

Medieval pottery from the kiln site at Colstoun, E. Lothian

Catherine M Brooks*

INTRODUCTION

The medieval pottery kilns at Colstoun have hitherto been known only from references in general discussions of Scottish medieval pottery (eg Laing 1973, 184) and in articles on the manufacture and distribution of face-mask jugs (eg le Patourel 1966, 164; Dunning 1968, 39; Laing & Robertson 1970, 149). The purpose of the present article is to describe and illustrate the pottery in the collection of the National Museum of Antiquities of Scotland from the two kilns excavated by Dr David Clarke. It is hoped that this will serve as a reference point for readers of the existing literature on medieval pottery, as well as a preliminary to future work on the subject.

The kilns lie in a 23-acre field on the Colstoun estate just over 2 miles S of Haddington, the county town of East Lothian (NGR NT 520709; fig 1). Shortly before the last war, Lady E Broun Lindsay uncovered a medieval kiln there, and in 1949 Dr J S Richardson did some more work on the site, but there are no surviving records of his work. In 1969, a new kiln of type 3 construction (Musty 1974) was excavated by Mr B J N Edwards for the National Museum of Antiquities of Scotland (*Medieval Archaeol*, 14 (1970), 205). The pottery from this kiln remains unpublished, apart from two kiln props (Brooks & Haggarty 1977, fig 2, nos 2, 3).

In 1971 Dr David Clarke of the National Museum of Antiquities re-excavated the type 2a kiln uncovered by Lady Broun Lindsay (*Medieval Archaeol*, 16, 1972, 208). The kiln (Kiln 2) was oval, built of undressed stone blocks acting as a lining to a pit excavated in the clay subsoil. On one side the wall survived to a height of 0.7 m. The flue at one end had been destroyed by a 19th-century field drain; the other flue cut into an earlier kiln (Kiln 1). This was similarly set into a pit in the subsoil; the walls, surviving to a height of 0.45 m, were of courses of small stone blocks interspersed with courses of clay bricks, alongside a section of large stone blocks. In the make-up of the wall was a large part of an earthenware mortar with a stamped rim (no 240). Kiln 1 was at the time taken to be funnel-shaped, but it seems more likely that it is an irregularly shaped type 2 kiln (compare Upper Heaton Kiln III, for example (Manby 1964, fig 5); interestingly, this kiln was reconstructed several times and the walls partially relined. The different construction techniques of the wall of Colstoun Kiln 1 might also indicate such alterations.) Undisturbed floor levels of burnt sand were found at the very base of Kiln 2, and in Kiln 1.

The pottery assemblage from the excavation is considerable, comprising just under 10,000 sherds. Most of the pottery was unstratified, coming from the plough soil and from Kiln 2 which had been almost completely excavated previously. The types from Kilns 1 and 2 were found to be the same, and pottery joins were established between the lowest levels of Kiln 2 (still *in situ*)

* York Archaeological Trust, St Anthony's Hall Annexe, 47 Aldwark, York

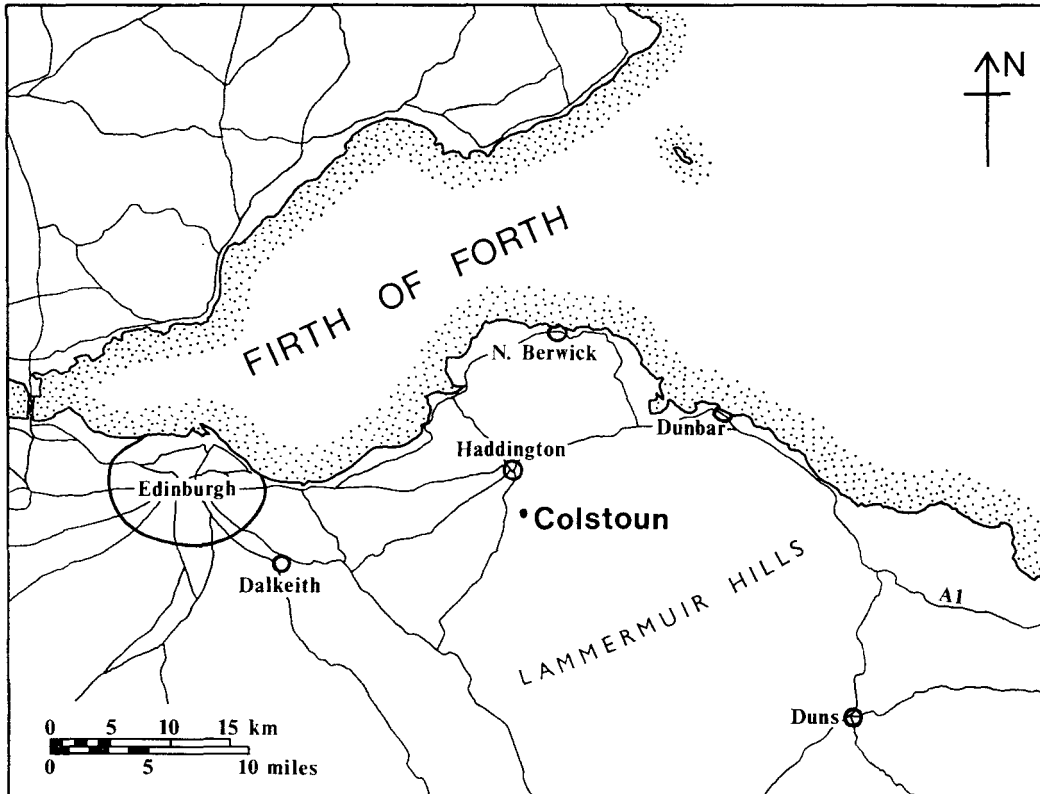


FIG 1 Colstoun: location map

and Kiln 1. This is not surprising as Kiln 2, cutting into Kiln 1, might be expected to contain some redeposited material. It was therefore decided, for convenience of restoration and analysis, to treat all the pottery as the one fairly homogeneous group that it appeared to be. Recent fieldwork by the writer (see Appendix 2) resulted in further collection of surface sherds of similar character; some have been included here to illustrate certain points (nos 33, 34, 68, 84), as have three pieces from earlier excavation in the area of Kiln 2 (nos 206, 247, 248; Colstoun Estate collection).

After the main part of this report had been completed and the illustrations prepared, a group of material in the National Museum's stores (no accession no) was brought to the writer's attention. This is a collection of some 200 medieval sherds and kiln brick fragments donated by Lady Broun Lindsay (*Proc Soc Antiq Scot*, 102 (1969-70), 296, no 15); the group represents the best finds from her earlier excavation. Since it contains better preserved examples of some Colstoun forms, a short report has been included (Appendix 1).

THE FABRIC

Over 97% of the sherds are in a hard pale quartz-gritted fabric, wheel-thrown and well fired. Most of the material presumably represents pottery that did not survive firing well enough to become marketable, and many sherds have been reduced and over-fired almost to vitrification, so it is not altogether easy to be sure of the intended final appearance. However, under oxidising

conditions the clay typically fired to a white (eg 2.5Y 8/2, 10YR 8/1-8/2 Munsell nos, *Munsell Book of Color*, 1971 edition) or pinkish-white (5YR 8/2, 7.5YR 8/2), usually with buff (5YR 6/6, 7.5YR 7/6) to very pale brown surfaces (10YR 7/4-8/4), occasionally with brown surfaces (10YR 5/3). Only rarely, in thicker pieces such as handles or cooking pot rims, do sherds exhibit a grey reduced core. The variability of the local clays is however reflected in the pottery, which covers a wide range from almost pure white (2.5Y 9/2, 10YR 9/2) to pink (5YR 7/4-8/3) and light red (2.5YR 6/6-6/8); sherds in these latter categories often have a sandwich-effect core, either lighter or darker pink than the surfaces. The pinker sherds are occasionally in a softer-fired powdery fabric. Reduced sherds are greyish-brown (10YR 5/2) or grey (10YR 5/1-6/1) to dark grey (10YR 4/1).

The clay matrix is usually fine and dense. The amount of temper in the fabric varies considerably, the jugs tending to be in less gritty paste than the cooking pots. The grittier fabrics often have grains protruding from the surface, giving a resemblance to the Gritty and Pimply wares of NE England. Two fabrics of different tempering can occur on the same vessel, a grittier fabric being used for a face-mask or jug handle, for instance. This may be a deliberate choice, to strengthen such added features, or may simply reflect a division of labour and different batches of clay. Sometimes the fabric is so fine and white as to resemble SW French pottery (eg bowl no 227). The grits present can be up to 2.5 mm or more across, but are mostly under 1 mm. Quartz, mica, haematite and sandstone fragments have been noted in the clay matrix (see Appendix 3).

2.7% of the sherds are in a thicker red (2.5YR 4/6-5/8) to dark red (2.5YR 3/6) fabric with little temper. These Red ware sherds are perhaps later in date than the bulk of the material, judging from the forms and lack of cooking pots,

The subsoil of the kiln field is for the most part a boulder clay varying in colour from yellow to reddish-brown, and firing to shades of red. As part of a recent fieldwork exercise, 20 random clay samples were gathered from nearby stream beds. The clays were often mixed and streaky, being grey-and-yellow, grey-and-red, or plain grey or reddish-brown. This streakiness matches well with most of the fragments of burnt daub gathered from the field, which are variegated white and red or pink. The clay samples were sent to a potter, Mr Ian Hird of the Kelso Pottery, who kindly agreed to examine them for their throwing potential, and make and fire some vessels. The results were interesting, showing that good potting clays firing both red and pale pink were available, indicating the medieval potter's strong preference for a pale fabric (while sometimes making use of red clays for decoration). Three samples were considered as excellent for potting; two fired almost brick-red, but the best was grey, with a few reddish ferruginous streaks, and fired to a pale pink. He commented: 'Lovely clay (similar in texture to my own clays) - throws beautifully, takes thin section and feels very mature. If this could be found in any quantity, it would be worth setting up a pottery for.' Thus it is very probable that somewhere nearby there is, or was, a purer source of good grey potting clay which would produce the white Colstoun fabrics (see also Appendix 4). The deliberate choice of white fabrics is common in eastern Scotland and NE England, and in all probability ultimately reflects the influence of the fine Stamford wares.

THE GLAZES

The upper parts of jugs are usually glazed, and bowls (226-7) are glazed internally and externally. Dishes or dripping trays (221; fig 16, no 16) are glazed internally. However, the runs or drops of glaze which appear on many cooking pot fragments are likely to be accidental (some-

times as a result of broken pots being used in the kiln as stacking sherds for glazed jugs – see nos 241–5). The glazes, where they have not been blistered and blackened through overfiring, show great variability, ranging from yellow and golden-brown through pale green, apple green and light olive green to a thick dark green glaze very like that found on Scarborough ware. A contrasting dark brown glaze is often provided by using a reddish-brown clay with high iron content for appliqué decoration. In most cases the lead glaze is left plain, oxidising to yellow and reducing to green, but the addition of copper to the glaze is responsible for the richer darker greens and speckled green glazes seen on some of the pottery, especially the more elaborate pieces. The glaze is usually thick and adheres well to the body of the vessel, though the surface is sometimes roughened by the protrusion of grits from the clay beneath.

CLASSIFICATION

An attempt has been made to establish the number of vessels represented in each class and type. This has been done using the rim sherds, which were sorted into types and then into approximate diameter groups, matching for joins where possible. Sherds from the same vessel rim, even when not joining, could be grouped together by this means. This gives some idea of numbers, without necessarily reflecting the proportions of pottery types actually produced in the kilns. Face-mask jugs, for instance, which involved more time in manufacture and must have been more profitable to market than other jugs, would probably have been given a favourable position in the kiln to minimise wastage (Bellamy & le Patourel 1970, 115; Bryant 1977, 111).

This count indicated that about 1,526 vessels were represented, over 55% of these being cooking pots, and 40% jugs. The remaining 5% comprises kiln stands and other forms such as bowls and pans. The term 'cooking pot' refers to a general class of vessel and does not necessarily indicate that they were all intended for cooking; such vessels probably had various kitchen uses such as food storage and preparation.

JUGS (figs 2–6)

Some 578 jugs are represented by rim fragments; no complete profiles could be reconstructed. There are a further possible 30–40 or more face-mask jugs which are considered below. The principal jug form seems to be ovoid and rather squat, with a sagging base, simple pinched spout and cylindrical neck pushed out below the rim to a ridge at which point a strap handle is usually attached (1–12; also fig 15, 2). A narrower form of jug is suggested by the presence of splayed bases, often with thumbing (100–02, 105–6, 108–10).

Rims and Spouts (fig 2)

Jug rims vary from 9–11 cm in diameter. 94% have ridged necks (1–12) and the remainder have cylindrical necks with slightly thickened rims (14–17). The ridge-necked jugs have more pronounced thickening at the rim, the cross-sections being in equal proportions squared, occasionally almost collared (1–3), rounded (4–6) and triangular, with slight variations (7–12). There is very often a cordon at the base of the neck (4, 5, 8, 13) which is echoed by a similar cordon or ridge on the shoulder of the jug (13). This shoulder ridge probably had a structural function as well as a decorative one, strengthening the pot (van der Leeuw 1975, 78).

The hazards of jugs stacked upside down in the kiln sticking to one another by the glaze at the rim seem to have been appreciated by the Colstoun potters. Although there are some

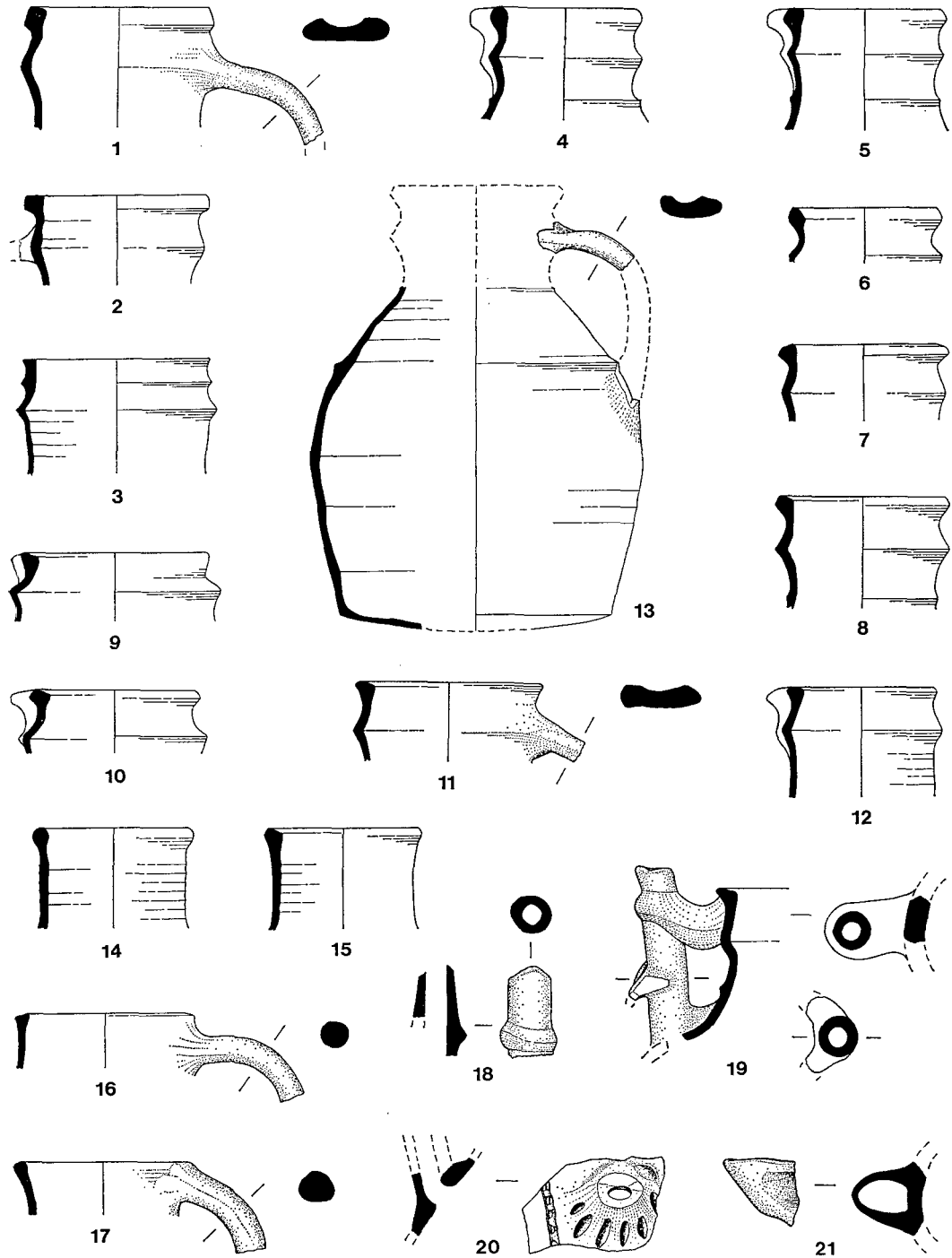


FIG 2 Colstoun: jugs (scale 1 : 4)

examples of rim scar damage, most of the jugs were only glazed from below the rim or even from below the neck ridge which helped to avoid this (in addition to the use of stacking sherds).

A pinched spout is the most common pouring arrangement (4, 5, 9, 10, 12, 46, 56). However, three bridge spouts were found, two plain (21) and one ornamented with a face-mask (65). There are also fragments of six tubular spouts (18–20) (cf Laing 1971b). These were attached to the jug neck with a strut. No 19 has two broken-off protuberances; there is another very similar spout, slightly smaller.

Handles (fig 3).

83% are strap handles and variations of straps, the rest are rod handles of different kinds. Of some 580 strap handle fragments, 471 are plain (22–6). At least 16 are from handled cooking pots (203–5, 207, 209) and there are probably more, eg 25, 26. Strap handles vary from 2–5 cm in width, and are usually drawn into leaf-shaped thumb impressions at their junction with the jug body. There are six examples with stabbing, perhaps to aid the drying-out of the clay (33, 35; see also fig 16, 11 where this occurs on a cooking pot handle). Eighty-nine strap handles are grooved (29–34) and one of these (34; with 33, from surface collection) has an applied incised pad of clay at the upper end suggestive of ‘beard’ decoration. This form of ornamentation at the top of a handle is rare, but a similar incised pattern was found above a ‘barley-sugar twist’ handle from Lochrutton crannog (Truckell & Williams 1967, fig 8, 2/19). Six sherds have thumbing along both edges of a simple strap (36). A further six have a cylindrical strip of clay added along the central groove, and the sides pushed against or over it with thumbing to secure it (38–40; also fig 16, 6–7). Similar handles are also known from Bothwell (Cruden 1952b, figs 7c, 37, 60) and Redkirk Point near Carlisle (Truckell & Williams 1967, fig 7, 4/1). A handle sherd similar to no 38 was found at Gullane, E Lothian, and is probably a Colstoun product (NMAS MEA 414). Thirty-eight has in addition an incised pad of clay at the junction of handle and rim (see 34 above, and 70, 71). Thirty-seven is a unique example with a narrow central groove and incised decoration, and may be the base of a bearded face-mask.

