ankle shoe with a one piece upper of cattle hide (style as Fig. 5.15 No. 7) represents a common shoe style found throughout the country in later 14th- and 15th-century contexts. An uncommon 15th-century style of ankle boot with a folded and tied fastening (style as Fig. 5.15 No. 8), of bovine leather with a moss-stuffed toe, had hardly been worn prior to discard.

Two calfskin shoes found in later 15th-century deposits (style as Fig. 5.16 Nos 1 and 2) are of a similar general style to the fashionable buckle and strap fastening shoes described above. They have vamps with long pointed toes and one-piece quarters around the heel that peak at centre back and dip to lie below the ankle. Both are of a size worn by men. High throated slip-on shoes (style as Fig. 5.16 Nos 3 and 4) were found in later 15th-century deposits; the low slip-on shoe (Fig. 5.21 No. 10) has an oval toe with an upper of calfskin, and is probably an indoor shoe or slipper. The remains of at least two wooden pattens were found at site 12 (style as Fig. 5.16 Nos 5 and 6). Two sandals (Fig. 5.16 No. 7) were also recovered. These had multi-layered soles; the small, divided toe-strap suggests an early 15th-century date. It has been suggested that sandals were worn by monks and nuns but there is no particular evidence in Britain that this type of footwear can be associated with monastic contexts; sandals have occured in non-monastic contexts in London (Geoff Egan pers. comm.), and conversely none have been recognised amongst

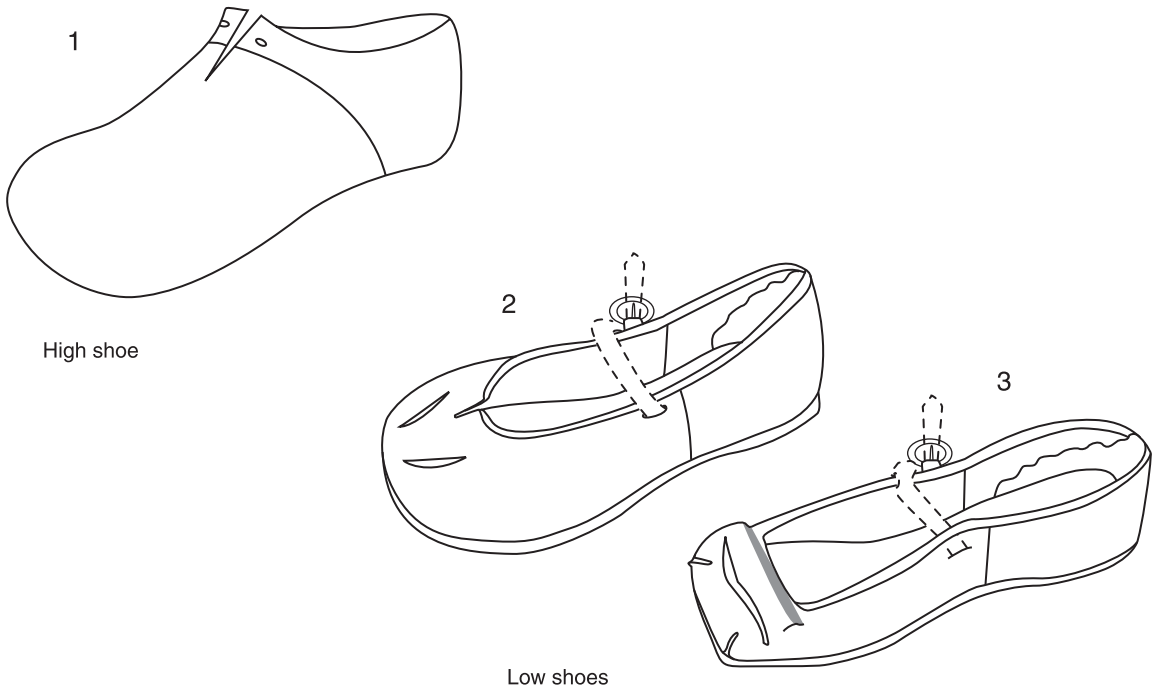


Fig. 5.17 Leather: 16th-century shoe types

shoe assemblages from Shrewsbury Abbey (Mould 2002) and the Austin Friars, Leicester (Allin 1981b).

16th-century shoe styles (Fig. 5.17)

A distinct group of shoes with wide soles and broad, round or occasionally square toes date from the very end of the 15th century and the earlier 16th century. High-throated shoes (style as Fig. 5.17 No. 1) were practical everyday working footwear. There is a very small hole for a tie lace in each of the quarters, though the holes may be secondary in what was originally a slip-on style. The low-cut shoes (style as Fig. 5.17 Nos 2 and 3) were dress shoes or summer wear. The better-preserved examples fastened with a strap and buckle across the instep. A square-toed shoe (Fig. 5.23 No. 17) of sheepskin was highly fashionable, with a short vamp that barely covered the toes and very low sides. The square throat has a line of decoration piping. A single shoe of this kind was found on the *Mary Rose*.

Later post-medieval styles, 18th- and 19th-century footwear (Fig. 5.18)

The later footwear was chiefly welted with two shoes being of riveted construction. The styles, heavy wear and extent of repair on the later shoes

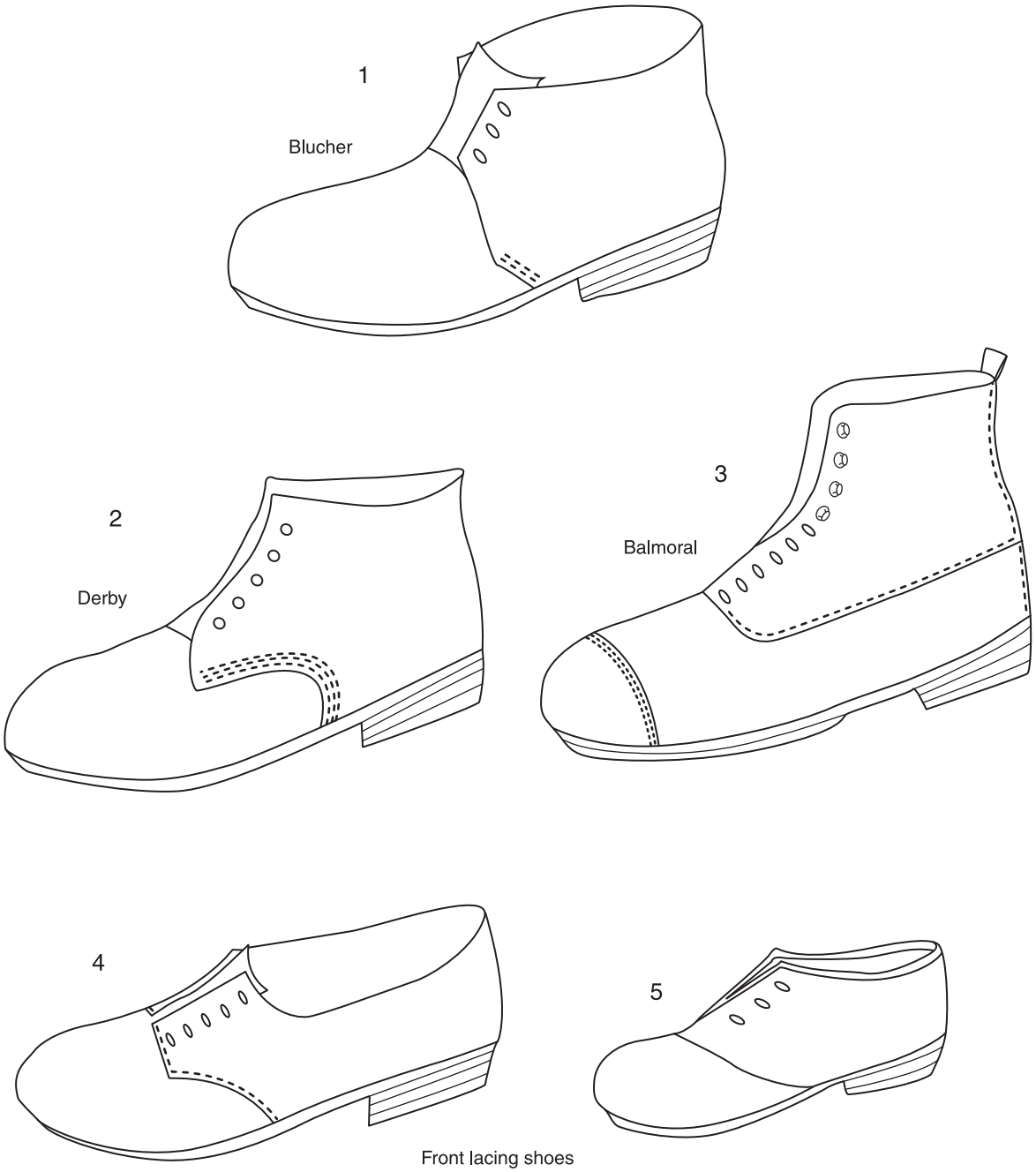


Fig. 5.18 Leather: 18th- and 19th-century footwear types

show them to be practical working footwear. The uppers were made of thick leather, cattle hide where identifiable, often grain side outward (suede). The majority had hobnailed sole repairs and two had a boot iron nailed to the low stacked heel. The shoes were principally for men, but a shoe for an adolescent or a woman and another for a small child were also present. The recognised shoe styles are shown in Figure 5.18.

Straps

A large number of straps were recovered, principally from the Yield Hall excavations in late 15th- and early 16th-century dumping within the channels (1206b pp5, 1207a pp6). At least 55 straps and strap fragments were found along with nine reinforcing pieces that were used to strengthen the area of strap where it was attached to a buckle. All were of cattle hide. Table 9.17 (CD-ROM) provides details of the straps found. All the straps were flat. The majority (47) were plain (eg Fig. 5.23 No. 18); six had a line of grain/flesh stitching sewn with thread (not preserved) running along each edge (eg Fig. 5.23 No. 19).

Although the straps varied in width (11–45 mm), over half measured 13-25 mm ($^1/_2$–1 in) and 82% measured 13–32 mm ($^1/_2$–$1^1/_4$ in). It may be that the straps were being cut to widths in standard imperial measurements; indeed, the two widest straps found conformed exactly to imperial measurements of $1^1/_2$ in and $1^3/_4$ in. It is difficult to be certain of this, as the spread of measurements, taken following conservation, no doubt reflects a certain amount of shrinkage during burial and treatment. Nearly half of the straps had one of their two terminals preserved. Ten pointed and four rounded terminals were found. Other straps had folded or looped ends present that had wrapped around the buckle frame or pin bar and were sewn with leather thong or occasionally with thread. Two straps had iron buckles still in place. Several straps had a series of buckle pin holes present; again their spacing appears to conform to imperial measurements from $^3/_4$ in–2 in, in increments of $^1/_4$ in; 1 in (25 mm) and $1^1/_4$ in being the most common. The highest number of buckle pin-holes found was 17, spaced 20 mm ($^3/_4$ in) apart on a strap (SF3103) from the clay foundation bed (10036) for the Minster Mill frame dated to *c* AD 1680. One strap had fragmentary remains of an iron strap end preserved, while two straps had rivet/shank holes from the attachment of decorative metal mounts; these mounts had been removed before the straps were discarded. Six straps had creased edges, that is an impressed line made with a blunt-ended tool called a crease iron running parallel to each edge (eg Fig. 5.23 No. 18). The creased line helped to prevent the edge from stretching and added a decorative finish. A single strap had a scored line along each edge. Two pieces of post-medieval harness strap (SF3119, 3120), found in a dump of material seen in TP333 located south of the river Kennet, were distinct from the rest of the straps recovered. One (SF 3120) had three parallel rows of oblique grain/flesh stitching each within a stitching channel and had originally been lined or of double thickness. The other (SF3119) had a line of faint, rouletted dots running either side of the creased line along each edge to imitate stitching.

Strap strengtheners

Eight strap terminal strengtheners were found. These were placed at the looped terminal of the strap to reinforce the area where the metal buckle pin passes through a hole in the strap to articulate with the buckle loop. The strengtheners take the form of a rectangular piece of cowhide, often with cropped corners, with a large central hole (eg Fig. 5.23 No. 22) or slit (Fig. 5.23 No. 21) to take the buckle pin. They were folded and inserted between the folded strap terminal and stitched in place with leather thong between the fold of the main strap. They varied in width between 28 and 46 mm apparently coming from straps 1in, $1^1/_4$ in and $1^1/_2$ in wide. While the majority had clearly been used, a single example (Fig. 5.23 No. 20), from a 1450-1500 pit fill (8902), had no stitching, was unfolded and, therefore, unused. One terminal strengthener (Fig. 5.23 No. 22) had been reinforced with a second piece of leather stitched to it. Another reinforcing piece to strengthen a strap at least 2 in wide was found separately (context 8895 pit/ditch fill 1450-1500 Project Phase 5). The majority of the strap strengtheners were recovered from late 15th- and early 16th-century dumping at the Yield Hall excavations (1207a) with a single example (SF3108) being found downstream of St Giles Mill adjacent to London Road (TP 315) in a dump (12523) dating to 1350-1450.

The strap strengtheners and the use of stitching with leather thong to attach the strengtheners and hold the buckle frame or ring in place suggests the straps were to be put under some strain and intended for heavy use such as harness rather than as dress accessories. Of the 53 straps, 30 had a cut end or ends, probably because reusable leather had been removed before disposal, and the majority of metal fittings had been removed. This and the recovery of an unused strap terminal strengthener (Fig. 5.23 No. 20) suggest that the straps and strengtheners are discarded waste from the refurbishing and refitting of horse harness.

Other straps

Fastening straps

A short, tapering fastening-strap with two buckle pin holes, probably from a bag, and a possible second example, were found in the fill (9003) of a pit (8990) dated 1450-1500.

Handles

A thick handle of folded cattle hide (SF3061) that had been nailed in place at each end was found in late 15th- to early 16th-century dumping (8510) in the western channel (8634).

A long, narrow strap of calfskin (SF3043) with a long central slit close to the straight cut terminal, found in a dump of material (8505) of 16th-century date, might be a broken handle. Such a simple strip handle can be found on a deerskin drawstring pouch of late 14th-century date from London (Egan and Pritchard 1991, 344-7 no. 1695 and fig. 228). The drawstring passes through the slotted end and the opposite end is stitched to the pouch.

Other leather objects

Knife sheath

A highly fragmentary and heavily worn knife sheath (SF3064), internally lined and with a central back seam, was found amongst a large dump of leather (8510) thought to have been deposited between 1500 and 1530 in the western channel (8634) as part of land reclamation.

Fringed border

A fringed border (Fig. 5.23 No. 23) of calfskin was found in the primary fill (8399) of a ditch or pit (8407) seen in TP 146 to the south-east of site 101. It may have been rolled to form a tassel; however, as it is folded at present, it may possibly be a heavily slashed mouth of a sword scabbard. It is comparable with the mouth of a sword scabbard found in a 12th-century context at Coppergate, York (cf. Cameron in Mould, Carlisle and Cameron 2003, no. 15601, 3366 and fig. 1690), that also had four vertical slashes just below the mouth on the front face. A fringe of goatskin closely dated to 1270-1300 was found at a domestic site at Svenborg, Denmark (Groenman-van Waateringe 1988, fig. 11.5 no. 6) but lacks the plain border and stitching seen on the Reading example.

Purses and cases

A finely sewn rectangular panel of calfskin (Fig. 5.23 No. 24), possibly the mouth torn from an implement case of some sort, was found in medieval silting (7324 phase 10101b) between the Kennet and the Back Brook (overlying 7830) dating to the later 12th century. A piece of sheep/goatskin (SF3088) with a very finely sewn lapped seam cut and torn from a larger panel was found in the fill (9003) of a pit (8990) at the Yield Hall dated to the second half of the 15th century (phase 1206b). The quality of the workmanship suggests it came from a luxury item, possibly a fine purse or case.

A fragment (SF3124), possibly of sheep/goatskin, cut from the worn front panel of a belt purse was found unstratified at the Yield Hall. A fragment of cattle hide panel (SF3072) that may come from a second example was found in a 15th- to early 16th-century dump (8510, 1207a) of material in the western channel (8634) at the same site. These flap-closing purses, often incorporating separate drawstring pouches to hold coins, were worn hung on a belt around the waist. Parts of purses of this type have been found in several leather assemblages in Britain (for example London, Hull, Shrewsbury Abbey, York) dating to the late 14th and 15th century and they are depicted in contemporary illustrations. The construction of belt purses is now better understood following the recovery of complete examples from the Netherlands and the reconstruction of others found in late 15th-century and 16th-century contexts at Criblet in Fribourg, Switzerland by Marquita Volken (Volken, Volken and Bourgarel 2001, 46-7, fig. 13-4).

Possible garment pieces

A folded panel (SF3081) of bovine leather with remains of a decorative, scalloped edge and a seam of paired grain/flesh stitching was found in fill (8885) of a N-S channel (8976) dated to the second half of the 15th century. The fold, seam and decorative edge suggest it may be a cuff, from a garment or a thick glove.

Two decorative semi-circular panels (Fig. 5.23 No. 25) of bovine leather lined with sheep/goatskin with scalloped borders and decorative stitching and tooling may be cap sleeves from a jerkin. The panels have grain/flesh stitching along the curved edge by which they may have been attached to the armholes of the jerkin. They were found in a dump of material (8510) in the western channel (8634) with shoes of late 15th-and early 16th-century styles. Few leather garments or parts of garments of this date have been recognised previously. Perhaps the best collection comes from the wreck of the *Mary Rose*, which sank in 1545. All the styles of leather jerkin recovered from the *Mary Rose* have 'integral' cap sleeves that are simple extensions of the upper arm holes lined on the inside, not separate pieces sewn around the arm holes. Separate cap sleeves appear to have become popular later in the 16th century (Forster 2005, 40). One of the jerkins (MR81A1650) did have scalloped edges on the skirt flaps. The jerkins from the *Mary Rose* were made in a variety of designs, and whilst nearly half were of calfskin, sheepskin, goatskin and cattle hide were also used, sometimes on the same garment. Some of the individual pattern pieces were made up from a number of varied pieces apparently in order to use whatever leather was available at the time. Once separated from the other components individual pieces of these garments would be very difficult to recognise. It may be that some of the larger stitched leather items found at Reading and discussed below may come from garments.

Sheet leather

Amongst the dumped leather recovered from the Yield Hall excavations were discarded seams and stitched fragments cut and torn from larger items when reusable leather was being salvaged. They varied from lengths of cut-down seam to the remains of large panels. Table 9.18 (CD-ROM) provides details of this sheet leather. It is not now possible to know from what items these fragmentary remains came but a number of different leather

goods including saddlery, upholstery and clothing may be represented. Those with particular features including nailing, curved seams and tooling are discussed under the broad heading of possible saddle fragments; other pieces are considered under discarded seams below.

Possible saddle fragments

A number of sheet leather items from 15th- and early 16th-century leather dumping in channels at the Yield Hall may come from saddlery or items of nailed upholstery. What little is known about medieval saddles comes from pictorial evidence and the few surviving examples in museum collections such as the wooden tree of Henry V's saddle in Westminster Abbey and a late 15th-century armoured saddle in the Wallace Collection (Waterer 1981, figs 109F and 110 respectively). The nature and variety of everyday riding saddles that might be discarded here is uncertain. One may imagine that the saddle comprised a wooden frame ('tree'), with a stuffed seat of leather with upstanding components front (a pommel or bow) and back (cantle) to support the rider, perhaps mounted on to a shabrack (padded horsecloth) or 'skirt'. The leather pieces described here have characteristics that suggest they were nailed to a wooden frame or come from large, shaped panels that might have covered the seat, the upstanding components or formed the shabrack/skirt. None of the pieces recovered have distinctive parallel lines of stitching that might indicate that the panel had been quilted, a feature often present on surviving saddle coverings.

The highly fragmentary remains of a cut down item of calfskin (SF3037), possibly from a saddle, were found in a late 15th-century dump (8395) of leather in the N/S channel (9269). A fragment of a pigskin panel (SF3038) with a curved grain/flesh seam was found in the same context and may come from the same item. The thirty fragments of calfskin (SF3037), the longest 245 mm in length, had remains of a curved seam with whip stitching; two bore the impression of dome-headed studs, two others had nail holes present. Two pieces appear to have been originally sewn together to form a 'cone-shape' (190 x 117 mm), perhaps the leather covering from a pommel or cantle terminal.

A large dump (8510) of leather in the channel 8634 contained a length of lined hem of worn bovine leather with decorative tooling (Fig. 5.24 No. 26), stitched panels of sheep/goatskin (SF3070 and Fig. 5.24 No. 27) and two pieces of thick leather (SF3066) nailed together. Part of a large panel of sheep/goatskin (Fig. 5.24 No. 27) had rounded corners and a bound seam running around the edge. Two other fragments (SF3070) are likely to come from the same object, possibly from a saddle seat or shabrack.

Amongst another large group of later 15th-century leather dumped in the latest deposit (8502/8505) in the western channel (8634) were other items possibly from saddlery. One (Fig. 5.24 No. 28) was a slotted, rectangular calfskin panel lined with pigskin with bound edges and tooled decoration. The panel retains a distinctive curvature that appears original, and the two iron nails present suggest it may come from a saddle. A rectangular piece of thick pigskin (SF3041), now folded, and formerly nailed along one side was found in the same context (8502). A curved panel of calfskin (Fig. 5.25 No. 29) crossed by a line of nail holes was also found (8505). Another curved panel (Fig. 5.25 No. 30) of calfskin along with a rectangular lined and bound panel of sheep/goatskin (SF3079) were found in the deposit (8713) lying directly above (8502) and may well be associated. These curved panels are comparable with others found previously at Reading at the Abbey Wharf (Mould 1997, 132 and fig. 76, no. 78) in a context dated from the dissolution of the abbey in 1539 to the early 18th century.

Discarded seams

In addition to the possible saddle fragments discussed above, a number of other seamed fragments lacking other distinguishing features were found. They range from the remains of sizeable panels of sheep/goatskin (SF 3099, 3100) and calfskin (SF3042 and context 8696, 9110) to small lengths of cut down seam (SF 3069). While most came from unphased contexts, four small lengths of cut down seam (SF 3069) were found in early 16th-century dumping (8510) in channel 8634, with a calfskin panel (SF3042) in the layer above (8502). A large calfskin panel was found in an 18th-century pit fill (8696) in the Yield Hall. A seam cut from a panel of sheep/goatskin was also found in fill (10253) of a possible channel of the Minster Mill stream seen in TP 156.

Leather associated with machinery

Steam engines were installed in the northern end of the 1750s mill at some time after 1850. The 1895 Goad insurance map shows the mill being run by Hurley and Son as a steam-powered flourmill. Power from a steam engine was transferred to machinery by a belt drive and the junction of a leather driving-belt (Fig. 5.24 No. 31) was found in Test Pit 318 in a metal dump layer (context 12531) associated with the mill. The area where two overlapping ends of wide strap had been stuck together and then reinforced by brass rivets and washers had been cut from a driving-belt. The leather belt was usually bought as a coiled length and joined 'on site'; later adjustment was undertaken as it stretched during use (Salaman 1986, 203-4). This join (Fig. 5.24 No. 31) would appear to have been discarded following adjustment of the belt.

A fragment possibly broken from a large leather washer was recovered from the fill of a construction or levelling cut (context 12085 Test Pit 301) of Victorian date inside the remains of the engine room.

The waste leather

Waste leather was recovered from 45 contexts across the areas of investigation but principally concentrated in four dumps. Waste leather was dumped at St Giles Mill in the mid 14th century and at the Yield Hall in the 15th and earlier 16th centuries. Four types of waste leather were identified relating to both leather processing and the manufacture of leather goods.

Leather processing waste

Primary waste: 210 pieces of primary waste were found, that is unusable parts of the skin or hide such as bellyskin, udders, areas around the head and legs and hide edges, trimmed off the hide during leather processing. Holes created when handling the hides and skins during processing are often present in the hide edges.

Currying waste: Currying was undertaken following tanning in order to make the tanned hides sufficiently thin and flexible to be made into a range of leather goods. As part of this process the currier pared down the thickness of the hides on the flesh side. A group of shavings resulting from this procedure with a dry weight of *c* 80g were found with 53 other pieces of primary waste in an alluvial clay (12554) seen in TP 333 on the south bank of the river Kennet. The context (12554) has not been phased but the seat area of a welted shoe sole found in the same deposit suggests a post-medieval date.

Manufacturing waste

Secondary waste: 304 secondary waste off-cuts produced when cutting out pattern pieces were recovered. Certain shapes of off-cut are characteristic of the cutting out of particular pattern pieces such as the triangular intersectional cutting pieces produced when cutting out shoe soles. A small number of other distinctive shapes were found that suggest the production of other categories of leather goods.

Tertiary waste: Secondary waste that takes the form of thin trimmings produced when paring down pattern pieces to fit during their assembly into finished items are recognisable and have been termed tertiary waste (Mould, Carlisle and Cameron 2003). 494 of these trimmings were found during these excavations.

The waste dumps

P*roject Phase 4 mid 13th to mid 14th century:* The earliest significant dump of waste leather was recovered in TP 312 from a dump layer (12506) dated to the mid 14th century (3002b) associated with the reclamation of ground downstream of St Giles Mill adjacent to London Street. The waste leather comprised 119 pieces of primary waste, 57 of secondary waste and 129 of tertiary waste. The primary waste included over 100 fragments of unusable areas from a variety of hides, principally bovine leathers, and 19 hide edges, two handling holes present. The secondary waste included an intersectional cutting piece characteristic of shoemaking debris as well as a small number of waste pieces of a distinctive shape along with particularly narrow slivers of waste trimmings. These more unusual waste pieces are indicative of the manufacture of another class of leather goods, possibly harness.

Project Phase 5 c 1400-c 1500: A large dump of organic material (8395, 8396, 9183) in a N/S channel (9269) at the Yield Hall included a dump of waste leather (8395). The 182 pieces of primary waste included three fragments of udder and 57 hide edges, 16 with handling holes present. 38 pieces of secondary waste and 60 trimmings were found; the secondary waste came from a variety of hides and skins including cattle hides, calfskins and sheep/goatskins. A further dump of waste leather comprising primary, secondary and tertiary waste along with a notable amount of small fragments of scrap was found in a later 15th-century context (8894). The waste included 62 hide edges, a piece of udder, 57 secondary waste off-cuts and 85 trimmings. A variety of hides were present in both the primary and secondary waste material, including bovine leathers, sheep/goatskin and pigskin. Goat hair from the processing of goatskin was also present in the dump (see Walton Rogers, above).

Project Phase 6 c 1500-c 1600: Waste leather was found with a large amount of cobbling waste dating to the 15th and earlier 16th century dumped (8510) into channel 8634. The primary waste included 63 hide edges, 14 with handling holes present, 4 pieces of udder and 3 pieces with the hair still remaining. The 98 pieces of secondary waste included 7 intersectional cutting pieces from shoemaking, one with two 'C' shaped marks made by a leather punch. 152 trimmings were also found. The secondary and tertiary waste was cut from a variety of bovine hides, sheep/goatskins and pigskin.

Catalogue of illustrated leather

Full explanations of technical terminology can be found in the complete leather report in Chapter 9, on the CD ROM.

Figure 5.19

Shoes

1 **Turnshoe ankle boot with buckle fastening,** right foot. Leather. Sole with oval toe, edge/flesh seam and rand. One-piece upper with straight, butted edge/flesh side seam. Straight cut top edge, concave throat with lapped seam with whip stitch to attach the lozenge-shaped tongue. Strap with tab end and buckle strap with circular iron buckle D 15mm. Heel stiffener at centre back. Leather: upper calfskin. Size child 4 (20), child 5 (22) with 10% allowance for

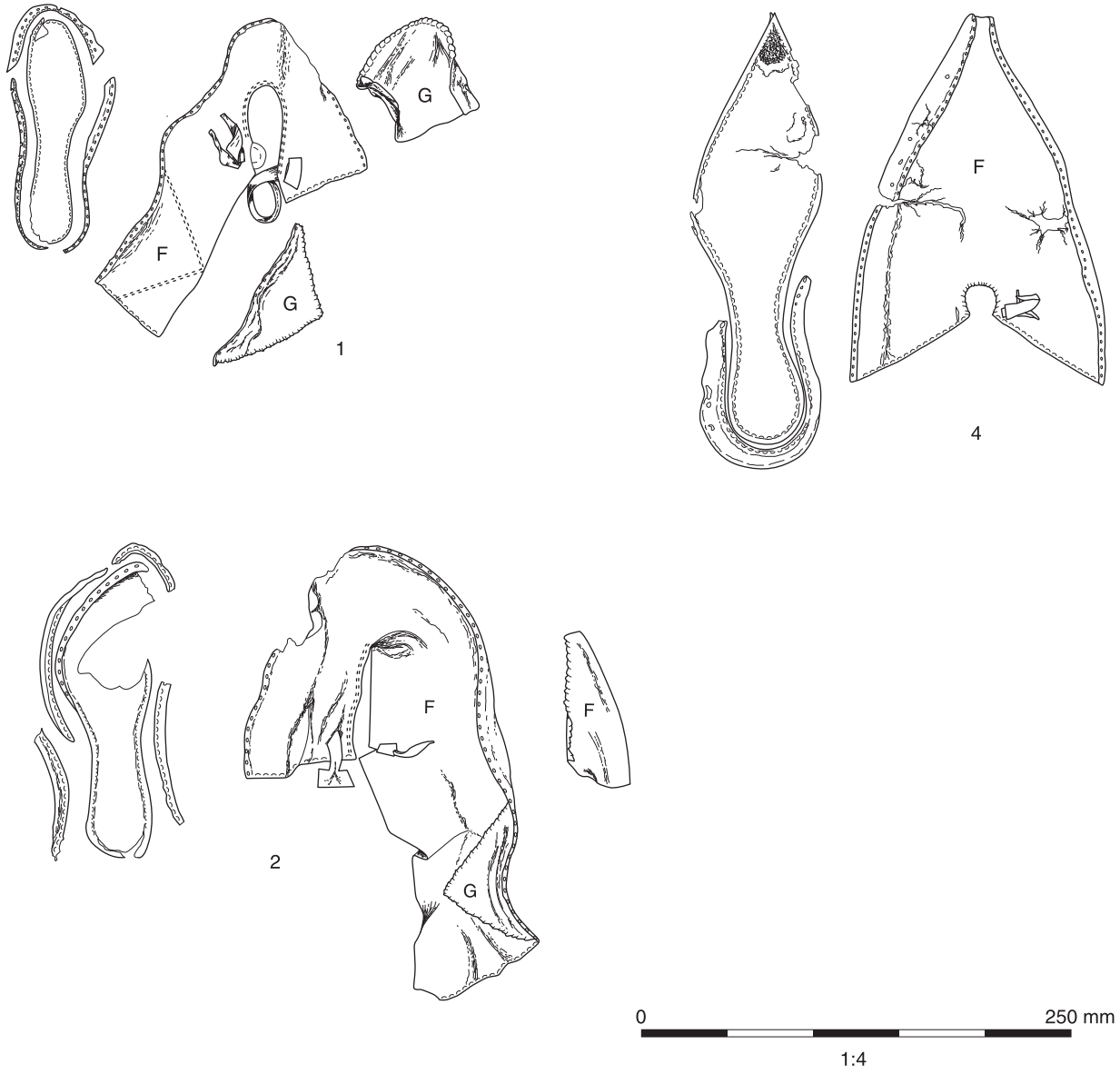


Fig. 5.19 Leather: Shoes (Nos 1-4)

shrinkage. Sole L: 130 mm. Upper ht centre back: 54 mm. Ctx 8505. Unphased. SF3044.

