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Excavations at Musselburgh Primary Health Care Centre: Iron Age and Roman discoveries to the north of Inveresk Roman Fort, East Lothian

Magnus Kirby

With contributions by

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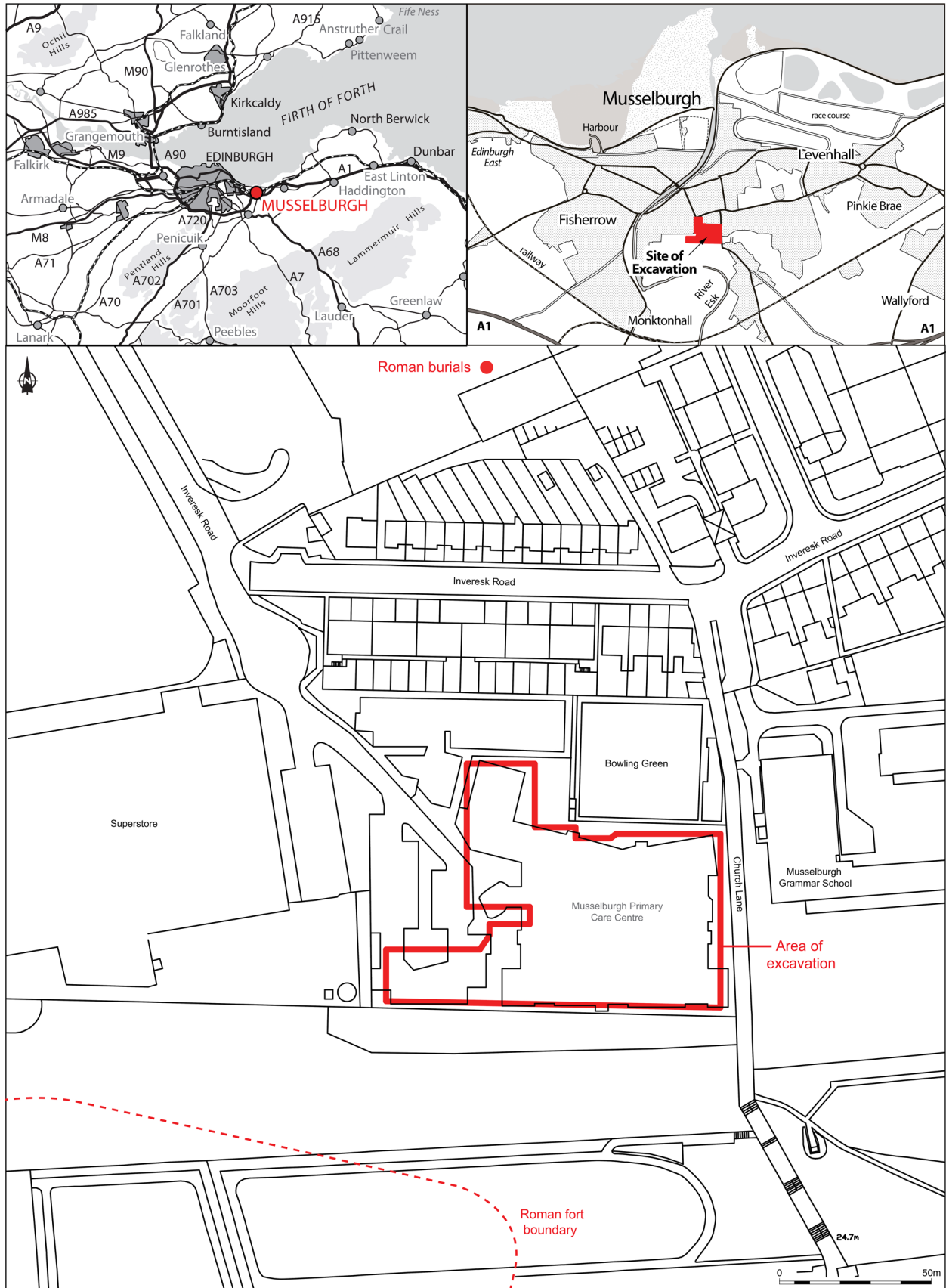
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1. ABSTRACT

An excavation was undertaken by CFA Archaeology Ltd (CFA) between August and November 2010 on the site of the new Musselburgh Primary Health Care Centre. The site, which lies to the south of Inveresk Road, is centred on NGR 33430 67224. Until its demolition, the area had been occupied by Brunton Wireworks. The Scheduled Monument of Inveresk Roman Fort lies at the top of the steep slope *c* 50m to the south of the excavation site.

The excavation identified six phases of activity on the site, the earliest being a Mesolithic flint scatter (Clarke & Kirby forthcoming). The area was used as a burial ground in the Iron Age and a ring ditch may also be of prehistoric date. Later, six Roman inhumation burials (four of which had been decapitated) and a horse burial were interred, and a possible Roman fortlet was constructed. Across the site, a network of interconnected ditches formed part of a Roman-period field system, which cut through the rampart of the possible fortlet, and through a number of the graves. Along the southern boundary of the site a large accumulation of Roman midden deposits overlay features associated with the field system, although it may have started to build up while the latter was still in use. A post-built structure was also found, one post of which cut a ditch of the field system.

The midden deposits extended along the full length of the southern boundary of the site, measuring 110m long by up to 20m wide. Numerous artefacts were recovered, representing the rubbish and discarded personal belongings of the fort occupants. The pottery included samian bowls with personal names scratched on the bases. Evidence from these, together with isotopic analysis of the human skeletons, shows that the ethnic origin of those living in the fort was diverse, as would be expected for the Roman army.



Illus 2.1 Location map (copyright CFA Archaeology Ltd)

2. INTRODUCTION

2.1 Archaeological background

In August 2010, CFA Archaeology Ltd (CFA) was commissioned by Dawn Construction Ltd to undertake a programme of excavation works in advance of the construction of the new Musselburgh Primary Health Care Centre. The new health care centre (NGR: NT 3428 7224; Illus 2.1) was situated immediately to the north of the scheduled area associated with Inveresk Roman Fort, on the site of the former Brunton Wireworks.

The Scheduled Monument of Inveresk Roman fort lies at the top of a steep slope immediately to the south of the excavation site. Inveresk has a long history of research, with the first significant find of a Roman altar dating back to 1565, but it was not until the late 1940s that the location of the fort was proven following trenching carried out by Sir Ian Richmond (Richmond 1980). Two phases of fort occupation dating to the Antonine period (139–165 AD) have been established (Richmond 1980: 294), while Leslie (2002a) has suggested three phases. Evidence for an associated civilian settlement extending eastward from the fort has also been revealed through excavation (Thomas 1988: 139; Bishop 2004). There has been some speculation (Richmond 1980: 298) that there may have been an earlier Flavian fort within the vicinity, but following the discovery of a Flavian-period fort at Elginhaugh *c* 5km to the south-west on the outskirts of Dalkeith (identified from aerial photographs in 1979 and found to date from the Flavian-period when it was excavated in 1986–7 (Hanson 2007)) this now seems unlikely, as contemporary Roman forts were generally located *c* 25–32km (one day's march) apart. Some tentative evidence from pottery discovered within the civil settlement (Bishop 2002b) suggests that occupation may have continued beyond the mid-Antonine period. A more detailed history of archaeological intervention at Inveresk is summarised by Leslie (2002a).

Earlier finds from the Brunton Wireworks included Roman burials consisting of at least five possible graves, which were discovered in July 1985 by workmen excavating a trench for machinery (Gallagher & Clarke 1993). The graves lay to the north of the development area approximately within

the location of the previous (now demolished) Tesco supermarket. The close proximity of the development site to these known Roman remains meant there was recognised potential for associated remains to exist within it. An archaeological evaluation carried out by AOC Archaeology Ltd (Cook 2009) to the west of the development area only identified 19th-century remains associated with the wireworks, suggesting that any earlier remains within that particular area had been destroyed.

Given the close proximity of the development site to Inveresk Roman Fort, combined with the extensive evidence for Roman occupation within the wider area, this area was considered to be one of high archaeological potential and consequently East Lothian Council attached a condition to planning consent for the development requiring a programme of archaeological works to be undertaken in advance of the construction of the health care centre. An archaeological trial trenching evaluation was carried out by Headland Archaeology Ltd in November and December 2009 (Robertson 2010) and identified a number of Roman-period features including linear ditches, a cremation burial and a cobbled surface sealed by a layer of clay. As a result of these discoveries, East Lothian Council Archaeology Service (ELCAS) required a programme of further excavation and post-excavation analysis to be conducted. The excavations, which were undertaken by CFA between August and December 2010, uncovered extensive Iron Age and Roman-period remains including burials, a rampart base, a field system, and an extensive midden, and led to the recovery of numerous artefacts and ecofacts including pottery, metal and bone. These remains form the basis for this paper. Also uncovered was an extensive Mesolithic/Neolithic flint scatter which is published separately (Clarke & Kirby forthcoming).

2.2 Topography and soil deposits

The site, which lies to the south of Inveresk Road, occupied a vacant plot of *c* 10,325m² in area (Illus 2.1). Cartographic information indicates that prior to the expansion of Brunton Wireworks in the 20th century, this area consisted of undeveloped farmland. Following the demolition of the wireworks, the area

was covered by a combination of modern overburden and reinforced concrete relating to the former works buildings. The site was largely flat, but sloped steeply upwards towards the southern edge to form an embankment running the length of the site where it bordered the scheduled area associated with Inveresk Roman Fort. The summit of this steep embankment was formerly occupied by the wire testing range associated with the wireworks. Beyond the embankment, the topography of the ground again sloped steeply up towards the summit of the ridge where the Roman fort was located.

The soil deposits across the area predominantly consisted of 0.8–1.5m of grey-brown sandy silt overlying pale yellow sand. Along the southern boundary of the site where the steep embankment was situated, the soil deposits measured up to 2m in depth and overlay silty clay slopewash at the western end and pale yellow sand at the eastern end. Roman-period features had been cut into the slopewash deposits so soil stripping was halted at this level. Test-pitting was later undertaken within the slopewash deposits on the discovery of a quantity of prehistoric lithics (Clarke & Kirby forthcoming). The overlying soil deposits at the southern end of the site contained numerous Roman-period artefacts and have been interpreted as a midden-rich deposit. Throughout the site there were areas of disturbance where features associated with the former wireworks had been cut into the subsoil, with various elements such as concrete pillar bases still surviving in situ.

2.3 Methodology

In agreement with ELCAS, the programme of works was undertaken as a phased excavation, with areas being signed over for development work on completion. Prior to the excavation, machine test-pitting was undertaken to assess the nature and depths of the deposits. Modern overburden was removed from the site under constant archaeological supervision using a 360° mechanical excavator equipped with a smooth-bladed ditching bucket. The Roman midden-rich deposits (C003) along the southern edge of the site were divided into 11 10m-wide zones (Zone 1 to Zone 11) and reduced by mechanical excavator in spits of <0.1m in order to allow the maximum

number of artefacts to be recovered. The recovery of metal artefacts was aided by the use of a metal detector. The entire area was cleaned by hand and all features were hand-excavated. Site plans were compiled using industry-standard total station surveying equipment.

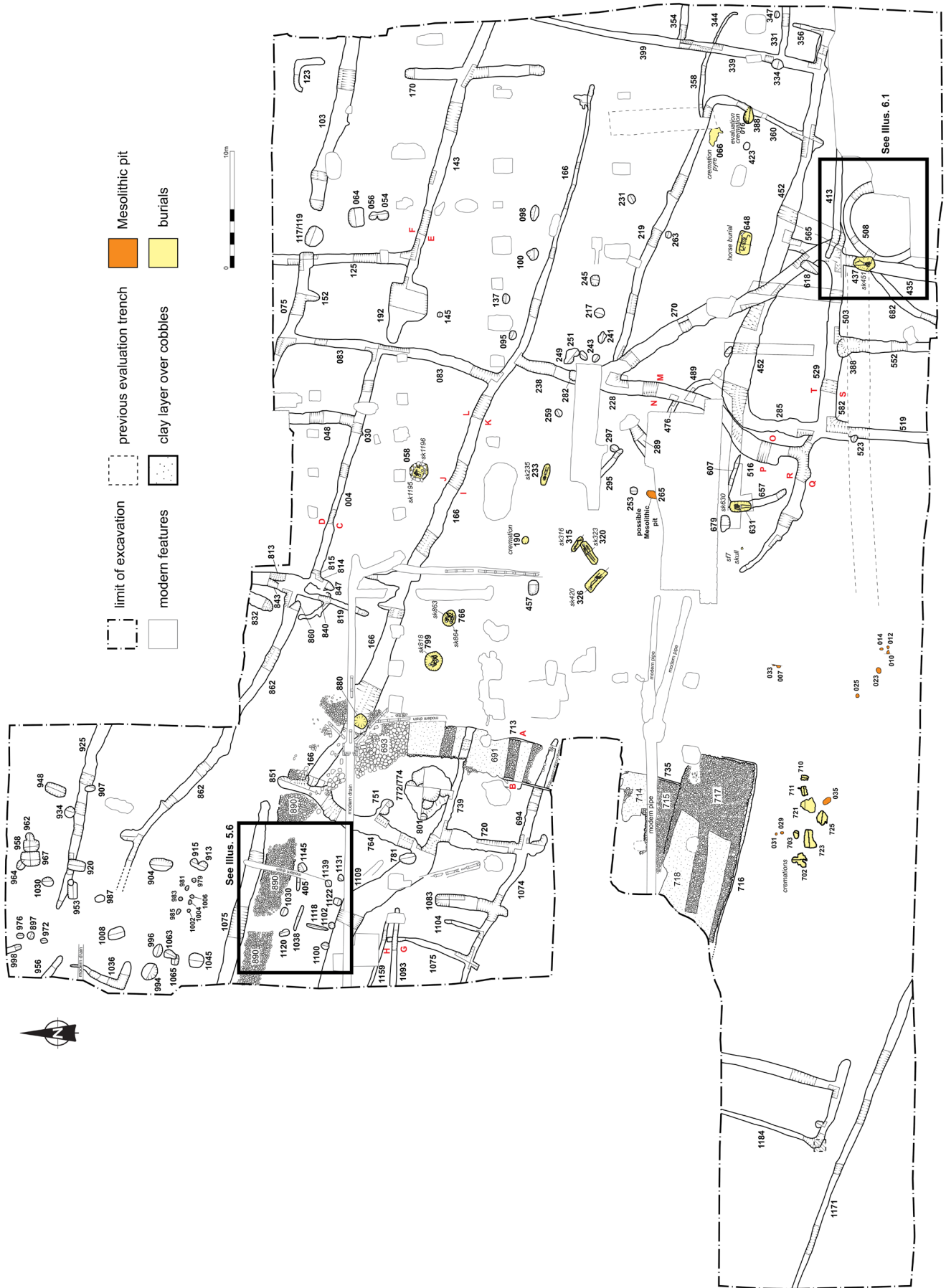
Radiocarbon dates were assayed by the Scottish Universities Environmental Research Centre in East Kilbride. Full details of the procedures, including sample pretreatment and quality control, is provided in Dunbar et al 2016. Calibration of radiocarbon dates was conducted using OxCal v4.1, using the IntCal09 calibration curve: $\delta^{13}\text{C}$ values were measured by accelerator mass spectrometry.

2.4 Summary of site phasing

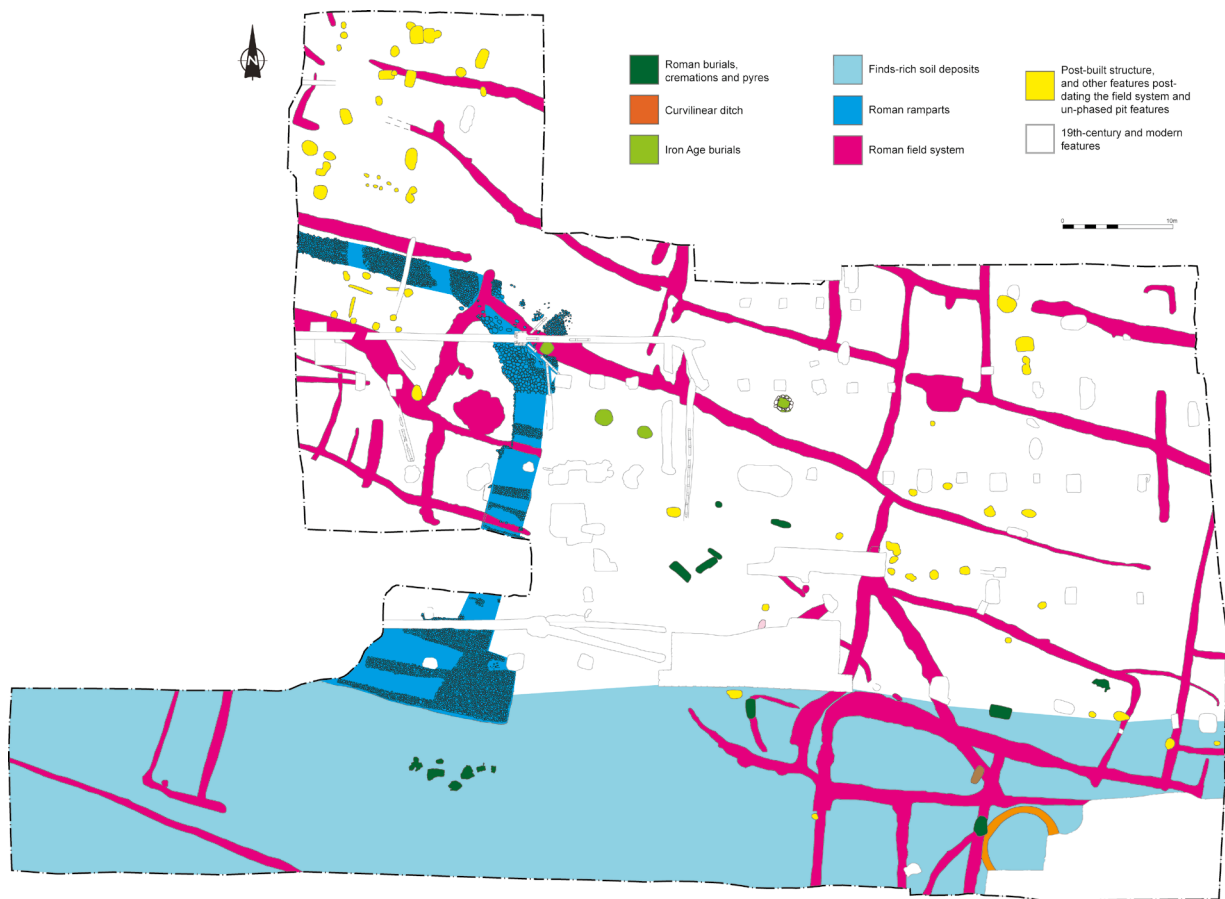
A number of different phases of activity were identified during this programme of works (Illus 2.2–2.3). However, these do not necessarily follow a linear chronological sequence, with a number of different phases/activities on the site potentially overlapping or being broadly contemporary.

The earliest identified phase consisted of a Mesolithic/Neolithic flint scatter (Clarke & Kirby forthcoming). This was followed by Iron Age burials dating from 50 cal BC–cal AD 90 (SUERC-38434) through to cal AD 0–210 (SUERC-38423) at 95% probability. A probable ring ditch towards the southern boundary of the site remains undated, but was cut by features relating to periods of Roman activity and is likely to be prehistoric.

Roman-period activity on the site consisted primarily of a series of burials, a possible rampart base and an extensive field system. Radiocarbon sampling of the Roman burials produced dates of cal AD 20–220 (SUERC-38425) through to cal AD 80–240 (SUERC-38426) at 95% probability. No direct stratigraphical relationship was established between the Roman burials and the rampart base, but both were cut by the field system, indicating that the latter post-dated these phases of use. A direct stratigraphical relationship was established at one point in the site where an Iron Age burial was overlain by the rampart base, which was in turn cut by a field system ditch. The field system itself may represent more than a single phase of activity, but apparent evidence of one ditch cutting another



Illus 2.2 Site plan (copyright CFA Archaeology Ltd)



Illus 2.3 Site plan showing phases of activity (copyright CFA Archaeology Ltd)

might represent the recutting or cleaning of existing ditches as they would have been filled up rapidly by the loose sandy soil present throughout the site. Along the southern edge of the site the field system had been sealed by a large quantity of midden-rich soil containing numerous Roman-period artefacts, and towards the north-western end of the site a backfilled field system ditch had been cut by post holes associated with a post-built structure located close to the edge of the rampart base. A number of isolated undated pits were also identified, but

it is unclear how these relate to the main phases of activity identified on the site.

Sections 3 to 5 give details of the archaeological findings from the main phases of activity identified on the site. As far as can be determined from the available evidence, they are arranged in chronological order (earliest first), but as already mentioned, a number of different phases may potentially overlap or be broadly contemporary. Additionally, there are a number of features that cannot be directly linked with any of the main phases of activity (Section 6).

3. IRON AGE BURIALS

3.1 Introduction

Four Iron Age inhumation pits (058, 766, 799 and 880) were identified during the course of the excavation (Illus 2.1). One of the inhumation pits (058) had been stone-lined and covered over with large capstones to form a burial cist, but the other inhumation burials had simply been cut into the sand subsoil (002) and then backfilled using the same material. Pits 058 and 766 both contained two inhumation burials and Pit 799 contained a single inhumation burial. It is assumed that Pit 880 would also have contained a single inhumation, but the only surviving human remains consisted of a small quantity of tooth enamel. Radiocarbon dates obtained from three of the pits indicate that they were buried within a timescale ranging from 50 cal BC–cal AD 90 (SUERC-38434) at 95% probability through to 40 cal BC–cal AD 130 (SUERC-38433) at 95% probability. Although technically this could mean that the earliest died in 50 cal BC and the latest in cal AD 130, the broad similarity of the dates would seem to indicate that they were buried within a comparatively short time of each other.

In addition to the single cremation from the evaluation phase of works (Robertson 2010), eight groups of cremated bone (190, 702, 703, 710, 711, 721, 723 and 725), a cremation pyre (066) and a possible redeposited cremation burial (539) of probable Iron Age date were identified. Seven of the cremation deposits (702, 703, 710, 711, 721, 723 and 725) were clustered within an area measuring *c* 8m by 3m towards the southern boundary of the site, with a single isolated cremation (190) located within close proximity of a cluster of Roman-period inhumations. Cremation Pyre 066 was situated towards the eastern end of the site near the single cremation uncovered during the evaluation phase of works. Redeposited Cremation 539 had been disturbed by a Roman-period horse burial (Pit 648).

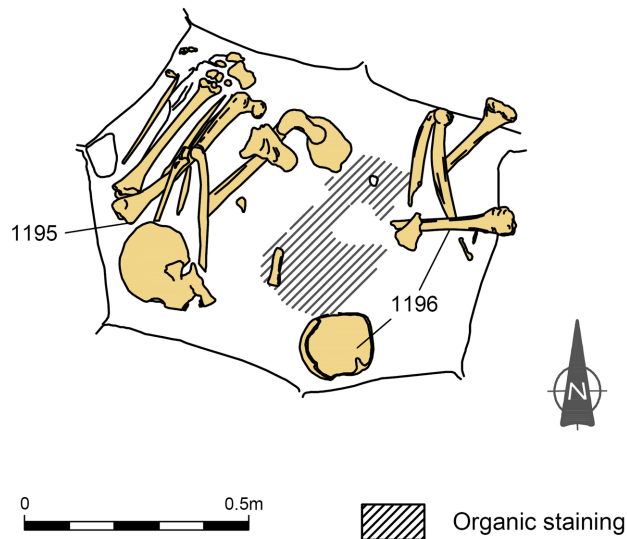
Samples of cremated bone gave radiocarbon dates of 170 cal BC–cal AD 50 (SUERC-38424) at 95% probability through to 0–210 cal AD (SUERC-38423) at 95% probability. Only the latest of these dates falls within the Antonine-period occupation attributed to Inveresk fort, indicating that the

cremation burials are most likely to be Iron Age. Cremation Deposit 539 was found in association with a Roman-period horse burial (Pit 648), which had resulted in the cremation deposit being dug out and then incorporated in the backfill material. This would indicate that the cremation deposit pre-dated the horse burial, but an absolute date for this cremation was not obtained.

3.2 The burials

3.2.1 Inhumations

Cist Burial Pit 058 measured 1.75m north-west to south-east by 1.55m at the surface, narrowing down to 1.1m by 1m at the base, and had been cut into the natural sand subsoil (002) to a depth of 0.96m. The lower sides of the pit had then been lined with up to four courses of angular and sub-angular undressed sandstone blocks (062) measuring up to 0.63m by 0.3m by 0.12m, creating a stone chamber measuring 0.92m by 0.86m by *c* 0.6m deep internally. Two human burials had been placed on the base of the pit (Illus 3.1). The surviving skeletons (1195 and 1196) were found in a tightly crouched 'foetal' position, indicating that the bodies may have been bound prior to deposition. An iron penannular brooch (SF8) of probable Iron Age date was found in association with Sk 1196, and Sk 1195 produced a radiocarbon date of 50 cal BC–cal AD 90 (95% probability; SUERC 38434). Following deposition of the burials, the pit had been backfilled with loose light yellow sand (063) and medium to dark brown silty sand (061). Originally, the pit is likely to have been stone-lined right to the surface, but a rough layer of stones (060) above the surviving structural elements is thought to represent the collapsed remains of the upper courses of lining together with the capstones. The probable collapsed upper courses (060) of the pit lining directly overlay Deposit 061 and included two large capstones measuring up to 0.6m by 0.58m by 0.08m thick. It is likely that there would originally have been a void between the upper surface of 061 and the base of the capstones into which this material had collapsed. A copper alloy knee brooch (SF1) of Roman date was recovered from the upper surface of Deposit 061 along with a Roman-period iron washer (SF106), seven iron hobnails and two iron

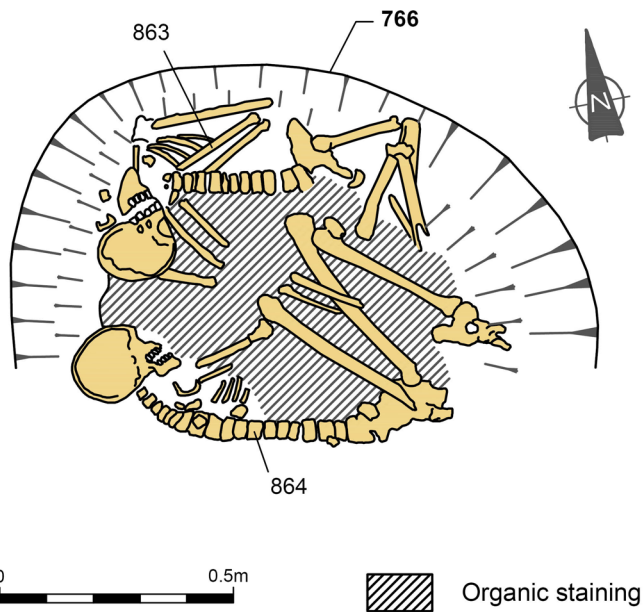


Illus 3.1 Iron Age Cist Burials 1195 and 1196 (copyright CFA Archaeology Ltd)

nails. These Roman-period artefacts within an Iron Age grave are considered to be intrusive and are likely to have entered by dropping down between the capstones into a void beneath. Following the collapse of the upper elements of the structure, the upper part of the pit had filled up with mid-brown silty sand (059). Roman-period finds consisting of a sherd of Roman pottery and a hobnail or tack were recovered from this deposit.

Burial Pit 766 was located 11.5m to the west of Burial Pit 058. It was roughly circular on plan,

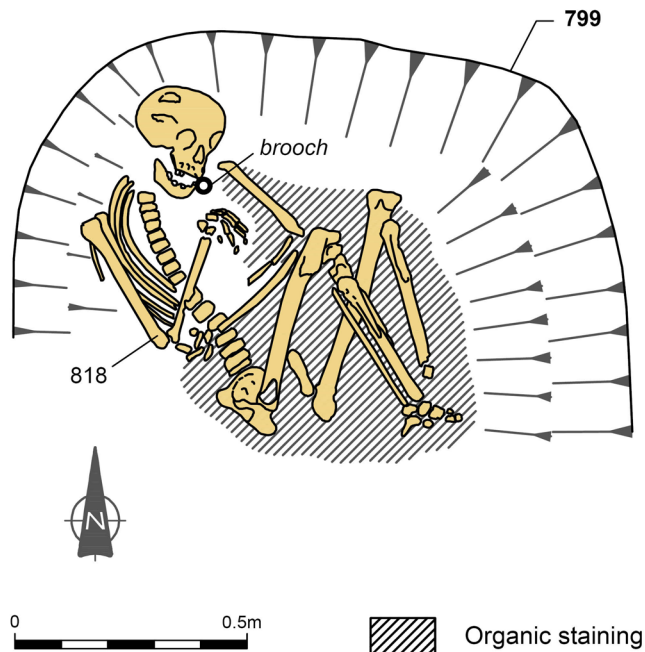
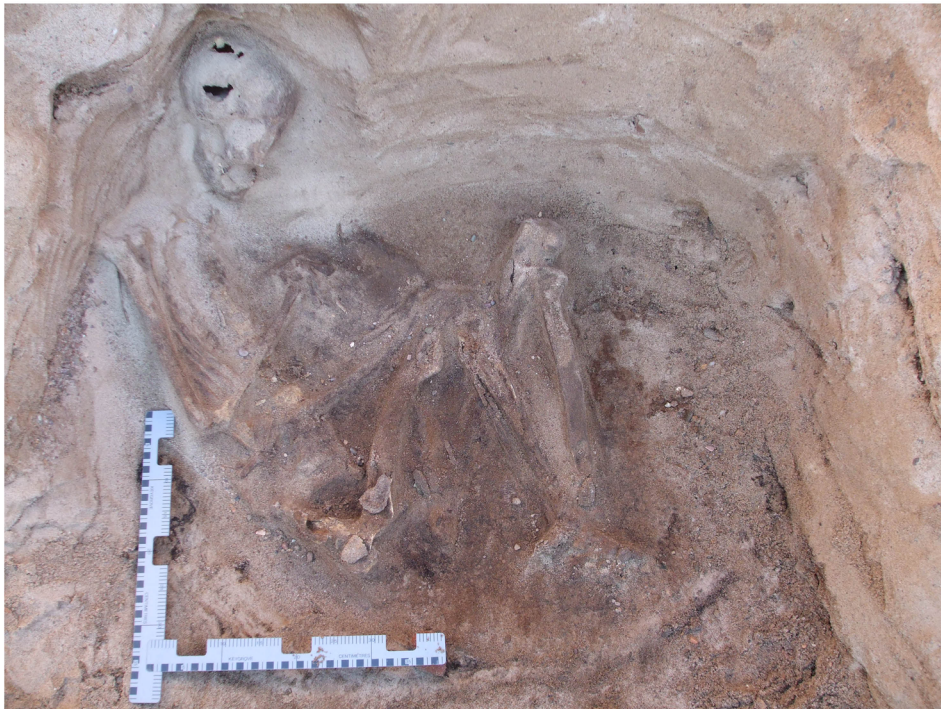
measuring 1.55m in diameter, and had been cut into the natural subsoil (002) to a depth of 1.25m (Illus 3.2). Two crouched inhumations (863 and 864) had been placed at the base of the pit. Skeleton 863 was lying on its back against the northern edge of the pit, with the legs drawn up towards the torso and resting on the side of the pit, the skull collapsed towards the right-hand side of the body and the arms folded across the chest. Skeleton 864 was lying on its left side, with the knees drawn up towards the torso and the hands placed beneath the skull.



Illus 3.2 Skeletons 863 and 864 (copyright CFA Archaeology Ltd)

The skeletal material was very damp and fragile and the survival of the bone was generally poor. Bone from Sk 864 produced a radiocarbon date of 40 cal BC–cal AD 130 (95% probability; SUERC 38433). Following the deposition of the bodies, the pit had been backfilled with mixed mid-brown and dark brown sand (879). A fragment of curved copper alloy rod (SF363), probably the remains of a finger ring, was found with the fingers of Sk 864.

Burial Pit 799 was located *c* 2.5m to the west of Burial Pit 766. It was roughly circular (Illus 3.3), measuring *c* 1.45m in diameter, and had been cut into the natural subsoil (002) to a depth of 1.48m. A single crouched inhumation (818) had been placed at the base of the pit, with the head resting against the pit edge to the north-west, the knees drawn up towards the torso, and the forearms crossed over the stomach area with the hands resting by the pelvis.

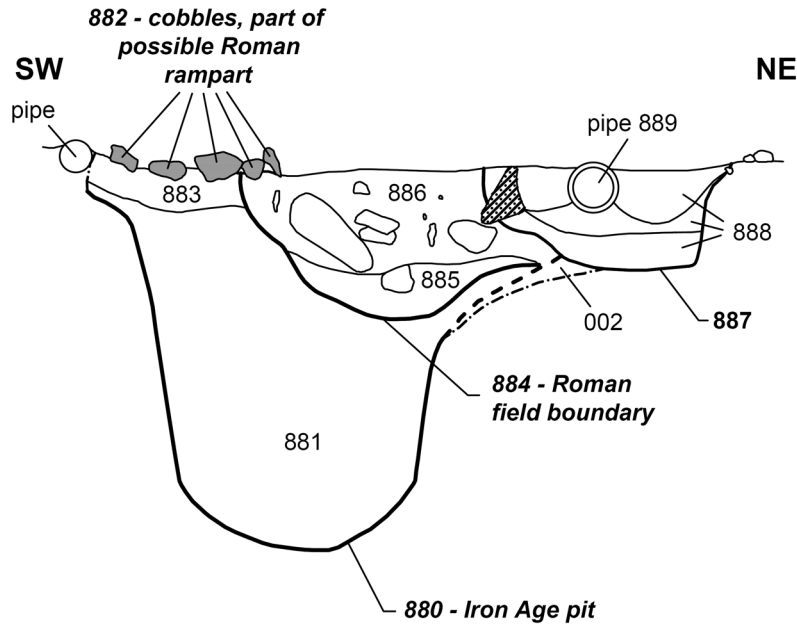


Illus 3.3 Skeleton 818 (copyright CFA Archaeology Ltd)

The skeletal material was in very poor condition, and with the exception of the skull, it was not possible to lift it intact. Bone from the skeleton produced a radiocarbon date of 50 cal BC–cal AD 120 (95% probability; SUERC 38432). The pit had been backfilled using loose mid-yellowish-brown sand (800). An iron penannular brooch (SF40) recovered from the region of the left shoulder is likely to date

to the 1st or 2nd century AD and showed evidence of Roman influence.

Burial Pit 880 was located 7m to the north-west of Burial Pit 799 (Illus 3.4). It was roughly oval in plan, measuring 1.39m east–west by 1.2m and had been cut into the natural subsoil (002) to a depth of 1.25m. Small quantities of human tooth enamel (881) were recovered from the base of the pit, but no further trace



Illus 3.4 Burial Pit 880 (copyright CFA Archaeology Ltd)

of the skeleton survived. The pit had been sealed by cobbling (882) associated with the base of the possible Roman rampart (693), and was cut by a later ditch (884). Ditch 884 also cut Rampart 693, providing a stratigraphic link between three of the main phases on the site. An iron nail tip and hobnail recovered from this pit are considered to be intrusive Roman material associated with the later field system.

3.2.2 Cremation burials

Cremation deposits 702, 703, 710, 711, 721, 723 and 725 measured up to *c* 1.2m by 0.8m by 0.08m and consisted of fairly dense concentrations of material with diffuse fans of material extending away from them. This diffuse pattern, together with the lack of any kind of a pit and the deposits' position

directly overlying subsoil 002, might indicate that the cremation deposits had been poured into slow-moving water and had fanned out as they sank to the bottom. A sample of cremated bone taken from Deposit 702 gave a radiocarbon date of 170 cal BC–50 cal AD (95% probability; SUERC 38424), pre-dating the Roman occupation of the area. Two small fragments of iron were recovered from 702 and 703.

Cremation Pit 190 was roughly circular in shape with a diameter of 0.7m, and had been cut into the natural subsoil (002), surviving to a depth of 0.16m. It had steeply sloping sides and a concave base. The fill (191) of the pit consisted of dark blackish-grey sand containing burnt bone and a few stone inclusions. One of the stones appeared to show evidence of heat damage, but there was no evidence of in situ burning. A sample of cremated bone produced a radiocarbon date of cal AD 0–210 (95% probability; SUERC 38423). These dates suggest that it is most likely to pre-date the Antonine occupation of the fort, and in the absence of any real evidence of Flavian occupation on the site, the balance of evidence suggests that it is most likely to be non-Roman. However, the possibility of this being a Roman cremation cannot be ruled out. The penannular iron brooch (SF141) from the pit is dated to the 1st–2nd centuries AD (see Section 3.4).

The cremation identified during the evaluation phase of works carried out by Headland Archaeology (Robertson 2010) measured 0.28m in diameter by 0.05m deep and was located within an oval pit measuring 1.1m by 0.8m by 0.15m deep. The circular nature of the cremation deposit (Evaluation Context 016) has led the excavator to suggest that it was probably deposited within an organic vessel which had not survived. Its close proximity to Cremation Pyre 066 makes it tempting to suggest that these two features were directly associated with each other, but the probable pyre material consisted of *Quercus* sp (oak) whereas the material from Pyre 066 consisted of *Betula* sp (birch) and *Corylus avellana* (hazel) (Section 3.7).

3.2.3 Cremation pyre

Cremation Pyre Deposit 066 measured 1m east to west by 0.6m and consisted of black charcoal containing cremated bone. It overlay/filled a pyre pit (070), which had a depth of up to 0.08m.

Surrounding Pit 070 was an area of scorched pinkish red natural sand (067), indicating that the pyre material was still in situ. Several pieces of carbonised wood (068 and 069) were identified running transversely across the pyre pit material. These pieces of wood appear to have been surviving remains of part of the pyre construction. A hobnail or nail tip was found in the deposit. A sample of cremated bone produced a radiocarbon date of 40 cal BC–cal AD 130 (95% probability; SUERC 38422). The dating of this cremation pyre is somewhat ambiguous as the radiocarbon date suggests Iron Age, but the hobnail is considered to be Roman.

3.2.4 Redeposited cremated bone (Burial 539)

Burial 539 consisted of a pit measuring 1.5m by 0.96m wide by 0.3–0.4m deep. The extent of this pit was defined by scorched sand, suggesting in situ burning, possibly indicating that this had been the pyre site. At a later date, it would appear that the pit had been dug out and extended to the west by a further 0.5m and deepened to a total depth of 0.77m in order to accommodate a Roman-period horse burial (Pit 648). The backfill of the horse burial consisted of three fills (624, 545 and 544 from bottom to top). Deposit 624 contained a few fragments of cremated bone thought to be the contents of Burial 539, while the majority of the cremated material was contained within Deposit 545. Any cremation material with Deposit 544 was limited to the interface with 545. The implication of this is perhaps that the contents of Burial 539 were kept separate when they were dug out, with the initial backfilling of the horse burial consisting of the recently excavated material (624) from the pit extension. This was followed by backfilling with the removed contents of Burial 539 (Deposit 545) and finally by any material that had overlain the contents of the original pit (Deposit 544).

3.3 Radiocarbon dates

Radiocarbon dates were obtained from three (818, 864 and 1195) of the six pit-grave inhumations and three of the cremation burials (066, 191 and 702), as shown in Table 3.1.

The dates from the pit graves place them within the Late Iron Age. Cremation 702 and Cremation 066 returned dates which indicated that both pre-dated

Table 3.1 Radiocarbon dates from the Iron Age burials. Calibration was conducted using OxCal v4.1, using the IntCal09 calibration curve

Lab No.	Context	Type	Date BP	68% probability	95% probability	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$	C/N ratio
SUERC-38432 (GU-26291)	818	human bone: right femur	1970±30	0–70 AD	50 BC–120 AD	–20.4‰	11.9‰	3.4
SUERC-38433 (GU-26292)	864	human bone: femur	1955±30	0–80 AD	40 BC–130 AD	–20.4‰	11.0‰	3.2
SUERC-38434 (GU-26293)	1195	human bone: femur	1975±30	20 BC–70 AD	50 BC–90 AD	–20.2‰	11.6‰	3.3
SUERC-38422 (GU-26284)	066	cremated human bone: femur	1960±30	0–80 AD	40–130 AD	–25.1‰	–	–
SUERC-38423 (GU-26285)	191	cremated human bone: tibia	1920±30	50–130 AD	0–210 AD	–23.8‰	–	–
SUERC-38424 (GU-26286)	702	cremated human bone: femur	2035±30	100 BC–20 AD	170 BC–50 AD	–25.2‰	–	–

the Roman occupation of Inveresk fort. With a date of cal AD 0–210 at 95% probability, cremation 191 is rather more enigmatic, although a date of cal AD 0–140 at 95% probability indicates that it is pre-Antonine. With no clear evidence of Flavian occupation relating to Inveresk, this cremation is considered more likely to relate to the native Iron Age population, but there is an outside chance that it may relate to the Antonine occupation of the fort.

3.4 Metal finds from the burials

Dawn McLaren and Fraser Hunter (with a contribution by Gemma Cruickshanks)

The iron penannular brooches (two of Fowler (1960) A1, one probably A3) are all associated with burials, two inhumations and one cremation. Penannular brooches have Iron Age origins, but these small knobbed examples are typical of the Romano-British period, in iron and copper alloy. Mackreth's recent analysis (2011: 211–15) emphasises a 1st–2nd-century AD *floruit*. There is evidence of type A4 in southern England in the early 1st century AD, and an A3 from Maiden Castle (Dorset) comes from a context which Mackreth dates to the later 2nd century BC (Wheeler 1943: 264, fig 86 no. 2), but this is an anomaly in the overall picture. It is most likely that the type emerges from Iron Age precursors (Fowler type A and Aa) in the 1st century AD, becoming a widespread Romano-British type. It is found locally in Iron Age burials from Dunbar Golf Course and Luffness (Baker 2002 (type A3); Society of Antiquaries of Scotland 1945–6: 152, fig 1 (A1 variant)), where the brooches are best seen as Roman imports; Luffness is undated, but radiocarbon dates from Dunbar confirm its Roman Iron Age date. The brooches are found at Inveresk with different burial rites: SF8 in a double burial in a cist; SF40 at the left shoulder of an inhumation; and SF141 with a cremation. A 2nd-century knee brooch was also recovered from the cist, but this came from the top of the backfill and is considered to be intrusive.

Iron objects are otherwise rare in the burials. Grave 058 produced a number of items, but these were recovered from the surface of the backfilled material and are almost certainly intrusive, possibly representing material that had been deliberately pushed through gaps in the capstones into a void

beneath. The items recovered included seven hobnails, with traces of leather indicating the deposition of shoes rather than casually lost nails; the low number suggests the sole was only partly nailed. This grave also produced two nails (47mm and 68mm long), one with a clenched tip indicating it was set into wood when it was deposited, so there must have been a wooden item within this grave. Single hobnails from Graves 320 and 880 could be accidental losses during backfilling, but might also be seen as token deposits. Hobnails from pyre sites (one from 066 and four from 539) indicate some of the deceased wore shoes to the pyre, although none came from any of the cremation deposits (702 produced a tack or nail fragment). A tack or nail fragment was recovered from Pyre 066 and a single chain mail link, perhaps a casual loss, was recovered from redeposited Cremation Deposit 545 (Burial 539). The finds from 066 are at odds with the Iron Age radiocarbon dates obtained and may be intrusive. Burial 539 was undated and may be Roman, but there is a possibility that these finds were intrusive, having entered the deposit when it was re-excavated for the insertion of a Roman-period horse burial.

Of the copper alloy, one knee brooch (SF1) comes from Cist 058, but this overlay the backfill of the grave and probably represents an intrusive item that had dropped down into the void beneath the capstones. The iron penannular brooch from the same cist appears to have been a deliberate inclusion and was found along with Sk 1196. SF363 also came from a burial; it is probably a fine, simple finger ring, but is too fragmentary and corroded for detailed comment.

3.4.1 Catalogue (Illus 3.5)

Iron

► **SF8 Intact penannular brooch of Fowler (1960) type A1**

Circular-sectioned hoop (rod Diam: 3.5mm) with expanded terminals (Diam: 5.5–6.5mm). Intact humped pin (L: 43, Diam: 3.5mm) made from circular-sectioned rod, flattened into a narrow flat rectangular strip curved round the hoop. Diam: 33mm. (Fill 063 of Burial 058)

► **SF40 Intact penannular brooch of Fowler type A1**

Circular-sectioned hoop (rod Diam: 3mm) with plain expanded terminals (Diam: 5.5mm). The

intact humped pin (L: 40mm, Diam: 3.5mm) is a circular-sectioned rod, one end flattened to form a narrow strip around the hoop. Diam: 32mm. (Burial 799, containing Sk 818)

► **SF141 Penannular brooch, broken during excavation, probably of Fowler type A3**

Approximately two-thirds of circumference of slightly ovoid hoop (rod Diam: 3.5mm) survives. The expanded terminals (Diam: 5mm) are separated from the hoop by a slight channel, suggesting it is an A3 rather than an A1 type. The circular-sectioned humped pin is intact (L: 40.5mm, Diam: 3mm), one end flattened into a rectangular strip which curves over the hoop of the brooch. Diam: 32.5–34mm. (S.49, Fill 191 of Cremation Pit 190)

► **SF106 Washer**

Corner fragment from a flat sub-square sheet, broken across a large, sub-square perforation (W: 7mm); broken ends distorted. L: 15, W: 14, T: 1.5mm. (Fill 061 of Burial Pit 058) Not illustrated.

► **SF132 Approximately 50% of small ring**

Diam: 1.5mm. S.121. (Fill 545 (539) within Horse Burial Pit 648) Not illustrated.

Copper alloy

► **SF1 Intact knee brooch**

Cylindrical spring case encloses a seven-coil spring with internal chord, held on an iron axis. Five-faceted bow, with a hole from a casting flaw; underside hollow. Snape (1993: 18–19) type B; Mackreth (2011: 190 and pl 130 no. 7522) type KNEE2.a1. A mid-2nd–early 3rd-century type. L: 34, W: 21, H: 18.5mm. (Fill 061 of Burial Pit 058)

► **SF363 Very fine, worn, curved rod fragment, ends broken**

Its fineness is consistent with an earring or finger ring; the latter is most likely as it was recovered with the finger bones of the skeleton. The condition is notably poor, but it is unlikely to be intrusive as the hands were placed under the head; it is thus likely to be a grave good, with most of the object destroyed by corrosion. 12.5 × 2 × 1mm. (Recovered with the finger bones of Sk 864 in Burial Pit 766)

3.5. Human skeletal remains from the pit graves

Sue Anderson

Five articulated skeletons were recovered from three Iron Age pit graves and a further grave contained only a few fragments of tooth enamel. The individuals were generally in fair to poor condition with a high degree of erosion and fragmentation.

3.5.1 Methodology

Recording follows the standards for UK assemblages as described in Brickley and McKinley (2004). Measurements were taken using the methods described by Brothwell (1981), together with a few from Bass (1971) and Krogman (1978). Sexing and ageing techniques follow Brothwell (1981), the Workshop of European Anthropologists (WEA 1980) and Buikstra and Ubelaker (1994), with the exception of adult tooth wear scoring, which follows Bouts and Pot (1989). Stature was estimated according to the regression formulae of Trotter and Gleser (Trotter 1970). All systematically scored non-metric traits are listed in Buikstra and Ubelaker (1994) and Brothwell (1981), and grades

of cribra orbitalia and osteoarthritis can also be found in the latter. Pathological conditions were identified with the aid of Ortner and Putschar (1981) and Cotta (1978). Disarticulated bone was reunited with the individual to which it belonged as far as possible.

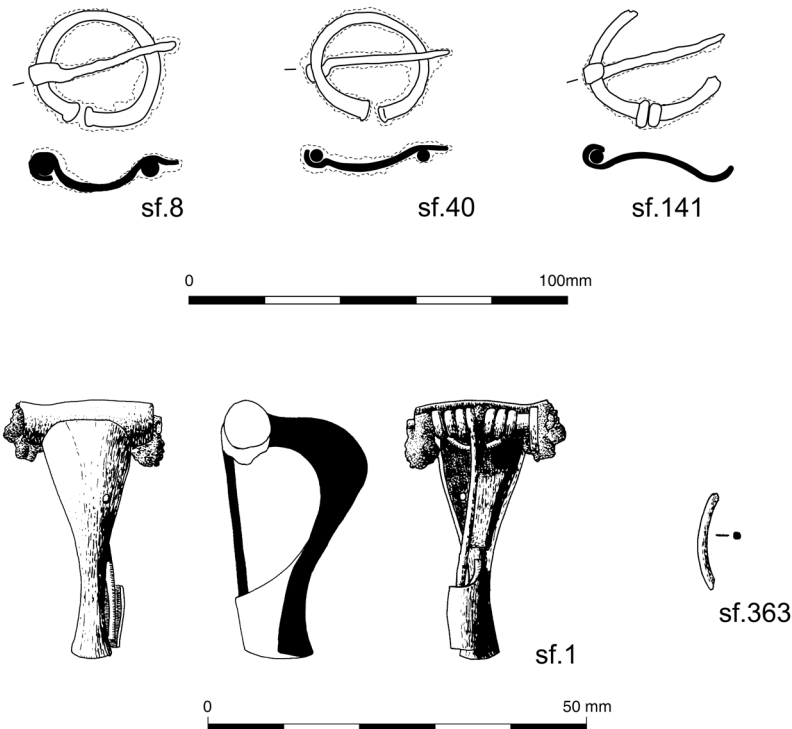
3.5.2 Demographic analysis

Table 3.2 shows the age and sex determinations for the six individuals. The Iron Age graves contained a single adult male skeleton, four possible females and an unsexed adult. The latter were all relatively young (*c* 18–35) when they died, while the male was in middle age (*c* 35–45).

3.5.3 Metrical and morphological analysis

Articulated skeletons were measured where possible and the results are included in the archive. Tables of systematically scored non-metric traits can also be found there.

Stature could be calculated for two ?females. They were 1.599m and 1.625m (5' 3" and 5' 4" respectively), which is comparable with the small groups from Lochend, Dunbar (Brothwell & Powers



Illus 3.5 Finds from the Iron Age burials (copyright CFA Archaeology Ltd)

Table 3.2 Age and sex of Iron Age skeletons

Grave	Sk no.	Male	Female	Unsexed
058	1195		<i>c</i> 20–3 (F?)	
058	1196		18–25 (F?)	
799	818	<i>c</i> 35–45		
766	863		<i>c</i> 18 (F?)	
766	864			<i>c</i> 20
880	881		<i>c</i> 25–35 (F?)	

1966: 191) and Winton House, Cockenzie and Port Seton (Lorimer 1991). A group of Iron Age skeletons from several sites in Yorkshire had an overall mean stature of 1.528m, based on 49 females (calculated from Stead 1991: table 12), but the Musselburgh females are within the range of means found at each of the six sites included there.

3.5.4 Dental analysis

Complete or partial dentitions were present for all of the skeletons. The group is too small for statistical analysis of disease prevalences, but a few general observations can be made.

The dentitions were generally in poor or fair condition: two were complete, one was near-complete and the other three comprised a few teeth each. The three most complete (Sks 1195, 863 and 864) showed no evidence of caries, abscesses or ante-mortem tooth loss, and none of the six surviving teeth of Sk 1196 or the 11 of Sk 881 were diseased either. The middle-aged male, however, had at least four abscesses of the upper and lower first and second molars, with periodontal disease on the upper left side and an infection of the palate (described further below). The unsexed adult, Sk 864, also had periodontal disease in the form of severe alveolar resorption around the lower left molars. Two individuals (Sk 1195 and Sk 864) had slight enamel hypoplasia, with lines in the enamel of their teeth suggesting that the condition had affected them between the ages of *c* 3 and 5, and *c* 2 and 3 years respectively; this condition may be associated with periods of malnutrition or illness during the formation of the tooth crowns.

3.5.5 Pathology

The skeletons were generally not well enough preserved to assess pathological conditions in any detail. Neither of the young ?females in Grave 058 showed any signs of disease. However, both young individuals in Grave 766 had cribrotic lesions in the orbits of their eyes, a condition known as cribra orbitalia and associated with iron deficiency anaemia. Sk 864 also had porotic changes in the maxillary sinuses, indicating that s/he had suffered from sinusitis.

The older male, Sk 818, was only assessable for cribra orbitalia in the left orbit, but was not affected, nor did he have any evidence of sinusitis. He did have an infection of the palate which appeared to have been caused by draining of an abscess at the upper right second molar, which had resulted in thickened new bone growth above the first molar on the palatal surface. He also appears to have suffered from osteoarthritis of the neck, with grade II lesions on the bodies of the third and fourth cervical vertebrae.

3.5.6 Summary and discussion

Four Iron Age pit graves contained skeletal remains representing six individuals. One of the pairs (Sk 1195 and Sk 1196) comprised two young women and the other pair was a young female (Sk 863) and a young unsexed individual (Sk 864). One single burial was of a middle-aged man (Sk 818) and the other was a young to middle-aged ?female (Sk 881). The remains were generally in relatively poor condition and few observations could be made. Two of the females were within the normal range for the period in

terms of their stature. Two individuals (Sk 818 and Sk 864) suffered from periodontal disease and one of these (Sk 818) had abscesses and a palate infection. Two of the young adults (Sk 863 and Sk 864) had cribra orbitalia and may have had a diet deficient in iron. The older individual (Sk 818) had osteoarthritis.

Other Iron Age burials excavated in the area have produced small groups of individuals, the largest assemblage being c 21 individuals from a cist at Dunbar (Brothwell & Powers 1966). This group comprised mainly adult remains, only one child being identified. Eight individuals were reported from Winton House, Cockenzie and Port Seton, and included males, females and juveniles with a range of ages at death. The females in this group had a similar height range to the Musselburgh group, although the male at Winton House was much taller than the average for the period at 1.83m (6ft) (Lorimer 1991). Two males from Belton Farm, Dunbar, ranged between 1.65m and 1.73m (5' 5" and 5' 8") (Lorimer 1992). Unfortunately the stature of the Musselburgh male could not be calculated.

3.6 Cremated bone

Sue Anderson

Groups of cremated or calcined bone from a 'pyre', a scattered group, two discrete burial pits, and a redeposited fill were examined. This includes one cremation burial recovered during the evaluation (C016).

3.6.1 Methodology

All bone groups were collected as samples and later sieved to >4mm, <4mm and <2mm fractions. In addition to the cremated bone, the <2mm samples contained pea grit, charcoal fragments and shell, so the bone was hand-separated from this residue for weighing (in some cases only a sample was sorted, the remaining bone weight being estimated from the weight of the sub-sample). The bone from each context was sorted into five categories: skull, axial, upper limb, lower limb and unidentified. All fragments within each category were counted and weighed to the nearest tenth of a gram, with the exception of the unidentified material, which was simply weighed. Measurements of maximum skull and long bone fragment sizes were also recorded. Observations were made, where possible, concerning bone colour, age, sex, dental remains and pathology. Identifiable fragments were noted. Methods used follow the Workshop of European Anthropologists (WEA 1980) and McKinley (1994, 2004). A catalogue of burials is included in the archive.

3.6.2 Quantification, identification, collection and survival

Table 3.3 shows the bone weights, percentages of identified bone from the six features containing human remains, and the proportions of bone identified from the four areas of the skeleton (skull, axial, upper limb, lower limb). Expected proportions (based on the study of modern cremated bodies; McKinley 1994: 6) are provided in the first row.

Table 3.3 Percentages of identified cremated fragments out of total identified to area of skeleton (*expected proportions from McKinley 1994, 6)

Context	Total wt(g)	% ident	% skull	% axial	% upper limb	% lower limb
Expected*			18.2	20.6	23.1	38.1
Burial 190	831.2	45.6	37.8	27.1	13.0	22.1
Burial eval 016	435.0	51.5	24.3	12.2	10.8	48.9
'Pyre' 066	300.3	39.3	6.0	6.5	7.0	80.5
Burial 539	126.1	42.5	50.2	8.4	13.1	28.3
Group 702–725	410.1	60.5	19.0	14.2	9.8	57.0

In the most complete burials, skull and lower limb fragments are generally over-represented amongst the identifiable material, and other areas of the skeleton are generally under-represented, although axial fragments were also over-represented in one case. It has been suggested that ‘it should be possible to recognise any bias in the collection of certain areas of the body after cremation’ (McKinley 1994: 6). However, there is also some bias inherent in the identification of elements. McKinley notes the ease with which even tiny fragments of skull can be recognised, and conversely the difficulty of identifying long bone fragments. These figures can therefore provide only a rough guide to what was originally collected.

Mays (1998: table 11.2) notes that the combusted weight of an adult skeleton has a mean of around 1,500g for females and 2,300g for males. The largest quantity of bone in this assemblage came from Burial 190 and is less than half the average weight of a male. All quantities in these burials are too low to represent complete skeletons.

3.6.3 Discrete burials

Two cremation burials were recovered from circular pits, summarised in Table 3.4. Both were unurned, but the circular nature of the deposit within Evaluation Pit 016 caused the excavator to speculate that it may have been buried in an organic container (Robertson 2010: 6). Both were probably truncated, either through ploughing or during soil stripping. Nevertheless, they are the two largest deposits of cremated bone from the site. Each of the burials appears to have contained

the bones of a single individual with no evidence for duplication.

Pathological changes were noted in the mature male. He had signs of degenerative joint disease such as osteophytic lipping of some rib facets and vertebral bodies. From the surviving dental remains, it appeared that no significant dental disease had affected either of these individuals.

The degree of fragmentation was quite high. Perhaps surprisingly, some of the largest and most intact pieces were from the axial skeleton, notably the vertebrae and the ilium of the pelvis. The largest long bone fragment was 60mm long in Cremation Pit 190 and 57mm long in Evaluation Pit 016. Few pieces showed signs of abrasion, although it did affect some powdery white fragments, particularly of the skull.

The majority of bone in this group was fully oxidised and white to grey in colour. The presence of a high proportion of white bone indicates firing temperatures in excess of *c* 600°C (McKinley 2004: 11). In this group, many fragments of the easily broken cancellous or ‘spongy’ bone were present, suggesting that the material was very well cremated and little had been lost through post-mortem decay. The abrasion of fragments which had been heavily oxidised to a powdery white may indicate that higher fired pieces were more susceptible to post-depositional changes in the sandy subsoil.

3.6.4 ‘Pyre’ and scattered deposits

Table 3.5 summarises the human remains from a ‘pyre’, an area of scattered deposits and a redeposited burial.

Table 3.4 Summary of cremation burials

Burial	Deposit	Age	Sex	Notes
190	191	mature	male	Good condition; some degenerative changes may indicate older age group; sexing based on finger bones and brow ridges, which appear relatively large.
Eval 016	Eval 015	??young adult	female	Good condition; age based on size, tooth eruption, complete fusion of vertebral bodies; sexing based on smooth glabella, small nasal bones, small ribs, sciatic notch seems wide. No evidence of degenerative changes on surviving joints, possibly young?

Table 3.5 Summary of scattered cremated remains

Burial	Deposit	Age	Sex	Notes
066	066	adult	male	Good condition, some large fragments; tooth roots fully formed and iliac crest fused; distal thumb phalange large.
539	544, 545, 624	sub-adult	?	Good condition; unfused posterior calcaneus suggests an age between 16 and 20 as the size is close to adult; no sexing evidence.
–	702, 703, 710, 711, 721, 723, 725	?mature adult	male	Good condition but most fragments small, particularly tiny pieces from 703, 710 and 711; fragments of skull generally of similar thickness in all contexts where present; radius head, finger phalanges and teeth large, suggesting male; one vertebral fragment shows possible osteophyte.