There are 117 rod handles varying from 1.5–3 cm across, of which 66 are plain (16, 17). There are 45 grooved rod handles (31, 42) and 6 ‘barley-sugar twist’ handles (43–5).

Bases (fig 6)

Of 1,220 basal angle sherds representing both jugs and cooking pots, 82% are of plain sagging bases (13, 124, 149, 154, 155), flat bases being rather rare. Such rounded or sagging bases with an obtuse angle between wall and base have the structural advantage of reducing cracks in drying or firing (van der Leeuw 1975, 79–80). Bases often show signs of trimming, and on the coarser fabrics this has the effect of dragging grits across the surface of the pot (eg 86, 149, 161; also fig 16, 15–6). The remaining 18% of basal angles could certainly be identified as belonging to jugs, as they are thumbed or splayed or both. Splayed bases (55 sherds) are usually trimmed around the edge (108, 110), although this is not always so (109); they may be flat or sagging. They probably represent a narrower-bodied jug. Thumbing occurs on both kinds of base. Most of the impressions are individually spaced, though two vessels have thumbprints arranged in groups of two (103). The spacing of prints varies from 1.5–10 cm apart. Ninety-three plain convex bases (103, 104, 107) and 60 fragments of splayed bases (100–102) have thumbing, including some thumbing underneath the base, Hurst’s groups 2 and 3 (Hurst 1963). On splayed bases the impressions tend to be much smaller and rounder – 12 base sherds have a rather different kind of thumbing in which the long axis of the impressions is horizontal rather than vertical (105–6).

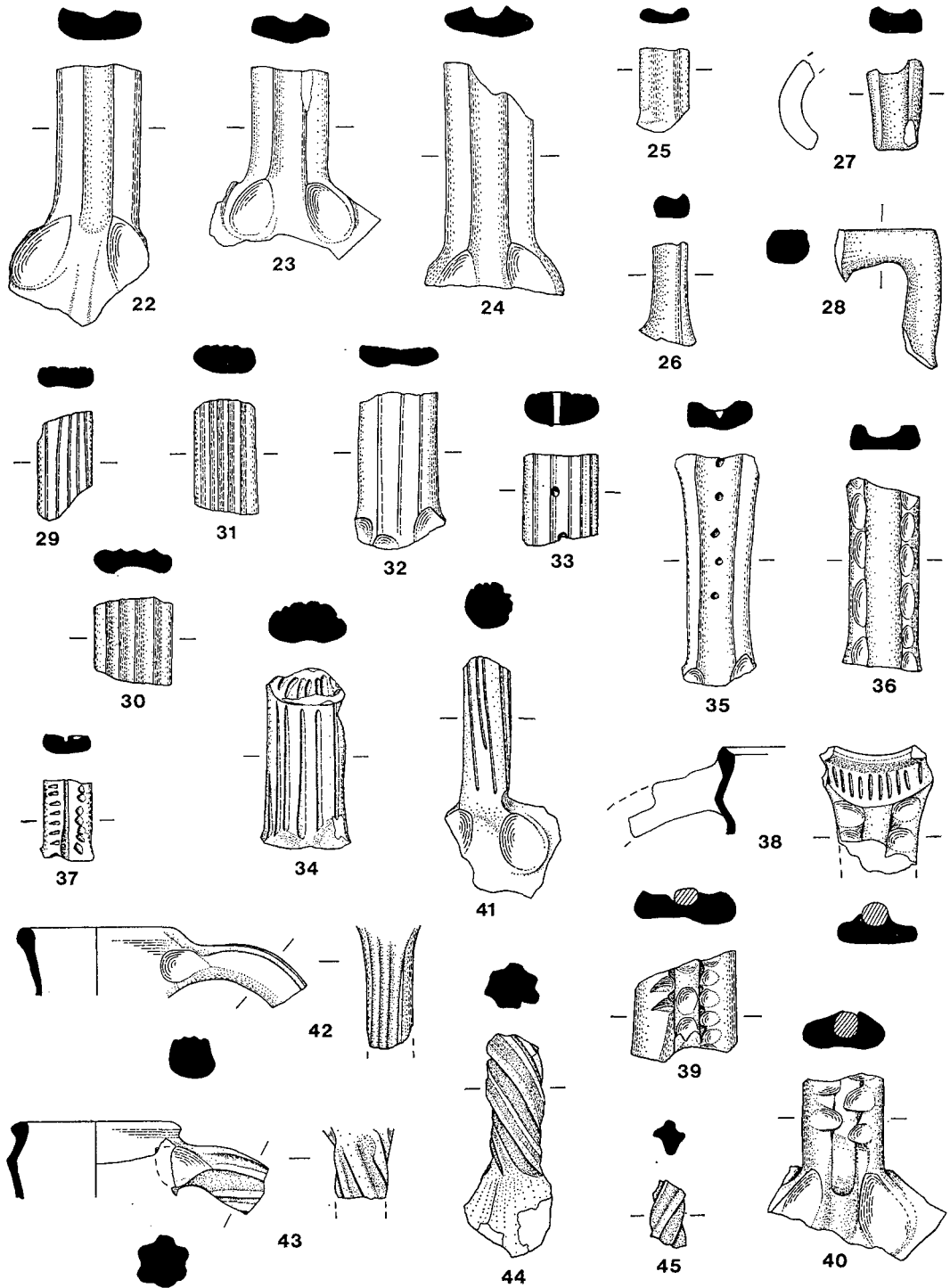


FIG 3 Colstoun: handles (scale 1 : 4)

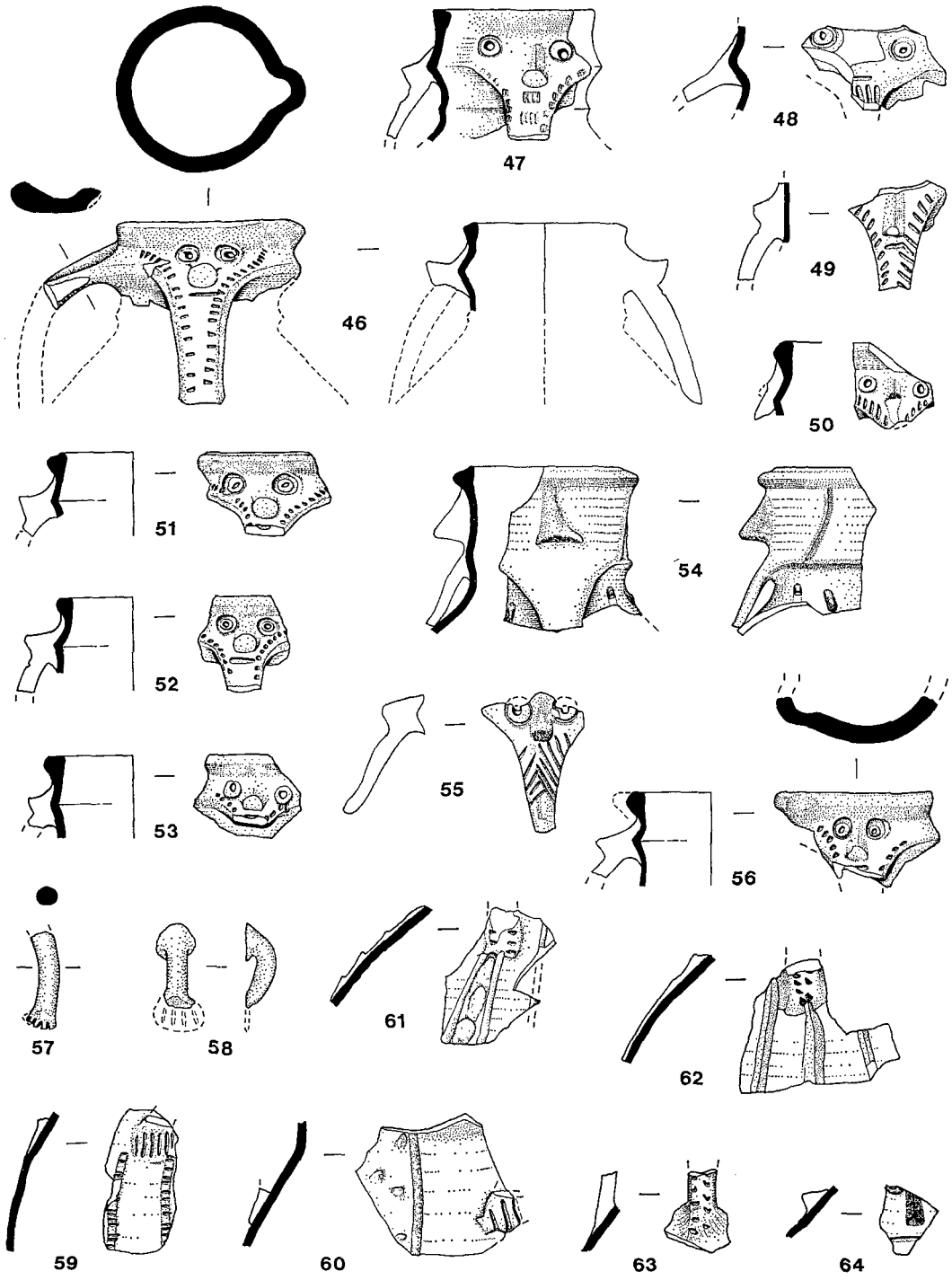


FIG 4 Colstoun: jugs with anthropomorphic decoration (scale 1 : 4)

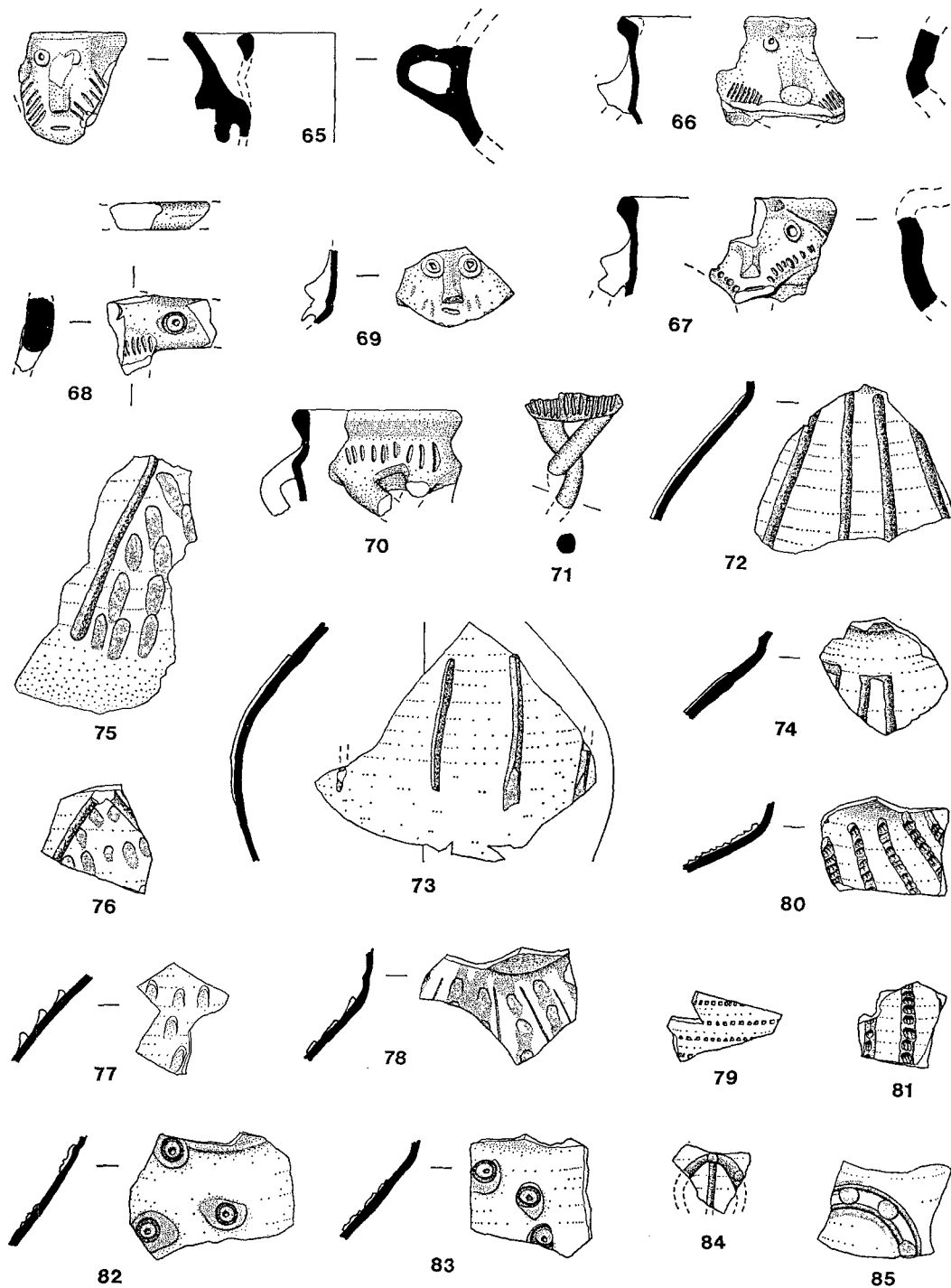


FIG 5 Colstoun: jugs with anthropomorphic decoration; decorated sherds (scale 1 : 4)

JUGS WITH ANTHROPOMORPHIC DECORATION (figs 4–5)

Some 65 fragments of jugs in this category were found, quite a few being overfired wasters; most belong to long-bearded face-mask jugs (Rutter 1961, type 5). No 46 is the most complete, having the entire rim and two face-masks, a strap handle and pinched spout. Altogether there are 30 examples of long beards and four of short beards, two of the latter being on spouts (50, 69; 65 and probably 66). Both bridge spouts (one example) and pinched spouts (three examples) can feature masks (65–7). The bridge spout face-mask (65) is similar to one from Melrose Abbey (Cruden 1953, fig 11). Generally long beards join the jug body at their base, although one (55) seems to be free-standing. 61–3 are bases of face-masks; there are eight other such sherds. There is also a unique jug body sherd apparently representing a face (64).

Beards are usually indicated with a series of small incisions, occasionally by longer grooves (55). Noses are fairly small, except in one case (54). This face-mask is also unusual in that it has no detectable beard markings or eyes; the vessel has a cordon on the neck with a strip of clay leading from it to the rim suggesting a 'hairline' or definition of the face. The eyes on face-masks are generally depicted by impressed dot-and-circles, but are sometimes formed by applied pieces of clay (69). In two instances, the eye is coloured dark brown. No 64 has a brown applied nose and eye; 68 (from surface collection) is a unique sherd from a vessel of unknown form, with a dark brown eye and green glaze on the front surface with splashes on the back. Where it is possible to distinguish glaze colour on face-masks, it is generally green, but sometimes yellow (54, with appliqué decoration in brown on the jug body; 69, which lacks a beard).

Applied arms and hands have also been included here as they usually occur on face-mask jugs (le Patourel 1966, 162; Rutter 1961, fig 2, 5/1; but see Dunning, Hodges & Jope 1958, fig 4, 9). There are 14 arm fragments (57, 58) and ten body sherds with applied incised hands, the arms having been broken off (59, 60; see also fig 15, 3).

OTHER FORMS OF DECORATION (figs 5–6)

There are over 5,000 body sherds in the whole assemblage, representing jugs and other forms. 37% of these are plain, 52% are glazed, whether deliberately or accidentally, and 11% are decorated. Of the 560 decorated sherds, most, but not all, are glazed.

Applied decoration is most common, 50% of the sherds having vertical applied strips. Over half of these have the strip added in a contrasting clay, so that when glazed it appears dark brown (72–4), or occasionally dark green, against a green or sometimes yellow background. Rarely, the reverse is done and the strip appears almost white upon a green ground. Otherwise the applied strip is self-coloured (61, 62) and often impressed with a small toothed implement (20, 59, 80, 81). A similar impressed strip also occurs on a cooking pot rim sherd (208). It is possible that more of the few unglazed decorated sherds may then belong to cooking pots, eg no 98 (compare Rutter 1961, fig 6, 41A/1).

29% of the decorated sherds have applied pellet decoration in a dark brown colour, affixed like 'scale' decoration but smoothed down onto the jug body at both ends instead of one (seen on anthropomorphic jug 54). These scale-like pellets are usually set further apart than scales, and arranged in horizontal rows. A further 16% have true scale decoration, some self-coloured (77) and some coloured brown (60, 61, 75, 76, 78). Often scales are arranged within areas defined by applied strips, sometimes in triangular zones (75, 76).