2 **Turnshoe ankle boot with buckle fastening**, left foot. Leather. Sole and one-piece upper as SF3044 above. Whip stitch on right side of central opening slit to attach the flat tapering rectangular tongue. Heel stiffener at centre back. Leather: upper calfskin. Size child 9 (27), child 11 (29) with 10% allowance for shrinkage. Sole L: 173 mm. Upper ht at centre back 78 mm. Ctx 1322. TP17. Unphased. SF73

3 **Turnshoe ankle boot with buckle fastening**, right foot. Leather. Sole with pointed toe with 35mm extension, narrow waist, edge/flesh seam. Vamp with butted edge/flesh side seams and central opening with stitching for lozenge-shaped bellows tongue. Strap with circular iron buckle and keeper loop on one side of central opening and fastening strap on the other. Quarters with central butted edge/flesh back seam and low triangular heel stiffener. Top edge cut to dip at centre back, appears secondary. Leather: upper sheep/goatskin. Size child 13 (31), adult 3 (35) with 10% allowance for shrinkage. Sole L: 249 mm. Quarters ht at centre back 98 mm. Ctx 8817. Ph.1207a. SF1715

4 **Turnshoe with buckle fastening**, left foot Leather. Sole with pointed toe with 35mm extension, medium waist, edge/flesh seam and stitching for repair to forepart and seat. Rand with stitching to attach clump repair. Vamp with toe stuffed with moss, butted edge/flesh side seams, small concave throat with small central slit. Strap with circular iron buckle D 15mm and keeper loop. Leather: upper bovine. Size adult 5 (38), 8 (42) with a 10% allowance for shrinkage. Sole L: 250 mm. Ctx 8505. Unphased. SF3045

Figure 5.20

5 **Turnshoe with buckle and strap fastening**, left foot Leather. Sole with pointed toe with 25 mm toe extension, medium waist, edge/flesh seam. Rand and forepart clump repair. Vamp with pointed toe stuffed with moss and straight throat. Edge/flesh butted side seams, left extending onto a buckle strap with small circular iron buckle D 14mm, right has whipped seam to attach fastening strap. Leather: upper bovine. Size adult 2+ (34), 5 (38) with a 10% allowance for shrinkage. Sole L:232+ mm. Ctx 1324. Ph.10103a. SF79

6 **Turnshoe with split strap tie fastening**, left foot. Leather. 2 part sole seamed across the waist, long toe with 30mm toe extension, medium waist, edge/flesh seam. Rand and forepart clump repair. Vamp with concave throat with central slit, butted edge/flesh side seams extending into instep tie straps the right with pair of large fastening holes. One-piece quarters with peak at left front seam and plain top edge raised at centre back. Stitching to attach a strengthening cord on interior at top of quarters front seams and junction of vamp throat and fastening straps. Lasting margin of heel stiffener present. Leather: upper calfskin. Sole L: 255 mm. Ht centre back 63 mm. Size adult 5(38), 8(42) with a 10% allowance for shrinkage. Ctx 1324. Ph.10103a. SF80

7 **Turnshoe ankle shoe or boot with front laced fastening**. Leather. Incomplete one-piece upper with stitching for large heel stiffener at centre back, butted edge/flesh side seam and plain cut top edge. Trapezoidal insert with butted edge/flesh and whip stitched seams. Divided lace passing through a pair of lace holes. Fragment of rand. Leather: upper bovine. Surviving ht centre back 115+ mm. Size unknown. Ctx 1319. Unphased corresponds to 10103a. SF67

8 **Turnshoe ankle boot with folded side tie fastening**, left foot. Leather. Sole with pointed toe with 25mm extension, narrow waist, edge/flesh seam and rand. Vamp with toe stuffed with moss, butted edge/flesh seam across throat, left side seam and seam running from side seam to centre of vamp. Pair of fastening holes at junction of side seam and throat. Leather: upper bovine. Size adult 2(34), 4(37) with a10% allowance for shrinkage. Sole L: 226 mm. Ctx 8510. Ph.1207a. SF3050

Figure 5.21

9 **Turnshoe high slip-on shoe**, left foot. Leather. Sole with pointed toe with 45mm extension, torn away, edge/flesh seam. Forepart clump repair. Vamp with straight throat and butted edge/flesh side seams with stitching to attach ends of topband on the interior. Leather: upper calfskin. Size adult. Ctx 8510. Ph.1204a. SF3049

10 **Turnshoe low slip-on shoe**, right foot. Leather. Sole with oval toe, edge/flesh seam, stitching for repair to forepart and seat. One-piece upper with butted edge/flesh seam at centre back, top edge with whip stitched to attach the flat top band. Long, low heel stiffener. Impression of a wide rand. Leather: upper bovine. Size child 11(29), 13(31) with 10% allowance for shrinkage. Sole L: c.190 mm Ht centre back 40 mm. Ctx 101/5 Unphased. SF1

11 **Turn-welted shoe**, upper cut away, right foot. Leather. Sole with pointed toe with 25mm extension, edge/flesh seam and welt with edge/flesh and grain/flesh seams. Forepart of matching sole, grain/flesh seam, cut across tread, and other sole fragments. Vamp with stuffed toe, cut. One-piece quarters and heel stiffener cut away above lasting margin. Leather: upper calfskin. Size adult 5(38), 8 (42) with 10% allowance for shrinkage. Sole L: 248 mm. Ctx 8502. Unphased. SF3039

12 **Patten straps**, left foot. Leather. Plain, triangular foot straps for wooden patten, end of one passing through a semi-circular hole in the other and held in place by an iron pin. Nailing strip with an iron nail present on right strap (nailing strip with 3 nails fitting on to the left strap found in context 8942 Ph 1204a). Curved arm from back strap with paired slits in the terminal. Leather: cattle hide. Tapering fastening strap with horizontal slit at each end. Leather sheep/goatskin. Individual foot strap L: 140 mm, W: 45 mm. Ctx 8941. Ph.1206b. SF 3084

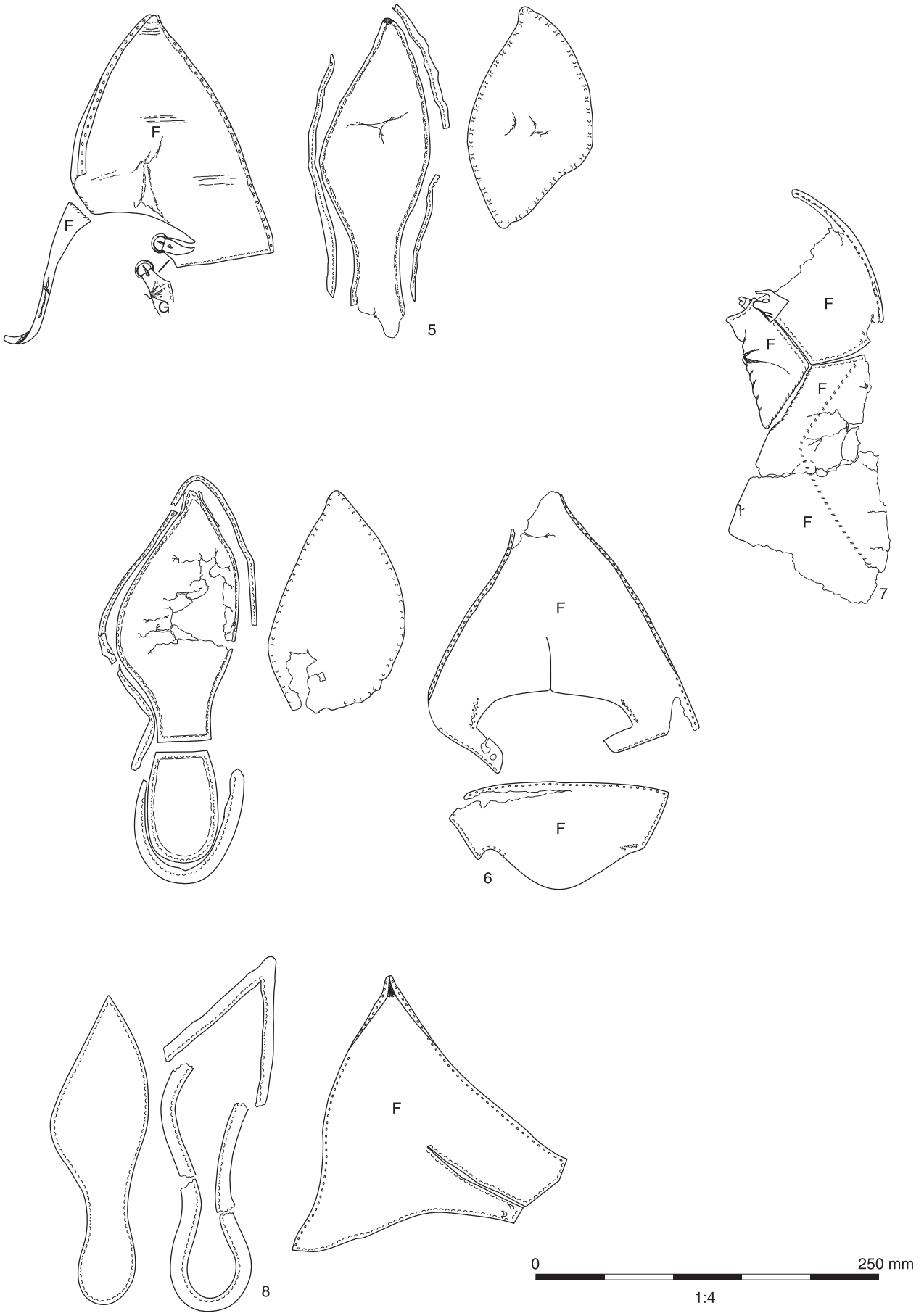


Fig. 5.20 Leather: Shoes (Nos 5-8)

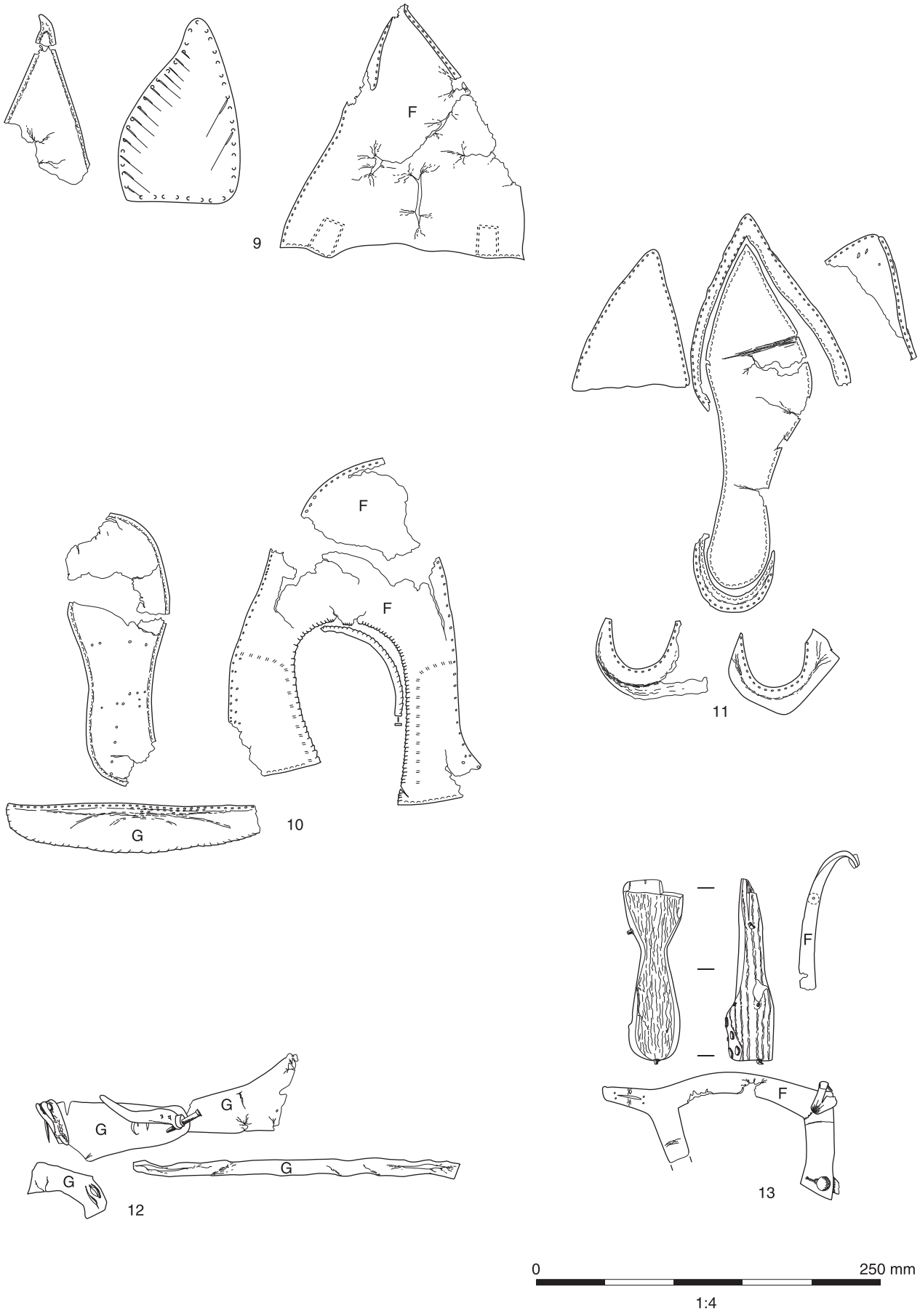


Fig. 5.21 Leather: Shoes and pattens (Nos 9-13)

13 **Hinged patten**, right foot. Wood and leather. Wooden sole with narrow waist and long seat, rebated for a leather hinge across the lower tread, toe missing. Leather top piece nailed to seat. Leather back strap with small integral strap on right side for a buckle (now missing) and the stub of a divided strap on the left. Base of the back strap strengthened by an additional strip through which it was nailed, nailing strip from one side of the forepart also present. Leather: worn bovine. Sole L: 127+ mm, Ht at seat: 29 mm. Ctx 8505. Unphased. SF3048

Figure 5.22

14 **Sandal**, right foot. Leather. Sole with multiple layers, five present, all with pointed toe, narrow waist, wide round seat, and with grain/flesh seam. One layer is pieced. Back strap with narrow ankle strap and small annular iron buckle, butted edge/flesh seam for a separate fastening strap, now missing. Remains of divided toe strap, part of which passes through a pair of vertical slits at the toe. Leather: cattle hide. L: 210 mm. Child's size 13 (Adult 2/3 with a 10% allowance for shrinkage). Ctx 41. Test Pit 6/7. Unphased. SF3003

15 **Turn-welted high shoe**, left foot. Leather. Two fragments of outer sole with grain/flesh stitching within a stitching channel. Inner sole with broad, round toe tapering from tread to seat, edge/flesh seam, stitching from repair to forepart and seat. Welt and fragment of clump repair. Right quarter with lasting margin cut off, butted edge/flesh back and front seam. Plain top edge with fastening hole at junction with front seam. Stitching for heel stiffener. Fragment of left quarter also cut away and other upper fragments. Leather: upper bovine. Size adult 3(35), 6(39) with a 10% allowance for shrinkage. Sole L: 235mm. Ctx 8512. Unphased. SF3074

16 **Welted low shoe with strap and buckle fastening**, left foot. Leather. Sole and mid sole edging with grain/flesh stitching, insole with edge/flesh stitching. Sole and insole with broad forepart, toe torn away. Broad, round-toed vamp with curving throat with small central slit with fastening hole to either side, pair of parallel slashes running from throat to toe. Straight butted edge/flesh side seam with remains of buckle strap, vamp wing torn away on other side. Left quarters with butted edge/flesh back seam with stitching for heel stiffener, front seam missing. Top edge with whip stitching for top band. Leather: upper cattle hide. Size adult. Ht at centre back 58 mm. Ctx 8510. Ph.1207a. SF3055

Figure 5.23

17 **Welted low shoe with strap and buckle fastening**, left foot. Leather. Insole with a broad, square toe, edge/flesh seam and welt. Second insole possibly placed on top of the first as an insock or from a second shoe. Low cut vamp with square throat with line of decorative piping and internal toe puff, both slashed across the toe. Low vamp wing present on one side with short butted edge/flesh side seam with tab-ended strap. Line of stitching to attach lining. Fragments of quarters, heel stiffener and linings. Leather: vamp sheepskin, lining calfskin. Size child 13(31), adult 3(35) with 10% allowance for shrinkage. Insole 180+ mm, ht vamp wing 21 mm. Ctx 1125. Ph.10103d. SF45

Straps

18 **Strap**. Leather. Plain strap with pointed terminal, other end broken, seven buckle pin holes spaced 20-25 mm apart. Crease line along each edge. L: 153 mm, W: 16mm Also rectangular piece cut from a strap across a large buckle pin hole and buckle pin slot. Leather cattle hide. L: 23 mm, W: 19 mm. Ctx.9293. Ph.1206b. SF3098

19 **Strap**. Leather. Stitched strap with line of grain/flesh stitch holes, with thread impression on grain side only, along each edge, ends torn. Two large buckle pin holes spaced 52mm apart. Leather cattle hide (5mm thick). L: 165mm, W: 25mm. Ctx.1324. Unphased equivalent Ph.10103a. SF81

20 **Strap terminal strengthener**, unused. Leather. Rectangular strap with central lozenge-shaped hole cut in the centre. Leather cattle hide. L: 104 mm, W: 46 mm. Ctx 8902. Ph.1206b. SF3083

21 **Strap terminal strengthener**. Leather. Rectangular strap with central horizontal slit, the strap was folded and stitched with leather thong. Leather cattle hide. L: 79 mm, W: 32mm. Ctx. 8510. Ph.1207a. SF3063

22 **Strap terminal strengthener**. Leather. Rectangular strap folded in half with a hole for buckle pin at the fold. Stitched to a smaller reinforcing piece with leather thong. Leather cattle hide. L: 50mm, W: 35mm. Ctx. 9110. Unphased. SF3096.

23 **Fringed border**. Leather. A plain border, *c* 12-13mm deep, with grain/flesh whipped stitching along the edge sewn with thong, and cut into a series of fine, vertical slits forming a fringe with torn edges below. Leather calfskkin. L: max 39 mm, total W: *c* 80 mm, folded 46 mm. Ctx 8399. Unphased. SF3033.

Purses and cases

24 **Rectangular panel**. Leather. A lapped seam with two lines of grain/flesh stitching with thread impressions on the grain side only runs down each side. The upper edge is skived with a whip stitched seam, stitch length 2mm, this stitching continues and marks the former position of an appliqué piece that extended 25mm below the edge. A double, tooled line producing a shallow, vertical raised rib marks the central line of the panel. Leather: calfskin. L: 67+ mm, W: 94 mm, Th: 2 mm. Ctx 7324. Ph.10101b. SF3017

Possible garment pieces

25 **Semi-circular panels** with a scalloped edge. Leather. Two panels of heavily worn bovine leather with separate linings of sheep/goatskin, placed flesh to flesh. Each panel has a curved edge with grain/flesh stitching, the corresponding linings with whip stitching, and a straight edge with a multiple-lobed border. A line of oblique grain/flesh stitching with thread impression on the grain side runs parallel to

Fig. 5.22 Leather: Sandal and shoes (Nos 14-16)

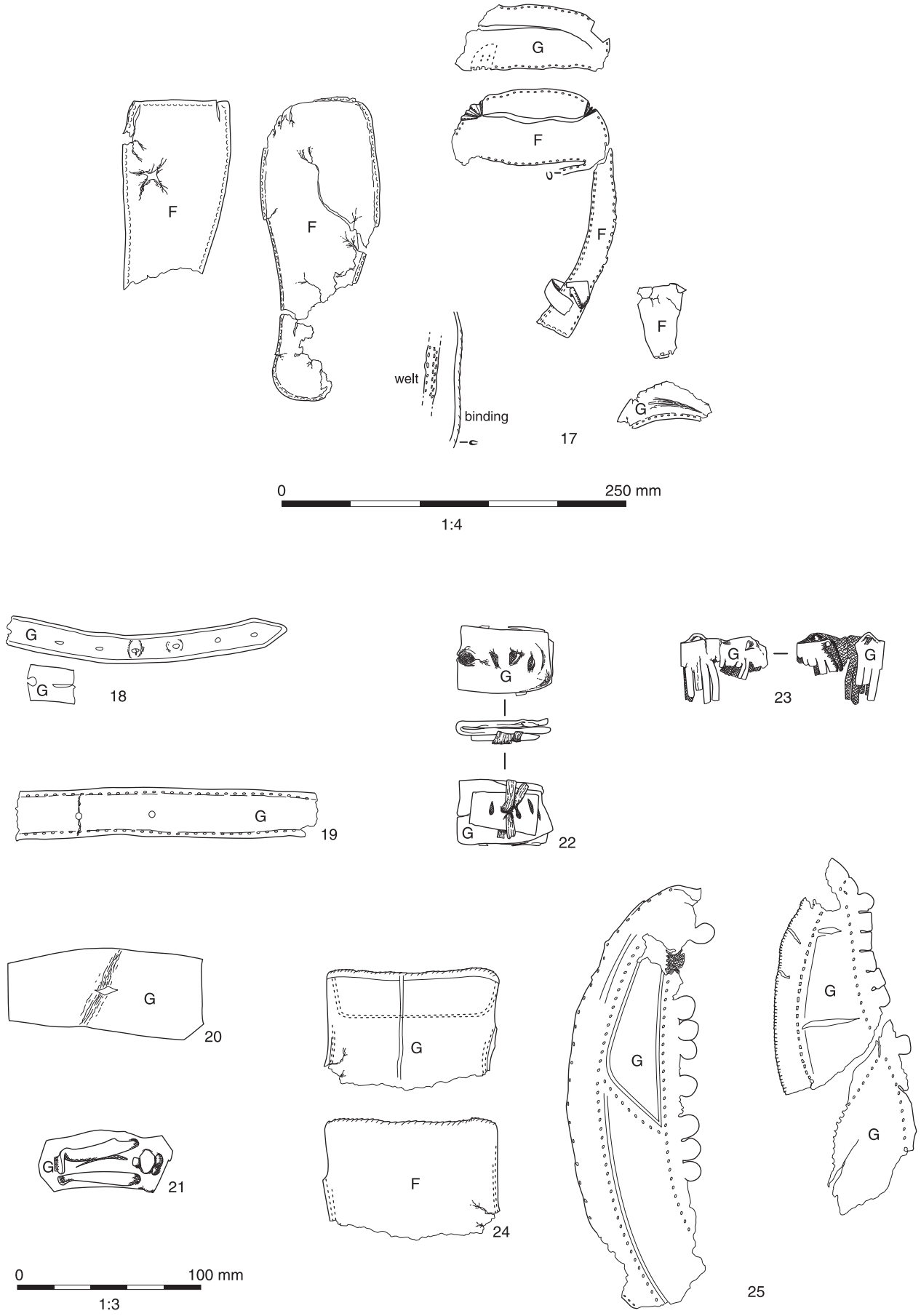


Fig. 5.23 Leather: Shoe, straps, border and panels (Nos 17-25)

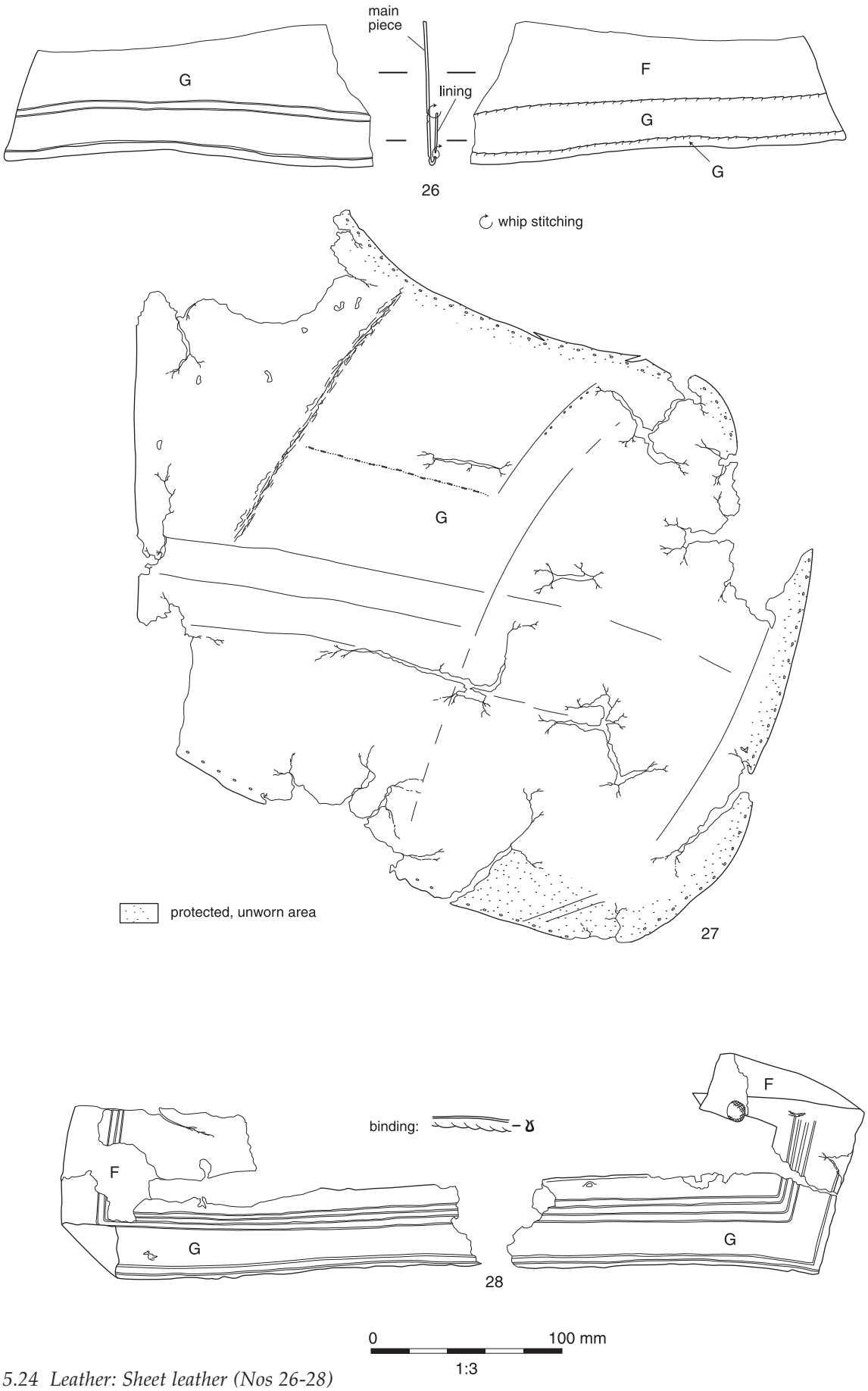


Fig. 5.24 Leather: Sheet leather (Nos 26-28)

the curved edge and the lobed border with an oblique line joining the two at the centre. The better preserved panel has a double tooled line that runs along the inner side of the stitching and may also have run along the outer edge on the left side. The grain surface of the leather is cracked and it is uncertain whether the tooling was incised or impressed. The linings each have a vertical cut present. Better preserved panel L: 245 mm, max W: 70 mm. Ctx 8510. Ph.1207a. SF3065

Figure 5.24

Sheet leather

26 **Lined hem**, cut down from larger item. Leather. Cut down hem, edge turned under and sewn with whip stitching to a separate lining 20mm wide that is sewn to the underside with whip stitching. The edge is decorated on the upper face (grain) with a tooled line with a fine double line 19mm above. Leather: worn bovine. L: 198 mm, W 77 mm. Ctx 8510. Ph.1207a. SF3068

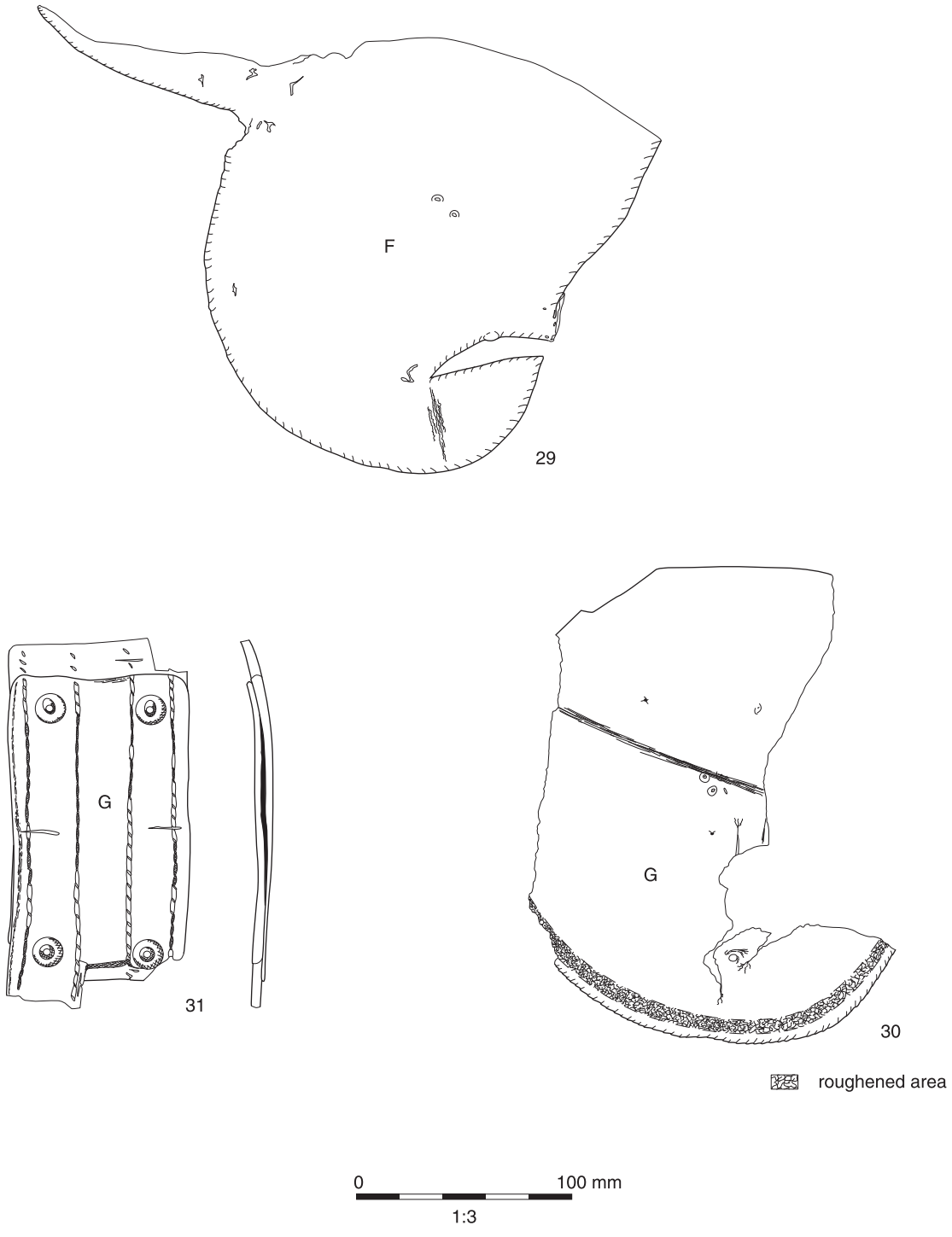


Fig. 5.25 Leather: Sheet leather and driving-belt junction (Nos 29-31)

27 **Rectangular panel** with rounded corners. Leather. Three sides of the panel have a grain/flesh seam originally protected by a binding the fourth side has been torn away. Paired stitching with thread impression visible on the grain side that is more polished and stained in that area indicates the former position of a rectangular piece underlying the panel. Three widely-spaced, tooled lines run down the centre at an oblique angle, they are followed by crease lines that suggest that the panel was folded along this axis but this may be a secondary feature. Another tooled line runs at right angles close to one edge. Leather sheep/goatskin. L: 370 mm, W 320 mm. Ctx 8510. Ph.1207a. SF3073

28 **Slotted panel**, lined and bound. Leather. Two lengths of rectangular calfskin panel with a central slot, torn but probably joining originally. The panel appears to have been symmetrical and has been cut across two areas in each case close to an iron nail. The panel is lined with pigskin, placed flesh to flesh, and secured along the edges with whip stitching. A folded calfskin binding 5-6 mm wide bound three of the four sides. Decorated with parallel, tooled lines. Leather: panel calfskin, lining pigskin. L: 220+ mm, max W 90 mm; L 165+ mm, max W 97 mm. Ctx 8502. Unphased. SF1606

Figure 5.25

29 **Curved panel**. Leather. Near circular panel with shallow semi-circular notch in one side. The majority including the notch has whip stitching along the edge the remainder is cut and torn. Panel extends into a second curved edge but the majority of this area has been torn away. A line of small holes from mounts or nails runs across the panel, two with the impression of circular domed heads present. Leather calfskin. L: 285 mm, W 204 mm. Ctx 8505. Unphased. SF3047

30 **Curved panel**. Leather. Panel with a curved edge with whip stitching, other edges cut and torn away. A group of three nail holes with impression of domed heads are present in the centre of the panel and possible holes from three others. Leather calfskin. L: 218 mm, W 165+ mm. Ctx 8713. Unphased. SF3078

Leather associated with machinery

31 **Driving-belt junction**. Leather. Two straps lying one on top of the other, each grain side upward with skived and cut ends, the upper strap is broken at the left end. Each strap has four parallel rows of oblique grain/flesh stitching, stitch length 5mm, the stitch holes were pricked out and the thread passes through alternate holes. The straps are secured by four rivets and washers of copper alloy (probably brass). Two small vertical cuts present in one strap, three in the other. Thread present. Leather likely to be cattle hide (oxhide). L: 165 mm, W: 80 mm, combined thickness 9 mm. Ctx 12531. Unphased. SF3111

The clay tobacco pipe industry in Reading
(Figs 5.26-5.31)

by David A Higgins

The Reading Oracle excavations produced an extensive assemblage of 3904 fragments of clay pipes dating from the early 17th century onwards. This is by far the largest assemblage of pipes ever recovered from Reading and it ranks amongst some of the largest groups from anywhere in the country. It is not clear precisely where in the town the clay pipe manufacturers operated and it may well not have been within the excavated areas, but the material still has the potential to be extremely informative about industry in the town. The full report on the clay pipes can be found in Chapter 9 on the CD-ROM. The present section provides an overview of the assemblage and the pipe-making industry in Reading, together with the bowl form typology for Reading that has been developed as a result of this study, and the full catalogue of illustrated pipes.

Although the social elite are likely to have been smoking in Reading from the late 16th century onwards it is only from around 1610 that tobacco became sufficiently affordable and readily available to allow smoking at all levels of society. It is clear, however, that the habit was rapidly adopted at Reading and that pipemakers soon set up in the town to meet the demand. As early as 1623 there were clearly pipemakers in the town, since the chartered company of tobacco pipe makers of Westminster tried to assert their rights over the Reading makers in this year (Oswald 1975, 9) and by the 1630s there were at least four pipemakers working in the town: Caleb Dearing, Ferdinando Hulyns, John Perry and Richard Wheeler (Oswald 1975, 160-161). Records of early pipemakers do not often survive and this is a large number compared with most other English towns of the period. These records suggest that Reading developed an early pipemaking industry and that it was of sufficient importance to attract the attention of the Westminster Company. It is also of interest to note that at least two of these early pipemakers had probably moved to Reading to set up in business. Ferdinando Hulyns is clearly not a local name while both the bowl form and style of mark used by John Perry suggest that he had learnt his trade somewhere in the West Country. This suggests that early 17th-century Reading was a dynamic centre, not only receptive to new ideas and fashions, such as smoking, but also a place that outsiders could move to and set up new businesses.

The significance of Reading as a pipe-making centre is demonstrated by the export of pipes from the town. A pipe of one 17th-century manufacturer, John Perry, was found in London at Queenhithe, one of the principal docks in the heart of the city. This almost certainly reflects 17th-century shipping from Reading that was trading right into the centre of London. During the 18th century, when the Thames was still one of the most important arterial

routes for the movement of goods in and out of London, Reading was ideally placed to take advantage of this trade. Reading continued to export pipes along the Thames into London including examples produced by John Greetham (Fig. 5.29 No.17) and the symbol marked pipes from Reading (Fig. 5.31 Nos 59-65).

For at least the next 200 years the town would almost certainly have been supplying the majority of the pipes consumed within a 10-15 mile radius. Studies from elsewhere have shown that pipes provide an excellent means of determining the market areas of towns (Walker and Wells 1979). Unfortunately, there are no good studies of pipes from the rest of the county with which to compare the Oracle finds and this is clearly a priority for future work. It is only once all the marked pipes from across a wide area have been systematically recorded that the true market areas and influences of Reading will become apparent.

Although Reading never became a major exporter of pipes or a regional trend-setter it is clear that the pipe making industry established itself in the town very early in the 17th century and that it continued to supply the local market until at least the later 19th century. The town sat at the crossroads of trade flowing along the Thames and out to the West Country. The local makers came into contact with pipes from these areas and absorbed elements of them into their own designs but did not establish their own distinctive identity. The impression is of a sound and well-established industry supplying the town and its hinterland, but not one that grew to supply a larger area or to set its own fashions. The majority of the pipes that they produced were very plain and ordinary but they were still able to produce a range of wares to cater for the top end of the market as well. During the 19th century improved transport systems brought increasing competition from more distant markets, which, together with changes in smoking fashions towards other forms of pipe or cigarettes, eventually led to the demise of the industry. In national terms, Reading supported a steady community of pipemakers for some three centuries who made an interesting range of products to meet the local market needs. These excavations have not only started to reveal their products but also to set them into a broader context.

Bowl form typology

One of the most important advances made as a result of this study has been the establishment of a bowl form typology for the town. The excavated material reliably charts the evolution of bowl forms for the two centuries from *c* 1610. Pipe styles changed rapidly during this period and many of the forms were produced for no longer than 30 or 40 years. Since pipes had a very short life expectancy, these bowl forms can be used to accurately date the archaeological deposits in which they occur.

The pipe bowls have been divided into two broad groups, spur forms and heel forms, prefixed 'S' and 'H' respectively, and a separate typological sequence has been provided for each. The typology has been established on the basis of the bowl profile, and it is the size and profile of the bowl that should be matched with the following forms; marks, decoration or finishing occurring on the examples selected are not significant.

The Spur Forms (S1-S18)

A total of 18 different spur types were represented amongst the excavated material. The earliest forms (S1-S5) are very similar to the styles produced in London and would be indistinguishable from them. After the middle of the 17th century there is a slight tendency for the Reading pipes to be rather more forward leaning than their London counterparts (S6-8) but the majority of the pipes remain very similar. The real break with London fashions is heralded from the 1660s onwards by the appearance of a few forms more typical of central southern England (S9-S10). These pipes tend to have more curved forms, their rims are more nearly parallel with the stem and they often have burnished (polished) surfaces. Some of these bowls are certainly imports to the town, but others may well have been produced in Reading, copying popular styles from further west.

During the late 17th and early 18th centuries the spur forms become rather taller and more slender but with well-developed curves to their profiles (S11-S17). These curved forms are typical of central southern England and some examples may actually be from there, for example, S14. The majority, however, were almost certainly produced in the town, where they become relatively common during this period. The end-date for these forms has generally been put at around 1730 but it is worth noting that well dated groups from this period are scarce and the terminal date for these forms is not very secure. Late 18th-century groups were not well represented from the excavations but there is no evidence for spur pipes from this period and they may well have gone out of fashion for a while. Spur forms reappear during the 19th century (S18), when they form a small element of the pipes in use.

The Heel Forms (H1-H35)

Heel forms were always more popular than spur forms in Reading and represent the majority of the pipes found at all periods. As with the spur forms, the heel forms dating from before around 1680 almost all mirror London styles (H1-H17). The only exception is H15, which is of a style used in central southern England and the West Country. Although this piece could be an import, there is a similar example stamped with the mark of John Perry, who is known to have worked in Reading. The Perry example clearly shows that this style was also produced in the town, even if only in small numbers. The profiles of the early bowls are very

variable, making it hard to divide them into clear-cut types. Most have round or oval heels although some are heart-shaped, for example, H6-H7.

Towards the end of the 17th century the heel bowls become rather more elongated and with markedly curved profiles (H18-H24), mirroring the changes seen in the spur types. One characteristic that does stand out is the occasional use of a particularly flared round heel (H22 and H24). Alongside these curved types are some interesting transitional forms that include relatively straight-sided types (H25-H27) and some very forward-leaning types (H28-H30). The latter seem to have been relatively common in Reading, where they may well represent a distinctive local development. At the very end of the 17th century a much more tubular, upright bowl form appears (H31-H32), which goes on to become the dominant form for much of the 18th century, when it occurs in large numbers, replacing almost all other forms. Examples of this type are very hard to date within the broad period of their currency, since the form changes little, although later examples tend to have thinner stems and bowl walls and smaller stem bores and makers' initials. This form was also dominant in London and many other areas of the south-east. Towards the end of the 18th-century type H33 evolved into a rather fuller form with a smaller heel (H34) before becoming rather more squat and with a deeper heel by the early 19th century (H35). Types H32-H35 usually have the maker's initials moulded onto the heel, the base of which was almost always trimmed before about 1800 but very rarely thereafter. Some of the examples dating from after *c* 1760 also have moulded decoration on the bowl, for example H34.