‘Pyre’ 066 was close to Evaluation Burial 016, and the possibility that it was the remains of the pyre for that burial was considered, but the two groups of bone appear to represent a male and a female and are therefore unrelated. The pyre was excavated in six sections. The majority of the leg bone fragments were recovered from sections 1–2, while most of the axial and upper limb fragments came from sections 3–4 (with smaller amounts in 5–6). Only small quantities of skull were recovered, and these were from sections 3 and 6. The fragments of bone appear, therefore, to have fallen into the pit in roughly anatomical order. This is what would be expected for the contents of a pit underlying a pyre, but it is also typical of *bustum* burials, in which a cremated skeleton was simply left in situ and the grave pit backfilled after the pyre had burnt out. However, the quantity of bone is small in comparison with other *busta* (eg examples from Colchester which produced in excess of 1.3kg each; Anderson 2010), and the pit is irregular, so on balance a pyre site is perhaps more likely. If so, the incomplete collection may suggest a lack of care in the collection of the remains, which could indicate that the rite was not carried out by family or friends, or that token removal to another burial place was enough.

Redeposited Burial 539 overlay and was included within the fill of Horse Burial Pit 648. Collection of this group of bone was also carried out in segments but there was no clear pattern of deposition.

The other seven ‘burials’ were located in a loose group of deposits towards the south-west of the site. The largest single groups were from 702 (179.7g) and 725 (159.2g) with the other contexts producing between 1.4g and 51.2g. There is no obvious duplication of elements between the contexts, and it is possible that they could represent a single, scattered burial. All identifiable fragments appear to be adult and in at least three of the contexts the sex was identifiable as male. Alternatively the group could represent pyre debris from several episodes of cremation, if the area was set aside for that purpose.

All groups of bone are in similar condition, with a high proportion of small and unidentifiable fragments, and are generally cream or white in colour.

3.6.5 Summary and discussion

The five groups of bone represent a minimum of five individuals. These comprise three adult males (one middle-aged or older), a ?young female and a sub-adult of unknown sex. If the scattered group of cremated bone represents seven individual pyre sites, then there could be a further six individuals, of whom at least one was male.

The total weight of bone indicates that the entire skeleton was not present in any of the burials, and in all five burials the quantity of bone was well below the average quantity which would be expected for individuals of the relevant age and sex. This may

be due to incomplete collection, poor preservation of incompletely cremated material following burial, or possibly retention of some fragments by the mourners. In the case of the possible pyres, presumably further remains were removed for burial elsewhere, but it seems unlikely that the two more complete pit burials are the same individuals as the pyre deposits.

Very little pathological evidence was present in these remains, although lesions which were present indicated that one individual may have suffered from joint pain.

Some insight into the cremation ritual can be gained based on the evidence of the colour of the bone and the degree of fragmentation. Most of the bone from this site indicates that firing probably reached the high temperatures normally associated with cremation. Although there is evidence for a degree of fragmentation, there were many large fragments and the breakage could simply be the result of post-depositional changes.

3.7 Charcoal associated with cremated bone

Mike Cressey

The charcoal assemblage included samples recovered from Cremation Pyre Deposit 066, and Cremation Pit 190. Several pieces of carbonised wood (Cremation Pyre Deposits 068 and 069) were found to run transversely across the pyre pit material and it was surmised that these were the remains of either supporting elements of the pyre structure itself or surviving elements of the pyre fuel. Charcoal recovered from Cremation Deposits 702, 703, 710, 711, 721 and 725 was also examined to assess the species and character of the wood selected for cremation. A Roman horse burial pit (Pit 648) was backfilled with cremated material (Burial 539, Fills 624, 545 and 544).

The condition of the charcoal varied across the assemblage, with a large proportion being amorphous, which is attributed to taphonomic process following its deposition. Charcoal derived from large-diameter branchwood was well represented. Vitrified charcoal was also present but was low in frequency. Vitrification occurs at temperatures over 800°C and reduces the cell structure of the wood to a glass-like appearance

and as a result it cannot be identified. Some of the charcoal had maintained a block-like shape which is a result of the stature of the wood (ie possibly larger branch wood or structural wood) and pyrolysis. The best-preserved charcoal was that derived from oak (Burial 539) and from heather stems (*Calluna vulgaris*), which are some of the most robust taxa when carbonised.

3.7.1 Methods

Charcoal was retrieved from bulk soil samples using a flotation tank with flots captured in a 4–1mm nest of sieves (Kenward et al 1980). Flotation samples were then air dried before being sieved into 2mm- and 4mm-sized fractions. Charcoal identifications were carried out on only the >4mm-sized charcoal fragments but the 2mm fraction was scanned for the presence of any interesting carbonised inclusions. Fragments below this size (2mm) are considered to be below the limit of identification (BLOI) due to the amorphous shape of the charcoal and problems encountered in obtaining a transverse cross-section on such small fragments. Identifications were carried out using bifocal microscopy at magnifications varying between ×50 and ×400. Anatomical keys listed in Schweingruber (1992) and in-house reference charcoal were used to aid identifications. Asymmetry and morphological characteristics were recorded using standard in-house methodology. An inventory of the identified material is available in the archive.

Table 3.6 Species composition from the >4mm charcoal assemblage

Species	No. of IDs	Weight (g)
<i>Quercus</i> sp	315	394.4
<i>Corylus avellana</i>	169	97.1
<i>Betula</i> sp	161	59.6
<i>Calluna vulgaris</i>	169	9.9
<i>Alnus glutinosa</i>	1	1.1
Straw	5	0.2
Amorphous plant material	7	42.7
Total	827	605.0

3.7.2 Results

A summary of the results is presented in Table 3.6. A total of 827 individual identifications were possible, providing a total weight of 605g of charcoal. Oak charcoal (*Quercus* sp) dominates the assemblage by weight. Hazel (*Corylus avellana*) is less frequent, followed by birch (*Betula* sp). Heather charcoal (*Calluna vulgaris*) was also present. Alder (*Alnus glutinosa*) was present but extremely rare.

The results of the identifications from the cremation deposits are listed in Table 3.7 and described below.

The charcoal from redeposited Burial 539 included Contexts 544, 545 and 624 that were redeposited in a horse burial. Oak, hazel and heather are represented. Oak is only present in C545, with two identifications providing a total weight of 165g. This assemblage comprised large fragments of roundwood oak, one of which measured 68mm × 44mm × 41mm. The other fragment also had an

oblique facet made by an axe and may have been derived from carpentry waste. Heather stems were present in Contexts 545 and 624, the latter context also contained fragments of cereal stems.

Cremation Pit 191 contained both birch and hazel charcoal, but in low amounts. The assemblage was dominated by small amorphous fragments. A single fragment was vitrified.

Birch charcoal dominated Pyre Deposit 066 (58.4g), with slightly lower amounts of hazel (52.9g). The charcoal assemblage was dominated by blocky fragments possibly representing charcoal derived from large branchwood.

The scattered cremation deposits (702, 703, 710, 711, 721, 723, 725) all contained oak and hazel. The oak charcoal from 702 was block-like in shape and may represent the remains of large branchwood. Heather was present in Contexts 702, 703 and 721. The latter and C723 also contained amorphous plant material classified as animal dung.

Table 3.7 >4mm charcoal identified from the features containing cremation deposits

Feature	Species	No. of IDs	Weight (g)
Redeposited Group 539 (544, 545 and 624)	<i>Quercus</i> sp	2	165.0
	<i>Corylus avellana</i>	78	34.2
	<i>Calluna vulgaris</i>	25	1.5
	<i>Alnus</i>	1	1.1
	Straw (cereal stem)	5	0.2
Total Redeposited Group 539		111	202.0
Cremation Pit 191	<i>Betula</i> sp	16	1.2
	<i>Corylus avellana</i>	21	1.2
Total Cremation Pit 191		37	2.4
Pyre Deposit 066	<i>Betula</i> sp	145	58.4
	<i>Corylus avellana</i>	41	52.9
Total Pyre Deposit 066		186	111.3
Deposits 702, 703, 710, 711, 721, 723, 725	<i>Quercus</i> sp	313	229.4
	<i>Corylus avellana</i>	29	8.8
	<i>Calluna vulgaris</i>	144	8.4
	Amorphous plant material	7	42.7
Total scattered cremation deposits		493	289.3
Total		827	605.0

3.7.3 Selection of cremation fuels

Oak, birch and hazel have been exploited for use for the cremation ritual. Heather and straw appear to have been used, probably as kindling. Cremation Deposits 721 and 723 contained amorphous carbonised material that is interpreted as animal dung. It is presumed that this may have been incorporated into the ritual deposit as either a starter fuel or as part of the pyre fuel itself. Experimental research on pyre structures has demonstrated that approximately one tonne

of wood is required to consume an adult human body (McKinley 1994). Traditional methods of construction employed the use of substantial billets/ poles of wood to form a rectangular platform. Such larger stunted roundwood might be represented in the redeposited Cremation 539, from which C545 produced the largest diameter roundwood in the whole assemblage. Such stout poles would afford far greater support to the body and produce a longer-lasting fire. This could also imply that such material was not in short supply in the vicinity.

4. ROMAN-PERIOD BURIALS AND DISARTICULATED HUMAN BONE

4.1 Introduction

Six Roman-period inhumations (233, 315, 320, 326, 437 and 631) and one horse burial (648) were identified. Four of the human burials (233, 315, 326 and 631) contained skeletons that had been decapitated prior to deposition, and had the skull placed separately within the grave in a variety of locations. The human skeletons produced radiocarbon dates of cal AD 20–220 at 95% probability through to cal AD 80–240 at 95% probability. A radiocarbon date taken for the horse burial suggests that it was broadly contemporary with the latest of the Roman inhumations. The remains of four disarticulated skeletons were also recovered. These consisted of four skulls as well as small fragments of bone or articulating vertebrae which may belong to them (or could represent at least two further individuals). Three of the skulls

came from the Roman-period midden deposits and a fourth came from the surface of a Roman-period pit. Their location overlying Roman-period ditches, but underlying Roman midden-rich deposits, would suggest that these remains are Roman in date.

4.2 The burials

Burial Pit 233 was orientated west-north-west to east-south-east. It measured 1.8m in length by 0.64m in width and had been cut into the natural subsoil (002) to a depth of 0.6m. The burial (Sk 235) consisted of a decapitated extended inhumation, placed on its back with the skull located between its legs (Illus 4.1). Its arms had been crossed over the chest and the hands placed on the collar bones. The entire skeleton appeared to be in a remarkably good state of preservation, with all of the bones being present. There were no grave goods. Following deposition, the grave cut had been backfilled with light yellow-brown silty sand (234). A sample of bone from this skeleton produced a radiocarbon



Illus 4.1 Skeleton 235 (copyright CFA Archaeology Ltd)

date of cal AD 20–220 (95% probability; SUERC 38425), making it the earliest of the Roman inhumations.

Burial Pit 315 was orientated north-west to south-east. It measured 1.56m long by 0.58m wide and had been cut into the natural subsoil (002) to a depth of 0.29m. The burial (Sk 316) consisted of a decapitated inhumation, with the body placed lying on its side and the spine twisted so that the upper part of the torso was almost on its front (Illus 4.2). The skull had been placed behind its back, the knees drawn up towards the torso so that the legs formed an angle of $c 90^\circ$, the right arm placed alongside the body and the left arm beneath the body. This skeleton was generally in a good state of preservation. There were no grave goods. Following deposition, the grave had been backfilled with dark greyish-brown silty sand (317), mottled mid-greyish-brown/pale yellow sand (318) and mottled orangey-brown silty sand (319).



Illus 4.2 Skeleton 316 (copyright CFA Archaeology Ltd)

Burial Pit 320 was orientated north-east to south-west. It measured 2.1m long by 0.8m wide and had been cut into the natural subsoil (002) to a depth of 0.45m. The burial (323) consisted of an extended inhumation, lying on its back with the head tilted towards the right, the arms parallel with the body and the legs outstretched. This skeleton was also in a good state of preservation, although there was some evidence of decomposition in the hands and feet. Some sherds of Roman pottery were recovered from beside the skeleton, but there was no clear evidence that any formal grave goods had been placed with the body. Following deposition, the grave had been backfilled with light yellow-brown sand (321) and mid-dark brown silty sand (322). A sample of bone taken from this skeleton produced a radiocarbon date of cal AD 80–240 (95% probability; SUERC 38426).

Burial Pit 326 was orientated north-west to south-east. It measured 2.29m long by 0.54m wide and had been cut into the natural subsoil (002) to a depth of 0.63m. The burial (420) consisted of a decapitated inhumation, with the body lying slightly on its right side (Illus 4.3). The skull was located at the south-eastern end of the grave facing north-west towards the feet, the legs were extended with the feet crossed, the right arm was roughly parallel with the spine, and the left arm was flexed with the forearm across the lower torso. In comparison with the other skeletons, Sk 420 was in a poor state of preservation, possibly as a result of a modern land drain cutting across the southern end of the grave, which may have leaked into it. Some possible hobnails were recovered from around the area of the skull, possibly indicating that some kind of footwear had been placed at the end of the grave. Following deposition, the grave had been backfilled with dark brown/mottled light yellow sand (330) and mid-brown/mottled mid-grey sand (329). The lower fill (330) contained animal bone fragments, but these were not considered to be formal grave goods and were probably incorporated unintentionally with the backfill material.

Burial Pit 437 was orientated north to south. It measured 1.8m long by 0.8m wide and had been cut through a possible prehistoric ring ditch (508) and into the natural subsoil to a depth of 1m. At the base of the pit, an inhumation burial (451) was identified. The skeleton within this pit was lying



Illus 4.3 Skeleton 420 (copyright CFA Archaeology Ltd)

slightly on its left side, with the head inclined to the left, slightly raised above the rest of the body. The arms were flexed to the left-hand side of the body with the hands clasped together and the left leg was straight, whereas the right leg was flexed, with the knee slightly raised to the right. Generally, this skeleton was in a good state of preservation, with just some splitting of the ribs and mandible noted. Following deposition, the grave had been backfilled using mid-dark brown sandy loam (468) and light brown sand (467). The upper fill (467) of the grave had been cut by a later linear feature (435, see Section 6, Illus 6.1) associated with the field system. Items recovered from this grave consisted of a small potsherd and an iron buckle pin, but neither are considered to constitute grave goods. A sample



Illus 4.4 Skeleton 630 (copyright CFA Archaeology Ltd)

of bone from this burial produced a radiocarbon date of cal AD 30–220 (95% probability; SUERC 38427).

Burial Pit 631 was orientated north-west to south-east. It measured 2.1m long by a maximum of 1.1m wide and had been cut into the natural subsoil (002) to a depth of 0.25m. The burial (630) consisted of a decapitated inhumation lying on its back with the feet and shoulders raised above the level of the torso (Illus 4.4). The head had been placed on the right side of the body, roughly level with the upper leg/pelvis. It was facing inward, with the top of the skull pointing towards the foot of the grave, and the right hand had been placed on the back of it. Both legs were straight and extended, and the left arm was flexed across the

torso, with the left hand resting on the right-hand side of the pelvis. This skeleton was in a very good state of preservation, with just a few breaks in the ribs noted. Following deposition, the grave had been backfilled with mid-grey/brown sand (632). The grave had been cut by a later ditch (657) associated with the Roman field system, which was in turn sealed by midden-rich Context 003. No grave goods were identified with this burial. A sample of bone from this burial produced a radiocarbon date of cal AD 70–230 (95% probability; SUERC 38428).

Burial Pit 648 was orientated east to west. It measured 2m long by 0.96m wide and had been cut into the natural subsoil (002) to a depth of 0.77m. The burial (647) consisted of a fully articulated horse skeleton lying on its left side with the legs folded under to the south and the head to the east (Illus 4.5). Pit 648 appears to have cut a cremation deposit (539; see Section 3.2). A sample of bone from the horse produced a radiocarbon date of cal AD 80–260 (95% probability; SUERC 38418).

4.3 Disarticulated remains

Three disarticulated skulls (003/5, 003/6 and 514) were recovered from midden-rich Context 003 and a fourth (665) was recovered from the surface of the upper fill of Pit 618 (003/3). Pit 618 cut one of the field system ditches, but was sealed by the midden deposits. Both Skulls 003/5 and 514 were recovered from within close proximity to Skeleton 630 (Grave 631), with 514 almost directly overlying it, but no direct link was identified between these features. All of the skulls were located at the base of the midden deposits, indicating that they related to the early stages of the build-up of this feature. While these skulls could represent the remains of decapitated heads which had been displayed on the site, the presence of other disarticulated human bone within C003 tends to suggest that they relate to burials which were disturbed by the field system and simply disposed of amongst the accumulating midden material.



Illus 4.5 Horse Burial 647 (copyright CFA Archaeology Ltd)

4.4 Radiocarbon dates

Samples from four (235, 323, 451 and 630) of the six Roman-period skeletons were submitted for radiocarbon dating (Table 4.1), along with a sample of bone from the horse burial (647).

All of these dates are compatible with the Antonine occupation of the fort. Skeletons 235 and 451 could feasibly fall within a Flavian period of occupation, but the balance of evidence from the

Table 4.1 Radiocarbon dates from the Roman burials. Calibration was conducted using OxCal v4.1, using the IntCal09 calibration curve

Lab no.	Context	Type	Date BP	68% probability	95% probability	$\delta^{13}C$	$\delta^{15}N$	C/N ratio
SUERC-38425 (GU-26287)	235	human bone: femur	1905±30	60–130 AD	20–220 AD	-20.7‰	10.8‰	3.2
SUERC-38426 (GU-26288)	323	human bone: right fibia	1845±30	130–220 AD	80–240 AD	-20.2‰	10.0‰	3.2
SUERC-38427 (GU-26289)	451	human bone: fibia	1895±30	70–140 AD	30–220 AD	-19.3‰	10.4‰	3.2
SUERC-38428 (GU-26290)	630	human bone: left fourth metatarsal	1870±30	80–210 AD	70–230 AD	-18.8‰	11.6‰	3.2
SUERC-38418 (GU-26283)	647	horse bone: left humerus	1830±30	130–220 AD	80–260 AD	-21.1‰	4.9‰	3.3

other skeletons and from the finds both here and elsewhere in Inveresk points towards them being contemporary with the c AD 142–165 occupation of the fort.

4.5 Finds from the burials

A few stray finds were recovered from the burials but are considered to be intrusive or residual in these contexts; none was in a position which would indicate intentional deposition as grave goods. Grave 320 contained a hobnail and three sherds of Roman pottery (BB1, samian and grey ware), and Grave 326 contained small fragments of animal bone (a cattle mandible and a pig maxilla). A small potsherd and a fragment of an iron buckle pin (SF162, see Section 7) was found in Grave 437. Horse Burial Pit 648 contained some hobnails and a ring mail fragment in the upper fill (see Section 3.4.1).

4.6 Roman human skeletal remains

Sue Anderson

Six articulated skeletons were recovered from discrete graves of Roman date. Nine contexts contained disarticulated remains which are undated but likely to be Roman, based on their condition in comparison with the Iron Age group and on their location underlying and within the Roman midden-rich deposit. A catalogue is included in the archive.

The bones were generally in relatively good condition and the inhumations were near-complete, with the exception of Sk 420, which appeared intact in the ground but which was in fact heavily fragmented.

4.6.1 Demographic analysis

The minimum number of individuals was ten. The disarticulated remains included four skulls, as well as small fragments of bone or articulating vertebrae which may belong to them (or could represent at least two further individuals). Table 4.2 shows the age and sex determinations for the ten individuals.

The skeletons comprised two young men and four middle-aged or older men. The disarticulated remains included a possible female and three males.

Table 4.2 Age and sex of Roman and undated skeletons

Period	Grave	Sk no.	Male	Female
Roman	233	235	<i>c</i> 35–50	
	315	316	<i>c</i> 35–50	
	320	323	<i>c</i> 20	
	326	420	<i>c</i> 25–30	
	437	451	<i>c</i> 35–50	
	631	630	<i>c</i> 35–50	
Undated	003/5			<i>c</i> 25–35 (?F)
	003/6		18–25	
	514		<i>c</i> 25–35	
	665		Adult	

4.6.2 Metrical and morphological analysis

Articulated skeletons were measured where possible and the results are included in the archive. Tables of systematically scored non-metric traits can also be found there.

The males ranged between 1.634m and 1.705m (5' 4"–5' 7") with a mean of 1.679m (5' 6"). The disarticulated ?female was the tallest individual in the group at 1.715m (5' 7") but her height was calculated from the radius length, which tends to provide an over-estimate in many groups. In the large Roman group from Trentholme Drive, York, the male average was 1.7m (5' 7") (Warwick 1968: 149), but the female mean was only 1.55m (5' 1"). At Cirencester (Wells 1982) the male mean was 1.691m (5' 6½") and the female 1.579m (5' 2"). This suggests that the male group was relatively short for the period, while the female was taller than her Roman counterparts in England.

Cranial length/breadth index could be calculated for five Roman males and an undated male, and the undated ?female. The ?female was just brachycranial at 80.5. One male was just dolichocranial at 74.9, four were mesocranial, and one was just brachycranial at 80.2. British Roman skulls tend to fall into the narrow (dolichocranial) or medium (mesocranial) ranges, so these individuals were within the expected range. The average of the seven skulls was 77.1. This is comparable with the male group from Trentholme Drive, for which 137 skulls had a mean of 76.5. The mean for Cirencester is not recorded, but the

majority of skulls were dolichocranial (47.5%), followed closely by the mesocranial group (42.5%).

Non-metric traits were only partially scored in this group owing to the poor condition of three of the adult skeletons. A profusion of large wormian bones was present in the lambdoid sutures of Sk 316, Sk 451 and Sk 514, and large sagittal and coronal wormian bones were also present in Sk 514. While it is possible that wormian bones are genetically or environmentally determined, a proliferation of them in a single suture can sometimes indicate a pathological condition. Two individuals (Sk 235 and Sk 003/6) were metopic (the central suture in the frontal bone was retained into adulthood), a trait which is often found in adjacent burials and seems to have a genetic link. Two had small mandibular tori (Sk 235 and Sk 451). In the post-cranial skeleton, the relatively infrequent trait of atlas bridging was present in two individuals in the Roman group, Sk 323 and Sk 630. Plaque formation on the necks of the femora occurred in four individuals, but this condition may be acquired rather than genetically determined. However, femoral third trochanter, which is often assumed to be linked to robusticity, was present in only two of the six Roman males (Sk 316 and Sk 451), all of whom had robust bones and well-defined muscle attachments; both individuals had the additional trochanter on the left side only. While there may be genetic links between these individuals, none with similar traits were from adjacent graves and it may be that the traits were frequent in the population from which they derived.

4.6.3 Dental analysis

Complete or partial dentitions were present for all articulated skeletons and three of the four undated individuals. The group is too small for statistical analysis of disease prevalences, but a few general observations can be made.

All six of the Roman dentitions were complete, although a few teeth had been lost post-mortem from Sk 420 and Sk 451. Most of the teeth had a degree of calculus and alveolar resorption, but only those individuals with large amounts have been noted below.

Sk 235 had lost the upper left first premolar before death, but the root was still in place, suggesting that it may have been knocked or pulled out. He had an abscess of the upper left third molar and moderate to heavy deposits of calculus. When the mandible was articulated with the skull, it was clear that there was a gap between the upper and lower anterior teeth which was caused by attrition, suggesting that the teeth may have been used as tools. Enamel hypoplasia was present at *c* 2–4 years.

Sk 316 had carious lesions of the upper first molars, abscesses of both lower first molars and the upper left, and another abscess of the upper left canine, although the latter was not at the root tip. The origin of the caries could not be ascertained as both lesions were large and most of the crowns had been lost. The lower right first molar was lost before death. Several teeth were chipped in life, and there was moderate calculus and advanced alveolar resorption. Periodontal disease with resorption affected the upper canines.

Sk 420 had an abscess of the upper right first molar which drained on both sides of the dental arch. There were large chips of the enamel on the upper left second and third and the lower left third molars. Enamel hypoplasia had occurred at *c* 4 years.

Sk 451, like Sk 235, had only roots in the place of two of his first premolars (both lower) and again the crowns seem to have been broken off in life, perhaps due to trauma. Abscesses were present beneath both these roots, and also on the upper right first molar. Several teeth were chipped.

Sk 323 and Sk 630 had complete dentitions with no pathology, although all wisdom teeth of Sk 630 were congenitally absent. He also had a large diastema (gap) between his upper central incisors.

In both individuals the upper left first premolar was slightly rotated in the alveolus.

Amongst the disarticulated remains, the young ?female had all her teeth with no pathology, but her first molars were heavily worn in comparison with all her other teeth, perhaps suggesting a change from a coarse to a softer diet at some time in her early childhood (between the eruption of the first and second molars at ages six and twelve respectively) or possibly that she used her teeth as tools but managed to avoid using the back molars. The young male Sk 514 also had all his teeth and no pathology. The slightly older male Sk 665 had only the upper teeth (the mandible was missing) and the second molar had been lost ante-mortem.

4.6.4 Pathology

Congenital and developmental anomalies

Apart from the systematically scored non-metric traits noted above and in the archive, a few other anomalies were noted in the skeletons of these men. Sk 235 had double proximal facets of both first metatarsals, and the corresponding joints of the first cuneiforms were also doubled.

Five males were assessable for spina bifida occulta, of which four had cleft arches of the lower segments only (S4 and S5 or S5 only). This part of the sacral spine is more frequently cleft than not, so this finding is as expected.

Other anomalies of the spine included the presence of six sacral segments (instead of the more usual five) in Sk 323, and possible lumbarisation of the twelfth thoracic and partial sacralisation of the fifth lumbar vertebrae in Sk 451. It is likely that the latter had only 11 ribs on each side, as the facets for the rib heads on the twelfth thoracic were replaced by small rounded protuberances. The body of the first sacral segment was unusually small, and it is unclear whether the fifth lumbar vertebrae was partially sacralised (a facet was present which articulated with the right sacral ala), or whether the first sacral segment was in fact lumbarised.

Sk 451 also had a slight asymmetry to the skull which had been caused by premature fusion of the left side of the coronal suture. Growth of the left parietal had been halted as a result and the bone was slightly smaller than the right parietal. While premature fusion of the cranial sutures (craniosynostosis) can cause problems in development of the brain, in this

case the reduction in cranial capacity was minimal and was unlikely to have had much effect.

A group of disarticulated vertebrae from Sk 003/6 included a fifth lumbar vertebra with a detached neural arch. This lesion can be caused by trauma, but there was no evidence for this here and it is likely that the arch was separate due to a developmental deficiency in the formation of the spine.

The young adult male skull Sk 514 had a mandible with an unusually large cleft chin, possibly a congenital or developmental anomaly.

Degenerative disease

The four older men in this group all suffered from some degree of degenerative joint disease. The lesions present are described below for each individual as the group is too small for statistical analysis of prevalences. Full details of joints involved are available in the archive catalogue.

Sk 235 had osteophytes in both big toes, the right knee, both knee-caps, the wrists (pisiforms only), the right sacro-iliac joint of the pelvis, most

upper and mid-rib heads and facets, and the T6–L4 vertebral bodies (large on the L3–4). There were small enthesophytes (ossified ligamentous attachments) on both calcaneums, but not on the patellae or proximal ulnae. The xiphisternum was calcified and the supraspinal ligament was also partly ossified in the lower part of the spine. There were osteoarthritic changes to both shoulder joints: very large osteophytes had formed bilaterally around the borders of the humerus heads, with enlargement of the scapula glenoids (Illus 4.6–4.7), new bone formation over the joint surfaces of the heads and down the bicipital sulcus, possibly with healed inflammatory changes on the left. Osteoarthritis was also seen in the cervical (C2–4 facets, grade III) and thoracic (T2–3 bodies and T4–6 right facets, grade II) spine.

Sk 316 had osteophytic bone growth in bones of the left ankle, both knees, the right hip, the left thumb, two distal finger joints, the wrists (pisiforms and greater multangulans), both elbows, and the left shoulder with enlargement of the glenoid (similar



Illus 4.6 Left shoulder of Skeleton 235 showing large osteophyte formation on humerus head and scapula glenoid border (copyright CFA Archaeology Ltd)



Illus 4.7 Right shoulder of Skeleton 235 showing large osteophyte formation on humerus head and scapula glenoid border (copyright CFA Archaeology Ltd)

to the changes seen in Sk 235 but less advanced; the right shoulder was damaged and not assessable). Osteophytes were present on most of the thoracic and lumbar vertebral bodies, and were large on the right side of the T5–10, L1–3 and L5 bodies. Calcified thyroid and costal cartilage were present, and there was new bone formation on the linea aspera of both femora and soleal lines of both tibiae. Again, the supraspinal ligament was partly ossified. Osteoarthritis affected a number of joints. In the feet, the right 4th–5th toes, the left 2nd toe, and the left cuboid to 4th/5th metatarsal were all affected with grade II lesions, while the left first metatarsal head and proximal phalange (big toe) had grade III lesions. The right knee also had grade III lesions on the lateral side, and in the left hip there was new bone growth over the joint surface and formation of large osteophytes at the border of the femoral head (Illus 4.8) and around the acetabular rim (Illus 4.9). Both sacro-iliac joints had grade II changes. In the hands, the right thumb had both grade III osteoarthritis (proximal inter-phalangeal) and

osteophyte formation (metacarpo-phalangeal). The left acromial facet (grade III) and the right scapula glenoid (grade II) were affected in the shoulder girdle. There was osteoarthritis or osteophytosis of most rib heads and in the spine the vertebral bodies of the neck were all affected with grade II–III osteoarthritis and there were further grade II lesions within the thoracic and lumbar regions. The right temporo-mandibular joint had an enlarged facet on the temporal and the condyle also appeared enlarged (only a fragment survived), with suggestions of grade II lesions.

Sk 451 had small osteophytes of both shoulders, most rib heads, both hip joints, the right elbow, the right thumb and most of the vertebrae. Enthesophytes were present on the patellae, the calcaneums and the radial tuberosities. Grade II osteoarthritis was present on the lateral clavicles and acromial facets bilaterally, and there were lesions of the C7 and L4–5 vertebral bodies.

In Sk 630 there were osteophytes of the scapula glenoids, the medial left clavicle, the left elbow,



Illus 4.8 Left femur of Skeleton 316 with large osteophytes around the head (copyright CFA Archaeology Ltd)

the right wrist (mainly of the distal radius and ulna), both sacro-iliac joints, and the thoracic and lower lumbar vertebrae. Very large osteophytes were present on the distal interphalangeal joints of the right second and fourth fingers. Grade II osteoarthritis was present on the anterior body of the L2, and on the lateral facets for the ribs of the T8. The individual also had a large and well-preserved calcified thyroid cartilage, as well as costal cartilage and the xiphisternum. Enthesophytes were present on the calcaneums and patellae.

Small osteophytes were present on the right side of the mid-thoracic spine (T7–9) of the ?female from Sk 003/6, and there was osteophytosis of the C1–2 of Skull 665. Osteophytes were also present on the disarticulated vertebrae from Zone 6 (L2–3 and S1), and on a right mid-rib from Pit Fill 255.

Metabolic disorders and indicators of physical stress

Cribra orbitalia, a lesion thought to be associated with iron deficiency anaemia, was not found in any of the five assessable skulls belonging to the articulated skeletons. All three disarticulated skulls were assessable for cribra orbitalia, but it was only present in young/middle-aged male 665, who had the cribriotic form in both orbits.

Schmorl's nodes form when the spine is put under pressure and the intervertebral discs herniate, causing small lesions in the surfaces of the vertebral bodies. They usually occur between the third thoracic (T) to lumbar (L) vertebrae. In this group, nodes were present in Sk 235 (T6–7 and L4 only, all small), Sk 316 (T3?, T8, and large on T10–L1), Sk 323 (T6–L4, large on T7–12), Sk 420 (T8–L1, all large), Sk 451 (T8–10 and L1–3) and Sk 630 (T10 only). They were also present on the T7–L2



Illus 4.9 Left acetabulum of Skeleton 316 showing porosity and new bone growth (copyright CFA Archaeology Ltd)

vertebrae (mostly large) of the 003/6 ?female. Small nodes were present in the T9–11 vertebrae from 515, and large ones were present in the T8–L4 vertebrae from Zone 6.

Small ‘stress’ lesions were present on both proximal hallucial facets of the big toes of Sk 420. This is a relatively common position for lesions of this type.

Infections and inflammatory response

Several skulls were complete and not assessable for maxillary sinusitis. However, the right sinus of Sk 316 was thickened and pitted with areas of porous new bone growth in the right maxillary sinus on the anterior part of the malar. There was no evidence for the condition in Sk 420 or Sk 451. Patches of frilly new bone growth were present in both maxillary sinuses of disarticulated Skull 514.

Slight pitting/porosity and thickening on the parietal bones of Sk 420 may be evidence for an

infection or inflammation of the scalp, or possibly for healed porotic hyperostosis, another condition which may be associated with iron deficiency.

Trauma

As noted above, Sk 235 had symmetrical lesions to both shoulder joints. Bilateral osteoarthritis of the shoulders is an unusual form of degenerative change and there is a possibility that the lesions might originally have been caused by dislocations of the joints. However, bilateral dislocation of the shoulders is also a very unusual occurrence which would most probably be caused by holding onto something which suddenly pulled away at speed. Modern examples of causes include water-skiing or push-starting a car and not letting go in time, but potentially a bolting horse or perhaps chariot-driving in the Roman period might have had a similar outcome.

The same individual also had a crush fracture of the lower back. The first to third lumbar vertebrae

were fused together at the bodies and arches with loss of joint space (Illus 4.10). There was some inflammation of the anterior bodies with pitting and new bone formation, and the supraspinal ligaments were ossified. This type of fracture is most likely to have been caused by a fall or jump from a height. In addition, small exostoses had formed on the linea aspera of both femora at the approximate point of insertion of the *adductor brevis* muscle, suggesting that the individual may have suffered from groin strains. Again, these could be caused by a fall, although today they are also commonly found in sports which involve kicking, running or rapid changes in direction.

Sk 316 had a false joint on the right clavicle which had formed at the insertion of the costo-clavicular ligament (Illus 4.11, lower). There was no evidence that the clavicle had articulated with the first rib, as sometimes happens. The medial end of the bone was missing, but possibly the new facet had formed



Illus 4.10 Lumbar vertebrae of Skeleton 235 showing ankylosis of L1-3 and osteophytes of L3-4 (copyright CFA Archaeology Ltd)

as a result of a dislocation of the clavicle from the manubrium. The right facet of the manubrium was enlarged and thickened. The new joint had grade III osteoarthritic changes. A sternoclavicular dislocation is most commonly caused by a blow to the shoulder. A similar lesion was also present at the *lateral* end of the left clavicle (medial end lost) in the area of attachment of the trapezoid ligament (Illus 4.11, upper).

Young male Sk 323 had large exostoses on the superior edges of both talus joints for the navicular in his ankles. Osteophytes had formed around the navicular joint for the talus on the right (the left was damaged) with possible porotic new bone anterior-inferiorly. There was another large exostosis on the lateral side of the anterior joint for the cuboid of the right calcaneum, and a fragment of the cuboid had osteophytes of the joint border. Sk 630 had exostoses or osteophytes on the tarsal naviculars at the joints with the second cuneiforms on both sides, as well as an exostosis with cyst formation on the superior left fifth metatarsal just above the proximal facet.

Sk 451 and Sk 630 had almost identical fractures of the tenth rib – Sk 451 on the right and Sk 630 on the left. Both had occurred close to the angle and had large callus formations. In Sk 630 there was a large exostosis on the superior edge of the callus formation. Rib fractures are most commonly caused by a blow to the chest, and those of the tenth rib may be associated with damage to the kidney. However, in both cases the callus formation indicates that the individuals survived the trauma and lived for some time afterwards.

Sk 630 had an injury to the right elbow joint which had resulted in secondary osteoarthritic changes (osteophyte formation, new bone growth, deformation and enlargement; Illus 4.12). The cause was indeterminate but a fracture of the joint seems likely. The individual also had an exostosis at the superior edge of the left femoral greater trochanter at the insertion of the *piriformis* muscle, a strain which may occur as an injury during running.

Thickened bone on the palmar surface of the proximal finger phalange (2nd?) found with the ?female in 003/6 was possibly an exostosis or growth following a wound.



Illus 4.11 Left and right clavicles of Skeleton 316 showing new bone formation at the lateral and medial ends respectively (copyright CFA Archaeology Ltd)

4.6.5 Evidence for decapitation

Based on the position of their skulls in the graves, four of the six Roman individuals had been decapitated. All surviving cervical vertebrae of the six skeletons were examined for cut marks. None was identified in the two individuals whose heads were in the proper anatomical position. The two best-preserved examples were in Sk 235 and Sk 630.

In Sk 235, whose head was buried under his thighs, the C1–5 vertebrae were found with the skull. Most of the C5 was missing apart from a fragment of arch and the left side with part of the zygapophyseal facet. This bone appears to have been cut through both superior and inferior parts. The C4 had a shallow diagonal cut across the anterior of the body (Illus 4.13). The C6 was buried with



Illus 4.12 Right elbow of Skeleton 630 showing osteophyte formation secondary to trauma



Illus 4.13 C4 of Skeleton 235 showing knife cut across the body (copyright CFA Archaeology Ltd)



Illus 4.14 C5-6 of Skeleton 630 showing knife cut across the lower body of the C5 and through the arch and body of the C6 (copyright CFA Archaeology Ltd)



Illus 4.15 Cut through the arch of the axis of disarticulated remains from Skeleton 003/6 (copyright CFA Archaeology Ltd)

the rest of the skeleton, but this too had a diagonal cut across the anterior of the body and also across the left zygapophyseal facet. At least three to four cuts had been made in the attempt to sever the head.

Sk 630 was decapitated through the C6 vertebra, which survived in four fragments with cut marks (Illus 4.14). The C5 had a cut through the lower anterior edge and there was a small cut in the right side of the C7. At least three cuts had been made.

In Sk 316, there was no evidence of cut marks on any of the vertebrae, but very little of the C3 survives and it is possible that the cuts were made at this point and did not affect the surrounding bones. The cervical vertebrae of Sk 420 were in poor condition and no cut marks were identified.

Two disarticulated skulls had cervical vertebrae associated with them, but in both cases only the C1–2 were present. No cut marks were present on those of Skull 665, but Sk 003/6 ?female had a cut across the arch of the axis on the left side below the facet (Illus 4.15). It was cracked across to the anterior side, but the cut did not continue right through the bone. This cut was made from behind. The mandible also had a possible unhealed cut on the right side from the lower margin running anteriorly across to the centre. The mentum was lost and the left side of the mandibular body was cracked. Although these ‘lesions’ had certainly occurred in antiquity based on the staining of the bone, it is possible that they could have happened during re-deposition of the skeleton (assuming it was originally buried in a formal grave).

4.7 Summary of the isotopic analysis of the human remains

Joanna Moore, Alice Rose, Jane Evans, Geoff Nowell, Darren R Gröcke, Vanessa Pashley and Janet Montgomery

Six male individuals dating to the Roman-period, four of whom appeared to have been decapitated, and one Iron Age individual of unknown sex were subjected to a range of isotopic and trace element measurements to investigate residential origins (Moore et al forthcoming).

Carbon and nitrogen isotope analysis of their dentine collagen (childhood) and rib bone collagen (later life) produced a small (c 2‰) range of values for the Roman-period burials ($\delta^{13}\text{C}$: dentine mean $-20.6\text{‰} \pm 0.8\text{‰}$ (1σ), bone mean $-20.4\text{‰} \pm 0.9\text{‰}$ (1σ); $\delta^{15}\text{N}$: dentine mean $+10.7\text{‰} \pm 0.8\text{‰}$ (1σ), bone mean $+11.1\text{‰} \pm 0.9\text{‰}$ (1σ)) indicating a largely terrestrial omnivorous diet in childhood and adulthood, despite the proximity of Musselburgh to the coast. The Iron Age individual also falls within this terrestrial range. One decapitated individual, Sk 630, has the highest $\delta^{13}\text{C}$ values in both dentine and bone (-19.2‰ and -19.3‰ respectively), which along with relatively high $\delta^{15}\text{N}$ may indicate some consumption of marine protein in line with other Roman-period populations in England (Müldner & Richards 2007; Müldner 2013). However, this apparent similarity of diet is not supported by the other isotope and elemental data obtained from the tooth enamel; these strongly suggest the Roman individuals are neither of local nor geographically similar residential origins.

The Iron Age individual has, in all cases, isotope ratios that are consistent with origins in the Musselburgh area: this is the only $^{87}\text{Sr}/^{86}\text{Sr}$ and $\delta^{18}\text{O}$ that in combination and allowing for measurement uncertainty could be consistent with local origins; this individual also has a very low lead burden, which is inconsistent with exposure to the anthropogenic lead pollution of the Roman Empire and in line with prehistoric lead levels (Montgomery et al 2010). The lead isotope ratios of this lead are also comparable with other prehistoric individuals from Scotland, indicating low-level natural exposure via the food chain from ancient rock sources (Montgomery et al 2010). This individual thus provides a good baseline against which to compare the intrusive Roman burials.

The Roman-period individuals exhibit extremely variable enamel isotope characteristics. One male with no evidence for decapitation, Sk 323, has the lowest $^{87}\text{Sr}/^{86}\text{Sr}$ in the group, which is indicative of origins in limestone or basalt terrains (Evans et al 2010) – both of which are found in the Lothian region of eastern Scotland. The low $\delta^{18}\text{O}$ value would support origins in eastern Scotland (Evans et al 2012) and the lead isotopes, which in combination with the very low lead burden, indicate natural exposure to lead from young or marine rocks (Montgomery et al 2010) also support origins in a region of limestones or basalts with no childhood exposure to Roman sources of lead pollution. Similar lead isotope ratios have been found in male individuals from the Roman decapitation cemetery at Driffeld Terrace, York who appear to be migrants to Britain, although these individuals have higher levels of lead indicative of anthropogenic rather than natural exposure so may not provide a valid comparison (Montgomery et al 2010). The strontium concentration is relatively high and in line with Scottish coastal or island populations (Montgomery et al 2007) but the $\delta^{18}\text{O}$ value would not support origins in the Western or Northern Isles or on the western seaboard.

Sk 630, the decapitated male with some evidence for marine protein consumption, is clearly not of local origin. Although the $^{87}\text{Sr}/^{86}\text{Sr}$ value of 0.7098 is relatively common, and therefore undiagnostic, amongst archaeological individuals in Britain and Europe and indicative of origins in regions of young sedimentary silicate rocks such as Mesozoic sandstones, the $\delta^{18}\text{O}$ value is too high for origins in eastern Britain. However, given the large uncertainty on the measurement, the $\delta^{18}\text{O}$ value is not high enough to indicate certain origins outside Britain, especially as cultural practices such as boiling and brewing drinks may artificially elevate human $\delta^{18}\text{O}$ values (Brettell et al 2012); such values are consistent with western and southern Britain. This individual has a high lead burden of 6.5mg/kg, the highest amongst the Musselburgh group, and coupled with lead isotope ratios that put this individual firmly in the centre of Roman-period burials from England and in the English ore field, it is clear that origins should be sought within the Roman

Empire, and all the data would be consistent with southern Britain.

The remaining four male individuals have high $^{87}\text{Sr}/^{86}\text{Sr}$ values that are not commonly found amongst Roman-period burials in Britain, where the majority are below 0.7120. Such values are indicative of origins in regions of granites or ancient silicate rocks of Palaeozoic Age or older (Evans et al 2010). When coupled with the mostly low $\delta^{18}\text{O}$ values of these four, it is clear that such combinations of values are even rarer, with only two comparable individuals reported, at Catterick in North Yorkshire (Chenery et al 2011). The lack of direct comparisons is also clear when the Musselburgh individuals are compared to all published data for archaeological humans across all periods and may be a direct result of the bias in the dataset: there is far less data for archaeological humans of any period from Scotland, where there is a preponderance of older geology than from England, where the geology is relatively younger and biosphere $^{87}\text{Sr}/^{86}\text{Sr}$ values are expected to be lower.

Three of these high $^{87}\text{Sr}/^{86}\text{Sr}$ individuals (Sk 235, Sk 420 and Sk 451) are also linked through their similar strontium concentrations, lead burdens which provide evidence for low-level childhood exposure to anthropogenic lead pollution, and the lead isotopes which are inconsistent with English ore lead sources and suggest exposure to older lead ores such as those found in Scotland. Nonetheless, such lead isotope ratios are not exclusive to Scotland and the decapitated male Sk 235 has a very similar lead and strontium isotope and concentration profile to a *c* eight-year-old child (BGB98–400) excavated in Roman London with $^{87}\text{Sr}/^{86}\text{Sr}$ inconsistent with southern England and a high lead burden that was found to be consistent with the lead isotope field of German ores and artefacts (Shaw et al 2016). Although Scottish origins were not considered for this child (although the data does not rule them out), it suggests that Sk 235 would also be consistent with German lead sources and his origins may lie outside Britain in a granitic terrain, such as occurs in the Rhineland. Skeleton 420 and Sk 451 have identical lead isotope ratios which are similar to other Long Iron Age humans from elsewhere in Scotland; it is thus possible these two males originate from elsewhere in mainland Scotland in

a region of older geology. They are inconsistent with origins in England, but a homeland overseas elsewhere in the Roman Empire cannot be ruled out, although their $\delta^{18}\text{O}$ values indicate this is unlikely to be in southern Europe unless at higher altitudes.

Finally, Sk 316, a decapitated burial, has a low $\delta^{18}\text{O}$ consistent with origins in eastern Britain or northern Europe and a high $^{87}\text{Sr}/^{86}\text{Sr}$ value indicative of origins in a region of granites. However, in contrast to the three above, the lead burden is low and the lead isotope ratios are not consistent with Scottish ore or rock sources; together they indicate exposure to natural lead sources from younger rocks such as those found in England. It should be noted, however, that isotopes are not unique to any one place and that virtually identical lead isotope ratios were obtained for 3DRIF-26, a male burial from Driffeld Terrace whose $\delta^{18}\text{O}$ value and aDNA point fairly conclusively to origins in the Levant (Martiniano et al 2016). Such an origin is highly unlikely for Sk 316, however, due to the high $^{87}\text{Sr}/^{86}\text{Sr}$ and low $\delta^{18}\text{O}$, but it demonstrates the equifinality of the data and, along with this highly variable dataset, the multitude of origins present in this small group of individuals excavated from Musselburgh. A broader understanding is needed of the isotopic variation amongst people who grew up on the old, silicate rocks of northern Scotland in all periods before these isotope profiles from the individuals subjected to intrusive burial rites at Musselburgh can be concluded to be non-British, but for four of the individuals examined they are clearly unusual amongst what is a highly variable dataset for Roman-period burials in Britain.

It is apparent from the isotopic data that the decapitation burials at Musselburgh do not represent the continuation of a native Iron Age population as none of them are of local origin and they do not share a common geographical origin, suggesting that something more complex than simply a shared ethnicity unites the individuals. The Musselburgh decapitation burials represent the earliest known examples of Roman inhumation and decapitation in Britain, and their apparent ethnic diversity coupled with a shared burial rite reflects the cosmopolitan nature of the Roman army.

4.8 Summary and discussion of the human remains

4.8.1 Articulated burials

Sue Anderson

Six individuals are certainly or probably of Roman date, all male. Four were in middle to old age at the time of death, and two were younger. Few Roman burials have been excavated previously in Scotland. A summary of the main groups is included in Collard & Hunter (2000), and there are few if any additions since then (F Hunter, pers comm). A couple of poorly preserved skeletons were recovered from a double grave at Camelon fort (Breeze et al 1976), but both were unsexed and not closely aged. One other skeleton has been recovered from the former wireworks at Musselburgh (Bruce 1993; Gallagher & Clarke 1993), another young adult ?male. Consequently the only geographically closely comparable material available for this group is from the north of England, the largest group being the Trentholme Drive, York, burial ground (Warwick 1968).

The Inveresk men were below the average height for large groups recorded in England, but their cranial indices were in the normal range for the period. Some rare non-metric traits were relatively frequent in this group, but individuals with specific traits were not buried in the same part of the site so no familial relationships could be suggested.

Dental disease in the form of carious lesions or ante-mortem tooth loss was not marked in this group, although four individuals were affected with abscesses. Two individuals appeared to have lost the crowns of their teeth through trauma, and a number of chips in the enamel suggested either a diet which contained a high proportion of grit (such as poorly milled cereals) or other hard foods, or possibly the habitual use of the teeth for some occupational purpose. The wear pattern on the teeth of Sk 235 in particular may indicate a practice which involved holding something in the teeth.

The two younger individuals in the group had few signs of bony pathology, although both had large Schmorl's nodes which indicated stress on their backs. The youngest male, Sk 323, also had changes to both ankles which are suggestive of some form of repetitive strain.

The four middle-aged or older males all had evidence of major trauma and osteoarthritis. Fractures to the spine or ribs were present in three individuals, and there was possible evidence of dislocation in two. Osteoarthritis appeared to be secondary to joint injuries in at least two cases, but there were also degenerative joint changes, particularly of the spine but also affecting the feet and hands in all four individuals, as well as other joints in some. However, the older men were less affected by Schmorl's nodes than the younger ones, perhaps suggesting that their spines were less affected by the physical stresses which are suggested by their other injuries. While osteoarthritis cannot be directly linked with specific occupations or activities, as its presence involves a number of other factors such as genetic predisposition, age and systemic factors (Rogers & Waldron 1995: 33), the widespread nature of the degenerative joint disease seen in these individuals does suggest considerable wear and tear on their bodies in life.

Evidence for post-mortem decapitation was noted on site in four of the six Roman burials, although only two had surviving evidence in their bones. The occurrence of this rite in such a high proportion of the burials is exceptional. Philpott (1991: 81) notes that the frequency varies between 1.6% and 31.4% in individual cemeteries in England, with an overall frequency of around 2.5% of all the 4th-century Roman burials known at the time of writing. Most of the decapitations with secure dating evidence in England can be placed in the 4th century, the only exceptions being a burial from Cuxton, Kent (dated AD 50–100 from pottery) and a group of infants from Temple IX at Springhead, Kent (dated to the mid-2nd century AD). If the Roman burials at Inveresk were associated with the fort, then they must be of 2nd-century date and are therefore one of the earliest manifestations of this rite in Britain. It has been suggested that the 4th-century rite spread from rural communities to urban ones in England (Philpott 1991), and that it may have been a revival of Iron Age pagan practices (Watts 1998: 89). Although there is a great deal of data on age, sex and possible social status of the 4th-century decapitations (all of which is diverse and not suggestive of a single 'type' of person being involved), this may not be directly comparable with the earlier Inveresk group. In this area, Roman influence was

less well developed than it was in 4th-century Britannia to the south, and Iron Age traditions of inhumation burials appear to have continued here, as in Northumbria (Philpott 1991: 57), into the 3rd century and beyond, although some cremation burials are also known (Collard & Hunter 2000; Lelong & McGregor 2007). Potentially here the rite of decapitation might represent a continuation of a Celtic tradition of belief in the power of the severed head, rather than a revival, and it may be related to the beliefs of the particular group of Roman soldiers who were posted here, even though isotopic analysis suggests that they may have originated in different parts of the empire. Although no definite evidence for decapitation has been identified amongst the few Iron Age burials in the area, a single cervical vertebra from the Lochend cist, Dunbar, showed evidence of a possible sword cut (Brothwell & Powers 1966: 197).

4.8.2 Disarticulated burials

Sue Anderson

The disarticulated remains were generally well preserved and it seems most likely that these were contemporary with the Roman, rather than the Iron Age, group. If so, they add a further four individuals to the Roman burials, of which one may be female and the others were male. These four were either young, young/middle-aged, or unaged adults. If contemporary, they change the demographics of the group slightly, producing a younger average age at death and adding a woman to the group. The latter was approximately as tall as the average Roman male at English sites and determination of sex is less than certain as a result. Cranial indices for two of the four were within the normal range for a Roman group, although again the ?female was above average. The presence of a metopic suture in the ?female skull may indicate a familial relationship between her and Sk 235, but as the skull was disarticulated in Midden 003, it is uncertain where her original burial place might have been located. Little dental pathology was present in this small group, although the oldest male had lost one tooth before death.

Degenerative joint disease was also found in this group, affecting the spines of three individuals. However, no osteoarthritis was present in this younger group. Three individuals, like the younger Romans, had very large Schmorl's nodes. One individual had cribra orbitalia, which was not present in any of the articulated burials.

Evidence for decapitation was also found in this group, although only the ?female individual was involved. In this case the single cut to the axis vertebra had been made from behind. However, this blow did not sever the head and it is likely that the crucial lesion was on a vertebra which had been lost following disarticulation of the body. The lesion on the axis was suggestive of a wider blade than had been used in the Roman group, and the position on the back of the neck suggests that it may have been the result of an execution, rather than post-mortem decapitation, in this case.

4.9 The horse burial

Jennifer Thoms

C647 contained the burial of a complete horse (in Pit 648), intact apart from the skull, which was heavily fragmented. The post-cranial bones did not show any signs of injury or trauma that might have resulted in death, nor did they show signs of old age, or of age-related disease such as arthritis. The skull was too fragmented to allow any sign of cause of death from a blow to the head to be detectable. The age at death evidence obtained from the fusion of the bones indicated the animal had been aged between four and six years at death, suggesting that the animal was at peak maturity, not showing any signs of lameness or infirmity. The bones displayed no signs of butchery or dismemberment, which, together with its apparently deliberate burial, indicates that it was not killed for economic or practical reasons. Thus we have a large, young, fit, active animal that has died and has not been disposed of in a similar manner to the many other dead horses on the site.

Data relating to the horse burial is further considered as part of the overall animal bone report (Section 8.2).

5. ROMAN REMAINS

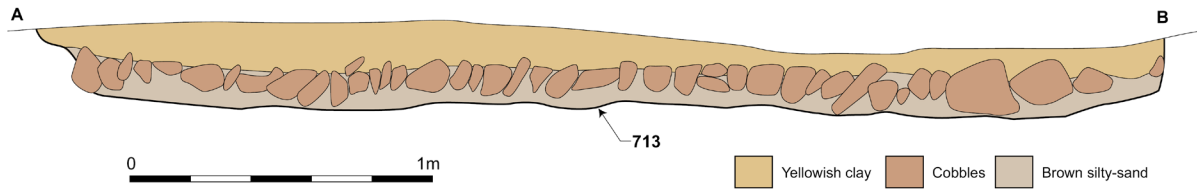
5.1 The rampart

A probable rampart base was identified towards the western edge of the site (Illus 2.2 and 5.1). It was not fully excavated as it extended outwith the development area. Internally, the rampart measured

31.5m north to south by more than 19.5m east to west and consisted of a continuous foundation of cobbles embedded within yellowish-grey clay with no obvious deliberate breaks indicating an entrance. Generally, the cobbling measured 2.5–3m in width, but the south-eastern corner measured up to 8.5m wide, indicating that there may have



Illus 5.1 Rampart base (copyright CFA Archaeology Ltd)



Illus 5.2 North-facing section through rampart base (for position see Illus 2.2) (copyright CFA Archaeology Ltd)

been some kind of additional structure within this location. The north-east corner also appears to have been considerably wider, but it had been heavily disturbed by more recent development leaving a number of isolated patches of cobbles surviving beyond the extent of the more coherent structure. This corner too may have been the base for some kind of additional structure. There was no evidence of any kind of external ditch, which might have been expected on a Roman military installation had its primary function been one of defence.

In the south-east corner, the cobbles had been cut into the natural subsoil and were neatly laid using stones of approximately equal size. Overlying the cobbles within this location was a layer of yellowish clay measuring 0.17m thick (Illus 5.2). This would indicate that the rampart itself may have been constructed from boulder clay. In contrast, the stones used for the north-east corner were much larger and showed a considerable variation in size. They were laid down in a much more haphazard fashion with no evidence of a foundation cut or of the remains of an overlying clay rampart.

A number of linear ditches were identified within the rampart, but some of these cut through the rampart base, indicating that they were part of the later field system. This would suggest that the rampart had been dismantled and levelled prior to the excavation of the field system ditches. The lack of any significant quantity of clay on site might suggest that it had been removed and utilised within other structures. Also identified were the remains of a post-built structure, but the posts for this cut the backfill of one of the field system ditches, indicating that it was a later structure. There was no clear indication of any contemporary structures within the rampart, but the area excavated was

comparatively small and was heavily disturbed by the later field system and by the wireworks.

5.2 Field system

Throughout the site, a network of over 60 interconnected ditches was identified (Illus 2.2–2.3 and 5.3). These varied considerably in size. For example, Ditch 452 measured 2.3m wide by 1m deep at its widest and deepest point, whereas Ditch 166 measured only 0.35m wide by 0.19m deep where it narrowed towards its eastern end. Throughout the site these ditches predominantly had sloping sides with a flat or rounded base, but occasionally they had a rather sharper V-shaped profile (Illus 5.4). The general trend of the ditches was to form a very small-scale field system with the long axis predominantly on a west-north-west to east-south-east alignment. This divided the area up into a number of rectangular areas, measuring up to 28m by 10m (0.028ha). However, it has to be stressed that this was just a general trend. There were also a considerable number of ditches on different alignments, some of which appeared to curve and meander to a degree. Some of the enclosed areas were also considerably smaller. For example, in the south-eastern corner of the site, Ditches 452, 339, 331 and 356 enclosed a small area measuring *c* 2.5m by 2.5m.

Entrances into the enclosed areas were apparent in some instances, but in others the plots were fully enclosed on all sides. The implication of this perhaps is that the ditches represent a number of different phases and were not all open at the same time. However, efforts to establish phasing yielded very limited results as, despite some ditch sections showing evidence of cutting others, the overall impression was of one ditch flowing seamlessly into



Illus 5.3 Field system ditches pre-excavation (copyright CFA Archaeology Ltd)

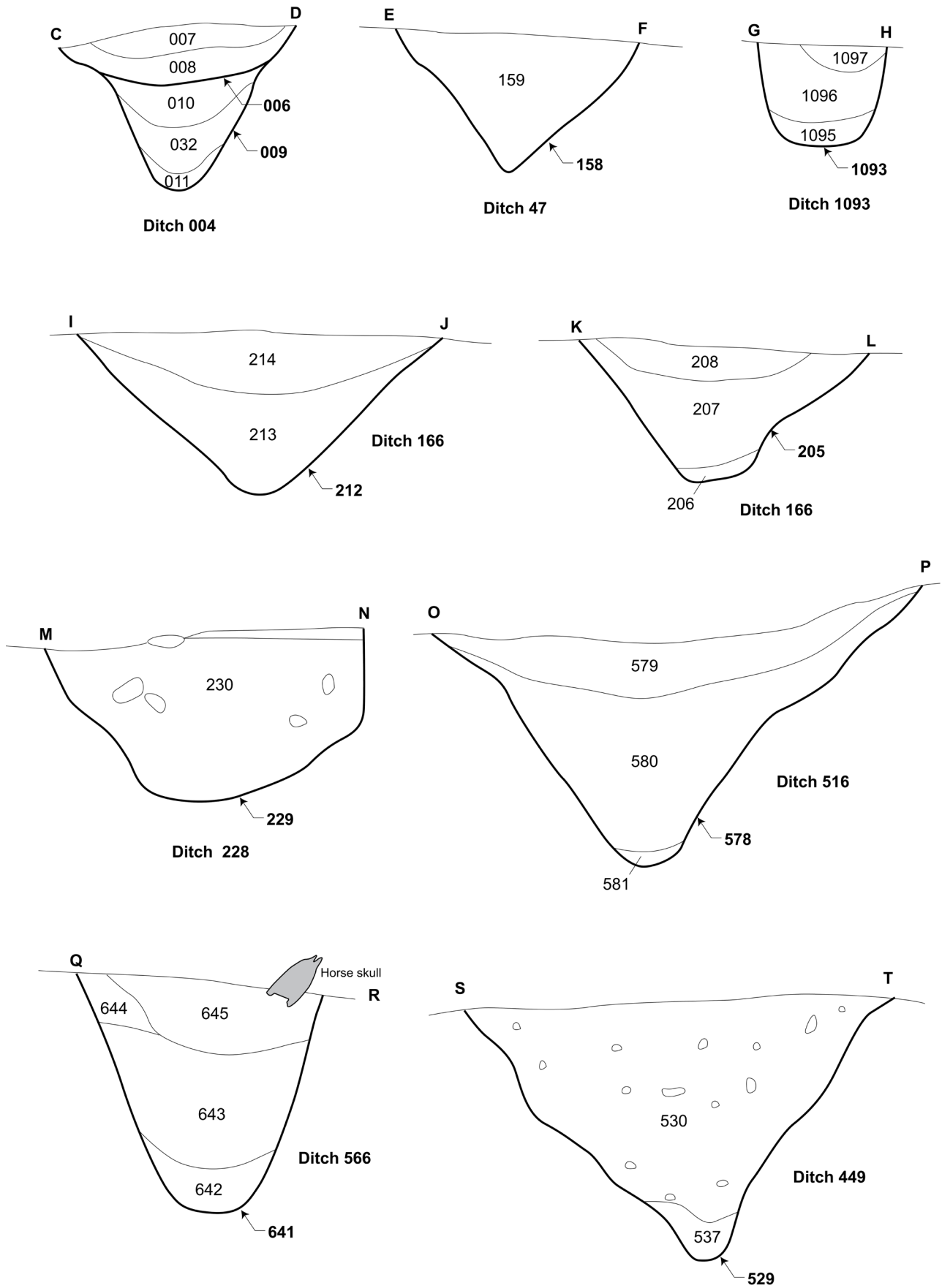
another and in many cases the apparent phasing was simply the evidence of numerous recuts and emptying as the ditch silted up rapidly with loose sand.