Other forms of decoration occur less frequently. There are a few broad applied bands which have thumbing (98) or stamped motifs (88, 89; also waster 241). Circular stamps containing

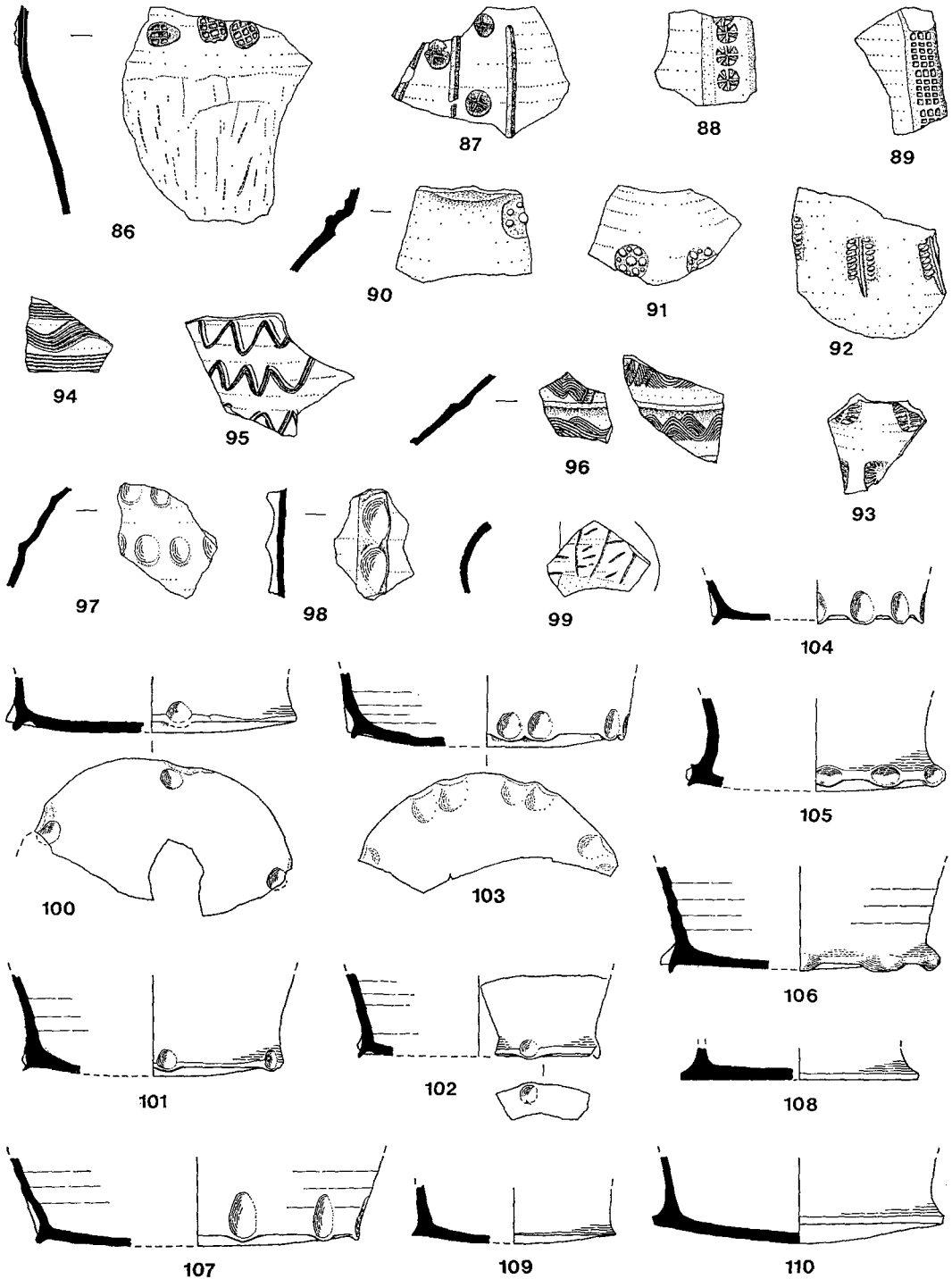


FIG 6 Colstoun: decorated sherds; jug bases (scale 1 : 4)

a gridiron or cruciform design appear too on applied pads of contrasting brown clay (86, 87). A larger stamp was used on the mortar, no 240. Applied brown pads also have impressed dot-and-circle motifs, resembling the 'eyes' of 64 and 68 (82, 83). Other forms of appliqué decoration include applied strips with pellets added along their length; there are four sherds of this kind too fragmentary to ascertain the total design, but this technique is best seen on a unique sherd with a 'brooch' motif (84, surface collection). The 'brooch' itself is dark brown, on a mottled green and yellow glaze. Brooches on pottery are very often, but not always, found on vessels with anthropomorphic decoration (Dunning 1969). There are only two other examples of brooch decoration published from Scotland, one from Kirkcudbright (Dunning, Hodges & Jope 1958, fig 4, 13) and a possible fragment from Dundee (Laing 1971a, fig 2, 20). No 85 has a larger curvilinear design, again with brown applied decoration on a green ground.

Incised and impressed decoration on the jug body itself is not common. Three sherds have simple thumb impressions (97). There are 11 sherds with embossed decoration, the wall being pushed out slightly from inside the vessel to press against a design stamp. The motifs found are 'raspberry' (90, 91), 'wheat ear' (92) and 'shell' (93). There are two rouletted sherds (79) and a few examples of wavy combed lines (94, 95). Incised decoration, though commonly used to represent beards and hands, is otherwise rare; it can take the form of slashes (20) or incised lines, either regular (78, where incised lines divide the rows of scales) or rather more irregular (99, a small glazed vessel of unusual form).

There are four fragments of another form of ornamentation, applied pads with incised decoration, dividing into a 2-strand plaited 'handle' (70, 71; fig 15, nos 4, 5 provide more complete examples). On no 71 the incised pad is glazed dark brown in contrast to the green glaze of the strands below. The incised decoration is beard-like (see handles 34 and 38) and the form may be related to a type of bearded face-mask ending in a plaited handle (eg Cruden 1956, fig 53). However, closer parallels occur at Hartlepool and Lindisfarne (Jarrett & Edwards 1962, 245, nos 9, 10). A similar form of decoration, though with the two projecting rods parallel and not twisted together, occurs on Scarborough ware jugs from Stamford (Farmer 1979, 49, pl IV) and King's Lynn (Clarke & Carter 1977, fig 94, 10).

COOKING POTS (figs 7–11)

Few complete profiles have been recovered. Some 843 vessels are represented by rims. Globular forms comprise 82%; of the remainder, 10% are straight-sided and 8% almost straight-sided, slightly barrel-shaped. Bases are usually sagging (cf van der Leeuw 1975, 79–80) but sometimes flat (161), and often trimming is visible around the basal angle (149, 161, 206). A small proportion of the cooking pots are miniature, so that the total range of rim diameters is from 8 to c 30 cm. Rim forms vary, the same forms often occurring on both straight-sided and globular vessels. The most common rim form is square in section (33%). This is usually set at an angle to the body. 26% are rectangular rims at an angle, and 18% are rounded. The remainder are mostly variants of the basic types.

111–117 164 vessels of this type, rim diameters ranging from 15–30 cm. One example (115) has slashed decoration along the outer edge of the rim, and another has a vertical applied strip and was probably handled (208).

118–123 93 vessels, rim diameters 15–30 cm. Rims of this kind are found among the handled cooking pots (207, 209), and more may belong to this category.

124–129 44 vessels, 13–27 cm.

130–133 42 vessels, 13–23 cm. Rims of this kind are found among the handled cooking pots.

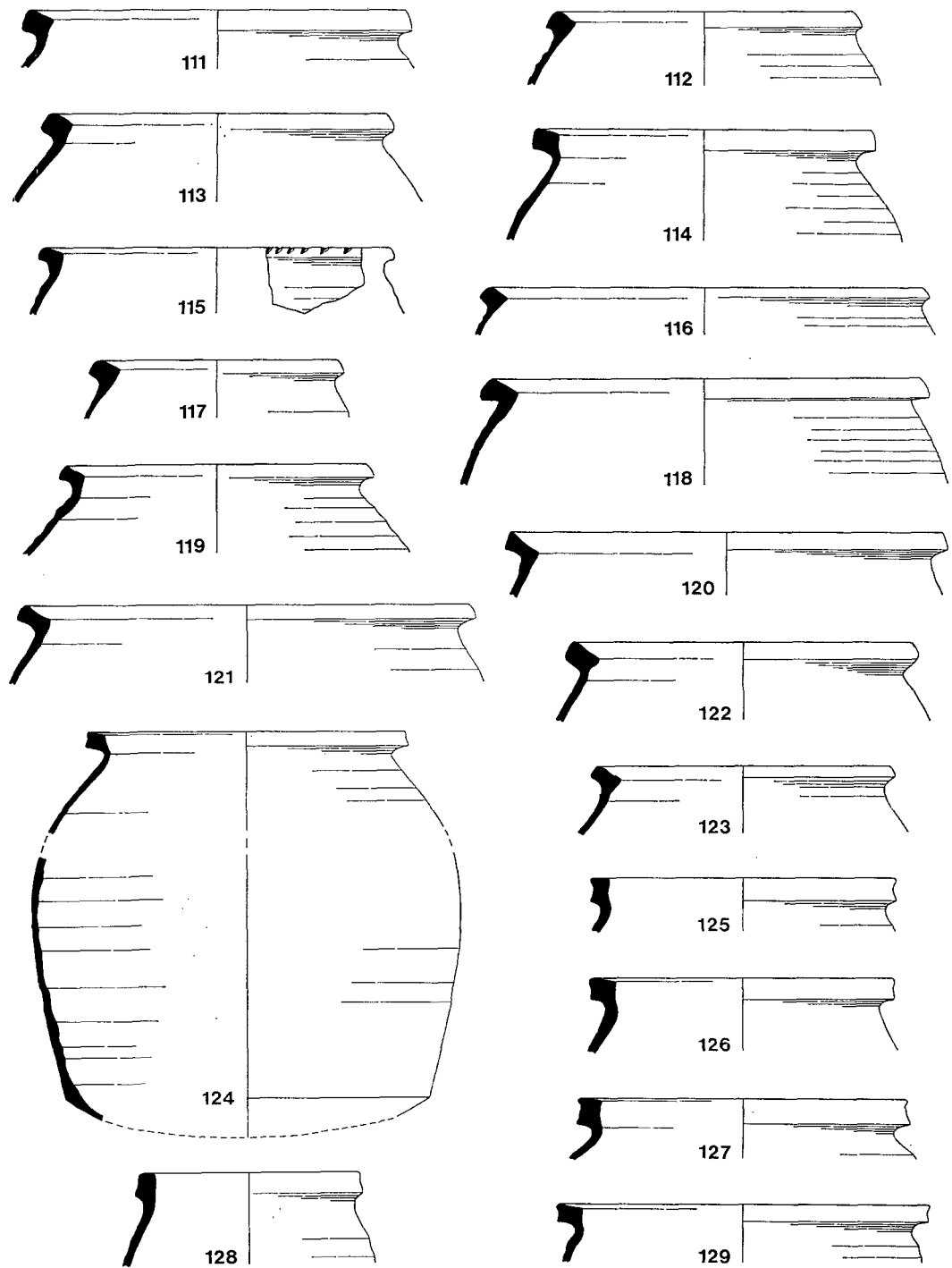


FIG 7 Colstoun: cooking pots (scale 1 : 4)

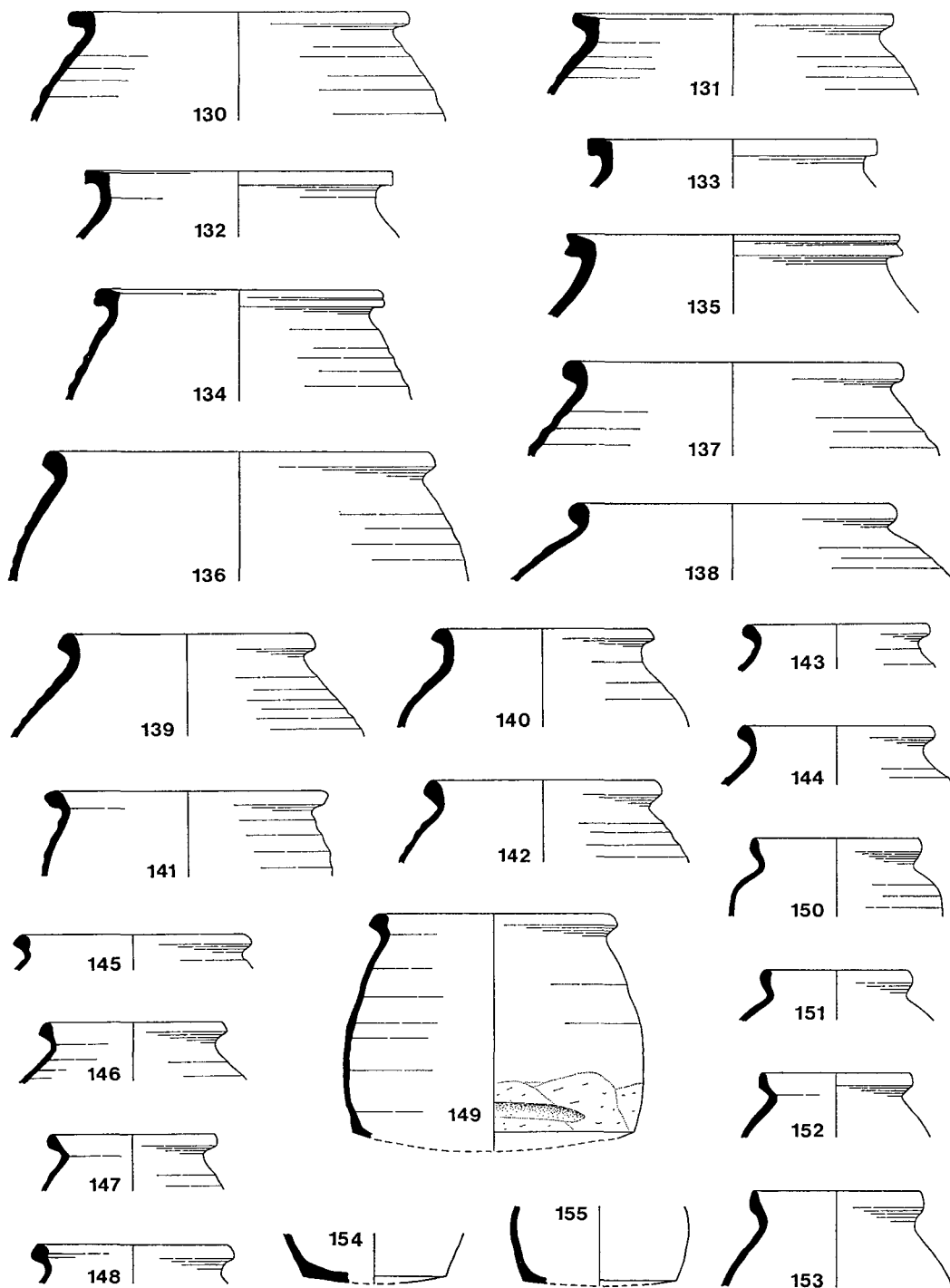


FIG 8 Colstoun: cooking pots (scale 1 : 4)

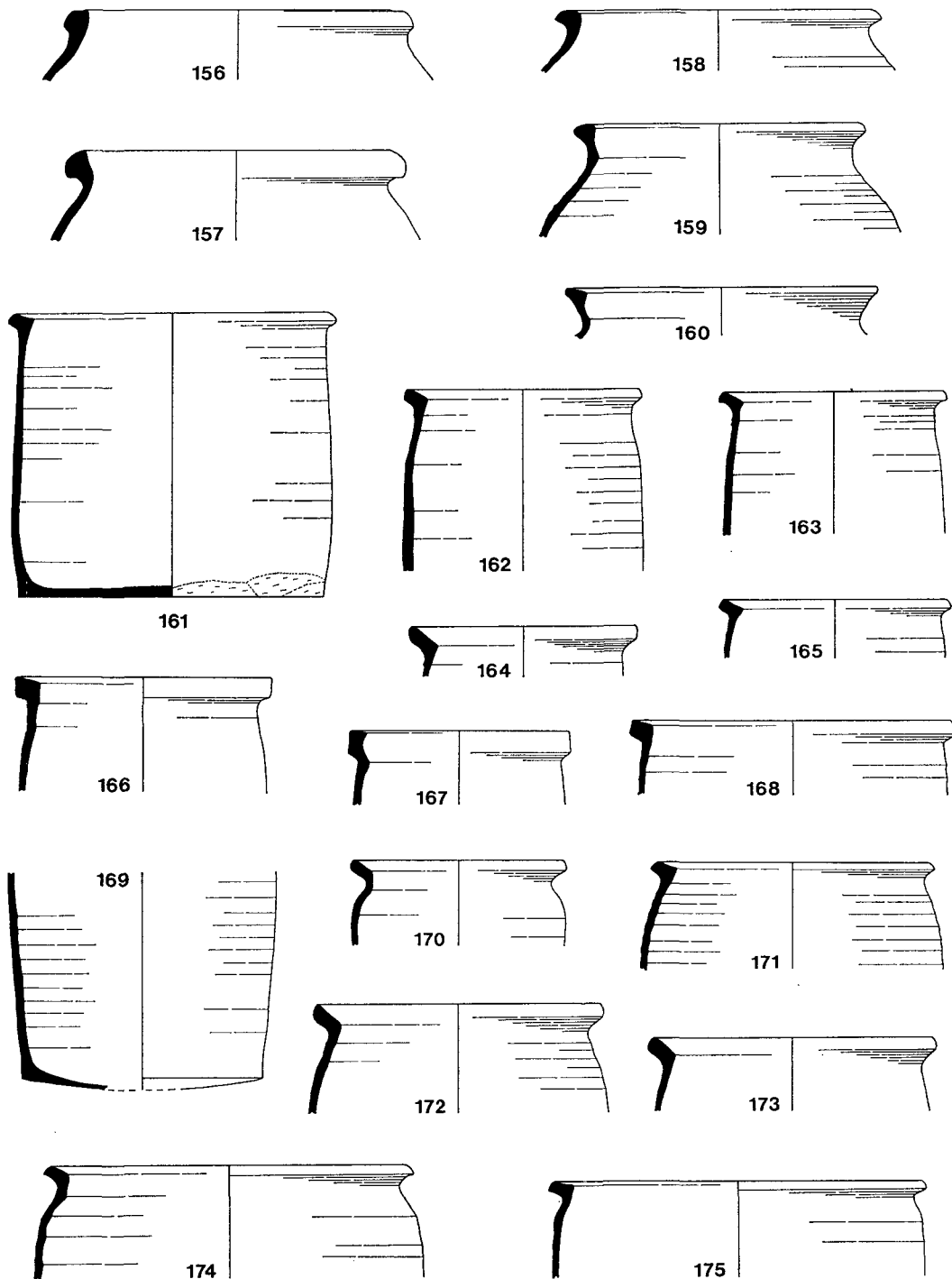


FIG 9 Colstoun: cooking pots (scale 1 : 4)