Not enough later material was present to establish a reliable 19th-century typology for either the spur or heel pipes although both forms would have continued to develop during this period. The main change later in the 19th century was the introduction of spurless pipes, such as Figure 5.31 No. 68, from about 1850 onwards.

Overall, the Oracle assemblage shows that London styles were followed until the middle of the 17th century but that, around the middle of the century, small numbers of pipes of central southern or West Country form appear. Initially these occur in very small numbers, both as actual imports and as local copies in that style. From about 1680-1750 these styles had a great influence on local production and local variants emerge, which form a significant element of the excavated assemblage during most of this period. Alongside the West Country styles other more London-orientated forms were produced, some of which also evolved into distinctive local types. Around 1700 a new upright, tubular London style appears, which gradually replaced the other more local forms to become the dominant type. Spur forms become much less common after about 1730 and may have totally disappeared for a while during the later 18th century. Styles start to change again from around the 1760s, once again following London trends. Later forms were not recovered in any quantity but it is almost certain that London styles would have been copied from the later 18th century onwards.

Decorated and modified pipes

Almost all of the pipes recovered from the excavations are plain. Four stems had been ground at one end after breaking (Fig. 5.28 Nos 1-4) and had probably been used like sticks of chalk for writing or drawing. A few examples of decorated stems include milling used to disguise sections that had been damaged and repaired during the manufacturing process (Fig. 5.28 Nos 9 and 10). Moulded decoration did not become common on British pipes until towards the end of the 18th century, a period poorly represented in this assemblage. A good early example of a fluted design can be seen on Figure 5.28 H34, and Figure 5.31 No. 66 is a relatively early and unusual example of swag decoration. It is a northern European import, most probably from France, where similar designs are illustrated in the Fiolet trade catalogue of 1846. This is the only known example of its type from the country.

Manufacturing and finishing techniques

Only a very small proportion of the fragments had been burnished, that is, finished with a polished surface during the manufacturing process, and it appears primarily on the West Country style bowls, suggesting that these pieces were either imported, or else that the technique was adopted along with the new bowl styles. Burnishing seems to have gone out of use in this area around 1730. Internal bowl marks are also rare. This technique, usually associated with the flat bowl interior bases of the late 17th and 18th century, was noted on only 12 of 385 examples. Ten of these had an upright cross aligned with the stem of the pipe (eg. Figs 5.28 H34; 5.29 No. 29; and 5.31 No. 63). One had an eight-arm star (Fig. 5.30 No. 46), and another an eight-arm star with spikes between the arms (Fig. 5.30 No. 45). The final point to note with regard to production techniques is that some of the late 17th- to early 18th-century pipes have unusually small stem bores. This feature was noted on 37 examples with stem bores of 4/64'', some of which occur in what appear to be early 18th-century groups. Such small stem bores are usually associated with late 18th-century or 19th-century pipes, although the author has noted that similar small stem bores appear to be characteristic of the Oxford industry during the early 18th century.

Marked pipes

Some 30 different manufacturers are represented by 187 different marks, the majority of whom are known, or presumed, to have worked in the town.

No examples of marked pipes appear to have been published from Reading before, making the examples illustrated here particularly valuable. The 17th-century pipes from Reading are very rarely marked. The only stamped heel from the excavations was marked John Perry, who is recorded as a pipemaker in the town during the 17th century. This is the first known example of a Perry pipe, which shows how inadequate the sample of pipes from the town still is. A few marked pipes of late 17th- to early 18th-century date confirm the arrival of pipes from the west and south-west of the country, for example from the regionally important pipe production centre of East Woodhay in Hampshire. These imported pipes tend to have incuse stamped marks and burnished surfaces, features not normally found in London and the Home Counties. By far the largest and most interesting groups of stamped pipes are those with the mark of John Greetham on the stem, 11 examples of which were found (Fig. 5.29 No. 17). A search of the internet IGI site has shown that a John Greetham, age 28, married Francis Pinnock at East Woodhay in 1704, and a John Greetham is listed as marrying at Reading on 21 December 1721. Was this a pipemaker from the East Woodhay production centre who moved to Reading, or perhaps his son? It seems almost certain that one of these is the maker who produced the pipes found in the excavations. A group of 30 distinctive West Country style bowls have various combinations of hand (or gauntlet), crown and star marks (Fig. 5.31 Nos 59-65). The occurrence of similar marks at London seems likely to be evidence for river trade between Reading and London, rather than the production of West Country styles in the capital itself.

From the later 17th century onwards, moulded marks came into such common use that the majority of the later pipes have them on the side of the heel. These are usually just the maker's initials, although occasionally symbol marks occur. Many of the initial marks can be linked with documented makers from Reading or the surrounding area. From the middle of the 19th century there was a fashion for incuse moulded stem marks, and this is reflected in the excavated assemblage by a single example produced in the town by the Brunsdon family (Fig. 5.29 No. 22). A full catalogue of stamped and moulded marks can be found in the clay tobacco pipe report in Chapter 9, on the CD-ROM.

Catalogue of illustrated pipes

All illustrations are at 1:1 with the exception of the details of the stamped marks, which are at 2:1.

Figure 5.26

S1 **Bowl fragment** of *c* 1610-1640 with fully milled and bottered rim and a stem bore of 7/64". Quite a good little form, but roughly finished. Area 22 Ctx 2135, Ref. No. 113.

S2 **Bowl fragment** of *c* 1630-1660 with unmilled and bottered rim and a stem bore of 7/64". Area 29 Ctx 3833, Ref. No. 173.

S3 **Bowl fragment** of *c* 1650-1670 with half milled and bottered rim and a stem bore of 8/64". Area 29 Ctx 4171, Ref. No. 321.

S4 **Bowl fragment** of *c*1650-1670 with fully milled and bottered rim and a stem bore of 7/64". Area 22 Ctx 1855, Ref. No. 66.

S5 **Bowl fragment** of *c* 1660-1680 with half milled and bottered rim and a stem bore of 7/64". Area 12 Ctx 572, Ref. No. 26.

S6 **Bowl fragment** of *c* 1660-1690 with unmilled and bottered rim and a stem bore of 7/64". Area 12 Ctx 752, Ref. No. 42.

S7 **Bowl fragment** of *c* 1680-1710 with unmilled and bottered rim and a stem bore of 6/64". Made of a fine sandy fabric. Area 29 Ctx 4486, Ref. No. 533.

S8 **Two joining bowl fragments** (freshly broken) of *c* 1680-1710 with a bottered rim and a stem bore of 7/64". Rim slightly damaged but probably never milled. Area 29 Ctx 4344, Ref. No. 379.

S9 **Bowl fragment** of *c* 1660-1690 with a bottered rim and a stem bore of 7/64". Incuse stamped mark reading R G across the stem – probably Richard Greenland of Norton St Philip, Somerset, recorded 1664-1710 (ob). The pipe has been finished with a good burnish. Area 29 Ctx 5600, Ref. No. 726.

S10 **Bowl fragment** of *c* 1680-1720 with unmilled and bottered rim and a stem bore of 7/64". Well finished spur bowl with good curved form and finely burnished surface. Rather a large bore for Reading at this date and almost certainly an import to the town. Area 29 Ctx 3958, Ref. No. 262.

S11 **Bowl fragment** of *c* 1680-1710 with a bottered rim and a stem bore of 7/64". Unusual form – uncertain if it has an unusually curved front or whether it has just been distorted when soft. Plain groove for one quarter of rim facing smoker. Area 29 Ctx 5602, Ref. No. 731.

S12 **Bowl and joining stem fragment** (fresh break) of *c* 1680-1720 with unmilled and bottered rim and a stem bore of 5/64". A total of 89mm of stem survives without a mark. Area 29 Ctx 5274, Ref. No. 606.

S13 **Bowl and four joining stem fragments** of *c* 1690-1730 with unmilled, internally trimmed and bottered rim and a stem bore of 7/64". The joining fragments suggest that this piece was freshly deposited, thus providing a reliable date for the context. Area 29 Ctx 3854, Ref. No. 207.

S14 **Bowl fragment** of *c* 1690-1750 with unmilled and cut rim and a stem bore of 6/64". The pipe has been given a good burnish. REORM 98 [U/S].

S15 **Bowl fragment** of *c* 1690-1730 with unmilled, cut and wiped rim and a stem bore of 5/64". Unusual form with very pronounced flare at rim and a sharp, forward pointing spur. Area 29 Ctx 5448, Ref. No. 641.

S16 **Bowl fragment** of *c* 1690-1730 with unmilled, cut and wiped rim and a stem bore of 6/64". Area 29 Ctx 5575, Ref. No. 702.

S17 **Two joining bowl fragments** (fresh break) of

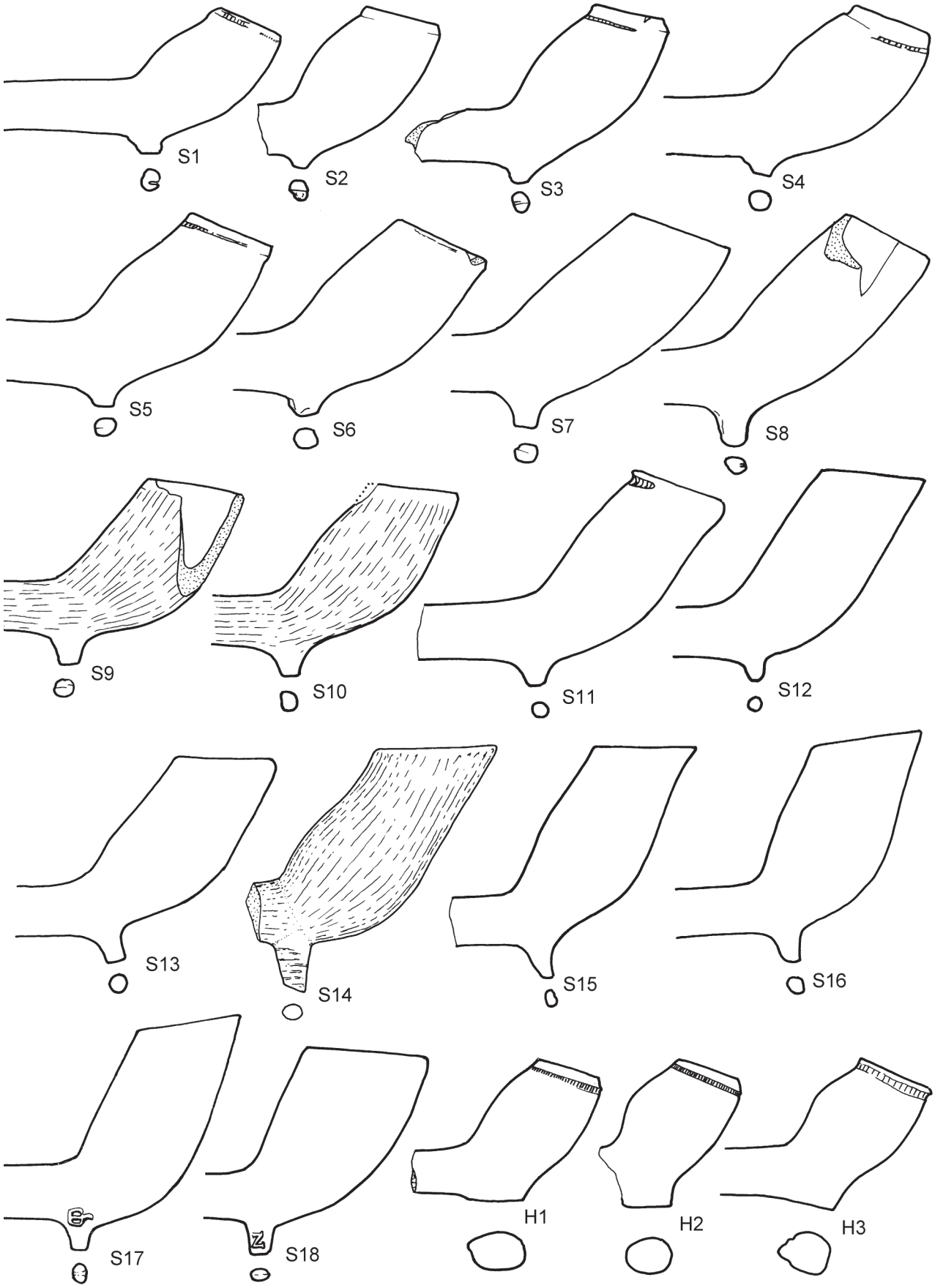


Fig. 5.26 Clay tobacco pipes: Spur forms (Nos S1-S18) and heel forms (Nos H1-H3)

c1690-1730 with unmilled and cut rim and a stem bore of 6/64". Relief moulded mark comprising a hand and crown on the sides of the spur. The bowl has an internal bowl cross – the 'upright' axis of which leans slightly to the left of the long axis of the pipe. Area 29 Ctx 5199, Ref. No. 590.

S18 **Bowl fragment** of *c* 1820-1880 with unmilled and cut rim and a stem bore of 4/64". Relief moulded mark reading I N on the heel sides. Same mould as an example in Context 282 (No 749). Made by John Norris of Reading. Area 304 Ctx 12560.

H1 **Bowl fragment** of *c* 1610-1640 with fully milled and bottered rim and a stem bore of 6/64". Area 22 Ctx 2002, Ref. No. 79.

H2 **Bowl fragment** of *c* 1610-1640 with fully milled and bottered rim and a stem bore of 7/64". Area 29 Ctx 4362, Ref. No. 403.

H3 **Bowl fragment** of *c* 1610-1640 with fully milled and bottered rim and a stem bore of 8/64". Area 22 Ctx 2000, Ref. No. 68.

Figure 5.27

H4 **Bowl fragment** of *c* 1620-1640 with fully milled and bottered rim and a stem bore of 8/64". Area 29 Ctx 5502, Ref. No. 684.

H5 **Bowl fragment** of *c* 1630-1660 with fully milled and bottered rim and a stem bore of 7/64". Area 22 Ctx 2053, Ref. No. 104.

H6 **Bowl fragment** of *c* 1630-1660 with half milled and bottered rim and a stem bore of 7/64". Area 29 Ctx 5250, Ref. No. 597.

H7 **Bowl fragment** of *c* 1640-1660 with half milled and bottered rim and a stem bore of 7/64". Lop-sided and rather oval heel. Area 22 Ctx 2000, Ref. No. 77.

H8 **Bowl fragment** of *c* 1650-1670 with half milled and bottered rim and a stem bore of 6/64". Area 28 Ctx 10266, Ref. No. 761.

H9 **Bowl fragment** of *c* 1650-1670 with half milled and bottered rim and a stem bore of 7/64". Area 29 Ctx 5475, Ref. No. 658.

H10 **Bowl fragment** of *c* 1650-1670 with half milled and bottered rim and a stem bore of 7/64". Area 22 Ctx 2199, Ref. No. 114.

H11 **Bowl fragment** of *c* 1650-1670 with half milled and bottered rim and a stem bore of 7/64". Very poor and lop-sided little bowl. Area 12 Ctx 9317, Ref. No. 55.

H12 **Bowl fragment** of *c* 1650-1670 with half milled and bottered rim and a stem bore of 7/64". Area 29 Ctx 3704, Ref. No. 131.

H13 **Bowl fragment** of *c* 1660-1680 with three quarters milled and bottered rim. Area 29 Ctx 3705, Ref. No. 132.

H14 **Bowl fragment** of *c* 1650-1670 with three quarters milled and bottered rim and a stem bore of 8/64". Area 29 Ctx 4376, Ref. No. 424.

H15 **Bowl fragment** of *c* 1650-1680 with unmilled and bottered rim and a stem bore of 6/64". Unusual bowl type for Reading – more typical of Central/Southern or West Country styles. Area 29 Ctx 5596, Ref. No. 724.

H16 **Bowl fragment** of *c* 1660-1680 with one quarter milled and bottered rim and a stem bore of 7/64". Area 12 Ctx 586, Ref. No. 29.

H17 **Bowl fragment** of *c* 1660-1680 with one quarter milled and bottered rim and a stem bore of 7/64". Area 29 Ctx 5790, Ref. No. 733.

H18 **Bowl fragment** of *c* 1660-1690 with half milled and bottered rim and a stem bore of 6/64". Area 29 Ctx 4439, Ref. No. 470.

H19 **Bowl fragment** of *c* 1670-1700 with unmilled and bottered rim and a stem bore of 7/64". Area 29 Ctx 5475, Ref. No. 663.

H20 **Bowl fragment** of *c* 1670-1700, unmilled and internally trimmed and bottered rim and a stem bore of 7/64". Area 29 Ctx 4209, Ref. No. 333.

H21 **Bowl fragment** of *c* 1670-1700 with unmilled and bottered rim and a stem bore of 6/64". Area 29 Ctx 5582, Ref. No. 715.

H22 **Bowl fragment** of *c* 1680-1710 with one quarter milled and bottered rim and a stem bore of 7/64". Transitional type with large flared heel. Area 29 Ctx 5544, Ref. No. 686.

H23 **Bowl fragment** of *c* 1680-1710 with unmilled and bottered rim and a stem bore of 6/64". Area 29 Ctx 3839, Ref. No. 179.

Figure 5.28

H24 **Bowl fragment** of *c* 1680-1720 with a milled and bottered rim. Stem bore unmeasureable. Transitional form with a flared heel and very curved body shape – not a London form. Bowl damaged. Area 29 Ctx 3787, Ref. No. 152.

H25 **Bowl fragment** of *c* 1670-1700 with a milled and internally trimmed and bottered rim and a stem bore of 7/64". Area 29 Ctx 5567, Ref. No. 696.

H26 **Bowl fragment** of *c* 1680-1710 with unmilled and bottered rim and a stem bore of 6/64". Area 29 Ctx 4463, Ref. No. 522.

H27 **Bowl fragment** of *c* 1680-1710 with one quarter milled and internally trimmed and bottered rim and a stem bore of 6/64". Relief moulded mark reading P I on the sides of the heel. Early use of a moulded initial mark – possibly arranged incorrectly and intended to read IP rather than PI. Area 29 Ctx 4463, Ref. No. 523.

H28 **Bowl and joining stem fragment** (fresh break) of *c* 1680-1710 with unmilled and internally trimmed and bottered rim and a stem bore of 7/64". Area 29 Ctx 4486, Ref. No. 540.

H29 **Bowl fragment** of *c* 1680-1710 with half milled and bottered rim and a stem bore of 6/64". Area 22 Ctx 2046, Ref. No. 93.

H30 **Bowl fragment** of *c* 1680-1710 with unmilled and internally trimmed and bottered rim and a stem bore of 7/64". Area 29 Ctx 4394, Ref. No. 460.

H31 **Bowl fragment** of *c* 1690-1740 with unmilled and cut and internally trimmed rim and a stem bore of 6/64". Area 300 Ctx 13273.

H32 **Bowl fragment** of *c* 1690-1720 with unmilled and cut and wiped rim and a stem bore of 6/64". Area 29 Ctx 5575, Ref. No. 707.

H33 **Bowl fragment** of *c* 1700-1770 with unmilled and cut and wiped rim. Area 29 Ctx 3789, Ref. No. 155.

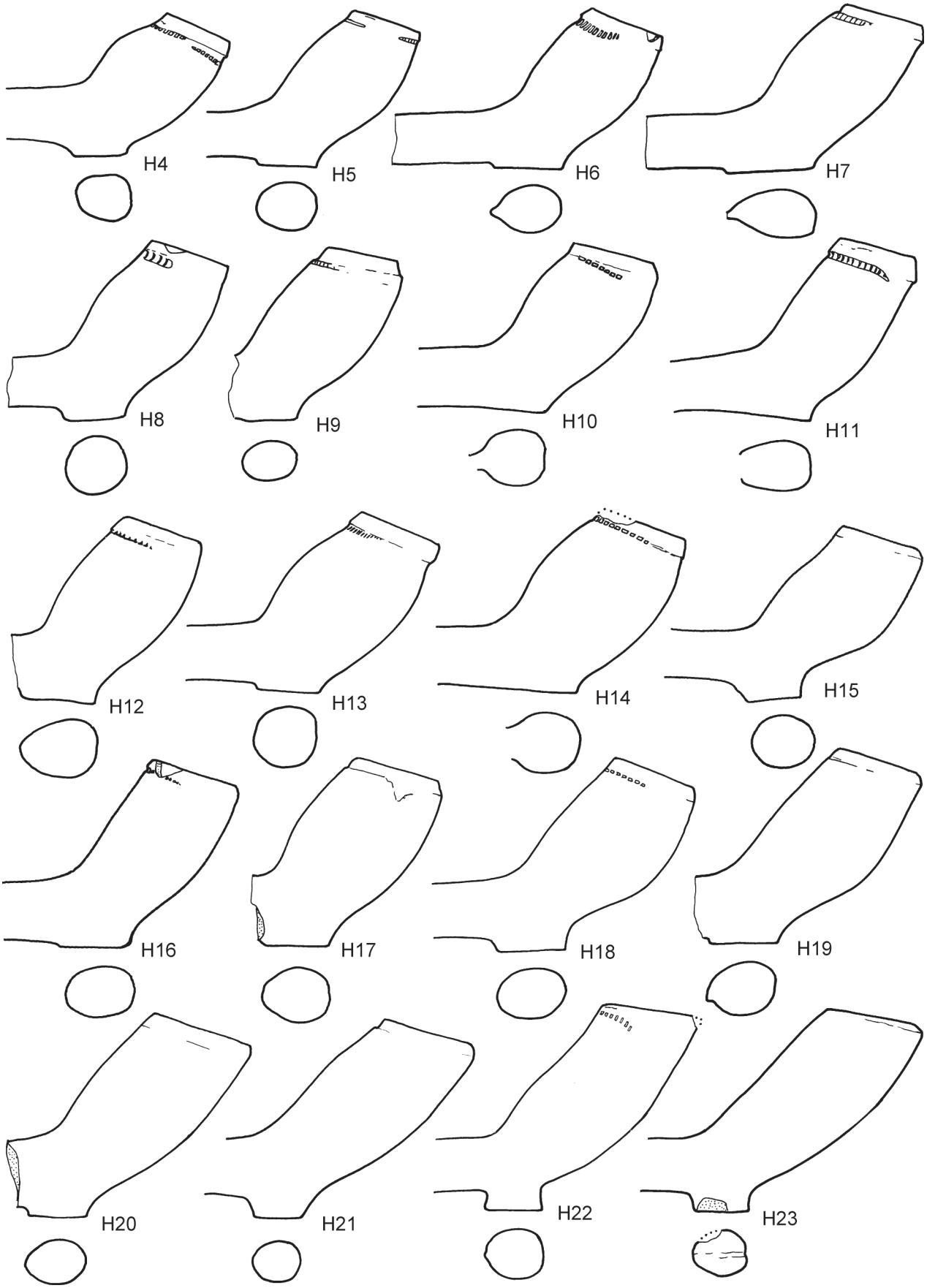


Fig. 5.27 Clay tobacco pipes: Heel forms (Nos H4-H23)

H34 **Bowl fragment** of *c* 1760-1820 with unmilled and cut rim and a stem bore of 4/64". Flutes and dots on bowl with foliage above. Traces of moulded initials on heel that appear to have been erased in mould. Heel base trimmed. Upright internal bowl cross. Area 29 Ctx 5475, Ref. No. 682.

H35 **Bowl fragment** of *c* 1780-1820 with unmilled and cut and possibly wiped rim. Relief moulded mark reading I N on the sides of the heel. Complete bowl with cut and possibly wiped rim. Base of heel not trimmed so most likely early nineteenth century in date. Area 29 Ctx 3704, Ref. No. 129.

1 **Mouthpiece fragment** of *c* 1700-1800 with a stem bore of 4/64". Unusual fragment comprising a mouthpiece with the broken end ground smooth to give a total length of 34mm for the re-worked fragment. Area 12 Ctx 627, Ref. No. 766.

2 **Stem fragment** of *c* 1670-1730 with a stem bore of 7/64". A 67mm section of stem with part of one end ground smooth (just one edge of the narrow end break). Area 29 Ctx 3715.

3 **Stem fragment** of *c* 1610-1700 with a stem bore of 7/64". Stem with one end ground smooth after having been broken. Area 12 Ctx 505, Ref. No. 765.

4 **Stem fragment** of *c* 1640-1700 with a stem bore of 7/64". Stem fragment with a single facet ground across one end after having been broken. Area 29 Ctx 5475, Ref. No. 664.

5 **Two joining stem fragments** (freshly broken) of *c* 1610-1700, pinched to give barley-sugar decoration and with a stem bore of 7/64". The stem is very highly fired to near stoneware and has slaggy encrustation. An associated bowl from the same context dates from c1650-1670. Area 22 Ctx 2060, Ref. No. 770.

6 **Stem fragment** of *c* 1680-1710 with a stem bore of 6/64". Unusual stem with faint lines along its length, as if burnished but too wet, and faint spiral decoration impressed. This is not a very clean line or milled, just a lightly impressed marks comprising two complete loops with flanking spirals. Area 29 Ctx 5544, Ref. No. 688.

7 **Stem fragment** of *c* 1610-1700 with a stem bore of 7/64". Stem fragment from near the mouthpiece that has clearly broken during manufacturing and been pushed together again, leaving a 'step' in the stem. This has been wiped smooth but not finished with a band of milling, as is usually the case. Area 29 Ctx 5370, Ref. No. 619.

8 **Stem fragmen**t of *c* 1610-1700 with a stem bore of 7/64" and a double spiral groove all along the stem. One groove is more steeply angled and has been applied over the other. Uncommon form of decoration. Area 29 Ctx 4468, Ref. No. 531.

9 **Stem fragment** of *c* 1650-1670 with a stem bore of 7/64". Stem fragment from mid-section of the pipe with a lumpy area decorated with a milled band, presumably from a stem repair. Area 29 Ctx 4376, Ref. No. 458.

10 **Bowl fragment** of *c* 1640-1660 with half milled and bottered rim and a stem bore of 8/64". Neat pattern of milled decoration on an expanded stem section with a smooth rather than ragged fracture. Almost certainly the milling was to disguise a manufacturing mend which has subsequently parted. Area 22 Ctx 2000, Ref. No. 69.

Figure 5.29

11 **Mouthpiece fragment** of *c* 1610-1700 with a stem bore of 7/64". Interesting mouthpiece with the end slightly expanded, rather like the nineteenth-century nipple type mouthpieces. Area 12 Ctx 752, Ref. No. 768.

12 **Stem fragment** of *c* 1660-1710 with a stem bore of 6/64". Stem with at least four neat, regular cuts made across the stem after firing. Fine, sandy fabric, most likely contemporary with main group of associated bowls, which date from c1680-1710. Area 29 Ctx 3839, Ref. No. 194.

13 **Stem fragment** of *c* 1700-1770 with at least three deep cuts made into stem after it has been fired (one is at the left hand break). The cuts are not deep enough to intersect the stem bore. Area 29 Ctx 3803.

14 **Bowl fragment** of *c* 1650-1680 with one quarter milled and bottered rim and a stem bore of 7/64". Incuse stamped mark reading IOHN PERRY on the heel. West Country style bowl and stamp. Pipemakers named John Perry are recorded at Reading in 1636-37 and 1694. Area 12 Ctx 823, Ref. No. 43.

15 **Bowl fragment** of *c* 1690-1730 with a stem bore of 6/64". Incuse stamped mark reading RICH/ARD/CVTTS across the stem 14mm behind the bowl. Cutts worked at East Woodhay where he married in 1693 and was buried in 1731. Area 29 Ctx 3864, Ref. No. 214.

16 **Bowl fragment** of *c* 1660-1690 with bottered rim and a stem bore of 7/64". Incuse stamped mark reading R G across the stem. Probably Richard Greenland of Norton St Philip, Somerset – recorded 1664-1710 (ob). The pipe has been given a good burnish. Area 29 Ctx 5600, Ref. No. 726.

17 **Bowl and joining stem fragment** of *c* 1690-1730 with bottered rim and a stem bore of 5/64". Incuse stamped mark reading IOHN/GREE/THAM across the stem. Fine spur bowl with joining stamped stem – the stamp starts 15mm from bowl. Illustrated pipe from Area 29 Ctx 5575, Ref. No. 700 with another stamp from Area 29 Ctx 5366, Ref. No. 614 used to complete the die detail. The second example has a stem bore of 6/64" and the stem stamp starts about 10mm from the bowl junction.

18 **Bowl fragment** of *c* 1690-1720 with cut rim and a stem bore of 6/64". Incuse stamped mark reading RICH/ARD.S/AYER across the stem. Richard Sayer is recorded at East Woodhay in Hampshire from at least 1685 unitl his death in 1716 (Cannon 1991, 25). Area 300 Ctx 13361.

19a **Bowl and joining stem fragment** of *c* 1690-1730 with unmilled, cut and wiped rim and a stem bore of 6/64". Relief moulded mark comprising a hand and crown on the sides of the spur and an octagonal bird stamp (probably an eagle) across the stem. The

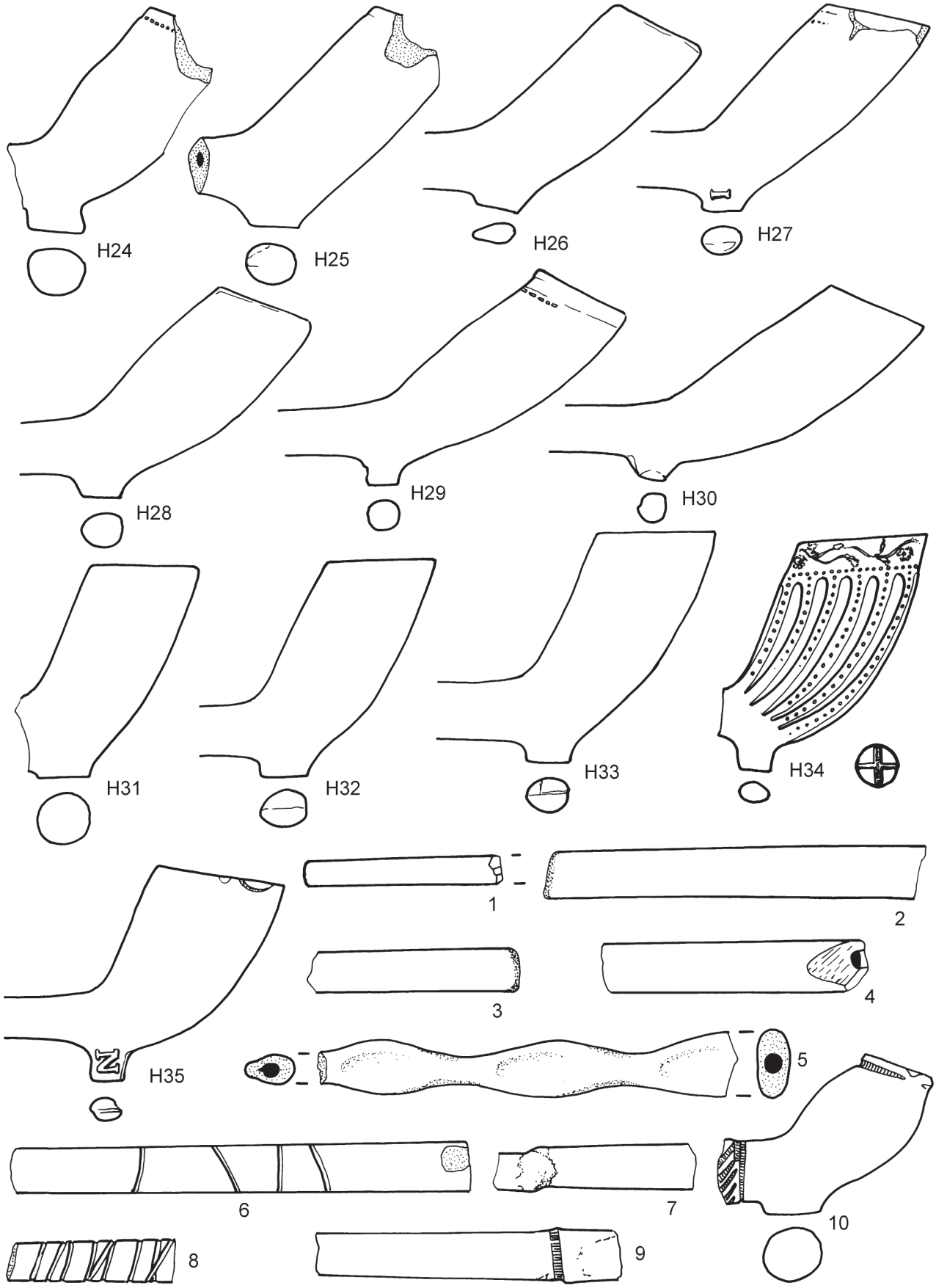


Fig. 5.28 Clay tobacco pipes: Heel forms (Nos H24-H35), other pipes (Nos 1-10)

joining fragment (old break) gives 15cm of stem surviving in all. The stem stamp starts 17mm from bowl and was clearly not associated with any other borders, etc. The pipe has been given a good burnish. Area 12 Ctx 8565, Ref. No. 49.

19b **Detail of a different bird oval stamped** across the stem of a bowl from the same mould as 19a above. This example has a cut rim, a stem bore of 6/64" and has been given a finely burnished surface. This stamp also occurs in isolation and starts 20mm from the bowl. Area 29 Ctx 4171, Ref. No. 323.

20 **Stem fragment** of *c* 1850-1920 with a stem bore of 3/64". Incuse stamped mark reading 'L. Fiolet/a St Omer' across the stem. Thin stem with moulded vine scroll design, picked out with enamel decoration. The firm operated from 1765-1921 but this mark was only appears to have been used after 1833 and the style of the pipe is mid-nineteenth century or later. Area 12 Ctx 646, Ref. No. 767.

21 **Stem fragment** of *c* 1880-1920 with a stem bore of 4/64". Incuse stamped mark reading 'Gambier/à Paris/M * H/Deposé' across the stem. This particular mark was only introduced in about 1879 by the firm. The stem has been given a good burnish. Area 29 Ctx 3831, Ref. No. 172.

22 **Stem fragment** of *c* 1850-1880 with a stem bore of 4/64". Incuse moulded mark reading BRUNSDON/READING along the sides of the stem. The Brunsdon family is recorded working at Reading from at least 1840-81. Area 12 Ctx 8788, Ref. No. 764.

23 **Bowl fragment** of *c* 1840-1880 with a stem bore of 3/64". Relief moulded mark reading I B on the sides of the spur. Not enough of the bowl survives to see whether it was decorated or not. Area 29 Ctx 4541, Ref. No. 556.

24 **Three joining bowl fragments** of *c* 1780-1820 with unmilled and cut rim and a stem bore of 4/64". Relief moulded mark reading W H on the sides of the heel. Unidentified maker. Area 356 Ctx 12691.

25 **Bowl fragment** of *c* 1680-1710 with one quarter milled, internally trimmed and bottered rim and a stem bore of 6/64". Relief moulded mark reading P I on the sides of the heel. Early use of a moulded initial mark – possibly arranged incorrectly and intended to read IP rather than PI. Area 29 Ctx 4463, Ref. No. 523.

26 **Bowl fragment** of *c* 1700-1770 with a stem bore of 5/64". Relief moulded mark reading P I on the sides of the heel. Lettering matches IP pipes, perhaps reversed in error. Area 300 Ctx 13271.

27 **Bowl fragment** of *c* 1760-1810. Relief moulded mark reading W I on the sides of the heel. Heel has been trimmed so probably dates from before c1800-1810. A similar example, but probably from a different mould, was recovered from Ctx 3923, Ref. No. 253. This piece is from Area 29 Ctx 3704, Ref. No. 127.

28 **Bowl fragment** of *c* 1810-1850 with unmilled and cut rim and a stem bore of 4/64". Relief moulded mark reading D M on the sides of the heel. Large serif initials on heel; thin flutes and alternating spikes and leaves on the bowl. Quite a short bowl form. Area 29 Ctx 3833, Ref. No. 176.

29 **Bowl fragment** of *c* 1760-1800 with cut rim and a stem bore of 4/64". Relief moulded mark reading I? M? on the sides of the heel. Thin-walled bowl with a faint upright internal bowl cross – leaning slightly to right. Damaged initials, possibly reading IM but not certain. Heel trimmed. Area 29 Ctx 5475, Ref. No. 678.

30 **Bowl fragment** of *c* 1780-1820 with a stem bore of 4/64". Relief moulded mark reading E N on the sides of the heel. Area 29 Ctx 3839, Ref. No. 193.

Figure 5.30

31 **Bowl fragment** of *c* 1780-1820 with unmilled, cut and possibly wiped rim. Relief moulded mark reading I N on the sides of the heel. Base of heel not trimmed so most likely early nineteenth century in date. Area 29 Ctx 3704, Ref. No. 129.