Field system Ditch 435 was identified as cutting Roman-period Burial 437 (see Section 6, Illus 6.1) and Ditch 657 was identified as cutting Roman-period Burial 631. In both cases the depth of these ditches was insufficient to disturb the burial itself, only affecting the upper part of the graves. This would indicate that the field system post-dated the Roman burials. Four disarticulated skulls identified within the midden deposits overlying the southern end of the field system suggests that further burials may have been disturbed when this network of ditches was being cut and simply disposed of in the easiest possible way.

The midden-rich cultivation soil, identified sealing the southern end of the field system and filling the upper part of the ditches, contained numerous Roman-period artefacts. Roman-period

debris was identified within the ditches, indicating that they were still open during the period in which the midden material had started to accumulate. Roman-period finds, predominantly pottery and animal bone, were recovered from the ditches, primarily from the upper fills, but pottery and animal bone were recovered from the basal fill of Ditches 452 and 449, and bone was recovered from close to the base of Ditch 566. This, together with the paucity of finds from ditches located further away from the midden deposit, would perhaps imply that the field system was still in use when the midden deposits started to accumulate.

Assuming a short timescale between the use of the field system and the accumulation of the midden deposits, it would seem fair to assume that the minimum of truncation would have taken place and that the excavated ditches sealed beneath the midden would be a fair reflection of their original depth. A number of ditches (516/228/238, 360/219 and 270) extended outwith the area sealed by the



Illus 5.4 Selection of field system ditch sections (copyright CFA Archaeology Ltd)

midden deposits and ditch sections excavated outwith the sealed area showed a fairly minimal reduction in depth when compared with the same ditch from beneath the sealed deposits. For example, a section recorded through Ditch 516 sealed beneath the midden deposits measured 1.7m wide by 0.95m deep whereas a section recorded through Ditch 238 which appears to have been a continuation of the same ditch outwith the sealed area measured 0.8m wide by 0.82m deep. If this ditch was the same depth along its full length, this would indicate truncation of c 0.1–0.2m across much of the rest of the site. This degree of truncation would only have removed fairly shallow features.

Away from the area of midden material, the fill of the ditches largely consisted of pure sand of very similar consistency and colour to the natural subsoil and the finds from the ditches were fairly minimal, with only five sherds in total occurring in 143, 166 and 219, for example. A small quantity of pottery and hobnails from at least two shoes were recovered

from large sub-square Pit 192 (part of Ditch 143), along with an iron ring and a lead melt-waste fragment.

5.3 Midden deposits

Midden deposits (C003) were identified running the full length of the southern end of the site (110m) and extending out from the southern boundary for a distance of up to 18m (Illus 2.2–2.3 and 5.5). With the exception of the very topmost deposits, which had been disturbed by modern development associated with the wireworks and pockets of modern finds, this deposit appeared fairly homogeneous in nature. This does not necessarily imply that they represent a single episode of deposition and they may in fact have built up over a number of years, but the similarity of the material means that it decayed into a single homogeneous mass. The most obvious source of this material is the Roman fort, which was situated upslope, and it is possible that the midden



Illus 5.5 Midden deposits pre-excavation (copyright CFA Archaeology Ltd)

represents an accumulation from throughout much of its approximately 25-year lifespan (AD 142–165). Soil micromorphology (Ellis, 5.3.1 below) identified that Midden Context 003 was a sandy loam comprising coarse sand and midden-derived organic material containing a quantity of coprolite.

This accumulation of deposits was up to 2m thick and appears to have been one of the last phases of occupation on the site as it sealed Roman burials, the ring ditch, the southern end of the Roman rampart and the southern end of the field system. Some of the field system ditches appear to have been open during the period of accumulation as their fill consisted of midden material. However, this apparent phasing does not preclude the possibility that the wider field system remained in use during and even after the period in which the midden deposits accumulated, as the deposits appear to have simply restricted the area available for agriculture. Indeed, human remains found on the midden may represent individuals from graves that were disturbed during the excavation of the field system and simply disposed of on an ever-accumulating waste tip. Furthermore, if it does represent material from throughout much of the lifespan of the fort, it could be that the earliest accumulations were broadly contemporary with the Roman rampart, whereas the later deposits were ones that had continued to accumulate after this feature had fallen out of use. This suggestion is of course based on the assumption that the field system and the rampart were broadly contemporary, with the field system being extended across the footprint of the rampart after it fell out of use.

These deposits were rich in finds including worked bone, animal bone, pottery and metal. The animal species identified consisted of cattle, sheep, pig, sheep/goat, red deer, cat, dog, goat, roe deer, goose and bantam, while the metal consisted of iron and copper alloy objects and the pottery consisted of samian, amphorae and coarse wares. Many of the items were of military origin including ballista bolts, fragments of swords, ring mail, helmet cheek-pieces, shield ribs and a possible armour buckle. Samian ware from the midden deposits is unlikely to have arrived on site prior to the early AD 140s and was probably deposited no later than AD 155–160, giving a fairly tight date range for their accumulation (see Section 7).

5.3.1 Soil micromorphology

Clare Ellis

Four sequential kubiena samples are analysed from Context 003 with the aim of elucidating the mode and environment of deposition. The summary results are given below and full descriptions are available in the archive.

Method

The sample was prepared for thin section analysis by G McLeod at the Department of Environmental Science, University of Stirling, using the methods of Murphy (1986). Water was removed and replaced by acetone exchange and then impregnated under vacuum using polyester crystic resin and a catalyst. The blocks were cured for up to four weeks, sliced and bonded to glass and precision lapped to 30µm with a cover slip. The four samples were assessed using a MEIJI ML9200 polarising microscope following the principals of Bullock et al (1985), FitzPatrick (1993) and Stoops (2003). A range of magnifications (40–400×) and constant light sources (plane polarised light – PPL, cross-polars – XPL, circular polarised light and oblique incident light – OIL) were used in the analysis.

Summary descriptions

The natural subsoil is a coarse sand with 10–15% rock fragments. There are very few silt-sized charcoal fragments within the limited amorphous organo-mineral matter that coats the sand grains (single to pellicular grain structure). The boundary between the natural and C003 is wavy, sharp and prominent.

C003 is a poorly sorted coarse sand, increasingly fine-grained up the profile, and becoming a poorly sorted bimodal sand. It has around 5% rock fragments. The sandy loam has a complex microstructure, dominated by granules that are formed from fused fauna excrement pellets and mineral grains. Amorphous organic matter dominates the fine material with frequent fragmentary phytoliths. Broken up coprolite material occurs as rounded to irregular clasts of contorted organic matter rich in phosphate; some of the coprolites have mineral grain inclusions. Other anthropic inclusions included very few fragments of pottery, fired clay, bone, clasts of ash and one piece of iron hammer scale. There are very few

larger charcoal fragments and very few silt-sized charcoal fragments within the fine organo-mineral material. Very few charcoal coatings and very few clay coatings were observed in the basal portion (of C003), but a clast within which the mineral grains were coated with charcoal was observed in the uppermost thin section. Roots were apparent in the upper three slides.

Discussion

The natural comprises a coarse dune sand. The boundary between the natural and C003 is defined by an irregular layer of phosphate-enriched organic matter interpreted as the remnants of dung (coprolite). The bases of some of the coprolite fragments along this boundary are charred and some of the coprolite material has been subject to limited eluviation/illuviation. There is no bone material within any of the coprolites observed throughout C003, indicating that these are not derived from either dog or cat, rather they are likely to have originated from either humans or herbivores. The mineral vivianite occurs within the organic matter and is indicative of the chemical weathering of the organic matter; such an environment may be found for example within accumulated organic matter and dung on a byre floor. This short sequence of deposits is interpreted as the initial spread of herbivore dung upon virgin dune sand. The presence of charcoal at the base of the spread of dung indicates that at least some of the dung may have been used as a fuel.

Mineral sand grains and amorphous organic matter dominate C003. It also contains frequent fragmentary phytoliths indicating that grass (in the broadest sense) was a major source of the organic matter. Some of the phytoliths may also have been originally derived from grass/turf ash, as clasts of ash rich in phytoliths were observed in one slide; however, elsewhere in the deposit bioturbation has probably resulted in the destruction and incorporation of such clasts. Charcoal is relatively rare in the deposit, perhaps because wood was not a particularly common fuel. The occurrence of well humified, amorphous organic matter, coprolites, the remnants of ash, and other anthropic-derived inclusions (pottery, fired clay, bone and hammerscale) within a single relatively homogeneous deposit indicates that C003 has a significant midden-derived component. In addition, a very few bright

reddish-brown clay coatings demonstrate that the lower portion of the deposit has been subject to limited eluviation/illuviation. All these features are indicative of soil manuring and can also be indicative of soil cultivation, but none conclusively prove soil cultivation (Courty et al 1989; Macphail et al 1990; Adderley et al 2006; Ellis 2008). Some of these features occur in non-cultivated soils (eg carbonised organics, Adderley et al 2006); middens (Ellis 2001) and conversely dusty coatings are not necessarily produced by cultivation (eg Courty et al 1989) nor necessarily occur in cultivated soils, be they modern or ancient (eg Davidson & Carter 1998). Furthermore, it is increasingly apparent that where soils (under pasture or arable cultivation) remain unburied or accessible to soil fauna, subsequent or continued bioturbation can rapidly, within a few decades, result in the destruction of all micromorphological features with the exception of extensive excremental pedofeatures (eg Macphail et al 1990; Ellis 1998; Davidson 2002).

In summary the micromorphological evidence (elevated organic content and intensive bioturbation, along with small rounded charcoal fragments, disseminated silt-sized charcoal, rounded clasts of ash and anthropic-derived inclusions) hints at the deliberate manuring and possible cultivation of C003.

Summary conclusions

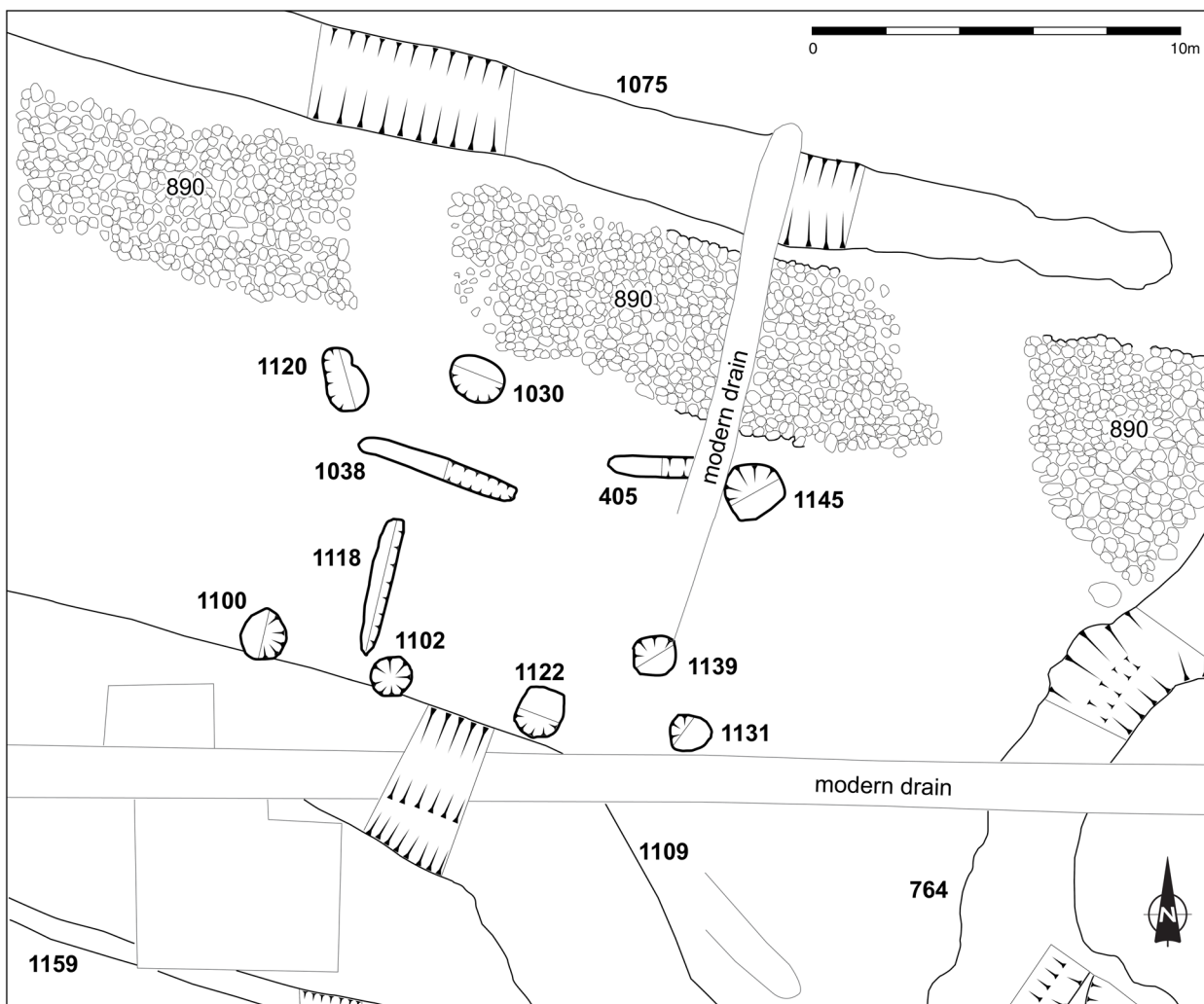
1. The natural is a coarse dune sand.
2. Herbivore dung, some of it burnt, was the first deposit to cap the dune sand.
3. C003 is a coarse sand which becomes bimodal (coarse and medium sand) up the profile.
4. In addition to the sand-sized mineral fraction, C003 is largely composed of midden-derived material.
5. Although there is no conclusive micromorphological evidence for the cultivation of C003, an elevated organic content and intensive bioturbation, small rounded charcoal fragments, disseminated silt-sized charcoal, rounded clasts of ash and anthropic-derived inclusions all indicate that the soil is very likely to be the remnants of a manured and cultivated soil.

5.4 Post-built structure

Within the Roman rampart the remains of a timber-built structure (Post Holes 1145, 1030, 1120, 1100, 1102, 1122, 1131 and 1139, and Slots 1118, 1038 and 405) were identified (Illus 5.6). The layout of the post holes indicates that the structure would have measured 6.5m east–west by 4.5m north–south. Typically, the post holes measured *c* 0.6m in diameter and contained stone and clay packing. The packing stones appeared very similar in nature to the stones used in the construction of the rampart base and may have been robbed from the latter. One of the post holes (1100) cut a ditch (1109) associated with the field system. This would indicate that the post-built structure was constructed following the silting up of that particular ditch and might indicate

that it post-dated the field system. Although these features appeared to respect the edge of the rampart, making it tempting to view them as a contemporary structure, the inference from the field system ditches cutting the rampart base is that this was a later structure, constructed after the demolition of the rampart.

Finds were recovered from three of the features, all of Roman date. These were a copper alloy pendant hanger and pendant (SF45) and one potsherd from 1114, three sherds of pottery and three iron tacks/hobnails from 1030, and two sherds of pottery and a hobnail/tack from 1038. While it is possible that these items represent residual material redeposited in later features, the lack of any later material would seem to imply a Roman date for this structure.



Illus 5.6 Plan of post-built structure (copyright CFA Archaeology Ltd)

5.5 Pits cutting the field system ditches

A group of pits (958/962/967, 953, 978, 920, 934, 948, 1008), at the northern edge of the excavation site also contained a small collection of pottery, iron and glass finds of Roman date. Four of these and one other pit (907) cut field system Ditch 925, from which no finds were recovered. A number of the pits were similar in plan, being sub-rectangular in form.

They may be evidence for activity of Roman date in this part of the site, perhaps contemporary with the use of the post-built structure. Other pit features cutting the field system ditch included 334, 388, 518 and 781. Several of these pits contained Roman-period artefacts including pottery and hobnails/nails, while Pit 618 contained a human skull on the surface of the upper fill. Pits 334, 388 and 618 had been sealed by midden-rich Context 003.

6. OTHER FEATURES

6.1 Introduction

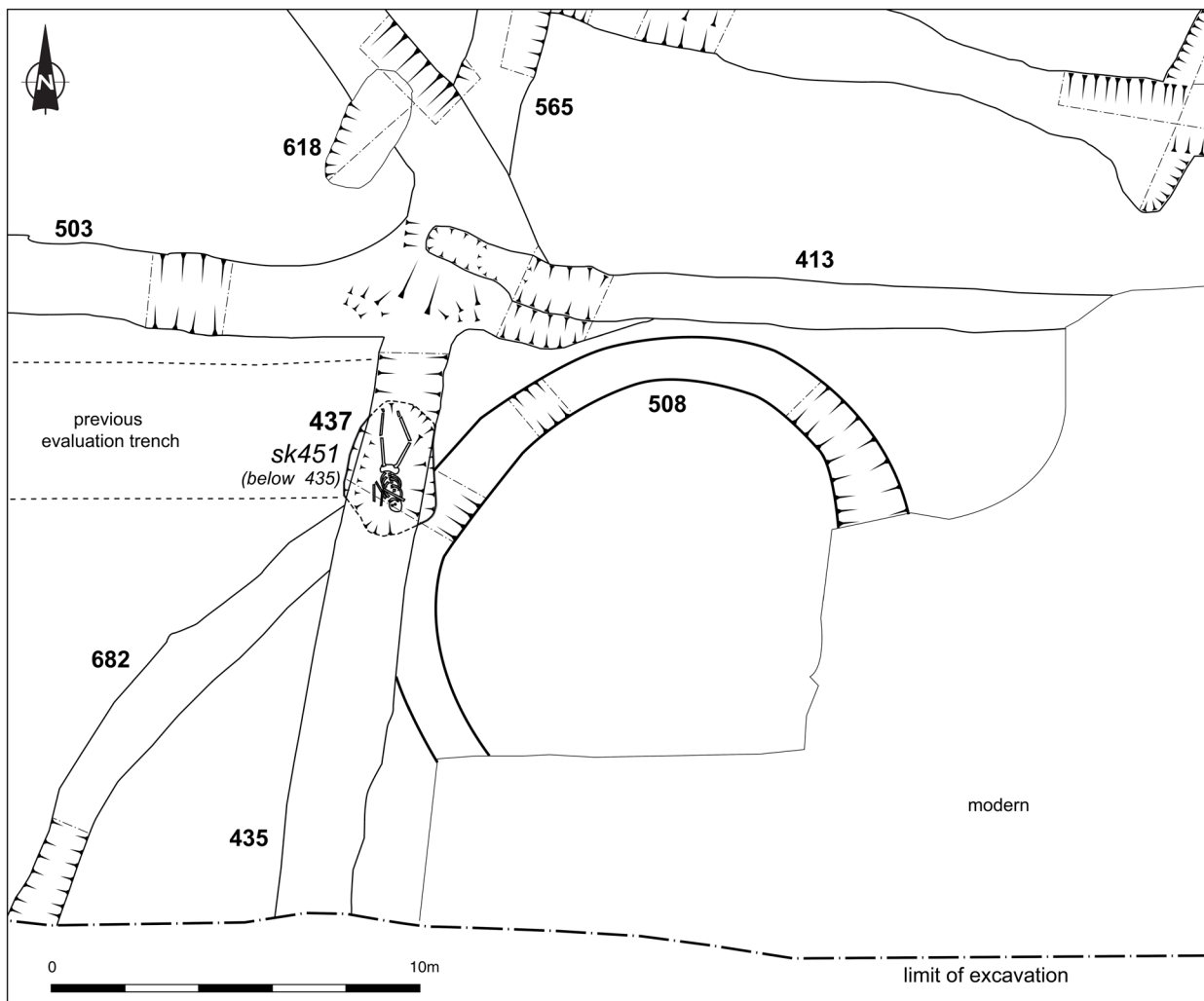
A number of features or groups of features were identified on site which either could not be directly linked with any of the main phases of activity or were found to predate them. These included a ring ditch enclosure and a series of unphased pits.

6.2 Ring ditch

The ring ditch (508) was situated towards the south-eastern corner of the site and had been partially destroyed by modern disturbance (Illus 6.1). What remained of this feature suggests that it may have originally been circular in plan (*c* 7.5m diameter externally), making it different in form

to any of the other ditches identified on site. The ditch measured *c* 0.7m wide by up to 0.6m deep and had sloping sides and a concave base. It had been cut by a Roman-period burial (437) which in turn had been cut by one of the field system ditches (435). There were no internal features which might have given an indication of the usage of this feature.

The stratigraphic sequence indicates that the ring ditch pre-dated the Roman-period burials but no absolute dates were obtained. Given the presence of Iron Age burials on the site, it is considered most likely to date to this period, but the presence of Grooved Ware within Midden Context 003 (Section 7.11) suggests that there was also activity on the site in the Neolithic period. The ring ditch can therefore only be broadly dated as prehistoric.



Illus 6.1 Plan of Ring Ditch 508 (copyright CFA Archaeology Ltd)

6.3 Unphased pits

Forty-five pits were identified that were not stratigraphically related to any other feature (Illus 2.2–2.3). It is thought that the majority of these are likely to relate to the Roman field system, but this cannot

be conclusively proven. Pit 265 produced numerous lithic artefacts and is thought to be Mesolithic in date (Clarke & Kirby forthcoming). Roman-period finds including pottery, iron and glass were recovered from ten of these pits, possibly suggesting that the majority of them are likely to be Roman in date.

7 ARTEFACTUAL EVIDENCE

7.1 Introduction

The site produced a large quantity of artefactual and ecofactual evidence. Finds predominantly came from midden-rich Context 003 and the ditches immediately underlying the midden deposits, but were also recovered from ditches associated with the field system, from some pits and from the burials (see Sections 3 and 4).

The strategy for dealing with such a large quantity of material was determined at assessment (Anderson 2011). It was clear that the best preserved and most intact finds of all types were recovered

from the large, but essentially unstratified, deposits which made up the midden. It was considered that the large assemblage from this layer was likely to represent rubbish discarded from the fort, and the study of this material in detail was of greatest value in providing information on the inhabitants and their material culture. The specialist analyses have been carried out with this aim in mind, and less emphasis has been placed on the scattered finds from other features (with the main exceptions of finds from the burials).

Context 003 was divided into 11 zones, each measuring 10m east to west by the full width of the investigated midden deposits (up to 18m) north

Table 7.1 Pottery from contexts other than C003. Key: NRFRC = National Roman Fabric Reference Collection (Tomber & Dore 1998); * = probably includes Rossington Bridge BB1

Fabric	NRFRC	Weight (kg)	Sherds
Samian		2.361	109
Mortaria		3.034	76
Amphorae		2.649	21
Fine wares			
Cologne colour-coated	KOL CC	0.035	9
Colchester colour-coated?	COL CC 2	0.005	1
Argonne colour-coated	ARG CC	0.009	3
Unsourced fine ware		0.001	1
Coarse wares			
Fine white ware		0.005	1
White ware		0.012	2
Severn Valley	SVW OX 2	0.031	2
Unsourced oxidised		0.095	11
Inveresk oxidised		2.114	78
Inveresk reduced		1.977	107
Inveresk cream		0.102	4
Grey ware with white core		0.151	9
Grey ware with pink core		0.084	4
BB1*	DOR BB 1	1.261	61
BB2	BB 2	2.044	153
East Anglian?		0.026	4
Shell-tempered		0.128	3
Unsourced reduced		0.410	34
Totals		16.534	693

Table 7.2 Pottery from C003. Key: NRFRC = National Roman Fabric Reference Collection (Tomber & Dore 1998)

Fabric	NRFRC	Weight (kg)	Sherds	EVE(%)
Samian		14.985	469	2193
Mortaria				
Newstead?		7.227	50	316
Scotland		2.204	18	102
Scotland or N England		2.026	31	167
Colchester		2.599	29	147
Verulamium	VER WH	0.162	1	8
Mancetter-Hartshill	MAH WH	0.069	1	14
Unsources		0.166	2	12
Amphorae				
Dressel20	BAT AM1	17.442	93	133
Gaulish amphorae 1	GAL AM1	1.890	36	72
North African amphora??	NAF AM	0.075	1	–
Normandy amphorae	NOM AM	0.159	1	27
Unsources amphorae		0.408	7	–
Unsources amphora lid		0.064	1	100
Fine wares				
Cologne colour-coated	KOL CC	0.086	11	34
Cologne colour-coated?		0.024	1	5
Argonne colour-coated	ARG CC	0.003	1	0
Colchester colour-coated?	COL CC2	0.010	2	0
Colchester red colour-coated		0.001	1	0
Upchurch reduced	UPC FR	0.093	5	20
Unsources fine wares (local?)		0.062	2	14
Coarse wares				
Fine white ware		0.022	2	0
White ware		0.050	1	17
Severn Valley	SVW OX2	0.209	2	0
Cream-slipped oxidised		0.014	1	0
Unsources oxidised		0.439	25	140
Inveresk oxidised		7.600	229	561
Inveresk reduced		5.412	152	599
Inveresk cream		0.240	7	68
Grey ware with white core		0.280	8	13
Grey ware with pink core		0.192	8	16

Fabric	NRFRC	Weight (kg)	Sherds	EVE(%)
BB1	DOR BB1	2.160	86	483
BB1 Rossington Bridge	ROS BB1	0.329	7	33
BB2	BB2	5.965	265	861
East Anglian?		0.219	5	65
Shell-tempered		0.125	6	0
Unsources reduced		1.275	52	64
Totals		74.286	1619	6284

to south. This was done in order to investigate the horizontal stratigraphy of the deposit. Due to a combination of the homogeneous nature of the deposit and the limited resources available, it was not investigated vertically. The context information referring to C003 zones is included in the following section in the form '003/x' where 'x' is the zone number.

7.2 Roman pottery

Alex Croom and Paul Bidwell, with contributions by Felicity C Wild, Kay Hartley and Eniko Hudak

The site produced 2,312 sherds of pottery, weighing 90.820kg. Nearly 60% came from Context 003, which was studied in detail. Catalogue entries include, in brackets, context and zone details and (where relevant) finds number (prefixed M, G or P).

Pottery from contexts other than the midden-rich Context 003 was quantified but not studied in detail. Table 7.1 presents the quantification by fabric.

7.2.1 Pottery from Context 003

This context produced 74.286kg of pottery, and was studied in detail (Table 7.2). The pottery was in very good condition, with many large-sized sherds.

The coarseware fabrics

Descriptions for the fabrics with National Reference Collection codes in Tables 7.1 and 7.2 can be found in Tomber & Dore 1998. Other fabrics are described below, or within the pottery catalogue.

► **Inveresk ware:**

The oxidised version of this ware was identified by V Swan, and has been described in some detail (Swan 1988). The most characteristic vessels in

this ware are quite chunky in appearance, being thick-walled and having heavy, thick bases. There is a preference for the bases of bowls and beakers to have a simple foot ring, often created by a wide groove (ibid: illus 20, nos 1.224, 1.233, 1.234; illus 21). The burnishing is often just in bands rather than continuous, and there is often an unburnished zone 10–20mm wide below the rim, either on the exterior or interior. It is noticeable that many bowls are not burnished at all on the interior, with some not even being smoothed but having the throwing lines left visible on the surface. On some vessels the lattice is almost incised rather than burnished, and others are poorly finished. There is the appearance that at least some of the vessels were made in a hurry, without much attention, or by competent but not very skilful potters.

The vessels are found in both oxidised and grey wares. There are at least two different fabrics, although there are many sherds that fall between the two extremes identified. There is a fine fabric, characterised by some common black inclusions, voids within the fabric and rare rounded quartz inclusions. The other fabric has plentiful, sometimes abundant, rounded quartz inclusions as well as the black inclusions, voids and often red inclusions. The fabric is micaceous, sometimes very micaceous, with silver mica plates visible on the surface.

There seems to have been little quality control over vessel colour. The colour range for both the grey and orange vessels is very varied, with light and dark grey finishes, and orange, buff and cream versions. There is one vessel which appears (from its fabric and a large dimple in its surface) to be a second, that has a thin cream wash, but this is generally very rare.

► **Inveresk ware (cream):**

Fabric as above, but cream or buff in colour, with a brown, black or grey exterior. This only makes up a very small proportion of the Inveresk ware on site. All the surviving vessels came from cooking pots.

► **Grey ware with white core:**

Fine, white fabric with very fine black inclusions and some voids, with dark grey surfaces, although some sherds have more quartz inclusions. A local product, with the same burnishing in bands and chunky vessels. Mainly cooking pots, although also some examples of flat-rimmed bowls.

► **Grey ware with pink core:**

Fine grey fabric, light or mid-grey, with wide pink or pink-buff core with indistinct edges. Some fine quartz inclusions; likely to be a local product. A range of vessels are found in this ware, including cooking pot, storage jar and lid.

► **BB1 Rossington Bridge:**

There was a small quantity of BB1 from Rossington Bridge, including a cooking pot (Illus 7.2, no. 26), a tankard, a flat-rimmed bowl, a second bowl with close-set lattice decoration, and the base of a third bowl or dish with scribbled decoration on the lower surface. This ware was distinguished from other forms of BB1 by its dark grey colouring and sometimes by the vessel type represented (Bidwell & Croom 2016).

► **East Anglian?:**

Fine, sandy grey ware, with abundant silver mica.

► **Shell-tempered:**

Grey fabric, sometimes with oxidised surface. Although sherds were found in a number of different contexts, they might all represent a single vessel (cat no. 43).

► **Fine white ware:**

Fine white fabric, with silver mica plates, scattered very fine black inclusions and numerous voids, some up to 2mm across. This is possibly an imported ware from Northern Gaul.

► **White ware:**

Slightly granular white fabric, with pink core. Probably an import.

► **Severn Valley ware:**

There were only a small number of sherds in this ware, all from storage jars. None illustrated.

► **Colchester red colour-coated ware:**

There is a single sherd from a very small rough-cast beaker (cf Symonds & Wade 1999: fig 5.31, nos 37–42). Not illustrated.

► **Cream-slipped oxidised ware:**

Hard orange fabric with a grey core and thick cream wash. A single body sherd from an *unguentarium*. Not illustrated.

Catalogue (Illus 7.1–7.3)

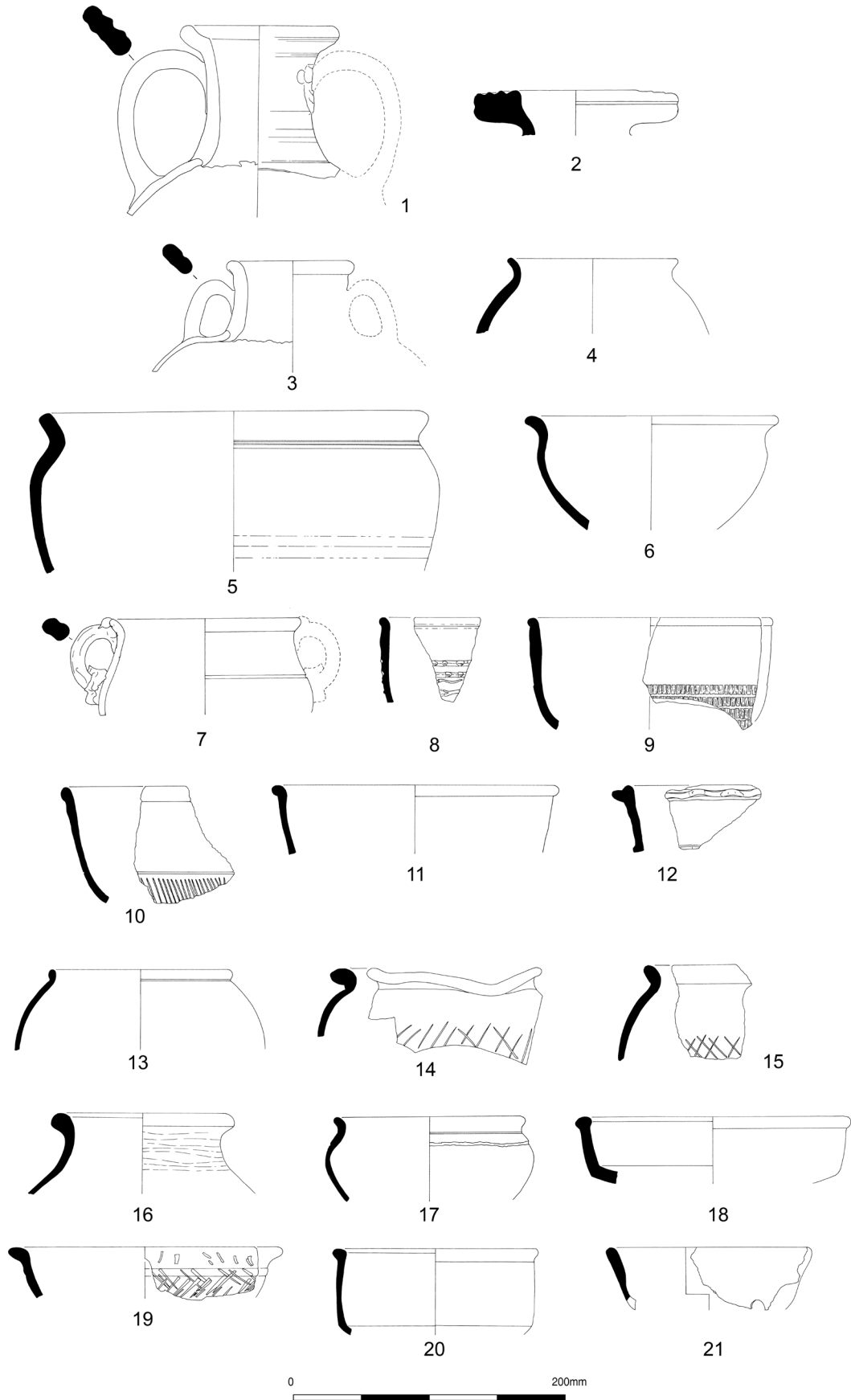
The entries include description, fabric and context number. C003 includes the relevant zone as the second part of the number.

Amphorae

1. Fine, hard, micaceous orange fabric with few inclusions. (003/5)
2. Fine, hard orange fabric, with plentiful fine white inclusions. Peacock & Williams 1991 Type 55 (Gauloise 12). NOM AM. (003/5)

Inveresk ware

3. Flagon. Discoloured through firing on the rim and handle. Fine. (003/11A)
4. Cooking pot, burnished on exterior. Orange fabric with thin brown wash. Sooting on exterior under the rim and onto the interior of the rim. (003/5A)
5. S-shaped bowl in a pale orange fabric. Burnished on exterior until just under the rim. There are a few burnished lines on the interior of the rim, but the rest of the interior is unburnished (003/5A). The S-shaped bowl is very characteristic of the ware (cf Swan 1988: illus 20, nos 1.83, 1.230; Dore 2004: fig 79, no. BO9, BO15)
6. S-shaped bowl in an orange fabric. Smoothed halfway up exterior with a red slip, interior not burnished. (003/2A)
7. Cauldron, with poorly formed attached pendant loop handle, and the only



Illus 7.1 Pottery: amphorae (1-2), Inveresk ware (3-12) and Inveresk grey ware (13-21) (copyright CFA Archaeology Ltd)

burnishing present on the top of the rim. The vessel is very roughly finished, particularly round the handle, while on the interior accidental incised marks have not been removed before firing. A small lump of clay has been added to the top of the handle to help attach it: cf no. 38. Fine. (003/11A)

8. Dr (Dragendorff) 37 imitation, two grooves with dot barbotine decoration over them, and tendril barbotine decoration on the body (cf Thomas 1988: 1:E9, illus 39, no. 1.235). This is the fifth barbotine-decorated bowl known from the site, while examples are also known from four sites on the Antonine Wall (Bidwell & Croom 2016). Well burnished on exterior; interior less well burnished in bands. Fine. (003/6A)
9. Dr 37 imitation. Burnished in bands above the rouletting and on the interior. Gritty. (003/10)
10. Dr 37 imitation. Burnished in bands above the rouletting, unburnished on interior. Cf Dore 2004: fig 79, no. BO14. Fine. (003/9)
11. Dr 37 imitation. Smoothed in bands on body, but with unburnished zone below rim. Unburnished interior. Buff-coloured fabric, darker brown where it has been smoothed and on the top of the rim. Fine. (003/5)
12. Tazza. Slight burning on rim. Cf Dore 2004: fig 85, no. BO55. Gritty. (003/10)

Inveresk grey ware

13. Cooking pot. Burnt on exterior, with surface spalling. Fine. (003/4)
14. 14. Cooking pot, with badly warped rim. Kiln second, if not waster. Gritty. (003/6A)
15. Cooking pot. Patchy burnishing on the shoulder until just under the rim; burnished in bands on the rim. Patches of sooting on the exterior. Fine. (003/5)
16. Narrow-mouthed jar. Burnished on

shoulder, with patchy lines of burnishing on the neck. Patchily burnished on interior of rim. Fine. (003/5)

17. Bowl. Burnished on exterior and rim. Gritty. (003/9)
18. Flat-rimmed dish. Burnished halfway up exterior, but not at all on the interior. Gritty. (003/5)
19. Flat-rimmed dish, in pale grey fabric. Burnished halfway up exterior, with rough burnished lattice that is almost incised, which continues up carelessly onto the underside of the rim. Interior burnished in bands. One patch of burning on the exterior. Fine. (003/5)
20. Flat-rimmed bowl. Burnished on exterior but not interior, which has visible throw lines. Fine. (003/5)
21. Cheese press with one damaged hole cut pre-firing near base of wall. There are sherds from at least three cheese presses on the site, in both oxidised and reduced wares. Fine. (003/5)

Inveresk cream ware

22. Jar. Cream fabric, burnished dark brown exterior and rim. Very gritty. (003/5)
23. Cooking pot. Highly micaceous pink fabric, brown interior surface. Brown exterior, burnished in bands, heavily sooted all over, including the interior of the rim. Gritty. (003/6)

Grey ware with white core

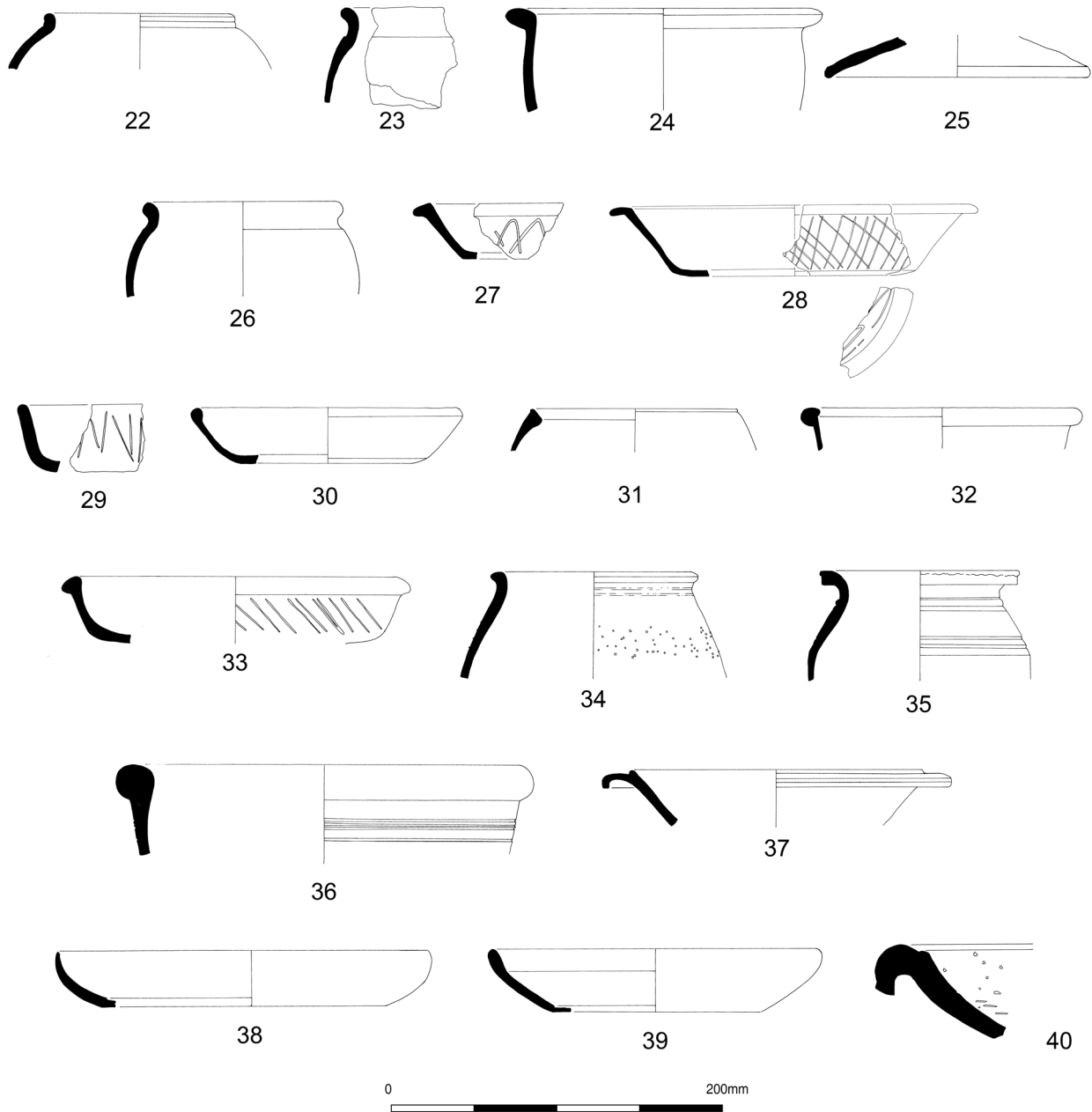
24. Flat-rimmed bowl. Patchily burnished on exterior and rim, and burnished in bands on the interior. (003/5)

Grey ware with pink core

25. Lid. (003/4A)

BB1

26. Cooking pot. Rossington Bridge fabric (003/5)
27. Flat-rimmed dish. (003/5)
28. Flat-rimmed bowl. (003/6)
29. Plain-rimmed bowl. (003/4)



Illus 7.2 Pottery: Inveresk creamware (22–3), grey ware (24–5), BB1 (26–9), BB2 (30–3) and other wares (34–40) (copyright CFA Archaeology Ltd)

BB2

- 30. Plain-rimmed dish, with high-quality burnish. (003/6)
- 31. Bead-rimmed cooking pot. Cf Dore 2004: fig 86, nos JA36–7. (003/5)
- 32. Triangular-rimmed dish. (003/5)
- 33. Rounded rim bowl/dish with lattice decoration. The rim forms slight bead on the interior. This is an extreme example of a feature found on some

BB2 bowls (cf Dore 2004: fig 84, no. BO29). (003/2–3)

Other wares

- 34. Thick-walled beaker in a fine cream fabric, with very fine red inclusions and rare larger soft red inclusions up to 1mm across. Clay rough-cast. Tan colour-coat on exterior and orange on the interior; there are patches of burning

on the exterior and a clearly defined band of burning on the interior of the rim. The rim has fine ridges caused by slight grooves on its underside, but is not a true cornice rim; the thick walls and the untidy finishing, including blobs of clay, under the rim suggest this might be a local product. (003/2)

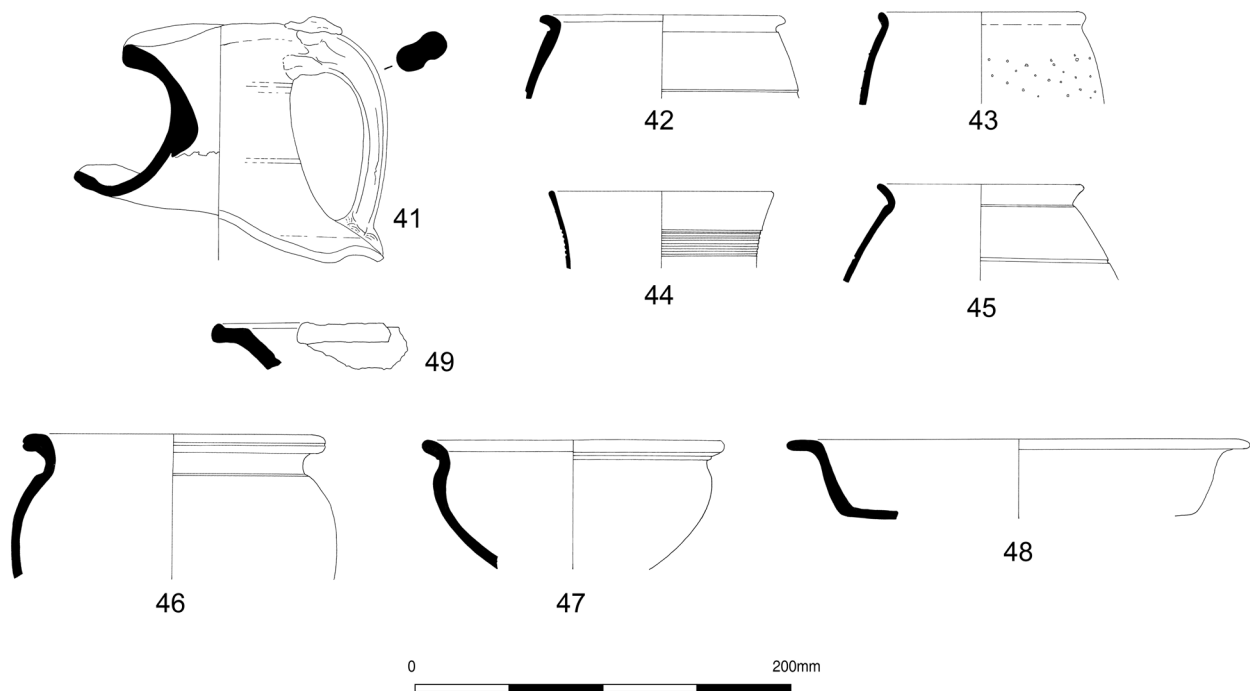
- 35. Jar. Pink granular fabric with a cream core and buff surfaces. Burnt in patches on the exterior and the rim, with some heavy sooting. (003/6)
- 36. Wide-mouthed bowl with bulbous rim. Sandy mid-grey fabric with thin pale grey margins and darker surfaces. Occasional large rounded white quartz and rounded black inclusions. (003/3)
- 37. Flanged bowl, with wide dark grey core, orange surfaces and the remains of a thick cream slip. Slightly micaceous, with fine red inclusions. (003/5)
- 38. A platter, with internal groove between base and wall. It has a mid-brown colour-coat on both interior and exterior, turning to dark brown on the

upper half of the exterior, which also has horizontal faceting from smoothing. The fine cream fabric has rare, very fine red inclusions and the very occasional piece of fine rounded quartz. The fabric and colour-coat look like Cologne colour-coated ware, and although only beakers in this ware have been found in Britain so far, this may be an example of a Cologne ware Pompeian red ware imitation. (003/4A)

- 39. Platter, with line of burning on exterior and just under the rim on the interior. (003/5)
- 40. Verulamium mortarium, AD 100–150. (003/4)

From contexts other than the midden

- 41. A kiln waster single-handed flagon. Distorted, burnt rim, and very distorted body. Not burnished. An extra strip of clay has been added to the rim where the handle joins it, and another piece has been added underneath the handle at the same point. This seems to be a characteristic method of reinforcing



Illus 7.3 Pottery: from contexts other than the midden (copyright CFA Archaeology Ltd)

- the handle attachment (cf no. 7 above). Inveresk (gritty oxidised). (515)
42. Cup with grooved decoration. Burnished on exterior, but not interior. Fine white ware. (547)
 43. Rough-cast beaker. Two burnished bands on shoulder. Inveresk (gritty oxidised), brownish in colour. (515)
 44. Poppy-head beaker in a sandy buff fabric, with wide grey core and dark grey exterior. Form as Dore 2004: fig 79, no. BK9. (1010, 1061)
 45. Poppy-head beaker in fine light grey fabric, with highly burnished exterior and rim. East Anglian? (TP5)
 46. Well-made cooking pot, with fine groove on outer edge of rim and groove on the body. Sooting on the exterior and rim, with thick limescale deposits on the oxidised interior surface. There is some pitting on the exterior surface, a feature noted on shell-tempered ware from Cramond (Holmes 2003: 86). Shell-tempered ware. (551)
 47. Bowl, roughly smoothed on lower half of body, leaving slight ridges on the surface, burnished on bands on the upper part. Interior not burnished. The whole of the interior is heavily sooted up to the rim, and there is a patch of sooting on the exterior. Inveresk (fine oxidised). (1176)
 48. Dish. Burnished on exterior and base; interior burnished in bands. Burnt along outer edge of the rim. Inveresk (gritty oxidised). (583)
 49. Dish in a highly micaceous, fine orange fabric with occasional soft brown inclusions up to 1mm across. There are the remains of a red slip on both exterior and interior. (2/2 cleaning)

7.2.2 The samian

Bowls and dishes are the most common type of vessel in C003, making up 80% of the samian

assemblage by EVEs, while cups only make up 15% (Table 7.3). This is in strong contrast with the assemblage from the Inveresk Gate excavations, where bowls and dishes make up only 55% and cups 44% (Table 7.3). Although a range of different bowl types are present, almost 60% of the samian vessels are examples of the Form 18/31 or 31 range of shallow dishes. The assemblage is not typical of that expected at a military or extramural site in that the number of decorated bowls is unusually low (12% compared to 27% for military sites and 38% for extramural sites: Willis 2005: table 45) while the number of dishes is approximately double what would be expected.

The decorated samian ware from Context 003 Felicity C Wild

The deposit produced 133 sherds of decorated ware from about 87 bowls, in a good state of preservation and mainly in fairly large pieces. The bulk of the material lay towards the centre of the deposit (003/4–6, 003/11). No decorated samian came from the outermost zones (003/1, 003/7–8). There were several instances where sherds apparently from the same bowls came from different zones, but in no case did they join. This, together with the size of the sherds, suggests that, once the material had been deposited, little or no further disturbance took place.

As might be expected, the assemblage was composed of the wares and potters typical of Antonine sites in Scotland. Central Gaulish ware made up about 75% of the assemblage (sherds from about 65 bowls); there was just over 3% (three bowls) from East Gaul, and a remarkable 22% (sherds from about 19 bowls) from South Gaul, most if not all likely to have been manufactured at Montans. In combination with the bowls from Inveresk already published (Dickinson 1988: 165 and fiche 1), this must certainly comprise the largest known group of 2nd-century South Gaulish ware from Scotland.

In the following report, arranged by source of manufacture, all the significant pieces have been described and illustrated. Some selection has been necessary. Ovolos without further decoration have been omitted unless they suggest the work of a potter not otherwise represented (eg 23 below), as have most of the smaller sherds by potters already

Table 7.3 Samian vessels from C003 and the Inveresk Gate site by EVEs, also shown as a percentage

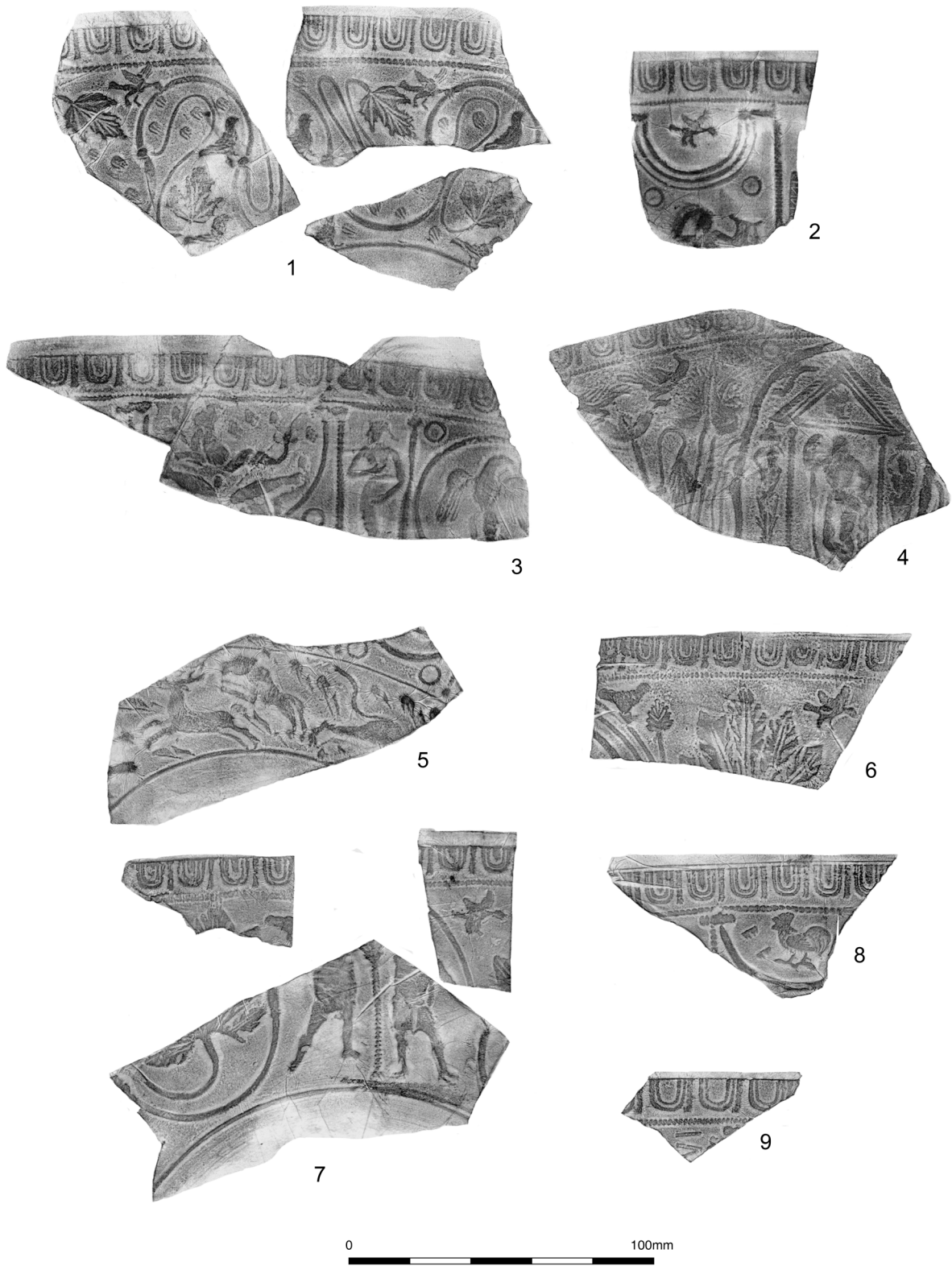
Vessel type	Context 003		Inveresk Gate	
	EVE	%	EVE	%
Cup				
27	97	3.6	453	20.1
33	215	9.8	379	16.8
46	23	1.0	120	5.3
O&P LV, 13	9	0.4		
Ludowici Tf			10	0.4
Cup			20	0.9
Beaker				
Dech 72			10	0.4
Dish				
18/31	1191	54.1	441	19.6
18/31R	no rims		156	6.9
18/31 or 31	58	2.6		
31	61	2.8	89	4.0
31R			31	1.4
35			123	5.5
36	44	2.0	9	0.4
Curle 15	113	5.1	8	0.4
Decorated bowl				
30	30	2.4		
30 or 37	38	1.7		
37	177	8.0	295	13.1
Bowl				
38	13	0.6	17	0.8
38 or 44			9	0.4
44	20	0.9	7	0.3
Curle 11			50	2.2
Unknown	108	4.9	23	1.0
Totals	2197		2250	

included. Figure types are quoted from Oswald 1936–7 (O.) and Rogers 1999 (R.); Central Gaulish decorative motifs are from Rogers 1974 (Rogers) and parallels from Stanfield & Simpson 1958 (S&S). Die numbers and potter numbers in lower case Roman numerals are from Hartley & Dickinson 2008–12; potter numbers in upper case Roman numerals are those used by Rogers (1999). The dates given for the

manufacture of the bowls are, where possible, based on the dates given in Hartley & Dickinson (2008–12) for the working lives of the various potters. All the bowls, throughout, are of Form 37.

Central Gaulish (Illus 7.4–7.5)

With the exception of four bowls by Cettus (nos 11–14), who worked at Les Martres-de-Veyre, the



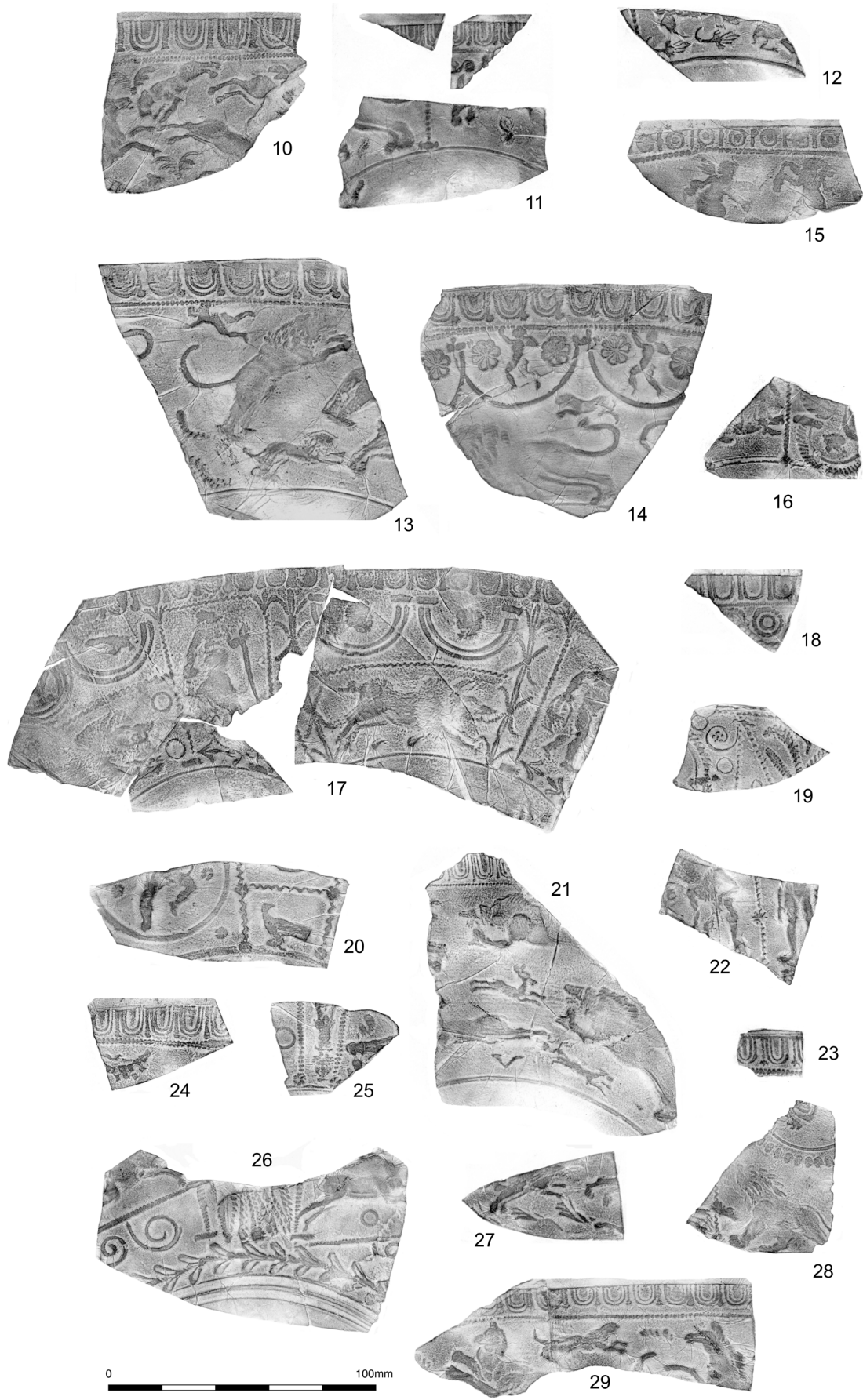
Illus 7.4 Pottery: Central Gaulish samian (copyright CFA Archaeology Ltd)

Central Gaulish ware was all likely to have come from Lezoux. As elsewhere in Scotland (Hartley 1972: 33), the work of Cinnamus ii and his associates predominated. Twenty-seven bowls in all (42% of the Central Gaulish ware) fell into this category. Of these, nine could be attributed with certainty to the Cerialis ii–Cinnamus ii style, with their ovolo Rogers B144, seven to Cinnamus' mature style, including ovolos B223 (four examples), B231 (one example) and B145 (two examples). A further 11 showed no ovolo, insufficient detail to distinguish between ovolos Rogers B144 and B143 (though B144 was in most cases the more likely), or simply showed leaf scroll or freestyle decoration with types and motifs typical of Cinnamus and related potters. Hartley & Dickinson (2008–12) date the Cerialis–Cinnamus style to *c* AD 135–160, Cinnamus' mature style to *c* AD 150–180. It may be worth noting that the ovolos B223, B231, B145 and the medium-sized mould stamp, die 5b (9 below), are all classed by Rogers (1999: 99) as belonging to Cinnamus' middle style, which he dates to *c* AD 142–160+. There seems no reason to think that any of this material necessarily arrived later than the mid-AD 150s.