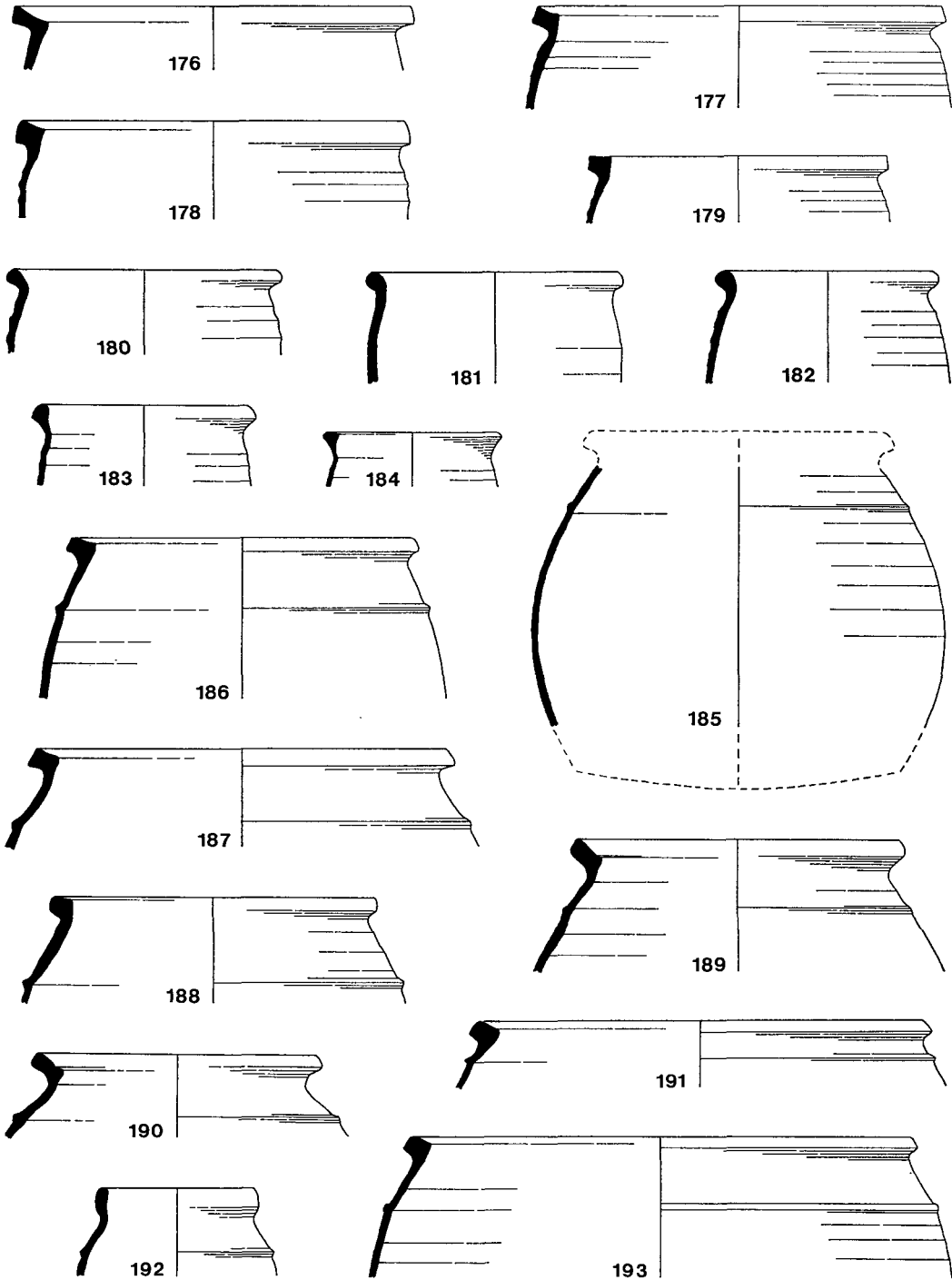


FIG 10 Colstoun: cooking pots (scale 1 : 4)

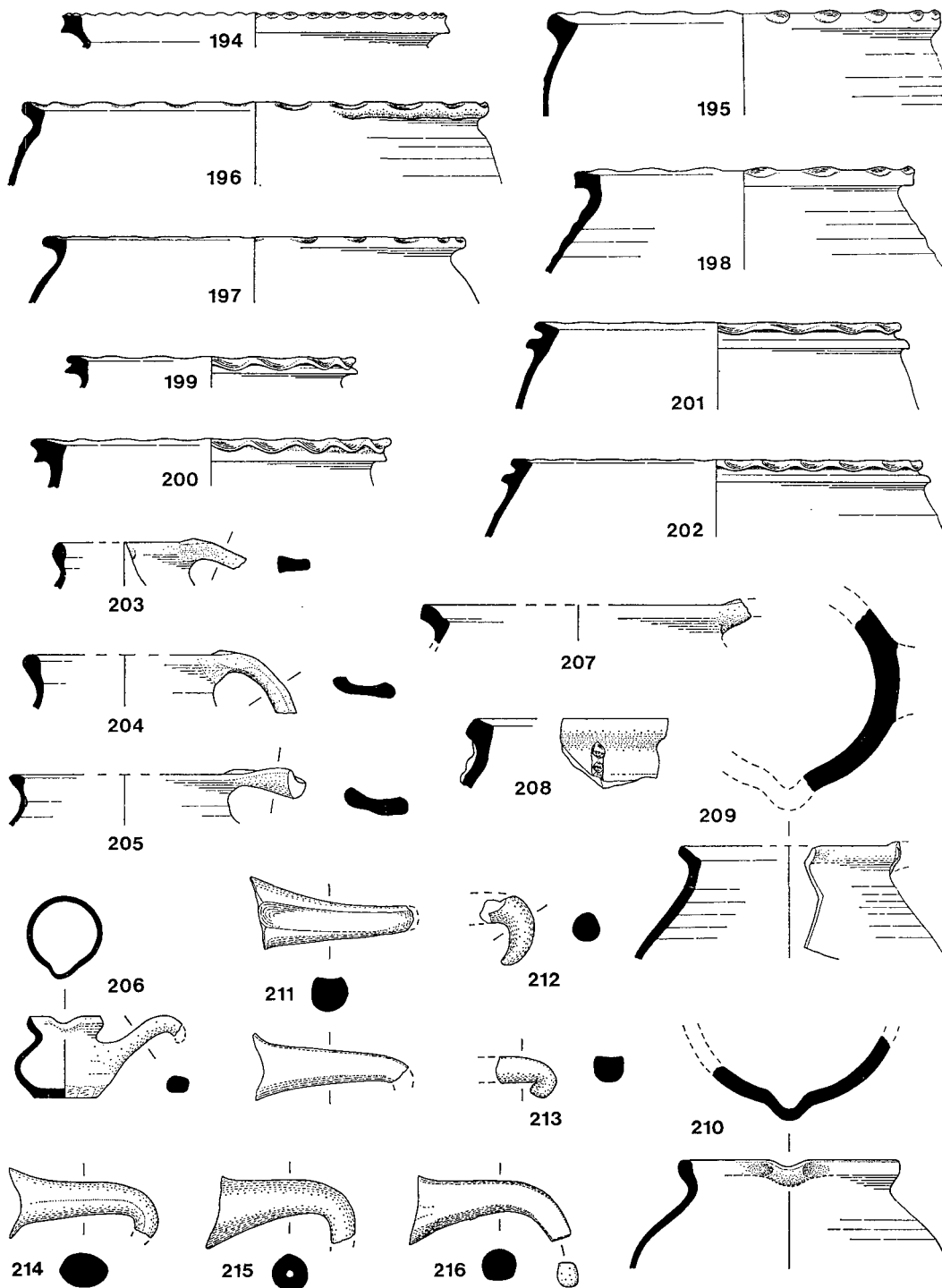


FIG 11 Colstoun: cooking pots and pipkins (scale 1 : 4)

- 134–135 17 vessels, 16–30 cm.
 136–144 128 vessels. A few of these are ‘miniature’ (143, 144); rim diameters vary from 11–26 cm.
 145–149 20 vessels, 9–16 cm. Handled vessels 203, 204 and 210 have this form. 149 shows a trimmed base with a horizontal groove, doubtless accidental.
 150–153 35 vessels, 8–14 cm. Miniature pipkin/ladle 206 has this rim form.
 154–155 Bases of miniature pots.
 156–157 10 vessels, 17–23 cm.
 158 5 vessels, 17–21 cm.
 159–160 19 vessels, 10–18 cm. 205 has this form.
 161–165 58 vessels, 12–27 cm.
 166–168 24 vessels, 12–28 cm.
 169 Base of a straight-sided or slightly barrel-shaped cooking pot.
 170–176 31 vessels, 12–25 cm.
 177–179 31 vessels, 19–27 cm.
 180–182 17 vessels, 13–18 cm.
 183 1 vessel, 13 cm.
 184 1 vessel, 10.5 cm.
 185–193 19 vessels, 18–30 cm, with one miniature at 9.5 cm (192). The shoulder cordon or ridge resembles that found on some jugs (see above). The rim form is generally square or rectangular, set at an angle (as nos 111–23). See also fig 16, 8–9, for handled versions of this form.
 194–198 42 vessels, 15–29 cm. Rim thumbing is added to vessels of normal types, mostly globular (types 118–33; nos 194, 197, 198) but sometimes barrel-shaped (types 170–6; nos 195, 196) and straight-sided (types 161–5).
 199–202 20 vessels, 16–30 cm. Half are straight-sided vessels with thickened squarish rims (199, 200; cf fig 16, 15) and the rest are rather barrel-shaped with little extra thickening to the rim (201, 202).
 203–216 Pipkins and handled cooking pots. From the rim count, perhaps 38 vessels, rim diameters 8–20 cm (206 being 4.5 cm). The two categories have been combined here as the sherds are often so fragmentary as to prevent detailed identification, eg several rims with pinched spouts (210; also fig 16, 8). There are 35 pipkin handles (211–16), sometimes with a thumb impression on the top (211) and usually with the end curved down either to a point (212) or a flat end (213, 216). One pipkin handle (27) is unusually wide and flat like a strap handle. Most remarkable is a unique near-complete miniature pipkin or ladle (206, Colstoun Estate collection). It is partially glazed with copper-speckled green glaze.
 A number of cooking pots have a strap handle, 2–4 cm across, fastened at the top directly on to the rim (203–5, 207, 209; also fig 16, 9–14). The rim forms vary; most are rectangular, as nos 118–23 (207, 209), other forms being ‘knobbed’ rims, as nos 145–9 (203, 204), everted flattened rims, as nos 159–60 (205), and square flat rims, as nos 130–3. Although fragmentary, nos 203, 205 and 209 have evidence of a pinched spout. There are several unglazed strap handles which clearly belong to this class, but not enough survives to identify the rim form (eg 25, 26). A unique unglazed rim sherd with impressed strip decoration probably belongs to this category (208). It is well paralleled at Downpatrick, Co Down (Pollock & Waterman 1963, fig 11).
 Cauldrons imitating metal prototypes were also occasionally made, as evidenced by an angular handle (28) and a fragment of a foot (not illustrated).

LARGE BOWLS (fig 12)

Fourteen large bowls are represented, rim diameters varying from c 27–38 cm. One sherd (not illustrated) may have a pinched spout. 220 has trimming on the exterior and green glaze on the interior of the basal angle, as well as a few splashes on the exterior.

SHALLOW DISH (fig 12)

There is one example of a shallow dish or dripping tray, with part of a pinched spout (221). The interior has a green glaze, blistered in places (cf fig 16, 16). It may have been oval in shape.

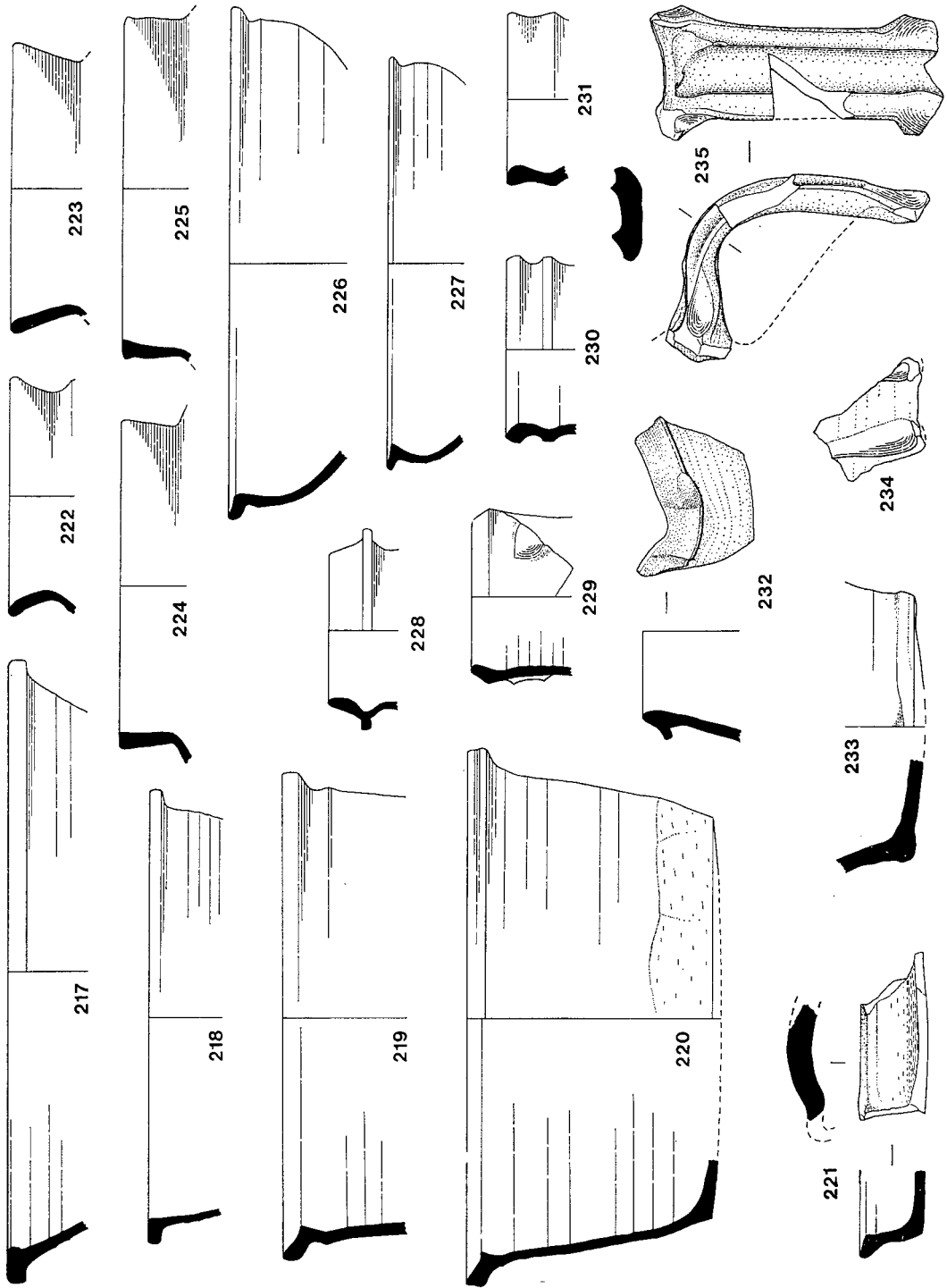


Fig 12 Colstoun: other forms; Red ware (scale 1 : 4)

COOKING POTS/JARS (fig 12)

There are 15 unglazed tall rims either flared (222, 223) or upright (224, 225). Rim diameters vary from 11–23 cm. They are paralleled at Coldingham Priory (Laing 1973, type 21).

ROUNDED BOWLS (fig 12)

Two vessels. 226 is a waster, c 30 cm in diameter, with thick brownish-green glaze over the rim and interior and traces of glaze on the exterior. 227 is a smaller bowl (diameter 24 cm) in very fine white fabric with thick green glaze, occasionally mottled dark green, on the interior and exterior.

RED WARE (fig 12)

The 260 red ware sherds are noticeably much thicker and smoother in fabric than the white wares. The lead glaze, where it survives, is usually green to olive-green, or reddish-brown. The forms are predominantly jugs, with slightly sagging thick trimmed bases (233), occasionally thumbed (234), the thumb impressions being much larger than those appearing on most Colstoun jugs (100–7). Handles are rather heavy plain strap handles (235), with one fragment of a grooved strap. Necks are either plain upright, turned inwards at the rim (229), ridged like the white ware jugs (230, 231) or collared (232, a waster), with pinched spouts. Rim 228 (two other similar sherds) has a cordon added to widen the neck ridge.

There are no decorated sherds and no cooking pots, which together with the simplicity and general heaviness of the ware would perhaps indicate a slightly later date than that of the kilns.

MORTAR (fig 13)

Part of a large mortar (240) was built into the wall of Kiln 1. It is unglazed, and the rim has been stamped twice with a cruciform design within a circle, and has part of a pouring lip. It seems probable that this mortar had an industrial rather than domestic purpose, perhaps being used to grind ingredients in glaze preparation; if so, it relates to a phase of pottery making prior to the construction of Kiln 1. Such a use was postulated for two pottery mortars of rather different form built into the wall of Laverstock Kiln 2 (Musty et al 1969, 136).

KILN FURNITURE (figs 13–14)

Kiln Bricks

About 30 kiln bricks are represented by fragments (236–9). The fabric is always extremely gritty and coarse, though made of the same clay as the pottery (see Appendix 4), and is usually fired to a buff or reddish colour with dark grey surfaces. They often have splashes of blistered glaze, and vary in thickness from 2.5–5 cm and in width from 10–17 cm. None have survived to the full length. Many but not all are pierced (238, 239). Some show a slight curvature lengthwise (236, 239) giving them a resemblance to flue arches such as those found at Upper Heaton (Manby 1964, fig 19, 1–4).

Stacking Sherds

Potsherds were used to reduce the area of contact between stacked glazed pots in the firing of the kiln, in an attempt to prevent glaze running down the rim of one pot from fusing it

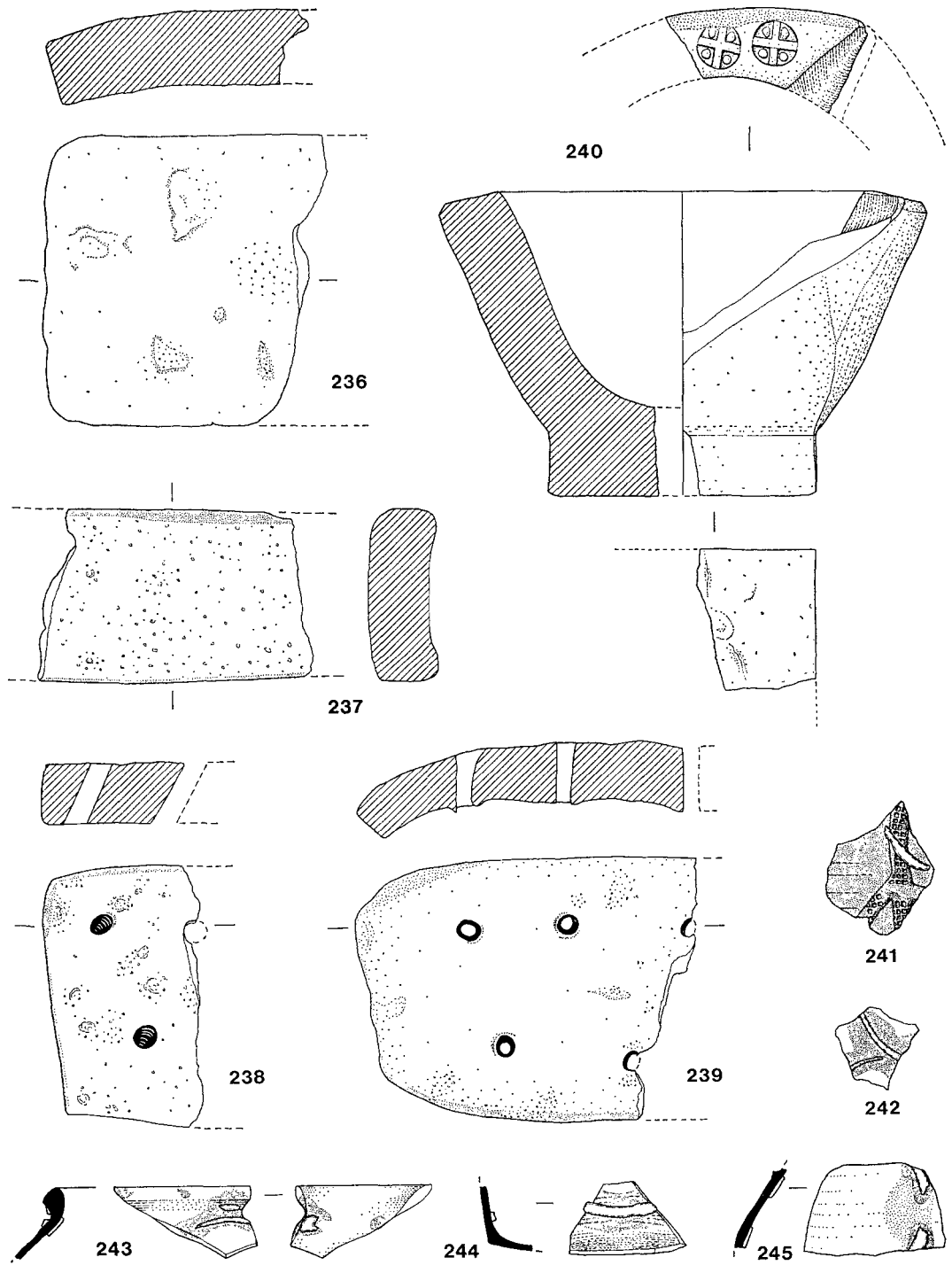


FIG 13 Colstoun: kiln furniture; mortar (scale 1 : 4)

irretrievably to the base of the vessel below. This practice is known elsewhere, for example at Downpatrick (Pollock & Waterman 1963, 99, & fig 14). Over 300 sherds show stacking scars which indicate their use in this way (241–5). Some have been used more than once, as they have stacking scars on both sides (243, a cooking pot rim sherd) or have two scars on one side, one scar being covered with glaze from the later firing (242).