32 **Three joining fragments** from a large, thin-walled bowl of *c* 1780-1820 with cut rim and a stem bore of 4/64". Relief moulded mark reading I N on the sides of the heel, which is not trimmed so most likely to be early nineteenth century in date. Area 29 Ctx 5475, Ref. No. 679.

33 **Bowl fragment** of *c* 1820-1880 with unmilled and cut rim and a stem bore of 4/64". Relief moulded mark reading I N on the sides of the heel. Same mould as an example in Ctx 282] Ref. No. 749. Made by John Norris of Reading. Area 304 Ctx 12560.

34 **Bowl fragment** of *c* 1780-1820 with a stem bore of 4/64". Relief moulded mark reading W N on the sides of the heel. Heel fragment only. Area 29 Ctx 3963, Ref. No. 275.

35 **Bowl fragment** of *c* 1820-1860 with unmilled and cut rim and a stem bore of 5/64". Relief moulded mark reading W N on the sides of the heel. Area 304 Ctx 12560.

36 **Bowl fragment** of *c* 1690-1730 with unmilled and cut rim and a stem bore of 5/64". Relief moulded mark reading I P on the sides of the spur. I has curled serifs; spur base is trimmed. Area 29 Ctx 4050, Ref. No. 306.

37 **Bowl fragment** of *c* 1690-1730 with unmilled and bottered rim and a stem bore of 5/64". Relief moulded mark reading I P on the sides of the spur. Area 29 Ctx 3887, Ref. No. 243.

38 **Bowl fragment** of *c* 1700-1750 with unmilled, internally trimmed and wiped rim and a stem bore of 6/64". Relief moulded crowned mark reading I P on the sides of the heel. Chunky bowl form – could well be early eighteenth century (c1700-20) and contemporary with other bowls in this context. Area 29 Ctx 3864, Ref. No. 218.

39 **Bowl fragment** of *c* 1700-1770 with unmilled, cut and wiped rim and a stem bore of 5/64". Relief moulded mark reading I P on the sides of the heel, with a dot moulded before the initial I. Area 12 Ctx 8565, Ref. No. 50.

40 **Bowl fragment** of *c* 1700-1770 with unmilled and cut rim and a stem bore of 5/64". Relief moulded

Fig. 5.29 Clay tobacco pipes: Pipes (Nos 11-30)

mark reading I P on the sides of the heel. Area 300 Ctx 13273.

41 **Bowl fragment** of *c* 1700-1770 with unmilled and cut rim and a stem bore of 4/64". Relief moulded mark reading I P on the sides of the heel. Curled serifs to the I. Area 29 Ctx 4039, Ref. No. 297.

42 **Bowl fragment** of *c* 1700-1770 with unmilled and bottered rim and a stem bore of 4/64". Relief moulded mark reading I P on the sides of the heel. I with curled serifs. Area 29 Ctx 4173, Ref. No. 330.

43 **Bowl fragment** of *c* 1700-1770 with unmilled and cut rim and a stem bore of 5/64". Relief moulded mark reading I P on the sides of the heel. Small bowl, very similar to 40 but from a different mould. Area 300 Ctx 13271.

44 **Bowl fragment** of *c* 1700-1770 with unmilled and cut rim and a stem bore of 5/64". Relief moulded mark reading I P on the sides of the heel. Area 29 Ctx 3868, Ref. No. 224.

45 **Bowl fragment** of *c* 1700-1770 with unmilled, cut and wiped rim and a stem bore of 5/64". Relief moulded mark reading I P on the sides of the heel and an unusual internal bowl mark comprising an eight-arm star with spikes between the spokes. Plain serifs on the I. Area 29 Ctx 3824, Ref. No. 160.

46 **Bowl fragment** of *c* 1700-1770 with unmilled and cut and wiped rim and a stem bore of 4/64". Relief moulded mark reading I P on the sides of the heel. Interior bowl mark comprising a fairly bold upright cross (+) and a slighter angled cross (x) making up an eight arm star. Area 29 Ctx 4046, Ref. No. 300.

47 **Bowl fragment** of *c* 1740-1780 with unmilled and cut and wiped rim and a stem bore of 4/64". Relief moulded mark reading I P on the sides of the heel. Area 29 Ctx 3870, Ref. No. 224.

48 **Bowl fragment** of *c* 1740-1780 with a stem bore of 4/64". Relief moulded mark reading I P on the sides of the heel. Area 29 Ctx 3870, Ref. No. 227.

49 **Bowl fragment** of *c* 1770-1820 with a stem bore of 4/64". Relief moulded mark reading M P on the sides of the heel. This fragment has traces of enclosed flutes on bowl. Base of heel not trimmed. Area 29 Ctx 5475, Ref. No. 683.

50 **Bowl fragment** of *c* 1700-1770. Relief moulded mark reading R P on the sides of the heel. Area 29 Ctx 3704, Ref. No. 119.

Figure 5.31

51 **Bowl and joining stem fragment** of *c* 1700-1770 with unmilled and cut rim and a stem bore of 5/64". Relief moulded mark reading R P on the sides of the heel. Bowl and joining stem (old break) to give 123mm of straight stem surviving. The R is rather small and poorly executed in comparison with the P. Area 29 Ctx 5582, Ref. No. 721.

52 **Bowl fragment** of *c* 1700-1770 with cut rim and a stem bore of 6/64". Relief moulded mark reading R P on the sides of the heel. Area 29 Ctx 4848, Ref. No. 562.

53 **Bowl fragment** of *c* 1700-1770 with a stem bore of 5/64". Relief moulded mark reading S P on the sides of the heel. Heel only, probably early C18, unidentified maker Area 302 Ctx 12201, Ref. No. .

54 **Bowl fragment** of *c* 1760-1810 with a stem bore of 4/64". Relief moulded mark reading T P on the sides of the heel. Heel fragment with trimmed base. Area 29 Ctx 5475, Ref. No. 680.

55 **Bowl fragment** of *c* 1690-1730 with a stem bore of 5/64". Relief moulded mark reading I S? on the sides of the spur – poorly moulded and with the surname initial unclear. Area 29 Ctx 5383, Ref. No. 629.

56 **Bowl fragment** of *c* 1700-1770 with unmilled and cut rim and a stem bore of 5/64". Relief moulded mark reading P or R S on the sides of the heel. Area 300 Ctx 13273.

57 **Two joining bowl fragments** (fresh break) of *c* 1700-1770 with unmilled and internally trimmed and cut rim and a stem bore of 5/64". Relief moulded mark reading T S on the sides of the heel. Area 29 Ctx 3833, Ref. No. 174.

58 **Two joining bowl fragments** (fresh break) of *c* 1700-1750 with unmilled and cut and wiped rim and a stem bore of 6/64". Relief moulded mark reading T? S on the sides of the heel. Area 12 Ctx 8676, Ref. No. 52.

59 **Bowl fragment** of *c* 1690-1730 with unmilled and cut and wiped rim and a stem bore of 5/64". Relief moulded mark comprising a star with a central dot on each side of the spur. This fragment has 62mm of surviving stem without any stamped mark on it. Area 29 Ctx 5384, Ref. No. 631.

60 **Bowl fragment** of *c* 1700-1740 with unmilled, cut and possibly bottered rim and a stem bore of 5/64". Relief moulded mark comprising a star with a central dot on each side of the heel. Area 302 Ctx 12201.

61 **Bowl fragment** of *c* 1690-1730 with unmilled and cut and wiped rim and a stem bore of 5/64". Relief moulded mark comprising a hand on each side of the spur. Area 29 Ctx 5383, Ref. No. 627.

62 **Bowl and joining stem fragment** of *c* 1690-1730 with unmilled, cut and wiped rim and a stem bore of 6/64". Relief moulded mark consisting of a hand and crown on the sides of the spur. Two examples from this particular mould type were found, each of which had a different bird stamp applied to the stem (see s 19a and 19b). Area 12 Ctx 8565, Ref. No. 49.

63 **Two joining bowl fragments** (fresh break) of *c* 1690-1730 with unmilled and cut rim and a stem bore of 6/64". Relief moulded mark comprising a hand and crown on the sides of the spur. The bowl has an internal bowl cross – the 'upright' axis of which leans slightly to the left. Area 29 Ctx 5199, Ref. No. 590.

64 **Bowl fragment** of *c* 1700-1740 with unmilled and cut and wiped rim and a stem bore of 6/64". Relief moulded mark comprising a hand and crown on the sides of the heel. Area 29 Ctx 5383, Ref. No. 628.

65 **Bowl fragment** of *c* 1760-1790 with a stem bore of 5/64". Relief moulded mark comprising a crown

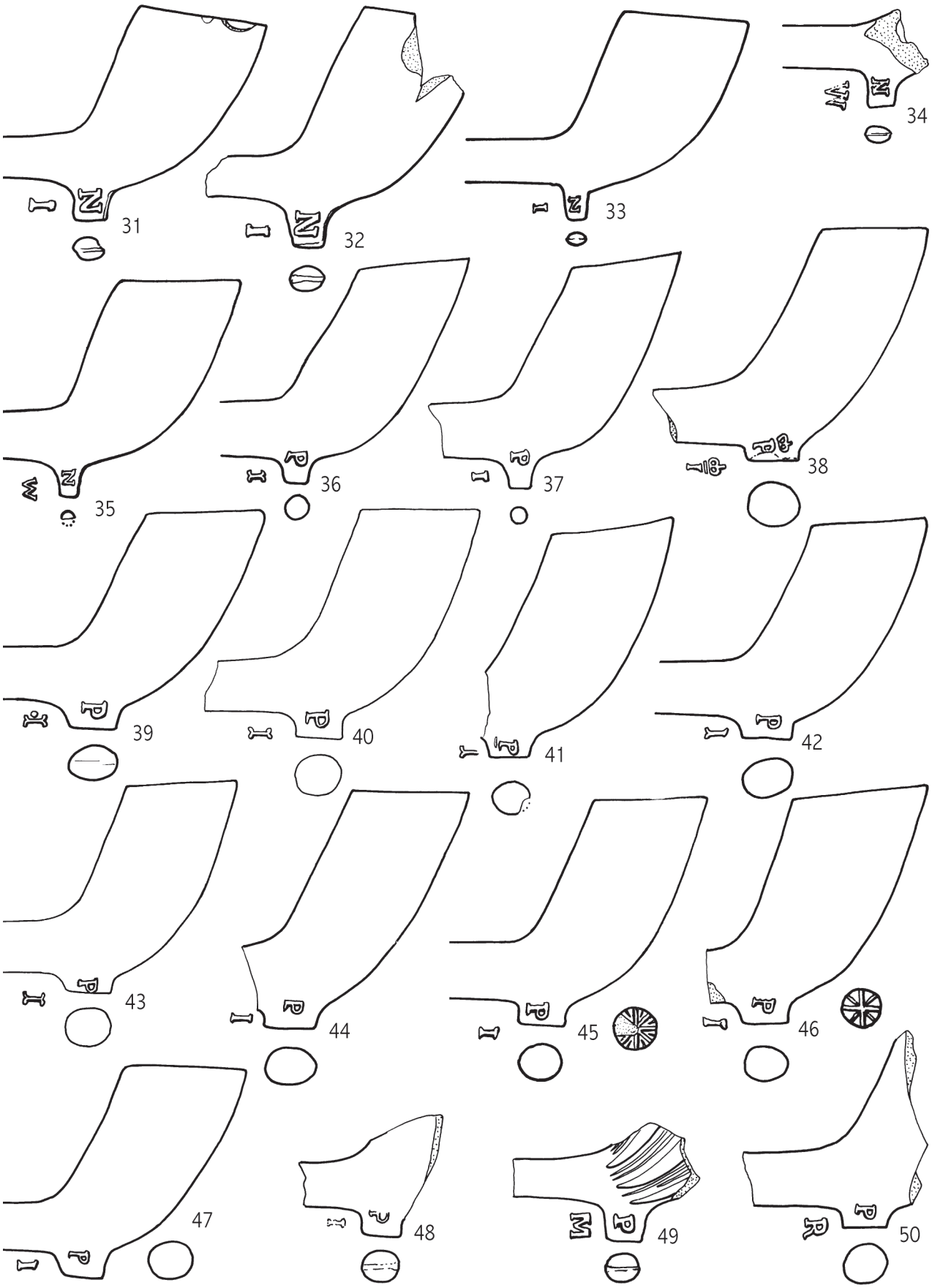


Fig. 5.30 Clay tobacco pipes: Pipes (Nos 31-50)

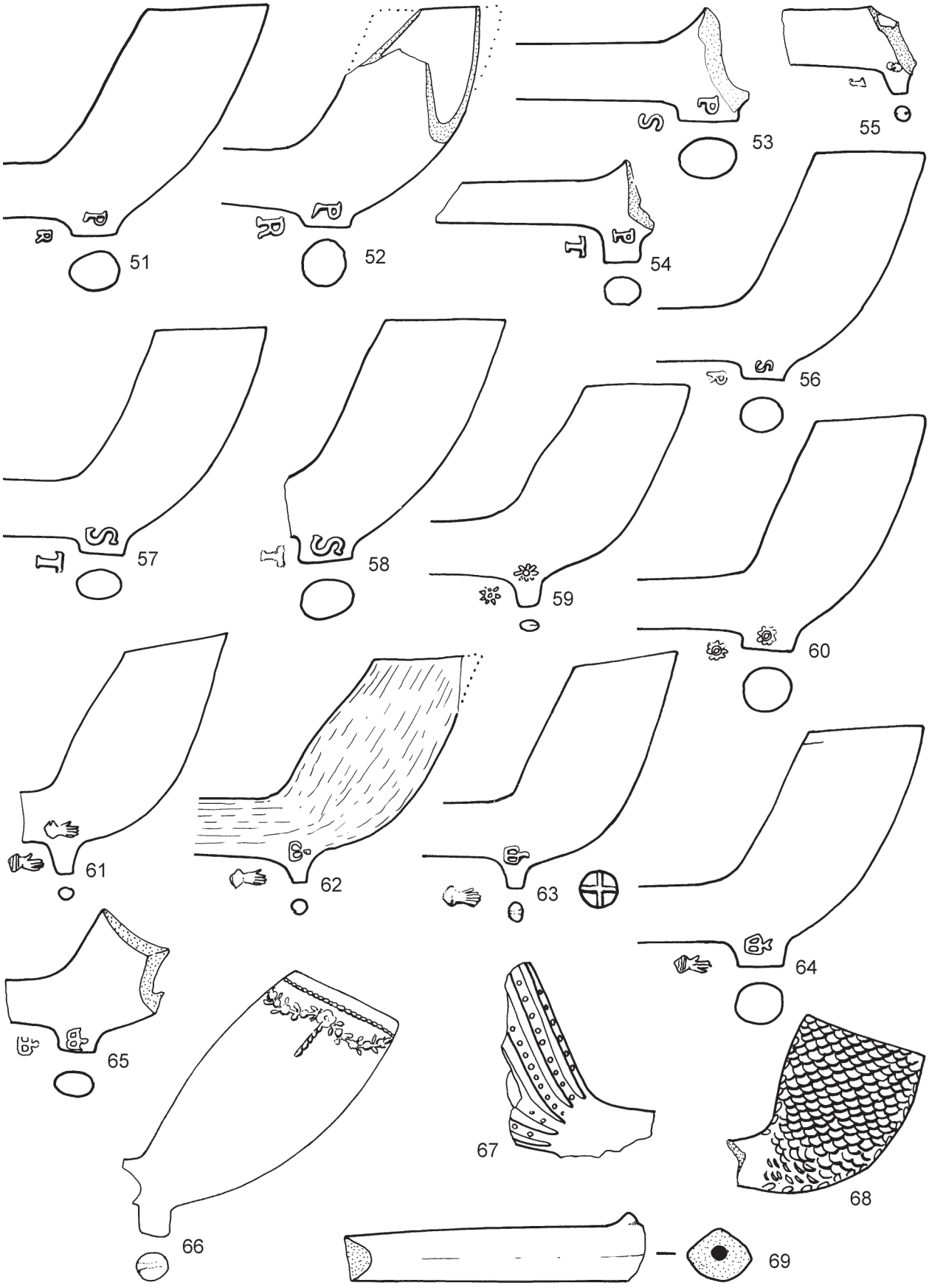


Fig. 5.31 Clay tobacco pipes: Pipes (Nos 51-69)

on each side of the heel. Area 29 Ctx 5378, Ref. No. 625.

66 **Bowl fragment** of *c* 1780-1850 with unmilled, cut and wiped rim and a stem bore of 5/64". Bowl decorated with moulded beading and floral swags; probably French. Area 301 Ctx 12043.

67 **Bowl fragment** of *c* 1780-1820 with moulded decoration consisting of bold, deeply moulded flutes with dots between. Another fragment probably from the same mould recovered from Ctx 5475] Ref. No. 681. Area 29 Ctx 3704, Ref. No. 126.

68 **Bowl fragment** of *c* 1850-1910 with unmilled and cut rim and a stem bore of 4/64". Spurless bowl with open leaves on seams and tile or scale decoration on the bowl sides. Area 12 Ctx 8899, Ref. No. 54.

69 **Stem fragment** of *c* 1850-1920 from a short stemmed or 'cutty' pipe with thorn decoration. The stem has a lozenge-shaped section. Area 300 Ctx 13011.

Other crafts, industries and activities on the floodplain (Figs 5.32-5.50; Plate 5.2)

(Copper alloy and worked bone by Leigh Allen, wooden objects by Steve Allen, lead objects by Cecily Cropper, metalworking by Roger Doonan, worked stone by Ruth Shaffrey, iron by Ian Scott)

Trades at the Oracle and the Yield Hall: the evidence from small finds

The small finds assemblages recovered from the excavations are dominated by utilitarian objects such as nails. There were very few objects from Project Phases 2-4, which is perhaps surprising given the evidence for medieval activity at sites 29 and 12. A very large proportion of the finds are associated with the late medieval and 16th-century leather and textile trades, and subsequently the products and waste of the small-scale craft workshops that were set up at the Oracle workhouse and the Yield Hall. There is also a notable presence of material associated with horses and stabling.

The first sizeable group is from site 12 in Project Phase 5 (15th century). Two thirds of this group comprised nails and miscellaneous fragments, and many of the identifiable objects came from dumps and channel fills and so may have been brought from elsewhere. However, there are some striking consistencies in the character of the different finds and environmental assemblages in this area, which suggests that a considerable proportion could result from fairly localised activities. Some items, particularly two awls and a pair of shears, are associated with leather working. Two fragments of frame from a purse or game bag and a buckle may also have been leather workers' debris. Site 12 also shows an interesting early concentration of knives, with all 9 knives from Project Phase 5 contexts occurring there, and 8 out of 13 of the knives from Phase 6 contexts. More awls and buckles occurred at the site in Project Phase 6. There were also two fragments of sickle blade and two possible fragments of rake tine, which might have been used in the gardens and meadows mentioned in numerous documentary references. Horse gear is also well represented at late medieval and Tudor site 12, with 5 horseshoes and a spur in Project Phase 5, and 3 curry combs, 2 horseshoes and a spur in Project Phase 6. A further spur of medieval form was found redeposited in a Project Phase 8 context. Straps from horse harness and leather panels that may have come from saddles were also found, and waterlogged plant remains from pit and channel fills show that stable waste was being dumped in the area, including compressed straw, bracken and twigs, animal feed and bedding, and the seeds of grassland plants from animal dung. Copper alloy finds from Project Phases 5 and 6 include 'sewing' pins, present from the 15th century onwards, lengths of copper alloy wire that would have been used to make them, thimbles, loop fasteners, strap fittings and buckles. It seems very likely that sewing pins and perhaps associated copper alloy items such as lace tags were being manufactured in the vicinity of the Yield Hall throughout the post-medieval period, starting in the late 15th century. Thimbles occur in small numbers in various phases at site 12 and seem to be particularly associated with it. These are generally coarse thimbles such as might have been used in leather working. A further interesting group of finds from site 12 comprises bone points (not illustrated; see Chapter 9 for catalogue). Some were fashioned from goose radii; the ends were cut obliquely and these objects could have functioned as a rudimentary form of pen, although this interpretation remains uncertain. Other points were fashioned from animal bone, with flat cut heads and tapering shanks, and could have functioned as hair or clothing pins. Potential refuse from specialised craft activities involving goose bones was also noted in the animal bone assemblage (Sykes, Chapter 10). The over-representation of butchered goose metacarpi at site 12 suggests feather exploitation. Many of these elements showed cut marks on the pollical facet or the nose where the ligament attaches (Fig. 10.8). A fragment from a large broken whetstone that would have been used in a workshop (Fig. 5.49 No. 1), and a weight that may have been used for weighing down skins during processing (Fig. 5.49 No. 3) were found in the fills of late medieval pits. A number of turned wooden vessels were found on the floodplain sites (Fig. 5.50 Nos 1, 3, 4 and 5), one of them, together with a crude wooden lid (Fig. 5.50 No. 2), from contexts of Project Phases 5-6 on site 12. A number of staves from coopered vessels (not illustrated; see S Allen, Chapter 9) were also found in deposits of Project Phase 6 at site 12. Iron finds from Project Phases 7 and 8 at site 12 are dominated by structural ironwork, especially nails, with a small quantity of horse gear in Phase 8, perhaps no more than might be expected from a single household. The assem-

blages from Project Phases 9 and 10, dating from the period 1750-1900, are dominated by industrial machinery and tools. The Yield Hall and the surrounding area were, by this time, leased out by the Corporation to a variety of tradesmen (see Chapter 4, above). These included a floorcloth manufacturer, a cabinet maker and upholsterer, a brewer, and by 1821 James Wilder's iron foundry, with which the ironworking debris found in a very late phase from Room 2 of the Yield Hall is certainly to be associated.

There are very few metal finds from site 29 prior to Project Phase 6, the 16th-century development of the area as a tannery and possibly also a cloth works. The copper alloy assemblage from this site and phase is of some interest, however, although there is little to reflect the presence of the tannery in the contemporary ironwork, which is dominated by structural items and tools such as a chisel and fragments of a saw blade, which may have been used in construction. Horse gear included a curb bit and six horseshoes. Contexts associated with the establishment of the sandstone house and its yard on site 29 in the earlier part of the 16th century have produced almost the only notable personal items from the whole site. These include a decorated pin (Fig. 5.34 No. 13), a highly ornate belt chape (Fig. 5.33 No. 12) and a sickle-shaped toothpick or earscoop (Fig. 5.35 No. 21). A number of copper alloy purse mounts are also represented (Fig. 5.34 Nos 17-20). These metal-framed purses appear to have been fashionable for a very restricted period, from the late 15th century until the late 16th century. These, and a number of the plainer buckles, may have been debris from the reworking of cloth or leather, or they may have formed part of a soft-leather worker's stock. Alternatively they may have belonged to fashionable citizens, perhaps living nearby; there are a number of other indicators (including imported glassware) of high-status lifestyles from site 29 at this period.

The Oracle was founded on the site in 1628 as the Kendrick Cloth Workhouse and was intended by its founder, John Kendrick, to provide work for the poor in the manufacture of cloth. Rooms with equipment were leased to various clothiers, but a general downturn in the cloth trade meant that new uses soon had to be found for the facilities (see Chapter 4, above). Pinmaking may have been established there fairly early, and by the 1720s the rooms were occupied by a variety of poor craftsmen making pins, silk and sailcloth. By the 19th century the Oracle housed manufacturers of sacking, rope and sailcloth, pins and light fabrics such as silk and satin. A Directory of 1830 records a ribbon manufacturer, a haberdasher and a rope maker at the Oracle. Out of the total of 806 copper alloy objects found at site 29, 564 were 'sewing' pins, made from drawn wire with a spiral wire head; in all, 1677 of these pins were recovered from all areas of Oracle excavations. There can be little doubt that these are the pins that were being made at the workhouse (Plate 5.2). A furnace and its fills were excavated (Project Phase 8) and produced evidence for cinder, coke and clinker, suggesting that smithing was taking place and using coke as a fuel, and this was confirmed by the identification of hammerscale on the site. The overwhelming predominance of short pins with two twists of wire tightly crimped into a spherical head suggests that the main period of manufacture was after 1630, probably after *c* 1700. Also present were over 100 lengths of copper alloy wire from which the pins were made. Pins of this type were used for dress-

Plate 5.2 Drawn wire 'sewing' pins

making and tailoring as well as for securing headdress. They were also used in the upholstering of furniture, and it is interesting to note that other furniture fittings such as tacks and drape rings were also in evidence among the Oracle copper alloy assemblages. While these could have been used within the work house, it is possible that furniture was being made there, or that upholstery supplies were manufactured. Lace tags frequently occurred in the same contexts as the pins, and may also have been manufactured on the site, as may the small number of buttons found. There is little evidence in the iron assemblage for these activities, however. Most iron finds are of structural metal-work (including nails) from demolition deposits; there are also horseshoes and bridle fragments, spurs and a number of tools such as a hammer and a possible craft knife. The final phase, Project Phase 10, relates to the period 1850-1900, following the demolition of the Oracle workhouse. The ironwork from this phase is still predominantly structural, but includes a wood chisel and two furniture fittings, a drop handle and a drawer handle. The 'stable and cabinet fac' shown immediately east of the site on the Goad Insurance map of 1895 (Plate 1.8) may have been the source of these.

Illustrations

Lead

Figure 5.32

1 **Lead plug or pot rivet**. Site 29, SF 841
2 **Near complete spoon** with the tip of the handle missing. Site 12, SF 1703
3 **Fragment of spoon handle** with a diamond-shaped section and conical tip. Site 12 SF 1788
4 **Complete spoon** with a pear-shaped bowl and a hexagonal-sectioned shank with a conical terminal. Site 101, SF 1331A
5 **Fragment of perforated lead sheet filter**. Site 28. Found in a timber channel linking two probable vats. It is likely to have been used as a filter in the dyeing process

Copper alloy

Figure 5.33

1 **Buckle frame**. A plain circular buckle frame with a D-shaped section and a thin central bar, probable shoe buckle. L: 30mm, 29 (4202), SF -, Phase 2909a
2 **Buckle frame**. Double oval buckle frame with expanded pin rests. L: 42mm, 29(3864), SF 847, Phase 2909c
3 **Buckle frame**. Oval hinged frame from a shoe buckle with 2 prongs on the inside of the frame to secure the shoe strap. L: 41mm, 29 (3704), SF 803, Phase 2910a
4 **Buckle frame**. Elongated D-shaped buckle frame with an inward facing pin rest, the frame has a D-shaped cross section and has moulded decoration all the way round. L: 38mm, 29(3829), SF -, Phase 2910a
5 **Buckle frame**. Double oval buckle frame with slightly protruding knops at the end of the central bar, the pin is still *in situ*. L: 28mm, 12 (668), SF 33, unphased
6 **Buckle frame**. Double oval buckle frame, the ends of the frame overlap and are secured by the central bar. L: 24mm, 12 (2742), SF 163, unphased
7 **Buckle frame**. A D-shaped buckle frame with a grooved rest for the pin and lobes at the end of the bar. L: 36mm, 101 (7132), SF 1326, unphased
8 **Buckle frame and plate**. Double oval buckle with a folded plate attached to the central bar. The frame is decorated with a stylised floral design. The folded plate has a scalloped attachment end and a single rivet to attach it to the strap. (see Southampton and LMMC). L: 35mm, 300 (13955), SF 2619, unphased
9 **Mount**. Octofoil sheet metal mount with domed lobes, there is a circular perforation through the centre for a rivet. L: 17mm, 29 (5604), SF1146, Phase 2905c
10 **Mount**. Fragment from a rectangular sheet metal mount. There are small circular perforations in the two surviving corners; the upper face is decorated with fine crosshatched lines. L: 37mm, 300 (12621), SF 2538, phase 3000
11 **Strap-end**. Tongue shaped sheet metal plate broken across 2 perforations at the attachment end. There is a third rivet through the point and a fine incised groove runs all around the edge. L: 33, 29 (6079), SF 1164, unphased
12 **Belt chape**. A cast belt chape with a slot at one end for attachment to the strap, the chape is highly decorated with knot designs and open-work. It has a recessed bar and a rectangular slot at the butt end for attachment of the chape to the strap; the slot is reminiscent of the design of 16th-century hooked tags. The body of the chape is roughly tongue shaped, highly decorated with openwork and a grooved design that looks like woven textile. L: 45mm, 29 (5521), SF 1154, phase 2908a

Figure 5.34

13 **Pin**. Pin with a hollow domed head that is formed from 2 flattened hemispheres joined together; the upper face is decorated with repousse bobbles. L: 62mm, 29 (4420), SF 933, Phase 2907a
14 **Pin**. Pin with a hollow domed head that is formed from 2 flattened hemispheres joined together; the upper face is decorated with repousse bobbles. L: 47mm, 101 (7132), SF -, unphased
15 **Pin**. Pin with a solid, cast head in the form of a knot made of interlacing strands of twisted wire. L: 45mm, 300 (13463), SF -, Phase 3002a
16 **Decorated lace tag**. A lace tag with edges that meet and then turn in on themselves (type 2). The lace tag is decorated all over with punched diamonds. L: 27mm, (7019), SF 1322, unphased
17 **Purseframe**. Fragment from the pendent frame of a purse with an L-shaped section. One face has a fine incised lattice pattern on it that may originally have been inlaid with niello. The other face has 6 small circular perforations along it to which the material of the purse would have been attached. (LMMC type A). L: 168mm, 29 (5071), SF 1041, Phase 2907a

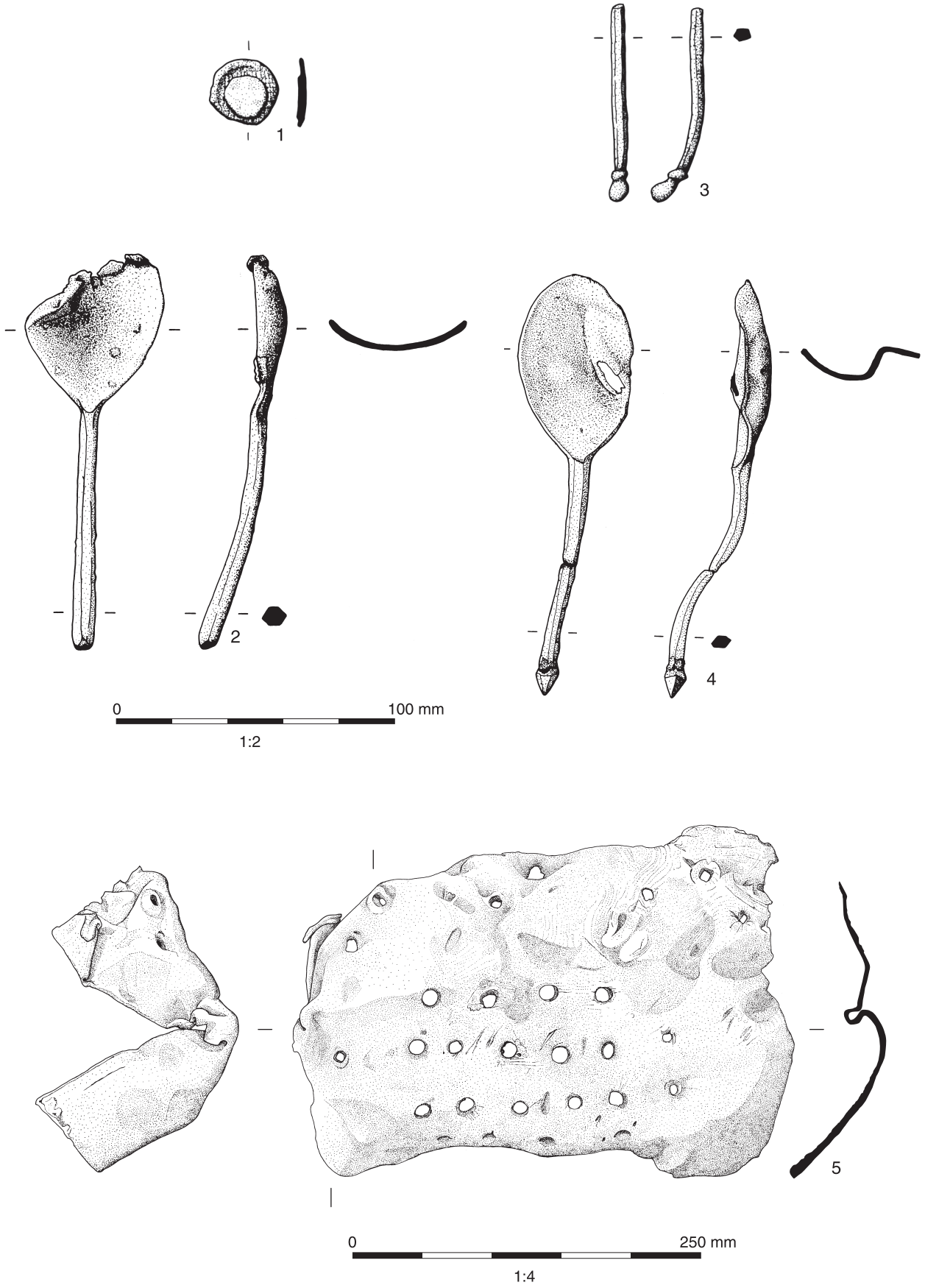


Fig. 5.32 Lead objects (Nos 1-5)

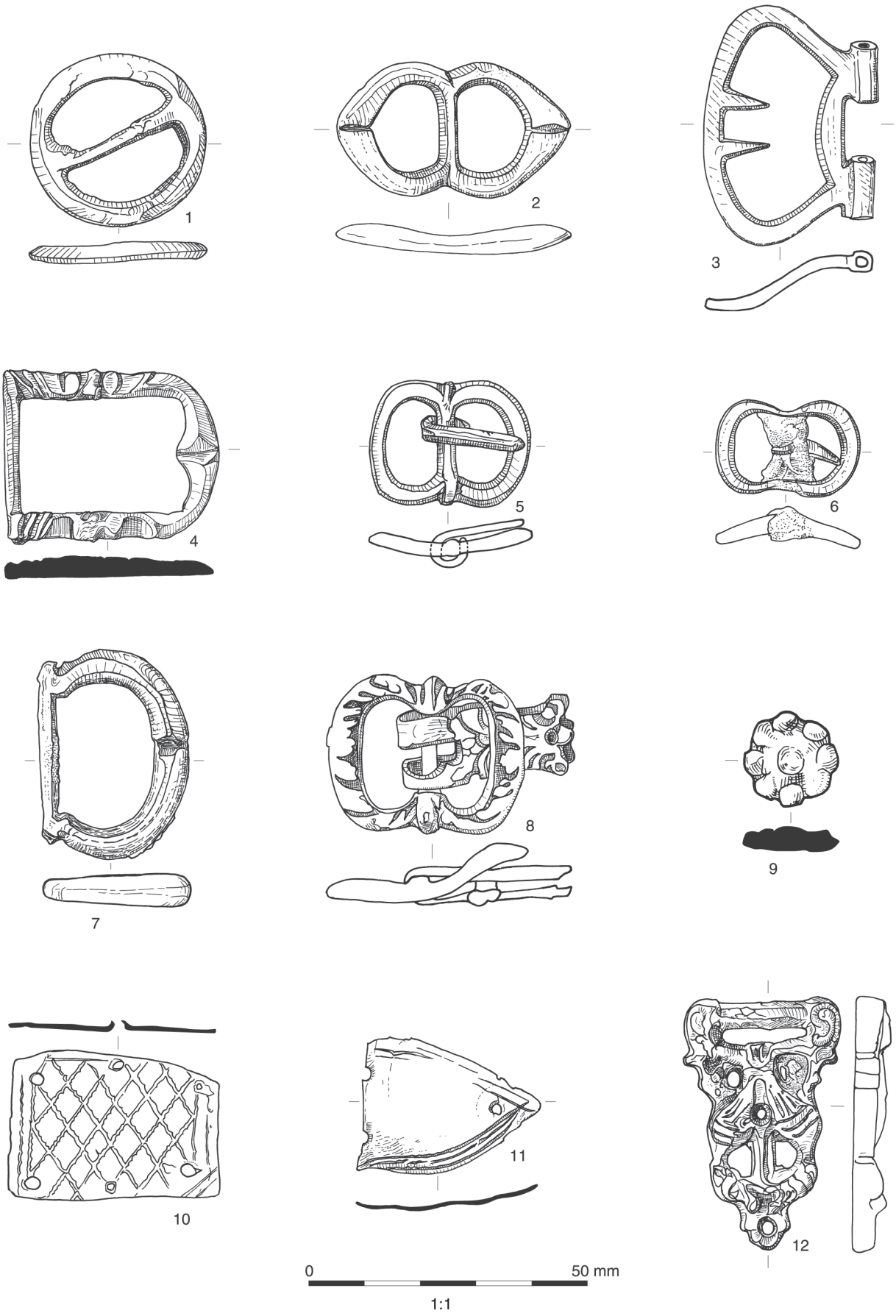


Fig. 5.33 Copper alloy: buckles and belt/strap fittings (Nos 1-12)

