English Heritage

IRON AGE CEMETERIES IN EAST YORKSHIRE

I M Stead

The Kirkburn Sword: a sword with enamelled handle in a decorated scabbard (burial K3)(photo: British Museum)

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Archaeological Report no 22

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Excavations at Burton Fleming, Rudston, Garton-on-the-Wolds, and Kirkburn

by I M Stead

with contributions by
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Mineral-preserved organics (wood, leather, etc) have been identified by Jacqui Watson (for Rudston and Burton Fleming) and Fleur Shearman (for Garton Station and Kirkburn), and their reports are incorporated in the text.

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1 Introduction

This project had its origins in a PhD research topic, carried out at Cambridge between 1958 and 1962, and published by the Yorkshire Philosophical Society in 1965 as *The La Tène Cultures of Eastern Yorkshire* (revised as *The Arras Culture* in 1979). The Arras Culture, like some other La Tène cultures in Europe, is best known from its burials, many of which had been excavated in the nineteenth century. But the records of that work were inadequate, the corpus of artefacts was small, and further progress in research depended on new discoveries. Most of the burials had been found under small barrows now lost because they have been flattened by ploughing, and the few recorded cemeteries seemed to have been thoroughly explored. It was always possible that an occasional undiscovered grave survived in one of the known cemeteries, but a small selection of unexplored burials was unlikely to provide much information, because the nineteenth-century investigators had shown that artefacts were few and grave-groups extremely rare. The only relatively rich graves were cart-burials – and even cart-burials could be poorly equipped. However, a cart-burial had a distinct advantage in the quest for undisturbed graves because the considerable amount of iron in the tyres was an obvious target for magnetic detecting devices, and in the late 1950s archaeologists had just been introduced to the proton magnetometer.

The obvious site for investigation was Arras itself, where three cart-burials had been found in the nineteenth century, but where virtually flat fields gave no hint of the hundred or so small barrows that had once existed. In 1959 M J Aitken (Oxford University Research Laboratory for Archaeology and the History of Art) used the proton magnetometer to survey five hectares of the Arras cemetery in search of cart-burials. In that respect he was unsuccessful, but he did make an unexpected and significant discovery when he located square-plan ditches defining two barrows – the first time that this distinctive feature of the Arras Culture had been recognised. The report on the Arras excavations (Stead 1961) listed seven sites with square barrows in eastern Yorkshire and related them to comparable sites on the continent. That meagre list was very soon dwarfed by discoveries from the air. The following year saw the publication of air photographs of square-ditched barrows in the Rhineland and France (Decker and Scollar 1962; St Joseph 1962), and two years later came the first air photographs of Yorkshire square barrows, adjoining the Burton Fleming henge monument (St Joseph 1964, pl xxxviia; though some years earlier other Burton Fleming examples had appeared, masquerading as medieval features in Beresford and St Joseph 1958, 264, fig 111, photographed in 1949 and classified as a 'problem picture'). Subsequently every season of air photography has brought additions to the list (Ramm 1978, 13–17; Whimster 1981, 111–16, 310–38). Thirty years ago the excavator was looking hard for the odd burial undisturbed by his nineteenth-century predecessors; today, he can choose from a selection of several thousands.

In the early 1960s few barrows were known from air photographs, and the Inspectorate of Ancient Monuments was keeping abreast of the situation by a combination of scheduling and arranging excavation of typical plough-threatened sites. The important Burton Fleming henge monument was an obvious candidate for scheduling, but at that time administrators wanted to schedule tightly-defined areas so they excluded the small barrows in the vicinity, which became the first Iron Age sites to be included in a plough-damaged barrow programme. Geophysical surveys and trial excavations commenced in 1967. In the same year the Royal Air Force was asked to take a series of vertical air photographs of the Gypsey Race valley, between Burton Fleming and Rudston, and the results were quite startling (their photographs, taken 22/8/67 and 29/7/70, are the basis of Figure 1). They provided a superb record of settlements and burials, including hundreds of square barrows. For the next few years the picture was supplemented annually by several air photographers, but especially by A L Pacitto, who flew from Grindale and concentrated on this area. Soon after the excavation project had started, the East Riding County Council Highways Department announced its intention to widen the road between Rudston and Burton Fleming. As the road cut a great swathe through the centre of one of the main concentrations of square barrows (the Makeshift cemetery), the opportunity was taken to supplement the air photographs by excavating burials on the very wide grass verges.

The Inspectorate's aim had been total excavation of a square barrow cemetery, but as the size of this task gradually became obvious two other factors came into play. One resulted from a change of ownership of more than half of the site. An early move had been to secure the cooperation of the farmers; Mr G R Wilson, to the west of the road, and Mr W W Gatenby (then Sir Ian Macdonald's tenant), to the east, showed great interest in the project and offered tremendous support. But in 1975 Mr Wilson died; his two sons, who inherited the farm, lacked their father's keen sense of curiosity, and permission for further excavations was refused. The second new factor was the discovery and complete excavation of another Yorkshire La Tène cemetery in the gravel valley at Wetwang Slack (Dent 1982). So plans were changed, and it was decided to terminate the Burton Fleming project by excavating two further areas of square barrows and part of the adjoining settlement. The excavations were concluded in 1978.