Kiln Stands

Experimental firings of medieval kiln types without raised floors have shown that the great heat immediately inside the flues can cause much wastage (Musty 1974, 57; Bryant 1977, 121). Bryant suggests that either the medieval potter could produce pots capable of withstanding the concentration of heat in this position, which seems unlikely, or that ‘pre-fired pottery’ was used to break the flames. At Colstoun this problem was solved by using special pots as stands for the lowest layer of the kiln load, acting as an artificial raised floor. In his own excavation at Colstoun, Mr B J N Edwards found such kiln stands still *in situ* (personal communication).

There are 170 distinctive kiln stand fragments, including several complete or near-complete examples (246–57). These pots vary in size and shape, but are basically composed of a simple rim, straight or concave profile and splayed flat or slightly concave base. Thirty-three vessels

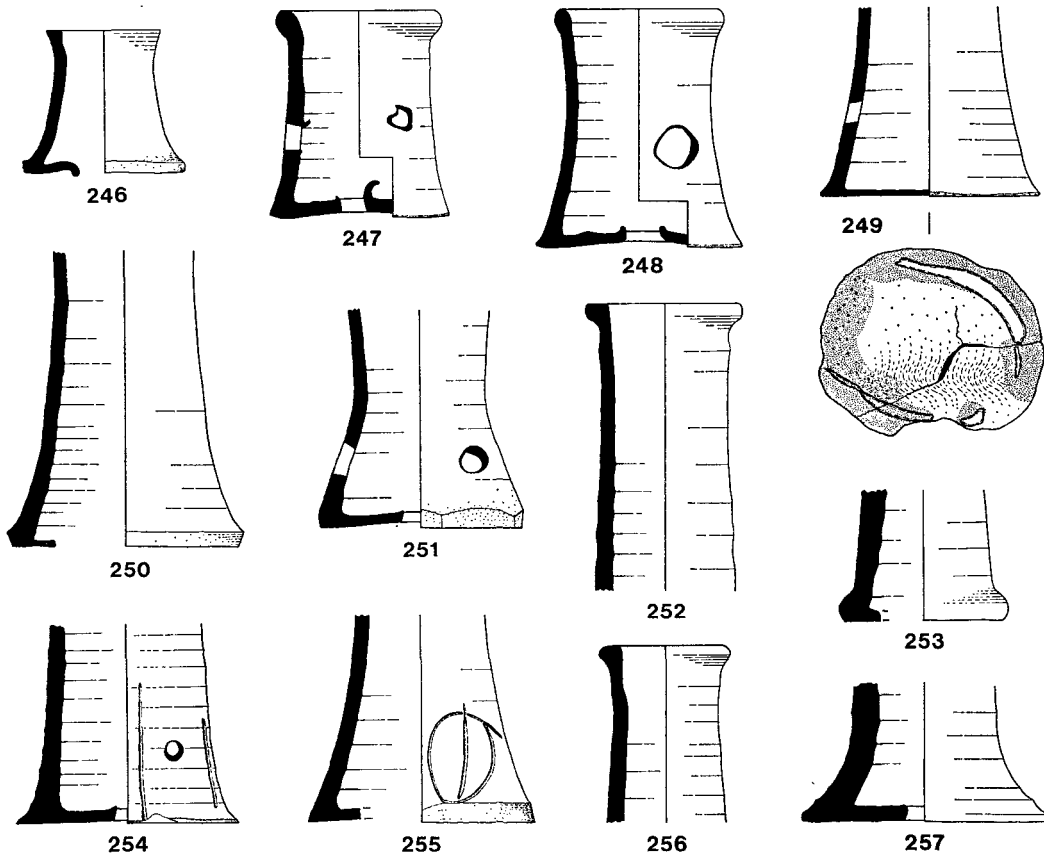


FIG 14 Colstoun: kiln stands (scale 1 : 4)

are represented by rim sherds, although the probable number represented by base fragments is 75. The most common rim form is a rounded flattened rim (252, 256); other rims are round (247, 248, Colstoun Estate collection) or flat (246). They are usually heavily rilled, especially on the interior, and sometimes very thick-walled. The fabric is coarse and gritty, white or buff with mostly grey surfaces, sometimes with red or buff patches. They often have traces of glaze on the base, and sometimes stacking scars, bearing witness to their function of supporting pots in the kiln (249, a waster, cracked and folded on the base). Many but not all are trimmed around the basal angle.

Where a large part of the kiln stand survives, it usually has a central hole in the base and one or two holes pierced in the sides, to allow circulation of the hot gases. Two fragmentary kiln stands are also decorated with incised markings (254, 255); two other basal angle sherds from separate pots each have part of a vertical incised line. These stands are paralleled elsewhere in Scotland at Rattray, Aberdeenshire, as well as at sites in England and Ireland (Brooks & Haggarty, 1977).

DISCUSSION

There is no direct dating evidence for Colstoun Kilns 1 and 2, and until Colstoun wares are identified from reliable stratigraphic sequences elsewhere, conclusions about dates must be drawn from comparative material in the N of England, especially Yorkshire, and elsewhere in Scotland. The pottery from Kirkcudbright Castle, for example, dates from AD 1288-1307 (Dunning, Hodges & Jope 1958), and Colstoun pottery finds certain parallels there in the anthropomorphic decoration and 'brooch' ornamentation. However, the most striking parallels are with the Scarborough ware face-mask jugs, which used to be given a similar date but are now considered to be somewhat earlier (Rutter 1961; Farmer 1979).

Scarborough ware is known to have been traded widely by sea, across to Scandinavian sites such as Bergen (Dunning 1968, 39-40) and Trondheim (Long 1975, 21), and also along the whole eastern seaboard of Britain. In Scotland, the distribution of Scarborough ware is mainly in the eastern counties and in coastal towns (Dunning 1963; Coutts 1966; Laing & Robertson 1970; Laing 1972; Laing 1973, 193-6). Recent large-scale excavations in the medieval burghs of Perth and Aberdeen have produced considerable quantities of Scarborough ware (L M Thoms, pers comm; Simpson 1974, 19-20; Murray 1978, 15-17; see also Appendix 4). Wherever Scarborough ware occurs, it seems to have greatly influenced local pottery styles, as for example Hartlepool type ware at Hart (Addis 1976, 103); Scarborough ware occurs there as at Hartlepool itself (Jarrett & Edwards 1962, nos 9, 10). Scarborough ware was also copied by the Grimston potters (Clarke & Carter 1977, 447). On Scottish E coast sites, the finer glazed wares and cooking pot forms show strong E Yorkshire influence (Laing 1973, 193-6), and Scarborough ware is well known from sites in Fife, Angus and Aberdeenshire (Laing & Robertson 1970, 146; to this list may be added a sherd from Leuchars Castle, NMA S Henderson collection). In SE Scotland, Scarborough ware is known from Abbey St Bathans (Dunning 1963, 235), Coldingham Priory, North Berwick Abbey, Dirleton Castle, the Isle of May and Haddington (Laing & Robertson 1970, 146; Laing 1972). There is also a small sherd from Rhodes Links, North Berwick (NMA S MEA 1-2). Further S along the coast, recent excavations at Berwick-upon-Tweed have produced much Scarborough ware (J Hunter, pers comm). Pottery was of course but one of various items traded along this coastal network; northern coal ships have been suggested as responsible for bringing Scarborough pottery to E Anglia (Clarke & Carter 1977, 449) and anthracite most probably from the Lothians has been identified in 13th-century levels in King's Lynn (Smith

1977). Quantities of corn were also shipped N from Lynn to Berwick and Scotland throughout the 13th century (Carus-Wilson 1963, 185).

This provides a background for the appearance of a pottery industry at Colstoun producing face-mask jugs which resemble Scarborough type 5 more than the products of the other English sites producing this kind of vessel (Rutter 1961; le Patourel 1966; Buckland et al 1979). The Colstoun jugs, however, have pinched spouts, and bridge and tubular spouts are quite rare. There is rather more variety in the modelling of the face-masks at Colstoun, and the appearance of face-masks on bridge and pinched spouts (65–7) is not paralleled at Scarborough. The general jug form with a ridged neck, usually cordoned at the base, is a common northern type (eg Rutter 1961, types 2, 7, 12; Pollock & Waterman 1963, figs 4, 5; Edwards 1966, 121, no 111), and the addition of a shoulder cordon (13) is also found in NE England (Addis 1976, 103). As has already been observed, plaited decorative ‘handles’ (70, 71) show a close link with Lindisfarne and Hartlepool. The general methods of decoration are closely paralleled in Yorkshire, but such techniques are also widespread in medieval Britain and Europe (Bellamy & le Patourel 1970, 113, 116–9; Dunning 1968, 47–51).

The dating for such ‘Highly Decorated’ pottery has been subject to revisions over recent years. Pottery types once dated to the late 13th/early 14th centuries, eg face-mask jugs and knight jugs (Rutter 1961), are now known to have begun much earlier, and had developed before the end of Scarborough Phase 1 (c 1225; Farmer 1979, 28–31) and probably by a similar period at Hallgate, Doncaster (Buckland et al 1979). At Winksley knight jugs were being made by the mid-13th century (Bellamy & le Patourel 1970, 119). It was thought that features such as ‘bridge and tubular spouts, round sectioned handles, pipkins and skillets represent innovations of the late 13th or early 14th century’ (Manby 1964, 104), but now it is recognised that they are present by the first quarter of the 13th century at least, and in some cases earlier (Farmer 1979; Buckland et al 1979; J Holdsworth, pers comm).

On the whole, it seems most likely that Colstoun Kilns 1 and 2 fit a middle to later 13th-century date range. The cooking pot parallels would seem to confirm this. The cooking pots relate generally to the Yorkshire and NE 12th–13th-century gritty ware tradition, both in fabric and forms (Jarrett & Edwards 1961; Laing 1967; Laing 1973), but also show connections with other Scottish sites. However, the cordoned form (185–93; fig 16, 8–10) would seem to be a distinctive Colstoun type with few parallels elsewhere (except a vessel in Edinburgh (Thoms 1976, fig 18, 102), but this may well be a Colstoun product). Most of Laing’s 13th/early 14th-century rim types are represented, but his early types 3 and 4 are lacking (Laing 1973). The frilled bifid rim (199–202; fig 16, 15) is a typical form further N in Fife and Angus, and has been claimed as a primarily Scottish development of the 14th century (Laing 1967, fig 9, 1; 1971a, fig 1, 6, 7; 1973, form 18). However, the form does occur in NE England, eg at Finchale (Jarrett & Edwards 1961, no 111, early 13th century), Scarborough (Rutter 1961, type 52), and Tyne-mouth (Edwards 1967, fig 10, 39). At Hart, Co Durham, there are prototypes in Saxo-Norman to mid-13th-century levels (Addis 1976, fig 13, 8, 31) and frilled bifid rims of the Scottish type in mid-13th/early 14th-century contexts (*ibid* fig 16, 96, 122; fig 17, 136). A related rim form with thumbing along the outer edge (194–8) has a similar distribution in NE England (eg Jarrett & Edwards 1961, 103).

Another form seen as a 14th-century Scottish development, originating in the 13th century and continuing into post-medieval times, is the handled cooking pot (Jarrett & Edwards 1961, 256; Laing 1969; 1973, 199). This is a globular form and two-handled in its final development, though it has been suggested that earlier examples were one-handled (and that French influence was responsible for the development of the type) (Laing 1973, 196–9). At Colstoun these vessels

are too fragmentary to be sure of the original number of handles (203-9; fig 16, 8-14). In Scotland, handled cooking pots are widespread (eg Cruden 1952a, 1952b, 1956; Laing 1971a, 1967, 1973). One from Traprain is probably a Colstoun product (see below).

However, handled cooking pots are also known from N England and Ireland, and may perhaps be considered as a N British type rather than Scottish (though they do occur further S, eg Rahtz 1969, fig 52, 5-6, dating from the 13th century). They have been recorded, for example, from Newcastle, Dunstonsburgh (Jarrett & Edwards 1963, nos 30, 60, 79), Tynemouth (Edwards 1967, fig 8, 14), Finchale (Jarrett & Edwards 1961, nos 90-5, 99, 100) and the 13th-century Winksley kilns (Bellamy & le Patourel 1970, fig 49, 69-72). At Hart, they occur in 13th-century levels (Addis 1976, fig 16, 114). A Downpatrick handled cooking pot with vertical impressed strip decoration parallels Colstoun no 208 (Pollock & Waterman 1963, fig 11). Similar decoration occurs on a Scarborough handled cooking pot (Rutter 1961, 41A/1; type 38). The related cauldron form with angular handles (28) is known from 13th- and 14th-century English contexts (eg Rahtz 1969, fig 53, 31; fig 54, 37; Medieval Catalogue fig 74, & pl LVI for a prototype).

The narrow straight-sided cooking pot (161-184) seems to be a fairly common form in E Scotland. Similar vessels have been found in recent excavations in Elgin, Aberdeen and Kelso (W Lindsay, C Murray, G Haggarty, pers comm).

The distribution area of Colstoun pottery is not known. Certainly Haddington, recorded as a burgh by the mid-12th century, was well supplied by the kilns there (NMA MEA 4, unstratified sherds from Haddington including Colstoun ware and a Scarborough ware handle). The identification of further kilns at Colstoun (Appendix 2) highlights the importance of this production centre, though the date of these kilns is of course unknown. A handled cooking pot sherd and three other handle sherds from Traprain probably come from Colstoun (NMA GV: 1955-233). Along the coast, sherds from Gullane, North Berwick (Rhodes Links) and Eldbottlewood may also be in Colstoun ware, including a handle from Gullane resembling no 38 from Colstoun (NMA MEA 3, 23, 414, 418; MEA 1-2; MEA 250). However, some of the sherds from these coastal sites are in a fabric with much larger, heavier grits than Colstoun wares, and bear a closer resemblance to some of the gritty Fife wares. Pottery from Melrose and Jedburgh Abbeys has a general similarity to Colstoun ware (Cruden 1953; 1956). Colstoun products have been suggested at North Berwick Abbey and Tantallon Castle (Laing & Robertson 1970, 151; the two face-masks from Tantallon are rather different in style from those noted so far at Colstoun), Coldingham Priory (Laing 1972, 246, note 3), and Edinburgh (Thoms 1976, 190; see especially fig 17, 78, fig 18, 102, 115). Trace element analysis has confirmed the presence of Colstoun pottery in Edinburgh (Appendix 4). A vessel from Finchale has also been claimed as a possible Colstoun product (Jarrett & Edwards 1961, 241-2, no 29). More work needs to be done in SE Scotland and the Borders, looking for other possible kiln sites and studying pottery in the area (preferably with scientific techniques), before we can assess with confidence the distribution area of Colstoun pottery and its local and national significance.

APPENDIX 1

FURTHER POTTERY FROM COLSTOUN

A group of unstratified pottery and kiln fragments in the National Museum, apparently from the earlier excavation of Kiln 2, has been included here as some of the Colstoun pottery types are represented by better examples.

There are 26 jug rim sherds, mostly of the ridge-necked type (fig 15, 2; see fig 2, 1-13), one being from a face-mask jug (not illustrated). There are a further 12 jug handle sherds, including plain and grooved straps, grooved and twisted rod handles, and thumbled strap handles with central applied strips

(fig 15, 6, 7; see fig 3, 38-40). There are three plain bridge spouts and one tubular spout fragment (not illustrated). Decorated body sherds do not add any new motifs or techniques to the Colstoun repertoire; fig 15, 1 shows a yellow-glazed jug with brown applied strips. There are seven applied 'arms', one still in position on a jug body sherd (fig 15, 3; see fig 4, 57-60), and three examples of intertwined 'arms' springing out from the neck of a jug to form a decorative strut (fig 15, 4-5; see fig 5, 70); the third, not illustrated, closely resembles fig 5, 71.