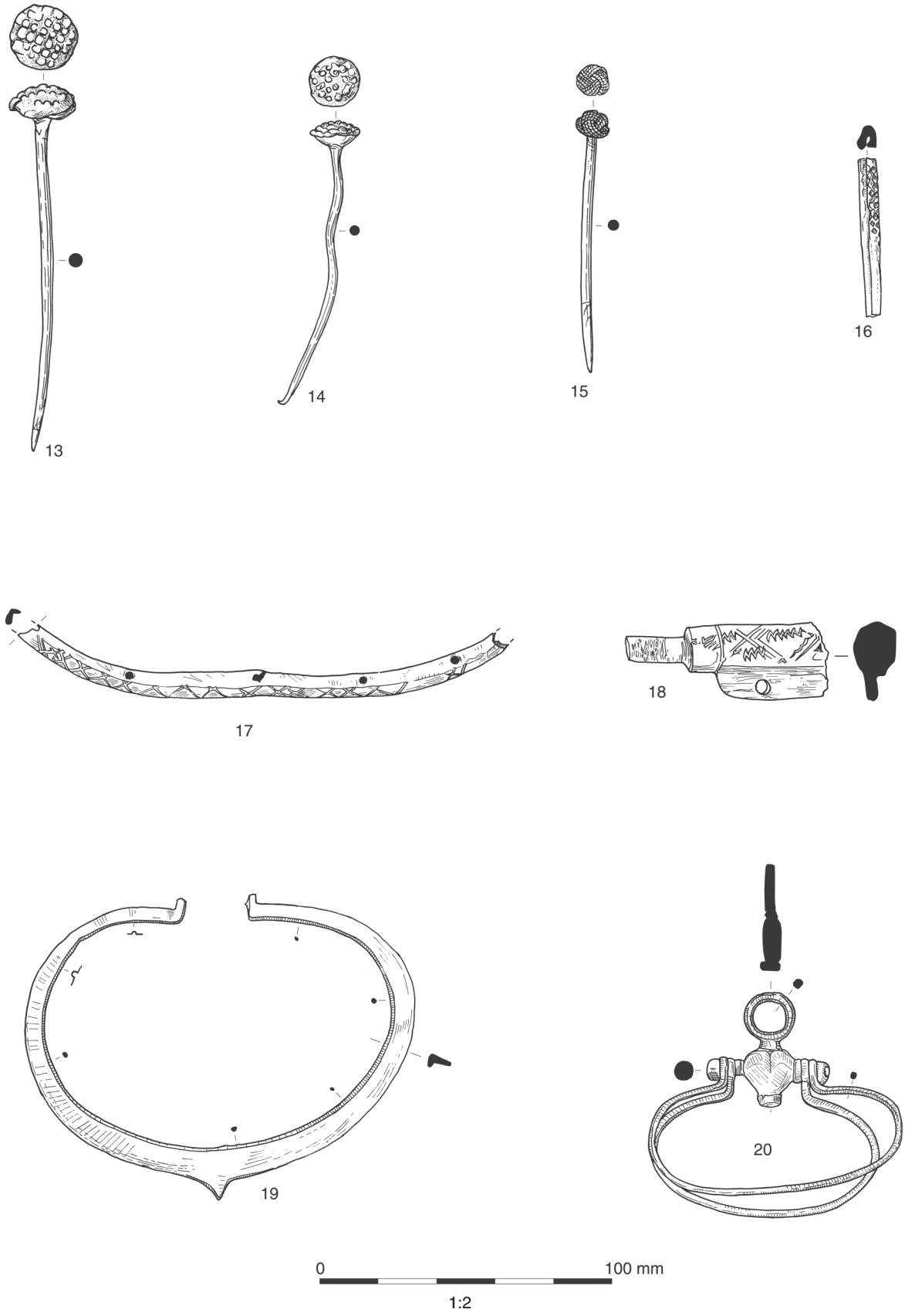


Fig. 5.34 Copper alloy: pins, lace tag and purse frames (Nos 13-20)

18 **Purseframe**. Fragment from the side bar of a purse, the fragment has a circular section and a flange below with a single circular perforation through it for attaching the material of the bag to. The fragment is decorated with a fine incised lattice pattern that may originally have been inlaid with niello. (LMMC type A1). L: 35mm, 29 (4524), SF 1130
19 **Purseframe**. A complete pendent frame from a purse with an L-shaped section with circular perforations running along one face to which the material of the purse would have been attached. The loops that would have attached the frame to the bar are broken. (LMMC type B). L: 132mm, 29 (4663), SF 1020, Phase 2908d
20 **Purseframe**. A complete purse frame with a shield shaped central boss, a short bar of circular section and two pendent loops of circular section (LMMC type B). L: 86mm, 29 (3723), SF 807, Phase 2910a

Figure 5.35
21 **Toothpick/Earscoop**. A combined toothpick/ earscoop with a sickle-shaped pick and a fluted
22 **Hooked clasp**. Sheet metal clasp, hooked at one end and with a flared terminal at the other. There is a rivet at the flared end, which would have secured the clasp to its sprung back plate. L: 33mm, 29 (4376), SF 931, Phase 2909b
23 **Hooked clasp**. Sheet metal book clasp hooked at one end and with a flared terminal at the other There is an iron rivet at the flared end which secures the clasp to a small surviving fragment of the sprung back plate. The upper face is decorated with a band of rocker arm decoration. L: 26mm, 101 (7109), SF 1305, unphased
24 **Fishhook**. A complete fish hook with a flattened terminal and a barbed hook. L: 38mm, 300 (13955), SF 2617, unphased
25 **Thimble**. Hemispherical thimble with horizontal spiralling indentations on the shoulders and sides. The very top of the thimble is plain and there is a narrow plain band at the rim. L: 18mm, 12/2 (8555), SF 1625, unphased
26 **Thimble**. Cast thimble with an elongated body and tapering sides, the indentations are all over the thimble and in clear horizontal lines. The indentations are large and deep. L: 20mm, 12/1 (564), SF 58, Phase 1210
27 **Spoon**. A near complete spoon with a fig leaf shaped bowl and a handle with a hexagonal section. The handle is broken just below the knop. L: 116mm, 12/2 (8655), SF 1669, Phase 1207a
28 **Pin**, possible practice piece.

Iron

Illustrated items from the complete ironwork catalogue; the complete catalogue can be found in Chapter 9 on the CD-ROM.

Figure 5.36
1 **Arrowhead**. Socketed arrowhead, with broad leaf-shaped head and flattened socket. L 44mm. 12/2 (0) unphased. (ID 1015). This arrow is of multi-purpose form as defined by Jessop (1996, 195-7 & fig 1; see also Jessop 1997).
4 **Dagger**. The blade is incomplete and has a simple iron guard or hilt with down turned kite-shaped terminals. The upper part of blade has single edge and triangular section; lower down the blade has a double edge. The x-ray plate suggests that the blade widens slightly at this point, and may be evidence that the blade was slightly curved. Just below the hilt the x-ray shows a circular hole or depression in the centre of the blade, which may have been a makers stamp. L 298mm. 28 (8059) Ph 8. (ID 717). This object cannot be readily paralleled. The initial impression is that the form is medieval with a simple cross hilt. However, although superficially medieval in form there must be doubts about the date of this weapon. Firstly the hilt is very loosely fitted, which suggests that the hilt was packed with organic material to fix it, rather than being a tightly fitted to the blade as we might expect. Secondly, the blade form is wrong, because it is parallel-sided, too narrow and the cross-section unusual for a medieval blade.
5 **Bullet mould**, of tong, or pincer, type for casting a single ball. L 170mm. 22 (2055) sf 319 unphased. (ID 661). This form of bullet mould for casting a single bullet is common from the 16th century; this example is probably of 19th-century date (Blair 1983, 512 & pls 112-3)
6 Possible **wedge**. Flat on one face, curved on the other face, it has chisel edges at each end. L 254mm. W 32mm. 300 (13463) sf 2608 Ph 4. (ID 2029)
9 **Adze**. Complete adze head. Rectangular eye for handle. It has a small hammer head. The x-ray plates show that there is a rectangular hole of slot in the centre of the blade. The function of this slot is uncertain. L 180mm; W 54mm. 300 (14023) sf 2626 Ph 1. (ID 2031)
15 **Claw hammer**. Hammer head, with oval eye. L 133mm. 12/2 (8614) sf 1630 Ph 5. (ID 924)

Figure 5.37
17 **Saw**. Fragment from the tip of a saw blade. The back is curved down towards the point. There appears to be a slight notch near the point. The teeth are spaced at 3+ teeth per inch (*c* 10 teeth per 3 inches). L 110mm. 12/2 (9334) Ph 4. (ID 1639)
19 **Awl**, with tapering circular section blade and tapering square section tang. The junction between the tang and blade is marked by slight encrustation. L mm. 12/2 (8822) Ph 5. (ID 1630)
20 **Awl**, with a square section tapering blade and broken tang. L 138mm. 12/2 (8655) sf 1636 Ph 6. (ID 929)
21 **Awl**, with a round section tapering point and a square section tapering tang. Marked step between the blade and tang. Probably for leatherworking. L 123mm. 12/2 (8675) sf 1646 Ph 6. (ID 974)
26 **Saddlery** or **upholstery needle** with circular section stem and elongated rectangular eye. The point is of diamond section and slightly curved. L 74mm. 300 (13361) unphased. (ID 1981)

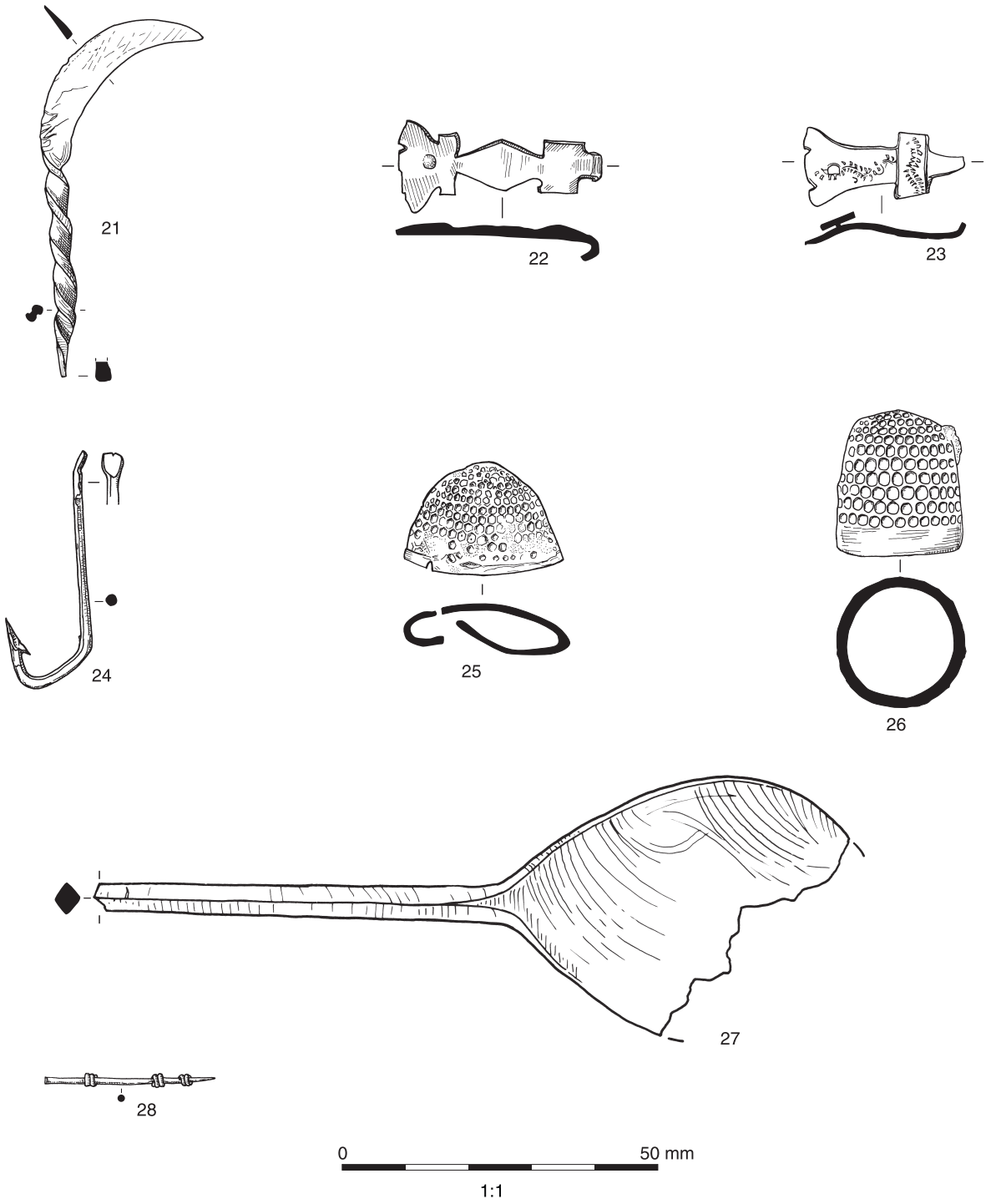
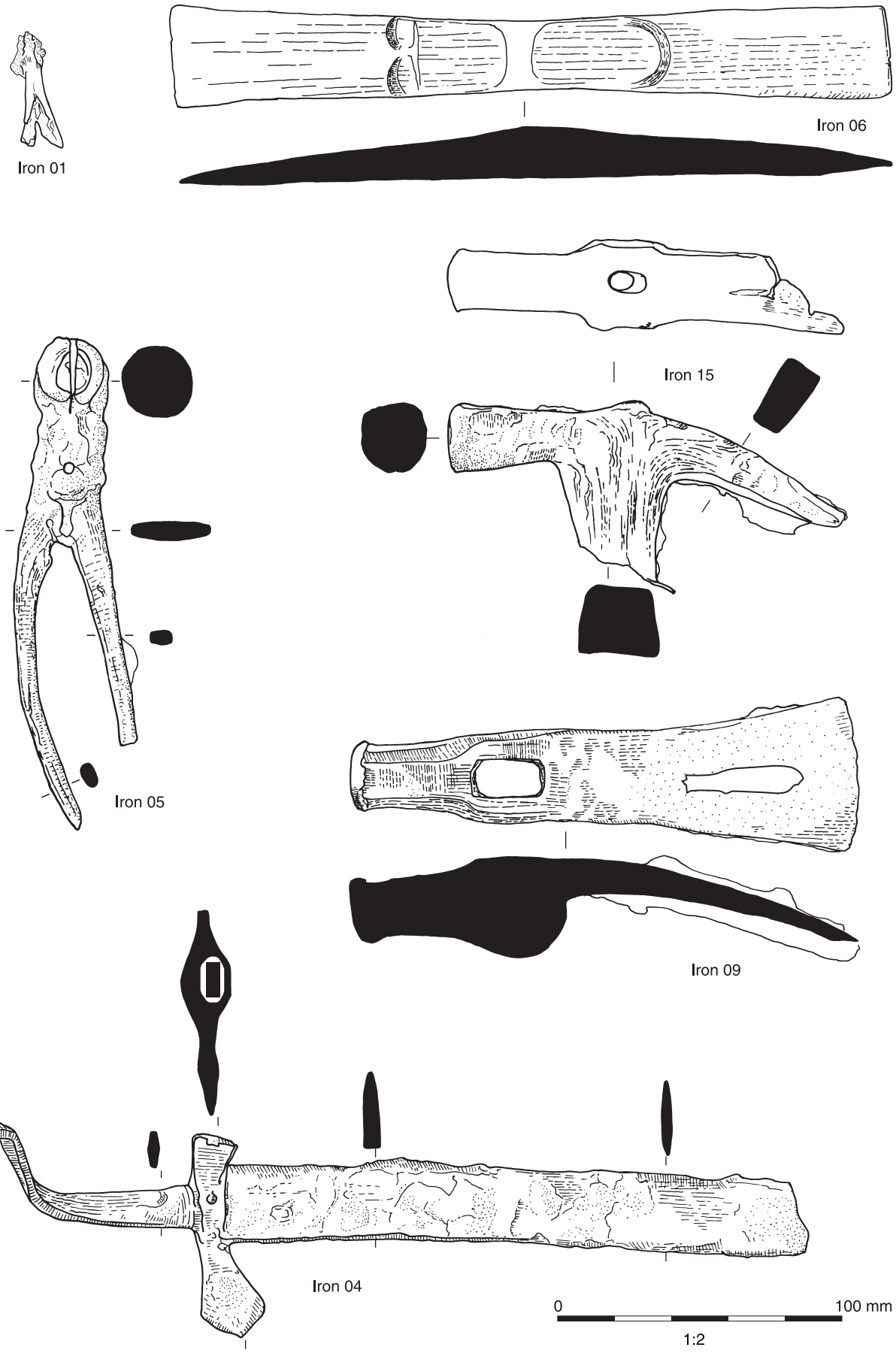


Fig. 5.35 Copper alloy: clasps, thimbles and various objects (Nos 21-28)

Fig. 5.36 (opposite) Iron: Arms, accessories and tools (Nos 1, 4-6, 9, 15)


Iron 01
Iron 06
Iron 15
Iron 05
Iron 09
Iron 04
0
100 mm
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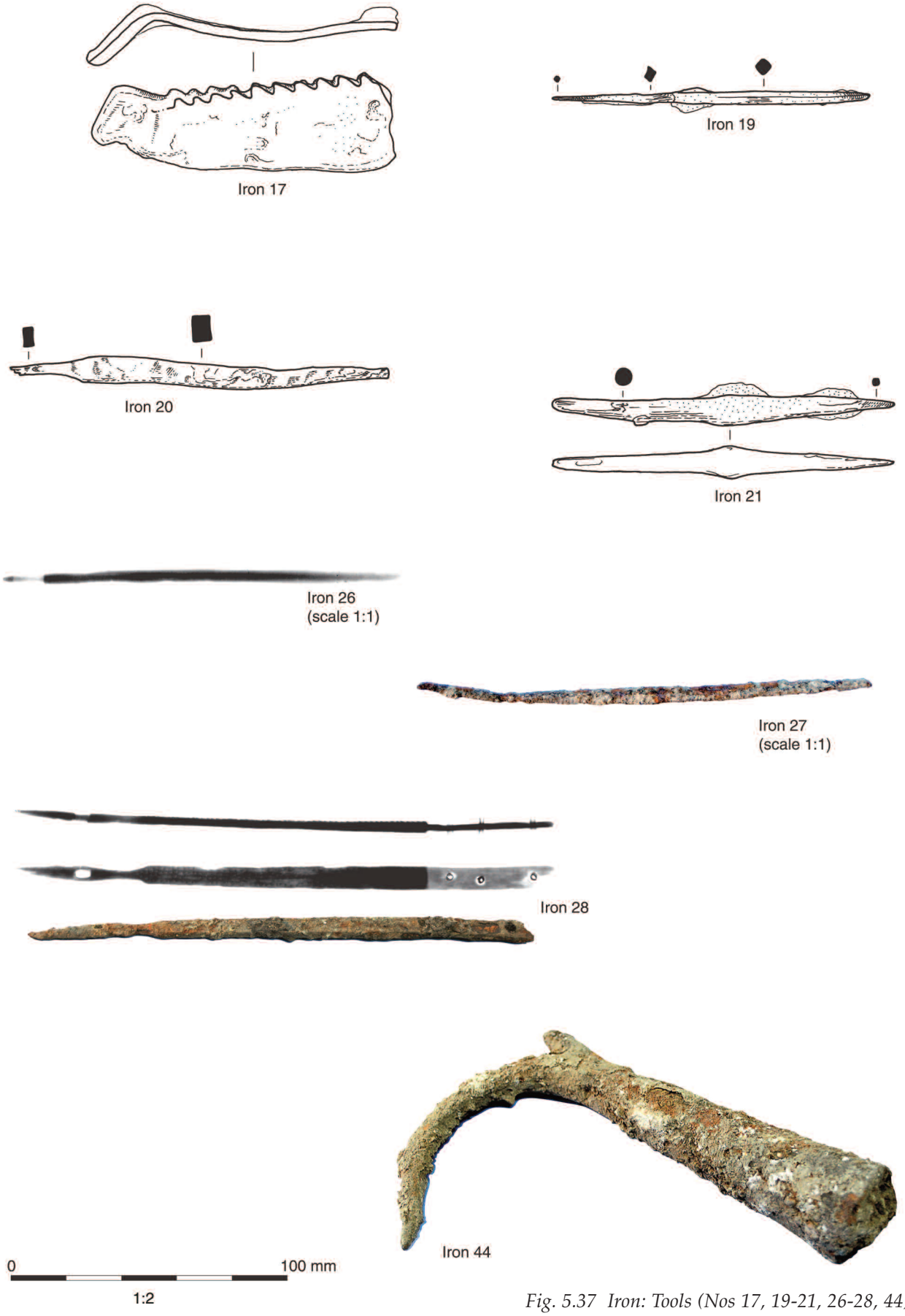


Fig. 5.37 Iron: Tools (Nos 17, 19-21, 26-28, 44)

Fig. 5.38 Iron: Industrial machinery and tools (Nos 45-48, 55, 57)

Iron 62

Fig. 5.39 Iron: Forked socketed object (No. 62)

27 **Saddlery** or **upholstery needle** with circular section stem. The eye is broken. The point is an elongated leaf-shape of diamond cross-section and slightly curved. L 112mm. 300 (13462) unphased. (ID 1985)

28 Possible **bailing needle**? Object with a scale tang handle, with 3 cu alloy rivets. There is a step to the blade, which tapers slightly and is of rectangular section. This portion has possible 'toothing' along one edge. The narrow end is then waisted before terminating in an elongated point with a perforation through it. Possibly some kind of bailing needle. L 199mm. 12/2 (9507) sf 1836 unphased. (ID 1058)

44 Possible **Boat hook**. Circular section socket. The hook is large and its end is has a slight bend. The spike is very small, almost vestigial. L 182mm; W 130mm. 300 (13463) sf 2615 Ph 4. (ID2036)

Figure 5.38

45 **Fire shovel**, with a long handle terminating in a small loop. Much of the fore part of the shovel blade is missing. L 950mm. REORM (12473) sf 2524 unphased. (ID 2072)

46 **Fire shovel**, with a long handle. Most of the shovel blade is eroded away. The handle is bent and terminates in an oval loop. L 695mm. REORM (12473) sf 2522 unphased. (ID 2074)

47 **Ash tray**. Rectangular tray with small upright vertical rim folded up on all four sides and riveted at the corners. The rod handle terminates in a neat loop. L 540mm. REORM (12473) sf 2521 unphased. (ID 2073)

55 Possible **mechanised mixing paddle**, comprising central spindle, with machined collar near one end. There is a short bar which turns about the spindle. Attached to each end of the short bar is a single long strip each of which has a series of staples along one face. These staples probably served to attach organic paddles. The strips are twisted. Probably a mechanically driven paddle for bulk mixing. L 720mm. REORM (12531) sf 2527 unphased. (ID 2075)

57 **Spanner**. Large spanner with square head at each end, one internally 45mm x 45mm, the smaller 35mm x 35mm. They are linked by a heavy bar which curves down to the ends. Spanner for use with machinery? L 420mm. 300 (13955) unphased. (ID 2027)

59 (Illustrated on Fig. 5.41) **Object**, with open socket at the centre; one end is formed of square section rod and ends in a hook; the other end is in the form of a strip and is incomplete. Function unclear. L 190mm. 12/1 (633) Ph 7. (ID 599)

Figure 5.39

62 **Large forked socketed object**, with waterlogged timber in socket. Attached by means of nails or bolts to wooden beam. In addition it has an iron band around the socket. Similar to sf 709, but much larger. The object is marked with 'VV [or W] L' followed 'XII on one fork, and on the other with 'VV [or W] C'. L *c* 610mm. 28 (8473) sf 708 unphased. (ID 1876). The function of this is uncertain. It may have served as the end of a prop or similar.

Figure 5.40

63 **Large forked object**, with open socket with 2 nail or bolt holes. Similar to but smaller than sf 708. The object has several markings: at the base of the fork is a 'P'; one arm has a crudely inscribed 'VV' or 'W', the other possibly 'DW', but the letters are very poorly formed. L c. 400mm. 28 (8473) sf 709 unphased. (ID 1877)

Figure 5.41

73 **Bridle bit**. Fragments of side bars from a curb bit identified from x-ray plates. The longer fragment is 175 mm and has part of a curving elongated lower arm. The outer part of the D ring to which the reins were attached is lost, but part of the jointed mouth bar survives. The shorter piece is 135 mm, and comprises the complete upper portion of the side bar, upper ring with attached small link, the D ring to which the reins were attached, part of the mouth bar and part of the lower arm. The small link attached to a ring at the top of the side bar is part of the curb chain. L 175mm & 135mm. 29 (5071) sf 1040 Ph 6. (ID 1074) P

74 **Bridle bit**. Comprises two elongated sidebars from a curb bit. One is incomplete but otherwise well preserved. This comprises a D ring to which the reins and mouth bar would have been attached, and an upper ring with an attached figure-of-eight link and hook to which the curb chain was fixed. There is a square lug below the D-ring with a small square hole, to which a decorative roundel could be attached. The second sidebar is bent and encrusted, but the long lower bar is present, with a straight bar, looped at each end, attached to it. Probably 18th century in date. L 234mm. 28 (8160) unphased. (ID 702)

75 **Bridle bit** fragment of side bar with D ring. L –mm. 29 (4439) Ph 8.

80 **Junction plate**. Tapering plate with two nail or rivet holes, and hook or eye at the narrower end, which has decorative cut outs. Probably for horse harness. L 55mm. 12/1 (900) Ph 8. (ID 754)

81 **Harness fitting**, comprising an elongated oval link with an attached swivel ring and a T-shaped buckle at each end. Probably from a bridle. L 100mm. 28 (8395) unphased. (ID 714)

Figure 5.42

82 **Rowel spur**, almost complete rowel spur. The rowel is missing, the neck is short and very slightly curved up, the crest is low and the arms are only slightly curved, with single loops at their ends. This is a small example. Probably of 14th-century date. L 115mm. 12/2 (9511) sf 1823 unphased. (ID 1046)

83 **Rowel spur**, incomplete. Rowel spur, with deeply curved sides, of flat section. The sides meet at a peak. There is long neck of ?diamond section. The

Fig. 5.40 Iron: Forked socketed object (No. 63)

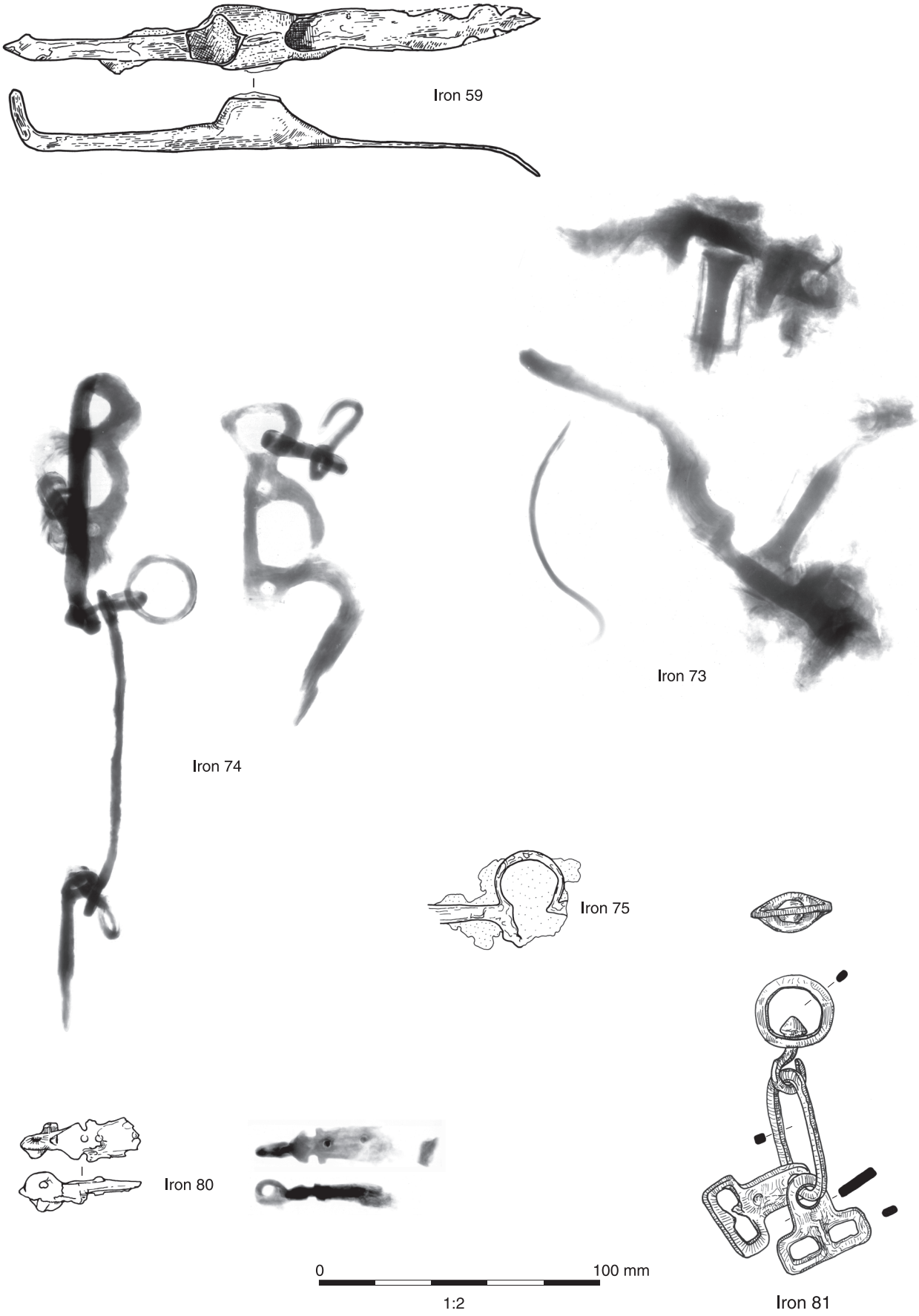


Fig. 5.41 Iron: Object of uncertain function (No. 59) and horse and riding gear (Nos 73-75, 80-81)

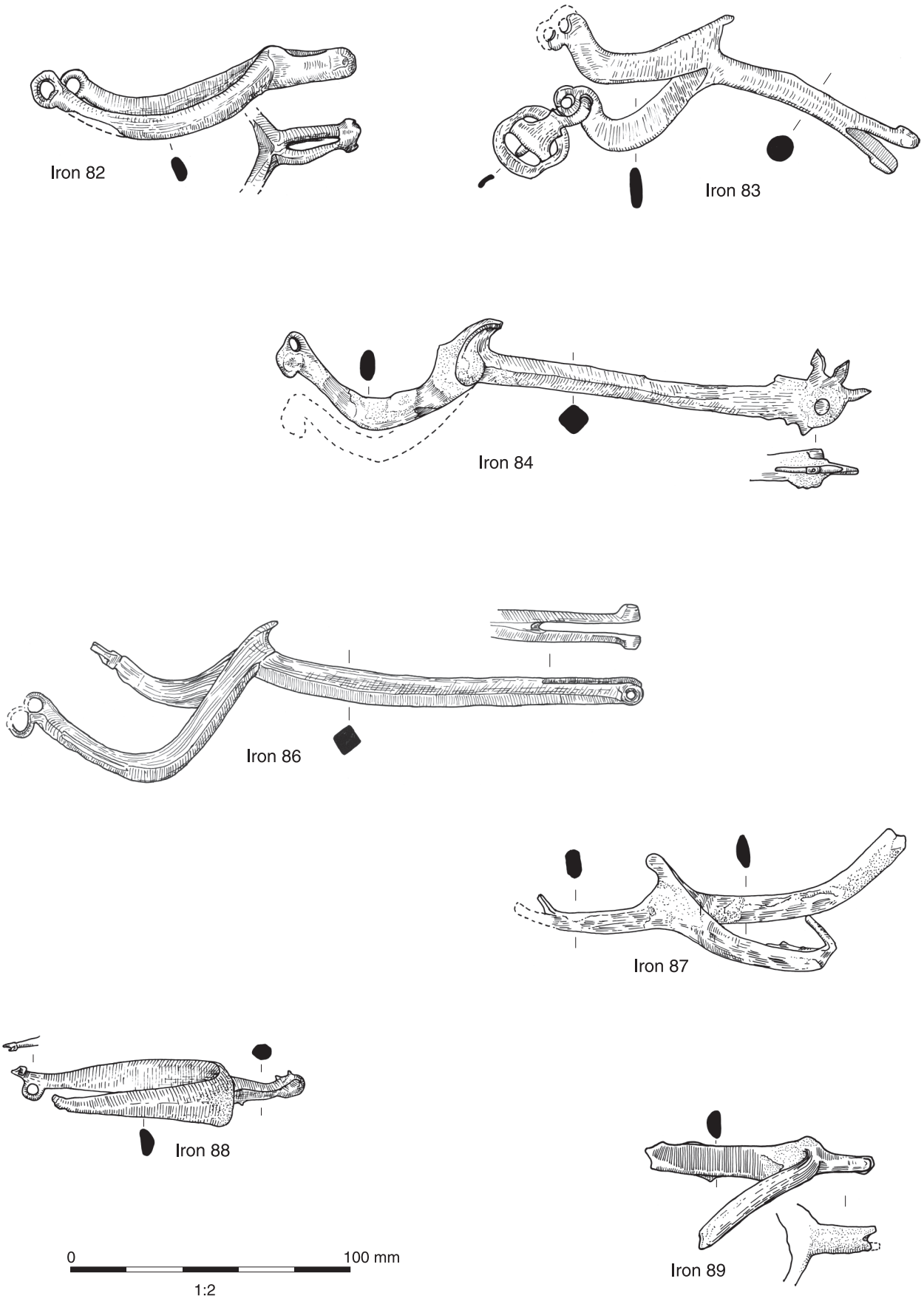


Fig. 5.42 Iron: Spurs (Nos 82-84, 86-89)

neck is slightly curved and slotted at the end to form the rowel box. The sides end in figure-of-eight terminals. A buckle is attached to one loop. 15th century. L 150mm; W 120mm. 300 (13463) sf 2616 Ph 4. (ID 2046). See an example from Trig Lane (Ellis 1995, 144 & fig 103, 348).

84 **Rowel spur**, almost complete. The neck is long and of diamond section. The rowel still in the slotted rowel box. The peak has a high crest. Only one arm, with a figure-of-eight terminal remains. The sides are deeply curved and have a flat rectangular section. 15th century. L 192mm. 12/2 (8731) sf 1688 Ph 5. (ID 959). See an example from Baynard Castle (Ellis 1995, 146-7 & fig. 104, 355).

86 **Rowel spur**, almost complete. It has deeply curved sides of triangular section, ending in figure-of-eight terminals. The sides meet at a peak at the junction with the neck. The neck is long and of diamond cross-section, and has a slotted rowel box. 15th century. L 217 mm. 101 (7209) sf 1328 Ph 6. (ID 850). Probably of 15th-century date.