Of the other Central Gaulish bowls, almost all are by potters whose work has previously been recorded in Scotland (Hartley 1972; Dickinson 1988 for Inveresk): Cettus (four bowls), Ianuaris ii/Paternus iii (at least three bowls), Criciro v or Divixtus i (small sherds, possibly from three), Albucius ii, Birrantus i, Illixo, Tetturo (two bowls), Paternus iv, X5 and X6. Rogers potter P16 (26 below) appears to have been related to Illixo. However, the sherd in the style of Libertus ii (15 below), a potter normally considered Trajanic–Hadrianic, appears to be a first for Scotland, and may suggest that his work continued later than previously thought. On the other hand, the bowl, which lacks crispness and detail, may have been made in an old and worn mould, or brought to the site as an heirloom or treasured possession.

1. Form 37. Four sherds of a bowl in classic Cerialis ii–Cinnamus ii style, with their ovolo (Rogers B144) and scroll with leaf (Rogers H99), birds (O.2315, O.2239B) and characteristic bud filling ornament (from Rogers J178). *c* AD 135–160. (003/6, 003/9)

2. Form 37. Two joining sherds of a bowl showing Cinnamus ii's tab stamp CINN[AMI] (ret.) in the decoration. The die (die 5d) is found exclusively, as here, with the ovolo Rogers B144, and belongs to the early period when Cinnamus worked with Cerialis ii. Decoration shows a panel with bird (O.2315) in triple medallion over Apollo (O.83). *c* AD 135–160. (003/3, 003/3A)
3. Form 37. Three joining sherds in Cerialis ii–Cinnamus ii style, with ovolo (Rogers B144) and panels showing festoon with sea bull (O.42) and fish (O.2412, O.2419), Venus (O.286), and medallion with eagle (O.2167). *c* AD 135–160. (003/4)
4. Form 37 in Cerialis ii–Cinnamus ii style, with their ovolo (Rogers B144) and scroll with leaves (Rogers H72, H101), birds (O.2295A, O.2250A) and acanthus (Rogers K12) in the upper concavity, and, in the lower, the pediment (Rogers U266) with mask, over Bacchus (O.580), with caryatids (O.1199) to each side. *c* AD 135–160. (003/9)
5. Form 37, showing a zone of panels containing festoons above freestyle decoration with the stag (O.1781), bear (O.1627) and panther (Rogers 1999: pl 32, 45). The types were all used by Cinnamus, as was the leaf-tip space filler (from Rogers H22), though the zonal decoration seems slightly unusual for him. *c* AD 135–160. (003/6)
6. Form 37. Two joining sherds of scroll bowl in Cerialis ii–Cinnamus ii style, with their ovolo (Rogers B144), birds (O.2239B, O.2315), small and large leaf (Rogers J99, H21). The fabric differs slightly from that of no. 7 below. *c* AD 135–160. (003/4A)
7. Form 37. Two sherds, including base with worn foot ring, of a bowl with scroll decoration, with the same leaf (Rogers H21) as 6 above, and the



Illus 7.5 Pottery: Central Gaulish samian (copyright CFA Archaeology Ltd)

- gladiators (O.1001, O.1002) in the lower concavity. Two small sherds from the same zone show the same leaf with the Cerialis–Cinnamus ovolo (Rogers B144) and birds (O.2239B, O.2315) and may come from the same bowl. The gladiators appear on a bowl from Castleford in the style of the Large S Potter (Dickinson & Hartley 2000: fig 35, 1015) and also on a bowl in Pugnus style together with a bead row ending in a trifold bud possibly similar to that used here (S&S: pl 154, 19). Whether or not the ovolo belongs to the same bowl, the date is likely to be Hadrianic–early Antonine. *c* AD 135–160. (003/2, 003/4)
8. Form 37, showing the Cerialis–Cinnamus ovolo (Rogers B144) and a panel containing single festoon with cock (O.2350), which occurs on a bowl in Cinnamus’ style from Castleford (Dickinson & Hartley 2000: fig 32, 1005). *c* AD 135–160. (003/4)
 9. Form 37, with Cinnamus ii’s ovolo (Rogers B223) and part of his medium-sized mould stamp [CINNA]MI (die 5b). *c* AD 150–180. (003/6)
 10. Form 37. Three joining sherds in the mature style of Cinnamus ii, with his ovolo (Rogers B145) and freestyle decoration with horseman (O.245), bear (O.1627), part of the panther (O.1512), stag (O.1720) and acanthus space filler (Rogers K26). *c* AD 150–180. (003/4A)
 11. Form 37. Three sherds, probably all from the same bowl, in the style of Cettus, with two of the sherds showing his characteristic small S motif (Rogers S72). The ovolo (Rogers B80) was used by him, as were the large and small lions (O.1450, O.1404), parts of which occur on the largest sherd. The squarish astragalus at the end of the bead row is characteristic of his style (S&S: pl 142, 27) and motifs occasionally occur, as here, beneath the decoration (S&S, pl 141, 4, 7). *c* AD 135–160. (003/3A)
 12. Form 37, showing panel with Cettus’ distinctive leaf (Rogers J144) and hare (O.2061). *c* AD 135–160. (003/4)
 13. Form 37, in the style of Cettus, with his ovolo (Rogers B263) and freestyle decoration with chevron (Rogers G392) as a filling ornament (S&S: pl 141, 16). The decoration, well spaced, shows his cupid (O.419), a lion to right (not in O.?), the tail of one to left (O.1450), small lion (O.1404) and the legs of a bear (O.1595) and ?boar (O.1641). *c* AD 135–160. (003/5)
 14. Form 37. Two joining sherds of bowl in the style of Cettus, with the same ovolo as 13 above and festoons with cupid (O.419) between two rosettes (Rogers C37) over the lion to left (O.1450), the tail of one to right (as on 13) and small panther (O.1570). *c* AD 135–160. (003/5)
 15. Form 37, showing the ovolo motif (Rogers B214) characteristic of Libertus ii and the cupids (O.339, O.497) assigned by Rogers to Libertus’ style B. Hartley & Dickinson (2008–12) comment that there is virtually no independent dating evidence for the work of Libertus and suggest, in view of the presence of his style at Corbridge, the furthest north that they note, that he may still have been active in the AD 120s or later, dating him to *c* AD 105–130. The presence of work in his style in a group from Antonine Scotland suggests that he could indeed have been working this late, though, as suggested above, this piece could have been an heirloom. (003/6)
 16. Form 37. The style is probably that of X5/Silvio II, who used the Victory (O.826) and festoon (Rogers F70) containing a small, indistinct mask (S&S: pl 67, 1). If this shows his characteristic ‘pine-cone’ border junction, it has been badly misapplied. *c* AD 120–145. (003/4)

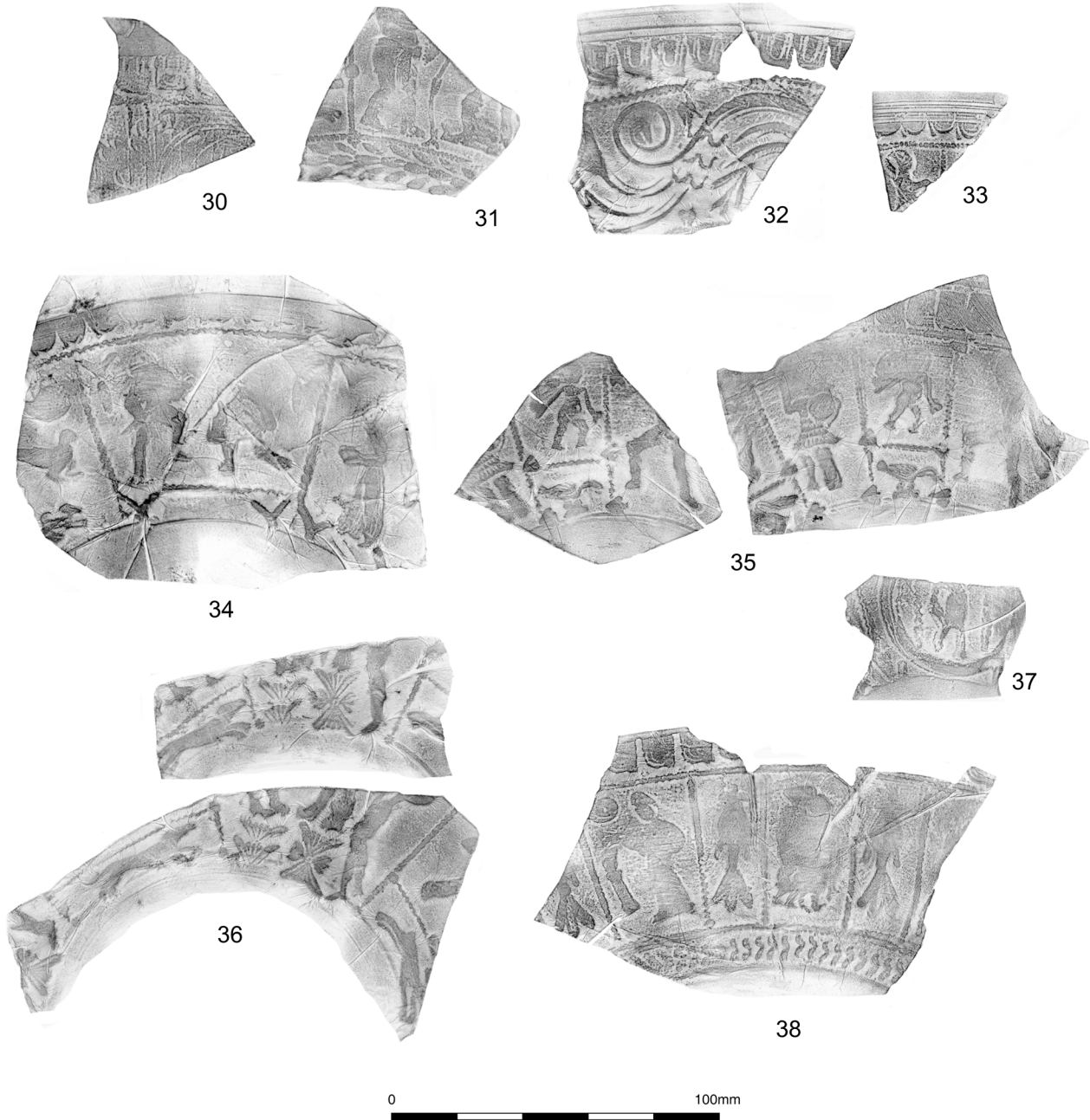
17. Form 37. Six joining sherds amounting to almost half the bowl, which had been fastened together with lead rivets, of which three remain, in a line across the base. There is part of a hole for a fourth rivet on a subsidiary break of a rim sherd. The style is that of the group of potters known as X6, with their ovolo (Rogers B35). Panel decoration shows, from left: two conjoined festoons containing a trifold bud and a goose (as on Rogers 1999: pl 135, 16) over the boar (R.4050); satyr with fruit (O.595); vertical rows of the trifold bud (Rogers G32) to either side of festoons containing masks (as on S&S: pl 75, 18) over the same boar. Most of the types and details are attributed by Rogers to his X.6B, apart from the ovolo, attributed to X.6C. A bowl from the Castleford Pottery Shop (Dickinson & Hartley 2000: fig 24, 474) shows the same vertical row of G32, and also the smaller bud (Rogers G97), which appears here beneath the satyr and on top of the borders. *c AD 125–150.* (003/10)
18. Form 37. The style is that of Birrantus i (Rogers' Birrantus II), who used the ovolo (Rogers B108) with finely-beaded borders and the beaded ring (Rogers C295, *cf* Rogers 1999: fig 12, 3). The only other Antonine site in Scotland to have produced work in this style appears to be Newstead (Hartley 1972: 30, note 93). *c AD 130–150.* (003/3A)
19. Form 37, in light-coloured, micaceous fabric with brown slip. Neat panel decoration shows part of an arcade and saltire with chevron ornament (probably Rogers G344). Of the potters who used this motif, the decoration is closest to a sherd attributed by Rogers to Secundinus III (Rogers 1999: pl 107, 16) which shows similar borders and a saltire with G344 in the upper compartment, though the dot rosette is different. That used here has five dots (Rogers C179) and was used by X6. No close parallels are forthcoming but a Hadrianic or possibly early Antonine date seems probable. (003/4)
20. Form 37, with panel decoration showing a pair of legs (possibly the cupid O.378?) in a medallion, and a bird (O.2297). The single medallion and wavy-line borders with rosettes (Rogers C120) placed at the junctions and as a filling ornament are characteristic of the work of Tetturo (S&S: pl 131, 2, 3), but neither of the types are attested for him in Rogers 1999 or S&S. However, comparatively little of his work is known. *c AD 130–160.* (003/6)
21. Form 37. Four joining sherds of a bowl with freestyle decoration in Ianuaris ii/Paternus iii style (Rogers' Ianuaris II/Paternus I). The ovolo (Rogers B228) was used by them, as were the bear (O.1617), stag (O.1732) and hound (O.1915A). The other animal is probably a hind (O.1816). The ovolo and chevron space filler appear on a stamped bowl, with different animals (Rogers 1999: pl 51, 14). *c AD 135–160.* (003/4)
22. Form 37, showing panel decoration with Vulcan (O.68) and figure standing on a mask (O.91). The style is that of Ianuaris ii/Paternus iii, who used the Vulcan, the leaf (Rogers J146) and the rosette (Rogers C194) across the bead row. O91 is not attested for them, but was used by Censorinus, a member of the later Paternus v group, of which Paternus iii may have been a predecessor (Wild 2005: 203). *c AD 135–160.* (003/3A)
23. Form 37. Small sherd showing Rogers' ovolo B17, used by Paternus iv. *c AD 130–150.* (003/2)
24. Form 37, showing the snake-on-rock motif (O.2155) used as a space filler by Criciro v and Attianus ii. The ovolo (Rogers B204) was also used by

- both potters. A date of *c* AD 125–155 probably covers the working life of both. (003/5)
25. Form 37, showing panels with caryatid (O.1199) used by Criciro v and Divixtus i. The motif at the end of the bead row and leaf-tip space filler are typical of Criciro (S&S: pl 117, 10). *c* AD 135–155. (003/5)
 26. Form 37. Three sherds showing panel decoration with an animal, probably a stag to left, over two spirals (Rogers S8, S3), a leaf-cross (Rogers L4) and a stag (?) to right (possibly O.1720) over the spiral S8. A bowl in the style of Rogers' potter P16 shows the leaf-cross, spirals and the same basal wreath of trifid buds (Rogers G154) over similar basal grooves (Rogers 1999: fig 84, 5). Although he notes no sherds from datable contexts, Rogers suggests a date of *c* AD 140–160, a suggestion borne out by the context of the present piece. (003/5)
 27. Form 37, showing freestyle decoration with the leaf-tip space filler used by Illixo (Rogers 1999: pl 48, 16). The only fairly complete type (a panther?) is not one attributed to him. *c* AD 145–165. (003/3A)
 28. Form 37, showing a festoon of large dots (Rogers F33) over the lion (O.1425). Both the lion and festoon were used by Illixo (cf Rogers 1999: pl 50, 24 for the festoon with inner line, there used as an arcade). Illixo used wavy-line borders, but there is no evidence that he used a rosette junction. *c* AD 145–165. (003/9)
 29. Form 37. Two joining sherds with freestyle decoration, with panther (O.1537), horse (O.1904) and small hound (O.1940). The style is that of Albucius ii, who used the ovolo (Rogers B107), types and leaf-tip space filler. *c* AD 145–175. (003/2)

South Gaulish (Illus 7.6–7.7)

The group of late South Gaulish ware is of particular interest and importance. A group of this size, which could not have reached the site before the early AD 140s, is perhaps still more important for the study and dating of late South Gaulish ware than for what it can say about consumption of samian ware at the site. With regard to Scotland, it may suggest that Inveresk was the point of import, from which the wares were distributed to the garrisons along the Antonine Wall and to other sites on the eastern side of Scotland. On 2nd-century South Gaulish ware, little systematic work has yet been done. This was recognised by Hartley (1972: 42), when he listed the sherds from Scotland, but without illustration, intending to publish them more fully elsewhere. Grace Simpson (1976) published a small but useful group from Montans itself, followed by a small collection from Wilderspool (Simpson 1987), but no synthetic work has appeared since then. References to the British examples are scattered. Much remains unpublished or without adequate illustration. We do not know for sure the sources of supply. Hartley (1972: 42, note 123) suggests the possibility of another late source in addition to Montans. To do full justice to the collection here would require a search for comparative pieces at Montans itself, as well as more detailed research on the British finds. In the meantime, one can but record and illustrate as fully as possible the range of wares present, as a basis for future research. In this task, I must express my gratitude to Geoffrey Dannell and Brenda Dickinson for allowing me to search the late Brian Hartley's archive of rubbings for parallels. Bowls without published reference are quoted from this source.

The bowls, all of Form 37, show various features which suggest manufacture at Montans. These include a double groove on the interior, below the rim, a characteristic elsewhere of Form 30, sometimes accompanied by fine grooving on the interior of the bowl as a whole. Some of the present bowls (nos 32, 33, 39, 42) also show shallow grooving on the outside of the rim, above the ovolo, possibly caused by careless finishing of the rim. There is sometimes a slight chamfer below the decoration, presumably caused during the finishing of the footring. The footring itself sometimes appears more similar to that of Form 29, with a groove beneath it and



Illus 7.6 Pottery: South Gaulish samian (copyright CFA Archaeology Ltd)

an internal potter's stamp. The present group has produced a base of this sort, stamped by Chresimus (stamp no. 6), though it appears to have been deliberately trimmed and therefore does not join any of the decorated sherds.

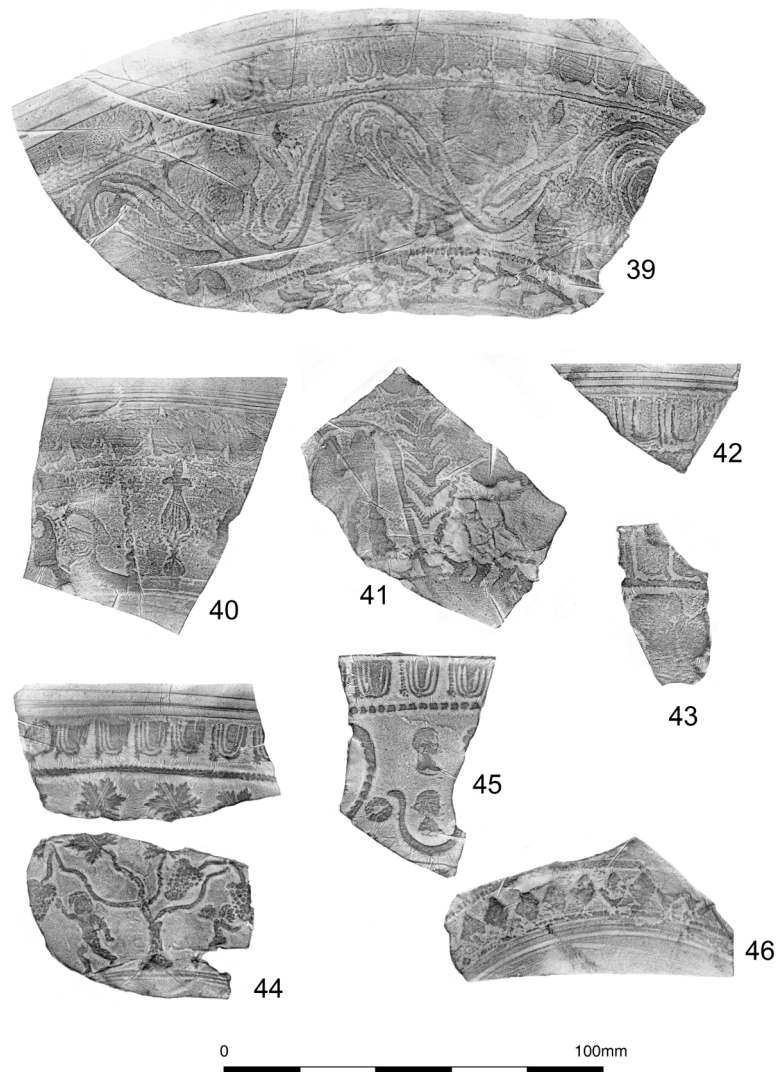
The decoration of late Montans bowls tends to be badly produced and poorly moulded. Types are copied from those of La Graufesenque by *surmoulage*, leading to lack of detail and a reduction in size. On some of the bowls (nos 34, 35), the clay has been well

pressed into the bottom of the mould, producing a firm impression of the lower part of the decoration, while on the upper part, the decoration, including the ovolo, is so faint as to be barely visible, making identification difficult, particularly of the ovolo. The bowls are not aesthetically pleasing. It is hard to see that they would have gained a market in competition with the contemporary products of Lezoux.

Few of the mould-makers signed their work. Hartley noted the occurrence in Scotland of the

stamped work of Chresimus and Felicio iv, along with Q.V.C., who did not make decorated ware. Potters with close associations with these potters and presumably of the same general date include Attilus iv, Malcio i, Florus iv and L.S. Cre-, though their stamps have not been found on Scottish sites. The present group of bowls falls within this general group. On the basis of their occurrence in Scotland, their manufacture has tended to be dated to *c* AD 110–145. Hartley & Dickinson (2008–12) put the dates slightly later for those potters whose stamps occur in Scotland, suggesting *c* AD 110–150 for Felicio iv and *c* AD 120–150 for Chresimus. Dates of manufacture are not suggested for the bowls here, as they will have arrived at the site not earlier than the AD 140s.

30. Form 37. Sherd of a very poorly impressed bowl with grooving inside. The squarish ovolo with single border was used by Felicio iv of Montans on a bowl from London (RGZM website, serial no. 2003196). The double borders are also a characteristic of Montans (Simpson 1987: fig 1, 2; fig 2, 6). The decoration is too poor to be identifiable. The circular marks appear to be scratches beneath the surface slip rather than part of the decoration. *c* AD 110–150. (003/2–3)
31. Form 37. Sherd of a very thick bowl in a fabric consistent with manufacture at Montans, showing panels containing an



Illus 7.7 Pottery: South and East Gaulish samian (copyright CFA Archaeology Ltd)

- animal type, and the satyr (O.609) and Bacchus with panther (O.565), with a vine with grapes between them. The types, common at La Graufesenque, are not significantly reduced in size. The basal wreath of buds, also common at La Graufesenque, was used on bowls by Florus iv (Mees 1995: taf 246, 1, 4), who appears to have migrated from La Graufesenque to Montans. Hartley & Dickinson (2008–12) date the working life of Florus iv to *c* AD 85–125. Simpson (1976: 269) dates his work at Montans to *c* AD 100–130. The potter and, indeed, the source of this piece are uncertain, but that work of this type appears here, in a purely Antonine group from Scotland, may suggest that it was still being produced at least into the AD 130s, unless perhaps it arrived as the treasured possession of one of the incoming inhabitants. (003/5)
32. Form 37. Four joining sherds of a small bowl with shallow grooves above the ovolo on the outside as well as two internal grooves below the rim. Decoration shows an untidy scroll with tendrils ending in a bud (Hermet 1934: pl 14, 50). The ovolo appears to be that used by Atillus iv on a bowl from Richborough (RGZM website, serial number 2003201). A similar untidy scroll, though with different motifs, occurs on a waster stamped by Atillus from Montans (Toulouse Museum). Another similar bowl, also from Montans, is stamped by a related potter LCRE (Simpson 1976: fig 4, 13). A bowl (*ibid*: fig 5, 15), with a stamp probably reading LSCRE and possibly the same ovolo, shows a tendril ending in a ‘degenerate arrowhead’ like the one here. Hartley & Dickinson (2008–12) doubt that this is the same potter as Chresimus, whose work is so well represented at Inveresk. (003/5)
33. Form 37. Rim sherd from a small bowl with grooves above the ovolo and on the interior of the rim. The ovolo is the same size and may be the same as that on a bowl from Kenchester (RGZM website, serial no. 2003200), though the detail is far clearer on the present sherd. The type, uncertain and lacking in detail, was presumably obtained by surmoulage. (003/5A)
34. Four joining sherds of a poorly made bowl with interior grooves and a slight chamfer below the decoration. Although little detail survives, particularly at the top of the bowl, the ovolo is probably the same as that on 33 above. Panels show a spiral, bird and small hound (O.1967), a pair of gladiators (versions of O.1043, 1044?) and a reduced version of the Victory (O.814). The Victory occurs on a bowl from Strageath with the split-tongued ovolo used by Chresimus and Malcio i, which also has chevrons in the field. The spiral is the same size as that appearing on another bowl, also from Strageath (Hartley 1989: fig 106, 34). (003/6)
35. Form 37. Two sherds showing panels with triangular junction motifs, a characteristic of Montans. Panels show reduced versions of La Graufesenque types: uncertain type over bird to left (O.2267 reduced), warrior (O.164A without spear), small figure with shield(?) over bird to right (O.2231 reduced) and reduced version of the warrior (O.992). A bowl from York with interior stamp of Chresimus shows the same ovolo with split tongue, O.992, birds and borders (RGZM website, serial no. 2003195). *c* AD 120–150. (003/6A, 003/11A)
36. Complete base of Form 37, of standard form and unstamped, with medium wear on the footring. The fabric is light-coloured, not inconsistent with Montans, and with a very matt orange-brown slip. The lower part of the decoration shows panels with types in use at La Graufesenque and Banassac,

- not significantly reduced: the hound (O.1927) and probably a gladiator over a hare (O.2072, also in use at Montans), interspersed with panels containing the legs and feet of uncertain types over a bud (Hermet 1934: pl 14, 84) by itself and arranged in a cross motif. No parallels are as yet forthcoming for this rather distinctive motif. The origin of the bowl must remain uncertain. (003/6A)
37. Form 37. Sherd from a small bowl with heavily worn footring. There is a slight groove beneath the base, as on Form 29. Poorly moulded decoration shows a vertical border ending in a heart-shaped leaf (?) and a medallion containing the satyr with grapes (O.597). Medallions with multiple lines, as here, were used at Montans (Simpson 1976: fig 4, 14, stamped by Attillus iv; fig 7, 32, with similar leaves/arrowheads in the panel corners). *c* AD 110–145. (003/6A)
38. Form 37. Four joining sherds of bowl with panel decoration. The ovolo is the same as that on the bowl from Strageath (Hartley 1989: D34), also probably on 32 above, though here it is spaced more evenly in the mould. The types, in shallow relief and lacking in detail, have clearly been produced by surmoulage. Panels show a composite motif of a bottle bud and trefoil alternating with a reduced version of the Venus at altar (Hermet 1934: pl 18, 21), a pair of figures (?) and, in the right hand panel, one of a pair of gladiators, all over a basal wreath of small chevrons. The spiral in the corner of the Venus panel is similar to that on the Strageath bowl, though smaller and the other way up. Two other bowls are known which are likely to have been from the same mould: one from Newstead (National Museum of Scotland), the other from recent excavations at Drapers' Gardens, London (D71 in Mills in prep). (003/11A)
39. Form 37. Large sherd of scroll bowl showing many of the characteristics of manufacture at Montans: fine grooving in the interior slip, two internal grooves below the rim, exterior grooving above the ovolo and a slight chamfer beneath the decoration. The ovolo and scroll are very poorly moulded. The ovolo appears to fit that on 32, 38 and the Strageath bowl (Hartley 1989: D34) for size, but is much more closely spaced, in some instances overlapping, and some impressions may show a trident tongue(?). Although obscured by shallow relief and lack of detail, the scroll may show the astragalus binding noted by Dickinson on a bowl from Inveresk (1988: 2.47), also noted by her at Wilderspool and on a bowl stamped by Malcio i from Montans. The trifid bud occurs on a scroll bowl, probably from Montans, with the stamp of the otherwise unknown potter Privatus vii, in a style with similarities to that of Attillus iv (cf Simpson 1976: fig 4, 14). (003/11–10)
40. Form 37, with panel decoration in low relief and types lacking in detail and reduced in size through surmoulage. There are two interior grooves below the rim. The ovolo appears similar to, though may be slightly larger than, that on the bowl from Kenchester (RGZM website, 2003200) which has similar borders and small rosettes in the panel corners. Panels contain the gladiator (O.1008 reduced) and a bottle bud motif. The gladiator occurs on a bowl from Richborough signed by Florus iv (Simpson 1976: fig 2, 6; Mees 1995: taf 246, 4), the bottle bud on the bowl from Strageath with the split-tongued ovolo used by Chresimus and Malcio i (see 34 above), which also has similar borders and rosettes. (003/11–10)
41. Form 37, in a fabric more similar to that of La Graufesenque, with a glossy slip, but with reduced types lacking

in detail. The ovolo, with tongue to right, is too indistinct to be identified in detail. Decoration shows an arcade containing the satyr with hare (O.602 reduced), which also occurs on the Kenchester bowl, a vertical row of toothed chevrons, the legs of an animal type and a basal wreath of smaller chevrons. (003/11–10)

42. Form 37. Rim sherd of a fairly small, thin bowl, rim Diam *c* 18cm, showing the split-tongued ovolo and internal and external grooves characteristic of Montans. The ovolo was used by Malcio i and Chresimus and occurs on bowls with stamps of Chresimus from Manchester (RGZM website, serial no. 2003194) and York (*ibid*, serial no. 2003195). (003/9)
43. Form 37. Small, worn scrap showing a degraded version of the same ovolo as 42 above, with a reduced version of the warrior (O.992), which also occurs on 35 above and the Chresimus bowl from Manchester. (003/9)

East Gaulish (Illus 7.7)

44. Form 37. Two small joining sherds in the style of Satto and Saturninus of Chémery-Faulquemont, showing their vine and cupids (O.430A, O.405) (Fölzer 1913: taf V). A rim sherd from a similar, probably the same, bowl shows their ovolo (Fölzer 1913: taf XXVII, 276) and a row of the same vine leaves. Although the occasional sherd has been found in later contexts in Britain, these potters were the main suppliers to the Saalburg Erdkastell, and their main output clearly took place in the Hadrianic–early Antonine period, *c* AD 120–160. (003/2, 003/11A)
45. Form 37, from Blickweiler, in the distinctive style of the Potter of the Small Ovolo (Knorr & Sprater 1927: taf 50, 1–3), with beaded festoon and smaller plain festoon (*ibid*: taf 82, 10, 11), rosette and bust (*ibid*: taf 77, 16).

Knorr & Sprater suggest a date for this style of *c* AD 130–145, a suggestion borne out by the location of the present sherd in Scotland. (003/5)

46. Form 37, probably East Gaulish. Base sherd of a thick bowl in orange fabric with very smooth orange slip, showing a worn and poorly impressed basal wreath of vertical trifold buds between rows of squarish beads. The buds appear similar to Ricken 1934 (taf XII, 16), associated with ovolo C at Lavoye, though slightly smaller. However, no examples are forthcoming of the bud used like this. The fabric suggests origin at a pottery such as Lavoye and an early Antonine date. (003/4)

Conclusion

On historical grounds, the arrival of the samian ware on site cannot have taken place before the early AD 140s. The work of fully Antonine potters, such as Albucius ii and Cinnamus ii, in his mature style, is present, but only in small quantities. One bowl (17 above), with worn footstand, had been broken in half and repaired, but this was the only case of repair noted. Comparatively few foot rings are present from which to gauge the degree of wear, but it is perhaps worth recording that of three found in the same zone (003/6A), two, both from South Gaul (36, 37 above) showed moderate and heavy wear respectively, while the third, in Cinnamus' style, was unworn. This may be merely coincidence, but could be added evidence to suggest that the deposit was laid down no later than *c* AD 155–160. This closely dated group of samian is important, not just for Antonine Scotland, but for the dating and contemporaneity of the various wares involved.

The samian stamps

Alex Croom and Eniko Hudak

All but one of the stamps came from C003. The identifications with die numbers are taken from Hartley & Dickinson 2008–12.

1. Form 33, stamped CARANIIN ← by Carantinus of Lezoux. Die 5b. AD 150–180. Previous examples of this stamp have been found at Inveresk (Dickinson 1988: 2.66–7). (003/6, P9)

- 2–8. Chresmius of Montans, AD 125–50.
Previous examples of vessels by this potter are known from Inveresk *vicus* (Dickinson 2004: 104, nos 1–2; 119, no. 2).
2. Form 18/31, stamped CRESIMI. Die 4a. Graffito no. 34. (003/8–9, P10)
 3. Form 18/31, stamped]ESIMI, Die 4a. Graffito no. 13. (003/10, P11)
 4. Form 18/31, stamped CRESIMI. Die 4b. (003/9, P18)
 5. Form 18/31, stamped CRISIMI. Die 4d. (003/6, P8)
 6. Form 18/31, stamped CR[]MI. Die 4d. (003/10–11, P20)
 7. Form 18/31, stamped CR[. (003/8, P25)
 8. Form 18/31, stamped]MI. Probably Die 4d. Graffito no. 25. (003/10–11, P12) 9–10. Cinnamus: see decorated ware nos 2 and 9.
 11. Form 18/31, stamped CV[. (003/1 soil strip, P1)
 12. Form 18/31, stamped ERICI•M, by Ericus of Lezoux. Die 1b. AD 135–60. Graffito no. 36. (003/9, P16)
 13. Form 18/31, stamped GNATI•M, by Gnatius ii of Les Martres-de-Veyre and Lezoux. Die 1a. AD 125–55. Graffito no. 35. (003/11, P14)
 14. Form 18/31, stamped GONGI•M, by Gongius of ?Lezoux. Die 2a. AD 145–75. Graffito no. 6. (003/3A, P13)
 15. Bowl, stamped]CRINV, by Macrinus ii of Lezoux, Die 4a. AD 120–50. (003/10, P19)
 16. Form 18/31, stamped M[]LIACI, by Malliacus of Lezoux. Possibly die 3h. AD 140–75. Graffito no. 3. (003/6A, P15)
 - 17–19. Suobnus of Les Martres-de-Veyre. AD 130–55.
Previous examples of vessels by this potter are known from Inveresk *vicus* (Dickinson 2004: 104, no. 8).
 17. Form 31, stamped SVOBNI•M. (003/6, P7)
 18. Form 18/31, stamped S[]OBNI•M. (003/5, P27)
 19. Form 18/31R, stamped SVOBNI•A. Graffito no. 16. (003/3A, P2)
 - 20–21. Q. V-C- of Montans, AD 120–45.
Two previous vessels by this potter have been found at Inveresk *vicus* (Dickinson 2004: 104, no. 9).
 20. Form 27, stamped Q•VC. (003/4, P3)
 21. Cup, stamped Q. V. C. (003/6A, P17)
 22. Form 27, stamped VIRONIM. Vironius (cf Camelon: Hartley 1972: 17). (003/11A, P23)
 23. Form 18/31, stamped M[. (003/5A, P4)
 24. Cup, stamped]ANI. (547, P24)
 25. Form 18/31, stamped]M. (003/5A, P5)
 26. Form 18/31, stamped]M. (003/5A, P6)
 27. Form 18/31, illegible. (003/11, P21)
 28. Form 27, illegible. (003/11, P22)

7.2.3 The mortaria

Table 7.4 shows the fabrics and quantities of all mortaria recovered from the site.

Fabrics

► **Newstead?:**

See stamps nos 1–8. The fabric is generally orange-brown, with ill-sorted moderate inclusions of fine quartz, some angular hard black inclusions and sometimes fairly frequent soft opaque white inclusions up to 2mm across. Cream streaks are often visible within the fabric. There can be a cream wash, sometimes thick, with noticeable mica plates within it. Trituration grits are medium-rounded grey, red and black pebbles and rounded and angular white quartz. There is a second, less common, cream fabric (see stamp no. 4).

► **Scotland:**

See stamp no. 9. This category also includes other fabrics probably from a number of different sources.

► **Scotland or northern England:**

See stamps nos 10–12 and 14. There are three

Table 7.4 Mortaria from the whole site

Fabric	Weight (kg)	Sherds	EVE (%)
Newstead?	8.076	55	392
Scotland	2.279	21	107
Scotland or N. England	3.192	39	196
Northern	0.007	1	
Colchester/Kent	3.506	87	196
Verulamium (VER WH)	0.162	1	8
Mancetter-Hartshill (MAH WH)	0.099	2	14
Un sourced	0.166	2	12
Totals	17.487	208	925

different fabrics for Docilis, two orange and one white. The first fabric is a fine orange fabric, with a slightly soapy feel. Moderate, fine inclusions such as quartz, with occasional angular red-brown fragments up to 3mm across, and sometimes cream streaks within the fabric. There is a thin cream slip with visible mica plates and ill-sorted trituration grits of red and brown pebbles and white quartz (stamps nos 10–11). The second fabric has a gritty feel, with plentiful small quartz inclusions with occasional larger opaque white or black fragments in the orange fabric. The trituration grits are mainly grey and black pebbles and white quartz (no. 12; see also no. 14). The third fabric is white, with fine quartz and red-brown inclusions, with trituration grits of white and pink quartz, with a few angular fragments of red pebbles (no stamped examples).

► **Northern England:**

See stamp no. 13.

► **Colchester/Kent:**

See stamps nos 16–18. There are two fabrics present: one buff or cream with a thick pink core, with flint and white and pink quartz inclusions; and the other a dark buff or cream colour with trituration grits of flint and opaque white quartz.

The stamped mortaria

Kay Hartley

The stamps on 1–6 are all retrograde and are on six different mortaria, all with stamps of the same

potter, whose namestamps read EMI and whose counterstamps read FEC with a small vertical bar before the F. This potter often impressed his stamps twice to each side of the spout and sometimes used them indiscriminately. EMI is presumably an abbreviation for some such name as Emius (not recorded) or Emianus; while FEC is an abbreviated form of *'fecit'* (made it).

While the stamps above prove the presence of six of his mortaria it is clear that many of the unstamped fragments from these excavations are from other mortaria of his for which the stamps have not survived, including the spouts from four further vessels. Up to nine other stamped mortaria of his have previously been recorded from Inveresk, making a total of up to 15 mortaria (Hartley 1988: fiche 1:F2 no. 3 (1.30), Phase 2, Antonine 1; Hartley 2004: 106–14, nos 2, 11, 18, 19?, 35). Other mortaria of his are known from Ardoch (up to 3); Balmuildy (3); Bothwellhaugh (1–2); Camelon (up to 6); Carriden (Bailey 1997, 587, no. 9); Castledykes (2); Cramond (2); Newstead (up to 9); Old Kilpatrick (2–3); and Rough Castle. All stamps from these dies have been recorded only from Scotland and all are from sites north of Newstead. There is evidence from surface finds to indicate pottery production in the vicinity of Newstead and it is highly probable that Emi.. and other potters had a workshop there in the Antonine period. Emi.. had access to more than one type of clay, and the large numbers of his mortaria at Musselburgh make it worth considering the possibility of production there.

Stamps 7 and 8 are from two different mortaria. They are from the single die of a potter whose complete stamps read BRIGIA[.], which is probably an abbreviation for a longer name. Most of his stamps have been in poor condition, but those on nos 7 and 8 are unusually clear and no. 8 is the best-preserved example to date. It is worth noting that the end of the letter panel is fitted around the second leg of the A. This is a very unusual feature; Hartley 1976 (fig 1, no. 2) gives the best published representation of this stamp, but is inaccurate at this point.

His mortaria are now known from: Camelon (3); Lyne (Christison 1901: 184, misread as SR); Inveresk (2) and Newstead (2). Although he has far fewer stamps than Emi., his work is similar in fabric, form and distribution (see Hartley 1976: fig 2) and it is likely that he was active in the same workshop in the Antonine period.

Stamp 9 is the die of the potter Invomandus, usually represented by stamps showing the long form of his name.

His mortaria are now known from Camelon; Inveresk (3); and Newstead. His fabric and distribution, limited as it is, is similar to that of Emi. and Brigia., but the unusual lettering in his stamp differs. The rim of no. 9 has a wide, shallow profile with a sharp vertical change of angle at the distal end of the flange; one other unpublished mortarium from Inveresk (FR 167) is closely similar, but from a different vessel, while the mortarium from Camelon (Hartley 1976: fig 2, no. 13) is generally similar. These types differ from those produced by Emi. and Brigia.. It is certainly possible that Invomandus worked in the same workshop, but the difference in his work suggests that he did not learn his potting techniques with them. It is worth noting that although the spout does not survive, it is clear that much less clay was added to form the spout than was usual at this period; as a result there is little if any distortion of the rim profile. Antonine.

Nos 10–12 are three different mortaria stamped with the same die. At least four other stamps from the same die are also known from previous excavations at Inveresk (Hartley 2004: 108, no. 10 and fig 78, no. 10; 112, no. 40 and fig 78, no. 40; in both examples the illustrations are not accurate); Thomas 1988: microfiche 1:E1, no. 2 and illus 44, no. 1.257); and unpublished (Hartley archive no. 16NK). This makes up to a total of seven mortaria

from Inveresk, all with stamps from the same die, which is the second of the two stamp-types represented in the waste pottery found at the kiln-site at Fisher Street, Carlisle (Hartley 2012: fig 10, nos 21–2).

Docilis 3 is used as an umbrella term for up to 13 dies used in workshops known to have existed at Wilderspool (Hartley & Webster 1973), Walton-le-Dale (Evans et al in prep) and Fisher Street, Carlisle (Hartley 2012), and it is possible that the 'Docilis 3 firm' was also active in Antonine Scotland. We do not know to what extent these workshops overlapped in date or were purely consecutive except that there is reason to suppose that most of the activity at Carlisle is likely to have post-dated most of the productions at Wilderspool and Walton (see stamp D·I·S/L·D·B from Southern Lanes, Carlisle: Hird & Brooks in prep). Docilis 1 and 2 refer to stamp-types used at Wroxeter by a potter who is considered to have initiated the Docilis activity in north-western England (ibid) referred to as Docilis 3. There is evidence from the workshop sites and from distribution to indicate which die-types were in use at the different workshops.

The distribution of mortaria stamped with the same die as the Inveresk mortaria is now as follows, in Scotland: Balmuldy; Camelon; Carzield (1–2); Inveresk (up to 7); Newstead; and in England from: Cardurnock (1–2); Carlisle (*c* 23); Chester; Chesters; Corbridge (2); Hardknott; Old Penrith; Stanwix; Watercrock.

The distribution of all of his work shows that Docilis 3 mortaria were made at Wilderspool, but there is every indication that their production there was minimal. There is much more evidence for their production at Walton, but the overwhelming evidence from fabric and distribution is for production at Carlisle. From the evidence available, we can reasonably assume that the die in question was never used at Wilderspool; no stamps from it are known from Walton-le-Dale though it could, of course, have been used without any having survived on the excavated site. Re-examination of the fabrics of the mortaria from south of Old Penrith could verify the sources of those stamps since the Walton and Carlisle fabrics and usually the Wilderspool fabric are distinctive. The outsider in the distribution of stamps from the die in question is the stamp at Chester, and re-examination and analysis should

reveal its source. At the moment, origin at Walton seems the more likely for that. Currently the most likely scenario seems to be that the die may have been used at Walton, but that it was used mainly at Carlisle. The extent of pottery production in Scotland in the Antonine period together with the relatively large number of his mortaria there (especially from this die), and the fact that he was so involved in production at multiple subsidiary workshops, make activity in Scotland a serious possibility (see Hartley 2012 for further discussion of this).

The Carlisle workshop which Docilis 3 was part of was set up within the period AD 110–20 and the production continued into the Antonine period; there is a distinct possibility that some of his Antonine production was in Scotland, perhaps in the vicinity of Newstead.

Minucius' stamps (no. 13) are always associated with small, neat vessels which resemble segmental bowls rather than the average mortarium made in northern England and Scotland. The neat little stamp with its beautifully made lettering is also highly unusual; there are few other potters who had dies which are in any way reminiscent of this; they include the northern potters Mascellio (Birley & Gillam 1948: no. 37) and Coertinus (ibid: no. 12). Nevertheless, the distribution of his stamps suggests that he was working in north-eastern England, Corbridge being a possible source. His fabric is normally a sandy, greyish- to buff-cream, as here. There is no reason to doubt that his work is primarily if not solely Antonine.

Stamps nos 16 and 17 are from mortaria which are superficially similar in form, but detailed examination tends to confirm that they are from two different vessels rather than being complementary stamps from the same mortarium. There are slight differences in the fabric, that of no. 17 appears to be the more compacted; there is also a distinctive demarcation on the outside of no. 17 at the junction between rim and body which does not appear on no. 16. Another stamp from the same die has also been recorded from Inveresk (Thomas 1988: microfiche 1:G1, illus 43, 1.41) and this appears to be on another mortarium indicating three mortaria from Inveresk with the same uncommon herringbone stamp.

Mortaria with the same stamp are now known in Scotland from Inveresk (2); and in England from: Canterbury (2, Williams 1947: 87, no. 1 in Pit 4

and fig 8, no. 14); Dover (Philp 1981: 203, no. 364); Greenhithe, Kent (Detsicas 1966: 180, no. 213); Ham Saltings, near Upchurch in Kent; and Richborough. This distribution is typical for mortaria with herringbone stamps, which were produced in Kent. Kilns have been found in Canterbury, where similar mortaria were being fired (Webster 1940; Jenkins 1960) and the whole production could well have been based there. In fabric, rim profiles, and the use of herringbone-type stamps, the Kentish production mirrors the much larger one in Colchester (Hull 1963), of which it was probably an offshoot. Antonine Scotland and to a lesser extent north-eastern England formed the major market for the Colchester mortaria (ibid: 114–16; Symonds & Wade 1999: 205/209), but those made in Kent did reach Scotland, probably transported along with BB2 ware, by the same coastal traffic. The production of the herringbone mortaria was within the period AD 130–70 and its floruit coincided largely with the Antonine occupation of Scotland.

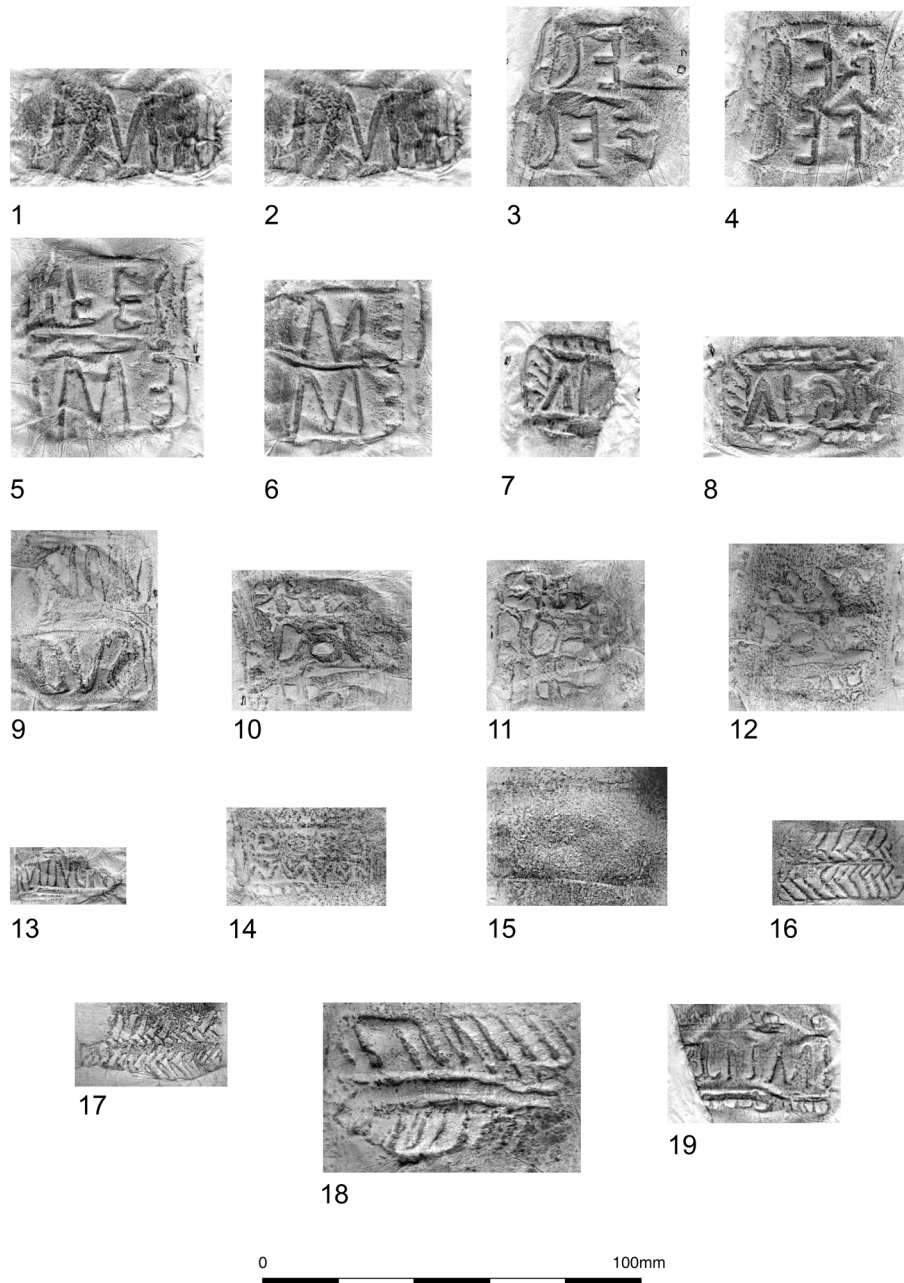
Mortaria of Similis 1 (no. 19) are now recorded in Scotland from: Balmuildy; Inveresk; Newstead; and Old Kilpatrick (2–3) and at least 35 stamps of his are known from sites in England, excluding his kiln-site. His mortaria from sites in Scotland show that he was active in the Antonine period, but his rim profiles and spouts suggest that his production began somewhat earlier, *c* AD 130/135. A date within the period AD 130–60 is indicated.

Similis 1 could be the same potter as Similis 2, who began working in these potteries but later moved to the Lower Nene valley (Upex forthcoming). The mortaria of Similis 2 are marginally later than those of Similis 1 and the stamps differ in type so they are treated separately for convenience.

Catalogue (Illus 7.8)

When the state of wear is not mentioned, the sherd is broken too high for it to be ascertained.

1. Small rim fragment with poorly impressed stamp reading [.]M[.]. Remains of cream wash. (003/4, M4)
2. Flange fragment with slight burning, with incomplete stamp reading [.]M[.]. Thick cream wash. (003/5, M8)
3. An almost complete section from a mortarium with the two left-facing



Illus 7.8 Pottery: mortaria stamps (copyright CFA Archaeology Ltd)

stamps impressed close together, both reading FEC. The fabric is very hard-fired, slightly darker than the norm and the slip a dull, dark red-brown. It is just short of being a second. The original surface of the clay is intact and one can be reasonably certain that it has never been used. The fine inclusions are more plentiful than usual, with prominent opaque white fragments up to 5mm across (003, 10–11, M11)

4. A mortarium in drab cream fabric with the two left-facing stamps impressed close together, both reading FEC. Well-worn. The fabric includes frequent fine red inclusions and the small, well-sorted trituration grits include a high proportion of red and pink pebbles and white quartz. (003/11, M13)
5. Almost half of the upper part of a mortarium with two nearly complete

- left-facing stamps impressed close together, one reading EMI, the other FEC, with a short vertical bar before the F; the stamps are impressed inversely to each other. Some burning on the inside and on part of the flange, and well-worn. There are patches of red-brown paint, notably on parts of the spout and on the bottom of the flange, but they are too slight for useful interpretation. There is a small graffito, post-cocturam, near the bottom of the flange, which may read IXI; this is likely to be an owner's mark. Prominent cream streaks within the fabric; slightly soapy feel. (003/6A and 11A, M14)
6. A mortarium with two left-facing stamps reading EMI, impressed close to each other and parts of the letters of a right-facing stamp, which would have read FEC when complete. This was probably the first of a pair to match those on the left side. Some blackening on the end of the flange probably occurred during firing. Cream wash. (878, M19)
 7. Incomplete rim-section with cracking underneath at junction of flange and body. The broken, right-facing stamp reads [...]IA retrograde; the A has a small diagonal dash instead of a bar, barely visible in this example. Thin cream wash. (003/6A, M9)
 8. Two joining sherds giving more than a quarter of the upper half of a mortarium with a right-facing stamp reading [...] IGIA, retrograde; the A has a thin diagonal dash instead of a horizontal bar; the tail of an R is visible before the I. Worn. Thick cream wash. Fewer inclusions than usual, small in size. (003/10–11, M12)
 9. This mortarium has cracking halfway down the internal surface, which probably developed at a weak point in the wall after sale, although it is, of course, the sort of cracking one might expect in a second or waster. The full section does not survive, but the inside surface of the sherd is intact, suggesting that any wear would have been in the centre base. This potter, Invomandus, always tried to stamp the whole of his long name by impressing each end of his die close together across the rim. On all known examples of his work where sufficient survives, he employed the same technique, but only one example is known where he succeeded in impressing the full name, from Newstead (Curle 1911: fig 35, no. 14) which reads INVOM in the upper impression and ANDVS in the lower impression (S reversed, while the O is triangular). On no. 9 the potter has made two attempts at stamping the beginning of the name with the result that the O overlaps the V on this rim; if that is ignored the impressions read from left to right, [...] OM and [...]DVS. There are only four of his mortaria which are complete enough to have both parts of his name present, but it is, nevertheless, interesting that he never made the mistake of impressing the same part of his name twice. Hard orange fabric, with moderate angular red and black inclusions and some fine rounded quartz. Highly micaceous, thick cream wash. Few visible trituration grits, but included rounded, multi-coloured pebbles and quartz. (003/4, M5)
 10. One sherd from a mortarium with right-facing stamp from a die of Docilis 3. Some wear. (003/5, M7)
 11. One sherd from a mortarium with a stamp from the same die of Docilis 3. (643, M15)
 12. One sherd from a mortarium with right-facing stamp from the same die of Docilis 3. The internal surface has been eroded. The fabric differs significantly from that of no. 10 and no. 11 and there is a raetian slip on the upper surface of the flange, extending to the bottom of the bead; there is also a slight concavity below the bead, of the type

- normal in raetian mortaria. Docilis 3 did not make raetian mortaria, but he was active in workshops where they were made, eg Wilderspool, Walton-le-Dale and Carlisle, and there remains the possibility of further activity in Scotland (Hartley & Webster 1973; Hartley 2012; Evans et al in prep). This example was certainly not made at Wilderspool or Walton. It is a result of some 'cross-fertilisation', an occurrence which was surprisingly rare given the proximity of production. (003/8, M10)
13. A flange fragment with broken stamp reading MINC[, with fragments of the following IV. This is from a die which gives MINCIVSF when complete, but the second part of the N is slightly splayed and the potter's name may be Minucius rather than Mincius; the name is followed by F for *'fecit'*. His mortaria have now been found at the following sites: Corbridge (1–2, Birley & Gillam 1948: no. 42) and High Rochester in Northumberland, and, in Scotland, from: Camelon; Inveresk (1–2, the previous find is from St Michael's Kirk graveyard); and Newstead (1–2, Curle 1911: fig 35, no. 18). (780, M16)
 14. A heavily worn mortarium perhaps in the same fabric as no. 12. The outer part of the surface of the flange is badly eroded and this has affected the two-line stamp. There is no other example recorded of the stamp and its exact reading or interpretation is unclear. It could well be an illegible or even illiterate stamp, but that cannot be assumed until further, clearer examples are found. If it were to be attributed to a potter it would probably be Docilis 3; it is possible to interpret it as DOCC retrograde on one line though the third letter could be an S; there is no way that one could treat this as a certain attribution and only the discovery of clearer stamps can clarify the reading. The mortarium profile is not one which Docilis favoured, but the similarity of fabric to no. 12 suggests that it was made in a workshop used by Docilis 3. The rim profile fits with a date in the Hadrianic–Antonine period. Pale orange fabric, very gritty fabric with fine quartz inclusions, few visible trituration grits but include some rounded red pebbles. (003/4, M6)
 15. This worn mortarium has, like no. 14, suffered from some erosion on the upper surface of the flange, but the 'stamp' is clearly a mock stamp made by making incisions across the flange to mark the edges of the 'stamp'. Examples of this practice are not common but one is certainly known from Carlisle (English Street, 8.03; unpublished, Tullie House Museum). This mortarium has some concentric scoring on the inside which suggests that it is more likely to be Hadrianic than Antonine. Pinkish-orange fabric with moderate inclusions or rounded quartz and some angular black and red pieces. There are the remains of a thin cream wash. (003/3, M3)
 16. A well-worn mortarium with left-facing herringbone stamp of unusual type. Buff fabric. (Cleaning, M18)
 17. A well-worn mortarium with black staining on the inside surface. The broken stamp is from the same die as the stamp on no. 16. Buff fabric. (780, M17)
 18. A sherd from a worn mortarium with right-facing, herringbone-type stamp. This stamp has been positively matched only once, in an unpublished stamp from Canterbury (16 WS 78; 1083; 107), and the mortarium may have been made there rather than at Colchester. Cream fabric with pink core (003/3, M2)
 19. A flange fragment with a left-facing broken stamp, which when complete, reads SIMILIS retrograde, with *lambda* L; the first S has not been impressed and

the break comes through the final S. This is from one of at least 12 dies used by Similis 1; at least 13 of his stamps were recovered from a kiln apparently used by Sarrius, in the Warwickshire pottery-making site adjoining *Manduessedum* (unpublished) and several more were found elsewhere on the site. A fully impressed stamp from a different, but similar, die can be seen in Hartley 1997: fig 371, no. 3372). (003/2–3, M1)

Discussion of the mortaria

The assemblage is dominated by mortaria made in Scotland (Table 7.5), and especially the probable production site near Newstead, with at least 12 vessels of Emi.. and Brigia.. Scottish mortaria make up 59% of the assemblage, in contrast to previous excavations where they have made up only 15% or 21%. Previously it has been vessels from Colchester/Kent that were the most common type (56% and 38%), followed by Scotland and then northern England (Hartley 2004: 124). The assemblage is

also noticeable for the complete absence of any Rhineland mortaria, which had previously made up 10% and 4% of the assemblages recovered.