There are 20 cooking pot rim sherds, ten from handled cooking pots, with a further three handles without rims (fig 16, 8-14; cf fig 11, 203-5, 207, 209). These vessels are all too fragmentary to yield a full

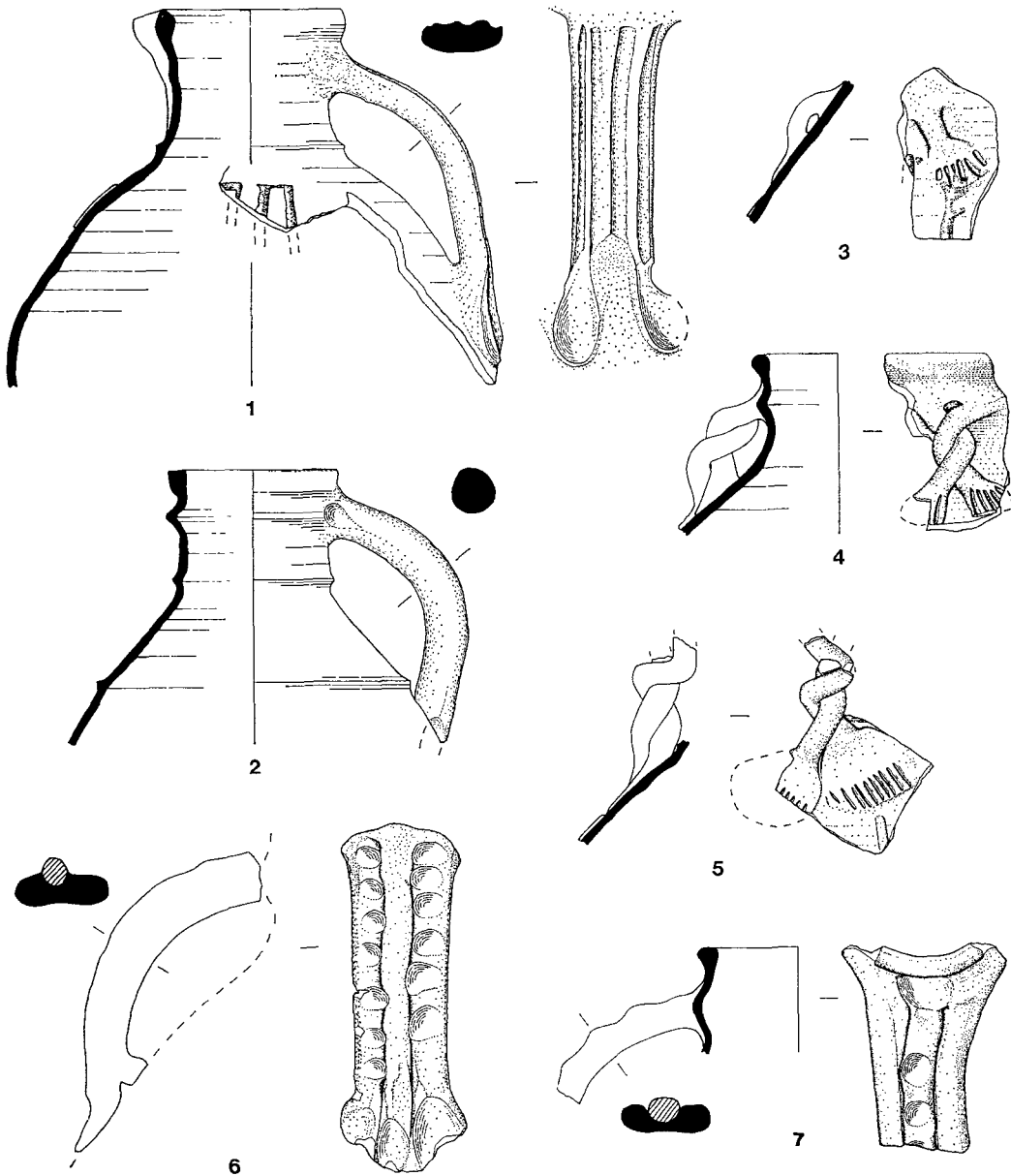


FIG 15 Colstoun: jugs (scale 1 : 4)

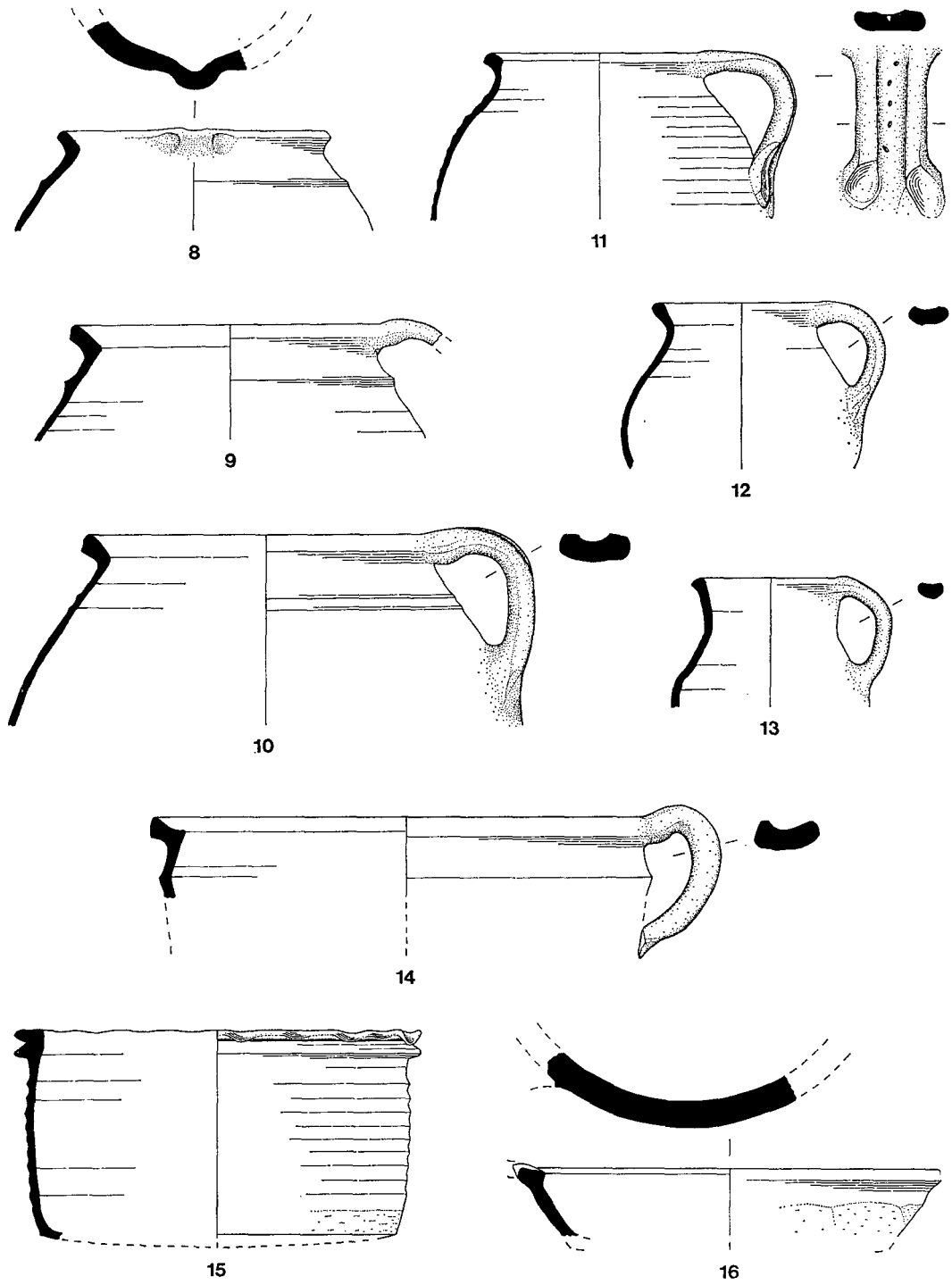


FIG 16 Colstoun: cooking pots and dish (scale 1 : 4)

profile or indicate whether they originally had one or two handles, and a pinched spout. Two have single shoulder cordons, one has a double cordon. Fig 16, 14 is unique, a large bowl with a handle (cf fig 12, 219). Of the remaining rim sherds, most are from cordoned cooking pots (as fig 10, 185–93). Fig 16, 15 has a frilled bifid rim and is almost straight-sided (cf fig 11, 199–200).

Apart from three kiln stand sherds, only one other form is represented, the dish or dripping tray (fig 16, 16; two other sherds from similar vessels). This example, a waster, is glazed internally and has evidence for a side handle (cf Cruden 1952b, figs 40, 42; Jarrett & Edwards 1961, 113–9). It may have been oval. Dripping trays often had a pouring lip (see fig 12, 221) and could be stood beneath the roasting spit to catch the meat juices.

APPENDIX 2

RECENT FIELDWORK AT COLSTOUN

A fieldwork project (geophysical and contour surveys, and trial trenches) was carried out under the direction of the writer over 3 weeks in December 1976 and October/November 1977.

1. *The Geophysical Survey*

The survey was carried out by Mr Roger Walker of the University of Bradford; his findings are summarised here. The field was gridded into 20 m squares, and the whole of this area was walked over with a fluxgate magnetometer; squares with exceptional anomalies were surveyed in detail, readings being taken at 1 m intervals. Fig 17 shows a general plan of the results: few anomalies were located in the N part of the field, in contrast to the regions flanking the central stream where there was considerable magnetic activity, indicating a further six probable and four possible kilns (fig 18) as well as probable pits, hearths and gulleys. Findings in the detailed survey areas are listed below; areas marked with an asterisk had surface scatters of pottery and daub fragments.

Area 1: Water mains pipe, one possible and one probable pit or burnt area.

Area 2: A probable pit.

Area 3*: Linear anomalies representing the culverted stream and other ditch-like features; pit or hearth areas. Though the magnetometer did not reveal the typical kiln configuration here, a considerable pottery scatter including glazed daub fragments and kiln stand sherds might suggest a ploughed-out kiln.

Area 4: Test strip to evaluate background 'soil noise'. Two lines of small anomalies could be due to field drainage or cable trenches; a negative anomaly to the N possibly represents the remains of a boundary bank, or it may be of geological nature.

Area 5*: A probable kiln, indicated by a typical configuration of a high positive anomaly flanked by small negative readings.

Area 6: Four possible pits or burnt areas.

Area 7*: A probable kiln, with a possible waster heap lying just N of it; various ditch-like features.

Area 8: A probable kiln and two probable pits.

Area 9*: Perhaps two adjacent kilns.

Area 10: Confused scatter of high anomalies and negative readings on the probable line of the stream; possibly a kiln or hearth destroyed by culverting.

Area 11*: Strong positive crescent-shaped anomaly in the area of excavated Kilns 1 and 2. Two possible kilns to the E of the area; there may be other kilns whose presence is masked by the crescent of magnetic anomaly.

Area 12*: Two large anomalies probably associated with the culverted stream, and one possible disturbed kiln (also indicated by a concentration of large stones on the surface). Several probable pits or patches of burning.

Area 13*: A positive anomaly probably associated with the stream, and a major field drain.

2. *The Contour Survey*

The survey, using a theodolite, was undertaken to relate the position of the kilns to streams now running underground; a plan with contour lines of 20 cm vertical interval was drawn up. Fig 18 is a simplified version, with contours at metre intervals.

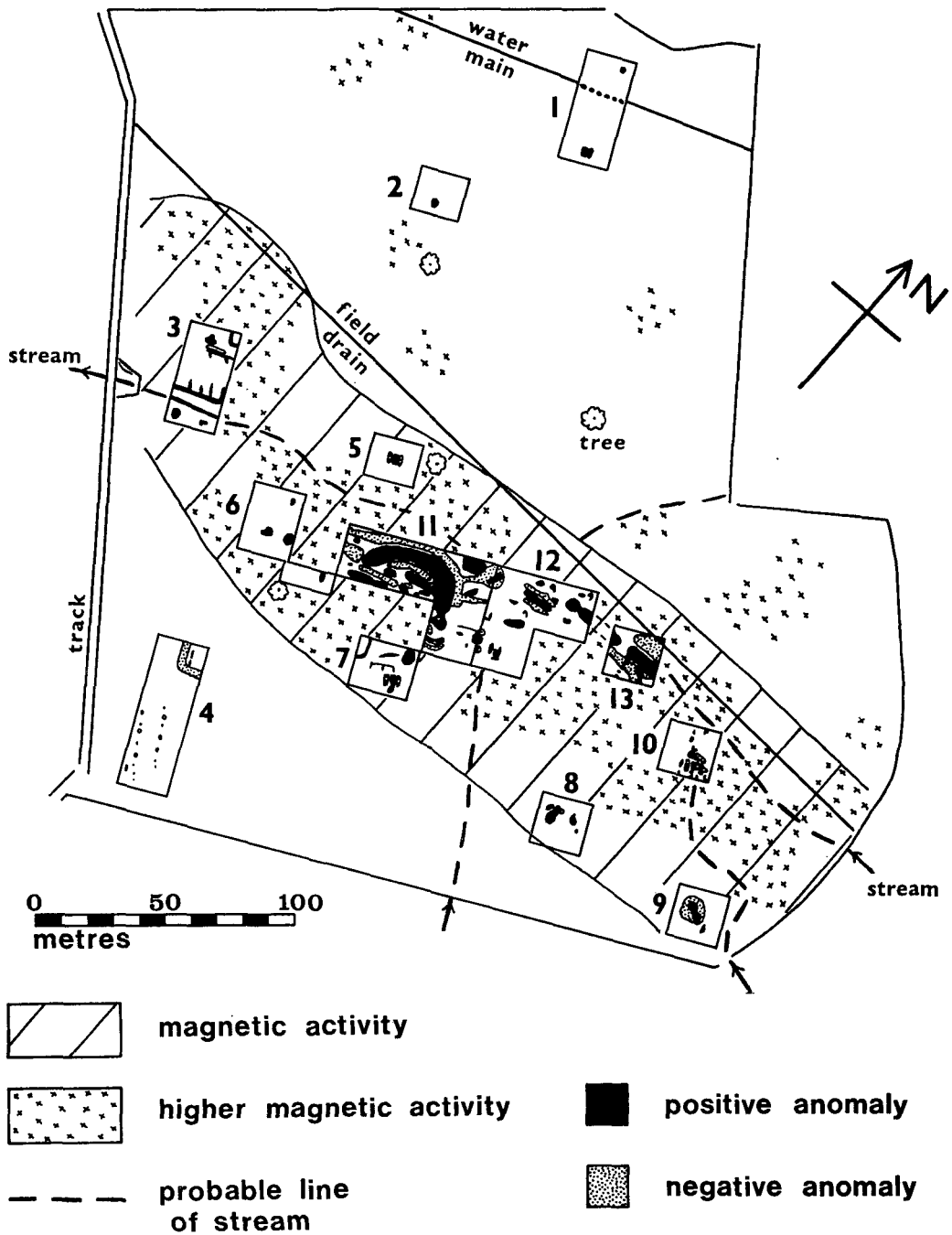


FIG 17 Colstoun: results of the geophysical survey, showing Areas 1-13

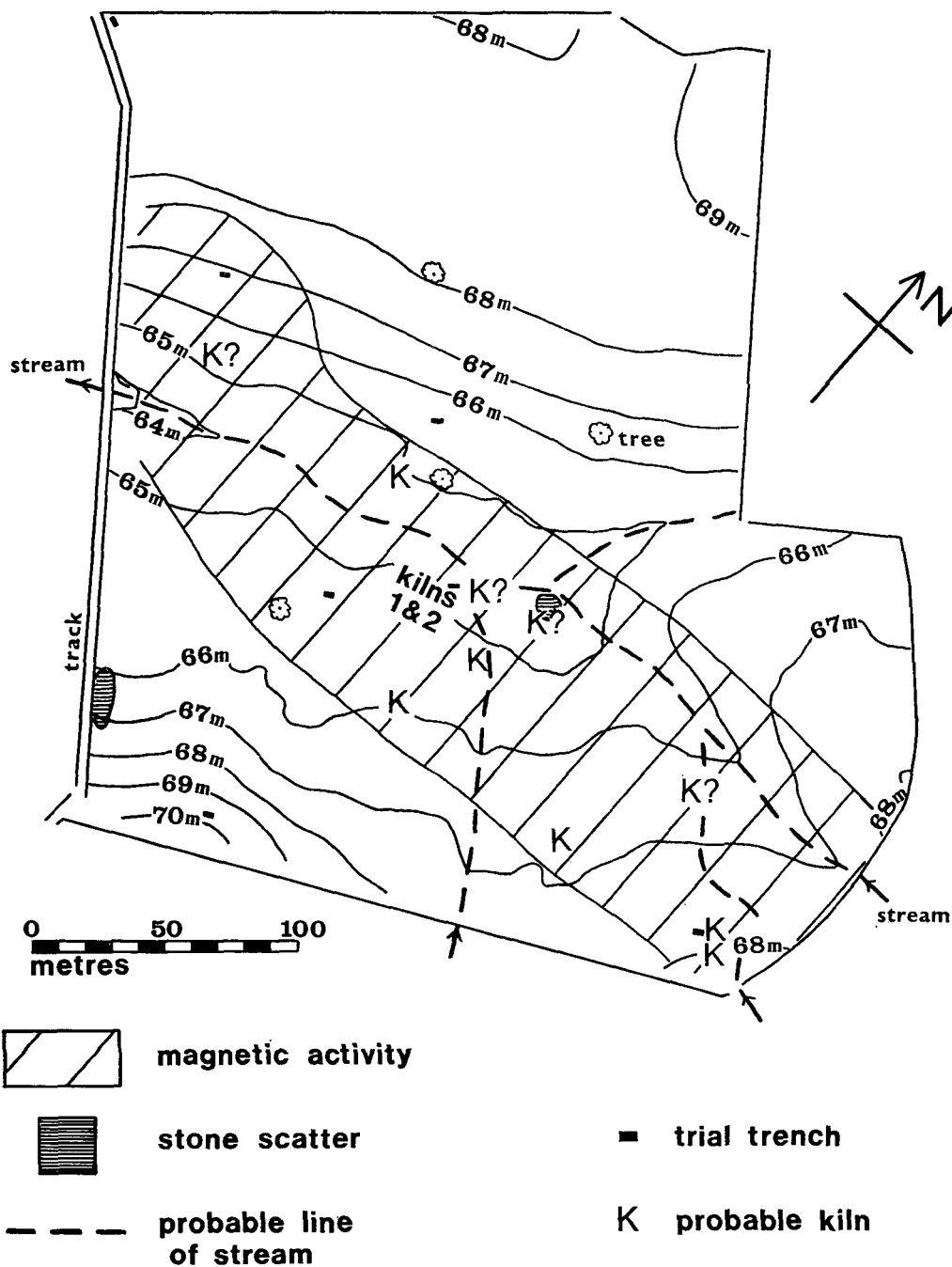


FIG 18 Colstoun: contour plan showing location of probable kilns; heights are above Newlyn Datum

Generally the stream courses were fairly clearly indicated, but on the flatter areas around the stream junctions it was difficult to know which anomalies were cut by, or due to, underground streams. The kilns and other magnetic anomalies cover a considerable area, kilns being situated not more than c 40 m from a stream. It is possible that the wide distribution of kilns may also represent distribution in time, the potters simply building new kilns in another spot when one area became full of old kiln debris, waster heaps and pits, but this could only be verified by excavation.

3. *The Trial Trenches*

Seven small trenches (fig 18) were dug to assess plough damage, with the imposed limitation of not revealing or excavating actual kiln structures as time and resources were limited. The only features found were a possible kiln flue in the Area 9 trench, and a small stone-filled gulley, perhaps an insubstantial foundation, in the S corner trench beside the 70 m contour. The gulley did not register on the magnetometer; neither did a surface scatter of small unburnt stones plotted to the W of Area 4.