87 **Rowel spur**, incomplete. It has curved sides of half round section. The sides meet at a distinct peak above the straight rowel neck. The latter is short and of oval cross section, and has a slot for the rowel, now lost. The arms appear to end in figure of eight terminals. 15th century. L 130mm. 12/2 (8504) sf 1603 Ph 8. (ID 902)

88 **Rowel spur** with straight tapering sides of triangular section. The sides originally probably ended in small figure-of-eight terminals. Short circular section neck probably with slotted rowel box. Possible decoration but not clear. 17th century. L 102m; W 69m. 300 (13273) sf 2606 Ph 7. (ID 2067)

89 **Rowel spur**, with short slotted neck but no rowel. The sides are straight and of half round section, not very deep. 17th or 18th century. L 70mm. 29 (3894) sf 815 Ph 8. (ID 861)

Figure 5.43

92 **Stirrup iron**, flattened but complete and otherwise well preserved. The sides are flat with thickened edges and pierced with a pattern of slots and small holes for decoration. The footrest comprises three bars of rectangular section, the central one flat, the outer ones on edge. The slot at the top to hold the stirrup leather is stepped, but undecorated. Possibly Tudor?. L 260mm. 12/2 (8567) unphased. (ID 1911)

93 **Stirrup iron**, with swivel attachment at the top to hold the stirrup leather. The footplate is formed from strips and is circular. The sides are formed from rod, flattened towards the foot plate. Later 17th or 18th century. L 159mm; W 128mm. 12/2 (8696) sf 1675 Ph 8. (ID 1005)

94 **Curry comb** with a blade of semi-circular cross-section and a handle that divides into two arms that are riveted to the back of the blade by means of two flattened terminals. One of the terminals ends in a rolled-over loop with an attached ring, the other ogee has no loop. There are two loose rings on each of the two arms. There are traces of teeth at the edge of the blade. The extant end of the blade is strengthened by thickening. Medieval. L 198mm; W 158mm. 12/2 (8655) sf 1734 Ph 6. (ID 989)

95 **Curry comb handle**. The handle was tanged and has three arms with loose rings from tanged curry comb handle. Each arm is flattened and pierced for a rivet near its end, and each terminates in a rolled-over loop holding a loose running ring. In addition there is a further single loose rings on each arm of the handle. The blade is missing. Medieval. L 208mm. 12/2 (8661) sf 1736 Ph 6. (ID 1912)

Figure 5.44

132 **Cast iron lion head plaques**. Two decorative fittings. They are shaped in such a way as to suggest that they were attached to a curved object or objects. There is only a single nail or rivet hole visible below the mouth of each lion plaque. They are hollow cast. Ht 100mmW

Figure 5.45

154 **Whittle tang knife**. Large whittle tang knife with a triangular blade and centrally placed tang. L 202mm. 12/2 (8616) sf 1631 Ph 5. (ID 906)

155 **Whittle tang knife**. Whittle tanged knife with almost triangular blade of triangular section. The tang is centrally placed and the edge has a slight s-curve. The back is straight. L 145mm. 12/2 (8616) sf 1634 Ph 5. (ID 913)

156 **Whittle tang knife**, with an almost triangular blade, the tang is central to the blade. The back of the blade is straight but angled down, at the tip it curves down to meet the straight edge. L 151mm. 12/2 (8974) sf 1748 Ph 5. (ID 1041)

157 **Whittle tang knife**. The blade, of triangular section has a sinuous back; the point is missing. L 154mm. 29 (5520) sf 1122 Ph 5 to 6. (ID 1272)

158 **Whittle tang knife**, poorly preserved, with possible maker's mark 'T' on one face. L –mm. 29 (5412) unphased. (ID 1064)

160 **Whittle tang knife.** Small whittle tang knife with broken blade and broken end of tang. Tang appears centrally placed. Rounded choil. Possible remains of a shoulder plate made of non-ferrous metal. L 98mm; W 11mm. 300 (13282) sf 2540 unphased. (ID 2063)

162 **Whittle tang knife**, with possible ?bolster. The blade has a possible curved back and straight edge, incomplete; tapering bone handle of sub-rectangular section. Maker's mark on blade. L 145mm. 29 (4465) sf 935 Ph 6. (ID 986)

163 **Whittle tang knife**, large, with a simple wooden handle. The blade is parallel sided and ends in a tapered point. The end of the tang has been roughly flattened to secure the handle. L 350mm. 12/2 (8510) sf 1621 Ph 6. (ID 1672)

Figure 5.46

164 **Whittle tang knife**. Blade of triangular section. The back of the blade and the blade edge run parallel. L 138mm. 12/2 (8655) sf 1642 Ph 6. (ID 976)

166 **Whittle tang knife**. It has a non-ferrous copper alloy hilt band around shoulder of tang and cylindrical

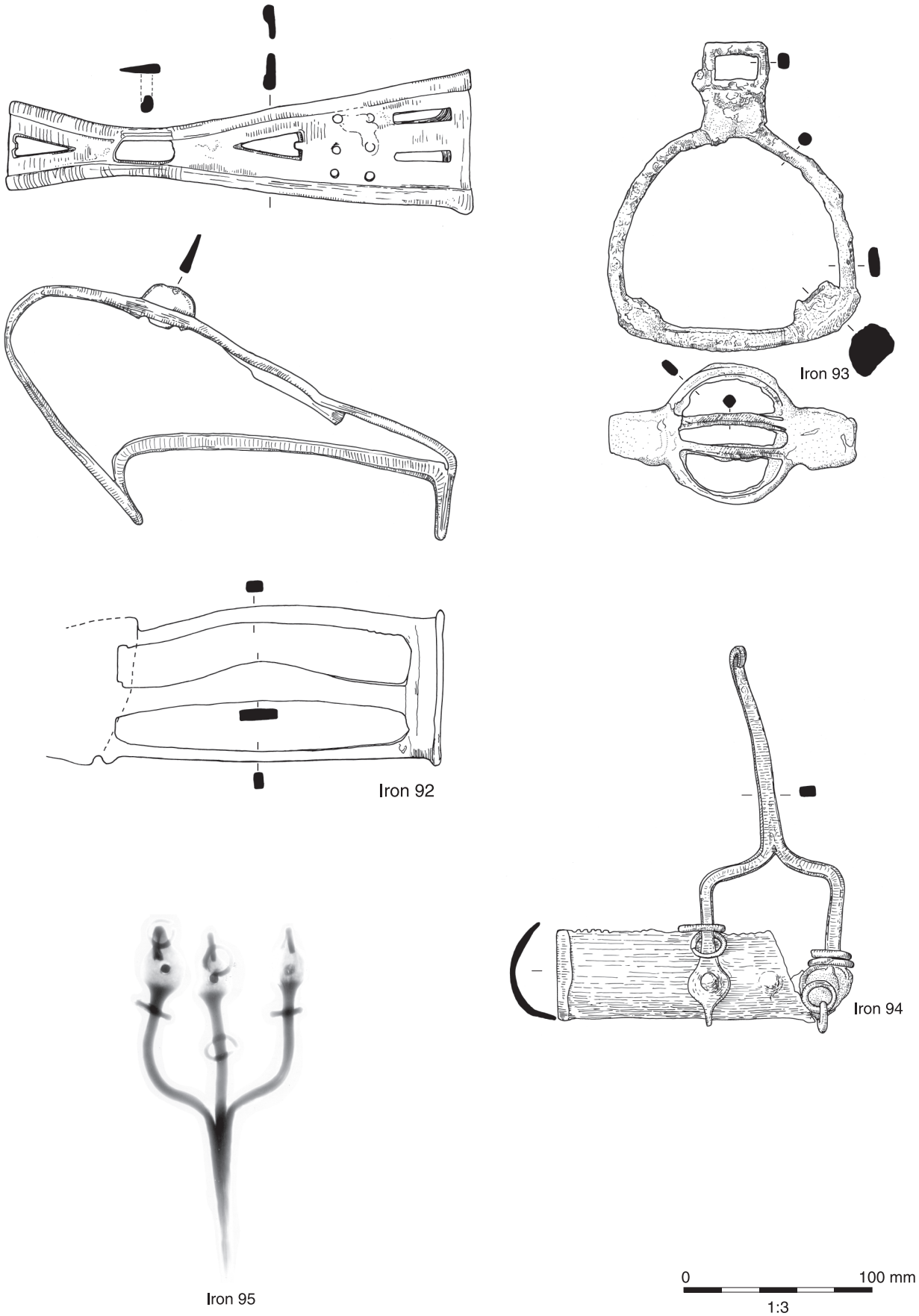


Fig. 5.43 Iron: Riding and horse gear (Nos 92-95)

Iron 132

Fig. 5.44 Iron: Cast iron lion head plaques (No. 132)

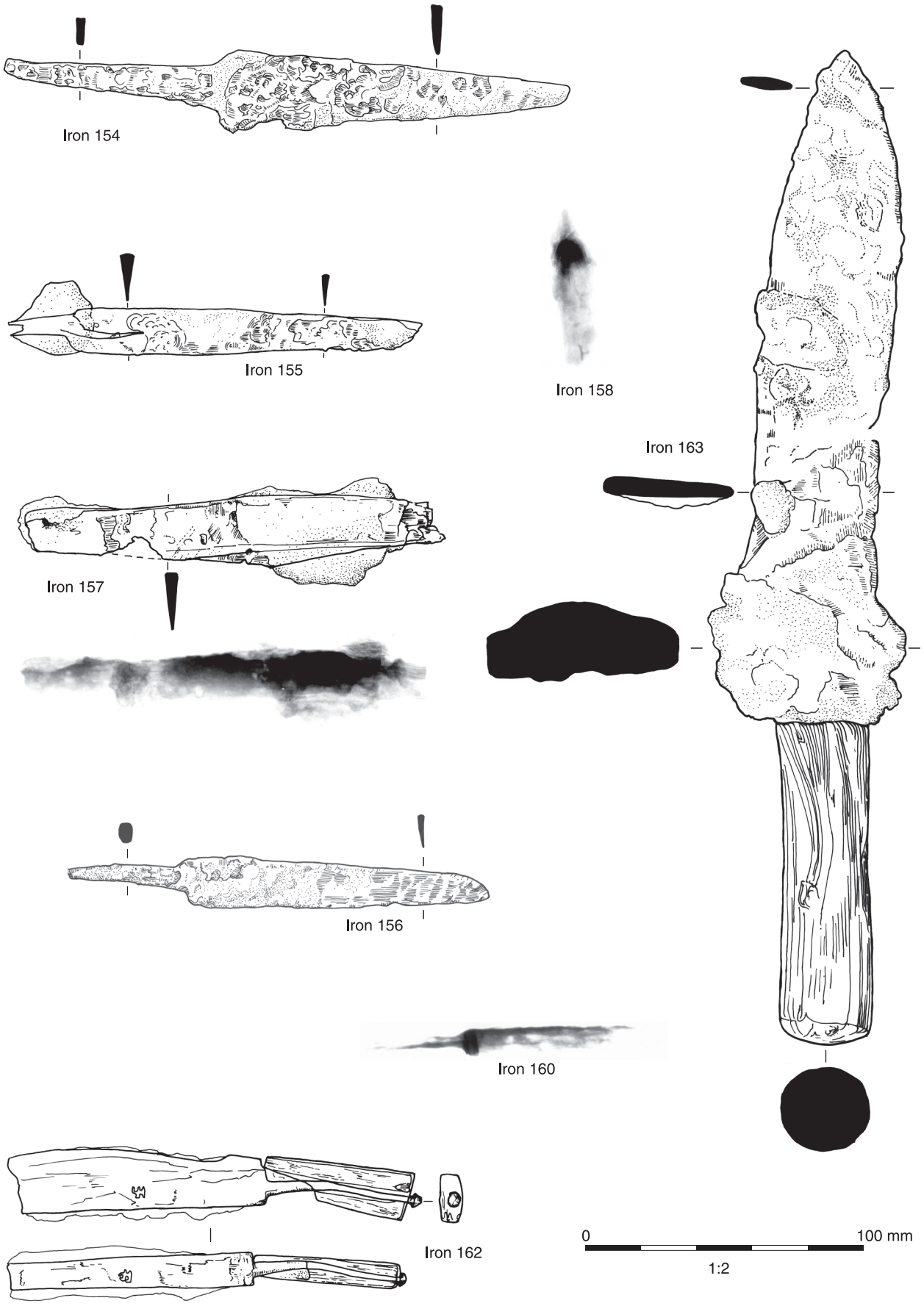


Fig. 5.45 Iron: Knives (Nos 154-58, 162-63)

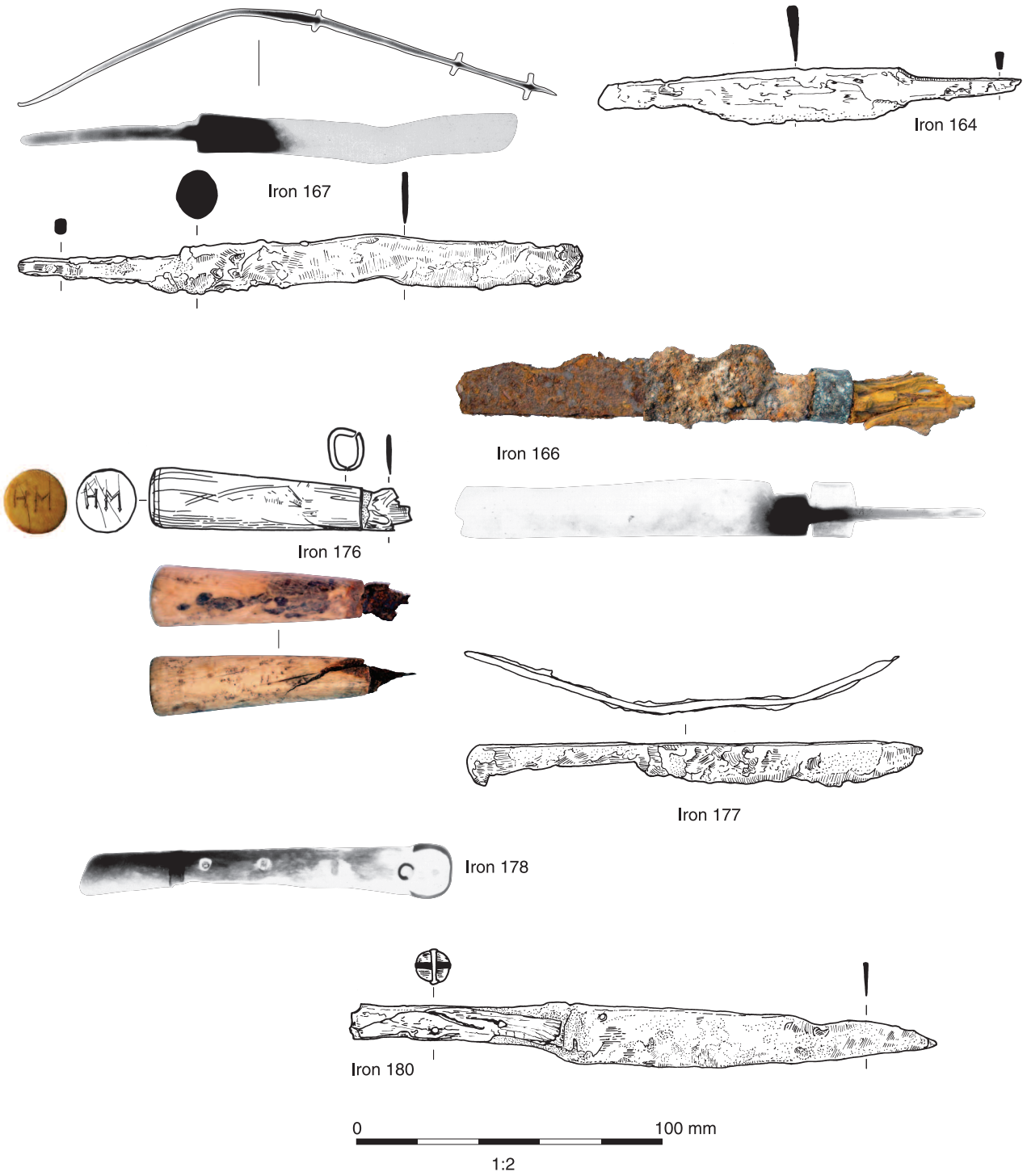


Fig. 5.46 Iron: Knives (Nos 164, 166-67, 176-78, 180)

wood handle. There is a solid bolster. The end and cutting edge of the blade are broken. The blade has a straight back and angled choil. L 170mm; W 22mm. REORM (12691) sf 2588 unphased. (ID 2070)

167 **Whittle tang knife**, with elongated solid bolster and broken blade. The back of the blade has a marked peak. The cutting edge is slightly eroded but appears to have matching shape. L 183mm; W 22mm. 300 (13462) unphased. (ID 1987)

168 **Whittle tang fruit knife** (NI), with decorated bone handle and elongated solid bolster. The back of the blade is straight. The choil is rounded, the edge curved. The brown bone handle is highly polished and, towards the end on each face of the handle, there is a circular depression with 8 small circles around it with radiating lines of dots between each small circle. The blade is broken but the back is straight and the edge eroded. L 133mm; W 11mm. 300 (13881) sf 2635 unphased. (ID 2041)

176 **Whittle tang knife handle**. Comprises tapering polished ?ivory handle of circular section with fragment of ?knife blade attached by a rod tang. The initials HM have been scratched on the flat end of the handle. L 92mm. 29 (3864) sf 850 Ph 9. (ID 877)

177 **Scale tang knife**. Complete scale tang knife. Bent. Straight line from handle through top of blade. Edge eroded, slightly curved and curves up to point. Possible square choil. Handle ends in slight hook. Three rivets/rivet holes. L 145mm; W 12mm. REORM (12523) Ph 4. (ID 1962)

178 **Scale tang knife**. Broken scale tang blade with parts of handle (wood?) preserved. There are the remains of four rivets in handle. The blade back is straight. The handle widens at the end and has a non-ferrous cap. The x-ray reveals that the knife has non-ferrous hilt plates L 120mm; W 14mm. 300 (13463) sf 2609 Ph 4. (ID 2069)

180 **Scale tang knife**, nearly complete. Only the end of the tang is missing. The tang has two rivets through it to secure the wooden scales (traces of the wood remain). The tang and the back of the blade are almost continuous, and dip slightly at the tip to meet the curved cutting edge. L 191mm. 12/2 (8857) sf 1722 Ph 5. (ID 994)

Figure 5.47

184 **Scale tang knife**, with antler handle plates. There are five hollow rivets through the handle and a copper alloy band/hilt plate. L 130mm. 12/2 (8655) sf 1751 Ph 6. (ID 1033)

185 **Scale tang knife**, with tapering tang pierced by 4 nail holes; the blade has a straight back and curved edge. L 210mm. 29 (4573) sf 954 Ph 7. (ID 1003)

187 **Scale tang knife**, with long tapering narrow blade with a rounded point and triangular section. The handle has a round end and there is a U-shaped hilt cap wrapped around the end. The handle has seven perforations, three of which have hollow copper alloy rivets. L 209mm. 12/2 (8502) sf 1607 unphased. (ID 909)

188 **Scale tang knife**. The blade is of triangular section, with a slightly curved back and a curved blade tapering to the tip which is missing. There are 2 nail holes through the tang, close to the junction with the blade. L 202mm. 12/2 (9078) unphased. (ID 1633)

190 **Scale tang knife**, with much of handle missing. There are the remains of possible hilt plate at junction of handle and blade. The handle and back of the blade are straight. The blade edge is curved, with a round choil and rounded tip to blade. L 165mm; W 20mm. 300 (13360) unphased. (ID 1977)

Figure 5.48

228 Large hook from **hook and eye fitting** for clothing. Probably 17th-century in date. L -. 29 (4440) Ph 8.

237 **Purse mount**, comprising iron rod pierced at the centre for the attachment of a swivel ring; the rod tapers slightly to each end and is pierced by a single small eyelet spaced at c. 45mm either side of the swivel for the attachment of the purse bag. L c. 290mm. TP 15 (1135) unphased. (ID 563)

240 **Key** for a mounted lock with an oval, or kidney-shaped, bow, The end of the solid shank protrudes beyond the bit. The bit is symmetrical, there is a stop over the bit in the form of a raised step. The bit has two opposed wards. L 107mm. 12/2 (8503) sf 1601 Ph 6. (ID 914)

241 **Key** for lever lock, with hollow stem joined to the plain oval bow by a solid collar; the bit has two vertical slots. L 86mm. 12/1 (766) sf 60 Ph 8. (ID 570)

242 **Key** for a mounted lock, with oval bow and a symmetrical bit with opposed wards. The stem is stepped by the first half of the bit and extends beyond the second part of the bit. L 105mm. REORM (12001) Ph 9. (ID 1949)

243 **Key** for a mounted lock with a stem that extends beyond the end of the bit. The stem has a step near the back of the bit, which has three wards. The bow is a plain oval, but incomplete. L 129mm. 12/2 (9307) unphased. (ID 1636)

244 **Key** with square bit and round bow. Bit is large, but heavily encrusted. In poor condition. Key for a mounted lock, probably medieval. L 108mm. REORM (12678) sf 2545 unphased. (ID 2043)

245 **Ward plate**, comprising slightly curved plate with an arched top. The plate narrows to each end and has a cut out or key hole at its centre. The x-ray shows traces of what appear to be cuts in metal on X-ray, but are probably remains of the wards. L 78mm. 29 (3729) Ph 8. (ID 1409)

256 **Butterfly hinge**, large with 5 nail holes in each plate. L 101mm. 29 (4338) sf 908 Ph 7. (ID 953)

258 **H-hinge**, or possibly **T-hinge** fragment. Comprises hinge cylinder with part of one plate. This tapers slightly and is rounded at the end with a small diamond shaped extension. Four extant nail holes. L 149mm. 29 (3793) Ph 10a. (ID 1414)

Worked stone

Figure 5.49

1 **Slab-shaped primary whetstone**. Fine-grained grey micaceous sandstone. Broken at both ends. One face

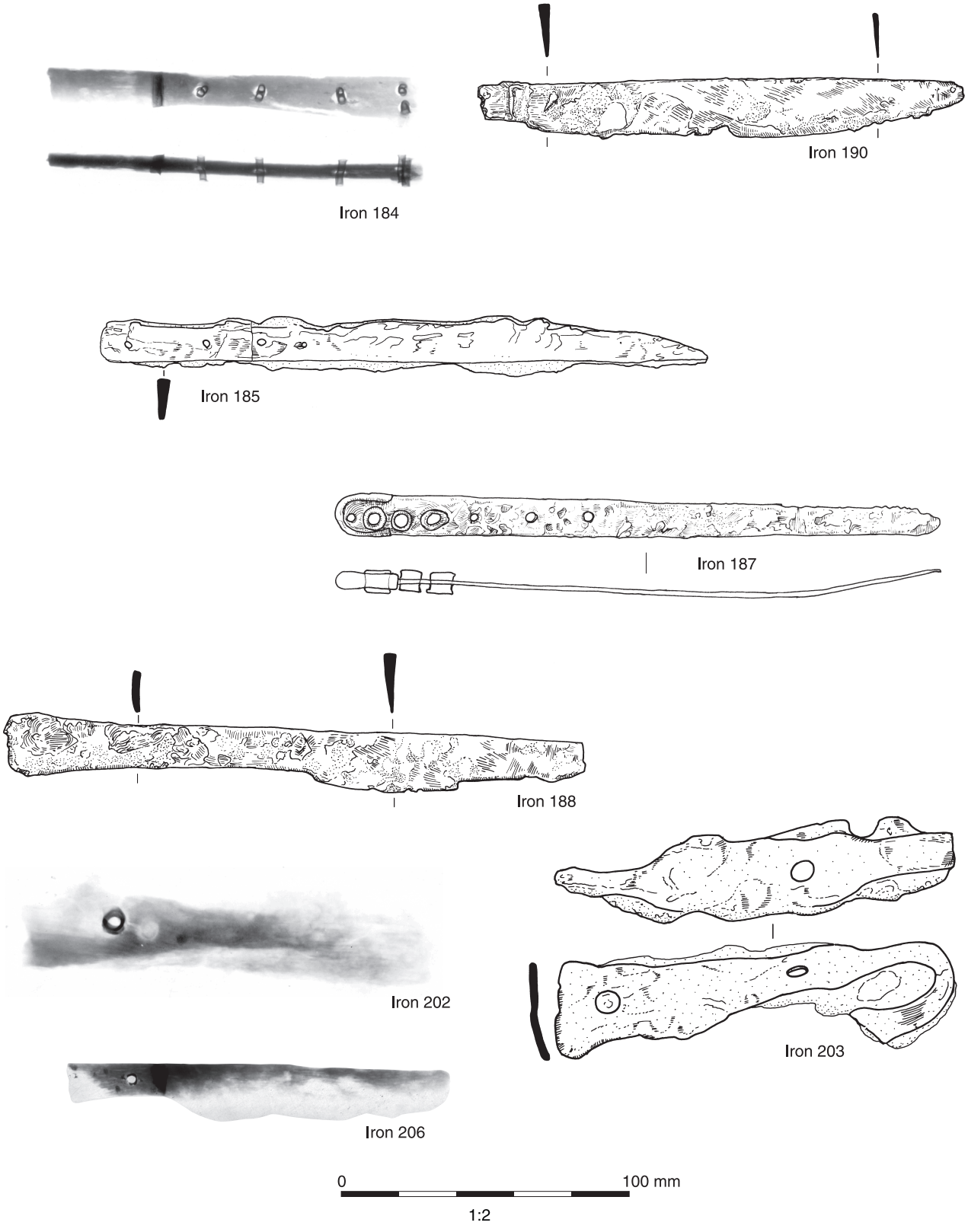


Fig. 5.47 Iron: knives (Nos 184-85, 187-88, 190)

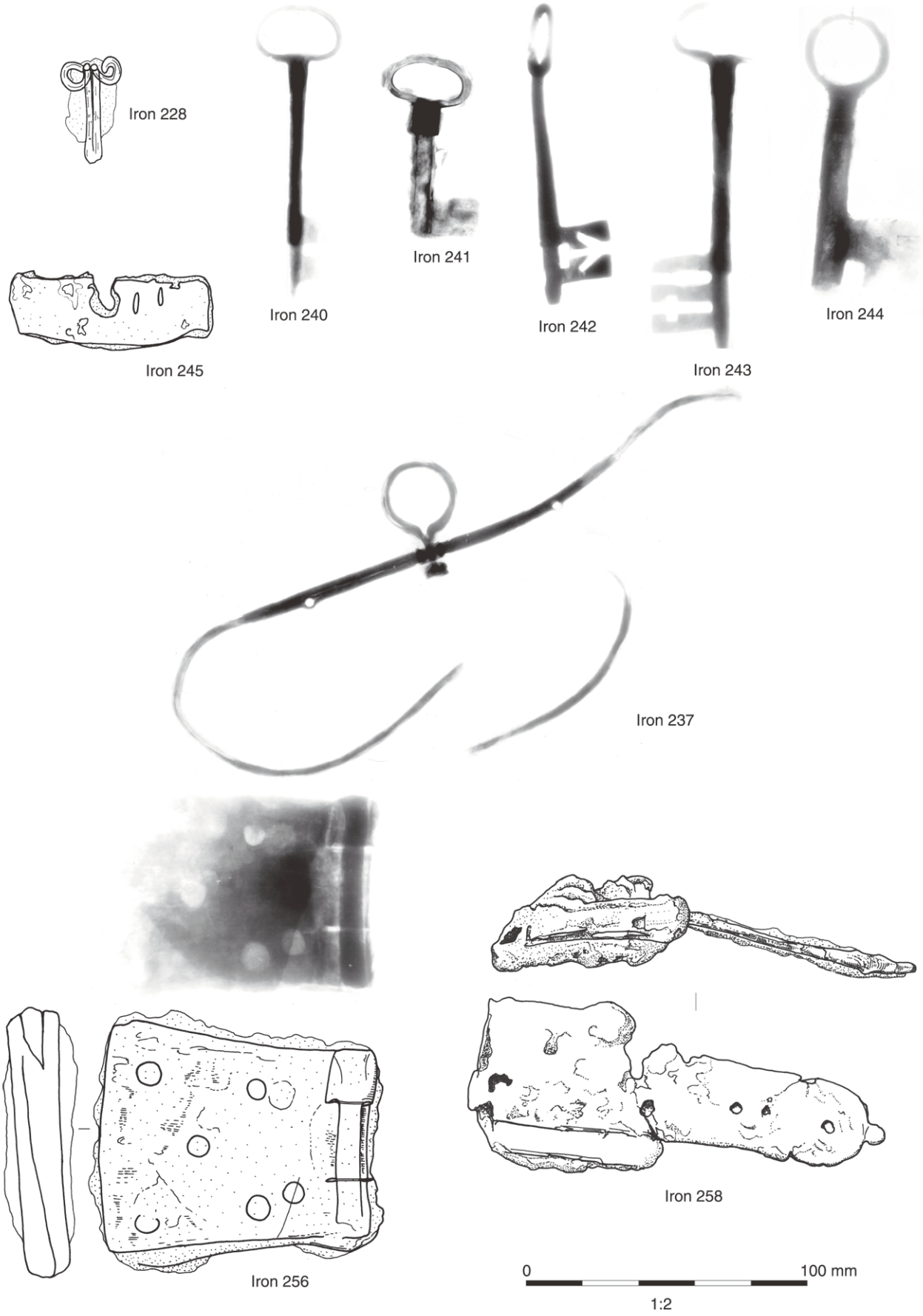


Fig. 5.48 Iron: Personal items keys and hinges (Nos 228, 237, 240-45, 256, 258)

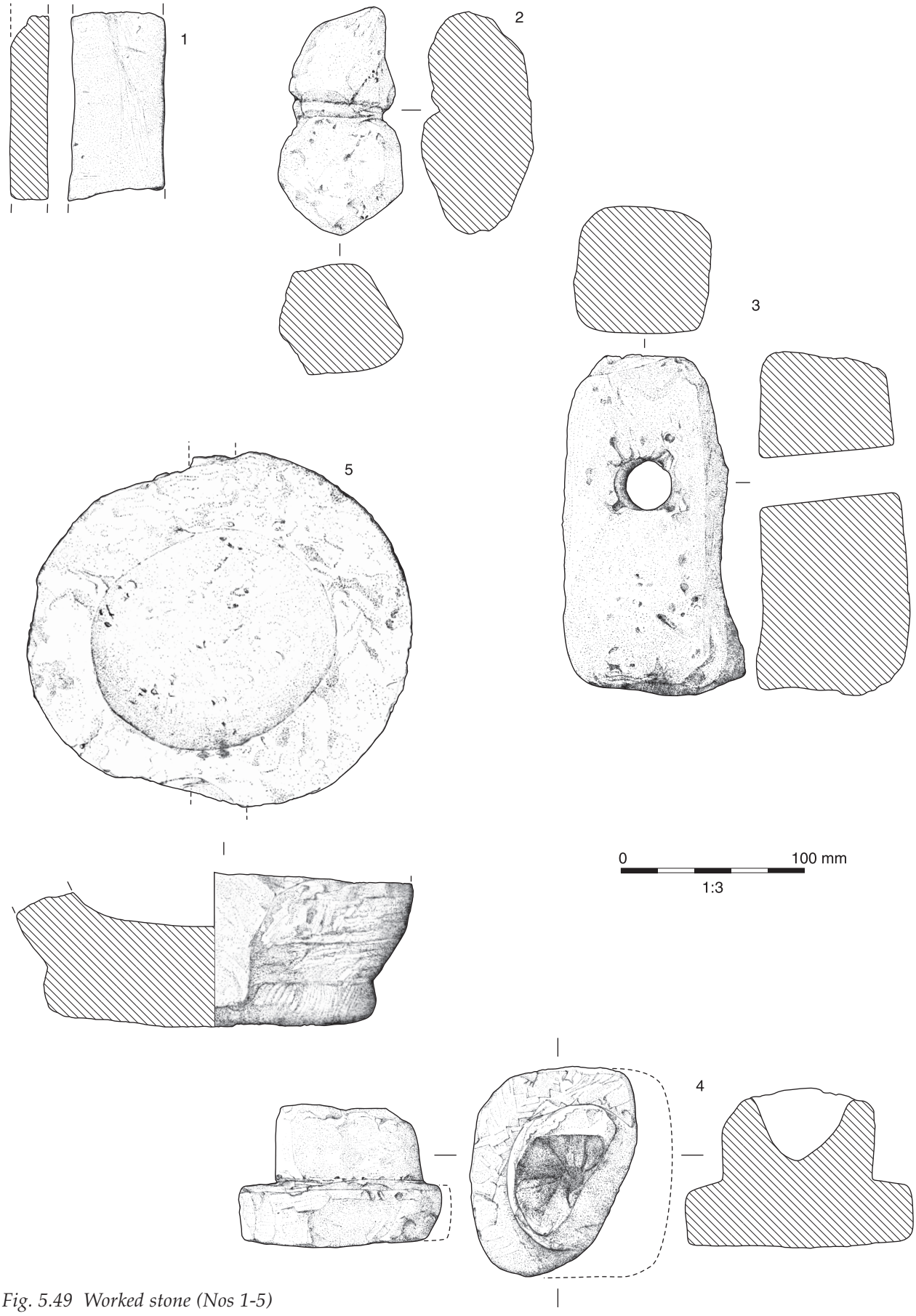


Fig. 5.49 Worked stone (Nos 1-5)

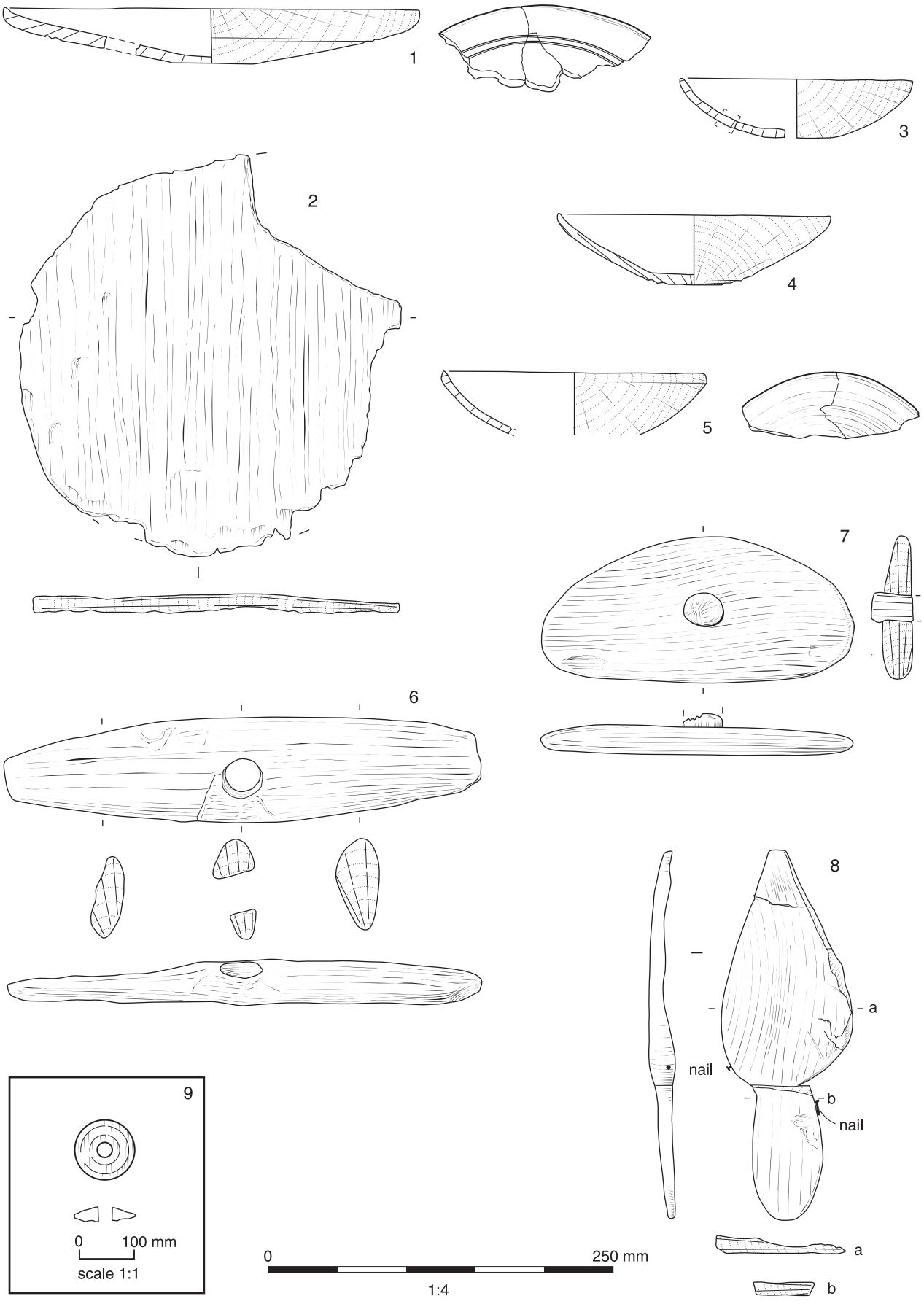


Fig. 5.50 Wooden objects (Nos 1-9)

is particularly smooth and has wear marks an polish longitudinally along the surface. Measures 100 mm remaining length x 51 x 21 mm. Ctx 8895. SF 1739. Ph 1206b

2 **Possible fishing weight**. Chalk. Roughly ovoid shaped stone with wear marks around the middle caused by attachment of cord rubbing away at the stone. Probable fishing weight. Ctx 7317. SF 1336

3 **Oblong weight**. Oolitic limestone. Large well shaped weight with perfectly circular and cylindrical perforation which is worn inside and with fittings on one face. Slightly damaged at each end. Measures 181 x 87 x 84 mm. Site 12. Ctx 8719. SF 670

4 **Crudely worked lamp with base**. Fine grained Jurassic limestone. Inside is burnt around the top half. Measures 115 mm square x 80 mm high. ST 815. Site 29. Ctx 6882. SF 815

5 **Base of mortar**. Fine grained shelly jurassic limestone. Mortar with thick base and remains of two diametrically opposed ribs. Nicely worked edges and smooth inside. Base inside is fairly flat and has an internal diameter of 105 mm although it has been worn through use into an oval shape. Site 28 (TP 180, in site 29). Ctx 11396. SF 721 Ph 2-3

Wooden objects

Figure 5.50

Wooden Vessels

1 **Turned bowl**. Eight fragments of which three refit, forming part of a wide, shallow, face turned vessel. Two prominent turned grooves around exterior at mid height. Black residue on inner and outer faces. Turned from tangentially faced *Alnus spp*. block. c. 300 mm dia, c. 38 mm high. Wall of vessel 10 mm th. Ctx 9110 SF 1777. Project Phase 5-6, Site 12.