7.2.4 The amphorae

As is usual on British sites, Dressel 20 from southern Spain is the most common type represented, making up 88% by weight and 71% by sherd count (Table 7.6). This is a lower figure than for the amphorae recovered during the Inveresk Gate excavations, where they made up 97% by weight (Dore 2004: 106), and is noticeably lower than some other sites. At Bearsden, Dressel 20 made up 99.5% by sherd count and 97.5% by weight, and even at Cramond, also situated on the east coast, it apparently made up 100% (Fitzpatrick 2016; Holmes 2003: 47; a single sherd of Gaulish amphora has been found in recent excavations in the barracks).

The second most common source is Gaul, making up 26% of the total by sherd count, representing a number of different vessels. This is the most common source for wine in the Antonine period (Fitzpatrick 2003: 63). There are two rims, one of which comes from a furrowed-rim Gauloise 12 from

Table 7.5 Mortaria from other excavations at Inveresk, shown as a percentage (2012 = current excavations, by weight; 1988 = Hartley 1988, by vessel count; 2004 = Hartley 2004, by vessel count)

Fabric	2012 (as a % of 17.487kg by weight)	1988 (as a % of the vessel count of 48)	2004 (as a % of the vessel count of 30)
Newstead?	46.2	–	–
Scotland	13.0	14.6	20.7
Scotland or N England	18.3	8.3	17.2
Northern	0.0	–	–
Carlisle area	–	4.2	–
Corbridge	–	2.1	–
Colchester/Kent	20.0	56.2	37.9
Verulamium (VER WH)	0.9	–	6.9
Mancetter-Hartshill	0.6	2.1	3.4
Lincoln	–	4.2	–
Wroxeter	–	4.2	–
Rhineland	–	4.2	10.3
Brampton	–	–	3.4
Un sourced	0.9	–	–

Table 7.6 Amphorae from the whole site

Fabric		Weight (kg)	Sherds	EVE (%)
Dressel 20	BAT AM 1	20.060	113	168
Gaulish amphorae 1	GAL AM 1	1.921	37	72
North African amphora??	NAF AM	0.075	1	–
Normandy amphorae	NOM AM	0.159	1	27
Un sourced amphorae		0.408	7	–
Amphora lid		0.064	1	100
Totals		22.687	160	367

Normandy. This is only the third site in Scotland known to have produced this type of amphora; so far a large part of a single vessel has been found at the native site at Carlungie I, Angus, and sherds from at least two vessels are known from Carpow (Fitzpatrick 2003: fig 5). This type of amphora has a limited distribution in Britain, being found only on a low number of sites in the south and east (Tyers 1996: fig 70), although sherds have now been recognised at a further six sites in north Britain (Bidwell & McBride 2010: 112–14). Many may have been distributed during the 3rd century, but the presence of this example in the midden deposit at Inveresk indicates some at least were reaching Britain in the middle of the 2nd century.

The range of other types of amphora is larger than that recovered from previous excavations, but other than the Gaulish amphorae, most are represented only by individual sherds, such as a fragment from a hollow spike in a lime-rich, pale orange fabric with slightly darker surfaces without visible quartz inclusions (003/8), and a body sherd in a granular red fabric with limestone inclusions and a patchy cream exterior (003/6A). Fabrics with limestone inclusions are typical of North African amphorae, and this sherd is similar in appearance to North African amphorae from later contexts in northern Britain. Given the small size of the piece, it is difficult to be certain whether the Inveresk sherd is from North Africa, although such amphorae are known in southern Britain from 2nd-century contexts (Tyers 1996: 104). There is also a complete amphora lid that has had an off-centre hole roughly cut through it, removing most of the knob (003/cleaning).

The site has previously also produced a late Haltern 70 variant, probably carrying grape syrup or preserved olives from Spain (Thomas 1988: M1:E1, no. 1.19). It has the ‘furrowed’ rim form (Carreras Monfort 2003: fig 2), but has the off-white slip of the later Ver 1908 type that remained current until sometime in the period 125–50 (Sealey 2003: 94). The presence of this example at Inveresk suggests production of the later developments of the Haltern 70 continued until the early Antonine period.

7.2.5 Discussion

The assemblage from C003 is notable because of the large quantity of samian, which makes up 28% by weight and 31% by sherd count (37% by EVEs). In contrast, the samian from the rest of the site only makes up 17% by weight and 16% by sherd count, and only 5% from the 1998 Inveresk Gate excavations (Dore 2004: fig 71). The quantity of samian in C003 is approximately three times what would be expected from an assemblage on a military site (10.7%, or 9.9% for an extramural site: Willis 2005: table 32). The samian is also distinguished by the high proportion with graffiti, including not just letters or marks on the underside but also names written out in full on the outside of the vessel. There were 31 vessels with graffiti from C003, and only four from contexts other than C003. Almost all were on samian vessels; there was one on a mortarium, one on an amphora, and none at all on coarse wares (see Section 7.3 below). There are few sites where a detailed comparison can be made, but at Wallsend fort there is one graffito for every 266 sherds of samian, or 350% of EVEs, in comparison with

C003, where there is one graffito for every 16 sherds, or 73% of EVEs.

Inveresk ware makes up 25% of the assemblage; when looking just at the coarse wares, it makes up 53%, followed by BB2 at 24% and BB1 at 10%. Although there is a range of other fabrics present, none were important sources of pottery, with most making up less than 1% each of the coarse wares brought to the site. These proportions are similar in the contexts on the rest of the site.

Swan noted the very wide range of forms made in Inveresk ware (1988: 167), to which can be added jug, narrow-mouthed jar, cauldron, cheese press and tazza (Table 7.7). There is also a single mortarium that is remarkably like some of the bowls, having a similar chunky footring and patchy horizontal burnishing on the exterior (003/9, base only), although it should be noted that K Hartley has found no evidence of mortarium manufacture in the local area (Hartley 2004: 114). There are also further examples of wasters and seconds (eg nos 14, 38; Illus 7.1–7.2). Despite the varied range of forms being made there were no examples of vessels made in a North African tradition, either in Inveresk ware or any other ware. This is in contrast to local pottery production at sites on the Antonine Wall, where North African tradition vessels often formed a recognisable component, even if generally small, of the local repertoire (Swan 1999: 405).

The pottery from C003 is noticeable for the low numbers of cooking pots, approximately half what

would be expected from a 2nd-century assemblage, where 35–45% is more typical (Bidwell & Croom 2016), although the figure from the assemblage from the 1998 excavations at Inveresk Gate was also relatively low at 26%. The quantity of storage jars is small when compared to the 1998 excavations, where they made up 11% of the group, but in this case it is the 1998 figure that is unusual, as a very low figure for storage jars is more typical.

7.3 Graffiti

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These graffiti were all made *after* firing, and thus relate to the ownership or use of the vessel. They are all on samian, except for one, which is on an amphora. Nineteen have been illustrated (Illus 7.9–7.10): the amphora, the samian Personal Names (i) complete or restorable, and three typical Marks of Identification, a ‘star’ (no. 34), a large ‘cross’ (P16) and a small ‘cross’ (P14).

7.3.1 Amphora (Illus 7.9)

1. Rim sherd of a south-Spanish oil amphora (Dressel 20), incised with two graffiti. (G28, site cleaning)

(i) In the upper surface of the rim:
[...]MI

Although notes of capacity are quite often found here, this would be much too small (see below), so it is presumably the end of the owner’s name in the genitive case: ‘(property) of [...]mus *or* [...]mius’.

(ii) Just below the rim where it curves into the neck, and inverted in respect of the vessel: VII S V[...], (*modii*) VII *s(emis) (sextarii) V[...]*. ‘Seven (and) a half *modii*, five [*or six, or seven*] *sextarii*.’

A note of capacity, expressed as usual in *modii* [each of 8.754 litres] and *sextarii*, of which there were 16 to the *modius*. Most notes of capacity for Dressel 20 range from seven to eight *modii*, with or without a fraction: see *RIB* II.6, 2494, and the note on p 33.

Table 7.7 Vessel types from C003 only

Vessel type	EVE(%)	as %
Flagon	248	4.1
Drinking vessels	457	7.6
Small jar	12	0.2
Bowl/dish	3306	55.2
Cooking pot	969	16.2
Storage jar	132	2.2
Mortarium	766	12.8
Lid	41	0.7
Cheese press	19	0.3
Tazza	37	0.6
Total	5987	

7.3.2 Samian

The other graffiti are all on samian vessels, most of them Form 18/31. They have been ordered into Personal Names (i) complete or restorable (in alphabetic sequence); Personal Names (ii) uninterpreted; and Marks of Identification, intersecting lines forming a 'star' or 'cross'.

Some of the names are commonplace Roman cognomina (*Candidus*, *Primus*, *Publius*, etc.), like *Crescens* and *Victor*, which have already been found at Inveresk (Tomlin 2008: 372, no. 5 and *RIB* II.7, 2501.610 respectively), but four are of special interest: *Deciba(l)us*, which is Thracian and may be specifically Dacian; *Drigissa*, which is Thracian; *Fradegus* (or *Fradegius*), which is unknown; and *[I]ulius La[...]*, which identified a Roman citizen.

The question of whether anything can be deduced from these names about the garrison of Inveresk is discussed below, in connection with *Deciba(l)us* (Graffito no. 5).

Personal Names (i), complete or restorable (Illus 7.9)

2. *Candidus*. Base sherd of a bowl. Scratched in bold capitals on the outer wall just above the foot ring: CCANDIDI, C{c}andidi. '(Property) of Candidus'. (003/11, G22)

The first two letters are incomplete, but their remains are almost identical, consisting of a diagonal foot curving at the end; this suggests a rather angular C. Since there is just enough space to the left to see them as the beginning of the graffito, it seems that the initial letter was written twice. The third letter has also lost its top, but can be read as a rather narrow A. This reading CCA is confirmed by the sequence which follows: *Candidus* is a common cognomen. Only the bottom survives of the final letter, which is either A or I. Although *Candidi* (genitive) is the most likely reading, *Candida* (feminine) and even *Candidi[anus]* are possible.

3. *Ce[...]*. Base sherd of Form 18/31. Scratched underneath in elongated capitals: CE. (003/6A, P15)

The owner's name, abbreviated to its first two letters. There are many possibilities, the most likely being *Celer*, *Celsus*, *Censorinus*, *Cerialis* and *Certus*. Graffito no. 4 may be another version of this abbreviation.

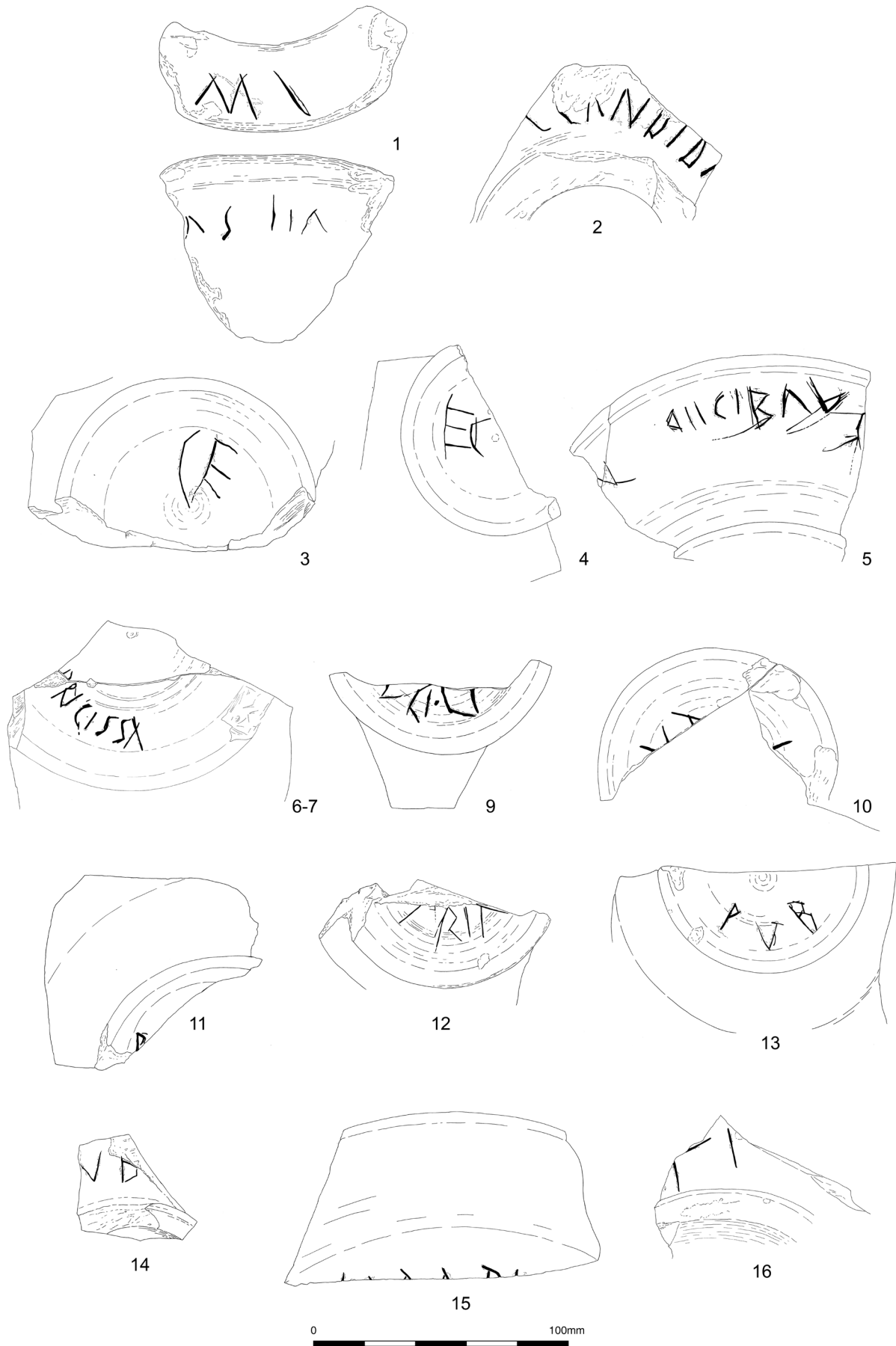
4. *Ce[...]* again(?). Three conjoining sherds preserving the base and profile of Curle 15. Scratched underneath, within the foot ring: E. To its right is a second, smaller letter, apparently C overlying a vertical stroke. It is hardly a reversed D. So read: EC. (003/5, G12)

Almost no names begin with *Ec-*, and those that do are very rare, so EC is unlikely to be an abbreviated name. But since E with its exaggeratedly long vertical resembles that in the previous item (P15), and may be by the same hand, the graffito is perhaps a garbled version of the same 'signature', CE.

5. *Decibalus*. Sherd preserving the profile of Form 18/31, with a small rim sherd conjoining. Scratched on the outside wall below the rim, in irregular capitals: DIICIBLVS. (003/11A, G18)

D is scratched as a small triangle, its left angle overlaid by a curving stroke, as if D has been reversed; this may be under the influence of the cursive form (a diagonal stroke with a loop to the left), but is more likely to be sub-literate. II is for E, as often in capital-letter graffiti. A is 'open' (without a cross-stroke). S is now broken, but enough remains of its down-stroke and tail to be certain of the reading. It was presumably the last letter, but this cannot be determined visually.

The name is evidently *Deciba(l)us*. The omission of L cannot be explained phonetically, and is presumably an error of writing, perhaps due to confusing L with V, both letters being made with a down-stroke and a second (up)stroke at an angle.



Illus 7.9 Graffiti: personal names (copyright CFA Archaeology Ltd)

The name *Decibalus* (also written *Decebalus*) is noted by Detschew (1957) as Thracian; further examples from Thrace and the lower Danube frontier have been discovered since, notably Flavius Decebalus, veteran of Legion I Italica in 222/35 (Kolendo & Bozilova 1997, no. 82). As the editors note, although it was famously the name of the last king of Dacia, by the 3rd century it had become part of the Thracian name-stock. Even in the Antonine period, therefore, a man named *Decibalus* is not necessarily Dacian, although it is suggestive that the first British instance comes from Birdoswald (*RIB* 1920), the station of *cohors I Aelia Dacorum*. The other British instance occurs on a samian vessel from Hadrian's Wall, but probably not from Birdoswald itself (*RIB* II.7, 2501.156 with note).

The assemblage includes another Thracian name, *Drigissa* (see below). We can only guess at how he and Decibalus came to Britain. It is tempting to see them as Dacians, founder-members of *cohors I Aelia Dacorum*, assuming it to have been raised by Hadrian, as its title *Aelia* would suggest, but this may well be a battle honour granted to a unit actually raised by Trajan (the alternative preferred by Jarrett in *Britannia* 25 (1994: 46)). In any case, the military diploma of 127 (*RMD* IV: 240), since it was issued to a Dacian who served in *cohors II Lingonum* in Britain, shows that we cannot deduce the presence of a Dacian cohort from the Thracian names *Decibalus* and *Drigissa*, even if they were actually borne by Dacians, which is far from certain.

The other epigraphic evidence from Inveresk is inconclusive. The tombstone of the trooper Crescens (Tomlin 2008: 372, no. 5) names the *ala Sebosiana*, but since he was an *eques singularis*, he may have been there on detached service

(a question discussed *ibid*, no. 12). A centurion of the Twentieth Legion is also attested in a position of authority (Tomlin 2011: 441–4, nos 5 and 6), but it is uncertain whether he was commanding legionaries (as suggested by the graffito G21, *[I]ulius La[...]*), or was the acting-commander (*praepositus*) of an auxiliary unit.

To the left of the graffito, and entirely detached from it, is part of another graffito probably by another hand, consisting of two and probably three strokes. It is probably part of the name of another owner, but too little remains to be sure of the letter(s) or even which way up it should be read.

- 6–7. *Drigissa*. Two conjoining base sherds of Form 18/31R. Scratched underneath within the foot ring: DRIGISSA. (003/3A, G2/P13)

Part of the D has been lost in the break between the sherds, where the surface broke away, and there is not enough space to the left to confirm visually that it is the first letter; but this name is already attested (see below), so the graffito must be complete. The third letter is identified as G, not C, by a diagonal stroke across its foot. The letters are of capital form, but A is 'open' (without cross-stroke).

The name is Thracian: Detschew (1957) cites *CIL* iii 14507, a33 (Viminacium), in which it is borne by a legionary veteran from Ratiaria who enlisted in 169 and was discharged in 195: T(itus) Aur(elius) Drigissa Rat(iariis); and (in a variant spelling) *AE* 1903, 249, a tombstone from the Danube frontier: Aurel(ius) Drigisa Aur(eli) f(ilius). In the garbled form *Drilgisa* it also occurs at Rome (*CIL* vi 1801).

8. *Fradegus*. Base sherd, probably of Form 18/31. Scratched on the outer wall, just above the foot ring: FRADEGI. (003/10, G17)

The graffito is complete, except that all but the first two letters have lost their very tops in the break; but there is no reason to doubt the reading. F is made in cursive fashion with a hooked second stroke, set too high for it to be read as K. A is also of cursive form.

Evidently a personal name in the genitive case, '(property) of Fradegus' (or Fradegius), but unattested and of unknown etymology. It is tempting to see it as Thracian like *Decibalus* and *Drigissa*, but it resembles nothing in Detschew (1957). It does not appear to be Celtic or German either, since it resembles nothing in Holder (1896) or Schönfeld (1911) and (1987); initial *fraw-* is indeed a Germanic name-element (Reichert 1987: II, 507), but it would be followed by a vowel.

9. *[I]ulius La[...]*. Small bowl base sherd. Underneath, within the foot ring, is part of a graffito scratched anti-clockwise around the circumference: [...]VLI LA[...], probably *[I]uli La[...]*, '(property) of Julius La[...]' (003/8, G21)

The medial point makes it clear that the owner had two names (in the genitive case here), if not also an abbreviated praenomen now lost. There are other nomina ending in *ulius*, but the imperial nomen *Iulius* is so common that its restoration is probable. Only the (incomplete) first stroke of A survives, but its angle in relation to L and especially to the foot ring excludes the reading of I. The most likely cognomina are *Laetus* and *Latinus*, but there are many other possibilities.

The owner was a Roman citizen, and (if indeed *Iulius*) his family had been citizens for more than a century; so he is much more likely to have been a legionary soldier than an auxiliary, especially since a legionary centurion is attested at Inveresk (Tomlin 2011: 441–4, nos 5 and 6).

10. *Karus(?)*. Two conjoining sherds preserving the profile of Form 18/31. Underneath, within the foot ring, scratched clockwise around the circumference: the upper parts of three letters which are consistent with the reading KA[R]I or KA[T]I, '(property) of Karus or Katus'. Both names are quite often written with initial K for C: see *RIB* II.7, 2501.281, 282 and 283. *Carus* is the more common. (003/10, G16)
11. *P[...]*. Base sherd of Form 18/31. Scratched underneath: P[...]. (003/5, G14)
- P is broken towards the foot by the edge of the sherd, which makes it uncertain whether it originally stood alone (for a name abbreviated to its initial letter), but since it was placed close against the foot ring and aligned with the diameter of the foot ring, it was probably the first letter of a name *P[...]* written across the width. The broken edge runs diagonally, so the letter A, for example, might have been written quite close to P.
12. *Primus*. Base sherd of Form 18/31. Underneath, within the foot ring, is part of a graffito scratched anti-clockwise around the circumference: PRIM[...], probably *Primus*. (003/7, G23)
- P is made with an incomplete loop, and only the first apex of M survives before the break, but the name *Primus* (and its derivatives such as *Primitivus*) are so common that the reading is certain enough. There is no knowing whether it was written in the nominative or genitive case.
13. *Publius*. Base sherd of Form 18/31. Half the foot ring survives, and within it, a complete graffito in angular capitals: PVB. (003/10, P11)
- This might be the initials of a Roman's tria nomina, but is much more likely

(especially in view of the reduced V) to be an abbreviated name. The most likely is the praenomen *Publius*, often used as a cognomen, but also possible is a name derived from it, for example *Publianus*, *Pubilius* and *Publicius*. Compare the next item (no. 14).

14. *Publius* again(?). Small base sherd, probably Form 18/31. On the outer wall, just above the foot ring: [...] VB[...]. (003/cleaning, G19)
- Various names are possible, but the likeliest is *[P]ub[lius]* and its derivatives; compare the previous item (P11).
15. ?*Simplex*. Rim sherd of Form 31. The broken edge is nicked by the tops of five or six letters scratched on the outer wall, below the carination. The traces are slight, but the two apices of M followed by the loop of P can be recognised: [...]..MP[...]. (003/5, G11)
- The other traces are consistent with *Simpl[ex]*, which is quite a common name; in Britain it occurs at York (*RIB* 690), Maryport (860), Carrawburgh (1546) and Kirkby Thore (II, 2501.518).
16. ?*Titus*. Base sherd of Form 18/31R. Scratched on the outside wall just above the foot ring, two incomplete lines intersecting at right-angles, and a vertical line to the right. This might be an elaborated 'cross' for identification, somewhat like G5 below, but is more likely to be literate: [...]TI[...], perhaps *Ti[ti]*, '(property) of Titus'. For this graffito on samian, see *RIB* II.7, 2501.542, 543 and 544. (003/3A, P2)

Personal Names (ii), uninterpreted

17. Base sherd, probably Form 18/31. Underneath, within the foot ring, are the ends of five strokes from a graffito scratched round the circumference, probably anti-clockwise. It was thus probably a name, but there is too little to justify a reading. (003/3, G1)
18. Small base sherd, probably Form 18/31. Underneath, part of two lines meeting at right-angles. Apparently a letter, for example E or L, rather than a mark of identification. (003/5A, G6)
19. Two conjoining sherds preserving the profile of Form 18/31. There are two graffiti; and since (i) has been erased, only too successfully, it is likely to be that of the first owner. (003/6, G7)
- (i) On the outer wall above the foot ring, the surface gloss or slip has been scraped off by means of an edged tool or a flat stone. Four parallel lines were then scored across this abrasion, cut more or less at right-angles by five other lines. Difficult to disentangle from this 'grid' are two or three angular strokes, probably part of the erasure, but just possibly V or M. It can only be said that the first owner's name was incised shallowly in the surface gloss, and was then erased entirely.
- (ii) Underneath, within the foot ring, are the ends of two lines once scratched across the whole width and intersecting at right-angles to form a large 'cross'.
20. Sherd preserving the profile of Form 18/31. Underneath, within the foot ring, was a graffito scratched around the circumference; but only the lower part of three strokes survives. There are too many possibilities to hazard a reading. (003/6, G8)
- On the outer wall, just above the foot ring, there is part of a stroke made *before* firing. Too little survives to determine whether it is actually part of a letter, or only casual damage before the slip was added.
21. Rim sherd of Form 31. On the outer wall, just above the carination, the edge of the sherd cuts two broad scores due to casual abrasion and then a much narrower scratch which may be deliberate. But too little survives of it to be sure. (003/5, G10)

22. Small base sherd, probably 18/31. There are the slight remains of two graffiti. (003/5, G13)

(i) Underneath, within the foot ring, the end of a line meeting the circumference. Probably part of a large 'cross'.

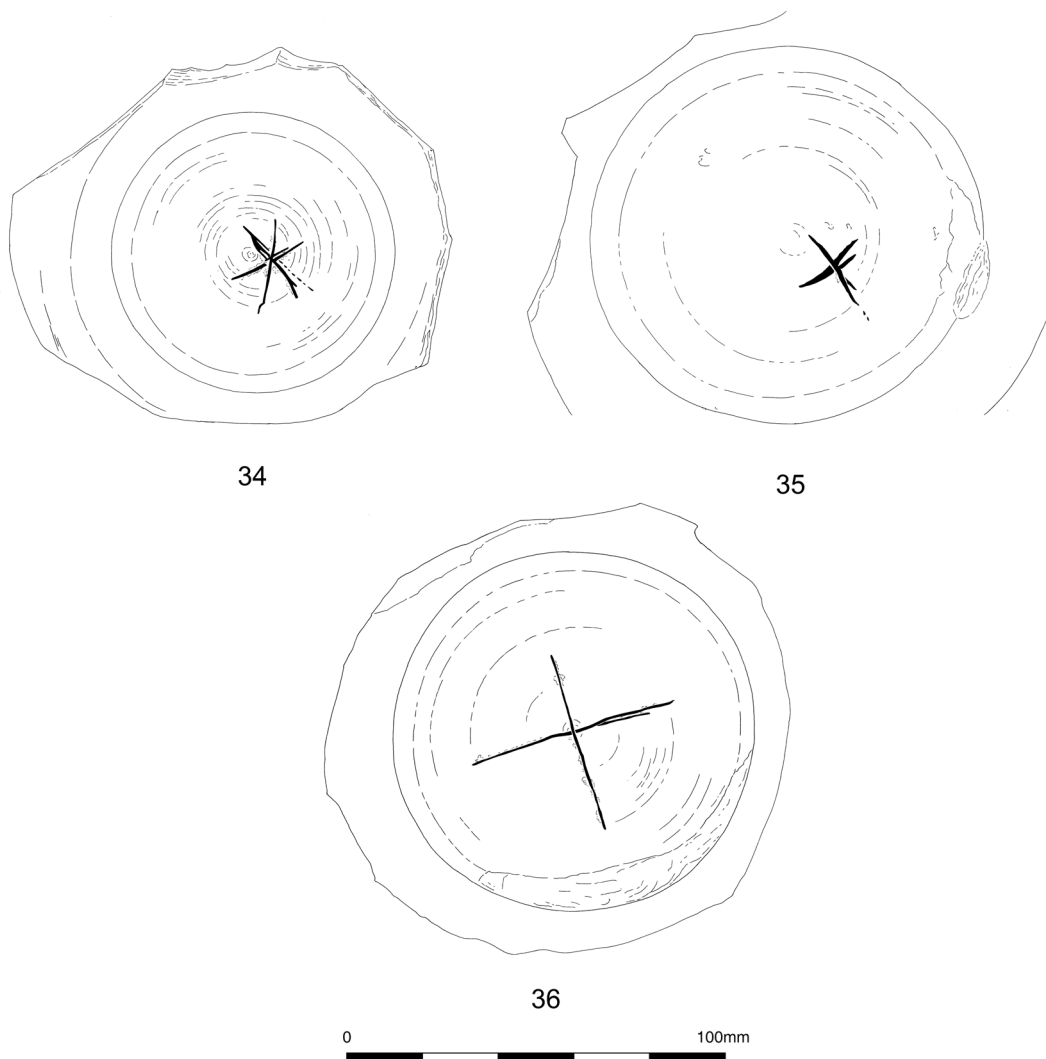
(ii) On the outer wall, two lines (the first incised twice) which meet at an acute angle at the carination. Too slight for identification, but possibly IM[...], the beginning of a personal name.

23. Sherd preserving the profile of Curle 15. A graffito was scratched underneath within the foot ring, but only the lower half of two letters survives. The first is

probably S, the second might be K, L or R. None of the resulting combinations are suggestive. (003/8, G20)

24. Small base sherd, probably Form 18/31. Underneath, within the foot ring, are the ends of four strokes from a graffito scratched round the circumference, probably anti-clockwise. It was thus probably a name, but there is too little to justify a reading. (001 soil strip, G25)

25. Base sherd, probably Form 18/31, with part of an unidentified stamp (probably ending in -MI but not the same as P10 and P11 (*Publius*)). Half the foot ring survives, and within it, the remains of three intersecting lines scratched across



Illus 7.10 Graffiti: marks of identification (copyright CFA Archaeology Ltd)

the whole width to form a large 'star'.
(003/10–11, P12)

Overlaid by this 'star', apparently two letters: [...]CI. The name of a previous owner in the genitive case, his name ending in *-cus* or *-cius*.

Marks of identification (see also above: 4, 16(?), 19, 20, 22 and 25) (Illus 7.10)

26. Small base sherd, probably Form 18/31. Scratched underneath within the foot ring, two short lines intersecting at right-angles to form a 'cross', now incomplete. (003/3A, G3)
27. Rim sherd of Form 31, Scratched on the outer wall below the rim, two lines intersecting at right-angles to form a 'cross'. (003/3A, G4)
28. Base sherd of Form 18/31. Underneath, within the foot ring, the ends of two parallel lines once crossed at right-angles by a third, all of them spanning the width; they would have formed an 'H', not a letter but a large 'double cross'. (003/3A, G5)
29. Base sherd of Form 18/31, with too little remaining to tell whether it was stamped, or whether there was a graffito within the foot ring. Scratched on the outside wall above the foot ring, two short intersecting lines to form a 'cross'. (003/5, G9)
30. Base sherd, probably Form 18/31, with remains of two graffiti. (i) Incised underneath, within the foot ring, the end of a line across the width; it presumably intersected with another at right-angles to form a large 'cross'. (003/5, G15)
 - (ii) In the outer wall above the foot ring, the end of a down-stroke. Since there is space either side, it was probably not a letter, but part of a 'cross'.
 - (iii) A notch has been cut across the foot ring. If it was not casual, it may have been cut (perhaps with others now lost) as a mark of identification.
31. Rim sherd of Form 18/31 (EG). Scratched on the outer wall below the carination, two lines intersecting at right-angles to form a 'cross', now incomplete. (551, G24)
32. Small base sherd, probably 18/31. Underneath, within the foot ring, the ends of two lines meeting the circumference. They would have intersected at right-angles, and probably formed a large 'cross'. (Site cleaning, G26)
33. Two conjoining sherds of Form 18/31, amounting to nearly half of the base. Scratched underneath, on the inner face of the foot ring, a graffito now incomplete; two short lines intersecting at right-angles to form a small 'cross'. (Site cleaning, G27)
34. Complete base sherd of Form 18/31. Scratched underneath within the foot ring, three short intersecting lines to form a 'star'. (003/8–9, P10)
35. Two conjoining sherds of Form 18/31 preserving the base and profile. Scratched underneath, within the foot ring, two short lines intersecting at right-angles to form a small 'cross'. (003/11, P14)
36. Complete base sherd of Form 18/31. Scratched underneath within the foot ring, two lines across the width intersecting at right-angles to form a large 'cross'. (003/9, P16)

7.4 Roman glass

Hilary Cool

The glass from this site, excluding the obvious modern pieces, is summarised in Table 7.8 according to weight as some pieces show strain cracking, which makes a fragment count unreliable.

With the exception of the two chips recovered from Burial Pit 880 all the material is blue/green. This is the commonest colour of the 1st to 3rd centuries. The assemblage is dominated by bottle glass. Where the fragments can be assigned to form they belong to the square variant which

Table 7.8 Roman vessel glass by weight (g) (+ indicates presence but not at a measurable scale)

Context	Bottle	Other vessels	Chip	Window glass	Total
Burial context	–	–	0.20	–	0.20
Ditch and pit contexts	26.15	2.44		1.97	30.56
Midden – C003	260.15	7.93	+	4.63	272.71
Total	286.3	10.37	0.20	6.60	303.47

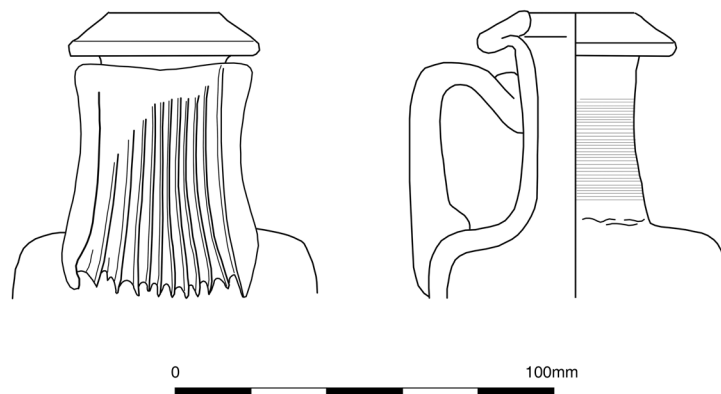
becomes very common in the late 1st century and continues in use into the 3rd century (Price & Cottam 1998: 194–8). None of the fragments retain any features that allow them to be more precisely dated within that period. Most are relatively undiagnostic body fragments though one from Context 003/6 is the substantially complete upper part of a square bottle (Illus 7.11). It is unusual to get such a large piece of bottle glass in a domestic rubbish deposit as bottle glass, being so thick, was especially useful for recycling as cullet or being chipped to form sharp-edged tools. This bottle presumably came from the same source that provided the large fragments of pottery vessels in the C003 soil deposits.

Other vessel forms were indicated by thinner walled and/or convex-curved body fragments. That from the midden, from 003/5, was relatively thick-walled and could have come from a utilitarian container. The fragments from the ditch fills 274 and 520 were thinner walled and could have come from tablewares. In none of these cases, however, can a vessel form be suggested.

The overall impression from the vessel glass from the midden and the field system is that it is curiously

limited. In a 2nd-century site associated with the military and with the amount of samian pottery seen here, one could expect a wider range of forms, including colourless tablewares. This was certainly the case when the civil settlement to the east of the fort was excavated (Thomas 1988: microfiche 2.B7, nos 3.58–62). This assemblage is admittedly small and there may be depositional reasons why it is generally only the substantial bottle fragments that survive. Equally though, it may be hinting that this assemblage came from rubbish deposits that derived from the more utilitarian end of the food preparation and consumption range of activities.

The two small chips from the burial pit stand apart from the rest of the glass with regard to their colour. Chips derived from samples, as these are, always provide problems because it can be difficult to ascertain the true colour. Here one seems to be a chip retaining no original surfaces in properly decolourised glass; the other is a very small body fragment retaining original surfaces in a slightly green-tinged colourless glass. With such tiny fragments (weighing together only 0.2g) the possibility of intrusion by worm action and the like can often not be excluded and it should be noted

**Illus 7.11** Glass bottle (copyright CFA Archaeology Ltd)

that chips of modern glass and Roman glass are difficult to distinguish from each other, making certainty of identification impossible. The top of this pit had been disturbed by a later field system ditch, increasing the possibility of intrusive items being present within earlier features.

Window glass of the typical blue/green matt/glossy variety was found in both the midden (a piece of 5.5cm²) and in the unphased Pit 958 (3cm²). Such glass would have been the type used in glazing in the 2nd-century fort and civil settlement and was presumably what was identified as window glass in the excavations to the east of the fort (Thomas 1988: 172).

7.4.1 Catalogue (Illus 7.11)

1. Square bottle. Complete rim, neck and handle with majority of shoulder and upper parts of sides. Blue/green. Rim bent out, up and in; cylindrical neck with tooling marks at base; reeded angular handle attached to shoulder, applied to neck and folded back onto upper part of handle; horizontal shoulder. Horizontal scratch marks on the neck. Rim diameter 56mm, width of bottle 83mm, weight 203g. (003/6)

7.5 Ceramic building material (CBM), fired clay and mortar

Sue Anderson

Seventy-nine fragments of ceramic building material (CBM) weighing 8,188g were collected from 23 contexts. A full catalogue is included in the archive. Table 7.9 shows the quantification by fabric and form. Post-medieval and unidentified CBM and mortar were recovered from the upper disturbed levels of C003; a report is available in the archive.

7.5.1 The Roman CBM

The Roman assemblage was quantified (count and weight) by fabric and form. Fabrics were identified on the basis of macroscopic appearance and main inclusions. Forms were identified with the aid of Brodrigg (1987). The presence of burning, combing, finger marks and other surface treatments was recorded. Tile thicknesses were measured and for flanged tegulae, the form of flange was noted and its width and external height were measured.

Fabrics were identified on the basis of macroscopic appearance and main inclusions. Nine fabric groups were identified as follows:

Table 7.9 CBM by fabric and form

Type	Form	Code	No.	Weight (g)
Roman	Flanged tegula	FLT	4	1735
	Imbrex	IMB	4	534
	Imbrex?	IMB?	1	63
	Roman tile	RBT	17	3339
	Roman tile?	RBT?	14	185
Total Roman			40	5856
Roofing	Pantile	PAN	23	1262
	Pantile?	PAN?	1	19
	Ridge tile?	RID?	1	105
Walling	Late brick?	LB?	1	39
	Brick	B	5	383
	Drainpipe	DP	6	442
	Drainpipe?	DP?	1	67
Total post-medieval			38	2317
Uncertain	Unidentified	UN	1	15

Table 7.10 Roman tile quantities by fabric and form (fragment count)

Fabric	FLT	IMB	IMB?	RBT	RBT?	Total
fs	1				6	7
fsv	1	1		9		11
fsm	2	2		3	6	13
fsc					1	1
fscq		1				1
fsfe				2		2
fsx				3		3
ms					1	1
msx			1			1

fs/ms Fine/medium sandy with few other inclusions

fsv Fine sandy with large voids

fsm Fine sand and mica, some voids, soft, pale buff

fscq Fine sandy with sparse to moderate coarse quartz fragments

fsc Fine sandy with calcareous inclusions

fsfe Fine sandy with ferrous inclusions

fsx/msx Fine/medium sandy poorly mixed clays with white streaks

In general, most fabrics contained a background scatter of the inclusions which occur commonly in local Roman and later ceramics, notably small ferrous particles, mica, small quartz pebbles, occasional burnt-out organic materials, grog and clay pellets.

Forty fragments comprised material of Roman date, much of which was recovered from C003. Table 7.10 shows the quantities by fabric and form. The wide variety of fabrics present suggests that the CBM used at the site was from more than one source. Fine sandy (fs, fsv) and micaceous (fsm) were the most frequent fabrics.

Four fragments of flanged tegulae were collected. Flange widths and heights were recorded where possible, and tile thicknesses measured. Three flange widths were in the range 30–33mm, one flange height measured 52mm, and four tile thicknesses 21–36mm. Flange shape was recorded for one tile, which was slightly concave with a rounded top. Two were from C003

(zones 6 and 9) and two were recovered during site cleaning.

Five fragments were identified as imbrices or possible imbrices. They measured between 16mm and 24mm thick. All were from C003 (zones 2, 4, 5, 6 and 6a).

Most pieces were unidentifiable to specific form (RBT). Thickness measurements were recorded for 15 of these (range 12–54mm), and this may provide a clue to the original function. Table 7.11 shows the numbers of measurable tiles in ranges of thicknesses and suggestions of types. However, the quantities form a normal distribution, and those in the mid-range in particular could belong to several types.

Surface markings made before firing were noted on only two tiles, one of which had an incised wavy line and the other was partly knife-trimmed on one edge. The latter was the thickest tile in the group.

The RBT fragments were largely from C003 (003/1–5, 6a, 7, 8 and 11), but also came from Ditch Fills 406 and 521, Pit Fill 1028 and modern Fill 551.

This is a very small assemblage for a Roman site. Likewise, the Inveresk Gate excavations only produced 14 fragments of Roman tile (Crowley 2004: 172). However, 64kg of CBM were recovered from excavations within the fort itself (Crowley 2005: 150), including large tiles such as *bipedalis*, box flue-tiles and roofing tiles. This suggests that several buildings might have used tile in their construction and indicates that the material is more likely to have been left in situ than dumped on the midden.

Table 7.11 Thicknesses of RBT and possible types

Thickness	No.	Possible type
10–14mm	1	Imbrex
15–19mm	2	Imbrex or flanged tegula
20–24mm	2	Flanged tegula
25–29mm	3	Flanged tegula
30–34mm	3	Flanged tegula/floor or wall brick
35–39mm	3	Floor or wall brick
>40mm	1	Floor or wall brick

7.5.2 Fired clay

Twelve fragments of fired clay (623g) were collected from seven contexts. They are listed by context in the archive. The majority were in fine sandy fabrics and comprised abraded lumps with no diagnostic features. Fragments from C504 were in a medium sandy fabric which was friable and not heavily fired. One fragment from 003/4a was a large piece with common voids and two wattle impressions, perhaps suggesting that it was a fragment of daub. A small fragment from 003/8 was flat with a smoothed surface and again may be a piece of the outer layer of daub. Like the CBM, a considerably larger assemblage of daub came from within the fort itself, amounting to 58kg (Crowley 2005: 152).

7.6 Iron

Dawn McLaren and Fraser Hunter, with a contribution by Gemma Cruickshanks

The broad range of ironwork includes some individually striking items. Nails and hobnails dominate (119 nails and tacks, 681 hobnails). The 74 other objects comprise a varied range, with a notably high component of weaponry, while other categories (such as vessel fittings) are rare. Table 7.12 summarises the assemblage (including items from burials, discussed in Section 3).

It is best to discuss the material by functional category. The bulk is associated with timber constructions (eg structural nails, brackets, door hinges and wall clamps). Some buildings or chests were secured with locks, attested by a padlock fitting and lift-key. Other domestic material is rare,

however, with only one drop handle and a handle fitting from a leather vessel. In contrast, there is a broad range of military equipment. Weaponry is represented by two possible sword fragments (tip SF19 and tang SF262) and three ballista bolt heads, the latter attesting to artillery at the site; one has a tip damaged from use. There are no spearheads (in marked contrast to the finds from Inveresk Gate and the fort itself; Bishop 2004: fig 92; Hunter forthcoming), but one or two ferrules may come from spears (SF197, 256). Armour is represented most frequently by shield rib fragments and by ring mail, both single finds, and a small cluster of patches which may have been collected for repair. These examples were made by alternate rows of solid and butted rings, in contrast to the alternating solid and riveted examples from the fort excavations (Hunter forthcoming).

The most striking find of armour is a fragmentary helmet cheek-piece, which has proved very hard to parallel. Top and bottom are lost, but it has two rivet holes for attachment straps, and the rear edge flares out to deflect blows. Alternating bands of scalloped decoration were intended to mimic hair; even everyday helmets, especially of cavalry soldiers, were often decorated. The unusual feature is its almost parallel-sided form as it survives, lacking the cut-outs common on the front edge to improve visibility in use.

Tools attest to a range of crafts. Woodworking is seen in the heavy-duty mortise chisel and a draw knife, while two punches may be a stonemason's tools (a craft not attested elsewhere on the site), although the specific function of such punches is hard to demonstrate. A fine file is probably for metalworking, although it could have been used for fine woodworking. No other metalworking tools were recovered, although small quantities of ironworking slag (McLaren, this paper) show that blacksmithing was taking place. A large needle is most likely for heavy-duty textiles such as packing material.

Another most unusual find is the arch of a collar for animal traction (SF287). These are rarely recognised from British sites, though they are found along the Continental frontier zone and depicted on sculpture (Alföldy-Thomas 1993: 331–6). Bridle bit fragments (SF283 (quite a heavy one), 284, ?242) may relate to cavalry use, but chain fragments and a

Table 7.12 Categories of ironwork (excluding nails and hobnails)

Category	Object type	No. intact
Weapons/armour (16)	Ballista bolts (3)	3
	Sword (2?)	
	Ring mail (3)	
	Helmet cheek-piece (1)	
	?Armour buckle (1)	
	Shield rib (6)	
Tools (13)	Stylus (1)	
	Rake? (1)	
	Knife (3)	
	?Stone-mason's punch (2)	2?
	Draw knife (1)	
	File (1)	
	Mortise chisel (1)	1
	Needle (1)	
Ornaments (6)	Tool tang (2)	
	Penannular brooch (3)	3
	Bow brooch (1)	
Transport (7)	Buckle pin (1)	
	Chains (2)	
	Junction plate (1)	
	Bridle bit (3)	
Fittings and fastenings (22)	Yoke fitting (1)	
	Lift key (1)	
	Lock fragment (1)	
	Handle (1)	
	Clamp (3)	
	Hook (1)	
	Hinge (2)	1
	Sheath (4)	
	Socket (3)	
	Ring (4)	2
Other (2)	1	
Other (11)	Other / ? (11)	
Total	74	13

junction plate are more likely to come from wagons or carts. A single stylus augments one of the same type from Inveresk Gate (Bishop 2004: 153, fig 104, no. 23).

The few personal ornaments are all clothes fasteners: a pin from a buckle, a bow brooch and three penannular brooches. Corrosion of the bow brooch makes its identification difficult; it is a small example with a humped profile, and seems to be a one-piece construction with a spring.

7.6.1 Distribution and condition

The iron is distributed widely across the site, with most of it from field ditches and midden-rich C003, and occasional finds (particularly fittings and fastenings) from pits; there are no clear spatial patterns (Table 7.13). The finds from ditches and the midden are closely similar in nature, predominantly tools, fixtures/fittings and weaponry/ armour, and it seems likely that the upper ditch fills have a similar formation process to the overlying midden-rich deposit.

Its condition is overwhelmingly fragmentary, both within each category and throughout the main contextual groups (midden, ditches, pits/post holes; graves are an exception). Some of the fittings may have broken during removal (eg brackets, wall-hinges) or been discarded as a result of breakage during use. Much of the material shows use-damage: for instance, the chain links are broken at the weld, both snaffle bits are damaged at one end, and many tools broken at the tang, the weakest point (eg file SF249, draw knife SF260, tangs SF233 and 227). Some items look substantially intact but show some damage (eg yoke collar SF287, possible wagon fitting SF264).

The weaponry and armour show something of the variety in survival. Swords are represented only by possible broken fragments, and the helmet cheek-piece is fragmentary; shield ribs are all broken, the bending of some suggesting deliberate removal from shield. The ring mail includes some small discarded fragments, while the strips and patches of SF290 may have been gathered to be recycled. A similar concern with repair is seen more clearly in the ?armour buckle SF150, where the fixing of the buckle loop has been replaced. The ballista bolt heads are intact, with only one (SF278) showing

signs of use; it is possible that these were used for pot-shots from the ramparts, but equally likely that the head was intact but the shaft broken.

Intact objects are very much the exception, with only 13 examples, including a door hinge (perhaps discarded with the timber) and two tools, a stonemason's punch and a mortise chisel. Intact objects are only the norm in burials, such as the three penannular brooches.

7.6.2 Comparison with other Inveresk assemblages

An attempt was made to compare assemblages between fort and *vicus* (civilian settlement) in the study of the material from the GUARD fort excavations (Hunter forthcoming). The main differences were the greater quantity of weaponry from the fort and the wider range of transport-related items in the *vicus*, but there was considerable overlap in the bulk of the assemblages. The current assemblage matches the fort one in its prevalence of weaponry. There is variation with the fort assemblage, such as the absence of spearheads and rarity of vessel fittings in the present site, but it is unwise to put too much weight on specific absences when the assemblages are relatively small: the similarity in broad categories of material is more reliable.

7.6.3 Catalogue

Abbreviations: Length, Width, Height, Thickness, Diameter, external, internal. All dimensions are in millimetres. Typology follows Manning (1985) unless otherwise stated.

Weapons and armour (Illus 7.12)

(Some of the sockets classed under fittings may be from spears.)

Ballista bolt heads (Manning 1985: 171, type 1)

► **SF191**

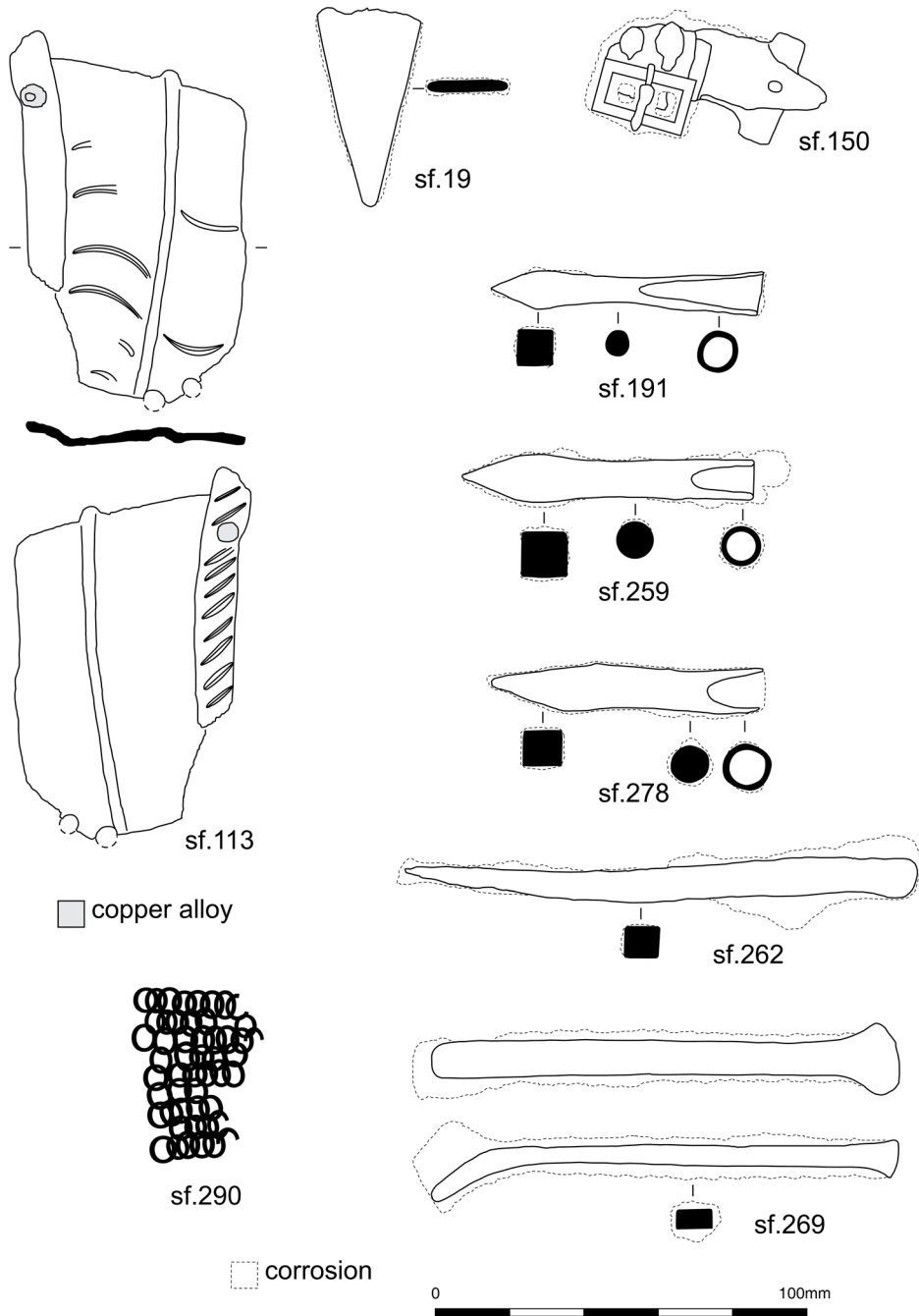
Stout pyramidal head (W 10.5) with conical split socket (ext Diam 12, int Diam 8). L 75.5. (003/11)

► **SF259**

Short pyramidal head (W 13.5) with slender conical, almost cylindrical socket (ext Diam 12, int Diam 9). L 80.5. (003/6)

Table 7.13 Distribution of ironwork (excluding nails and hobnails)

Category	Ditch	Grave	Pit	Post hole	Midden	Unstrat
Contexts	270, 285, 449, 552, 764	058, 190, 437, 799	192, 564, 648, 772, 747, 781, 1080	100	C003 (Zones 1–11)	
Weapons/ armour	Ballista bolt (SF278); ring mail (SF290); shield rib (SF269); ?sword tip (SF19)		Ring mail link (SF132)	Shield rib (SF279)	Ballista bolts (SF191 and SF259); cheek piece (SF113); hinged buckle (SF150); ring mail (SF178); shield ribs (SF154, SF192, SF281, SF282); sword tang (SF262)	
Tools	Masonry punch (SF268); needle (SF294); rake tine (SF199)		?Tool tang (SF227)		Draw knife (SF260); file (SF249); knife fragments (SF248 and SF280); lift key (SF237); mortise chisel (SF265); punch (SF153); stylus (SF261)	Knife blade (SF224); ?tool tang (SF233)
Ornaments		Penannular brooches (SF8, SF40, SF141); buckle pin (SF162)			Bow brooch (SF285)	
Transport					?Bridle-bit ring (SF242); possible wagon fitting (SF193); snaffle-bits (SF283 and SF284); animal traction collar (SF287)	Chain loops(SF263a and b)
Fittings and fastenings	Drop handle (SF148); L-clamp (SF198)	Washer (SF106)	Hook fragment (SF274); joiner's dog (SF210); rings (SF145 and SF218); U-shaped binding (SF158)		Barb-spring padlock bolt (SF193); bolt (SF142); bracket (SF238); collar (SF146); door hinge (SF253); ferrule (SF256); handle mount (SF155); hinge (SF258); perforated sheet mount (SF255); perforated bar (SF157); pole sheathing (SF149); ring (SF236)	Ring (SF223)
Other	Unidentified (SF161)				Elongated rod (SF315); sheet fragment (SF196 and SF301); strip (SF190); unidentified (SF156, SF195, SF197 and SF295)	Tapering bar (SF221)



Illus 7.12 Ironwork: weapons and armour (copyright CFA Archaeology Ltd)

► **SF278**

Stout pyramidal head (W 13) with cylindrical split socket (ext Diam 10, int Diam 9). Tip flattened and slightly bent from use. L 73. (Fill 551 of Ditch 552)

Swords

► **SF19**

Triangular blade tip fragment, probably from a sword, although the flat section is a little unusual;

majority of one face lost to severe corrosion. Remaining L 54.5, W 27, T 3mm. (Fill 520 of Ditch 285)

► **SF262**

Possible sword tang. Elongated, square-sectioned tapering tang, broken at blade junction (W 10.5). The opposite narrow squared end is slightly burred (W 4–5) to retain an organic handle, no traces of

which survive. Length and burring consistent with identification as a sword tang. L 140. (003/6)

Armour

► SF113

Left cheek-piece fragment from a helmet. Parallel-sided; broken at top (where two perforations, Diam *c* 7mm survive) and base. Curved in section and split vertically into three zones, with a marked step between the first two and the rear one flared. The first two have scalloped decoration in opposed directions (chased in from the front), the lines *c* 10mm apart; the flared narrower rear zone has chased diagonal lines *c* 4mm apart. It swells slightly towards the surviving end, where a copper alloy cast attachment rivet has the head on the inside, the outer tip hammered flat (Diam 6, shank Diam 2.5). Presumably this held a fastening strap. Surviving L 120, W 59, T 3. (003/6A)

The identification seems secure but the form is an odd one. The surviving length preserves about two-thirds of the original. The curve would allow the cheek-piece to fit the face, while a flange on the rear or, more often, lower edge is paralleled on other helmets (Robinson 1975: fig 120, pl 258–9, 286; Chapman 2005: 98, Qb01; Bishop & Coulston 2006: 174, fig 113; James 2010: fig 49 no. 372). Well-dated examples of flanges are 3rd-century, but Robinson argues some belong to the later 2nd century (Robinson 1975: 96–7; Bishop & Coulston 2006: 174). Most cheek-pieces were hinged, but two straps were commonly used as well, with double rivets on the bowl for the strap fixing (eg Robinson 1975: fig 94–5, 107–9, 111–12, 155) and sometimes on the cheek-piece (eg Junkelmann 2000: taf XII). The odd feature is the form, as Roman cheek-pieces were typically curved at the rear and cut out at the front to improve visibility and breathing. The straight form of this one is unusual, even allowing for possible curves at the lost top and bottom. Straighter forms can be seen on some depictions of cavalry helmets (eg Robinson 1975: fig 122); if the two rivet holes are aligned horizontally the cheek-piece angles forward, much as on depictions. A connection to cavalry is likely given the decoration; the scalloping probably reflects the waves of hair which were commonly depicted on or applied to cavalry parade helmets (eg Garbsch 1978: taf 23.4; Meijers & Willer 2007: 80–100).

The decoration is closely paralleled on a neck-guard fragment from Caerleon (Scott 2000: 391, fig 95 no. 11) and a helmet from Straubing (Walke 1965: 53, taf 103,2).

Ring mail

► SF178

Small fractured corroded lumps of articulated and fragmentary rings (Diam 7, T 0.7) comprising rows of alternating solid and clenched rings. Two nails (SF177) also recovered. (003/3) Not illustrated.

► SF290

Twenty-one corroded lumps of articulated ring mail comprising rows of solid and clenched rings (ext Diam 6.5–7, wire Diam 0.7) forming rectangular strips or squared patches; perhaps scraps for reuse. Together the fragments represent an area of *c* 100 × 100mm. The external diameter is similar to others from Inveresk and from Cramond and Newstead (Curle 1911: 161; Holmes 2003: 104, illus 84, nos 10–12; Hunter forthcoming). (Fill 520 of Ditch 285)

Shield rib fragments (not illustrated)

Six fragments of shield ribs derive mostly from the midden at C003. One preserves an original terminal (SF192) and three have nail holes, one of which is clearly countersunk (SF281). Their bent, distorted and broken condition suggests that most, if not all, had been removed from the shields prior to deposition.