The plough soil varied over the field between 23-37 cm in thickness (9-14 in). There was very little evidence of plough marks in the subsoil. Damage was, however, certainly done to the site with the onset of ploughing; a control trench in the unploughed W corner of the field showed topsoil only 16-19 cm deep (c 7 in), the soil being a loam with far less clay than the plough soil. A few stones on the field surface had plough scarring. There has also been considerable destruction wrought by culverting streams and laying numerous land drains. In Area 12 were several large stones, mostly with traces of burning, which may be derived from a kiln, but a recent brick was also present in this scatter and the magnetometer readings suggested disturbance by the culverted stream. Neither of the two stone scatters had been visible on previous visits to the site, and it was concluded that, rather than being the result of new plough damage, they had originally been loosened by ploughing and/or laying field drains but brought to the surface at this time by a mechanical potato harvester.

Conclusions

Knowledge of the site has been considerably increased; a number of probable new kilns are known. The area between the kilns may still contain remains of workshop and living areas, the pattern of a potters' settlement such as has rarely been uncovered at kiln sites elsewhere (Musty 1974, 57-8), and if excavated would add to the significance of this site. Agricultural activity has already destroyed some of the archaeological evidence, and it is important that future damage be minimised by closely monitoring any field drainage operations or cultivation deeper than 9-10 in.

APPENDIX 3

THIN SECTION ANALYSIS OF SOME COLSTOUN SHERDS

Ian M Betts, University of Bradford

Six sherds covering the range of Colstoun fabrics (except Red ware) were selected, and more than one thin section was taken from each to ensure that rarer kinds of inclusion would not go undetected. Thin section analysis indicates that all the pottery was produced from the same clay source. The mixture of metamorphic and sedimentary rock fragments is strongly suggestive of a boulder clay, as is the wide range of mineral and rock fragment sizes. Variations in the mineralogy of the pottery are likely to be a reflection of variations in the clay deposit. Rock fragments are noticeably rare in some of the finer grained pottery; either they were removed, or perhaps rock fragments were virtually absent in some parts of the clay, which seems a more likely explanation. Listed below are the main rocks and minerals found in the clay matrix.

Quartz

Quartz is the dominant mineral, the majority of crystals ranging in size from 0.015 to 0.135 mm. They exhibit a wide variation in shape, some being very rounded, others still retaining their angular appearance. These quartz grains seem to be part of the clay deposit rather than to have been added as temper. In most of the sherds there are also much larger quartz grains up to 0.9 mm across; these are more frequent when the smaller quartz crystals are less numerous, perhaps indicating that quartz sand was added to temper clay low in quartz. Large fragments of vein quartz occur in some sections.

Muscovite

The mica muscovite is a common mineral found in all sections in varying amounts. Many of the crystals are small even under high power magnification. Where the larger crystals are common, they frequently show a crude alignment.

Haematite

Haematite grains are frequent; they are very irregular in shape and vary in size up to c 0.3 mm. Haematite is commonly found in rock inclusions where it often occurs binding quartz grains together in sandstone. It is also present as a replacement product of quartz and microcrystalline silica.

Plagioclase

Plagioclase feldspar, frequently badly altered, occurs in small amounts.

Chert

Most samples contain small amounts of microcrystalline silica. The less altered fragments are clearly chert.

Rock Fragments

Sandstone fragments are commonest, consisting of quartz, with muscovite, set in a matrix of clay or haematite, or sometimes goethite. Several fragments have been badly weathered, while others have been subject to metamorphism. Some have traces of chlorite.

Mica schist occurs in most samples, consisting mainly of quartz and muscovite. The mica crystals are orientated, giving the rock inclusions their laminated appearance.

APPENDIX 4

NEUTRON ACTIVATION ANALYSIS OF MEDIEVAL POTTERY FROM COLSTOUN AND ELSEWHERE

In 1976–7 a programme of neutron activation analysis of Scottish pottery was carried out by the author at the NMAS Research Laboratory. This technique can be used to measure the amounts of certain trace elements naturally occurring in clays, and so to ‘fingerprint’ pottery from different sources (Tite 1972, 273–8, 315–23; Aspinall 1977). The methods used at Edinburgh have been described in detail elsewhere (Davidson & McKerrell 1976; Davidson 1977) and so will not be discussed here.

The eight elements selected as useful discriminants are chromium, thorium, hafnium, caesium, scandium, iron, cobalt and europium. For reasons of space it is impossible to reproduce all the analytical data here, but a list of typical results is given in Table 1. Initial clustering of the data is done by a computer, generating a dendrogram (eg fig 19). A further programme can be used to test clusters, producing results which can be represented graphically as in figs 20–3 (Davidson & McKerrell 1976). The first column of each shows the trial cluster, with the percentage probability of each sherd really belonging to that cluster. This is produced by Mahalanobis distance calculations, measuring the squared Euclidean distance a particular sample lies from the centre of a group, divided by the group variance in that direction. The other columns show samples compared to the initial cluster, each sample being given a percentage probability of belonging to that cluster. This procedure usually reveals quite clearly which other sherds do or do not belong with the main grouping. One practical limitation on the use of Mahalanobis statistics is that the basic sample group must have more members than the number of variates, in this case the eight chemical elements measured for each sample. Ideally the number of samples in a group should be at least twice, and preferably three times as large as the number of variates. This means that smaller sample groups from various sites could not be adequately tested in this way, which limits the conclusions that can be presented here. Unfortunately for various reasons it was not possible to analyse further batches of samples and so expand group numbers, which would have been desirable. The groups illustrated in figs 20 to 23 are based on all eight elements unless stated otherwise.

The logical starting point for examining the ceramics of an area in this way is with known sources. Pottery samples were taken from the only excavated Scottish kilns, Colstoun and Stenhouse (Hunter 1959–62) and also from a probable kiln site at Kinnoull, Perth (Stevenson & Henshall 1956) and a

TABLE 1

Pottery and clay analyses (all figures in parts per million)

	Sherd no	Th	Cr	Hf	Cs	Sc	Fe	Co	Eu		
Colstoun (Total of 70 sherds)	C1	17.4	151	5.8	11.1	19.0	29800	13.4	2.3		
	C2	16.0	186	8.4	9.9	19.7	25400	10.6	1.3		
	C3	17.0	158	6.5	11.8	17.8	24400	18.0	2.3		
	C4	18.2	204	8.7	13.5	17.7	18500	10.8	1.6		
	C5	15.1	180	7.7	10.0	17.8	27400	20.6	2.1		
clays (20 samples)	X19	16.9	142	9.8	9.2	20.2	31900	11.1	2.2		
	X20	17.8	168	6.0	17.3	17.5	18000	5.8	1.3		
Stenhouse (20 sherds)	S1	15.7	172	11.5	5.3	17.9	48200	14.1	1.5		
	S2	16.4	178	8.5	8.0	19.7	43500	22.5	1.6		
	S3	15.5	164	10.7	5.9	19.4	52300	18.8	1.8		
	S4	15.6	255	9.4	5.8	19.0	51500	18.2	1.5		
	S5	16.8	182	10.0	7.3	19.9	50200	16.3	1.7		
Balchrystie (13 sherds)	B1	16.9	170	6.0	6.2	21.7	15300	15.2	2.1		
	B2	16.7	197	7.0	4.1	18.5	17100	16.6	1.8		
	B3	14.3	210	5.0	6.3	15.0	13700	14.7	1.7		
	B4	15.4	172	5.4	6.1	18.5	18700	15.5	1.7		
	B5	19.4	207	10.1	5.5	21.9	19000	17.7	2.0		
Kinnoull A ware (5 sherds)	K1	13.0	135	7.0	8.5	18.2	37600	19.5	1.9		
	K2	12.5	145	6.5	7.9	18.3	38600	13.2	1.7		
	K3	13.1	155	7.2	7.7	18.5	36300	16.0	1.7		
	B ware (4 sherds)	K6	13.2	134	6.7	9.1	18.4	40100	14.3	1.8	
		K7	13.4	142	7.7	8.4	17.8	40900	14.5	1.6	
		K8	12.6	137	6.3	8.6	16.5	34300	10.3	1.3	
	C ware (3 sherds)	K10	20.3	174	9.5	4.5	23.1	21100	10.1	2.2	
		K11	17.8	165	4.8	8.0	17.8	14500	10.7	2.2	
K12	17.9	180	4.7	10.7	20.4	17100	10.0	2.2			
Edinburgh (25 sherds)	E1	20.8	212	8.4	12.0	20.3	15500	16.8	2.0		
	E2	20.6	212	7.3	11.9	21.0	18500	13.1	2.2		
	E3	20.5	194	7.4	11.4	20.7	18300	16.8	2.1		
	E4	22.7	195	5.1	13.5	24.9	24700	12.6	2.3		
	E5	19.8	211	7.6	7.8	26.2	24100	14.1	2.1		
Perth (25 sherds)	A ware	P14	15.9	229	7.2	7.0	19.7	34900	12.0	1.8	
		P15	15.2	182	8.2	5.2	19.6	43600	12.4	1.7	
	B ware	P6	14.4	169	7.3	5.4	18.1	40700	14.6	2.0	
		P7	14.7	152	7.6	5.0	18.1	40400	13.5	1.8	
	C ware	P9	19.2	185	4.5	4.5	22.0	15300	7.5	1.5	
		P10	17.7	210	4.4	5.1	21.4	16600	8.1	1.2	
	Aberdeen (73 sherds)	Scarboro' ware Phase 1	A7	15.8	169	13.7	8.2	18.3	26200	7.8	2.1
			A12	14.5	157	13.5	8.4	16.8	22800	6.5	1.4
		Phase 2	A1	17.9	184	10.6	9.5	21.9	25300	20.4	2.8
			A2	16.8	162	13.0	6.3	17.0	18100	12.6	2.0
Local		A16	17.6	142	5.6	8.6	25.3	56100	23.6	2.9	
		A17	11.6	203	7.6	6.5	18.9	38100	12.7	1.1	
		A18	18.1	177	6.3	8.9	17.9	33000	9.5	1.7	
		A19	14.6	136	5.8	12.2	20.3	20600	13.1	1.4	

TABLE 1 (contd.)

	Sherd no	Th	Cr	Hf	Cs	Sc	Fe	Co	Eu
Scarborough									
Phase 1	Y1	16.5	172	13.6	10.6	18.5	27300	8.1	1.9
(7 sherds)	Y9	16.5	161	11.1	8.0	18.7	27600	13.7	2.0
	Y12	15.4	165	12.5	8.7	17.0	22600	6.8	2.2
Phase 2	Y2	17.5	158	12.1	9.3	20.0	28400	18.9	2.3
(17 sherds)	Y3	17.7	155	11.4	8.0	19.5	24200	21.5	2.3
	Y4	17.6	155	10.8	9.7	19.6	25100	16.6	2.3
Hartlepool area									
Scarborough									
Phase 1	D1	15.9	170	12.2	10.5	16.9	27600	8.5	1.4
(7 sherds)	D2	14.9	155	12.2	9.2	16.7	23000	6.7	1.3
Phase 2	D12	15.9	143	8.7	9.9	18.6	26400	15.6	2.2
(9 sherds)	D13	15.1	150	11.2	7.0	16.5	20400	13.5	2.0
Hartlepool type ware									
(7 sherds)	D4	15.5	212	8.1	8.7	21.9	29800	11.8	1.8
	D5	17.2	177	6.7	8.4	20.4	49300	8.5	1.1
	D6	18.6	178	10.3	8.4	21.5	42400	8.1	3.0
	D7	17.9	229	7.9	8.9	21.4	49300	11.7	1.4
Nottingham									
Scarboro' ware									
Phase 2	N1	16.8	143	10.7	7.8	19.4	19700	14.8	2.2
Local	N2	16.8	152	8.7	10.1	18.2	32200	15.8	1.7
(10 sherds)	N3	15.8	186	7.3	14.9	22.5	34500	16.5	1.7
	N4	16.1	442	5.5	20.0	29.3	28600	17.9	1.3
	N5	14.5	297	4.3	14.7	22.1	36500	17.4	1.5

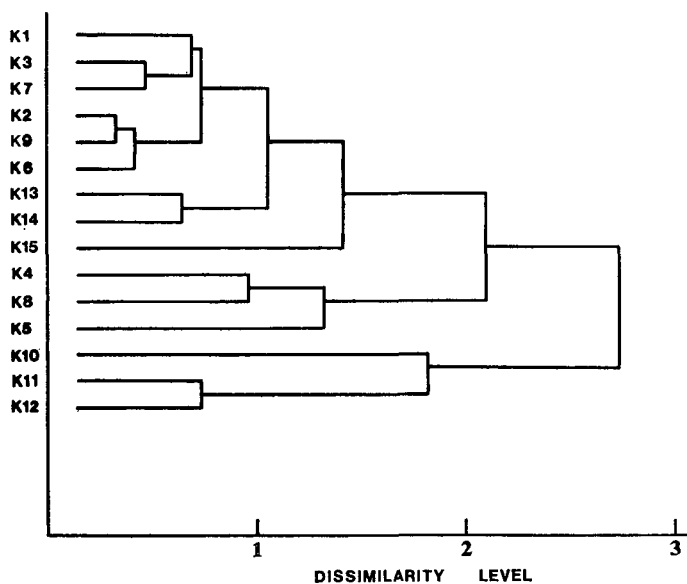


FIG 19 Computer clustering dendrogram of pottery from Kinnoull, Perth

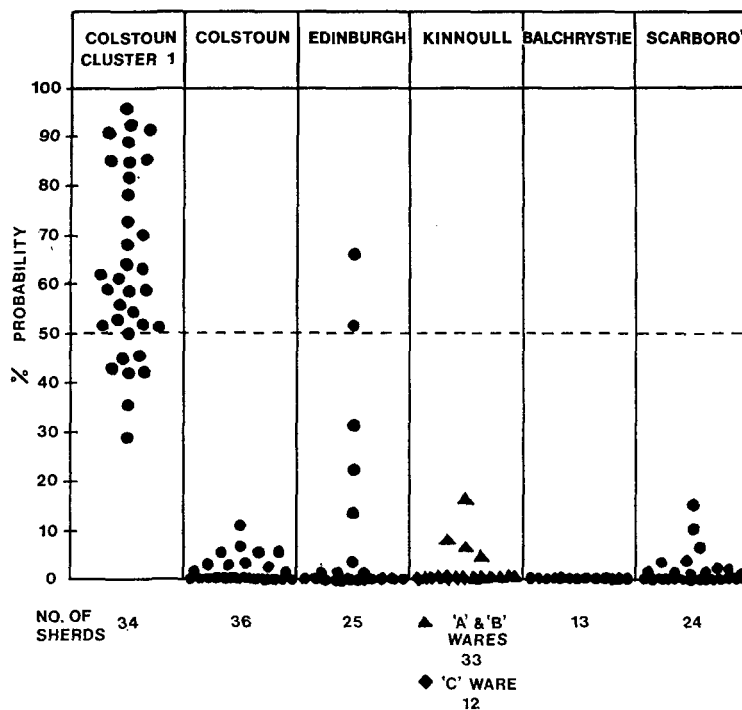


FIG 20 Probability evaluation based on Mahalanobis D^2 statistics: Colstoun Cluster 1

possible site in Fife, Balchrystie (Wedderburn 1973). The pottery from all these sites could be divided visually into two groups, low iron and high iron clays. Within these groups, the analytical data clearly distinguished one source from another, even if the sherds were visually very similar ('white' clay – Colstoun, Balchrystie and Kinnoull 'C' ware; 'red' clay – Stenhouse, Kinnoull 'A' and 'B' wares). The programme was extended to cover pottery from urban sites such as St Ann's St, Perth, Edinburgh High St, and Broad St and Virginia St, Aberdeen. The presence of large quantities of imported Scarborough ware in Aberdeen led to some analytical work being done on pottery from Scarborough itself, and also on Scarborough ware found in NE England, and the Nottingham Moot Hall knight jug.

Colstoun

While Colstoun sherds are generally distinguished from Balchrystie and Kinnoull 'C' ware, there is a considerable degree of variation within the group, reflecting the variable geology of the site; fluctuations in iron particularly may be due to variations in the quantity of haematite grains (see Appendix 3). One main group, Cluster 1, emerged (fig 20). The remaining sherds form a number of small clusters, none large enough for statistical testing. Interestingly, two Edinburgh sherds show a high probability of belonging to this group and can be presumed to be imports. As one would expect, sherds from Kinnoull, Balchrystie and Scarborough show very low probabilities. Cluster 1 does not correlate with any visually distinct group, however; it does cover the whiter end of the Colstoun spectrum, including very fine fabrics (eg bowl no 227 and bridge spout no 21) and several face-mask jugs, but also included are fairly gritty cooking pots, two kiln stand fragments and two pieces of kiln brick which are extremely gritty. This is interesting as it shows clearly that the same clay source was used for a range of purposes, from building kilns to making the finest of the jugs.