2 **Lid**. Cut to roughly circular plan but much damage and erosion, especially to edges. Several small charred patches on one face and part of edge. Radially faced oak (*Quercus sp.*). 267 mm max dia., 10 mm th. Ctx 8655. Project Phase 6, 1207a

3 **Turned bowl**. Six fragments of which five refit, forming the rim and partial base of a face turned vessel. Black residue on inner and outer faces. Turned from tangentially faced *Salix spp*. block. c. 170 mm dia, 42 mm high. Wall of vessel 06 mm th. Ctx 7319 SF 1337. Project Phase 6, 10104b.

4 **Turned bowl**. Seven fragments of which several refit, forming part of a face turned vessel. Prominent turning marks. Black residue on inner and outer faces. Turned from tangentially faced *Alnus spp*. block. c. 200 mm dia, 49 mm high. Wall of vessel 06 mm th. Ctx 8306. Project Phase 7, 15006a.

5 **Turned bowl**. Three fragments refitting to form the rim and much of the wall of a face turned vessel. Sharp angle at rim, base missing. Prominent turning marks. Black residue on inner and outer faces. Turned from tangentially faced *Alnus spp*. block. c. 190 mm dia, more than 44 mm high. Wall of vessel 07 mm th. ctx 1319 SF 62. Not phased.

6 **'Raddle'**. Stave, tapered towards each end with asymmetric twist along length. Rounded edges and a single central drilled hole, passing at angle from face to face, retaining part of a roundwood shaft. Radially faced oak (*Quercus sp.*). 345 mm l, 78 mm w, 28 mm th. Hole 27 mm dia., roundwood 64 mm l. Ctx 8696. Project Phase 8, 1210a.

7 **Rake head**. Board with one straight edge and one curved edge/ends. Edges and ends rounded. Single central drilled hole retaining the end of a roundwood handle. All surfaces worn. Head radially faced, both pieces oak (*Quercus sp.*). 230 mm l, 102 mm w, 19 mm th. Hole 25 mm dia, roundwood 22 mm l. Ctx 3202. Not phased, TP 11

8 Wooden sole from **Patten** for a right foot. Carved to give a rounded heel, broad instep and long tapering toe. Upper face smoothed to the contours of the foot. Lower face work and damaged. One nail in edge at rear of instep, second nail in opposing edge at heel. Broken into three refitting sections. Radially faced *Salix spp*. 267 mm l, 92 mm w, 18 mm th. Ctx 8942. Project Phase 4, 1204a.

9 **Button**. Single central through perforation. Biconvex cross section with concentric groove on one face. Prominent turning marks. Cut from a ring porous hardwood, species not identified. 12 mm dia, 04 mm th. Hole 05 mm dia. Ctx 4781 SF 442. Project Phase 7, 2908e.

Metalworking

Other than the material reviewed above, the excavations did not recover evidence for metalworking on the floodplain on any significant scale, and there is no evidence for a tradition of metalworking here prior to the establishment of Wilder's Foundry in the early 19th century. Much of the evidence recovered is likely to relate to small-scale activity undertaken as part of general building and repair works. The exception to this was a relatively sophisticated forge operating on the George Hotel site (site 22), and the evidence for this is available in the project archive.

The most interesting metalworking remains came from the Yield Hall site (site 12), where bell-founding debris was identified (see Chapter 9, below). Since this was almost certainly dumped on the floodplain from elsewhere, we have only limited information about the activity it represents. The debris did, however, include mould fragments and casting dross, and seems to have derived from a single casting of a bell approximately 55 cm in diameter and 50 cm high. The metal used to make the bell was a high tin bronze, which, in combination with the stratigraphic evidence, suggests that the casting took place in the 15th or early 16th century. The Yield Hall site also produced metallurgical evidence for iron smithing during the 16th century and tools such as a smith's punch from a late 17th- to mid 18th-century context.

The excavations of St Giles Mill produced a smith's punch from a 13th- to 14th-century context, which may well have been lost during construction

works at this site. The function of a substantial cast iron crucible found at the site (unphased) remains unclear. Three unphased fireshovels (Fig. 5.38) are probably to be associated with the period when the mill had been converted to steam power.

Brewing

Little physical evidence of brewing was found during the excavations, although it is attested in medieval documentary records, and was one of the most widespread occupations in medieval towns. A pit excavated in TP27 (adjacent to the site of the Minster Mill, see Chapter 2, above) produced a large assemblage of partially germinated oats and barley dating to the 12th century, which is interpreted as malting waste. The process of malting involves steeping the grain in water until it is swollen then turning it out onto the floor in a heap or 'couch' for the germination of the grain, the 'chitting'. Once this is sufficient, the process is terminated by parching or roasting in a kiln or oven ('curing') with hot air (Brown 1983; Corran 1975; Fenton 1978). The final stage involves the malted grain being 'cracked' before it is mashed; a process, as at the Oracle site, likely to be associated with a mill. A similar association of malting and mills was identified at West Cotton (Campbell 1994). At Minster Mill it appears that a fire may have destroyed the malting grain, and grain of wheat and rye possibly awaiting milling.

A hop seed was recovered from site 12. The transition from un-hopped to hopped beers is supposed to have occurred in the late 15th century (Corran 1975), although hopped beer was apparently brewed throughout the medieval period in Europe (Greig, 1996) and a large cargo of hops on the Graveny boat (Wilson & Conolly 1978) suggests hops may have been used from the 10th century. Hops were recorded in small numbers throughout the deposits at Reading Abbey and in large quantities by the 18th century (Carruthers 1997). By this time, malting and brewing had become major industries in Thames-side towns such as Reading and Abingdon, which supplied malt to London. The scale of the brewing industry in Reading at this period is reflected in the foundation of Simonds' large brewery on Bridge St by 1794.

Fishing, fowling and poultry-keeping

The natural resources afforded by the floodplain and river channels were exploited in many different ways. At least three finds testify to fishing in the channels. A chalk fishing weight (or line sinker), was found in the silty deposits at the base of the Back Brook dating to the early 16th century (phase 10104b, Project Phase 6) and a probable barbed fish hook was found in a 17th-century context (phase 10105c). A further fish hook was also found in an unphased channel fill associated with St Giles Mill. Numerous fish trap structures were set up across the channels (see, for example, Plates 2.28 and 2.31). The bone assemblage contains numerous examples of freshwater fish (chub, pike and perhaps eels and salmon) that could have been caught in the nearby streams and rivers. A holding tank for the storage of live fish was identified on site 101 (Back Brook).

Geese and ducks are present in substantial numbers in 15th- and 16th-century deposits on both site 12 and site 29 (Table 10.2) and may have been reared on the floodplain. As well as being used for food, these birds also provided the valuable resource of feathers. Naomi Sykes (Chapter 10, below) has noted an interestingly high representation of goose carpometacarpi in the site 12 assemblage. This is reminiscent of a 14th-century assemblage from Victoria Road, Winchester which Serjeantson (2002) interpreted as evidence for feather exploitation. Wild birds also appear among the bird bone remains (Table 10.2) and were presumably caught for the table: edible species identified include swan, grey heron, snipe, woodcock, golden plover, curlew, pigeons and partridge, although not all of these are likely to have been caught locally.

MILLS AND MILLING

by Ben Ford

(with contributions on wooden mill machinery by Steve Allen and millstones by Ruth Shaffrey and Fiona Roe)

Introduction

Excavation in the 1960s uncovered the remains of the Abbey Mill, which was the only mill in Reading to have been excavated prior to 1997. The date of this mill's construction is not certainly known; Slade (1971/2, 67) thought that it must have been contemporary with the main construction phase of the abbey itself, and therefore dated to some time between 1121 and 1164 (but see also Hawkes and Fasham 1997, 18). Excavations on the site of the Oracle revealed the remains of three further locations where mills had been positioned within the landscape of an urban if not an industrialised valley floor. Two of the mill sites, St Giles Mill (site 300) and Minster Mill (site 150), were subject to area excavation and have a comprehensive record of the remains of their foundations and water races. The other site, that of the water pumping mill (Test Pits 268 and 293) upstream from St Giles Mill, was subject to recording under watching brief conditions and therefore the details of its foundations were less comprehensive.

Other excavations within the project area revealed details of the watercourses that led to and away from these mills, which enables the mills to be placed within their lowland landscape, and shows how their position affected subsequent developments within that landscape. The results show that there was a long continuity of mill location at the sites of the St Giles and Minster mills. In the case of

Minster Mill this lasted possibly from as early as the 11th century (and almost certainly from the 12th century) until the 20th century, and at St Giles Mill from the 12th century until the 20th century. St Giles Mill was finally demolished in 1900, and Minster Mill in the 1940s. In addition to the substantial timber and brick structural remains from these sites, the excavations recovered an unprecedented number of objects, including elements of the mill gearing mechanisms from the 12th and 13th centuries, and parts of waterwheels and sluicing structures from 14th- to 19th-century mills. In addition, evidence for the milling of four types of grain at Minster Mill was recovered. In combination with the documentary record these discoveries greatly expand our understanding of the changing and evolving form and function of these mills, essentially the engines of the pre-industrial period, and their effect upon the surrounding landscape.

Medieval mills and milling in Reading

Domesday Book lists Reading as having 6 mills (Astill 1978, 80). Excavation did not reveal any remains that could definitely identify the site of any of these. However postholes (whose fills dated to the late 11th or 12th century) that held timber uprights for an earthfast structure indicate that there was possibly a mill on the site of the later Minster Mill in this period (see Chapter 2, above) and large millstone fragments of Niedermendig lava that may be from Saxon millstones were recovered from later contexts at site 29 and site 12. Although there have been a number of Anglo-Saxon mills excavated in England, none has a proven continuity of location through to the post-Conquest period. Not a single Domesday period mill has been definitely identified from excavation (Watts 2002, 83-4), and these remains from Minster Mill are among only a few cases in the country where this link can be more than tentatively suggested.

In 1125 the foundation charter of Henry I granted the abbey all the mills in Reading, although these were not necessarily all within the town (see Chapters 1 and 4, above). Archaeological evidence suggests that both Minster Mill (see above) and St Giles Mill were in existence by this time; at St Giles Mill a pond associated with a probable bypass channel was silting up in the early 12th century, and the silts contained a discarded pitwheel that is most likely on technological grounds to date to the period 1100-1150 (see Chapter 2 above, and this chapter, below). While Reading Abbey was under construction, the Abbey Mill may also have been built (Slade 1971-2, 67). St Giles Mill may be the mill mentioned in a lease by the abbey of the period 1173-86 (Kemp 1987, 115). Minster Mill is first explicitly mentioned in a grant of 1250, and St Giles Mill is mentioned as being used to full broadcloths in the late 13th century (see Chapter 4, above, and this chapter, below). The mills remained in the ownership of the abbey for a little over four centuries until the Dissolution, when a Royal Schedule of the late dissolved monastery dated to *c* 1540 records:

> Borough of Reading. Mills. Two grain mills and fulling mill called St. Giles' mills, with the tythes of the same; a fishery called Tanlock; two other mills and a fulling mill in St Mary's parish, called Mynster mills, and a fishery called Grey's lock (Hurry 1901).

Water supply

Although located within a lowland environment, the fast-flowing channels of the Kennet at Reading are very suitable for milling. A watermill needs a fall of water and a relatively constant flow; both the volume and height (head) of water and the rate at which it was allowed to flow onto the waterwheel needed to be controlled to guarantee efficient working. In lowland areas a fall of water was often created by building a dam or weir across a river and diverting water from its crest to the site of the mill along an artificial channel known as a leat. Weirs were often built at a natural bend in the river so that the height of the water could be raised and the main flow directed into the leat. Surplus water flowed over the weir and returned to the natural level of the main course of the river, but the leat channelled water to the mill at a higher level to create the necessary fall to power the waterwheel.

Evidence from excavation and historic maps suggests how the water supply for the mills in Reading was managed. All three were powered by leats taken off the main channel of the Kennet. The Holy Brook clearly exists as a separate channel for a long distance upstream of Reading. Evidence for the early natural channels of the floodplain in the project area, however, suggests that it may originally have merged with the forerunner of the Minster Mill Stream in a wider natural channel around the northern edge of the floodplain. The straight cut running to the Abbey Mill may well have been a human modification. Cartographic evidence (see Chapter 1, above) suggests that by the 18th century the leats for the Minster Mill and St Giles Mill (Minster Mill stream and Mill Water) were taken off the Kennet at the point where it turns eastwards just outside the area of the medieval town, near the site of the present County Lock. It seems likely that this would also have been the case in the medieval period. Speed's map of 1611 (Fig. 1.3) shows St Giles Mill at around the time of a major rebuild identified by excavation (see Chapter 3). He shows the mill located on the main channel of the Kennet. Although the precise configuration of the water supply may have changed with this rebuild, it is unlikely that either phase of the mill was located directly on the main channel of the Kennet, and the excavations have clearly demonstrated the presence of a medieval revetted leat of late 13th-century date along the line of the later formalised Mill Water. Evidence for the mainte-

nance of the Minster Mill stream by the late 11th or early 12th century was seen on site 150 and in TPs 27 and 119.

Water supply to a mill was further controlled by the use of bypass and spillway channels and sluices. When the mill was not working, or at times of high water or floods, water could be diverted out of the leat through a bypass or spillway channel. A spillway channel close to the site of the mill provided an easily accessible point for final adjustments to the water level and flow, and could run through or around the mill building. Water flow into the leat and into bypass and spillway channels was controlled by sluices, which could be opened (raised) or closed (lowered) as required. The Oracle excavations have shown how numerous bypass channels were strengthened, realigned, redug and backfilled during the medieval period as needs changed. A probable bypass channel leading to a pond was the strongest evidence for the existence of St Giles Mill by the early 12th century (Fig. 2.22b). This appears to have been replaced by a channel to the south in the late 13th century, and then reinstated with the major rebuilding of the early 14th century. The early 14th-century mill frame at the site was clearly designed to accommodate at least one spillway channel (Fig. 2.23). At site 12, a probable early bypass channel of the Minster Mill provided a water source for industrial activities in the area from the later 12th century onwards (Fig. 2.13). A second channel was soon dug in the area, bringing water from downstream of the mill, which suggests either that the bypass channel was not a reliable enough source, or that the demand for water from the newly established industries was interfering with the supply to the mill. The digging of the new channel seems to have been a successful compromise.

The tailrace channel carried the water away from the mill after it had turned the waterwheel. It was essential to get the water away from the wheel at a level low enough to prevent backwatering, in which the operation of the wheel was hindered by the pooling or backflow of dead water. The tailrace channel of the Minster Mill carried water back to rejoin the main course of the Kennet, via the Back Brook, a short distance upstream of High Bridge. St Giles Mill appears to have had two tailrace channels, a very long, narrow channel known historically as Gunter's Brook or Mill Tail, and a shorter, wider and possibly less formalised channel leading almost directly back to the main course of the Kennet. A long, narrow tailrace channel was in existence by the late 12th century, surviving as a strip of dark organic silts associated with post and plank revetments. The channel was observed for a length of 80 m east of the mill site, and numerous timbers from the revetment gave dendrochronological date ranges between the mid 13th and early 14th century. Excavations at the eastern end of the Holy Brook found a revetted channel interpreted as the tailrace channel for the Abbey Mill, which appeared to have been constructed between the 12th and early 13th centuries (Hawkes and Fasham, 1997).

The excavations have demonstrated that the positions of these mills remained fixed within the landscape of the valley floor from the 12th century until the 20th century. Where their associated waterways ran through the project area they appear to have had a similar longevity. On maps dating to the post-medieval period (for example Plate 1.4), the organisation of the valley floor becomes apparent and the evidence shows that this has its roots in the medieval period. It is notable that water was taken off at a single point to feed both Minster Mill and St Giles' Mill, and also that the tailrace channels of both St Giles' Mill and the Abbey Mill return to the main Kennet at similar points, while water from Minster Mill was returned upstream of the bridge. This suggests a high level of organisation of the valley floor through the town, with water management and the placement of mills at its heart.

The mill races and waterwheel

Water was fed from the leat to the waterwheel of a mill via a channel known as the headrace. This was sometimes funnel shaped at its upstream end, with a grille to exclude debris positioned at its downstream end. Upon leaving the head race, the water entered the wheelpit (or wheel trough) where it struck the waterwheel, causing it to turn, and then flowed out of the wheelpit via the tail race and into the tailrace channel, which returned it to the main course of the river. In the medieval period the races and wheelpit were often lined with timber. The rate at which the water passed onto the wheel would be controlled by a sluice, a wooden shutter that could be raised or lowered.

The best evidence for mill design in the project area comes from the early 14th-century rebuild of St Giles Mill (see Chapter 2, above). A large horizontal timber frame with associated vertical posts and piles (Fig. 2.23; Plate 2.40) was found set into a chalk platform that lined the base of a large construction cut. The three large timbers set transversely to the direction of water flow would have supported the end of the timber head race, and the wheelpit and tailrace in their entirety. The westernmost timber, the Head Sill, retained three large equally-spaced trenches (Fig. 2.24; Plate 2.41) in which it is suggested that the 3 timber troughs for the water races would have been seated. From south to north these trenches measured 0.47 m , 0.55 m and 0.55 m wide. The northern trench probably held a bypass channel, perhaps utilised as a fish trap, with the remaining 2 trenches housing the upstream end of the junction between two head races and two wheelpits. The troughs were probably of timber plank construction, perhaps similar to those found at Bordesley Abbey (Astill 1993, figs 33 and 36), and the width of the troughs would have been significantly narrower than the trenched housings in the Head Sill. Recovery of a near complete paddle or

float (Fig. 5.53 No. 16, see Allen, below), still jointed to two starts, indicates the form of the waterwheel in use on this mill (reconstructed on Fig. 5.53). The paddle is the part of the waterwheel that was struck by the water and it was jointed to the ring of the waterwheel by the starts. It appears to retain its full width, 0.33 m, a dimension that would have been compatible with the troughs. The gradient formed by the beams on which the wheelpits would have been seated shows that there was no gradient in the wheelpit (if a flat based trough is assumed), whereas the tail race has a gradient of 1:13. A drop in level in the tail race was important to prevent water flowing back into the wheelpit and impeding the operation of the wheel.

No structural remains of the head race or possible associated sluice gates survived upstream of the Head Sill and therefore it is impossible to ascertain the gradient of the head race. In a lowland environment such as the Kennet floodplain at Reading it is very likely that the mill at this time would have been undershot or stream fed, where simply the flow of water onto the paddles drove the waterwheel, and the head race would have been at the same level as the wheel race. The force of the water onto the wheel could have been increased on an undershot wheel by use of a sluice gate.

The level at which the race floors were constructed tended to rise over time with each rebuild (Fig. 5.56).

The operation of the mill

The machinery of an early vertical watermill is illustrated in Figure 5.51, which shows the components that were recovered in the excavations at St Giles Mill. It should be noted that the illustrated components derive from a mill of probable 12th-century date, while the structural remains are of the early 14th century.

The waterwheel was mounted on the outer end of the waterwheel axle. On the inner end of the axle was the main driving wheel of the mill, the pitwheel (often called the cogwheel in the medieval period). The pitwheel was a timber gear with cogs projecting from its face. In a corn mill the pitwheel meshed with a smaller gear known as a lantern pinion (or trundle). This was made of two timber discs with a number of vertical staves or rungs fixed between them. The lantern pinion drove the upper millstone (the lower millstone was stationary), transforming the vertical motion of the waterwheel and pitwheel into horizontal motion and increasing the speed of rotation. The millstones were supported by a sturdy timber frame known as the hurst frame, which enclosed (and often also supported) the pitwheel and lantern pinion. One of the earliest known illustrations of a waterwheel comes from the *Hortus Deliciarum* of Herrad von Landsberg of *c* 1200 (illustrated in Watts 2002, fig. 42). It shows a waterwheel driving a pitwheel and lantern pinion, with the grain being fed into the millstones via a hopper. The gears and millstones are supported by the timber hurst frame.

The most important finds from this early period came from St Giles Mill, and comprise an entire pitwheel (without spokes and cogs; Fig. 5.51 and Plate 2.36), and part of a lantern pinion (Fig. 5.52). The excavated contexts of these objects are described in Chapter 2, above, and the technical details of their construction are considered by Steve Allen in this chapter, below. Both objects had clearly been discarded, the pitwheel thrown into the silting pond that formed part of the mill bypass channel, and the lantern pinion into the chalk and rubble foundations of the early 14th-century mill rebuild. It is interesting to note that the pitch between the position of the cogs and staves was compatible, and it is therefore possible that they were from the same mechanism and operated together (Watts pers. comm.). The pitwheel had 36 holes for cogs and the lantern would have had 6 staves, giving a gearing ratio of 1:6; that is, for each turn of the waterwheel and main axle the vertical shaft would have turned 6 times.

Both gear wheels showed signs of damage, clearly illustrating the problems that these early wooden gearing mechanisms experienced and how the millwright dealt with them. Running across the face of the pitwheel immediately before the vacant holes for the cogs were long indentations. These were only apparent on one of the four wooden rim segments (or felloes). It is thought that the indentations were made by the 'staves' of the lantern pinion colliding with the face of the pitwheel. The fact that the wear from this problem focused on a single felloe indicates that this element of the pitwheel was out of true or buckled. This was possibly as a result of a weakness in the grain of the wood, inferior jointing, or an incorrect selection and use of timber for the task by the millwright. This fault had a 'knock-on' effect on the lantern pinion. Although less than half of one of the lantern pinion 'discs' or 'roundels' survived, there was clear evidence that it had broken into at least two pieces, which had been rejoined with an oak dowel. The depths of the indents suggest this fault had been a problem for some time and was only remedied when the lantern pinion finally broke. Although it was repaired, it is impossible to tell if the pitwheel was replaced at the same time. Perhaps the repairs were a temporary 'make-do' solution, simply to get the mill operating again. Faults such as these may have prompted the longer term solution of rebuilding the mill in the early 14th century, when these objects were finally discarded.

The gearing mechanisms described above would have been supported on a hurst frame, although no contemporary 12th-century evidence of it survived. The remains of the early 14th-century St Giles Mill, however, included groups of posts (14086 and 14060, Fig. 2.23) that are interpreted as components of a hurst frame. Posts 14060 would have supported the outer end of the waterwheel axle, on which the

waterwheel itself turned. Posts 14086, set in a trapezoidal arrangement, formed the base of the hurst frame. The pitwheel would have been located within the frame, meshing with the lantern pinion and turning the millstone above.

The form and function of the medieval mills at Reading

The entire superstructure of the medieval St Giles Mill, including the water races, was probably dismantled in a rebuild during the early 17th century. However, sufficient evidence survived from the 14th century to indicate the form of the mill that operated during this period. The waterwheels projected from the north side of the mill building, probably from a gable end, although the mill building itself lay outside the excavated area and there is no direct evidence for its medieval form. The excavated evidence described in Chapter 2 and in the present chapter, above, implies the presence of three channels at the mill, one of which is likely to have been a spillway. The position of the waterwheel on the channel closest to the mill building can be inferred from the location of the ground beams and the posts that would have formed the foundation to the hurst frame that supported the waterwheel axle. This mechanism would certainly have been used to drive a cornmill.

However, it is clear from documentary sources that St Giles Mill was being used for fulling by the late 13th century. Documentary evidence from the cartularies of Reading Abbey of the period 1260-1290 state that a gift in free alms was made to Reading Abbey by Richard de la Watere of 6d for annual rent from a tenement leading from Old Street to the fulling mill in the parish of St Giles, between the tenement of William Dyer and the mill (Kemp 1987, 135). This is supported by a separate reference from a quit claim dated to the period *c* 1270-1285, made by Richard de la Hyde to the Abbey of Reading, of his right in a tenement once held by James Forester in the parish of St Giles near the fulling mill (ibid, 178). It is possible that one wheel drove a combination of grinding stones, and then, via the main axle, which would have extended into the mill building beyond the hurst frame, a set of fulling stocks. The only example of such a multiple mill was identified from a late 14th-century documentary reference in Layham, Suffolk (Holt 1988, 132).

Plate 5.3 'Two Water Mills and an Open Sluice', Jacob van Ruisdael, 1653 (The J Paul Getty Museum, Los Angeles)

However, fulling machinery could also be driven directly from a waterwheel axle by the use of cams. These are stout projecting pegs that catch and lift hammers or stampers as the wheel rotates. Water-powered fulling mills were introduced into England in the 12th century using either vertical stampers or heavy timber hammers called stocks to full cloth. Bolts of newly woven cloth were put in a container with water and a scouring agent, then pounded by the action of the stocks or stampers, which felted together the fibres and shrank the cloth so that it was fit for use (Watts 2006, 43-4). Given the evidence for a second channel at St Giles Mill, it is likely that there was a separate waterwheel, on the central channel, that could have driven a set of fulling stocks directly.

By 1545, when William Grey bought St Giles and Minster mills, they were both described as two corn mills and a fulling mill, that is, two sets of grinding stones and a set of fulling stocks would have been present at each mill. If so, then the three processes appear to have been driven by two waterwheels, suggesting that one of the wheels drove two processes. Current knowledge suggests that it was not until the 16th century and the inception of the spur wheel that two separate processes could be driven by one wheel (Watts 2002, 136-7).

A good impression of how St Giles Mill may have looked by the later medieval period can be gained from Jacob van Ruisdael's painting of a Dutch lowland mill of 1653 (Plate 5.3), although the Dutch mill is of breast-shot type rather than the undershot type suggested for St Giles Mill. Although this painting is from the mid 17th century, the dilapidated state of the building indicates that it was probably of late medieval construction.

There was much less evidence for Minster Mill during the medieval period. A very early deposit (Project Phase 2, see Chapter 2, above) from a small pit on the site of Minster Mill produced an exceptionally large assemblage of charred grains which was dominated by partially germinated oats and barley interpreted as evidence for malting, and a significant proportion of wheat and rye probably awaiting grinding into flour. The initial stages of the malting process, 'chitting' and 'roasting', lead to a final stage which involves the malted grain being broken open or 'cracked' before it is mashed. Therefore malting is a likely activity to be associated with a mill. A similar association of malting and mills, although from the Anglo-Saxon period, was identified at West Cotton (Campbell 1994). No other deposits of grain were recovered from the mill sites or any other location or period during the excavations. The deposit suggests that in the 12th century Minster Mill had two separate functions, perhaps requiring two sets of machinery and therefore two separate waterwheels. Rollers or hammers may have been used for 'cracking' the roasted grain as part of the malting process, and grinding stones for processing wheat and rye into flour. The charred nature of the grain suggests that a fire may have destroyed the building it was being stored in, which may have been a warehouse or the mill itself. Unfortunately no elements of the mill's machinery were recovered that could be directly linked to this period, although fragments from what were possibly very early millstones were recovered from later contexts in the vicinity (see below).

Millstones

by Ruth Shaffrey and Fiona Roe

Three large pieces of millstones made from Niedermendig lava, along with a few small weathered fragments, were discovered during the course of the excavations, but all were redeposited in secondary contexts. Among the most interesting was a fragment from site 12 (SF 1760), from a relatively small millstone, with an estimated diameter of 560 mm and a maximum thickness of 100 mm. There were traces of worn grooving on the grinding surface. A millstone with this diameter falls within the size range given for lower stones from the late Saxon Thames Exchange site in London (Wright 1992, 76), and it is a possibility that this millstone could be linked with a late Saxon mill. Small millstones such as this example were usually used in horizontally-wheeled mills (Grenville Astill pers. comm.) which suggests that the Minster Mill might originally have been of this form. Niedermending lava, which was imported from the Rhineland, was widely used for millstones during the mid and late Saxon period, although lava millstones tended to be in a minority in the medieval period. It is not clear why the only millstone fragments found at the site were of lava, when other types of stone were more commonly used at the time. A second fragment came from an early Project Phase 2 context on site 29, dating it to the late 11th or early 12th century. This fragment is from a larger millstone, of a type more common in the 17th and 18th centuries, although known from as early as the 11th century in London. The third fragment, found in a relatively modern context at St Giles Mill, is of the same material and type.

Millstones

Not illustrated

Fragment of small millstone. Niedermendig Lava. Traces of grooved grinding surface and cement from re-use as building stone. Measures 560 mm diameter x 100 mm maximum thickness at the edge. Ctx 8523. Site 12. SF 1760. Modern

Fragment of probable lower millstone. Niedermendig Lava. Roughly shaped underside. Measures approximately 1200 mm diameter x 105 mm thick towards centre. Site 150. SF 61. U/S

Fragment of probable lower millstone. Niedermendig Lava. Traces of grooved grinding surface, lower side very uneven. Found with SF 907. Measures approx. 1200

mm diameter x 90 mm maximum thickness at centre. Ctx 13030. Site 300. SF 906. Probably modern?
Probable rotary quern or millstone fragments. Niedermendig Lava. Two small fragments with small sections of worked surface. Ctx 6954. Site 29. Ph 2902b
Probable rotary quern or millstone fragments. Niedermendig Lava. No worked surfaces remain and sample is very weathered but is likely to be from a rotary quern or millstone. Ctx 3353. Site 150 (TP 27). Modern

Watermill machinery and fittings from the excavations

by Steve Allen

A number of pitwheels (sometimes known as cogwheels) have been identified in recent years, but the example from Reading Oracle is the most complete. The wheel had clearly been used, as several of the pegs which once fastened the spokes were *in situ* and wear marks were present on the face between the cog holes. The construction of the wheel is relatively straightforward. Four slightly curving pieces of timber were selected, one of which was cut from a branch trunk junction. The curvature of the timber was not sufficient for the tight curve required by the wheel diameter and so each piece was cut to shape working from the middle of the timber towards the ends. The signature marks indicate that this was done with an adze, rather than an axe. Each section (known as a felloe) was shaped individually before the wheel was finally fastened together, as the facets cut by this adze do not continue across from one felloe to the next where they overlap at the scarf joints.

The scarf joints were cut with axes. Though technically a stop-splayed scarf joint, the splay is very shallow. It should be noted that that the scarf at one end of each felloe is the mirror image of the scarf at the other end; the splays are cut into the same face at each end. When one face of the wheel is seen with the felloes joined together, this gives the impression that the wheel is made of unequal sized felloes (Watts 2002, 95) whereas the felloes are actually the same size. A stepped lap housing cut completely across the face from the inner to the outer edge to hold the ends of the spokes. The shoulders of these housings were sawn, not hewn. Each housing was located midway between the scarf joints, with the deeper part of the step at the inner edge.

All joints were fastened in place with wooden pegs. These were headed, that is, shaped to have one thicker end. In each case they were driven into pre-cut auger holes and moreover, driven into the same face as that in which the lap housings for the spokes had been cut. The thinner ends of the pegs were cut off more or less flush with the face from which they protruded, and locked firmly in place by a thin wedge driven into the end.

The holes for the cogs were cut after the wheel had been assembled. The holes are each *c* 42 mm in diameter, spaced between 55 and 61 mm apart (edge to edge). The holes are not cut perpendicular to the face of the wheel, but slope at 7° from the vertical. All these holes slope in the same direction. Shallow wear marks are present on one face of the wheel, between these cog holes, but are not perpendicular to the outer edge of the wheel. This suggests that these marks were made as the cogs or staves on the other wheel rubbed against the face of the surviving wheel as they were disengaged.

Two other medieval pitwheels are currently known, from Chingley (Crossley 1975) and Beckside, Beverley (Allen unpublished), with a related trip wheel from Bordesley Abbey (Allen 1993, 216). The scarf joints on the Reading wheel are very similar to those of the late 12th-century Bordesley example, though in the latter case the scarf is pegged from both faces. The spokes of the Bordesley wheel are housed in through mortices, though not enough of the joint survived to indicate whether this was pegged or not. At Chingley the wheel rim fragment appears to have been shaped, being wider about the lap dovetail housings for the compass arms. No indication of any sloping was noted and none of the joints to neighbouring felloes had survived. The Beckside wheel is the closest parallel to the Reading wheel, though again the joints between the felloes have not survived. Though the spokes are pegged into bare-faced lap dovetail housings, the *c* 48 mm diameter cog holes (spaced 52-58 mm apart) are also sloped, at around 6° from the vertical.

The lap housings for the spokes and the pegs used to fasten the joints are set into or driven from the opposite face of the wheel to that where traces of wear are evident. The intention seems to have been to leave that face of the pitwheel from which the cog heads projected clear of minor obstructions, perhaps to avoid any risk of jamming the wheels or throwing them out of gear.

A similar concern may lie behind the sloping of the cogs relative to the wheel face, making it easier for the cogs to catch and release as the wheels rotated. This feature is illustrated in a number of medieval manuscripts, such as Herrad von Landsberg's *Hortus Deliciarum* of *c* 1200 (reproduced in Watts 2002, fig. 42), but does not appear to have been commented on. All reconstruction drawings of medieval watermill machinery show cogs perpendicular to the face of the pitwheel. Whilst this is certainly true in some cases, the presumption seems to be that the angle of the cogs in medieval illustrations is either an artistic convention or poor draughtsmanship. The Reading and Beckside wheels can now demonstrate that the artist in these cases was accurately reproducing an important feature of contemporary mill gearing.

The disc (or roundel) from a trundle or lantern pinion (Reid 1987, 70) appears to have been made from two halves, though it is not clear whether they were intended to be fastened together around the

axle or to have had the axle passed through them after they had been joined. Ben Ford (above) discusses the possibility that the joining of the two pieces of disc may have resulted from the item suffering damage while in operation. Assuming an even spacing around the wheel, there would have been six such staves. The wood from which these staves were cut cannot be closely identified but is one of the fruit wood species, apple (*Pirus malus L.*), pear (*P. communis L.*) or hawthorn (*Crataegus* sp.). All are very hard and resistant to wear, and are among those recommended for use in watermills for cogs and similar applications (Fuller and Spain 1986, 147; Reid 1987, 69).

The remainder of the identifiable watermill machinery components are from the waterwheels. Four 'Starts', the staves on which the blades or 'Floats' of a waterwheel are mounted, were recovered, one with the float still attached. The starts were generally shaped with one face of the head cambered, the float being attached to the flat face by two or three trenails. The shafts of the start are worked so as to fit into one of several sockets located around the circumference of the wheel rim. None seems to have been pegged or nailed in place, but this is not unusual as these objects appear to have been secured to the waterwheel with wooden wedges (Allen 1993, 214; Salisbury 1993, 74). Similar wedges in the small finds assemblage could have been used for this purpose.

The one medieval float is almost complete and has two auger holes additional to those used to peg it to the start. These are not symmetrical and may be a means of allowing water to drain quickly from the float as it was lifted out of the water.

The form of the waterwheels from which these components derive is uncertain. 12th-century wheels such as those at Bordesley (Allen 1993, 214) and Hemington Fields (Salisbury 1993, 74) have floats mounted on starts set into the wheel rim, with their ends stabilised by struts fitting into rectangular slots towards the ends of the board. 14th-century examples such as Chingley have the floats pegged or nailed to shrouds, boards which enclose the floats on each side, making the rim of the wheel into a series of boxes. The 14th-century wheel at Batsford (Bedwin 1978, 194) has wooden pegs passing through holes in the shrouds across the face of the floats, helping to support them. The Oracle example of Project Phase 4 lacks rectangular slots for struts, yet was clearly not nailed or pegged through its edges to any shrouds. On current evidence, it may be suggested that the wheel was open sided and the starts so firmly wedged in place that there was no need for additional struts.