► SF154

Bar, plano-convex in section; broken at both ends. L 31, W 11, T 9. (003/5)

► SF192

Plano-convex bar, broken across a circular nail hole (Diam 6.5). Opposite end also broken, with nail (W 6) and washer (Diam 20) in situ. L 90.5, W 11–13.5, T 8. (003/11)

► SF269

Plano-convex strip, one end flattened into an expanded oval disc (L 21, W 30, T 4) with central square nail hole (Diam 5); opposite end bent (from removal?) and broken. L 132, W 9.5, T 5. (Fill 512 of Ditch 449)

► **SF279**

Plano-convex strip with slightly expanded flat rounded head (W 18, T 6), other end broken; bent mid-length. L 154.5, W 16.5–14.5, T 6.5–7. (Fill 101 of Post Hole 100)

► **SF281**

Long narrow plano-convex strip with countersunk square nail hole (W 4) mid-length; broken at both ends. Remaining L 284, W 10.5, T 7. (003/4)

► **SF282**

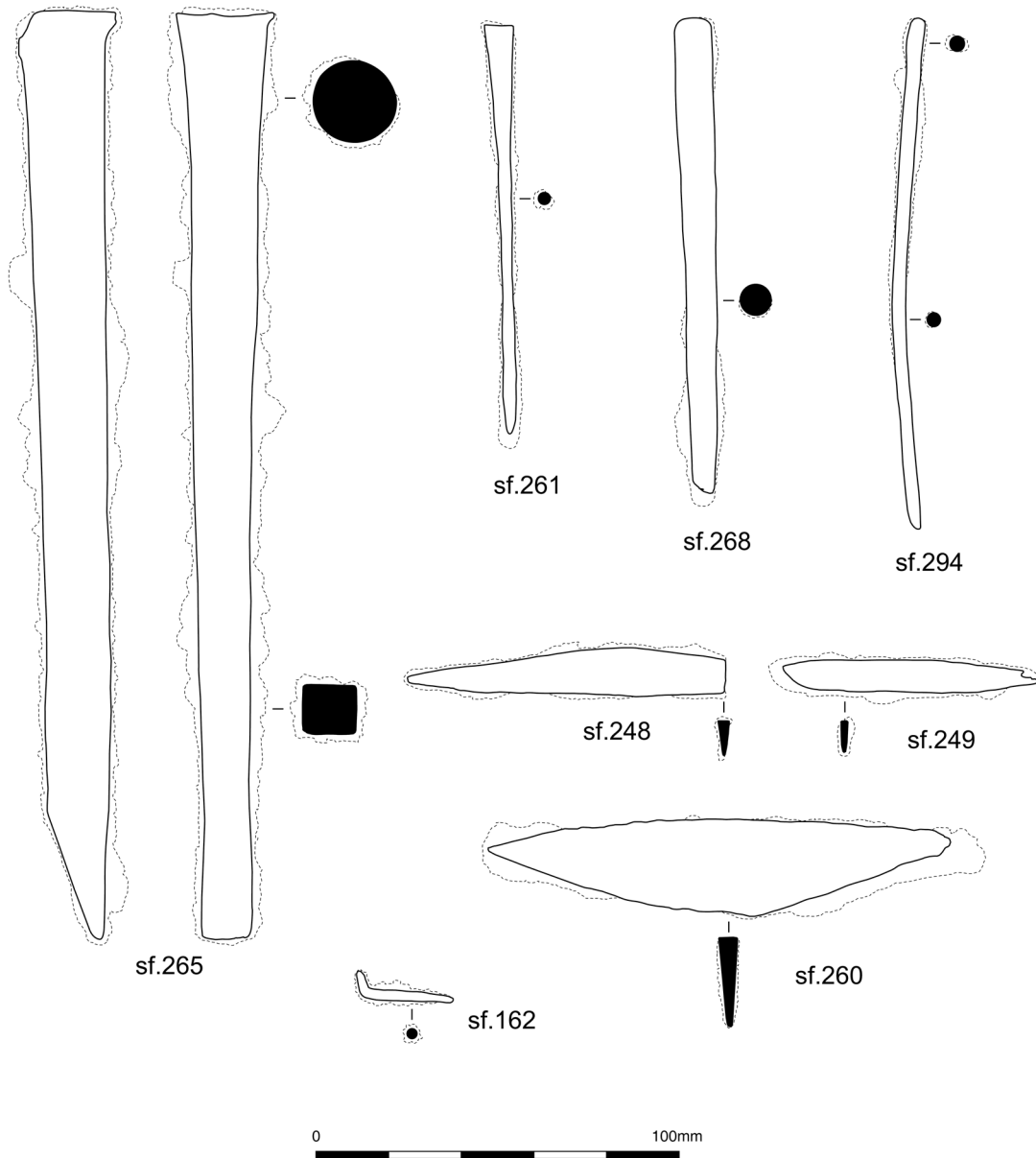
Slightly tapering plano-convex strip, broken across square nail hole (W 4) at widest end; opposite end

also broken. Remaining L 97, W 9.5–13, T 7.5. (003/4)

Other

► **SF150**

Buckle. The construction is complex, and it has been repaired. The buckle is riveted to the T-shaped tongue (W 30) of an iron plate, broken where it expands into the main body of the plate. A strap (T 3) and an iron plate are riveted to this tongue by a single rivet (Diam 3.5) near the plate's broad end. This plate is parallel-sided with a triangular broad end, the other end apparently tapering to a squared tip (35 ×



Illus 7.13 Ironwork: tools and ornament (copyright CFA Archaeology Ltd)

15mm). Over this lies a U-shaped loop (18 × 13mm, Diam 3.5mm), tapering to the ends. It is likely that this was an impromptu repair after the fixing to the buckle loop broke. The buckle loop is rectangular (30 × 19mm) with a single tongue. It has proved hard to identify the fragment. The attachment of a buckle to an iron plate might suggest use in armour, such as *lorica segmentata*, but it is anomalous. The use of iron rather than copper alloy for a *lorica* buckle is unusual but not unknown (cf Chapman 2005: 68, Lc25). More problematic is the form. The T-shaped tongue of the plate implies it was intended for insertion into something which would then be buckled closed, but this form of fastening does not appear in the standard reconstructions of *lorica segmentata* (Bishop 2002c). It may derive from an arm guard, which also used iron plates, though such tongues are not known on the few recognised examples (Bishop 2002c: 68–71). Mike Bishop (pers comm) does not consider it is likely to be an armour fragment, so it presumably had a more domestic role. (003/6)

Tools (Illus 7.13)

Knives

► SF224

Possible fine blade tip. Thin strip with wide squared broken end tapering to a blunt rounded tip, slightly curving along length. Heavily corroded edges preclude certain identification. L 32, W 4–16, T 3. (Unstratified) Not illustrated.

► SF248

Knife blade and tang; tip missing. Round-tipped, rectangular-sectioned expanding tang, set more or less on blade midline with distinct shoulder between tang and blade edge; less distinct damaged shoulder at back. Blade edge straight; back slightly arched, tapering towards lost tip. Remaining L 89.5; blade remaining L 44.5, W at shoulder 14.5, T 3.5; tang L 45, W 10, T 3–4. (003/5)

► SF280

Possible knife blade fragment. Thin rectangular strip, slightly tapering along length and in thickness; broken at both ends and severely damaged along possible straight blade edge. L 46.5, W 15–17, T 3.5–1. (003/4) Not illustrated.

?Stonemason's tools

► SF153

Punch or chisel. Short robust circular-sectioned tool, expanding towards a rectangular-sectioned blade; slightly distorted along length from use. L 77; head Diam 15.5, blade W 17.5, T unknown due to corrosion. (003/5) Not illustrated.

► SF268

Masonry punch? Circular-sectioned robust tool with flattened circular-sectioned head (Diam 13 × 11), burred by hammering; tapers to thick blunt rectangular-sectioned tip (5 × 4), slightly angled by use. L 137. (Fill 430 of Ditch 448)

Woodworker's tools

► SF260

Draw knife. Curving lentoid-shaped blade with gently curving thick back; blade severely distorted along length but tapers at both ends (W 16.5), forming robust rectangular broken tangs bent at 90° to the vertical face of the blade. Substantial draw knives such as this example are likely to have been coopers' tools (Jackson 1985: 139). A less distorted example comes from Vindolanda (ibid 139: no. 43, fig 49). L 140; blade L 115, W 31, T 6.5–5; tangs W 12.5, T 11. (003/6)

► SF265

Mortise chisel; complete. Robust square-sectioned shank (W 17) with angled blade (W 19, T 8). Flattened circular-sectioned conical socket (Diam ext 33, int 23) with a clear split or join visible on X-ray. These chisels were primarily intended for heavy work and struck with a mallet (Manning 1985: 23, fig 4: 5–6). L 260, W 17–13.5, T 17–13.5. (003/6)

Other

► SF199

Possible rake tine. Damaged, thick rectangular-sectioned bar tapering towards blunt square-sectioned tip, distorted along length. Diagnostic attachment end missing, and function thus not certain (cf Manning 1985: 59; Jackson 1985: 141, no. 59, fig 51). L 133.5, W 5–13.5, T 7.5–10. (Fill 530 of Ditch 449) Not illustrated.

► SF249

File, based on its form (cf Duvauchelle 2005: pl 7, no. 50); no teeth are visible in its corroded state.

Short sub-rectangular bar, plano-convex section, one end squared, the other tapering into a narrow, rectangular-sectioned broken tang (W 5.5). Such files are usually classed as metalworking tools, though they could also be used for fine woodworking. L 81.5, W 8.5–11, T 4–7.5. (003/5)

► **SF261**

Stylus. Slender, circular-sectioned stem (Diam 4), flattened at one end to a fine, rectangular-sectioned eraser (W 8.5, T 3); opposite end broken and tip lost but appears to swell and then contract (Diam 5). Manning type 2/3 (1985: 85, fig 24). L 122. (003/6)

► **SF294**

Large needle. Circular-sectioned elongated rod, one end flattened and expanded into rectangular-sectioned rounded end with central countersunk circular perforation (Diam 2.5), other tapering to broken tip. Size suggests role as a packing needle rather than any domestic function. L 146; head W 11.5, T 4.5; Diam 5. (Fill 432 of Ditch 270)

► **SF227**

Possible tool tang. Flat rectangular-sectioned bar broken at 'blade' end, expanding to a rounded, rectangular-sectioned damaged terminal. L 41.5, W 7–14. (Fill 782 of Pit 781) Not illustrated.

► **SF233**

Possible tool tang. Tapering square-sectioned bar, broken at both ends and damaged severely on one face. Remaining L 46.5, W 6.5–12, T 9–13. (Unstratified) Not illustrated.

Ornaments (Illus 7.13)

► **SF162**

Possible pin from a small buckle. Short circular-sectioned tapering pin, one end a fine rounded tip, the other flattened into a rectangular-sectioned strip (W 8.5, T 3mm), bent at 90° and broken. L 28, Diam 4. (Grave 437 with Sk 451) Presumably intrusive/residual as this grave is in the midden area.

Transport (Illus 7.14)

► **SF263**

Two large figure-of-eight loops from robust chain separated at weld; one squared circular-sectioned terminal, the other broken. Possibly from a wagon

(Manning 1985: 139). a: L 125; b: L 156. (003/cleaning)

► **SF264**

Perforated plate. Sub-rectangular flat strap, perforated by three irregularly set circular holes (Diam 10.5–11.5) to hold circular-sectioned bolts rather than nails. Two original corners remains; the other corners are damaged. Possibly designed as a mobile junction in a wagon, with the outer holes fixing one piece of wood and the middle one allowing another to turn; for the concept, though not morphologically identical, cf Künzl (1993: taf 430). L 152.5, W 43, T 7. (003/11)

► **SF283**

Robust snaffle-bit bar. Square-sectioned bar (16 × 20), flattened and tapering at both ends (W 12, T 4–7); one is broken, the other curves over on itself to form a rounded hook (Diam 22.5). The taper at the broken end suggests the bar was symmetrical, with a similar rounded hook now lost. Remaining L 73. (003/4)

► **SF284**

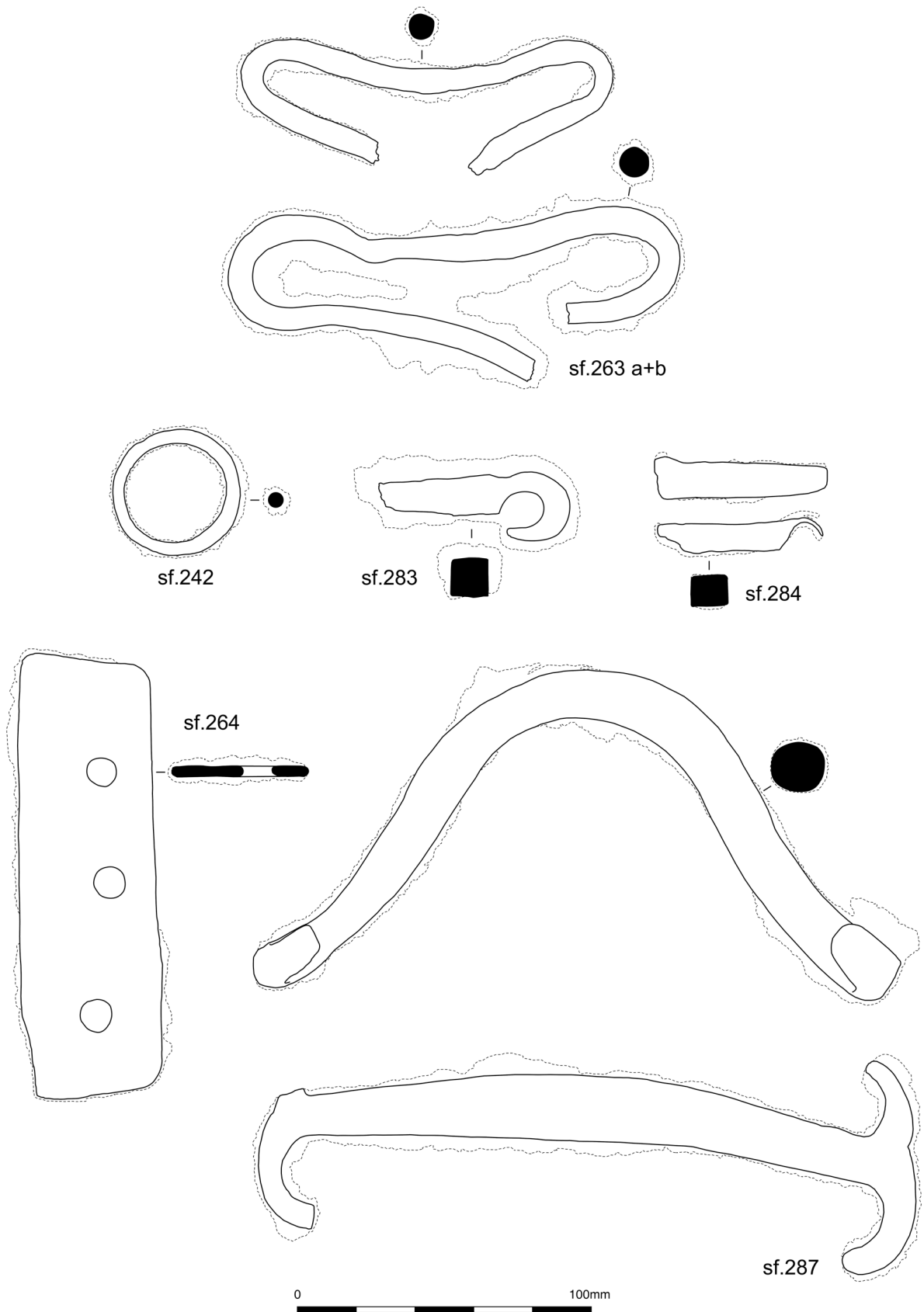
Fragment of a two-link snaffle-bit. Square-sectioned bar, flattened and tapering at both ends (W 9–12, T 4). The ends appear to curve round to form oval hooks; damage to one resulted in loss of the tip, the opposite hook has been lost. L 57, W 10mm. (003/4)

► **SF242**

Circular-sectioned ring (Diam 4); complete. Large diameter is consistent with a bridle bit ring, but there is no wear to confirm identification. Diam 44mm. (003/5)

► **SF287**

U-shaped top of a horse or oxen collar, formed from a robust, circular-sectioned bar, the terminals split and curved back (Diam 6–8; one side badly corroded). Such fittings were used in harnessing draught animals, with the ends fixed to wooden pads and a leather strap running round the animal's chest. They are attested on sculpture on both oxen and horses (Alföldy-Thomas 1993: 331–6, taf 526–30). The published distribution (ibid: Abb 5) focuses on the Upper Rhine and Danube, but there are British examples; Newstead has produced a pair where the



Illus 7.14 Ironwork: transport (copyright CFA Archaeology Ltd)

attachments on the terminals are rings; the open attachments of the Inveresk one fall into Alföldy-Thomas' group NG1a (1993, 335; Teil 2, Typentafel 35). L 216mm, bar Diam 18. (003/4-5A)

Fittings and fixtures (Illus 7.15)

Locks and keys

► **SF193**

Double-spine barb-spring padlock bolt (Manning 1985: 95-6, fig 25:11). Sub-rectangular head (Diam 19, H 9, T 10). Rectangular-sectioned central bar splits into two slightly splayed, tapering rectangular prongs (W 6) with barbs on both sides. Tips damaged.

There is a parallel from Mumrills (Macdonald & Curle 1929: 560, fig 123:7). L 75. (003/11)

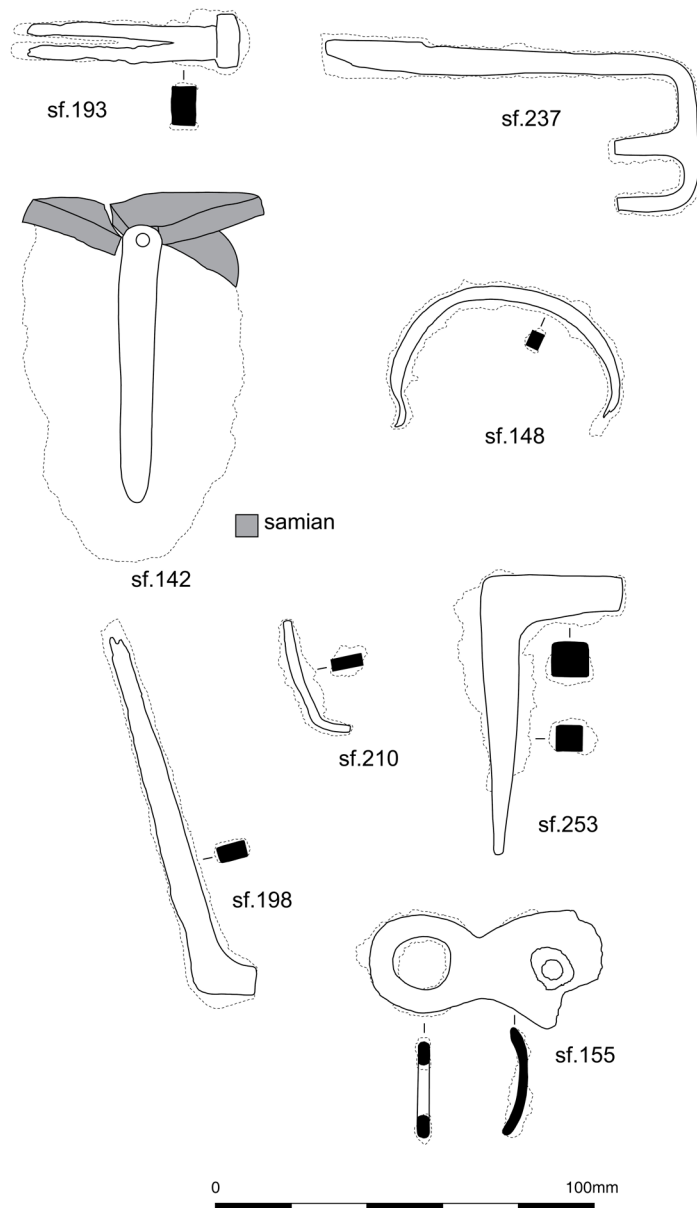
► **SF237**

L-shaped lift-key, broken at the handle end, with two widely-spaced teeth (L 20, 5); the commonest type of key found in Roman Britain (Manning 1985: 90, fig 25: 2-3). L 120, W 50, rod W 11. (003/5)

Clamps

► **SF198**

L-clamp or wall hook. Rectangular-sectioned bar, bent at 90° at one end; broken. Opposite end tapers



Illus 7.15 Ironwork: fittings and fixtures, and miscellaneous (copyright CFA Archaeology Ltd)

gently towards broken end; tip lost. Remaining L 127, W 6–9.5, T 7.5. (Fill 469 of Ditch 270)

► **SF210**

Joiner's dog/clamp fragment. Flat rectangular strip, squared end gently expanding, bent at 45° towards fractured end. Remaining L 45, W 11–15.5, T 4. (Pit 1080)

► **SF238**

U-shaped clamp or strapping, distorted and damaged. Rectangular section, slightly tapering to rounded narrow tip, broken at one end. L 140, W 9.5, T 3–4. (003/5) Not illustrated.

Hinges

► **SF253**

Door hinge; intact. Robust L-shaped square-sectioned bar, bent at right-angles mid-shank, tapering to a narrow blunt square-sectioned point. L 135, W 14–5.5, T 13–16. (003/9)

► **SF258**

Possible hinge fragment. Rectangular-sectioned strip with straight, slightly tapering edges, one severely damaged. Broken at narrowest end. Opposite end curved into a robust cylinder (W 9, T 12), likely to be hollow but too corroded to determine. L 67, W 12–19.5, T 6.5. (003/6) Not illustrated.

Sheathing, binding and mounts (not illustrated)

► **SF149**

Pole or handle sheath fragment. Rounded corner fragment from a wide curving open flanged socket or sheath. Square nail hole (W 4.5) central to remaining fragment with nail shank in situ. Remaining L 64.5, W 31.5–37, T 3. (003/6)

► **SF157**

Perforated rectangular-sectioned bar, broken at one end across a square nail hole (W 6), with two further nail holes spaced equally along the bar. Other end broken; original length and form unknown. L 62.5, W 19, T unknown due to corrosion. (003/5)

► **SF158**

U-shaped binding strip or bracket. Flat rectangular strip with expanded circular flat perforated head (Diam 21.5; square nail hole W 4); bent at two points at 90° to form a U-shaped bracket; nail in

situ mid-length. One arm is distorted, suggesting deliberate removal. L 246, W 13.5, T 6; distance between arms 61.5mm. (Fill 773 of Pit 772)

► **SF255**

Sheet mount with perforation. Thin, slightly curving sheet, only one original straight edge remaining, other edges lost; broken across a large circular perforation (Diam 12). Organic traces on both faces. L 50.5, W 42.5, T 3.5. (003/6)

Sockets (not illustrated)

► **SF146**

Squat cylindrical collar formed by curving a thick rectangular strip. Diam ext 41, int 33.5, T 7.5, H 35. (003/5)

► **SF197**

Rounded tip fragment from a conical tapering split ferrule. L 21.5, Diam 12.5. (003/4–5A)

► **SF256**

Ferrule fragment. Narrow, slightly angled fragment of a conical ferrule with wood traces in the interior; possibly from a spear. Surviving Diam 23.5, approximate int Diam 16.5, remaining H 23.5. (003/6)

Rings (not illustrated)

► **SF145**

Intact, slightly oval, circular-sectioned (Diam 5mm). Ext Diam 34–40. (Fill 193 of large Pit 192)

► **SF218**

Distorted, circular-sectioned (Diam 4), oval, broken at weld. Diam 32. (Fill 807 of Pit 772)

► **SF223**

Circular-sectioned (Diam 4.5); complete. Diam 32. (Unstratified)

► **SF236**

Circular-sectioned ring fragment, broken at one end, other end squared. L 28, Diam 4. (003/5)

Other

► **SF142**

Perforated spike or tapering bolt driven through the base of a stamped samian vessel. Perforation Diam 4; L 88, W 6–12, T unknown. (003/5a)

► **SF148**

Drop handle, terminals broken. Omega-curved square-sectioned bar. L 74, W 3.5, T 4; inner distance between arms 58. (Fill 520 of Ditch 285)

► **SF274**

Hook fragment, broken at both ends. Circular section, tapering towards one broken end. L 41, Diam 6.5. (Pit 747) Not illustrated.

*Nails and hobnails**Gemma Cruickshanks*

Nails

Nails, tacks and hobnails dominate the iron assemblage. Nineteen modern nails and screws from the southern edge of the site are likely to have been associated with the wireworks factory. A further 119 nails and tacks were recovered from 46 contexts. Where intact, the nails could be broadly classified using Manning's typology (1985: 134, fig 32). Three unusual examples (SF219, 241 and 326) are catalogued in detail; the others are summarised and can be found in the archive catalogue. Of the 59 examples where head and shank shape were discernible, 46 fit within Manning's type 1B, with flat sub-rectangular or round heads and square-sectioned shanks. Their length varies from 17.5mm to 46mm with 65% between 30–70mm. Most have straight shanks while 13 are curved, indicating they were removed before deposition, and five are clenched at 90°, suggesting they were in situ. Around half of the type 1B nails were recovered from the midden-rich C003. The others came from a variety of secondary deposits (eg pit and ditch fills) across the site and there are no patterns in distribution indicating their specific use.

Four relatively small dome-headed nails correspond with Manning's type 8, and along with the unusual nail types catalogued separately were likely to have had a specialist function compared to the more common type 1B.

Unusual nails

► **SF42**

Disc-headed bolt or large nail; shank broken. Remaining L 80mm; head Diam 53 × 43, T 4.5; shank Diam 13.5mm. (Fill 921 of Pit 920)

► **SF219**

Disc-headed nail with off-centre broken square-sectioned shank. Remaining L 23; head Diam 26.5, T 4; shank Diam 4. (Fill 807 of Pit 772)

► **SF326**

Robust round-headed nail with rectangular shank; bent at 90° towards tip, suggesting it was deposited still clenched in timber. L 161; head Diam 18.5, T 11; shank Diam 8 × 5. (003/4)

Hobnails

Hobnails were used to secure and strengthen the leather soles of footwear and are commonly found on Roman sites. A total of 681 hobnails were recovered, all with characteristically square-sectioned shanks and domed heads. Of these, 611 are part of 18 clusters of 12–76 hobnails, corroded together and retaining the shape of the sole. One cluster of 69 hobnails is an almost complete sole (SF278) with the X-ray revealing five regularly spaced lines of hobnails converging at the rounded toe. This was recovered from the fill of large Pit 192.

Fifteen of the hobnail clusters have preserved leather in the corrosion from the sole. Such clusters are likely to represent deposition of a whole or partial shoe, either as rubbish disposal or from the burial of individuals with footwear. These hobnail clusters are associated with ditch fills (feature numbers 340, 349, 429, 438, 516, 517, 530, 797) and pits (feature numbers 192, 935, 1052). In contrast, single hobnail finds scattered widely across the site are likely to be the result of casual loss.

The largest concentration of hobnails (188), many with mineralised leather traces representing whole or partial soles, were recovered from C515 in association with a human skull within the midden deposit (C003). Six further contexts containing human bone were associated with hobnails, including deposits of cremated bone, pyre material and inhumation burials (Contexts 061, 068, 321, 544, 545, 881). Most of the hobnails (66%) were from the fill of various pits, post holes and ditches.

Miscellaneous (Illus 7.15)► **SF155**

Possible handle mount for leather vessel or loop-strap terminal fragment. Slightly bow-waisted strip with an oval loop (L 34, W 34, T 4.5) at the top to

receive the end of a handle or leather strap; broken mid-length. Wear has elongated the eye of the loop (L 18.5, W 17). Below the loop a dome-headed rivet (Diam 17) secures the mount to a thin inner iron plate, only a small portion of which survives (L 35, W 30, T 2). Leather traces sandwiched between the two suggest use as a handle mount for a leather vessel. A very similar complete double-waisted mount for a copper alloy vessel comes from Vindolanda (Jackson 1985: 145, no. 91, fig 53). Remaining L 74. (003/5) Phase 7.

► **SF190**

Flat rectangular-sectioned strip fragment; broken at one end, squared at other. Remaining L 28.5, W 26, T 4.5. (003/11) Not illustrated.

► **SF221**

Tapering rectangular-sectioned bar, broken at both ends, curving upwards towards wide broken end. Original length unknown. (Unstratified) Not illustrated.

Unidentified (not illustrated)

► **SF161**

Unidentified object fragment. Amorphous ovoid nodule, heavily corroded. (Fill 780 of Ditch 764)

► **SF195**

Fragment of a robust curving sub-circular object, expanding towards one end, encased in mineralised organic material (?wood); broken at both ends. Remaining L 36.5, W 8.5–15.5, T 13.5. (003/4–5A)

► **SF196**

Flat edge fragment from a thin iron sheet; other edges lost. L 28.5, W 23.5, T 3.5. (003/4–5a)

► **SF254**

Unidentified, heavily corroded fragmentary object. Curving corner of a rounded sheet fragment with irregular thickened area around one original edge; the opposite edge and end area broken. L 52.5, W 35, T 5. (003/6)

► **SF285**

Blacksmith's offcut? Rod, broken at one end, bent in three places; flattening of the narrow tip suggests it was intended to be gripped by tongs. L 35, surviving W 19, H 22. C003, midden (Zone 4) Phase 7.

► **SF295**

Oval amorphous corroded iron object; unidentified. L 71.5, W 51, T 44. (003/3)

► **SF301**

Flat angular sheet fragment, only one original straight edge remains. L 48, W 26, T 4. (003/2–3)

► **SF303**

Flat sheet fragment, only one original edge remaining. L 39, W 24.5, T 4. (003)

► **SF315**

Circular-sectioned tapering rod; one squared end remaining, the other has been lost. L 118, Diam 6–10. (003/8)

7.7 Copper alloy and lead

Fraser Hunter

The assemblage of non-ferrous objects comprises 34 copper alloys and two lead items. As the site was metal-detected extensively during excavation, it is likely that this is a representative sample of the material present. Table 7.14 summarises it by broad type and phase. Fixings and fastenings dominate; most of the military items also fall into this category, as strap junctions or mounts. There is only a small assemblage of ornaments, two of them from burials, and only a few vessels. A significant proportion of the material is unidentifiable due to its fragmentary condition, and it is clear that the bulk of the finds were discarded after breakage. Many items are broken while others, although complete in themselves, lack other components (such as the likely bridle bit ring). In the case of strap fittings, it is plausible that they were discarded when the strap broke. The only certainly complete item was brooch SF1 (from a burial); ring SF363, also from a burial, was probably also buried intact, but was heavily corroded.

A significant proportion of the finds are certainly or probably related to military equipment, mostly strap fittings. Many of these are most likely connected with horse harness, but this is only certain with the two junction loops, a well-known cavalry type (SF21, SF41). The two phallic strap mounts are also well known in military contexts, with good parallels from the northern frontier and further afield (eg South Shields, Corbridge, Vindolanda;

Table 7.14 Distribution of the non-ferrous metalwork by type and feature group

Category	No.	Burials	Field system	Midden	Other
Military	8		2 junction loops, Phallic strap mount	Phallic strap mount Button-and-loop fastener Enamelled stud	Fine strap pendant and terminal (post-built building) Strap terminal (cobbles)
Ornaments	5	Knee brooch Finger ring frag		Knee brooch Fine ring-mounts	?post-Roman strap end (cobble spread)
Vessels	2		Jug lid	Dipper/strainer handle	
Fixings and fastenings	11		Bridle bit ring? Mount	Washer Stud × 2 Mount × 4 Cylindrical fitting Stud fastener	
?	8		2	5	Pit 811
Lead	2				Casting waste (Pit 192) Rod (TP6)

Allason-Jones & Milet 1984: nos 3.588–9; Bidwell 1985: fig 40 no. 25; Allason-Jones 1988: 179, fig 85 nos 168–9; for German parallels, see Oldenstein 1976: taf 42, nos 410–12). Two examples adorned a headstall buried with a horse at Beuningen (NL; Zwart 1998: 79, fig 3.1–2), suggesting a link to cavalry harness is likely with the Inveresk examples. The phallus was widely used as an amuletic symbol to ward off the evil eye and as a symbol of fertility or virility. It occurs on a wide range of material on military and civilian sites (Crummy 1983: 139): for Scottish examples, note a phallic pendant from Birrens (Robertson 1975: fig 38 no. 5) and mounts with phallus and phallic fist from Newstead (Curle 1911: pl LXXVII nos 2–3).

Other strap fasteners and mounts could have come from horse harness or from other straps among a soldier's equipment. The button and loop fastener (SF356) is common on military sites. The strap terminal SF38 is a type used for soldiers' belts, but again saw wider use. The pendant and terminal group SF45 come from a notably fine strap. The ring SF13, included under fastenings, could also be seen as military, as its size is consistent with use in a bridle bit.

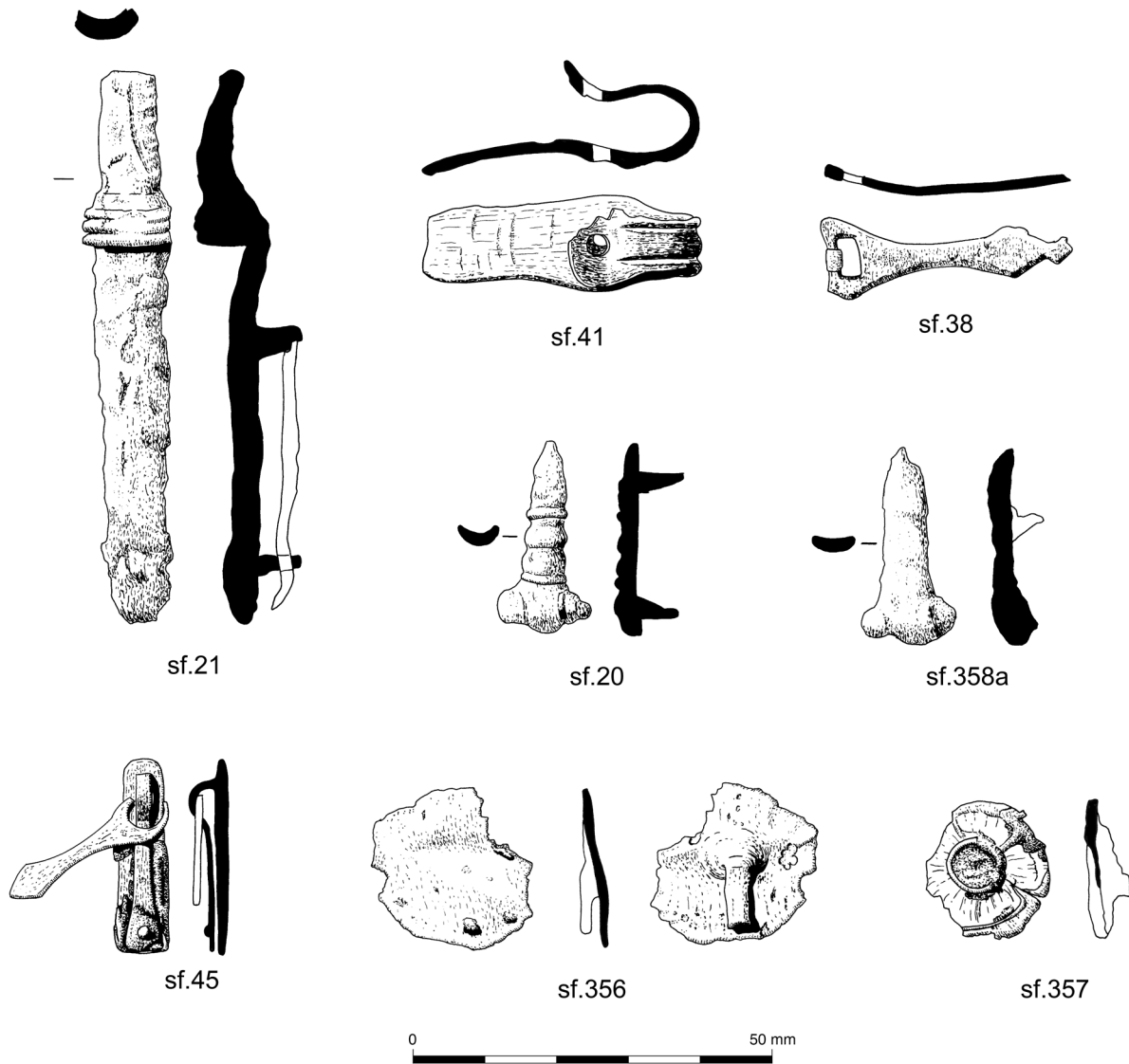
Ornaments are few, but include two knee brooches, typical of the Antonine period and already well represented at the site. Table 7.15 shows the spectrum of brooches currently known from Inveresk, dominated by knee and penannular types.

The two vessel fragments are types well known from Scottish fort sites. The range of fixings and fastenings is hard to link to specific roles, but includes a number of sheet mounts, either ornaments (perhaps on organic items) or patches, as well as a number of studs and rivets. Two unusual items which have proved hard to parallel are the conical stud fastener SF364, with preserved traces of two straps, and the hollow cylinder SF353a, its central band suggesting something was fastened to it.

There was little lead from the site, and the two fragments are not securely from Roman contexts. The other notable absence is coins; these are well represented at other Inveresk sites, including the equivalent midden phase at Inveresk Gate (Stabler 2004: table 45; three of the 17 coins are from the midden). It suggests that some care was taken in selecting what was deposited on the north side of the fort.

Table 7.15 The brooch assemblage from Inveresk. (Sources: this report; Thomas 1988: fiche 2: B3, B12 no. 3.25; NMS 1992: 50; Bishop 2004: 133, 151–2; Hunter forthcoming)

Type	No.	Details
Knee	7	All Snape type B = Hull type 173B
Alcester	2	
Penannular	7	A1 × 3; A2 × 2; A3 × 2
Plate	3	Hull type 262, 263, 269
Unidentified	2	Iron fragment; spring
Total	21	



Illus 7.16 Copper alloy: military equipment, strap fasteners and mounts (copyright CFA Archaeology Ltd)

7.7.1 Catalogue (all copper alloy unless stated)

Military equipment: strap fasteners and mounts
(*Illus 7.16*)► **SF21**

Cavalry harness strap junction loop, a variant of Bishop's type 8g (1988: fig 51), the curved portion broken and distorted from use. The thin rectangular washer, held by two shanks, is preserved on the underside, giving a strap thickness of 4mm. Plain body, plano-convex in section, curved down towards the end, then steps up into the loop at a triple-moulded collar. One side of the loop has a curved incised decorative line, lacking on the other. Its underside is hollowed. L 76, W 13, H 15mm. (Fill 520 of Ditch 285)

► **SF41**

Cavalry harness strap junction loop, lacking one end of the plain waisted body. Two grooves on the loop define a raised centre; the perforation has been repaired, giving a figure-of-eight form on one side (Diam 5 × 2mm; 3.5mm on underside). The rounded end on the underside is sprung from removal of the strap. There is a close parallel from Binchester (Bevan 2010: 355 no. 120; fig 96 CA 67). 39 × 12.5 × 14mm. (Fill 896 of Ditch 851)

► **SF20**

Stylised phallic strap mount with small testes and ribbed shaft; collars define the base and tip. Two shanks (L 6mm) on the slightly hollowed underside. Close parallels from South Shields and Zugmantel show similar ribbing (Oldenstein 1976: taf 42, no. 412; Allason-Jones & Miket 1984: 187–8, 3.588). L 27, W 13.5, H 10mm. (Fill 583 of Ditch 449)

► **SF358a**

Phallic stud strap mount. Cast, with rather stylised anatomical detailing in low relief. The sunken underside has two shanks (L 4.5mm) for attachment to leather, traces of which survive at the rear. 27.5 × 14 × 7.5mm. (515 = 003)

► **SF38**

Lanceolate pendant strap terminal. Squared end with D-perforation (5.5 × 3mm) containing remains of a copper alloy loop which would have attached to a strap. Body is waisted before biconical tip ending in a dot terminal. Edges faceted on upper surface.

Slightly bent. Such pendants are often thought to come from military aprons but could have belonged to straps with a range of uses (Chapman 2005: 147; James 2010: 85 no. 152); there are plentiful close parallels (eg Caerleon; Chapman 2005, Wa09, Wa10; Newstead; unpublished, NMS FRA 1025). 35 × 11 × 1.5mm. (Cleaning top layer of Cobbles 717)

► **SF45**

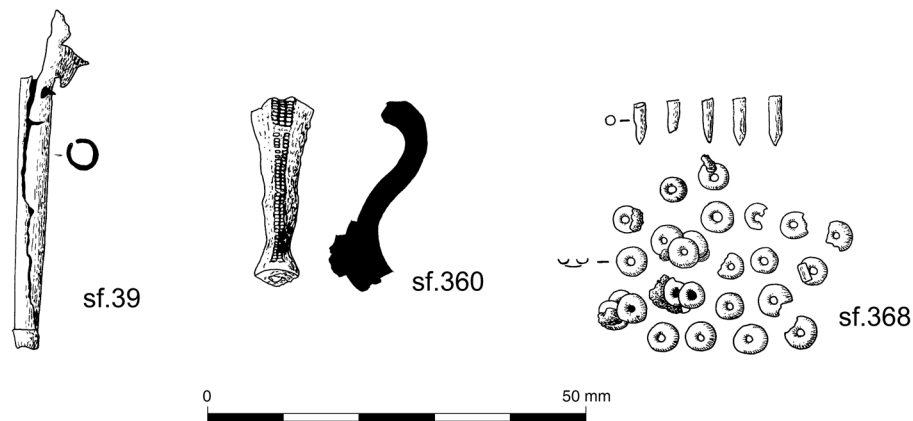
Fine pendant hanger and strap terminal. The hanger is a tapered rectangular strap end with integrally cast waisted loop on rear to hold a strap (T 2mm) by a single rivet. The strap survives and stops short of the end of the fitting where the loop expands, leaving a space through which another fine strap (max H 3, L 4mm) could fit. 26 × 8.5 × 5.5mm. Compare an example from Caerleon (Chapman 2005: 157, Wn06). The fine pendant has a rounded terminal with broken circular perforation (Diam 4.5mm), thinned and expanded from use wear. Waisted body, tip expands and then tapers. Slightly rounded edges on one face (cf Saalburg; Oldenstein 1976: taf 36 nos 303–4). 25 × 6 × 1mm. (Fill 1115 of Post Hole 1114)

► **SF356**

Disc-headed button and loop fastener (Wild 1970: class V c), the loop mostly lost and the disc margins damaged and distorted. The shank lies close to the disc, implying it was used in material no more than 2mm thick. Fine feathered filemarks on the surface from finishing. Wild's listing (1970: 151–2), while now very dated, gives plentiful parallels from British fort sites but the type is rare in an indigenous context, in contrast to other such fasteners; he records only two from Traprain. Such items were commonly, but not exclusively, used as strap fasteners for horse harness. There is an enamelled variant of class VI a from the Inveresk *vicus* (Rogers 2002: 39). Diam 25, T 5, disc T 0.6mm. (003/3A)

► **SF357**

Enamelled disc-headed stud with integrally cast slightly bent shank (L 5, Diam 2.5mm) in centre of slightly dished underside. Two enamelled fields separated by reserved metal circle; central dot, any surviving enamel hidden by corrosion, and peripheral ring. Most of the enamel here is lost, but it can be reconstructed as five curved millefiori blocks, each separated by three narrow stripes (alternating green, light blue and green).



Illus 7.17 Copper alloy: ornaments (copyright CFA Archaeology Ltd)

The main blocks are too damaged to reconstruct, but include white and translucent ?turquoise enamel, the design featuring both diagonals and a chequerboard element. Such enamelled studs were strap ornaments, and can be paralleled at Inveresk and on other Scottish fort sites such as Newstead, Mumrills, Camelon and Birrens; not all are closely dated but there are clear second-century parallels (Christison et al 1901: 405, plate A3; Curle 1911: 332, pl LXXXIX nos 17, 21, 24; Macdonald & Curle 1929: 555, fig 115 nos 9–11; Robertson 1975: fig 31 nos 1 & 3, fig 37 no. 6; Bishop 2004: fig 89 no. 18). Diam 19.5, H 7.5mm. (003/4–5A)

Ornaments (Illus 7.17)

► **SF360**

Knee brooch, the head lost recently. Rounded profile with upturned foot, solid plano-convex section, central relief dot on upturned foot. Applied longitudinal decorative strip with three fine rows of bosses; perhaps set in a slight groove on the head, elsewhere laid on surface and soldered. Analysis of similar examples shows that the strip would have been in a contrasting white metal, often silver (Bailey 1997: 589; Bayley & Butcher 2004: 180). Probably of Hull type 173 (Bayley & Butcher 2004: 180); Snape (1993: 18–19) type B or D; Mackreth (2011: 190) type KNEE1.b; dating as for SF1. L 26, W 8.5, H 8mm. (003)

► **SF368**

Series of fine decorative mounts and four small tacks or rivets. The rivets are solid, headless, slightly

tapered and faceted, L 6 × W 2mm (one broken). The mounts are shaped like half-doughnuts (Diam 3.5, H 1mm), with a rounded profile and central perforation (Diam *c* 0.5mm). They are made from sheet, hollowed underneath, and probably punched in a die. Their fineness suggests they were once fastened (probably stitched) to leather or textile, but three small clusters include some which are clearly stacked. This and the lack of surviving organics implies they were not attached when deposited. There are 17 intact examples, with fragments representing a minimum of six more. (003/9, T5)

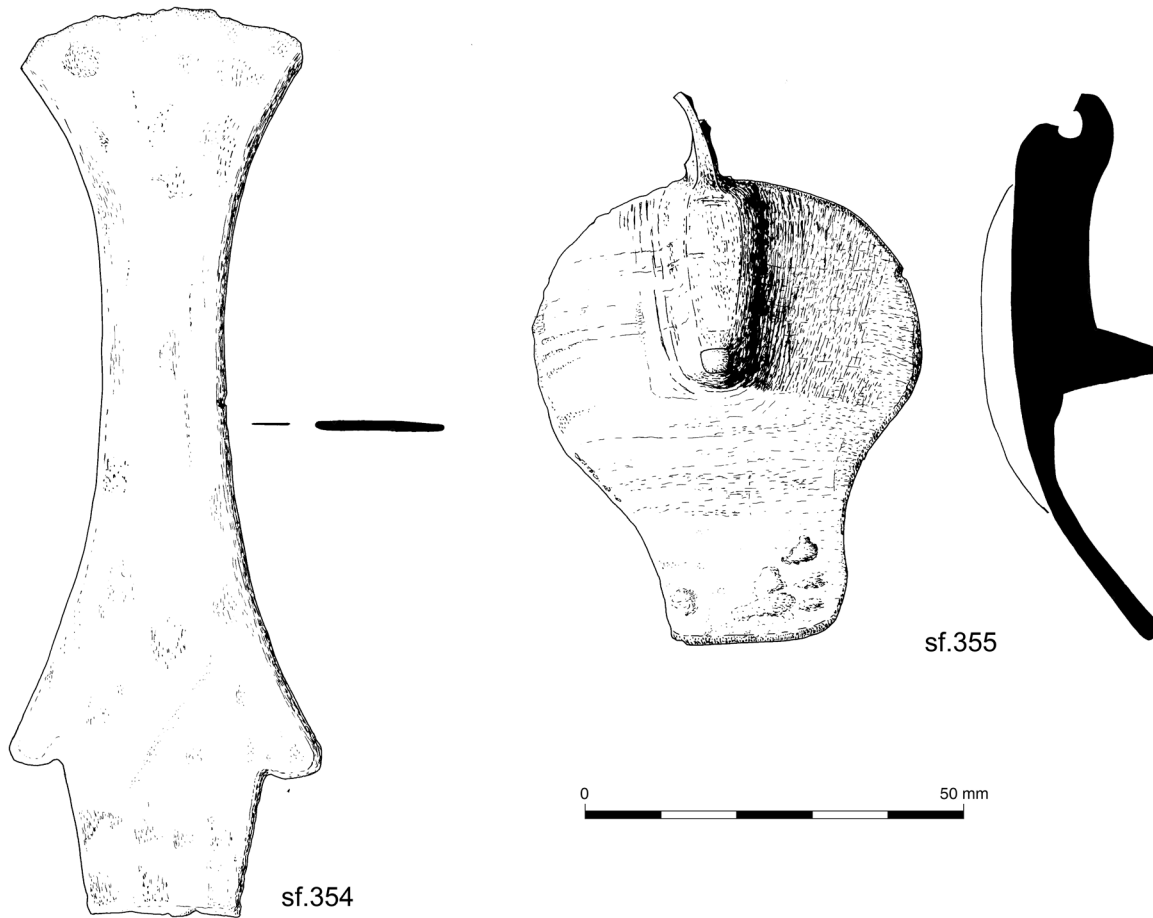
► **SF39**

Strap end made from tapered sheet cylinder, one end open (and distorted), the other closed over. Would take a strap or thong of Diam 3.5mm. L 45, Diam 4.5mm. Perhaps post-Roman. (N Cobble Spread 717)

Vessels (Illus 7.18)

► **SF354**

Handle of a dipper or strainer of Eggers (1951) type 160 or 161, snapped cleanly just below mid-shaft, preserving the flared terminal (its end rounded) and the slightly flared and lobed central portion. Very well finished; slightly rounded edges on the upper surface. Petrovsky (1993: 98–102) dates the type's production from *c* AD 35–160; there are other examples from Scottish forts (eg Castledykes and Cramond; Robertson 1964: 161, pl 7 no. 16; Holmes 2003: 109, illus 99). L 119, max W 41, T 1.5mm. (003/5)



Illus 7.18 Copper alloy: vessels (copyright CFA Archaeology Ltd)

► **SF355**

Hinged jug lid; the pear-shaped body, slightly curved in profile, tapers and rises to a squared tip. An integrally cast ridge on the rear of the lid has a vertical spike at its front end, used to open it, and a thinner perforated plate to the rear to take the hinge. This plate is slightly bent and the perforation (Diam 3.5mm) is broken. Extensive filemarks from post-casting finishing. A similar lid comes from Inveresk *vicus*, with other Scottish examples from Birrens, probably Balmuildy, and Newstead, the latter also producing a jug handle with a fitting for such a lid (Curle 1911: pl LIV.6; NMS FRA 3289 (lid, unpublished); Miller 1922: pl LIII no. 11; Robertson 1975: fig 36.1; Bishop 2004: fig 89 no. 23). They come from sheet bronze spouted jugs of Eggers type 128, probably for heating water (Eggers 1951: taf 11 no. 128; Koster 1997: 30–31; Tassinari 1993: type E5000). L 73, W 50.5, H 21mm. (Fill 428 of linear feature 368)

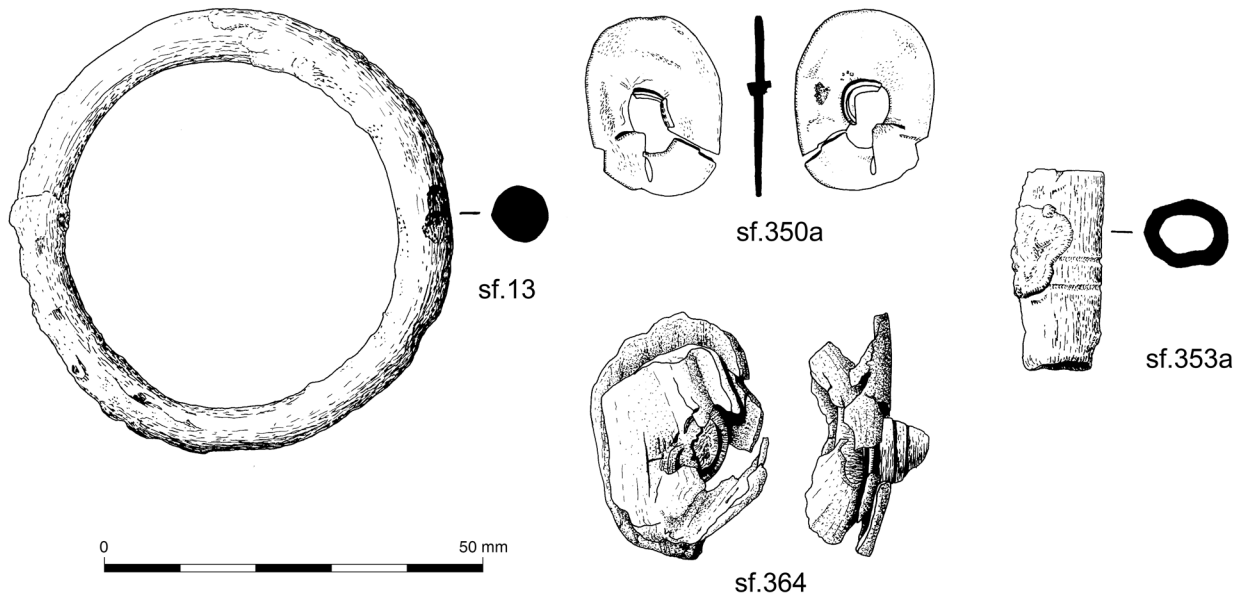
Fixings and fasteners (Illus 7.19)

► **SF13**

Solid ring cast in two-piece mould (traces of join survive). Size consistent with use in a bridle bit, though this cannot be proven; it is thinner on one side from wear or irregular casting. Diam 59, H 7.5, W 5.5–8.5mm. (Surface of Fill 547 of Linear Feature 566)

► **SF350a**

Unusual cast oval washer with a low integral collar on both faces around the central perforation (Diam 4.5mm). Some filemarks around collar from post-casting finishing. Slight dishing from use around the perforation on one face. Cracked from use-strain. The form is unusual for a washer (which normally lies flush), and suggests it was made to slot or engage precisely into something on both sides. 24 × 18.5 × 2.5mm. (003/5)



Illus 7.19 Copper alloy: fixings and fasteners (copyright CFA Archaeology Ltd)

► **SF350b**

Small cast disc-headed stud, slightly irregular. Size suggests it was for decorating leather. Diam 7, H 4, shank L 2.5 × Diam 2mm. (003/5) Not illustrated.

► **SF350c**

Fragments of large cast stud with flat head of uncertain form and integral broken shank. Max L 15, H 6.5, shank Diam 3mm. (003/5) Not illustrated.

► **SF351**

Flat disc, probably a mount, rear obscured by corrosion. Diam 27, T 1mm. (003/5) Not illustrated.

► **SF352**

Very fragmentary mount(s). One fragment preserves an angular corner, rounded in profile; another fragment is also slightly rounded. These differ notably in profile from a third which is a flat sheet, preserving an original straight edge with a cast rectangular-sectioned rivet through it (L 10.5, shank 2–2.5, head W 6mm), very similar to SF370. The variety in profile suggests more than one sheet object is represented. One is probably a simple flat sheet mount or patch; the other was more three-dimensional, with angled corners, but its form is unclear. Max L 15.5, T 0.5mm. (003) Not illustrated.

► **SF353a**

Cylinder with central slightly sunken encircling band defined by two marginal grooves. Its recessed ends are obscured by corrosion, but by calculation its mass (6.1g) implies it must be hollow. Perhaps some kind of junction or fixing, with something running through it and something else (a thong?) held in the central band. L 27, Diam 10mm. (003/cleaning)

► **SF353b**

Buckled rectangular sheet, one corner lost; perhaps ripped around an off-centre perforation, although corroded edges obscure the evidence. Perhaps an impromptu washer. 28 × 19 × 1.5mm. (003/cleaning) Not illustrated.

► **SF364**

Conical stud fastener, set into a surviving fragment of leather strap; this obscures the attachment mechanism, but no shank pierces it so it must be embedded. Stud has moulded profile, with flat base and rounded collar below a conical peak. A second strap fragment is held between the collar and base, suggesting this acted as a fastener and was not purely decorative. Diam 13.5, H 14mm. (003/5)

► **SF369**

Sheet mount fragment (13 × 9 × 1mm), edges lost, with remains of perforation, and two fragments of

fine rivets or tacks, solid-cast with circular section (Diam 1.5, L 16 and 7.5mm). (003 S.86) Not illustrated.

► **SF370**

Small sheet fragments, some slightly bowed in section, original form unclear, and a solid-cast rivet with tapered square-sectioned shank and slightly distorted square head (L 7.5, head W 3, shank W 1mm). (Fill 530 of Ditch 449, S.118) Not illustrated.

Unidentified (not illustrated)

Undiagnostic fragments and flakes were also recovered from Fill 276 of Ditch 238 (SF359); C003 (SF366); Fill 653 of Ditch 285 (SF367); and sheet fragments from C003 (SF353.3, 358.2).

► **SF361**

Tapered bent strip, cut square at narrower end, other end lost. Function uncertain. 37.5 × 12 × 0.2mm. (Fill 812 of Pit 811)

► **SF362**

Curved, tapered cast rod fragment; unidentified. 18.5 × 6.5 × 6mm. (003/4)

► **SF365**

Long thin rod ending in blunt tip, other end broken recently. Oval section, its irregularity suggesting it is not a pin; function uncertain. 99.5 × 4 × 2.5mm. (003/11)

► **SF371**

Irregular flat melted lead fragment, slightly curved in section, edges lost in places. Heat-affected lead or casting waste. 52 × 25 × 7mm. (Fill 193 of large Pit 192)

► **SF372**

Lead rod, one end flat and slightly expanded, the other curving gently into a blunt tip. L 58.5, Diam 12mm. (TP6, 1.8–2m depth)

7.8 Miscellaneous small finds

Fraser Hunter

7.8.1 Shale

A single lathe-turned bangle fragment was discovered (SF18; Illus 7.20). Although it is unstratified, lathe-

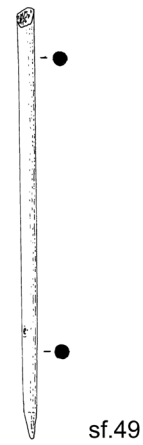
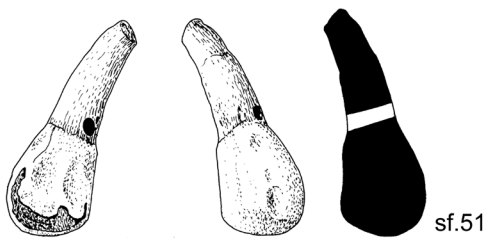
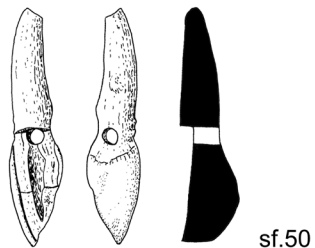
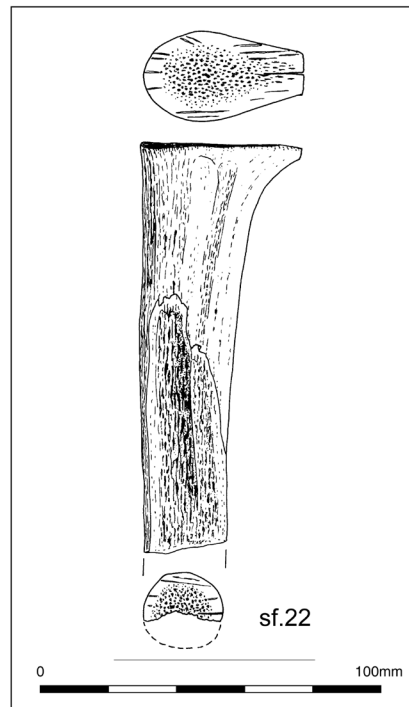
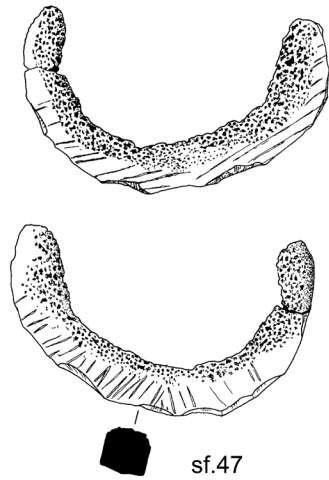
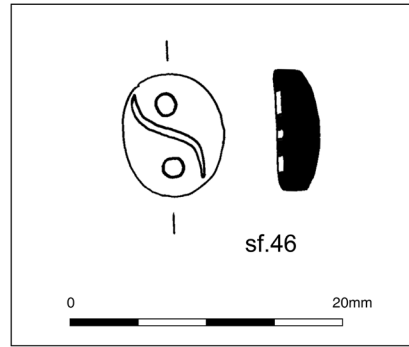
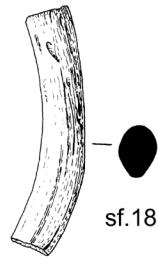
turning was not a local technology, and is only certainly found in Scotland during the Roman period. Bangles of black organic-rich stone are known from a number of Roman sites in Scotland (Hunter 2006: 85), including another, rather larger example from Inveresk (Bishop 2004: 149, fig 99.127). There are both imported examples (often lathe-turned) and local, hand-carved products. The current example is likely to be an import from the Kimmeridge area of Dorset, where there was an extensive industry of lathe-turned armlets (Calkin 1955; Lawson 1975). Allason-Jones (1996: 6–7) cautions that Kimmeridge shale does outcrop further north as well, but so far there is little evidence for a significant industry in other areas, and a Kimmeridge source is likely. This bangle might have come in on someone's arm, but could also have moved north as a trade good as part of the system which brought other Dorset products to the northern frontier, notably Black Burnished 1 pottery. Its large internal diameter is quite typical of the bangles known in Roman Scotland, and contrasts with the broader range represented in Iron Age contexts and in more southerly parts of Roman Britain (eg Lawson 1975: fig 3), suggesting on the frontier these were predominantly male ornaments.