Clustering on seven elements, normalisation to a 5% iron content gave a more coherent picture, with four groups, A–D, which could also be labelled 'White 1', 'White 2', 'Pink' and 'Red' by their relative iron content (although of course this is all within the range of whites and pinkish-buffs, as no true 'Red ware' was analysed). This grouping does not correspond exactly with the non-normalised data, as Cluster 1 members fall into both Groups A and C. Fig 21 shows that there is in fact a probable overlap

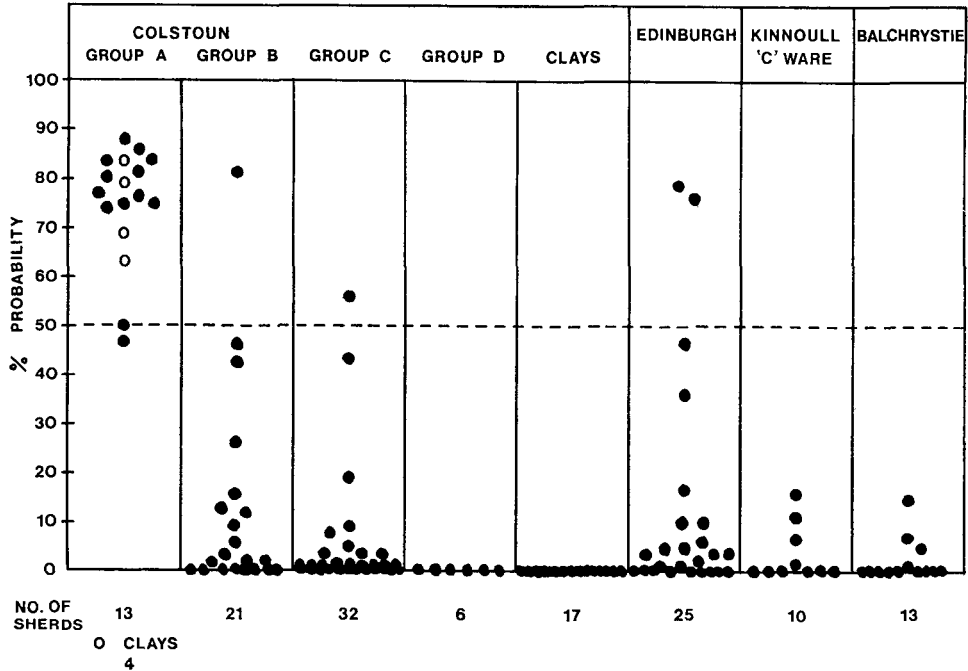


FIG 21 Probability evaluation based on Mahalanobis D² statistics: Colstoun Group A (analytical data normalised to a 5% iron content using Th, Cr, Hf, Cs, Sc and Co)

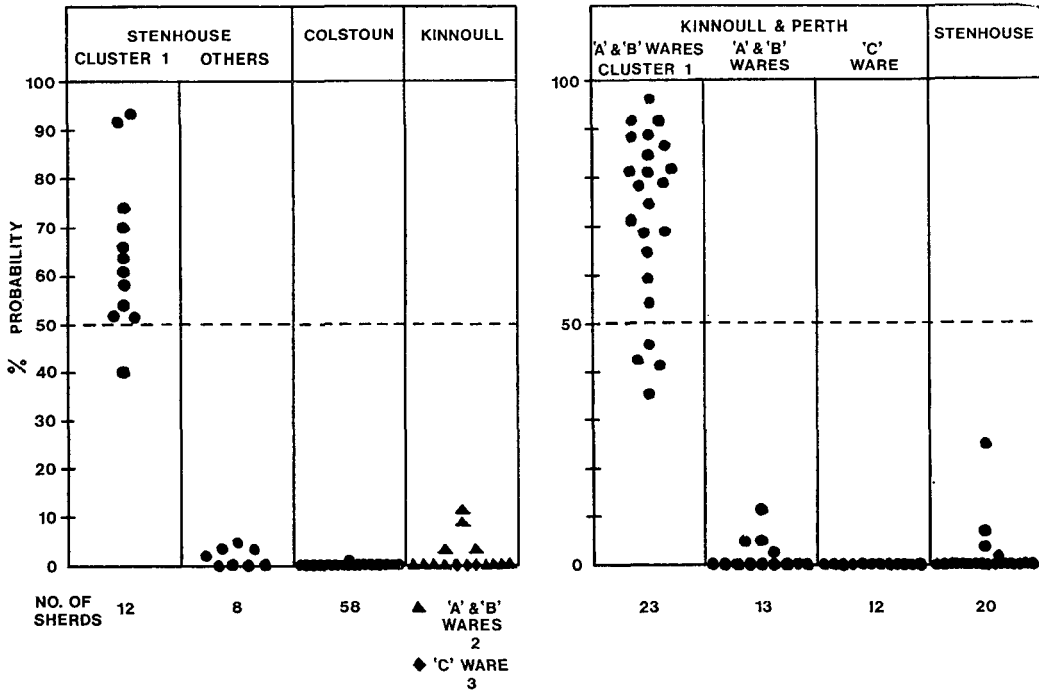


FIG 22 Probability evaluations based on Mahalanobis D² statistics: Stenhouse Cluster 1 (analyses used for Th, Sc, Fe, Eu) and Kinnoull A and B ware Cluster 1

between Groups A, B and C. However, with normalisation four of the clay samples from the site group well with the pottery. The similarity of several Edinburgh sherds can also be noticed, while other Scottish white wares show a very low probability level.

Balchrystie

Thirteen sherds only were sampled, all of white gritty fabric except one (B13) in a smooth pinkish-buff paste. The remaining twelve grouped well together (on four elements; not illustrated) with probabilities ranging from 42-96%.

Stenhouse

Again, there is a certain variation within the clays from one distinct group. Fig 22 shows a cluster of 12 samples which includes a lump of daub from the site. Pottery from Colstoun and Kinnoull shows a low level of probability.

Kinnoull

'Three distinct wares' had been recognised (Stevenson & Henshall 1957): A ware, a hard pink-buff, often glazed; B ware, buff or orange, often rather chalky, with white or pink slip; and C ware, a hard, thin grey or white heavily gritted fabric. Cluster analysis showed that in fact A and B ware are made of the same clay; superficial differences probably result from different manufacturing techniques and firing conditions. Within groups A and B there are two slightly different clays, which emerges in fig 19 - the larger sub-group consists of three A ware sherds (K1, K2, K3), three B ware sherds (K6, K7, K9) and three lumps of daub (K13, K14, K15). A smaller sub-group consists of two A ware sherds (K4, K5) and one of B ware (K8). C ware is represented by three samples, K10, K11 and K12, which again indicate two possible different groups.

These results were amplified when pottery from St Ann's St, Perth was included - not surprisingly, much of the local pottery grouped well with the Kinnoull samples. Clustering produced two groups of A

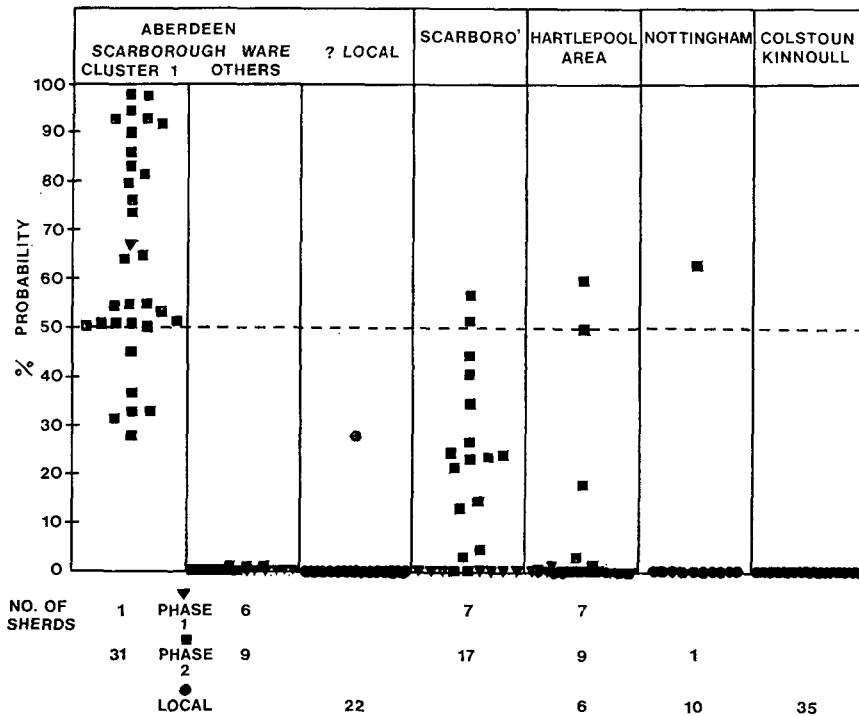


FIG 23 Probability evaluations based on Mahalanobis D² statistics: Aberdeen Scarborough ware Cluster 1

and B ware – Cluster 1 (fig 22) had 9 sherds of B ware, 12 of A ware and 2 daub fragments (the presence of which in this group seems conclusive proof that there was in fact a kiln on the site). There was a smaller cluster of ten A ware and two B ware sherds and 1 daub fragment, and two small clusters (seven and five sherds each) of C ware – these were all too small to test statistically. Pottery from Stenhouse had a generally low probability level.

Scarborough ware

A group of 24 sherds from Scarborough was analysed, seven of Phase 1 fabric (soft, pinkish) and 17 of Phase 2 (hard buff) (Farmer 1979, 28). Thirteen of the Phase 2 sherds clustered well together. There were two small groups of Phase 1 and 2 respectively, and one group with one Phase 2 and three Phase 1 sherds – a slight chemical overlap of the phases (usually distinct) is a feature that appears elsewhere. Forty-seven Scarborough sherds from Aberdeen were analysed, and one Phase 1 sherd and 31 Phase 2 sherds form Cluster 1 (fig 23). Two smaller clusters of Phase 2 were also noted (total of seven sherds), one group of five Phase 1 sherds and one small mixed group of one Phase 2 and two Phase 1 sherds. Fig 23 shows the high probability of several Scarborough sherds being made from the same clay source as sherds in Cluster 1. Presumed local Aberdeen sherds had a low level of probability except for one, which may in fact be a Scarborough ware sherd. These convincing analytical indications of trade are backed up by comparison with Scarborough wares elsewhere. Of nine Phase 2 sherds available from sites in the Hartlepool area, two have a high probability of belonging to Cluster 1. The local Hartlepool-type ware (Addis 1976) is sometimes quite similar to Scarborough ware in appearance, but proved to be quite distinct chemically. Of 11 Nottingham samples, one has a high probability of belonging to Cluster 1. Sample N1 is from the well-known Moot Hall knight jug (Dunning 1955; Rackham 1972, pl D), whose source of manufacture has been much debated. This result would seem to confirm that it is in fact a Scarborough Phase 2 product (Farmer 1979, 36). A small selection of Nottingham local pottery has a very low level of probability, as do the Scottish kiln products.

ACKNOWLEDGMENTS

I am much indebted to the National Museum of Antiquities of Scotland for permission to publish material from its collections, to successive Keepers Mr R B K Stevenson and Mr A Fenton for their generous cooperation and support, and to Dr D V Clarke for information on the excavation. Nos 206, 247 and 248 are published by kind permission of Lady E Broun Lindsay and the Colstoun Estate, who also allowed us to carry out fieldwork on the site. Thanks are due to Mr Ian Hird for his experiments in throwing Colstoun clays and to Mr Ian Betts for the thin section analyses.

The 1976–7 fieldwork project was financed by the Department of the Environment and an excavation grant from the Society of Antiquaries of Scotland, and administered by Miss L M Thoms. I am much indebted to Mr Roger Walker for the magnetometer survey, to all the volunteers who worked on the project with much enthusiasm despite adverse weather conditions, especially Mrs M Kenworthy, Mr W Findlay, Mr L Nebelsick and Mr M Wilson, and to Miss Thoms and Mr C J Tabraham for their encouragement.

Facilities for neutron activation analysis were very generously made available to me at the NMAS Research Laboratory under the direction of H McKerrell. I am grateful to my supervisors, Professor S Piggott, Mr E Talbot and Dr T Watkins, and to all those who made available pottery for sampling, especially Miss L Addis, Nita and Peter Farmer, Colvin and Moira Greig, Mr A MacCormick and Miss L Thoms. Above all, I am greatly indebted to Dr T E Davidson for his help and advice from the conception of the project.

REFERENCES

- Addis, E L 1976 'The pottery', in Austin, D, 'Fieldwork and Excavation at Hart, Co Durham, 1965–1975', *Archaeol Aeliana*, 5 ser, 4 (1976), 100–24.

- Aspinall, A 1977 'Neutron activation analysis of medieval ceramics', *Medieval Ceramics*, 1 (1977), 5-16.
- Bellamy, C V & le Patourel, H E J 1970 'Four medieval pottery-kilns on Woodhouse Farm, Winksley, near Ripon, W Riding of Yorkshire', *Medieval Archaeol*, 14 (1970), 104-25.
- Brooks, C M & Haggarty, G R 1977 'Notes on Scottish medieval kiln furniture from Rattray, Aberdeenshire', *Proc Soc Antiq Scot*, 108 (1976-7), 379-82.
- Bryant, G F 1977 'Experimental kiln firings at Barton-on-Humber, S Humberside, 1971', *Medieval Archaeol*, 21 (1977), 106-23.
- Buckland, P C, Dolby, M J, Hayfield, C & Magilton, J R 1979 *The Medieval Pottery Industry at Hallgate, Doncaster*. Doncaster.
- Carus-Wilson, E 1963 'The medieval trade of the ports of the Wash', *Medieval Archaeol*, 6-7 (1962-3), 182-201.
- Clarke, H & Carter, A 1977 *Excavations in King's Lynn 1963-1970*. Soc Medieval Archaeol Monogr, 7.
- Coutts, H 1966 'Scarborough ware from the Overgate, Dundee', *Proc Soc Antiq Scot*, 98 (1964-6), 323-5.
- Cruden, S 1952a 'Glenluce Abbey: finds recovered during excavations', *Trans Dumfries Galloway Natur Hist Antiq Soc*, 29 (1952), 177-95.
- Cruden, S 1952b 'Scottish medieval pottery: the Bothwell Castle Collection', *Proc Soc Antiq Scot*, 86 (1951-2), 140-70.
- Cruden, S 1953 'Scottish medieval pottery: the Melrose Abbey Collection', *Proc Soc Antiq Scot*, 87 (1952-3), 161-74.
- Cruden, S 1956 'Scottish medieval pottery', *Proc Soc Antiq Scot*, 89 (1955-6), 67-82.
- Davidson, T E 1977 *Regional Variation within the Halaf Ceramic Tradition*, PhD thesis, University of Edinburgh.
- Davidson, T E & McKerrell, H 1976 'Pottery analysis and Halaf period trade in the Khabur Headwaters region', *Iraq*, 38 (1976), 45-56.
- Dunning, G C 1955 'The decorated jug from the Moot Hall at Nottingham', *Ann Rep Peverel Archaeol Group*, 1955, 18-23.
- Dunning, G C 1963 'Report on Scarborough ware found at Kildrummy Castle', *Proc Soc Antiq Scot*, 96 (1962-3), 233-6.
- Dunning, G C 1968 'The trade in medieval pottery around the North Sea', in Renaud, J G (ed), *Rotterdam Papers*, Rotterdam, 35-58.
- Dunning, G C 1969 'Medieval jugs decorated with brooches', *Antiq J*, 49 (1969), 388-90.
- Dunning, G C, Hodges, H M W & Jope, E M 1958 'Kirkcudbright Castle, its pottery and ironwork', *Proc Soc Antiq Scot*, 91 (1957-8), 117-38.
- Edwards, B J N 1966 'Medieval pottery', in Harbottle, R B 'Excavations at the South Curtain Wall of the Castle, Newcastle upon Tyne, 1960-61', *Archaeol Aeliana*, 4 ser, 44 (1966), 104-30.
- Edwards, B J N 1967 'Medieval pottery', in Jobey, G 'Excavations at Tynemouth Priory and Castle', *Archaeol Aeliana*, 4 ser, 45 (1967), 70-83.
- Farmer, P 1979 *An Introduction to Scarborough Ware and a Re-Assessment of Knight Jugs*. Hove.
- Hunter, D M 1959-62 'Stenhouse', *Discovery & Excavation in Scotland 1959*, 33-4; 1960, 37-8; 1961, 46; 1962, 45-6.
- Hurst, J G 1963 'Jugs with bases thumbed underneath', *Medieval Archaeol*, 6-7 (1962-3), 295-8.
- Jarrett, M G & Edwards, B J N 1961 'Medieval and other pottery from Finchale Priory, Co Durham', *Archaeol Aeliana*, 4 ser, 39 (1961), 229-78.
- Jarrett, M G & Edwards, B J N 1962 'Medieval and other pottery from Hartlepool, Co Durham', *Archaeol Aeliana*, 4 ser, 40 (1962), 241-52.
- Jarrett, M G & Edwards, B J N 1963 'Medieval pottery in the possession of the Society of Antiquaries of Newcastle upon Tyne', *Archaeol Aeliana*, 4 ser, 41 (1963), 85-106.
- Laing, L R 1967 'Excavations at Linlithgow Palace, West Lothian, 1966-7', *Proc Soc Antiq Scot*, 99 (1966-7), 111-47.
- Laing, L R 1969 'Medieval and other material in Linlithgow Palace Museum', *Proc Soc Antiq Scot*, 101 (1968-9), 134-45.
- Laing, L R 1971a 'Medieval pottery in Dundee Museum', *Proc Soc Antiq Scot*, 103 (1970-1), 169-77.
- Laing, L R 1971b 'Pottery from Kinnoull, Perth, and the distribution of tubular spouts in Scotland', *Proc Soc Antiq Scot*, 103 (1970-1), 236-9.

- Laing, L R 1972 'Medieval pottery from Coldingham Priory, Berwickshire', *Proc Soc Antiq Scot*, 104 (1971-2), 242-7.
- Laing, L R 1973 'The origins of the Scottish medieval pottery industry', *Archaeol J*, 130 (1973), 183-216.
- Laing, L R & Robertson, W N 1970 'Notes on Scottish medieval pottery', *Proc Soc Antiq Scot*, 102 (1969-70), 146-54.
- le Patourel, H E J 1966 'Hallgate, Doncaster, and the incidence of face-jugs with beards', *Medieval Archaeol*, 10 (1966), 160-4.
- Long, C D 1975 'Excavations in the medieval city of Trondheim, Norway', *Medieval Archaeol*, 19 (1975), 1-32.
- Manby, T G 1964 'Medieval Pottery Kilns at Upper Heaton, West Yorkshire', *Archaeol J*, 121 (1964), 70-110.
- Medieval Catalogue 1940 *London Museum Medieval Catalogue*. London.
- Murray, J C (ed) 1978 *Aberdeen: the Town Beneath the City*. Aberdeen.
- Musty, J 1974 'Medieval pottery kilns', in Evison, V I, Hodges, H & Hurst, J G (eds), *Medieval Pottery from Excavations*, London, 41-65.
- Pollock, A J & Waterman, D M 1963 'A medieval pottery kiln at Downpatrick', *Ulster J Archaeol*, 26 (1963), 79-104.
- Rackham, B 1972 *Medieval English Pottery*. 2nd ed, London.
- Rahtz, P A 1969 *Excavations at King John's Hunting Lodge, Writtle, Essex, 1955-57*. Soc Medieval Archaeol Monogr, 3.
- Rutter, J G 1961 *Medieval Pottery in the Scarborough Museum*. Scarborough and District Archaeol Soc Res Rep, 3.
- Simpson, G G (ed) 1974 *Aberdeen's Hidden History*. Aberdeen.
- Smith, A H V 1977 'Coal', in Clarke and Carter 1977, 347-9.
- Tite, M S 1972 *Methods of Physical Examination in Archaeology*. London.
- Thoms, L M 1976 'Coarse pottery', in Schofield, J 'Excavations South of Edinburgh High Street', 1973-4', *Proc Soc Antiq Scot*, 107 (1975-6), 190-206.
- Truckell, A E & Williams, J 1967 'Medieval pottery in Dumfriesshire and Galloway', *Trans Dumfries Galloway Natur Hist Antiq Soc*, 44 (1967), 133-74.
- van der Leeuw, S E 1975 'Medieval pottery from Haarlem: a model', in Renaud, J G (ed), *Rotterdam Papers II*, Rotterdam, 67-87.
- Wedderburn, L M M 1973 'Balchrystie Farm', *Discovery and Excavation in Scotland 1973*, 26.