One of the boards from Project Phase 9 (12096) may be a float from the type of shrouded waterwheel just described. This board shows marked differential wear across its faces, with the ends unworn and the middle of each face very highly abraded. This is a pattern which occurs when the ends of a piece of wood are retained and protected in a groove or slot whilst the rest of the board is open to erosion. It is possible that this would happen to a float whose ends were retained in grooves or between a pair of battens.

The second board from Project Phase 9 (12537) is another possible float, but if so it is from a much wider wheel. Differential wear on one of the faces indicates that this piece had two starts pegged to it with *Pomoideae* species pegs, one start towards each end.

One final artefact which may be related to the latest phase of watermill is 12535, which may be part of a sluice gate. The presence of a layer of hair between the layers of boards is an arrangement normally associated with caulking or making a join watertight, desirable qualities if it were to be used in shutting off a water supply to a mill race. However, this identification is not certain and it is possible that the object is simply an insulated shutter or hatch.

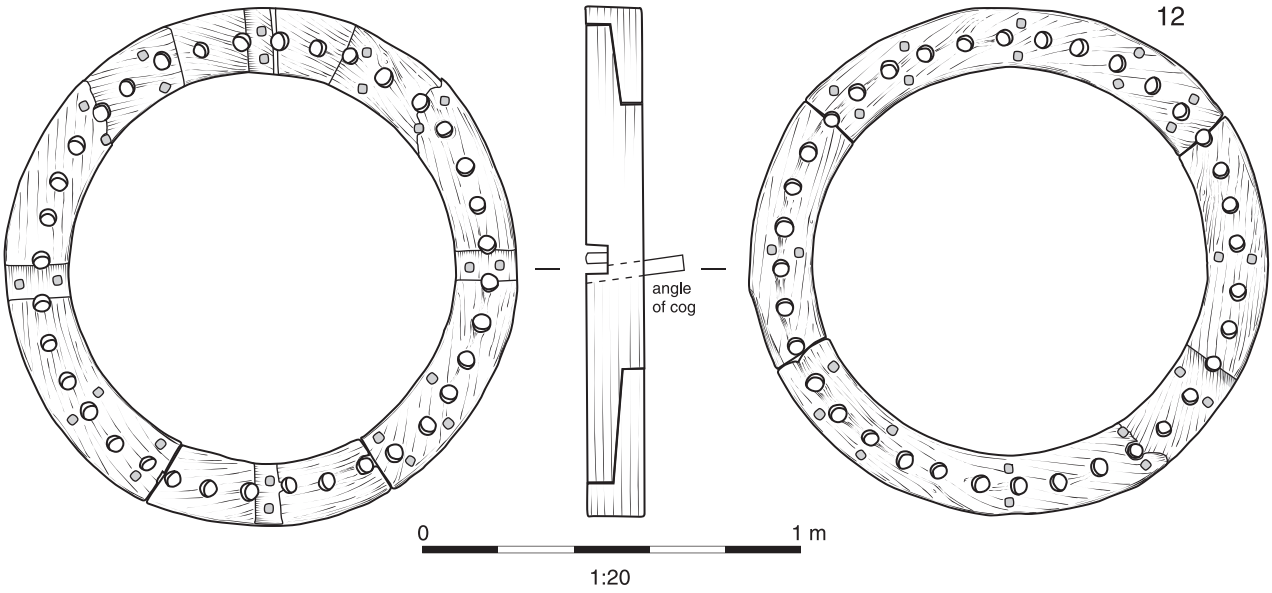
The objects discussed above were all recovered from silted deposits within water channels, either within the mill race or associated with it, having been discarded. Of interest is that one of the starts (No. 14, below) is from a deposit which predates any of the watermills excavated in the current project area. As such it adds to the evidence for a pre-14th-century watermill at or upstream from the site. An unusual aspect of the wood assemblage from these watermills is the absence of any cogs. Cogs in whole or in part were recovered from Bordesley (Allen 1994, 214-216) and Batsford (Bedwin, 1978, 199). Where they are absent from mill sites, this coincides with the almost complete absence of other wooden small finds, as at Hemington Fields (Salisbury 1993) and Blackwater Green (Place and Bedwin 1992). It must be presumed that such cogs may have been swept away down river. A cog and a cog head, not recognised at the time, were in fact recovered downstream from these mill sites, in medieval deposits at the Abbey Wharf (Mills 1997, 175, Nos 9 and 10).

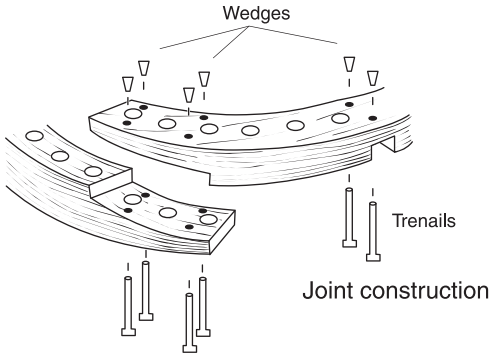
Catalogue

The catalogue of illustrated mill machinery and fittings is an extract from the full structural timber catalogue, which can be found in Chapter 8 on the CD ROM.

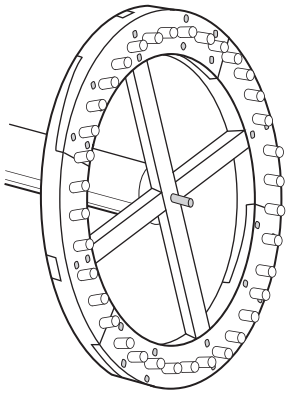
Figure 5.51

12 **Ring of a pit- or cogwheel**. Constructed from four felloes joined by stop splayed scarf joints. Stepped lap housings for four compass arm spokes in two pairs. Each scarf fastened by four trenailed pegs and each spoke fastened by two headed trenailed pegs. Face of wheel pierced by 36 through holes, 40-42 mm diameter spaced 55-61 mm apart (edge to edge). All felloes oak (*Quercus* sp.), two box quartered, two box halved. Some of pegs are *Pomoideae* sp. External diameter *c* 1.34 m, internal diameter *c* 1.04 m, width of felloes *c* 157 mm, thickness of felloes *c* 150 mm. Ctx 13385. Project Phase 2, 3001a.

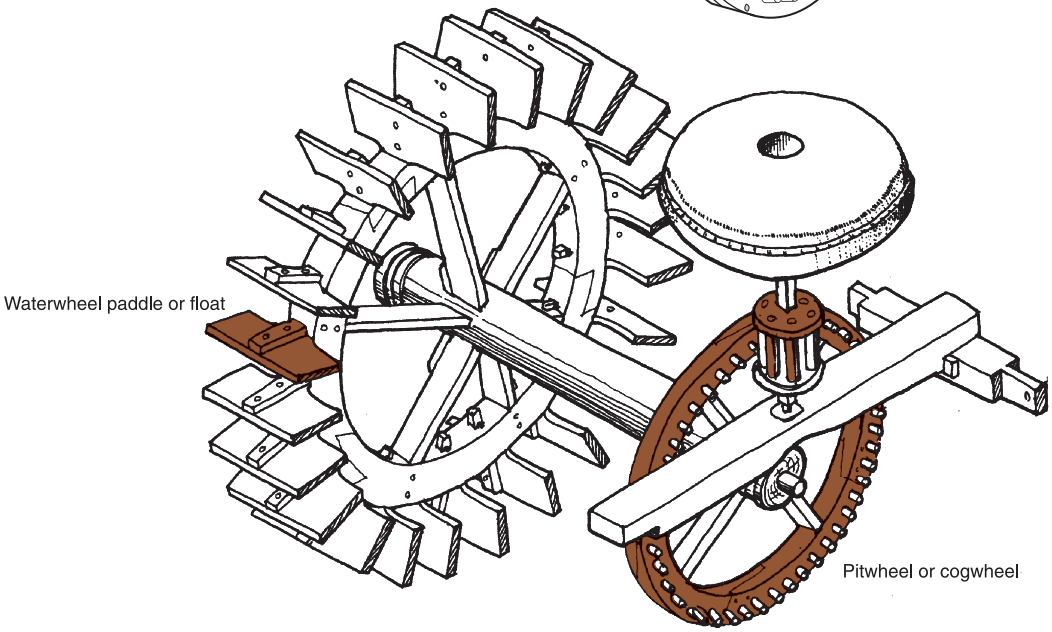




Joint construction



(NB. method of attaching axle not known)



Components found at St Giles Mill

Figure 5.52

13 **Part of the Disc or Roundel from a lantern pinion**. Approximately 75 % of one half of the disc present, remainder broken and missing. Single 23 mm diameter through peg hole for attachment to missing half of disc, with peg *in situ*. Three 41 mm diameter through holes in face, spaced 64-65 mm apart (edge to edge), two of which contain the cylindrical shafts of the 'staves'. Part of rectangular socket to house axle/spindle towards flat edge of object. Disc and attachment peg are oak (*Quercus* sp.), disc box halved from a piece of burr wood, peg radially faced. Shafts are *Pomoideae* sp., both radially faced. Very worn and eroded surfaces. Overall 290 mm l, 140-150 mm w, 120 mm th. Ctx 13628. Project Phase 4, 3002a

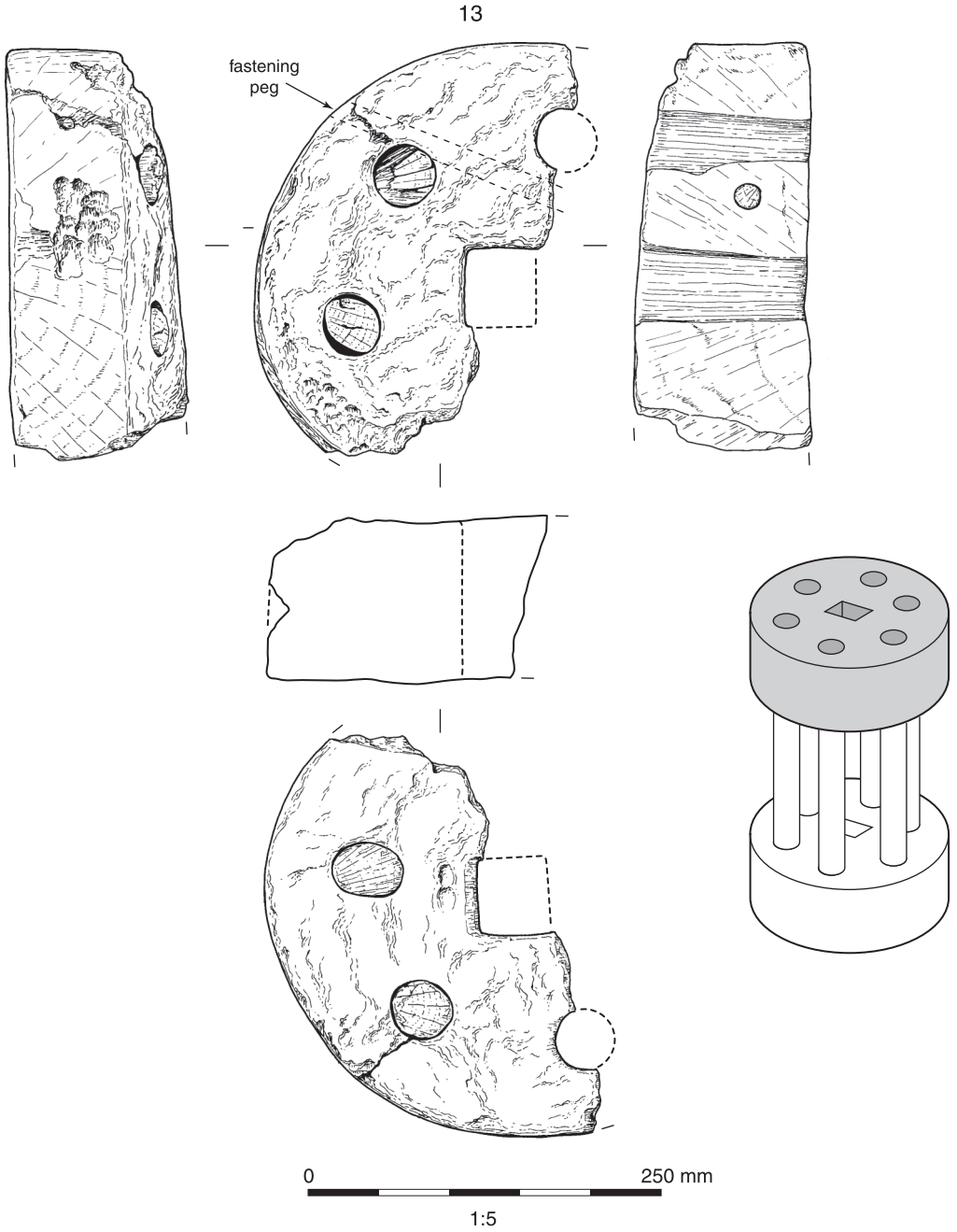


Fig. 5.52 Structural timber, watermill machinery and fittings: Part of the disc or roundel from a lantern pinion (No. 13)

Fig. 5.51 (opposite) Structural timber, watermill machinery and fittings: Ring of a cog- or pitwheel (No. 12); the machinery of an early vertical watermill showing the components recovered in excavations at St Giles Mill (after Watts 2002)

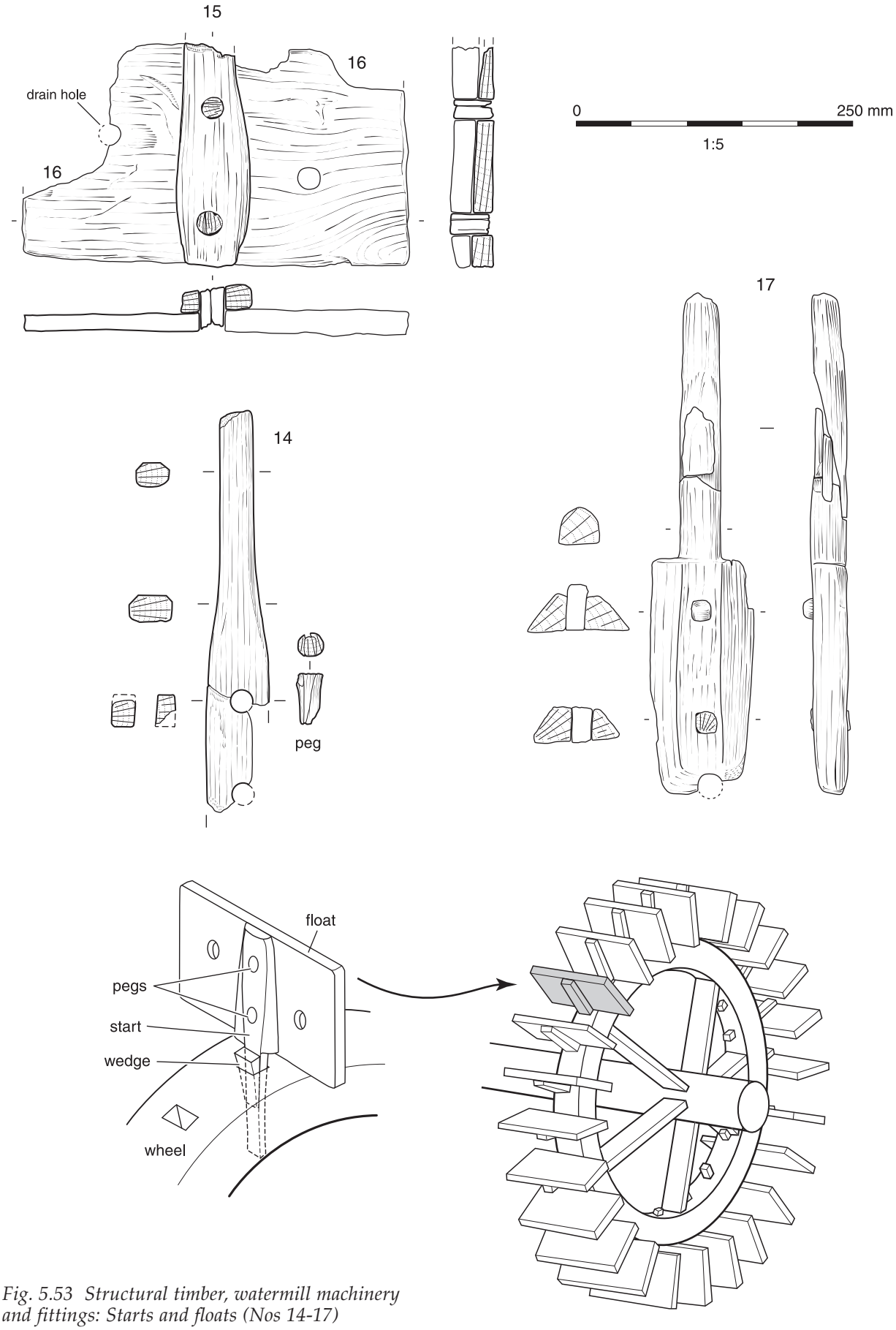


Fig. 5.53 Structural timber, watermill machinery and fittings: Starts and floats (Nos 14-17)

Figure 5.53

14 **'Start' from Waterwheel**. Stave with one end cut to form octagonal cross-section shaft, remainder cut to a wider flat blade or head. Top and most of one edge of head missing. Head is flat on each face and pierced by two holes, one at the broken end. The complete hole retains part of a peg. 'Start' and peg are radially faced oak (*Quercus* sp.). Overall 363 mm l, 54 mm w, 20 mm th. Shaft 200 mm l, 30 mm w, 20 mm th. Peg holes 22 mm dia, spaced 64 mm apart. Ctx 13980. Project Phase 1, 3000

15 **'Start' from Waterwheel**. Head of 'Start', cut to form a flat blade, shaft broken away and missing. Head is flat on each face and pierced by two holes. The two holes retain parts of two trenailed pegs attaching the piece to the face of No. 16 (ctx 13968). 'Start' and pegs are radially faced oak (*Quercus* sp.). Overall 203 mm l, 68 mm w, 25 mm th. Peg holes 20 mm dia, spaced 120 mm apart. Ctx 13967. Project Phase 4, 3002a.

16 **'Float' from Waterwheel**. Board with one corner and most of one end broken and missing. Pierced by two holes along mid point of length, one towards each edge, which retain parts of two trenailed pegs attaching the piece to the face of No. 15 (ctx 13967). Two further holes present set asymmetrically, one towards each end. Radially faced oak (*Quercus* sp.). 350 mm l, 200 mm w, 16 mm th. All holes 20 mm dia. Ctx 13968. Project Phase 4, 3002a.

17 **'Start' from Waterwheel**. Stave with one end cut to form cylindrical shaft, remainder cut to a wider flat blade or head. Top of head missing, shaft broken but refitting. Head is flat on each face but edges are chamfered to give a wider and a narrower face. Head is pierced by two holes, with the remains of a third at the broken end. The two complete holes retain parts of two trenailed pegs. 'Start' is radially faced oak (*Quercus* sp.), both pegs elm (*Ulmus* sp.). Overall 474 mm l, 88 mm w, 37 mm th. Shaft 261 mm l, 27 mm dia. Peg holes 25 mm dia, spaced 34 and 80 mm apart. Ctx 9213; SF 1790. Project Phase 5, 1206b

Figure 5.54

18 **Part of float from waterwheel?**. One edge broken away and missing. Remains of two cut holes, one towards each end, asymmetrically placed. Both faces highly eroded except at ends. Radially faced oak (*Quercus* sp.). 406 mm l, 165 mm w, 26 mm th. Ctx 12096. Project Phase 9, 3004b.

Figure 5.55

19 **Shutter, hatch or part of sluice gate?** Composite artefact built from two tangentially faced oak (*Quercus* sp.) boards joined edge to edge by iron spikes with set of iron spikes in one edge for attachment to a third missing board. A layer of hair is applied to one face of these boards and three thin scots pine (*Pinus sylvestris* L.) boards are nailed on top of this. On the opposite face is nailed a transverse batten of radially faced pine (*Pinus sylvestris* L.). Very eroded, much surface damage. 1.02 m l, 545 mm w, 84 mm th. Ctx 12535. Project Phase 9, 3004b.

20 **Part of float from waterwheel?** Board with two adjacent corners and most of the edge between them broken and missing. Remains of three through peg holes in face, two towards one end, one towards the other. Strip of uneroded wood surface between the holes running edge to edge. Tangentially faced oak (*Quercus* sp.). 1.012 m l, 350 mm w, 22 mm th. Holes 20-21 mm dia. Ctx 12537. Project Phase 9, 3004b

(not illustrated) **'Start' from Waterwheel**. Stave with

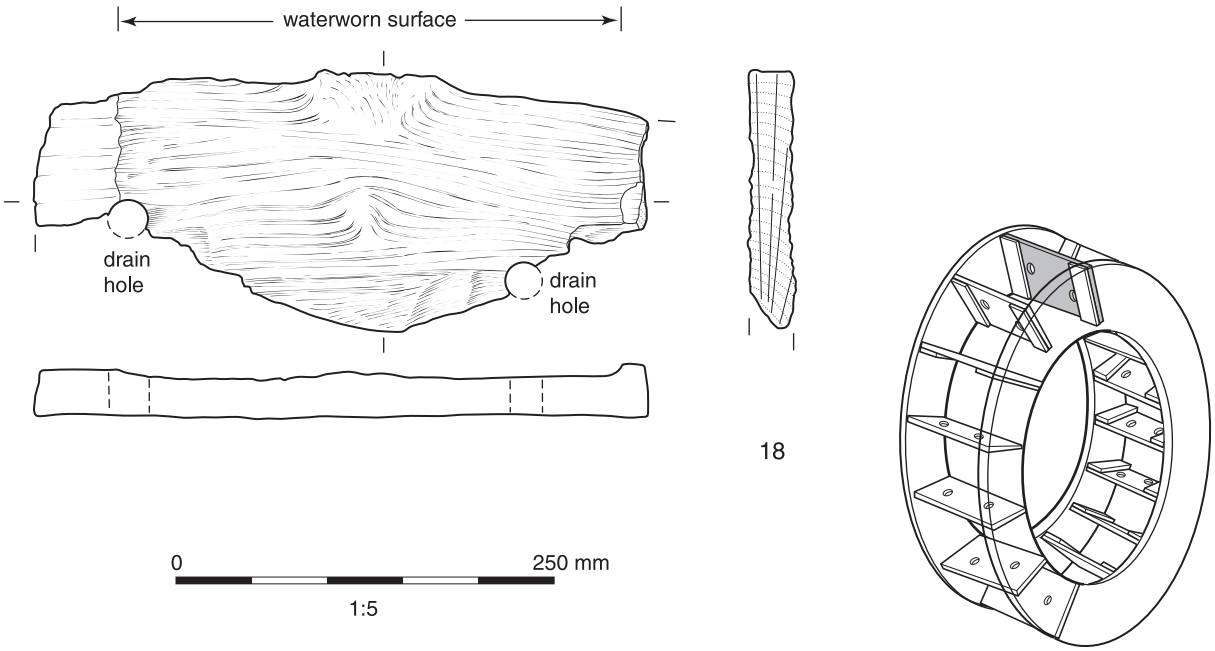


Fig. 5.54 Structural timber, watermill machinery and fittings: Possible float from waterwheel (No. 18)

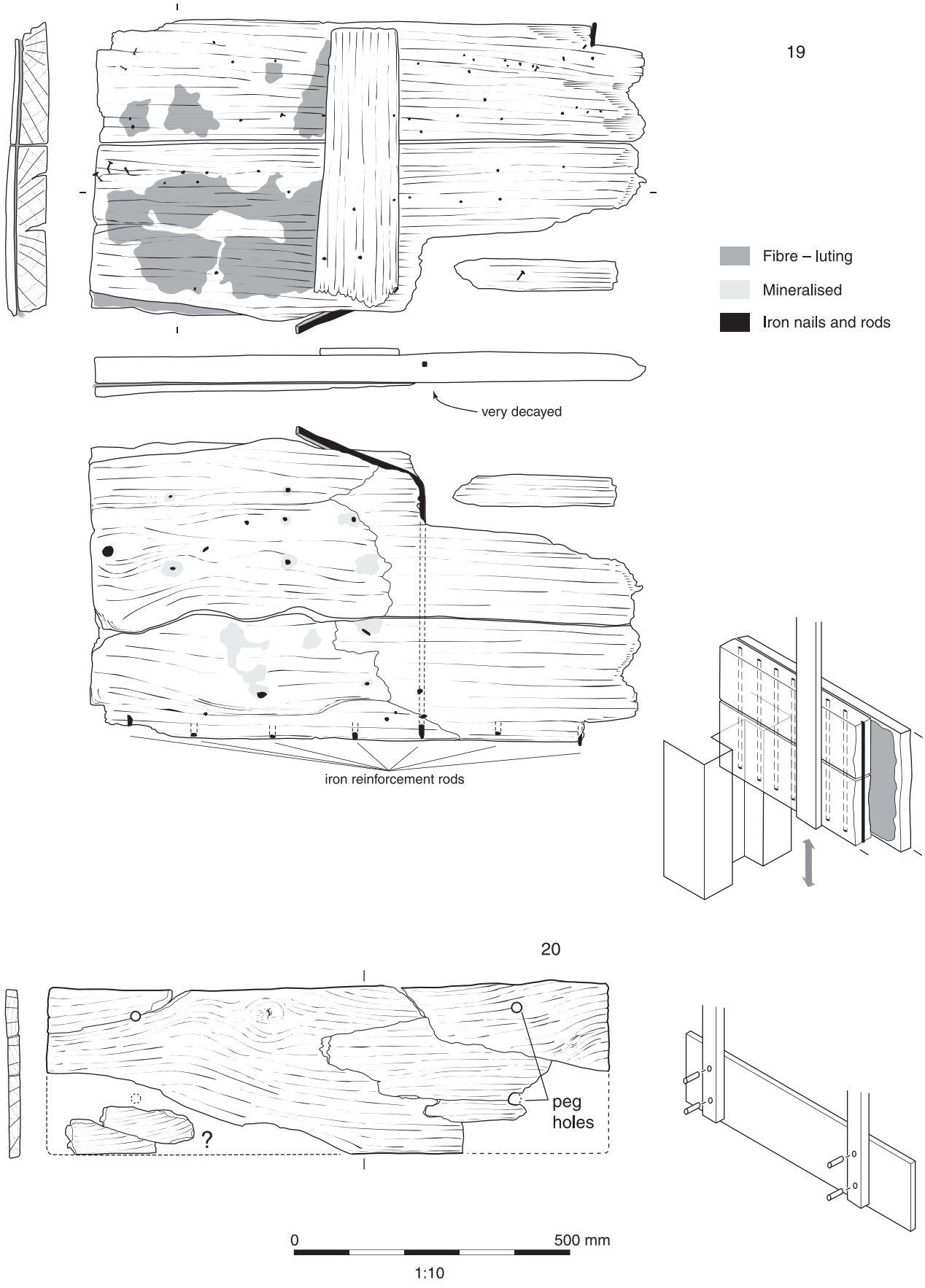


Fig. 5.55 Structural timber, watermill machinery and fittings: Possible shutter, hatch or sluice gate fragment (No. 19) and possible float (No. 20)

one end cut to form cylindrical shaft, remainder cut to a wider flat blade or head, end missing. Head is flat on one face and cambered on the other. Head is pierced by two holes, one of which holds part of an *in situ* trenail. All elements radially faced oak (*Quercus* sp.). Overall 430 mm l, 100 mm w, 35 mm th. Shaft 230 mm l, 33 mm dia. Peg holes 24 mm and 22 mm dia, spaced 73 mm apart. Site 28 Test Pit, Ctx 8395; SF 707. Not phased.

Millwrights and mill carpentry

Some of the evidence from the excavations gives insights into different aspects of the millwright's trade, not only relating to the machinery within a mill, but to structural elements of the buildings themselves.

Structures

It is believed that medieval timber-framed buildings were prefabricated at the carpenter's yard, dismantled, and then re-assembled at the construction site (Quiney 1990, 114), thus leaving only minor re-adjustments to be made at this final stage. Limited evidence in the form of a linear deposit of oak chips on the surface of the foundation/construction platform in the early 14th century at St Giles Mill (Fig. 2.23; Plate 2.39) suggests this was also the practice for the construction of mills. This deposit was not very large and would have resulted from carpenters' work at the construction site with the use of a side axe or adze.

Until the 15th century the remains of the mill structures discovered were exclusively made from oak. This timber was sourced from naturally grown and managed woodland from along the Thames Valley upstream from Reading (Miles, Chapter 11, below). This situation changed in the late 15th to early 16th centuries, when a greater variety of wood species were used, including beech and elm as well as oak, which were sourced from the Kennet valley. In the 18th and 19th centuries timber (still from a variety of species) was once again mainly sourced from woodlands bordering the Thames upstream from Reading. During the period when timber sources shifted from the Thames to the Kennet, a characteristic timber joint was introduced in the timber framing for mill channel foundations. The wedged bare-faced dovetail tenon was used to join transverse to longitudinal beams at St Giles Mill in the rebuild of 1611 (see Plate 3.35). Interestingly the first recorded use of this joint for this purpose in a similar structure is from Greenham Mill, near Newbury and dated to *c* 1570 (Allen in Hawari, 2004-2008). Although the evidence is currently limited, it does suggest the emergence of a construction tradition associated with timber sourced from the Kennet valley, from the late 16th century into the early 17th century. It is interesting to speculate whether this was developed by local millwrights based along the Kennet, using local timber. These two distinct trends may reflect changes in sources of supply linked to the demise of Reading Abbey, whose woodlands had probably provided much of the excavated timber from the medieval structures.

Locks are closely associated with mills within the landscape. As far as the author is aware no examples of medieval locks have been excavated, although references in documentary records confirm their existence, in other parts of the country as well as in Reading. Early 'flash' locks were relatively simple. The passage of boats up and down stream was made possible by removing timber elements, or paddles, from the weir and the boats travelled through the gap. This was a potentially hazardous operation, which not only lost the head of water from behind the weir but also depleted the water level in the mill leat, and was therefore unpopular with mill owners. The later pound locks were safer and made more efficient use of water. In this type of design water was contained between two sets of gates within a chamber where its level could be controlled. Pound locks were introduced on the Exeter Ship Canal in 1564. Both mills and pound locks share a common structure, that of the timber water channel. Head and tail aprons at either end of the lock pound are equivalent to the head and tail races at either end of the wheel race in the case of mills. Excavations at Monkey Marsh lock on the Kennet navigation at Thatcham (Harding and Newman 1997) demonstrate that the timber floors for the Phase 1 lock head and tail aprons, which dated to the second half of the 18th century, were constructed in an almost identical way to the floors of the mill races at St Giles Mill, Minster Mill and the water pumping mill in the post medieval period. Other parallels between these structures include the mixed use of oak and elm. At Monkey Marsh it is suggested that elm may be more commonly used where the structure would be continually submerged below water. This may also be true for St Giles Mill, although none of the above-water elements survived for comparison.

The similarity between the water-carrying structures for locks and mills suggests that there was a link between those who designed and those who carried out the building works of these structures. It is probable that the skills and knowledge of the millwrights, acquired over many hundreds of years, if not the actual labour itself, would have been used in the design and building of locks. Indeed John Rennie (1761–1821), engineer and architect of the Kennet and Avon Canal, trained as a millwright with Andrew Meikle, who was himself a millwright.

Rebuilding

The archaeological evidence demonstrated that mill channels were rebuilt in the same position as their predecessors, and the new foundations were often constructed upon the remains of those from the

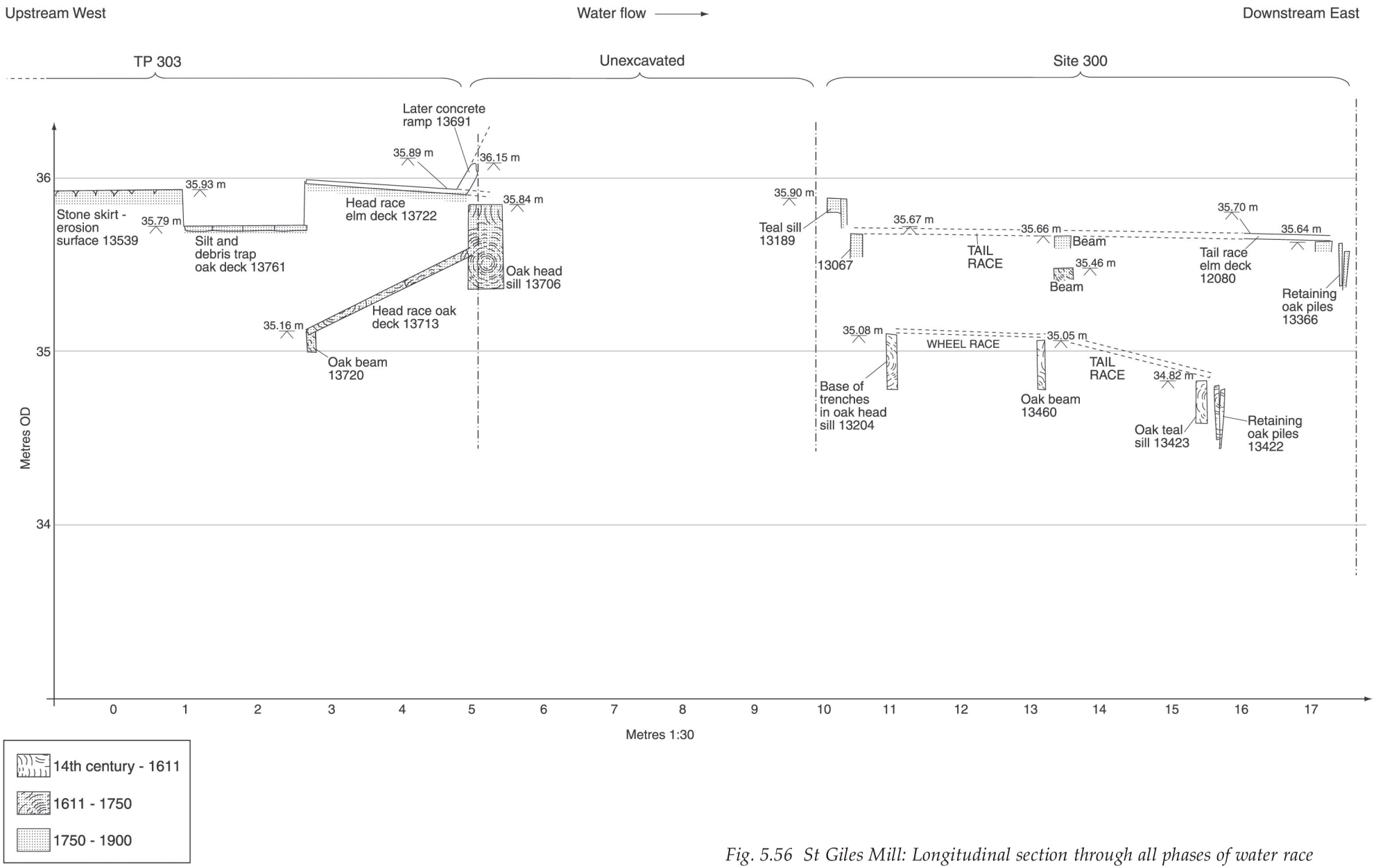


Fig. 5.56 St Giles Mill: Longitudinal section through all phases of water race

former channels. Timber posts or piles might have been too difficult to remove, but primary transverse and longitudinal beams were also often retained *in situ* to provide extra stability to the new structures (see Figs 3.14, 5.56; Plates 3.35, 3.45). Evidence was also found that elements of earlier structures were re-used *ex situ* during the rebuilding works, for the purposes of choking and blocking up new beams to the correct height, and to fashion makeshift walkways to facilitate these works. These features of the construction process demonstrate a consistently practical and pragmatic approach by the Reading mill builders to their work over many centuries.

Repair

In terms of repair to the mill structures themselves, the evidence is restricted to elements of the foundations, because much of the superstructure of the mills had been destroyed. Where repair was recognised it was mainly concerned with water erosion of various parts of the structure. The effects of erosion were identified in two principal locations. Water in the mill tail affected the foundations of the downstream end of the mill structures, and water eroded the timber of the water races and seeped through the race floors to erode the ground and affect the foundations below the races. Tree-ring dating at St Giles Mill demonstrated that the piles retaining the tail sill supporting the tail race from the mill tail needed reinforcement in the mid 15th century.

Increasing productivity and changing methods of power generation

The most notable changes that can be seen from excavated and cartographic evidence within the project area in the post-medieval period are related to the need for increased productivity and the subsequent demands for increasing, and increasingly efficient, use of water power. This process ultimately resulted in the replacement of water engines by steam engines. This is discussed further in Chapter 6, below.