► **SF18**

Shale bangle fragment; D-sectioned, with notably rounded and slightly asymmetrical interior. Well finished, and polished to a low lustre. Residual fine striations indicate that it was lathe-turned; a series of angled filemarks on the curve of the interior are probably from smoothing the detachment scar where the core was removed. Extensively used, the outer surface much worn. Its grey, laminar nature identifies it as shale, and it is most likely Kimmeridge shale – the main Roman source for lathe-turned bangles (Calkin 1955). L 37, W 7, T 8, int Diam 80–85mm (14% survives). (Unstratified)

7.8.2 Amber

An amber intaglio (SF46) from the midden dump in C003 is an enigmatic item (Illus 7.20). Amber was used for Roman finger rings, although more often as complete rings with designs in relief rather than intaglio (eg McCarthy et al 1982: 88, pl IVA, from Carlisle; Carina Calvi 2005: tav 1–33). Amber



Illus 7.20 Bone, antler, shale and amber: miscellaneous small finds (copyright CFA Archaeology Ltd)

intaglios are much rarer, although not unknown, in the Roman world (there is one from Traprain Law, for instance, with a chequerboard design; Burley 1956: 174 no. 156). The yin-yang motif on this one is hard to parallel on Roman intaglios but more typical of modern jewellery, and there is other intrusive material in this context. However, it would be harsh to condemn it outright without stronger evidence, and its identification remains in the balance pending further parallels.

► **SF46**

Amber oval intaglio with an abstract design of a curved S-like groove across the field, forming a yin-yang motif straddled by two dots on the longitudinal axis. It has a flat face, perpendicular sides (apart from one small sloped facet) and a convex rear. A small dark fragment on one side is probably corroded traces of a ring or the adhesive to fix it. The front is in good condition, with use-scratching; the back is more corroded, perhaps from its fixing. L 9.8, W 8.1, T 3.3mm. (003 S.86)

7.8.3 Bone and antler (Illus 7.20)

Inveresk is rare among Scottish Roman sites in preserving bone, and previous excavations have produced an interesting range of bone and antler objects (Thomas 1988: 172; Bishop 2004: 147–9, 155–8, fig 98–9, 106). A small cluster of finds came from midden-rich C515 within C003. All are ornaments: a broken pin shaft, and two tooth pendants. Such pendants, here made from incisors, are a well-known Roman type (eg Greep 1995: 1130, no. 913 with discussion). The broken pin and needle tips are readily paralleled in the existing finds from Inveresk, while an unfinished ring and handle (SF47, SF22) confirm that antler working took place at the site (cf Bishop 2004: 155 no. 53).

► **SF50**

Tooth pendant; incisor, worn in use with the dentine exposed. A cylindrical suspension hole (3mm D) was drilled at the top of the root, parallel to the tooth's plane. There is a little polish around the perforation from use. L 35, W 12.5, T 8.8mm. (515=003)

► **SF51**

Identical tooth pendant, with part of the tooth lost in a recent break. Polish from use around the hole is

slightly more pronounced. L 35, W 7.5, T 8.5mm. (515=003)

► **SF49**

Broken pin shaft, well finished; the extreme tip tapers sharply and shows some rounding from use. Its carefully polished circular section suggests it is a pin rather than a needle; broken in use. L 64.5, Diam 2.5mm. (515=003)

► **SF48**

Tip of a bone needle or pin, slightly faceted, with use polish. The faceting suggests appearance was not critical, and thus it is perhaps more likely to be a needle. L 15.5, Diam 1.5mm. (003 <86>) Not illustrated.

► **SF47**

Half of an unfinished antler ring, in two joining fragments. A segment of beam was sawn into a thin disc, the surfaces filed and the interior (cancellous) tissue hollowed out. A series of shallow knife-cut facets have trimmed the outer surface into a near-circular form. Its intended function is uncertain, but compare examples from South Shields (Allason-Jones & Miket 1984: 2.120–22). Ext Diam 45, H 8, W 8.5mm. (Fills 430 and 432 of Ditches 429 and 431)

► **SF22**

Antler handle roughout. Beam segment, sawn square at ends, with single facets trimmed horizontally along the sides. The broad end cuts through the point where a tine had been detached (also by sawing), creating an expanded end very suitable for a handle, and this was probably its intended function; abandoned owing to fracture of the other end. L 120, H 47.5, W 26.5mm. (Fill 616 of Ditch 449)

7.9 Coarse stone artefacts

Ann Clarke

A small number of coarse stone artefacts were found, most of which date to the late prehistoric and Roman occupation of the site (Table 7.16). Two cobble tools, both of which are rounded hammerstones, were associated with the Late Mesolithic activity, one from the lithic scatter at the southern edge of the site and the other from the Mesolithic Pit 625. Both of these tools were most likely used as

Table 7.16 Types of coarse stone artefacts

Type	No.
Cobble tools	4
Whetstones	4
Anvils	3
Shale	2
Counter-sunk pebble	1
Structural stone?	3
Slab fragments	7

knapping hammerstones and they are discussed together with the flaked lithic assemblage (Clarke & Kirby forthcoming).

The two other cobble tools comprise a small smoother/rubber (SF10) and a pounder/grinder (SF24), both of which are classic Iron Age tool types. Short multi-directional striations were left on the face of the smoother/rubber from its use, suggesting it was worked against a material coarser than the fine-grained sandstone of the cobble. The pounder/grinder is a nice example of its type with two ridged facets ground on one end and a single face which has been worn flat and smooth. These types of cobble tools are thought to have been involved in processing foodstuffs such as grain (Clarke 2006). There is a strong possibility that this tool was then reused as a heavier pounder as demonstrated by the traces of coarse, random pecking on the opposite end, which are at odds with the original ground facets and face. Later reuse of these grinding tools as heavier hammerstones is a feature of pounder/grinders from the Iron Age site at Mine Howe, Orkney (Clarke 2008) and suggests that the Musselburgh tool was originally used earlier than its final use (and deposition) suggests, perhaps as far back as the Late Bronze Age/Early Iron Age.

None of the whetstones is heavily worn but the fragment of medium-grained sandstone (CS4) from 003/6 has a rectangular cross-section indicative of a more formal tool type. Unfortunately, because of weathering not much survives of the original worn face to illustrate the extent of wear. Another whetstone fragment (CS2) from Pit 232 is of fine-grained sandstone with an ellipsoid cross-section.

Narrow facets have been worn down the parallel sides and on both faces of the tool.

The remaining two whetstones are larger and appear to be less heavily worn than the above tools and they could be under-used hones or else used for some purpose other than the maintenance of a metal blade. The larger tool is a fine-grained metamorphic stone (CS7) from Pit 287 and the flat lower face may have been used as a smoother but a long, narrow facet has been worn along one edge, suggesting its use as a whetstone. The fragment (CS3) from 003/8 has an oval cross-section and its flatter face may have been worn through use as a smoother or whetstone, though no striations are visible.

The presence of anvil stones perhaps indicates that some craft activities were carried out in the vicinity. They are made variously on a thick slab or flat cobbles. Burning has affected CS6 from Ditch 368 and CS13 from 003/5 causing cracking and breakage post use. The use wear on all three of the anvils is randomly placed comprising patches of sporadic heavy pecking with occasional striations over the surface and indeed the wear traces on the slab (CS11) from the midden, C003, are so indistinct as to suggest incidental damage rather than deliberate use wear. There is no indication that any of the anvils were used for specific or detailed workings which would have left more localised and distinctive wear patterns.

A countersunk pebble (CS9) from 003/7 is an interesting artefact. This flat oval pebble of medium-grained sandstone has a single, almost circular, round-based hollow worked onto each face. The hollows are placed off-centre and directly opposite each other. The pecked surface of the interior of the hollows and the symmetry of the cross-sections indicate that the hollows were carefully shaped. Some slight damage around the perimeter of the pebble is most likely incidental rather than as the product of deliberate hammering. There is also a residue over one face as if from the deposit it has been lying in. Both the function and dating of this object is difficult to assess as they were not commonly used in prehistoric Scotland. Recently excavated examples include two fragments of countersunk pebbles from an Iron Age Roundhouse at Bornais, South Uist (Clarke 2012) and a less symmetrical piece from Late Iron Age deposits at Pool (Clarke 2007). They are sometimes interpreted in the literature

as unfinished perforated weights or maceheads but the regularity of the working suggests that they are finished objects in their own right. They occasionally crop up in the Mesolithic literature, for example countersunk pebbles are mentioned from excavations at Culverwell, Dorset (Palmer 1989) but these are more irregular in form than the Musselburgh example and were clearly shaped through their use as anvils, while closer to home there is an unstratified example from the Borders mentioned as being of a possible Mesolithic date (Saville 2004: 192). It is likely that these Mesolithic 'countersunk' pebbles are in fact more highly developed forms of the dished cobbles recorded from recent excavations at Sand, Applecross (Clarke 2009) and as such are not 'finished' shaped objects such as the one from Musselburgh. An Iron Age date would therefore seem to be the most likely for this artefact.

Two pieces of shale were recovered; one an unworked friable lump (CS1) from Pit 920 and the other (CS10) from 003/11A, a very friable, probably burnt fragment with traces of working. The shaping on this fragment of shale comprised a defined ridge on the surviving surface with a modified, slightly concave surface to one side of it. Groups of unidirectional striations are visible running perpendicular to the ridge, indicating the main direction of working, and there are also some more randomly placed striations over the rest of the surface. This would appear to be an unfinished item, perhaps discarded because of breakage, and there is no sense from the blank of what the intended object was to be.

Three possible structural fragments and seven slab fragments were also recovered. The sandstone slab fragments range between 19mm and 28mm thick and are too broken to determine original shape and size. Two pieces, S3 and S4 from Pit 618 and 003/6, are sooted and may have been associated with some activity about a hearth or fire.

A possible architectural fragment, CS12 from 003/5, may be from a simple moulding from around a window or door. A flat 'rim' on CS15 (003/6A) may also have been shaped for an architectural or structural function, though it was made of coarser sandstone than the possible moulding CS12. The third piece, CS14, is unstratified and is a simple fragment of thick pink sandstone with no sign of deliberate shaping.

It is highly probable that all of the stone tools were used and deposited during occupation dating to the Iron Age. The cobble tools and whetstones in particular are quite specific to assemblages of this date across Scotland and the countersunk pebble can be compared with a few others from Iron Age contexts. The artefacts are scattered across the site, being found in a range of unphased contexts as well as the Roman soils in the southern part of the site, and there is no indication from the distribution of tools of any specific craft or processing areas.

7.9.1 Catalogue of illustrated coarse stone (Illus 7.21)

► SF10

Smoother/rubber. Fragment of a flat pebble of very fine-grained sedimentary rock. Multi-directional groups of striations on both faces indicate that this stone was used to smooth or even polish some other material. (Fill 173 of Ditch 170)

► SF24

Pounder/grinder. Sub-oval cobble of medium-grained sandstone. On one end two pecked and ground facets form a ridge. A large part of this end is detached, most likely from heat damage. Opposite end has broad patch of heavy pecking which does not form facet. One face is ground flat, with a light patch of pecking towards one end. Could this be a pounder/grinder which was then reused later, as demonstrated by the heavily pecked end? (Geological section)

► CS4

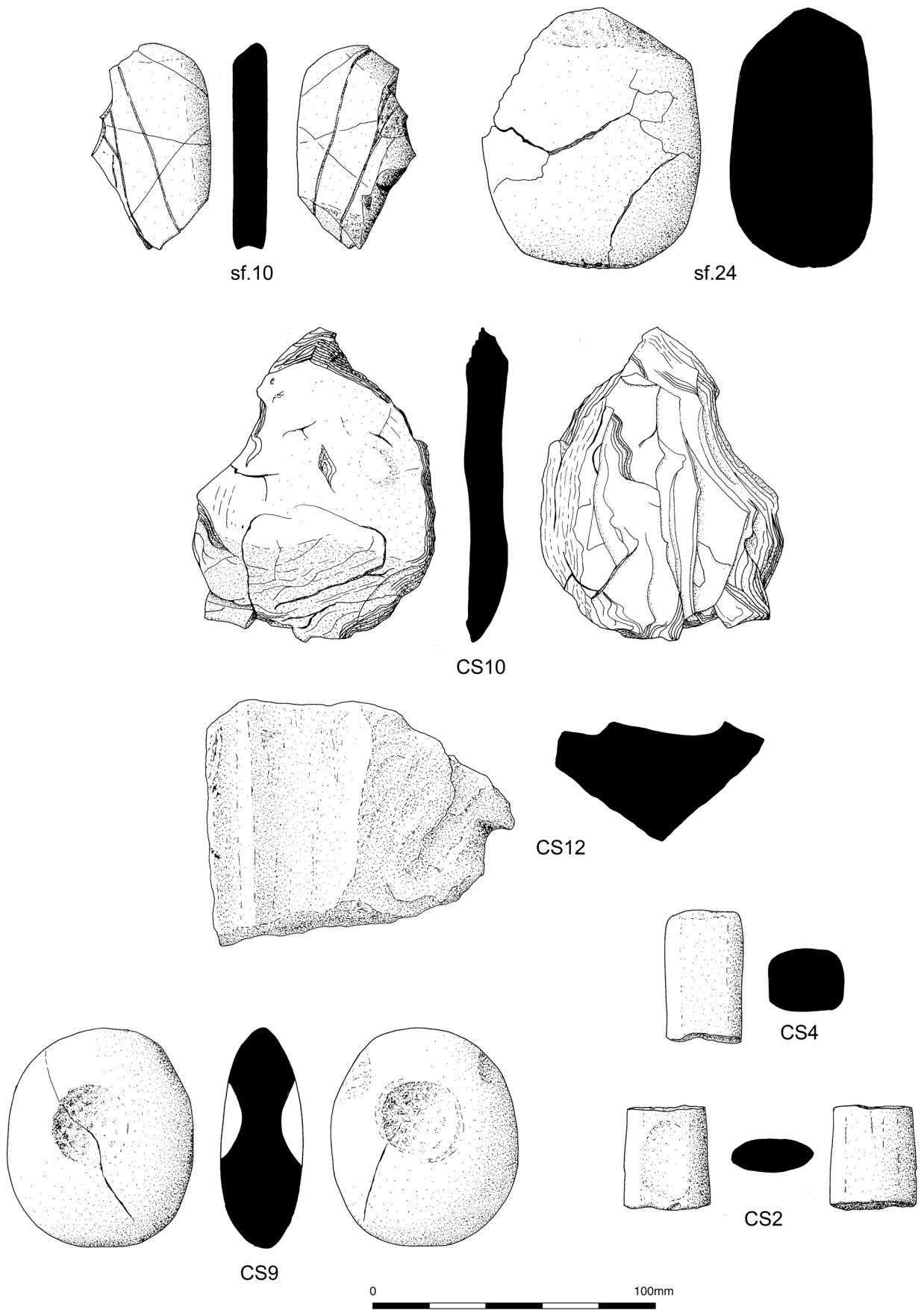
Whetstone. Fragment of a rectangular pebble of medium-grained sandstone. Very abraded from weathering and this has affected the original worn surface of the tool. The rectangular cross-section and surviving smoothed edge indicate it was originally used as a whetstone. (003/6)

► CS2

Whetstone. Segment from a pebble of fine-grained micaceous sandstone. The pebble is parallel-sided and with an ellipsoid cross-section. Facets have been worn down both sides and on both faces through use as a whetstone. (Fill 232 of Pit 231)

► CS9

Countersunk pebble. Flat oval pebble of medium-grained sandstone. Single, almost circular, round-



Illus 7.21 Coarse stone (copyright CFA Archaeology Ltd)

based hollows have been worked just off-centre on opposite faces. The interiors of the hollows retain pecking scars. There is some slight damage around the perimeter of the pebble though this appears incidental and not as a result of hammering. The artefact also bears a residue over one face as if from the deposit it had been lying in. (003/7)

► **CS10**

Worked shale. Fragment of finely laminated mudstone/shale. Pale orange in colour, probably burnt. Very friable. The surviving face has been ground to create a sharp ridge with a modified, slightly concave surface to one side of it. Groups of unidirectional striations are visible running perpendicular to the ridge indicating the main direction of working and there are also some more randomly placed striations over the rest of the surface. (003/11A)

► **CS12**

Architectural fragment? Fragment of medium-grained sandstone. Part of the surviving face appears to be a shaped fragment as if from an architectural moulding for a window. (003/5)

7.10 Vitrified material

Dawn McLaren

A small, restricted quantity (263.3g) of vitrified material was recovered from 22 contexts across the excavated area (Table 7.17). With the exception of three hand-retrieved amorphous lumps of unclassified iron slag, the assemblage comprises small, fractured residues identified during soil sample processing, the majority less than 5mm in diameter and less than 1g in weight. Two broad categories of vitrified material were identified during macroscopic examination: a small amount suggestive of ironworking, and those that could be created during a range of pyrotechnic processes, not necessarily metalworking. A full catalogue is included in the archive report.

7.10.1 Ironworking debris

Although no diagnostic bulk ironworking slags (eg plano-convex cakes, tapped slag) were recovered, 259g of vitrified material is suggestive of ironworking. Three dense, magnetic, fractured slag fragments

Table 7.17 Summary of the vitrified material assemblage (weight in g). For abbreviations see text

Feature/context	UIS	HS & SS	MVR & Prill	NMVR	Fuel ash slag/ cramp	ABPM	Iron spall	Total mass (g)
Cremation Deposits (066, 191, 544, 545, 703, 723, 725)		0.08	0.47	0.17	0.11			0.83
Ditch Fills (288, 432, 530)		1.1	0.18	0.74				2.02
Midden (003)	257			0.34				257.34
Pit Fills (284, 298, 881, 921, 959, 968, 991, 1000, 1001)			0.43	1.46		1.28	0.11	3.28
Post Hole (191)		0.01						0.01
Total	257	1.19	1.08	2.71	0.11	1.28	0.11	263.48

came from 003/6. These fragments are likely to be rake-out material from a hearth or furnace and are best described as unclassified ironworking slags (UIS) as they cannot be confidently assigned to either iron smelting or smithing. Also present were small quantities (1.2g) of magnetic spheres (SS), averaging 2mm in diameter, and angular flakes (HS), ranging between 2mm and 7mm in length, probably hammerscale produced during bloom or blacksmithing. Magnetic vitrified residues (MVR), including spalls from larger fragments of iron slag and prills, were present in very small numbers (1.1g).

7.10.2 Other

The remainder of the assemblage is composed of a variety of non-magnetic, non-diagnostic vitrified residues (NMVR), including small fragments of fuel ash slag or cramp (0.1g) and amorphous burnt plant material (ABPM; 1.3g). Cramp is recurrently associated with prehistoric cremation burials (Callander 1936; Photos-Jones et al 2007: 1). Typically, cramp is similar in appearance to fuel ash slag in that it is a low-density, glassy, vesicular and sometimes porous vitrified material, ranging in colour from white or light grey through to green. It is formed when fragments of bone, ash from the pyre, silica in the soil and fuel fuse together during a high-temperature pyrotechnic process, such as that of a funeral pyre (Stapleton & Bowman 2005: 381).

7.10.3 Contextual analysis

As Table 7.17 demonstrates, the vitrified material was found as a scatter throughout the excavated area, being found in cremation deposits, pyres, midden material as well as ditch, pit and post hole fills.

Material identified during examination as fuel ash slag or cramp derives exclusively from cremation deposits and pyre debris. The ironworking debris is clearly residual, as it was found in a range of secondary contexts. No concentrations of material could be determined that may indicate the presence of a specific metalworking area or structure. The presence of hammerscale, indicative of iron smithing, suggests that ironworking was taking place in the vicinity of the excavated area in the Roman period, but its location and detailed chronology is unknown.

7.11 Prehistoric pottery

Melanie Johnson

Three sherds of prehistoric pottery were recovered from the Roman midden-rich Context 003/2–3, weighing 66g in total. Two of these are plain body sherds and one is a rim sherd. The rim sherd has little of the body present but is a thick rounded rim which turns inwards slightly. The diameter was not measurable. The rim has two perforations on the exterior, one which goes all the way through the thickness of the sherd and which is at the broken edge of the sherd, and another which is conical in profile and which does not quite entirely perforate the wall thickness. It is possible that this is a sherd of Grooved Ware pottery. The rim sherd and one of the body sherds have thick charred residue adhering to the interior. All of the sherds are abraded, with smoothed surfaces, dark grey to brown or black in colour. The fabric is coarse and hard with 1–2% of rock inclusions up to 6mm in size and with mica present. It seems likely that the two plain body sherds belong to the same period as the rim sherd, given the similarities in fabric.

8. ENVIRONMENTAL EVIDENCE

8.1 Introduction

The majority of the ecofactual evidence consisted of animal bone which was recovered from midden-rich Context 003. Soil micromorphology was carried out for the lower midden-rich deposits, and analysis was carried out on the carbonised wood (charcoal) from the cremation burials (see Section 3) and other features.

8.2 Animal bone

Jennifer Thoms

The majority of the contexts containing animal bones came from the period of Roman occupation of the site. Midden-rich Context 003 produced around half of the animal-bone assemblage. A surprisingly large quantity of horse bone, including a complete horse burial, had been noted during excavation. The aims of the faunal analysis were as follows:

- to identify the number of horses represented on site and to ascertain whether cause of death could be determined and why the bones were present in such numbers;
- to investigate the horse burial to elucidate the age and condition of the horse and whether there was any evidence for why it had, apparently, been treated differently from the other horses on the site;
- to determine the origin of the animal bones and to reflect on what they could tell us about diet, food acquisition and/or husbandry at the time the site was occupied;
- to study the general condition of the bones in order to discover variation across the site;
- to set the results in the context of other sites in the north of Roman Britain.

8.2.1 Methods

The bone fragments were retrieved by hand from the trench during excavation. Some samples were processed and the bones retrieved from these samples have been catalogued separately. The bones were washed and dried at room temperature before being identified to species and element as far as possible using identification atlases (Schmid

1972; Hillson 1986; Cohen & Serjeantson 1996) and archaeological and modern skeletal reference material. Some bones, such as ribs and vertebrae, are difficult to identify to species with accuracy so they were allocated to a size category: small, medium or large. Likewise, some bone fragments, while identifiable to element, could only be identified to a group of possible species, such as large ruminant (cattle or red deer) or large mammal (cattle, red deer or horse). The distinction between sheep and goat follows Boessneck (1969).

The age at death evidence was assessed by studying epiphyseal fusion, tooth wear and tooth eruption. The epiphyseal fusion data was compared to those given by Silver (1969) for approximate fusion ages for the main domesticates. The tooth wear data was compared to those given by Payne (1973, 1987) for sheep and Grant (1982) for cattle and pigs.

Each identifiable bone fragment was inspected for taphonomic indicators such as signs of burning; gnawing by carnivores or rodents; erosion by water or any other agent. The degree of fragmentation was also recorded, following Dobney & Rielly's (1988) zones method. The staining on a bone was assessed according to how much of the surface area of the bone was affected by any staining present. A similar method was used for assessing preservation state where the degree of completeness of the bone surface was assessed by visual comparison to a reference set of bones demonstrating each preservation state. Any taphonomic indicators were also noted.

Measurements were taken on fused bones when completeness would allow and follow the methods and notation detailed in von den Driesch (1976). Horse measurements were used to calculate withers height following von den Driesch & Boessneck (1974).

8.2.2 Results

As the overwhelming majority of the bones came from contexts of Roman date, all bones from the site were analysed together. A total of 1,566 identifiable bones were retrieved from the excavations. This figure excludes fragments that could be identified as originating from the rib (683 fragments) or vertebrae (372 fragments) of the animal. An estimated 5,000 fragments of indeterminate, unidentifiable bone were also retrieved. The number of unidentifiable

fragments is difficult to estimate for this assemblage because much of the bone was very friable and often in very tiny pieces. When a large quantity of 'crumbs' was present in a bag an estimate was made, often to the nearest hundred fragments.

Preservation

Apart from their friable nature, most of the bone fragments were generally in reasonably good condition, with 56% being classified as in good condition and only 3% being classed as in poor condition. More than half of the identifiable bone derived from C003, from which the bone was actually slightly better preserved than the other contexts (with some variation in preservation across the different zones), although the figures are very close (Table 8.1). Many of the bones had suffered recent breaks, reflecting their structural fragility, even when the surface of the bone was relatively intact.

Staining

Most of the bone fragments (85%) were not stained or discoloured in any way, and 11% showed staining on less than 25% of the surface of the bone. Only 60 fragments had staining affecting more than 25% of the surface of the bone fragment. The bones from Contexts 290, 291, 447, 485, 613, 619, 664, 773, 775 and 779 were all stained or discoloured, suggesting that these contexts may have been persistently poorly drained. In the case of C003 only 003/8 showed 100% staining in the fragments. The contexts with 100% stained bones all had small quantities, generally between one and three fragments. The exception was C779, which contained 12 fragments, all of which were stained. One cattle third phalanx (hoof) was stained red and had concretions of mineral-rich material adhering to it

Species present

Cattle were the most abundantly represented species (665 fragments), followed by horse (463 fragments), pig (139), sheep/goat (132) and red deer (42). Other species were represented by fewer than 20 fragments; cat (2), dog (17), goat (1), roe deer (4), goose (10) and bantam (2). As only one bone could be definitely attributed to goat it is safe to assume that the sheep/goat bones are predominantly from sheep. The presence of a complete horse burial causes the figures for horse to be artificially high. Bird bones were very scarce, comprising 1% of the assemblage. Similarly cat and dog bones made up 1% of the assemblage. Bones from micromammals (rats and mice) were very scarce, even in the contexts sampled for processing. The remaining identifiable bones (89) could only be identified to a range of species – cattle or horse, or sheep/goat/roe for example.

Minimum numbers

C003 contained bones from a minimum of 17 cattle, 14 horses, seven sheep/goat and seven pigs. In the case of horse and cattle the most abundant skeletal element present, from which these figures are calculated, was the metatarsal.

Age at death

While examining the bones it was clear that the majority of them were from mature animals; unfused bones were less abundant in the assemblage than fused ones. Only two neonatal bone fragments were retrieved, both metacarpals, one from sheep/goat and one from a calf.

The only unfused cattle bones present were from bones that fuse later in life (over 30 months), indicating an absence of immature beasts on the site. There was evidence from the epiphyseal fusion of some animals being killed in their third year

Table 8.1 Animal bone preservation scores

Contexts	% good (b)	% fair (c)	% poor (d)	No. of frags
All contexts	56	41	3	1566
003 only	57	40	3	1028
All except 003	53	45	2	538
Horse Burial 647	6	94	0	78
All except 647	58	39	3	1488

(25–36 months of age), and in their fourth year (37–48 months), but the majority of the later-fusing bones were fused. The age at death epiphyseal fusion evidence indicates that most of the cattle were killed when fully mature (ie older than three or four years). The one exception, the neonatal bone, may be from a foetal animal. The unfused bones (from animals younger than 3–4 years) mainly derived from C003 (15 fragments) as did the neonatal bone. Two unfused bones came from C515 (within 003) and one from Ditch Fill 583. Epiphyseal fusion evidence was available from around one-third of the cattle bone fragments retrieved.

Epiphyseal fusion evidence was available from 152 horse bone fragments. No unfused horse bone was retrieved, but some epiphyses had only recently fused. As with cattle these were from the epiphyses that fuse later in life. The few horse bones (6) retrieved from immature horses all came from C003 and represent a minimum of two animals. Evidence of osteoarthritis was present on one horse metatarsal

(Illus 8.1), suggesting that the animal had reached a mature age (although disease and over-work can accelerate this condition).

Forty-nine bone fragments of pig contained epiphyseal fusion evidence. There was much more unfused pig bone present than was the case for cattle or horse. Pigs had mainly been killed in their first year of life and there was also evidence of animals between one and two years old when killed. At least three pigs had been killed in their third year of life, as shown by fully fused distal tibia.

Only one bone had derived from a neonatal sheep. There was evidence of more young sheep among the assemblage than had been the case with the other animals, although, again, some survived into their third and fourth years.

All but two of the red deer bones which displayed epiphyseal fusion evidence came from mature animals. The two unfused bones came from the reasonably late-fusing metacarpal and radius, suggesting the animal was adult.



Illus 8.1 Horse metatarsal showing osteoarthritic changes to the proximal end (copyright CFA Archaeology Ltd)

No unfused bird bone was retrieved. The two cat bones were from an adult animal as were all but one of the dog bones. Two of the three roe deer bones displaying fusion evidence were unfused, though these were both from metacarpals, suggesting the animals were adult but not fully mature.

Element distribution

The element distribution was calculated on the total number of fragments for cattle, horse and sheep/goat. This analysis indicates that smaller bones are under-represented, as are the more fragile skeletal elements. There is little variation in element distribution between the different species. The larger long bones, in particular the metapodials, radii and tibiae, are well represented and the smaller bones (astragalus, calcaneus and phalanges) are under-represented for the three species. This suggests that the main factors influencing element distribution are taphonomic – that is, processes affecting the bones after their deposition in the ground. For example, the larger bones tend to be tougher and more resistant to destruction when buried, as well as being more easily seen and retrieved by hand during excavation. The bone was very fragile and friable, and prone to breaking when handled. Therefore the smaller bones may well just not have survived as well as the larger, more dense bones. A lack of a large-scale sample sieving will also decrease the recovery of smaller bones – bones from smaller animals and the smaller skeletal elements of the larger species (Payne 1975). In this assemblage large, robust bones from hind and fore-limbs are equally abundant; this, together with the roughly equal abundance of high-meat and low-meat bones, indicates that animals were taken onto the site whole, rather than as jointed pieces of meat.

Because the number of horses in the assemblage is unusually high and because most of the horse bone was retrieved as complete bones, rather than broken fragments, a second method of calculating element distribution was used. This method involved calculating the minimum number of elements, rather than the more basic fragment count. Once again the long bones were most abundant, with the smaller bones being relatively under-represented and the flatter bones, the pelvis and scapula, also being somewhat under-represented. The element distribution analysis suggests complete horses were

originally deposited on the site. There is no evidence for the selective deposition of particular body parts, as might be found if the bones were left over from an industrial process, or from domestic butchery and consumption, for example.

Size of horses

The sizes of the horses, calculated from measurements of complete bones, varied from 9.2hh to 15.1hh. (The term ‘hh’ means ‘hands high’, and represents the height of the withers of the horse from the ground.) Today, any animal less than 14.2hh would be considered a pony, rather than a horse. The method of calculating withers height from the greatest length of the long bones is inexact for several reasons, including individual morphological variation within the horse skeleton, and a margin of error of around one hand (101mm/4 inches) should be accepted (von den Driesch & Boessneck 1974). The figures obtained for the size of the buried horse indicates it was one of the larger horses on the site, between 14hh and 15hh.

Butchery

Table 8.2 shows the percentage of butchered bones retrieved from each context. In this instance ‘butchered’ means displaying knife marks of any sort. The butchery results for the different zones within C003 have been calculated and are shown in Table 8.2. It can be seen that C003 has a higher percentage (20%) of butchered bone than the rest of the site (11%). While 003/7 and 003/10 appear to have high proportions of butchered bone (29% and 36%), they also had small numbers of identifiable bone. The zones with the largest numbers of identifiable bones retrieved from them (003/4, 003/5 and 003/6) all contained between 18% and 22% butchered bone. This is quite a high percentage and suggests that the animal remains represent food waste. The presence of large quantities of horse bone within a midden-rich deposit is unusual within archaeological sites generally.

For many of the other contexts (excluding 003), only a few identifiable bones were retrieved. The contexts containing fewer than 20 bones have been excluded from the table (this number has been chosen arbitrarily). Ditch Fill 430 stands out as having a very low proportion of butchered bones. Ditch Fill 288 has the highest proportion of

Table 8.2 Butchered bone percentages

Context	Total frags	% Butchered (all species)
003/1	2	0
003/2	48	15
003/2–3	34	24
003/2A	38	8
003/3	57	12
003/3A	38	18
003/4	210	20
003/4–5A	11	27
003/4A	38	26
003/5	262	22
003/5A	9	22
003/6	114	18
003/6A	43	19
003/7	7	29
003/8	3	0
003/9	25	24
003/10	22	36
003/11	46	22
003/10–11	5	0
003/11A	16	19
515=003	73	19
Total 003	1101	20
Ditch 438 (Fill 288)	24	21
Ditch 448 (Fill 430/432)	24	4
Ditch 519 (Fill 520)	34	15
Ditch 449 (Fill 530)	30	13
Ditch 449/Pit 564 (564/614)	38	11
Horse Burial 647	78	0
Total other contexts	228	11

butchered bones, being roughly equal to the figure obtained for C003 as a whole; this context was underneath the midden.

Table 8.3 shows the species involved. In C003, the bones from the main 'food' domesticates, cattle, pig and sheep, display most butchery marks, as might be expected. One dog bone and 21 horse bones also had signs of knife marks on them. This is more puzzling, and will be discussed further below. Lack

of knife marks does not imply the animal has not been butchered, most skilled butchery would not be expected to leave a mark on the bone. A particular type of shallow, oblique mark was particularly common in this assemblage. It appeared to have been carried out at an almost horizontal angle to the bone surface, and perpetuated with a serrated blade or saw (Illus 8.2).

In the other contexts, the main food species are the most butchered – cattle, sheep, pig and red deer.



Illus 8.2 Shallow butchery cuts on a humerus (copyright CFA Archaeology Ltd)

Only three horse bones showed any sign of knife marks, and there was no indication of butchery on the dog bones retrieved from the rest of the site. As with C003, the bird bones did not display any signs of butchery marks. Further evidence of bone working was discovered on a complete sheep metatarsal which had two holes bored through its proximal end (Illus 8.3). This may have been to allow the attachment of a thin rope or strip of hide or fabric.

There were no knife marks or signs of injury or age-related bone degeneration on the complete, buried, horse. However, the skull of that animal was totally fragmented into small pieces, so, if it had suffered a blow to the head, then that evidence is missing.

The high figure for red deer can be partly explained by the low number of red deer bones retrieved and also by the fact that many of the butchered bone fragments in C003 were antler, mainly off-cuts from

Table 8.3 Variation in butchery across species

Species	Context 003		Other contexts	
	No. of ID bones	% butchered bone	No. of ID bone	% butchered bone
Cat	2	0	0	0
Dog	6	17	11	0
Horse	273	5	190	3
Cattle	486	28	179	21
Sheep/goat	83	22	49	14
Pig	77	14	61	13
Red deer	37	32	5	60
Roe deer	4	0	0	0
Bird	3	0	9	0



Illus 8.3 Sheep metatarsal with holes drilled in the proximal end (copyright CFA Archaeology Ltd)



Illus 8.4 Cattle mandible showing evidence of an abscess around the first molar (copyright CFA Archaeology Ltd)

antler working. Two antler fragments were retrieved from the other contexts; neither showed signs of knife marks nor other bone working, but one deer mandible and two post-cranial bones displayed knife marks.

Fragmentation

A greater percentage of the bones in C003 are fragmented than is the case in the other contexts. Fifty-eight per cent of the bones in C003 were fragmented, while the figure for all other contexts excluding C003 was 40%. This figure may be artificially low due to the presence of the horse burial (647), so recalculating the percentage of fragmented bones for all contexts except 003 and 647 gives a figure of 47%, still considerably lower than that obtained for C003.

Pathology

The first molar in a cattle mandible from C430 was very loose in the socket, indicating infection such as an abscess in life, leading to loss of bone (Illus 8.4).

A horse pelvis had abnormal bone growth on the surface, possibly indicating trauma. Similarly,

a small hole, formed during life, in a cattle pelvis may be a result of stress on the animal's bone due to excessive breeding, and is indicative of a mature animal (Illus 8.5).

8.2.3 Discussion

The assemblage is unusual, in terms of Scottish animal bone assemblages, for several reasons. It contains much more horse bone than would normally be expected in an archaeological bone assemblage. The basic figure given for horse (463 identifiable fragments) has been slightly inflated by the presence of the complete skeleton in the horse burial because the ribs and vertebrae of that one animal have been recorded, which is not normal practice. Removing the ribs and vertebrae from the horse bone fragment-count provides a more realistic number for the total fragments identified, at 431. The horse bones derive from a minimum of 20 horses (from the number of left metatarsals): 14 in C003, plus five from the rest of the site, plus the one within the horse burial.



Illus 8.5 Pelvis with perforation formed in life (copyright CFA Archaeology Ltd)

The evidence indicates that cattle, sheep and pig at peak meat-producing age were slaughtered, butchered and the bones dumped throughout the site. The bones within C003 particularly resemble cooking waste, with more fragmented and more butchered bones present in this context than was the case over the site as a whole.

Horses

It is worth now considering why the bones of so many relatively young and apparently fit (not affected by bone disease or pathology at least) animals were killed and dumped with the general refuse from the site. Although there is a general shortage of parallels in the archaeological record, one does exist. At Ribchester, there is evidence of the disposal of a large number of relatively young horses. Most horse bones on non-military Romano-British sites derive from elderly animals that probably died naturally of age-related health problems (Stallibrass 1995: 150). At Ribchester, many of the horse bones were excavated as partially disturbed skeletons in ditches. There is documentary evidence of a cavalry unit at Ribchester and Stallibrass speculates that those relatively young horses may be ones that have been culled due to unsatisfactory performance during training as cavalry horses. Another explanation might be that the Romans simply used their horses excessively, wearing them out, leading to injuries, or general exhaustion, and early death.

The presence of butchered horse bone raises the question of whether the animal was ever eaten by Roman soldiers (with their varying ethnic origins), and if so, did that consumption reflect normal cultural practices or might it signify a time of particular adversity and food shortage? An alternative explanation would be that the horse bones had been dismembered and used for some other, more industrial, purpose, or for feeding animals such as dogs. A range of skeletal elements displayed butchery marks: from the shoulder and front leg, the scapula, humerus, radius; and from the hind quarter and leg, the pelvis, femur, tibia and metatarsal. The element distribution reveals that the remains of at least two butchered horses were present within C003. Only three fragments of butchered horse bone were retrieved from other contexts (530, 564 and 653) and they were fragments of femur, humerus and tibia.

The other common domesticated food animals

The element distribution analysis indicates that the animals were taken onto the site whole, possibly as livestock, rather than as jointed pieces of meat. The age analysis supports this, with no young animals being present among the assemblage other than two neonatal animals, which may have been in utero at the time of death.

The age of death of the animals indicates the consumption of prime meat animals, suggesting high-quality meat was eaten.

Setting the results in context

Previous work on bones from Inveresk Gate (O'Sullivan 2004; Henderson 2004) and Inveresk (Smith 2005) provide useful comparative data and demonstrate certain similarities with the assemblage discussed above. Most of the assemblages were found to be in poor condition and had suffered a great degree of taphonomic loss while in the ground. O'Sullivan (2004: 60) remarked on the high number of fresh breaks and that the surviving bone was fragile enough occasionally to suffer further breakage during post-excavation analysis. Bones from two wells and a ditch (Henderson 2004) were in better condition and were less fragmented than those from other contexts. Smith (2005), reporting on assemblages from several seasons of excavations, remarked that the bones were in generally poor condition, suffering from moderate to severe surface erosion. Recent breaks on the bones were again commented on, as an unavoidable consequence of their poor condition.

In all assemblages cattle were the most abundant animal, followed by sheep and pig, present in roughly equal quantities. Very little horse was present in the assemblages studied by O'Sullivan (2004) and Smith (2005), but Henderson reported on two partial skeletons and two (separate) legs of horse excavated from ditch fills and pits. The apparently widespread scatter of disarticulated horse bones described above, particularly in C003, does not seem to have been noted previously in this area, but has been observed elsewhere. For example Stallibrass (1995), in her review of Roman vertebrate remains in northern England, remarks that the usual disposal of horse on Roman military sites is occasional bones in amongst other general refuse.

The relative under-representation of other species, in particular wild animals, fowl and fish, has been

noted previously at Inveresk (Smith 2005) and remarked upon at The Lanes, Carlisle (Stallibrass 1995).

The age at death evidence from other work at Inveresk presents similar results to that found at the present site. The cattle were fully mature, with occasional elderly beasts being present (Henderson 2004; Smith 2005). One young animal (under six months of age) was present in the assemblage from a well (Henderson 2004) and this raises the question of whether the better preservation conditions in the well led to the younger, more delicate bone surviving in a recognisable state. This might imply that younger animals may have been present in the other assemblages analysed from the Inveresk area but have not survived, young bone being less dense than that from mature animals. The sheep, generally, appear to have been killed at a younger age than the cattle, and the pigs younger still (O'Sullivan 2004; Henderson 2004; Smith 2005). As cattle and sheep would have been used for other purposes, such as provision of milk, traction and wool, this is not surprising. None of the horses analysed by Henderson (2004) was under three years old, with one individual believed to be 12–15 years old (Henderson 2004: 73).

Both O'Sullivan and Henderson (2004) agree that the evidence from the element distribution suggests that animals were taken onto site whole, rather than in jointed pieces. Henderson detects a deposit of secondary butchery waste (from the 'latter end of the slaughter to consumption process' (Henderson 2004: 69)) in one of the assemblages he studied.

Henderson obtained withers heights of 13.1hh, 13.3hh, 13.3hh and 15hh for the four horse skeletons represented in his assemblage, within the range of the figures presented above.

The highly fragmented state of the animal bone at Inveresk was remarked upon by all three workers. High percentages of butchered bone were noted in all the assemblages from Inveresk discussed here, with proportionately fewer marks noted on the bones of sheep and pigs, presumably because their smaller size made them easier to handle and to cook without extensive chopping beforehand. Evidence of antler working was noted by Henderson (2004) and Smith (2005).

8.2.4 Conclusions

The animal bone evidence suggests that C003 was indeed derived from a midden. The butchered and fragmented remains from the main meat-producing domesticates – cattle, sheep and pig – of prime meat age are present in this context. A relatively large number of horse bones in C003 is unusual, particularly as some (at least two horses) have been butchered. The bones were generally fairly well preserved although many had suffered recent disturbance and new breaks were common.

At least 20 horses are represented on the site, with 14 of these having been disposed of in C003 and one individual having been buried in a pit by itself. The buried horse was mature, but not old, when it died. There was no sign of traumatic injury, such as a broken leg, or of chronic disease such as arthritis on the post-cranial bones. The bones showed no signs of unusual stresses during life – there was no excess growth at the points of ligament attachments and there had been no fusion of vertebrae together.

In general, and with the possible exception of the horse remains, the animal bone assemblage reflects domestic waste from peak meat-producing animals, predominantly cattle, pig and sheep. A few bone fragments, from red deer, roe deer and goose, indicate some variation in the diet provided by wild animals, presumably hunted locally.

A few bones from dog and cat indicate their presence on the site and it can be speculated that they may have had a role in pest control.

Evidence from faunal remains is notably scarce from Roman sites in Scotland and the north of England. The reason for this varies; sometimes early excavators did retrieve large bone assemblages but were unable or unwilling to analyse the material; often very little animal bone survives on the site. The evidence for the north of England is summarised by Stallibrass (1995). Various syntheses of Roman faunal evidence have been carried out and have been usefully summarised by O'Sullivan (2004: 60). The material from the Primary Care Centre represents a large and useful contribution to the dataset of Roman faunal evidence in Scotland as a whole, and at Inveresk in particular.

8.3 Calcined bone

Sue Anderson

A very small quantity (10.2g) of probable human bone was recovered from the upper fill of linear feature 998, part of the field system ditches. The fragments comprise pieces of iliac crest, femur and fibula.

Small quantities of calcined bone of animal or uncertain origin were recovered from 27 features and are likely to represent food waste. The largest single quantity, 16.8g from 284, was certainly animal. A full list is included in the archive.

8.4 Charcoal

Mike Cressey

Charcoal from the cremation pits has been discussed above (Section 3). Charcoal recovered from features including pits and post holes was also assessed to determine the species likely to have been exploited for domestic use. The charcoal recovered from features other than cremation deposits is shown in Table 8.4. Hazel, oak, birch, and willow are all present. Heather is present in Pit Fills 192 and 284.

8.4.1 Charcoal condition

The poor preservation of some of the charcoal is mainly a result of taphonomic processes within the buried environment which result in the amorphous

character of much of the charcoal. The sub-rounding effect on the charcoal is a result of the abrasive nature of the local soils, which are derived from sand and gravel. The free-draining nature of these types of soils can result in saturation of the charcoal, which leads to increased fragmentation. The type of wood being burnt and its position in the fire will also have a direct bearing on how the fragments have been derived.

8.4.2 Species composition as an index to the local woodland

Although a rough indication of woodland composition can be postulated from deposits of fuel debris surviving from hearths and funerary pyres, the interpretation of such material must take into account the biases inherent in the sub-sampling process and differential survival as a result of pyrolysis in the first instance (Asouti & Austin 2005; Braadbart & Poole 2008) and the differential survival of taxa as a result of taphonomic processes (Thery-Parisot et al 2010).

For the purposes of this report, the overall dominance of species is based on the frequency of charcoal fragments per species in each sample and the overall occurrence of species in the total number of samples examined. Only five species are represented (including those from the cremation deposits), which in order of abundance comprised

Table 8.4 >4mm charcoal identified from pit fills and other features

Feature	<i>Quercus</i>		<i>Corylus</i>		<i>Betula</i>		<i>Salix</i>		<i>Calluna</i>	
	No.	Wt (g)	No.	Wt (g)	No.	Wt (g)	No.	Wt (g)	No.	Wt (g)
Context 003			5	0.6						
Pit 192	3	0.4	24	3.2	2	0.3			10	0.3
Pit 265	10	0.8								
Pit 282			15	11.0					50	3.9
Pit 431			1	0.8						
Ditch 529	5	0.8	4	0.6	2	0.3	1	0.4		
Pit 816	25	6.4								
Pit 920	2	0.5	7	3.5			1	0.3		
Pit 953			5	0.7						
Pit 958			1	1.5	19	3.2				
Total	45	8.9	62	21.9	23	3.8	2	0.7	60	4.2

oak, hazel, birch, alder and willow, all of which would have been common within the locality of the site in the Roman period. Oak is at the apex of woodland development and would have been well represented on the fertile soils within the locality. Birch is hardy and most versatile and will grow in everything from wet to relatively dry conditions. It is a small tree (15m), light-demanding and short-lived, only living for 50–80 years. Willow and alder are wetland species and would have been exploited

from within the Esk valley. Heather is tolerant of acidic soils, typical of open heathland but it could also have also been an understorey plant below birch and oak woodland.

The pit charcoal assemblages reflect material that was consumed domestically and has been incorporated into these types of features as refuse. Therefore the charcoal represents fuel residues that represent only a fraction of the wood that would have been consumed at the site.

9. DISCUSSION

9.1 Iron Age Inveresk

9.1.1 Occupation

While the majority of the archaeological remains in Inveresk relate to the Antonine occupation of the fort, a number of Iron Age features have been identified. At Monktonhall (Hanson 2002: 59–60) three roundhouses of ring-groove construction were identified along with two ring ditches of probable Iron Age date. Attached to each of these ring ditches was a pit indicating possible burial evidence. At Inveresk, segments of two concentric ring-grooves were identified (Neighbour 2002: 45). These have been interpreted as either two phases of a ring-groove house, or a single complex ring-groove house. Evidence of possible Iron Age settlement was also identified at Howe Mire (Cook 2004), where the possible remains of a roundhouse were uncovered.

Aside from the burials, there was no definite evidence of native Iron Age occupation on the Primary Health Care Centre site, although a ring ditch enclosure was identified as pre-dating the Roman-period burials and may be an Iron Age ring-groove house (amongst other possibilities). The 7.5m diameter of this feature places it within the known size range of ring-groove houses, although others within the general area were rather larger. Those at Monktonhall (Hanson 2002) measured 11–13m diameter and the concentric ring-grooves at Inveresk (Neighbour 2002) measured 10m and 13m. Post holes identified at Howe Mire (Cook 2004) have been interpreted as the remains of a roundhouse with a diameter of 6–7m, but this feature is thought to date to the Late Bronze Age or Early Iron Age.

Coarse stone tools within midden-rich Context 003 are of possible Iron Age date (Clarke, Section 7.9), but three sherds of native pottery recovered from the midden (see Section 7.11) appear to have been Grooved Ware of probable Neolithic date.

9.1.2 Burials

The coursed drystone masonry construction technique of the cist at the Primary Health Care Centre site appears to be a reasonably well documented, but by no means common, burial

practice in Scotland. Within East Lothian, Wallace's handlist of Iron Age burials in Scotland (Wallace 2011) records six sites with burial cists of this type. These were located at Dunbar Golf Course (Baker 2002), Gullane (Richardson 1902), Lochend, Dunbar (Longworth 1966), North Belton, Dunbar (Crone 1992), Seacliff House (Stuart 1867) and The Knowes, Whitekirk (Haselgrove 2009). The Group C burial excavated by Dalland (1991) at Winton House, Cockenzie and Port Seton, also appears to fall within this category, as does a burial uncovered at Law Road, North Berwick (Suddaby 2005).

A further ten examples are known to the north of Hadrian's Wall (Scotland and Northumberland), with the majority of these being located within the Scottish Borders (Wallace 2011). This burial practice is notably absent from west and south-west Scotland, where very few Iron Age burials have been identified, and within the north of Scotland there is only one recorded example, at Golspie (Woodham & Mackenzie 1957), which may be earlier or later in date (a comparable cist found nearby was covered with a slab bearing five incised Pictish symbols, but another burial from the same group produced a Late Bronze Age radiocarbon date). It is perhaps of note that this method of construction occurred almost exclusively within areas where direct contact with the Romans was at its greatest, and might reflect Roman influence on an earlier cist burial tradition.

In terms of construction, the Primary Health Care Centre cist was very similar to other examples in East Lothian, for example Dunbar Golf Course and Gullane, which both consisted of an oval stone-lined pit with stone capstones. With internal measurements of 0.8 by 0.5 by 0.4m deep, the Dunbar Golf Course cist was rather smaller in size than the 0.92 by 0.86 by 0.6m of the Primary Health Care Centre example, while the Gullane example was broadly of the same dimensions, with internal measurements of *c* 1.0 by 0.75 by 0.9m deep (size extrapolated from the scale plan provided by Richardson 1902). In both these cases the stone lining extended almost to the top of the pit and this may also have been the case with the Primary Health Care Centre example prior to the possible collapse of the upper courses. Other stone-lined cists, however, were rather different in nature, with the very large 'boat-shaped' cist at Lochend, Dunbar having an internal measurement of *c* 2m by 0.55–0.9m. The

Dunbar Golf Course cist contained a single child burial in flexed position while the Gullane example contained three individuals in a tightly crouched position similar to the Primary Health Care example, and the massive cist at Lochend contained at least 21 individuals which appear to have been interred in an advanced stage of decomposition. Radiocarbon dating of the skeletal remains indicates that the Primary Health Care Centre cist was slightly earlier than the Dunbar Golf Course example (50 cal BC–cal AD 90 as opposed to cal AD 70–250 at 95% probability; GU-9150).

A short cist is recorded from Kirk Park, Inveresk (A Sheridan pers comm: NMS ID no. X.ET 64), acquired by the NMS in 1888, and containing a skull from an adult female aged 35–45(?). Bone from the mandible was radiocarbon dated as part of the *Beaker People Project*, providing a date of 2038±32 BP (OxA-V-2167–45), calibrated to 100 BC–AD 10 at 95% probability. This places it within the same broad period as the cist burials from the Primary Health Care Centre. Another short cist at Kirk Park contained a skull and leg bones of a middle-aged adult male; these were presented to the Edinburgh University Anatomy Department in 1890 and are now in the NMS (A Sheridan pers comm; NMS ID no. EUAD IB 208). These latter remains have not been dated, so it is unclear whether they could also be Iron Age. However, the presence of the former cist suggests wider usage of the area for burials during this period.

Parallels for the pit graves are known from the Iron Age cemeteries at Dryburn Bridge (Dunwell 2007), Broxmouth (Hill 1982), Winton House (Dalland 1991), as well as a single example at Fishers Road East, Port Seton (Haselgrove & McCullagh 2000). At Dryburn Bridge (Dunwell 2007), the burial rite appears to have been fairly similar, with the body placed in a crouched position in the base of an unlined pit. Where it does differ, however, is that each of the ten graves at Dryburn Bridge only contained a single individual whereas two of those at the Primary Health Care Centre were double inhumations. It is also of note that the backfill at Dryburn Bridge appears to have been imported material whereas at the Primary Health Care Centre, the graves appear to have been backfilled using the excavated material. The Dryburn Bridge cemetery would also appear to have been considerably earlier,

with dates of *c* 770–400 cal BC at 95% probability. Dunwell (2007: 106) has noted that single burials tend to occur in confirmed settlement contexts whereas multiple burials occur in apparently off-site contexts. The Primary Health Care Centre site is rather ambiguous in this respect as it had a combination of single and double burials, although the ring ditch that pre-dates the Roman-period burials might give a tenuous indication that there was earlier settlement on the site.

Iron Age cremation burials are known from a number of sites within East Lothian, including Eweford West, Pencraig Hill and Phantassie (Lelong & MacGregor 2007), and The Knowes, Whitekirk (Haselgrove 2009). However, the majority of these were associated with cists. At Phantassie, Lelong & MacGregor (2007) suggested that the rite of cremation was tied in with the agricultural cycle, with cremated remains being dumped on the midden and subsequently spread on the fields. Discrete cremation burials from this period not associated with cists or cairns appear to be very rare in Scotland. A pit with cremation deposits at Hill of Tarvit, Fife (James & Duffy 2001) appears to have been a pyre site.

Cremations have been identified with Roman forts, but the majority of these are contained within Roman-period urns. The exception to this appears to have been Newstead, Scottish Borders, where there were several cremation deposits in shallow pits, one of which contained iron nails and quartz pebbles (Wallace 2011). The paucity of Iron Age cremations combined with the known Roman cremations associated with forts led to the original assumption that the Primary Health Care Centre cremations were Roman. However, the radiocarbon dates would suggest that they are more likely to be Iron Age and if this was also found to be the case with the examples from Newstead, it could provide some tentative evidence for a more widespread Iron Age tradition of un-urned cremation burials in shallow pits.

9.2 The Roman period

9.2.1 Burials

With Sue Anderson

All of the dates obtained for the Roman-period burials were compatible with the Antonine occupation of the Fort. Roman inhumations are

particularly uncommon in Scotland with the only previous known examples being the earlier finds from Inveresk (Gallagher & Clarke 1993) and those excavated at Camelon, Falkirk (Breeze et al 1976). The example from Camelon consisted of a double interment in a cist, which contained weapons along with the remains of the two individuals. Building work carried out at Inveresk to the north of the Primary Health Care Centre site identified five possible graves which were visible as U-shaped cuts within a machine-cut trench (Clarke & Kemp 1985). The remains of a single individual (young (?) adult male, A Sheridan pers comm) were recovered, but the skeletal material had been removed from its context prior to the archaeologists being on site and therefore the form of the burial was not noted. In common with the Primary Health Care Centre site, the previously discovered Roman graves appear to have been cut into the sandy subsoil and the remains of the individuals simply placed directly into the grave with no evidence of any kind of coffin.

As well as adding significantly to the known Roman inhumations within Scotland, the Primary Health Care Centre site is of particular significance as it is the first Scottish site providing evidence for decapitation. Post-mortem decapitation appears to have been a fairly common custom throughout the Roman provinces, with known examples from areas such as Belgium and Scandinavia (Philpott 1991). Of particular note is the large Roman cemetery at 1–3 and 6 Driffield Terrace, York (Mullen 2011). Here, 80 inhumations were discovered, of which 48 were identified as having been decapitated with the skull placed within a variety of locations, including between the knees or feet or beside the torso. With all of the remains apparently relating to males with ages ranging from 19 to 45, there have been a variety of explanations put forward relating to the decapitated individuals, including that they were gladiators, Roman soldiers, executed criminals, or those who had been ritually decapitated.

In common with the Driffield Terrace burials, all of the in situ Roman burials at the Primary Health Care Centre were male. However, one of the skulls recovered from the midden material, potentially from a disturbed grave, was possibly female, and four of the skeletons appear to have been older individuals over the age of 45. The bulk of burials from the Driffield Terrace site were also rather

later, dating to the 3rd or 4th century AD, but there was some tentative evidence of decapitation from the earlier phases of the site, possibly pushing the earliest decapitations there back into the early to mid-2nd century.

As is the case for most decapitation burials, the evidence relating to the various theories behind this burial rite is rather ambiguous. With a possible amphitheatre identified at Inveresk (Neighbour 2002) it would be tempting to view the traumatic injuries identified on the skeletons (Section 4.6 above) as the result of gladiatorial combat, but in reality injuries of this nature were probably nothing out of the ordinary for individuals doing hard manual work in a harsh environment. The argument for them being soldiers is a reasonably strong one given the close proximity of the fort, and the injuries sustained may have been the result of battle or training accidents, but this appears coincidental to them being decapitated as it in no way indicates that post-mortem decapitation was reserved exclusively for soldiers.

At Driffield Terrace the suggestion that the individuals may have been executed relates to one of the skeletons having leg shackles, but there was no such evidence relating to the Primary Health Care Centre site. The only slight evidence supporting this theory is the failure of later development on the site to respect the location of some of the burials, with a number of the remains ending up amongst the midden material. It might be that those carrying out the later development had no knowledge of the burials being there, but this would seem surprising given the apparently short duration of the Antonine usage of the fort. A possible explanation would be a new garrison taking over, although it has to be questioned why they should simply dump the remains on the midden once they were uncovered. The final suggestion relating to ritual is perhaps the most plausible, but is a very general explanation and fails to explain whether the rite related to a specific group, or group of beliefs or if it was carried out generally within the wider community.

Evidence from the personal names inscribed on some of the broken dishes suggests that at least two of the individuals living in the fort may have originated in Dacia. This, together with the evidence from the isotopic analysis (Section 4.7 above), suggests that the 'Roman' individuals here

had diverse origins. Where exactly they came from cannot be pinpointed, although the evidence is largely in favour of a Mediterranean or Germanic source. It seems likely, given this diversity, that the practice of decapitation was not one which related to a single ethnic group of men within the fort, and is more likely to be a product of their beliefs than their geographic origins.

9.2.2 The horse burial

Jennifer Thoms

The apparently deliberate burial of an animal in antiquity is of interest, and is a phenomenon which occurs across Britain during all periods, though is especially prevalent in the Iron Age. When the burial is of a 'companion' animal – one of the species such as cats, dogs and horses which in many societies today are not generally eaten and have a different status to the other domesticates – eg being given names, being allowed to share human domestic space, being valued for characteristics beyond their calorific meat value – then the burial is of particular interest. Cross (2011) argues persuasively that a complete horse burial is almost certainly the result of a ritual, if not a sacrificial act. Due to the size of the animal it can safely be assumed that it died, or was killed, near the burial site. There is no evidence present on this horse skeleton of a violent death, or deliberate killing, which would imply a sacrificial burial. However, the highly fragmented state of the skull would have obscured such evidence.

It is possible that this horse's role as a companion animal led to its deliberate burial. The fact that it is close to human burials might imply that it was killed to accompany an elite burial. Cross (2011) summarises some examples of this practice in the archaeological record and the historical literature. The practice is often interpreted as reflecting an elite status of the horse, presumably transferred by the status of its owner. Could that be a reason why this horse was buried while so many others were dumped as (often disarticulated) waste? (See Section 8.)

While we are unlikely ever to uncover the reason why at least one horse at Inveresk was given a purposeful burial while others were not, we can speculate that it may have been because it was distinctive from the others. It was not of a notably different stature to the others (war horse as opposed

to beast of burden); nor was it obviously suffering from chronic ill-health, such as arthritis, which would have rendered it economically useless. It might have been associated with a person of high status; or it may have achieved high status itself, through performance, or loyalty, and earned an honourable burial.

9.2.3 The rampart

The surviving archaeological evidence suggests that this structure was a boulder clay rampart set on a river cobble foundation. Clay appears to have been a material commonly used for Roman military rampart construction during the Antonine period. At Inveresk fort itself, the excavators (Leslie & Will 2005) describe the rampart construction as being entirely of clay, while other forts with clay ramparts within southern Scotland included Bothwellhaugh, Cappuck, Cramond and Newstead. The use of a cobbled foundation to the clay rampart appears to be less common, but is paralleled at Newstead, where there was a strip of cobbling beneath the clay.

While the information for the aforementioned sites refers to the main fort ramparts rather than any ancillary structures, a similar rampart base was identified at Newstead enclosing the baths associated with the fort. Curle (1911: 97) describes the rampart base as a foundation of river cobbles 12ft (3.66m) broad, enclosing an area 113ft (34.4m) by 78ft (23.77m). The cobbles had been embedded in clay and, at the eastern end, were covered in a layer of yellow puddled clay measuring 1.5 to 2ft (0.46–0.61m) in depth. Although the rampart at Inveresk was only partially uncovered, it would have enclosed an area of at least 32.3m by over 20m, meaning that it was potentially of very similar dimensions to that excavated at Newstead. Where it does appear to differ markedly from Newstead is at the corners, which at Inveresk appear to have been widened out and squared off, whereas those at Newstead were nicely rounded. This may indicate that there was some kind of additional fortification on the corners at Inveresk, but there was no surviving evidence of this.

This parallel with Newstead raises the question as to whether the rampart at Inveresk could have enclosed a bath house, as a Roman fort such as Inveresk would almost certainly have had this type

of amenity situated close by. There is a known bath house (NT37SW 13) situated fairly close by at Inveresk Gate and although Richmond (1980: 298) has suggested that it may have been an earlier structure associated with a possible Flavian fort (for which there is currently no evidence), its location would suggest that it is more likely to have served the *vicus*. However, beyond the parallel with Newstead and the tentative circumstantial evidence that there would have been a bath house within close proximity to the fort, there was certainly no archaeological evidence for this being a bath house, with all the features uncovered inside the rampart apparently relating to either the field system or the 20th-century wireworks. As previously mentioned, the area uncovered was comparatively small and the disturbance caused by later development was considerable, but this is still unlikely to have completely removed any traces of a substantial bath house and there was no evidence of any of the flue-tiles or *opus signinum* normally associated with Roman baths. It is also of note that Curle (1911: 97) could cite no known parallel of a rampart enclosing a bath house, while Richmond (1980: 296) cites an area close to the south-east corner of the fort, where an abundance of flue-tiles were discovered, as being the most likely location for a bath house.

Whatever the purpose, the parallels with Newstead do suggest that this feature is likely to have been some kind of military installation associated with the fort. Further evidence comes from the fort itself, where a series of excavations carried out between 1991 and 2001 (Leslie & Will 2005) identified the extensive use of clay in the construction of the ramparts. However, the excavators specifically refer to the use of yellow clay for the construction of the ramparts as opposed to a pinky-red variety for ditch lining and a grey variety for foundation deposits. They also note that it was yellow clay that was used for rampart construction at Newstead (Curle 1911: 33), and Bothwellhaugh (Maxwell 1975: 23–4) and even speculate that it may have been chosen deliberately for a combination of reasons such as good coherence quality and possibly even visual impact. The yellowy-grey clay overlying the cobbles is perhaps more reminiscent of that used for foundation deposits within the main fort complex, and Leslie & Will (2005: 35) describe significant structural elements of the fort (notably the west

gate) being supported by a foundation constructed from cobbles set with a matrix of grey clay. This might imply that the rampart base was in fact a foundation for a significant stone-built structure, but at 2.5–3m wide it was significantly larger than the 1.5m-wide structural elements of the west gate, indicating that it is more likely to have been the base of a clay rampart.

The use of stone to provide a foundation for a rampart appears to have become quite common practice during the Roman period and Jones (1975: 32, 78) has suggested that it was widely used by the late 1st century AD. However, Leslie & Will (2005: 43) have suggested that this technique was more applicable to turf ramparts, with numerous Antonine forts consisting of ramparts constructed entirely from clay, or clay with an outer face of dressed stone, as appears to have been the case with the main rampart at Inveresk. Nevertheless, they do cite the example of Newstead, which appears to provide the closest parallel to the probable rampart excavated at Inveresk, as they both appear to be examples of a clay rampart constructed on a base of cobbles.

The aforementioned evidence provides a fairly strong argument that this was a rampart base associated with a Roman military installation. However, its exact purpose is speculative, as nothing was found which would suggest its function. While an attractive idea, the suggestion that this may have been the site of the fort baths has no supporting archaeological evidence. An alternative possible function might be something along the lines of a defensible storage or goods area where defence was not the primary function. The case for defence not being the primary function is further strengthened by the lack of an external ditch, which was a common feature on many Roman military installations.

Presumably, this structure would have been demolished after it fell out of use and was levelled prior to the excavation of the field system ditches through its footprint. This would doubtless have been a considerable undertaking as it would have entailed the removal of many tonnes of heavy clay. The lack of any clay deposits on site might indicate that it had been removed and utilised in another structure elsewhere, although it is also possible that it was simply stockpiled within the part of the site that was unexcavated.

9.2.4 The field system

The maximum size of the individual fields or plots at Inveresk is 0.028ha. This small size would perhaps point towards something more along the lines of allotments or paddocks, which may have been associated either with the fort or with the *vicus*. Indeed, the use of ditches is interesting within the context of this area which, with the exception of the clays along the southern boundary of the site, appears to have been very free draining. This would suggest that the purpose of the ditches was primarily as a form of land division, possibly implying differing ownership or tenure. On the face of it, some kind of upstanding boundary such as hedges or fences would perhaps have made more sense given the speed with which these ditches are likely to have filled up, but the use of ditches would perhaps have supplied a degree of flexibility as they could be rapidly backfilled or re-excavated elsewhere if the terms of the tenure changed and a larger or smaller area had to be enclosed.

Soil micromorphology (Ellis, Section 5.3.1) suggests that the lowest deposits of the overlying midden material at the southern end of the area consisted of herbivore dung, possibly suggesting that the field system had been manured, but it could also suggest that this area was being used to corral cattle, or perhaps horses associated with the fort.

Elsewhere, CFA (Mitchell & Anderson 2011) recorded similarly small plots within close proximity to the *vicus* associated with the Burgh II fort, Cumbria, while at Rough Castle, Falkirk (Mate 1995) the plots were also on a rather smaller scale, being described by Breeze (2006: 136) as more appropriate for market gardening activities, so it may be that these were a fairly common feature close to Roman forts, with the larger-scale agricultural land being further out into the hinterland. Within the Inveresk area, larger-scale field systems are known at Lewisvale Park (Leslie 2002b) and Howe Mire (Cook 2002, 2004) and further extensive field systems are likely to have been destroyed by recent agriculture and modern development.

Aside from a general trend towards a west-north-west by east-south-east-aligned field system, much of the layout of the ditches appeared rather random, with plots of irregular shapes and sizes. This was particularly the case towards the southern

part of the site, and at the western end within the area that had previously been enclosed by the Roman rampart. These areas contained a maze of interconnected and apparently intercutting ditches. The most obvious explanation for this would be that they represent several different phases of the field system, and indeed a large number of the relationships investigated between the ditches did suggest one ditch cutting another. However, at many of the junctions where this was the case, the ditches still appeared to respect each other, with quite a number of T-junction connections having nicely rounded edges where one ditch flowed seamlessly into another. The implication of this is perhaps that the ditches were broadly contemporary and the impression that one ditch was cutting another may have been created in a number of cases by the need to re-cut the base of the ditches as they filled up rapidly in the sandy soil conditions. This does not imply that all of the ditches were open at the same time but is perhaps an indication of them being of a somewhat transient nature. Indeed, this impression was reinforced during the course of the excavation when during dry and windy conditions, open ditch sections would become backfilled practically overnight by wind-blown sand. Overlying deposits may have provided some degree of stability during the period in which they were under cultivation, but the impression left is one of a constant cycle of recutting and reopening as the ditches became rapidly backfilled.

Ditches associated with the field system had cut Burials 437 and 631 indicating that it post-dated these features. It was also of note that human remains were found within the midden-rich deposits (C003) possibly indicating further burials which had been disturbed by the field system and simply dumped with the accumulating refuse. However, the field system appeared to respect the location of Roman-period Burials 233, 315, 320 and 326, as they were located within an open area towards the centre of the site. Indeed, the site plan indicates quite a large area immediately to the east of the rampart base, where there had been minimal disturbance aside from the insertion of the burials and the much more modern features associated with the wireworks. This is unlikely to have been a matter of survival as the evidence indicates minimal truncation across the site. If it was left unused in respect of the burials, it is

unclear why this group of burials should be afforded this treatment whereas others were cut by the field system, especially as the radiocarbon dates indicate that they were approximately contemporary. Perhaps a possible explanation is that they were marked in some way whereas the others were not. However, an alternative explanation could be that this open area related to the rampart and might indicate that part of the field system was in use at the same time as the rampart.

9.2.5 The midden-rich deposits

The evidence from the midden deposits suggests that they were Antonine in date and that they built up over the period of occupation of the fort. They overlay the southern extent of the field system as well as part of the rampart base and some of the Roman-period burials.

Within the midden deposits there were a high number of horse harness fittings of probable military origin (Section 7.7), lending weight to the suggestion that a cavalry unit was stationed at Inveresk. Horse remains also represented an unusually high percentage of the animal bones recovered, with at least 14 individual horses being present on the midden and a further six from the remainder of the site (Sections 4.9 and 8.2). Evidence of the use of horses was also identified within midden deposits at Inveresk Gate (Bishop 2004), with finds such as snaffle bits, hipposandal fragments and girth buckles. There was also a high percentage of barley macrofossils, a crop that has been interpreted as being for animal fodder rather than for human consumption. Based on the evidence from Inveresk Gate, Bishop (2004: 184) has suggested that the presence of equine items need represent no more than a cavalry detachment or even simply a few horses ridden by officers within an infantry unit. Whether anything more than this can be interpreted from the Primary Health Care Centre excavations is open to question, but the growing body of evidence for the use of horses does go some way to support Richmond's (1980) suggestion of a possible cavalry unit.

Further parallels with the Inveresk Gate midden come in the form of the number of military items recovered. Indeed, the quantity uncovered at Inveresk Gate has led Bishop (2004: 84) to the

conclusion that it was a military midden and that it implied an absence of civil settlement within the immediate vicinity during its period of usage. This midden deposit appears to have been one of the earlier phases at Inveresk Gate and fell out of use as the civil settlement was developed. The excavator (Bishop 2004) has speculated that the location for the midden must have been moved elsewhere and has suggested the southern side of the fort as the most likely location. If this were the case, this programme of works has suggested that the midden was in fact moved to the northern side of the fort, with the southern side maybe being rejected due to the possible location of the bath house. Supporting the case for the Primary Health Care Centre midden post-dating the Inveresk Gate midden is the indication that it came late in the sequence of phasing, whereas the Inveresk Gate midden appears to have been early. However, as already mentioned, the midden materials could have been building up for some time prior to them engulfing parts of other significant phases of activity.

An alternative theory to the assumption that the midden deposits built up gradually over the life of the fort is that they represent one or several large-scale dumping events following the departure of a garrison. The main argument behind this is that articles have been found on middens that might otherwise have been saved and recycled as scrap (Bishop 1985: 12; 2004: 184–5). Also perhaps of note is the sheer quantity of samian ware, as it seems surprising that such a large amount should be broken in day-to-day usage and end up on the rubbish tip. Against this argument however is the need to keep domestic waste, with its associated disease risks, separate from the living quarters, and it is perhaps unlikely that within a well-organised Roman fort, midden material should have been allowed to build up to any great degree. The largely homogeneous nature of the Primary Care Centre midden is also perhaps indicative of a gradual build-up of material rather than several large-scale dumping events which are likely to have left contextual breaks, and a single dumping event is considered unlikely based on the sheer quantity of material and its apparently selective nature.

Bishop (2004: 183) cites the *Schutthügel* (waste tip) (Hartmann 1986: 92) outside the legionary base of Vindonissa (Windisch, Switzerland) as being the

most obvious parallel for Inveresk Gate, and this parallel appears to be even more applicable to the midden uncovered at the site of the Primary Health Care Centre. The *Schutthügel* was linear in form and lay parallel with the defences at Vindonissa at a distance of around 6m (Ettlinger & von Gonzenbach 1951: 40), but was situated on the southern side of the fort rather than the northern side. During the course of the excavation there was some speculation that the Primary Health Care Centre midden may have been altered in form in order to accommodate the wire testing range that was constructed along its summit, but it seems likely that the builders simply took advantage of its existing linear form for the construction of the range. Although running at a slight angle to the fort, the midden was parallel to the break in slope at the base of the ridge on which the fort was situated. At *c* 60m distant from the fort, this midden was considerably further away than the *Schutthügel* was from the fortifications at Vindonissa, but the steep drop down from the ridge on which the fort was situated would have made this a convenient dumping ground. The Inveresk Gate midden was situated at a distance of *c* 170m (Bishop 2004) from the fort, while middens at Echzell and Carnuntum (Grünwald 1983: 8–9) were situated at 64m and 700m respectively.

The *Schutthügel* is believed to have accumulated over a 70-year period and is estimated to have had a volume of 10,000m³ (Bishop 2002b). This was considerably larger than the Primary Health Care Centre midden, where the excavated deposits measured 110m by 20m by a maximum of 2m deep. Based on an average depth of *c* 1m, it would have had an estimated volume of at least 2,200m³ and with each cubic metre of earth weighing in at around 1.5 tonnes, this material would have had a weight in the region of 3,300 tonnes. A large percentage of this would no doubt have been wind-blown sand, but it does nonetheless represent a significant amount of waste material. It is also by no means certain that the excavated area represents the full original extent of the midden; the deposits are likely to have been landscaped to a degree to accommodate the wire testing range, and it is by no means certain how far back into the scheduled area the deposits extended. It is also of note that the area to the west of the development area had been significantly truncated by the wireworks, potentially removing further

midden deposits. While any attempts to estimate the original size of the midden – based on its having extended the full length of the northern side of the fort – would be purely speculative, it is probably safe to assume that the excavated deposits do not represent its full extent. All this serves to reflect the vast amount of resources required by a large Roman fort, and potentially indicates that large areas of the hinterland would have been directly under military control.

9.2.6 The post-built structure

The post-in-pit building technique appears to have characterised the second civil period identified by Bishop (2004: 17) (*vicus* period II) at Inveresk Gate and a substantial post-in-pit structure interpreted as a possible amphitheatre was identified at Park Lane (Neighbour 2002). Bishop (2002a: 33) has also noted that post hole buildings are characteristic of the Antonine occupation of Scotland (although not confined to this period). At Inveresk Gate the description of the post holes with their clay and cobble packing appears to be broadly the same as those identified at the Primary Health Care Centre site. However, both at Inveresk Gate and Park Lane, the post holes were predominantly square or rectangular whereas those at the health care centre site were circular. The use of a similar building technique might imply that the post-built structure was broadly contemporary with the second period of the civil settlement although this theory is largely conjectural. The earliest occupation of the *vicus* (*vicus* period I; Bishop 2004: 15) was characterised by post-in-trench construction whereas the later third period (*vicus* period III; Bishop 2004: 18) was characterised by the use of unmortared stone. Assuming the post-built structure was contemporary with the second civil settlement, this is likely to push the rampart back into the first civil settlement period or into the purely military period that pre-dated the civil settlement.

9.3 Conclusions

The excavations at the Primary Health Care Centre site have provided another important piece to the jigsaw of the complex history of Inveresk Roman Fort. This previously unexplored area to the north

of the fort illustrates the degree of change that could take place within the comparatively short space of time of the Antonine occupation of the site. Within this *c* 26-year period, an area previously used for Iron Age burials had seen a substantial rampart constructed and demolished, a Roman burial ground incorporated into a field system, and a massive midden deposit accumulating along the northern side of the fort, most likely gradually swallowing up the previous features occupying the site as it was continually added to.

The reasons why so much change should have taken place are unclear but may be a reflection of the transient nature of the Roman army with one garrison replacing another. Possibly the Roman-period burials relate to the early phases of construction and occupation, and represent a continuation of the Iron Age usage of this area as a burial ground. The rampart also is likely to belong somewhere early on in the occupation of the fort as it appears to have been both constructed and demolished within this comparatively short space of time. Given the quantity of clay that it would have taken to construct this feature, this would have been a considerable undertaking, especially in view of the possibility that it may have been removed from site.

The fact that some of the burials were cut by the field system could indicate that either a new garrison had taken over and was unaware of the burials, or that for some reason the burials were considered unimportant, possibly indicating a socially marginalised group such as criminals or deserters. It

might also be a reflection of the economic situation, possibly with the need to produce crops or graze animals overriding the need to maintain the sanctity of the burial ground. The importance of the field system is perhaps also reflected in the quantity of work required in the removal of the rampart. It is perhaps also of note that the field system lay adjacent to the midden, which would have provided a plentiful supply of compost to improve the yield of the plots.

During the initial phases of occupation the midden deposits were presumably fairly small, but as they grew and expanded, gradually engulfing areas of the field system, there may have been the need to extend the plots outwards. Whether or not the field system remained in use until the end of the Antonine occupation of the fort is open to question as the post-built structure of possible Roman date was found to cut the fill of one of the field system ditches. With this post-in-pit construction method being reminiscent of the second civil period (*vicus* period II; Bishop 2004: 17), it might reflect the extension of elements of the civil settlement into what appears to have been a militarised zone. Although conjectural, the possibility of a second civil settlement structure representing the final Roman occupation of the site appears further to condense the time period for the earlier features, especially when considered in light of the fact that there was a third civil period, and might provide some tentative evidence of Roman activity continuing beyond AD 165.

10. ARCHIVE

The finds have been deposited with National Museums Scotland (Treasure Trove no. TT/231/12) and the paper archive will be deposited with the National Record for the Historic Environment.

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12. REFERENCES

Abbreviations

AE *L'Année Épigraphique*
CIL *Corpus Inscriptionum Latinarum*
RIB *Roman Inscriptions of Britain*
RMD *Roman Military Diplomas*

- Adderley, P, Simpson, I A & Davidson, D A 2006 'Historic landscape management: a validation of quantitative soil thin-section analysis', *Journal of Archaeological Science* 33(3): 320–34. <https://doi.org/10.1016/j.jas.2005.07.016>
- Alföldy-Thomas, S 1993 'Anschirungszubehör und Hufbeschläge von Zugtieren', in Künzl 1993: 331–44.
- Allason-Jones, L 1988 'The small finds', in Bishop, M C & Dore, J N *Corbridge: Excavations of the Roman Fort and Town, 1947–80*, 159–216. London: English Heritage.
- Allason-Jones, L 1996 *Roman Jet in the Yorkshire Museum*. York: Yorkshire Museum.
- Allason-Jones, L & Miket, R 1984 *The catalogue of small finds from South Shields Roman fort*. Newcastle: Society of Antiquaries of Newcastle upon Tyne.
- Anderson, S 2010 'Cremated human bone', in Orr, K *Archaeological excavations at 1 Queens Road (Handford House, now 'Handford Place'), Colchester, Essex 2003 and 2004–2005*, 65–78. CAT Report 323, Colchester Archaeological Trust. http://llws-colchester.esdm.co.uk/LLFiles/1331/full_1331.pdf. Accessed 11 June 2019.
- Anderson, S 2011 'Musselburgh Primary Health Care Centre, Former Brunton Wireworks, Inveresk Road, Musselburgh, East Lothian. Assessment and Project Design for Post-excavation Analysis', CFA Report No. 1845.
- Asouti, E & Austin, P 2005 'Reconstructing woodland vegetation and its relation to human societies, based on the analysis and interpretation of archaeological wood charcoal macroremains', *Environmental Archaeology* 10: 1–18. <https://doi.org/10.1179/env.2005.10.1.1>
- Bailey, G B 1997 'Excavation of Roman, mediaeval and later features at Carriden Roman fort annexe in 1994', *Proc Soc Antiq Scot* 127: 577–94.
- Baker, L 2002 'An Iron Age child burial at Dunbar Golf Course, East Lothian', *Proc Soc Antiq Scot* 132: 205–12.
- Bass, W 1971 *Human Osteology*. Missouri: Missouri Archaeological Society.
- Bayley, J & Butcher, S 2004 *Roman brooches in Britain: a technological and typological study based on the Richborough collection*. London: Society of Antiquaries.
- Bevan, L 2010 'Copper alloy objects', in Ferris, I *The beautiful rooms are empty. Excavations at Binchester Roman fort, County Durham 1976–1981 and 1986–1991*, 346–61. Durham: Durham County Council.
- Bidwell, P T 1985 *The Roman Fort of Vindolanda at Chesterholm, Northumberland*. London: Historic Buildings and Monuments Commission for England.
- Bidwell, P & Croom, A 2016 'The coarse ware', in Breeze, D J *The Roman Fort on the Antonine Wall at Bearsden. Excavations 1973–82*, 108–29. Edinburgh: Society of Antiquaries of Scotland.
- Bidwell, P & McBride, R 2010 'The coarse wares', in Snape, M, Bidwell, P & Stobbs, S 'Excavations in the military vicus south-west of the Roman fort at South Shields in 1973, 1988 and 2002', *Arbeia Journal* 9: 98–119.
- Birley, E & Gillam, J P 1948 'Mortarium stamps from Corbridge 1906–1938', *Archaeologia Aeliana*, 4th series, 26: 172–201.
- Bishop, M C 1985 'The military fabrica and the production of arms in the early principate', in Bishop, M C (ed.) *The Production and Distribution of Roman Military Equipment, Proceedings of the Second Roman Military Equipment Research Seminar*, 1–42. Oxford: British Archaeological Reports, International Series, S275.
- Bishop, M C 1988 'Cavalry equipment of the Roman army in the first century AD', in Coulston, J C (ed.) *Military Equipment and the Identity of Roman Soldiers*, 67–195. Oxford: British Archaeological Reports, International Series, 394.
- Bishop, M C 2002a (ed) *Roman Inveresk: Past, Present and Future*. Duns: Armatura Press.
- Bishop, M C 2002b 'Inveresk Gate', in Bishop 2002a, 29–35.
- Bishop, M C 2002c *Lorica Segmentata Vol. I. A Handbook of Articulated Roman Plate Armour*. Duns: Armatura Press.

- Bishop, M C 2004 *Inveresk Gate: Excavations in the Roman Civil Settlement at Inveresk, East Lothian, 1996–2000*. Scottish Trust for Archaeological Research, Monograph 7.
- Bishop, M C & Coulston, J C 2006 *Roman Military Equipment: From the Punic Wars to the Fall of Rome*, 2nd edition. Oxford: Oxbow books.
- Boessneck, J 1969 ‘Osteological differences between sheep (*Ovis aries* Linne) and goats (*Capra hircus* Linne)’, in Brothwell, D & Higgs, E (eds) *Science in Archaeology 2*: 331–58. London: Thames and Hudson.
- Bouts, W & Pot, T 1989 ‘Computerized recording and analysis of excavated human dental remains’, in Roberts, C, Lee, F & Bintliff, J (eds) *Burial Archaeology: current research, methods and developments*. Oxford: British Archaeological Reports, British Series, 211.
- Braadbart, F & Poole, I 2008 ‘Morphological, chemical and physical changes during charcoalification of wood and its relevance to archaeological contexts’, *Journal of Archaeological Science* 35(9): 2434–55. <https://doi.org/10.1016/j.jas.2008.03.016>
- Breeze, D J 2006 *The Antonine Wall*. Edinburgh: Historic Scotland.
- Breeze, D J, Close-Brooks, J & Ritchie, J N G 1976 ‘Soldiers’ burials at Camelon, Stirlingshire, 1922 and 1975’, *Britannia* 7: 73–95. <https://doi.org/10.2307/525763>
- Brettell, R, Montgomery, J & Evans, J 2012 ‘Brewing and stewing: the effect of culturally mediated behaviour on the oxygen isotope composition of ingested fluids and the implications for human provenance studies’, *Journal of Analytical Atomic Spectrometry* 27: 778–85.
- Brickley, M & McKinley, J 2004 *Guidelines to the Standards for Recording Human Remains*. Reading: IFA/BABAO.
- Brodribb, G 1987 *Roman Brick and Tile*. Gloucester: Alan Sutton.
- Brothwell, D 1981 *Digging up Bones*. London: BM(NH)/OUP.
- Brothwell, D & Powers, R 1966 ‘The Iron Age people of Dunbar’, *Proc Soc Antiq Scot* 98: 184–98.
- Bruce, M 1993 ‘Human bone’, in Gallagher & Clarke 1993: fiche 2: A7–13.
- Buikstra, J & Ubelaker, D (eds) 1994 *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archaeological Survey Research Series No. 44, Fayetteville.
- Bullock, P, Fedoroff, N, Jongerius, A, Stoops, G, Tursina, T & Babel, U 1985 *Handbook for Soil Thin Section Description*. Wolverhampton: Waine Research Publications.
- Burley, E 1956 ‘A catalogue and survey of the metalwork from Traprain Law’, *Proc Soc Antiq Scot* 89: 118–226.
- Calkin, J B 1955 “‘Kimmeridge coal-money’. The Romano-British shale armlet industry’, *Proceedings of the Dorset Natural History & Archaeological Society* 75: 45–71.
- Callander, J G 1936 ‘Bronze Age urns of clay from Orkney and Shetland, with a note on vitreous material called “cramp”’, *Proc Soc Antiq Scot* 70: 441–52.
- Carina Calvi, M 2005 *Le ambre romane di Aquileia*. Aquileia: Associazione Nazionale per Aquileia.
- Carreras Monfort, C 2003 ‘Haltern 70: a review’, *Journal of Roman Pottery Studies* 10: 85–91.
- Chapman, E M 2005 *A Catalogue of Roman Military Equipment in the National Museum of Wales*. Oxford: British Archaeological Reports, British Series, 388.
- Chenery, C, Eckardt, H & Müldner, G 2011 ‘Cosmopolitan Catterick? Isotopic evidence for population mobility on Rome’s Northern frontier’, *Journal of Archaeological Science* 38: 1525–36. <https://doi.org/10.1016/j.jas.2011.02.018>
- Christison, D 1901 ‘Excavation of the Roman camp at Lyne, Peeblesshire, undertaken by the Society of Antiquaries of Scotland in 1901’, *Proc Soc Antiq Scot* 35: 154–86.
- Christison, D, Buchanan, M & Anderson, J 1901 ‘Account of the excavation of the Roman station of Camelon, near Falkirk, Stirlingshire, undertaken by the Society in 1900’, *Proc Soc Antiq Scot* 35: 329–417.
- Clarke, A 2006 *Stone Tools and the Prehistory of the Northern Isles*. Oxford: British Archaeological Reports, British Series, 406.
- Clarke, A 2007 ‘Coarse stone’, in Hunter, J R, Bond, J & Smith, A *Excavations at Pool, Sanday. A multi-period settlement from Neolithic to Late Norse Times*. Kirkwall.

- Clarke, A 2008 *Coarse stone assemblage from Mine Howe, Tankerness, Orkney*. Unpublished report for ORCA.
- Clarke, A 2009 'Craft specialisation in the Mesolithic of Northern Britain: the evidence from the coarse stone tools', in Finlay, N, McCarten, S, Milner, N & Wickham-Jones, C R *From Bann Flakes to Bushmills*. Oxford: Oxbow.
- Clarke, A 2012 'Site Activities: Cobble tools', in Sharples, N (ed.) *A Late Iron Age farmstead in the Outer Hebrides: Excavations at Mound 1, Bornais, South Uist*, 284–7. Oxbow Books.
- Clarke, A & Kemp, M 1985 'Bruntons Wireworks (Inveresk p), Roman burials', *Discovery and Excavation in Scotland* 1985: 28.
- Clarke, A & Kirby, M forthcoming *The Flaked Lithic Assemblage from Mesolithic and Early Bronze Age activity at Musselburgh Primary Health Care Centre, Inveresk Road, Musselburgh*. Scottish Archaeological Internet Reports.
- Cohen, A & Serjeantson, D 1996 *A Manual for the Identification of Bird Bones from Archaeological Sites*. London: Archetype Publications.
- Collard, M & Hunter, F 2000 'A Roman burial from Cramond (Edinburgh) rediscovered', *Proc Soc Antiq Scot* 130: 525–35.
- Cook, M 2002 'Amongst the field systems III: Howe Mire' in Bishop 2002a: 66–9.
- Cook, M 2004 'Howe Mire: excavations across the cropmark complex at Inveresk, Musselburgh, East Lothian', *Proc Soc Antiq Scot* 134: 131–60.
- Cook, M 2009 *Brunton Wireworks, Inveresk: Archaeological Excavation*. AOC Data Structure Report 20462.
- Cotta, H 1978 *Orthopaedics, a brief textbook*. Stuttgart: Georg Thiem Verlag.
- Courty, M A, Goldberg, P & Macphail, R 1989 *Soils and Micromorphology in Archaeology*. Cambridge: Cambridge University Press.
- Crone, B A 1992 'An Iron Age cist at North Belton, Dunbar', *Proc Soc Antiq Scot* 122: 161–70 and fiche.
- Cross, P J 2011 'Horse Burial in First Millennium AD Britain: issues of interpretation', *European Journal of Archaeology* 14(1–2): 190–209. <https://doi.org/10.1179/1461957111798369409>
- Crowley, N 2004 'Building materials', in Bishop 2004: 172–3.
- Crowley, N 2005 'Building materials', in Leslie & Will 2005: 150–2.
- Crummy, N 1983 *The Roman Small Finds from Excavations in Colchester 1971–9*. Colchester: Colchester Archaeological Trust.
- Curle, J 1911 *A Roman Frontier Post and its People: the Fort of Newstead in the Parish of Melrose*. Glasgow: James Maclehose & Sons.
- Dalland, M 1991 'Burials at Winton House, Cockenzie and Port Seton, East Lothian', *Proc Soc Antiq Scot* 121: 175–80.
- Davidson, D A 2002 'Bioturbation in old arable soils: quantitative evidence from soil micromorphology', *Journal of Archaeological Science* 29(11): 1247–53. <https://doi.org/10.1006/jasc.2001.0755>
- Davidson, D A & Carter, S P 1998 'Micromorphological evidence of past agricultural practices in cultivated soils: the impact of a traditional agricultural system on soils in Papa Stour, Shetland', *Journal of Archaeological Science* 25: 827–38.
- Detschew, D 1957 *Die Thrakischen Sprachreste*, Schriften der Balkankommission/Linguistische Abteilung XIV. Österreichische Akademie der Wissenschaften Philosophisch-historische Klasse. Vienna: R M Rohrer.
- Detsicas, A P 1966 'An Iron Age and Romano-British site at Stone Castle Quarry, Greenhithe', *Archaeologia Cantiana* 71: 136–90.
- Dickinson, B M 1988 'Stamped and decorated samian', in Thomas, G D 'Excavations at the Roman civil settlement at Inveresk, 1976–77', *Proc Soc Antiq Scot* 118: 165 and fiche 1: A7–B9.
- Dickinson, B 2004 'Samian stamps from Inveresk Gate', in Bishop 2004: 104.
- Dickinson, B & Hartley, B 2000 'The samian', in Rush, P, Dickinson, B, Hartley, B & Hartley, K F 'Roman Castleford, Excavations 1974–85, Vol. III, The Pottery', *Yorkshire Archaeology* 6: 5–88.
- Dobney, K & Rielly, K 1988 'A method for recording archaeological animal bones: the use of diagnostic zones', *Circaea* 5: 79–96.
- Dore, J 2004 'Roman pottery', in Bishop 2004: 101–27.
- Driesch, A von den 1976 *A Guide to the Measurements of Animal Bones from Archaeological Sites*. Harvard: Peabody Museum.

- Driesch, A von den & Boessneck, J A 1974 'Kritische Anmerkungen zur Widerristhöhenberechnung aus Längenmassen vor- und frühgeschichtlicher Tierknochen', *Säugetierkundliche Mitteilungen* 22: 325–48.
- Dunbar, E, Cook, G T, Naysmith, P, Tripney, B G and Xu, S 2016 'AMS 14C Dating at the Scottish Universities Environmental Research Centre (SUERC) Radiocarbon Dating Laboratory', *Radiocarbon* 58(1): 9–23. <https://doi.org/10.1017/RDC.2015.2>
- Dunwell, A 2007 'Cist Burials and an Iron Age Settlement at Dryburn Bridge, Innerwick, East Lothian', *Scottish Archaeological Internet Report* 24.
- Duvauchelle, A 2005 *Les outils en fer du Musée Romain d'Avenches*. Avenches: Musée Roman d'Avenches.
- Eggers, H J 1951 *Der Römische Import im Freien Germanien*. Hamburg: Hamburgisches Museum für Völkerkunde und Vorgeschichte.
- Ellis, C 1998 'Soil analyses and soil micromorphology', in Rees, T 'Excavation of Culhawk Hill ring-ditch house, Kirriemuir, Angus', *Tayside and Fife Archaeological Journal* 4: 113–6.
- Ellis, C 2001 'Soil thin section analysis', in Haselgrove, C & McCullagh, R (eds) *An Iron Age Coastal Community in East Lothian: the excavation of two later prehistoric enclosure complexes at Fishers Road, Port Seton, 1994–5*. Edinburgh: STAR Monograph.
- Ellis, C 2008 'Soils and sediments; micromorphological analyses', in Cook, M & Dunbar, L *Rituals, Roundhouses and Romans, Excavations at Kintore, Aberdeenshire 2000–2006. Volume 1: Forest Road*. Edinburgh: Scottish Trust for Archaeological Research.
- Ettliger, E & von Gonzenbach, V 1951 'Die Grabung am Schutthügel 1950', *Jahresbericht Gesellschaft Pro Vindonissa* 1950/51: 20–48.
- Evans, J A, Montgomery, J, Wildman, G & Boulton, N 2010 'Spatial variations in biosphere $^{87}\text{Sr}/^{86}\text{Sr}$ in Britain', *Journal of the Geological Society* 167: 1–4. <https://doi.org/10.1144/0016-76492009-090>
- Evans, J A, Cheney, C A & Montgomery, J 2012 'A summary of strontium and oxygen isotope variation in human tooth enamel excavated from Britain over the last 6000 years', *Journal of Analytical Atomic Spectrometry* 27: 754–64.
- Evans, J & Rátkai, S with Hartley, K F forthcoming 'The Walton-le-Dale pottery', in Davis, C, Garner, D, Gibbons, P, Miller, I & Olivier, A *Excavations at Walton-le-Dale, Lancashire*.
- Fitzpatrick, A P 2003 'The place of Gaulish wine in the military supply of amphorae-borne commodities to Roman Scotland', *Journal of Roman Pottery Studies* 10: 60–3.
- Fitzpatrick, A P 2016 'The amphorae', in Breeze, D J *Bearsden: A Roman Fort on the Antonine Wall*, 171–6. Edinburgh: Society of Antiquaries of Scotland.
- FitzPatrick, E A 1993 *Soil Microscopy and Micromorphology*. Chichester: John Wiley & Sons.
- Fölzer, E 1913 *Die Bilderschüsseln der ostgallischen Sigillata-Manufakturen*. Bonn: Marcus & Weber.
- Fowler, E 1960 'The origins and development of the penannular brooch in Europe', *Proceedings of the Prehistoric Society* 26: 149–77. <https://doi.org/10.1017/S0079497X00016285>
- Gallagher, D B & Clarke, A 1993 'Burials of possible Roman date from Inveresk, East Lothian', *Proc Soc Antiq Scot* 123: 315–18.
- Garbsch, J 1978 *Römische Paraderüstungen*. Munich: C H Beck.
- Grant, A 1982 'The use of toothwear as a guide to the age of domestic ungulates', in Grigson, C, Wilson, R & Payne, S (eds) *Ageing and Sexing Animal Bones*, 91–108. Oxford: British Archaeological Reports, British Series, 109.
- Greep, S 1995 'Objects of bone, antler and ivory from C.A.T. sites', in Blockley, K, Blockley, M, Blockley, P, Frere, S S & Stow, S *The Archaeology of Canterbury V: excavations in the Marlowe Car Park and surrounding areas*, 1112–52. Canterbury: Canterbury Archaeological Trust.
- Grünwald, M 1983 *Die Funde aus dem Schutthügel des Legionslagers von Carnuntum. Die Baugrube Pingitzer*, Der römische Limes in Österreich, 32. Vienna: VÖAW.
- Hanson, W S 2002 'Amongst the field systems I', in Bishop 2002a: 52–61.
- Hanson, W S 2007 *A Roman Frontier Fort in Scotland: Elginhaugh*. Stroud: The History Press.
- Hartley, B R 1972 'The Roman occupation of Scotland: the evidence of samian ware', *Britannia* 3: 1–55. <https://doi.org/10.2307/526021>

- Hartley, B R 1989 'Samian potters' stamps and decorated ware', in Frere, S S & Wilkes, J J *Strageath, Excavations within the Roman Fort, 1973–86*, 212–18. *Britannia Monograph 9*.
- Hartley, B R & Dickinson, B M 2008–12 *Names on Terra Sigillata. An Index of Makers' Stamps and Signatures on Gallo-Roman Terra Sigillata (Samian Ware)*. London: Institute of Classical Studies.
- Hartley, K F 1976 'Were mortaria made in Roman Scotland?', *Glasgow Archaeological Journal* 4: 81–9.
- Hartley, K F 1988 'The mortaria', in Thomas 1988, 166 and fiche 1, E12-G3.
- Hartley, K F 1997 'Mortaria', in Monaghan, J *Roman Pottery from York (The Archaeology of York 16/8)*, 930–43. York: Council for British Archaeology.
- Hartley, K F 2004 'Mortaria' and 'Stamped Mortaria' in Bishop 2004: 106–14, 121–7.
- Hartley, K F 2012 'Mortaria' and 'Stamped mortaria', in Johnson, M, Croom, A, Hartley, K & McBride, R 'Two Flavian to early Antonine Romano-British pottery kilns at 7a Fisher Street, Carlisle', *Journal of Roman Pottery Studies* 15: 106–14, 121–7.
- Hartley, K F & Webster, P V 1973 'Romano-British pottery kilns near Wilderspool', *Archaeological Journal* 130: 77–103. <https://doi.org/10.1080/100665983.1973.11020368>
- Hartmann, M 1986 *Vindonissa Oppidum-Legionslager-Castrum*. Effingerhof: Brugg.
- Haselgrove, C (ed.) 2009 *The Traprain Law Environs Project Fieldwork and Excavations 2000–2004*. Edinburgh: Society of Antiquaries of Scotland.
- Haselgrove, C & McCullagh, R (eds) 2000 *An Iron Age Coastal Community in East Lothian: The Excavation of Two Later Prehistoric Enclosure Complexes at Fishers Road, Port Seton, 1994–5*. Edinburgh: STAR Monograph 6.
- Henderson, D 2004 'Mammal bone from the Well and Plot 16', in Bishop 2004: 67–74.
- Hermet, F 1934 *La Graufesenque (Condatomago)*. Paris: Librairie Ernest Leroux.
- Hill, P H 1982 'Broxmouth Hillfort excavations, 1977–1978. An Interim Report', in Harding, D W (ed.) *Later Prehistoric Settlement in South-East Scotland*, 141–88. Edinburgh: University of Edinburgh Department of Archaeology Occasional Paper 8.
- Hillson, S 1986 *Teeth*. Cambridge: Cambridge University Press.
- Hird, L & Brooks, C M in prep *Roman and Medieval Carlisle: the Southern Lanes, Excavations 1981–2, Fascicule 3. The Roman and Medieval Pottery*.
- Holder, A 1896 *Alt-celtischer Sprachschatz*. Leipzig: Teubner.
- Holmes, N 2003 *Excavation of Roman Sites at Cramond, Edinburgh*. Edinburgh: Society of Antiquaries of Scotland Monograph 23.
- Hull, M R 1963 *The Roman Potters' Kilns of Colchester*. Oxford: Reports of the Research Committee of the Antiquaries of London 21.
- Hunter, F 2006 'Recent finds from Strageath Roman fort', *Tayside & Fife Archaeological Journal* 12: 81–8.
- Hunter, F forthcoming 'The small finds from the Inveresk Fort excavations', in Will, B & Leslie, A *Excavations in the Roman Fort of Inveresk*.
- Jackson, R 1985 'The objects of iron', in Bidwell, P T *The Roman Fort of Vindolanda*, 130–51. London: Historic Buildings and Monuments Commission for England (= Archaeological Report No. 1).
- James, H F & Duffy, P 2001 'Archaeological Investigation on the Tarvit to Balmullo water pipeline route, Fife', *Tayside and Fife Archaeological Journal* 7: 27–33.
- James, S 2010 *Excavations at Dura-Europos 1928–1937. Final Report VII: the arms and armour and other military equipment*. Oxford: Oxbow Books.
- Jarrett, M G 1994 'Non-legionary Troops in Roman Britain: Part One, The Units', *Britannia* 25: 35–77.
- Jenkins, F 1960 'Two pottery kilns and a tiler's of the Roman period at Canterbury (*Durovernum Cantiacorum*)', *Archaeologia Cantiana* 74: 151–61.
- Jones, M J 1975 *Roman Fort Defences to AD 117*. Oxford: British Archaeological Reports, British Series, 21.
- Junkelmann, M 2000 *Römische Helme. Band VIII Sammlung Axel Guttman*. Mainz: Verlag Axel Guttman/Verlag Philipp von Zabern.
- Kenward, H K, Hall, A R & Jones, A K G 1980 'A tested set of techniques for the selection of plant and animal microfossils from waterlogged archaeological deposits', *Science in Archaeology* 22: 3–15.

- Kolendo, J and Bozilova, V 1997 *Inscriptions grecques et latines de Novae (Mésie Inférieure)*. Bordeaux: Ausonius Éditions.
- Knorr, R & Sprater, F 1927 *Die westpfälzischen Sigillata-Töpfereien von Blickweiler und Eschweilerhof*. Speyer: Historisches Museum der Pfalz.
- Koster, A 1997 *Description of the Collections in the Provinciaal Museum G M Kam at Nijmegen XIII. The Bronze Vessels 2*. Nijmegen: Provinciaal Museum G M Kam.
- Krogman, W 1978 *The Human Skeleton in Forensic Medicine*. Illinois: C.C. Thomas.
- Künzl, E 1993 *Die Alamannenbeute aus dem Rhein bei Neupotz*. Mainz: RGZM.
- Lawson, A J 1975 'Shale and jet objects from Silchester', *Archaeologia* 105: 241–75.
- Lelong, O & MacGregor, G 2007 *The Lands of Ancient Lothian: Interpreting the Archaeology of the A1*. Edinburgh: Society of Antiquaries of Scotland.
- Leslie, A 2002a 'The Roman Fort at Inveresk' in Bishop 2002a: 17–28.
- Leslie, A 2002b 'Amongst the field systems II: Lewisvale Park' in Bishop 2002a: 62–5.
- Leslie, A & Will, R 2005 'Excavations at Inveresk Roman Fort 1991–2001', GUARD unpublished draft report.
- Longworth, I H 1966 'A massive cist with multiple burials of Iron Age date at Lochend, Dunbar. Part I: The archaeological report', *Proc Soc Antiq Scot* 98: 173–83.
- Lorimer, D H 1991 'The human bones', in Dalland, M 'Burials at Winton House, Cockenzie and Port Seton, East Lothian', *Proc Soc Antiq Scot* 121: 175–80.
- Lorimer, D H 1992 'The human bones', in Crone, B A 'An Iron Age cist at North Belton Farm, Dunbar', *Proc Soc Antiq Scot* 122: 161–70.
- Macdonald, G & Curle, A O 1929 'The Roman fort at Mumrills, near Falkirk', *Proc Soc Antiq Scot* 63: 396–475.
- Mackreth, D 2011 *Brooches in Late Iron Age and Roman Britain*. Oxford: Oxbow Books.
- Macphail, R, Courty M A & Gebhardt, A 1990 'Soil micromorphological evidence of early agriculture in north-west Europe', *World Archaeology* 22.1: 53–69. <https://doi.org/10.1080/00438243.1990.9980129>
- Manning, W H 1985 *Catalogue of the Romano-British iron tools, fittings and weapons in the British Museum*. London: British Museum.
- Martiniano, R, Caffell, A, Holst, M, Hunter-Mann, K, Montgomery, J, Müldner, G, McLaughlin, R L, Teasdale, M D, van Rheenen, W, Veldink, J H, van de Berg, L H, Hardiman, O, Carroll, M, Roskams, S, Oxley, S, Morgan, C, Thomas, M G, Barnes, I, McDonnell, C, Collins, M J & Bradley, D G 2016 'Genomic signals of migration and continuity in Britain before the Anglo-Saxons', *Nature Communications* 7: 10326. <https://doi.org/10.1038/ncomms10326>
- Mate, I D 1995 'Excavations of an enclosure system at Rough Castle, Falkirk', *Proc Soc Antiq Scot* 125: 483–97.
- Maxwell, G S 1975 'Excavation at the Roman fort of Bothwellhaugh, Lanarkshire, 1967–8', *Britannia* 6: 20–35.
- Mays, S A 1998 *The Archaeology of Human Bones*. London: Routledge.
- McCarthy, M R, Padley, T G & Henig, M 1982 'Excavations and finds from The Lanes, Carlisle', *Britannia* 13: 79–89.
- McKinley, J I 1994, *The Anglo-Saxon Cemetery at Spong Hill, North Elmham Part VIII: the cremations*, East Anglian Archaeology 69. Gressenhall: Field Archaeology Division, Norfolk Museums Service.
- McKinley, J I 2004 'Compiling a skeletal inventory: cremated human bone', in Brickley, M & McKinley, J I (eds) *Guidelines to the Standards for Recording Human Remains*, IFA Paper No.7. BABAO and IFA.
- Mees, A W 1995 *Modellsignierte Dekorationen auf südgallischer Terra Sigillata*, Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 54, Stuttgart.
- Meijers, R & Willer, F (eds) 2007 *Hinter der silbernen Maske*. Nijmegen & Bonn: Museum Het Valkhof/Rheinisches Landesmuseum.
- Miller, S N 1922 *The Roman Fort at Balmuildy (Summerston, near Glasgow) on the Antonine Wall*. Glasgow: Maclehose, Jackson & Co.
- Mills, J forthcoming 'The samian', in Hawkins, N *Excavations at Drapers' Gardens, Throgmorton Avenue, City of London*.
- Mitchell, S & Anderson, S 2011 'Further investigations within the vicus settlement at

- Burgh by Sands, 2006', CFA Archaeology Ltd. <https://doi.org/10.5284/1026344>
- Montgomery, J, Evans, J & Cooper, R E 2007 'Resolving archaeological populations with Sr-isotope mixing models', *Applied Geochemistry* 22: 1502–14. <https://doi.org/10.1016/j.apgeochem.2007.02.009>
- Montgomery, J, Evans, J A, Chenery, S A, Pashley, V & Killgrove, K 2010 'Gleaming, white and deadly: using lead to track human exposure and geographic origins in the Roman period of Britain', *Journal of Roman Archaeology, Supplementary Series* 78: 199–226.
- Moore, J, Rose, A, Anderson, S, Evans, J, Nowell, G, Gröcke, D R, Pashley, V, Kirby, M & Montgomery, J forthcoming 'A multi-isotopic study of Iron Age and Roman Period skeletons from Musselburgh, Scotland', *Journal of Archaeological Science*.
- Müldner, G 2013 'Stable isotopes and diet: their contribution to Romano-British research', *Antiquity* 87: 137–49. <https://doi.org/10.1017/S0003598X00048675>
- Müldner, G & Richards, M P 2007 'Stable isotope evidence for 1500 years of human diet at the city of York, UK', *American Journal of Physical Anthropology* 133: 682–97. <https://doi.org/10.1002/ajpa.20561>
- Mullen, E 2011 'An Examination of the Burials at 1–3 and 6 Driffield Terrace, York', unpublished MSc Thesis.
- Murphy, C P 1986 *Thin section preparation of soils and sediments*. Berkhamsted: AB Academic Press.
- Neighbour, T 2002 'Excavations on the "amphitheatre" and other areas east of Inveresk fort' in Bishop 2002a: 41–51.
- NMS 1992 'Inveresk (Inveresk parish)', *Discovery and Excavation in Scotland* 1992: 50.
- Oldenstein, J 1976 'Zur Ausrüstung römischer Auxiliäreinheiten', *Bericht der Römisch-Germanischen Kommission* 57: 49–284.
- Ortner, D & Putschar, W 1981 *Identification of Pathological Conditions in Human Skeletal Remains*. Washington: Smithsonian Institute.
- Oswald, F 1936–7 *Index of Figure Types on Terra Sigillata*, University of Liverpool Annals of Archaeology and Anthropology, Supplement.
- O'Sullivan, T 2004 'Animal bone', in Bishop 2004.
- Palmer, S 1989 'Mesolithic Sites of Portland and their Significance' in Bonsall, C (ed) *The Mesolithic in Europe. Papers Presented at the Third International Symposium, Edinburgh 1985*. Edinburgh: John Donald Publishers Ltd, 254–7.
- Payne, S 1973 'Kill-off patterns in sheep and goats', *Anatolian Studies* 23: 281–303.
- Payne, S 1975 'Partial recovery and sample bias', in Classon, A T (ed.) *Archaeozoological Studies*, 7–17. New York: American Elsevier.
- Payne, S 1987 'Reference codes for wear states in the mandibular cheek teeth of sheep and goats', *Journal of Archaeological Science* 14: 609–14. [https://doi.org/10.1016/0305-4403\(87\)90079-3](https://doi.org/10.1016/0305-4403(87)90079-3)
- Peacock, D P S & Williams, D F 1991 *Amphorae and the Roman Economy: An Introductory Guide*. London: Longman.
- Petrovsky, R 1993 *Studien zu römischen Bronzegefäßen mit Meisterstempeln*. Buch am Erlbach: Marie L Leidorf.
- Philp, B 1981 *The Excavation of the Roman Forts of the Classis Britannica at Dover 1970–1977*, Kent Monographs Series 3.
- Philpott, R 1991 *Burial Practices in Roman Britain. A survey of grave treatment and furnishing AD 43–410*. Oxford: British Archaeological Reports, British Series, 219.
- Photos-Jones, E, Ballin Smith, B, Hall, A J & Jones, R E 2007 'On the intent to make cramp: an interpretation of vitreous seaweed cremation "waste" from prehistoric burial sites in Orkney, Scotland', *Oxford Journal of Archaeology* 26(1): 1–23. <https://doi.org/10.1111/j.1468-0092.2007.00270.x>
- Price, J & Cottam, S 1998 *Romano-British Glass Vessels: a Handbook*, CBA Practical Handbook in Archaeology 14, York.
- Reichert, H. 1987 *Lexikon der Altgermanischen Namen*. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
- Ricken, H 1934 'Die Bilderschüsseln der Kastele Saalburg und Zugmantel', *Saalburg Jahrbuch* 8: 130–84.
- Richardson, J T 1902 'Prehistoric remains near Gullane', *Proc Soc Antiq Scot* 36: 654–8.
- Richmond, I A 1980 'A Roman Fort at Inveresk, Midlothian', *Proc Soc Antiq Scot* 110: 286–304.
- Robertson, A S 1964 *The Roman fort at Castledykes*. Edinburgh: Oliver & Boyd.

- Robertson, A S 1975 *Birrens (Blatobulgium)*. Edinburgh: T & A Constable.
- Robertson, A 2010 *Data Structure Report of an Archaeological Evaluation at the Former Brunton Wireworks, Musselburgh*. Headland Archaeology. <https://doi.org/10.5284/1019068>
- Robinson, H R 1975 *The Armour of Imperial Rome*. London: Arms and Armour Press.
- Rogers, G B 1974 *Poteries Sigillées de la Gaule Centrale I: les motifs non figurés*, Gallia Supplement 28.
- Rogers, G B 1999 *Poteries Sigillées de la Gaule Centrale II: les potiers*, Cahier du Centre Archéologique de Lezoux.
- Rogers, I 2002 'Eskgrove, Inveresk: a watching brief in the vicus', in Bishop 2002a: 36–40.
- Rogers, J & Waldron, T 1995 *A Field Guide to Joint Disease in Archaeology*. Chichester: Wiley.
- 'Samian Research', RGZM. <http://www.rgzm.de/samian/home/frames.htm>. Accessed 12 April 2019.
- Saville, A 2004 'The material culture of Mesolithic Scotland', in Saville, A (ed.) *Mesolithic Scotland and its Neighbours*, 185–221. Edinburgh: Society of Antiquaries of Scotland.
- Sealey, P R 2003 'Ver 1908 amphoras introduced', *Journal of Roman Pottery Studies* 10: 92–5.
- Schmid, E 1972 *Atlas of Animal Bones – for prehistorians, archaeologists and Quaternary geologists*. Amsterdam: Elsevier.
- Schönfeld, M 1911 *Wörterbuch der altgermanischen Personen- und Völkernamen*. Heidelberg.
- Schweingruber, F H 1992 *Microscopic Wood Anatomy*. Birmensdorf: Swiss Federal Institute for Forest, Snow and Landscape Research.
- Scott, I R 2000 'Objects of iron', in Evans, E *The Caerleon canabae. Excavations in the civil settlement 1984–90*, 386–407. London: Society for the Promotion of Roman Studies.
- Shaw, H, Montgomery, J, Redfern, R, Gowland, R & Evans, J 2016 'Identifying migrants in Roman London using lead and strontium stable isotopes', *Journal of Archaeological Science* 66: 57–68. <https://doi.org/10.1016/j.jas.2015.12.001>
- Silver, I 1969 'The ageing of domestic animals', in Brothwell, D & Higgs, E (eds) *Science in Archaeology* 2: 283–302. London: Thames and Hudson.
- Simpson, G 1976 'Decorated terra sigillata from Montans', *Britannia* 7: 244–73.
- Simpson, G 1987 'Production céramique de Montans (Tarn) et masque de théâtre de Wilderspool dans le Cheshire', *Revue Archéologique de l'Est et du Centre-Est* 38: 251–5.
- Smith, C 2005 'The animal bone', in Leslie & Will 2005.
- Snape, M E 1993 *Roman brooches from North Britain. A classification and a catalogue of brooches from sites on the Stanegate*. Oxford: British Archaeological Reports, British Series, 235.
- Society of Antiquaries of Scotland 1945–6 'Donations to and purchases for the museum 1945–46', *Proc Soc Antiq Scot* 80: 151–6.
- Stabler, K A 2004 'Coinage', in Bishop 2004: 128–32.
- Stallibrass, S 1995 'Review of the vertebrate remains', in Huntly, J P & Stallibrass, S *Plant and Vertebrate Remains from Archaeological Sites in Northern England: data reviews and future directions*. Architectural and Archaeological Society of Durham and Northumberland, Durham.
- Stanfield, J A & Simpson, G 1958 *Central Gaulish Potters*. London.
- Stapleton, C P & Bowman, S G E 2005 'An examination of the cramp from Barnhouse and Mouseland, Mainland, Orkney', in Richards, C (ed.) *Dwelling among the Monuments. The Neolithic village of Barnhouse, Maeshowe passage grave and surrounding monuments at Stennes, Orkney*, 381–4. Cambridge: McDonald Institute Monograph.
- Stead, S, 1991 'The human bones', in Stead, I *Iron Age Cemeteries in East Yorkshire*. English Heritage Archaeological Report 22.
- Stoops, G 2003 *Guidelines for analysis and description of soil and regolith thin sections*. Madison: Soil Science of America, Inc.
- Stuart, J 1867 *Sculptured Stones of Scotland Volume Second*. Edinburgh: Spalding Club.
- Suddaby, I 2005 'Law Road, North Berwick (North Berwick parish), long cist; short cist', *Discovery and Excavation in Scotland* 6: 55.
- Swan, V G 1988 'Comments on Inveresk ware', in Thomas 1988: 167–71.
- Swan, V G 1999 'The Twentieth Legion and the history of the Antonine Wall reconsidered', *Proc Soc Antiq Scot* 129: 399–480.
- Symonds, R & Wade, S 1999 *Roman Pottery from*

- Excavations in Colchester, 1971–86*. Colchester Archaeological Report 10.
- Tassinari, S 1993 *Il vasellame bronzeo di Pompei*. Rome: 'L'Erma' di Bretschneider.
- Thery-Parisot, I, Chabal, L & Chrzavzez, J 2010 'Anthracology and taphonomy, from wood gathering to charcoal analysis. A review of the taphonomic processes modifying charcoal assemblages, in archaeological contexts', *Palaeogeography, Palaeoclimatology, Paleoecology* 291: 142–53.
- Thomas, G D 1988 'Excavations at the Roman civil settlement at Inveresk, 1976–77', *Proc Soc Antiq Scot* 118: 139–76.
- Tomber, R & Dore, J 1998 *The National Roman Fabric Reference Collection: a Handbook*, London: MoLAS.
- Tomlin, R S O 2008 'III Inscriptions', *Britannia* 39: 369–89. <https://doi.org/10.3815/006811308785916908>
- Tomlin, R S O 2011 'III Inscriptions', *Britannia* 42: 439–66. <https://doi.org/10.1017/S0068113X11000638>
- Trotter, M 1970 'Estimation of stature from intact long limb bones', in Stewart, T D (ed.) *Personal Identification in Mass Disasters*. Washington: Smithsonian Institute.
- Tyers, P 1996 *Roman Pottery in Britain*. London: Batsford.
- Upex, S G forthcoming *Iron Age, Roman Military and Civilian or State Control over a Lower Nene Valley Landscape: Rescue Excavations at Lynch Farm II, Orton Waterville, Peterborough*. East Anglian Archaeology.
- Walke, N 1965 *Das römische Donaukastell Straubing-Sorviodurum*. Berlin: Verlag Mann (= Limesforschungen 3).
- Wallace, C 2011 'A rough handlist of Iron Age and Roman Iron Age burials from Scotland (C8BC–C5AD), other than long-cist and dug-grave cemeteries and extended inhumations under low cairns', unpublished. http://www.academia.edu/1743090/handlist_of_Iron_Age_burials_from_Scotland. Accessed 11 June 2019.
- Warwick, R 1968 'The skeletal remains', in Wenham, L P *The Romano-British Cemetery at Trentholme Drive, York*, MoW Archaeological Reports No. 5. London: HMSO.
- Watts, D 1998 *Religion in Late Roman Britain*. London: Routledge.
- WEA 1980 'Recommendations for age and sex diagnoses of skeletons', *Journal of Human Evolution* 9: 517–49.
- Webster, G 1940 'A Roman pottery kiln', *Archaeologia Cantiana* 53: 109–16.
- Wells, C, 1982 'The human burials', in McWhirr, A, Viner, L & Wells, C *Romano-British Cemeteries at Cirencester*. Cirencester Excavation Committee.
- Wheeler, R E M 1943 *Maiden Castle, Dorset*. Oxford: Society of Antiquaries.
- Wild, F C 2005 'Paternus I or II?' in Dannell, G B & Irving, P V (eds) *Journal of Roman Pottery Studies* 12: 201–3.
- Wild, J P 1970 'Button-and-loop fasteners in the Roman provinces', *Britannia* 1: 137–55.
- Williams, A 1947 'Canterbury excavations in 1945', *Archaeologia Cantiana* 60: 68–100.
- Willis, S 2005 'Samian pottery, a resource for the study of Roman Britain and beyond: the results of the English Heritage funded Samian project. An e-monograph', *Internet Archaeology* 16. <https://doi.org/10.11141/ia.17.1>
- Woodham, A A & Mackenzie J 1957 'Two cists at Golspie, Sutherland', *Proc Soc Antiq Scot* 90: 234–8.
- Zwart, A J M 1998 'A bridled horse burial from Beuningen (NL)', *Journal of Roman Military Equipment Studies* 9: 77–84.