In one respect the excavations had been disappointing, because no cart-burial had been found. Determined attempts had been made by A J Clark (Ancient Monuments Laboratory), who surveyed considerable areas of the Burton Fleming and Rudston complex with a magnetometer; similar operations were mounted at Scorborough and Cowlam

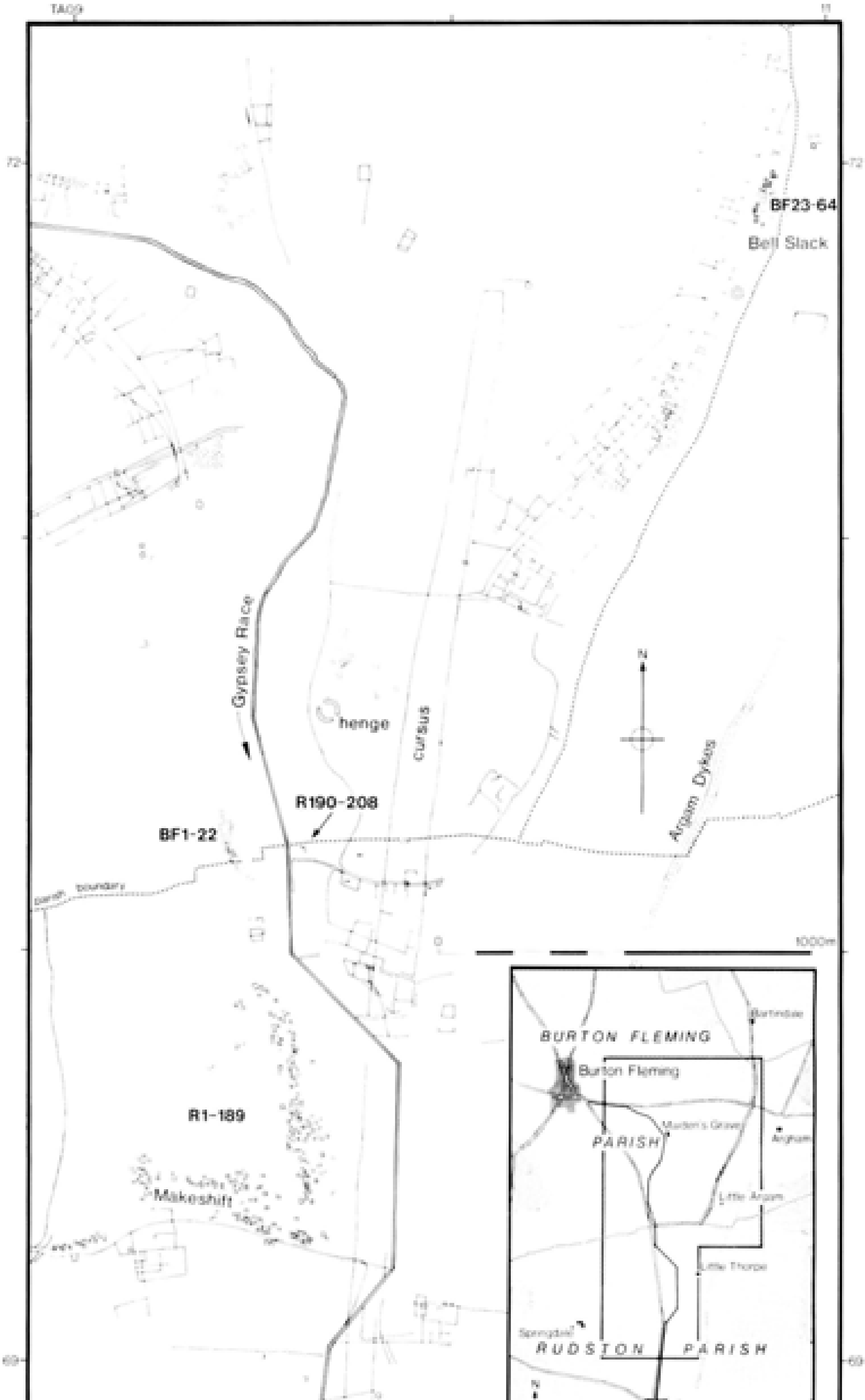

Fig 1 The Gypsey Race valley, between Burton Fleming and Rudston, showing archaeological sites revealed by aerial photography and the excavated burials R1–208 and BF1–64

(Stead 1975; 1986). The geophysical surveys were hampered by the lack of a control; no cart-burial had been excavated in modern times, so the response of ancient iron tyres in a grave had never been recorded. That control should have been provided in 1970 when T C M Brewster discovered a cart-burial in Garton Slack (Brewster 1971; Stead 1984a), but his excavation was carried out in great secrecy and no geophysical device was used. It took a further 14 years before a chance find provided the much-needed control, further west in the same valley, where J S Dent excavated three cart-burials in Wetwang Slack (Dent 1985a). A L Pacitto operated both metal detector and gradiometer on the site, and was surprised at the very strong response of the iron tyres; hitherto a much slighter anomaly had been expected. This observation meant that extensive areas could now be surveyed rapidly on a relatively coarse grid. In the autumn of 1985 several square barrow cemeteries were surveyed and one, at Garton Station (only 4km from the site of Brewster's cart-burial and 5km from Dent's), was selected for excavation. One cart-burial was duly discovered, but a comparable anomaly proved to be an Anglian grave in which a unique and massive iron object had been buried, in the very centre of an Iron Age enclosure. The excavation of part of the Garton Station cemetery was completed in 1986, and in the same year a second cart-burial was detected in the field to the south, across the parish boundary in Kirkburn; it was excavated in 1987.

Between 1967 and 1979 more than 700 Arras Culture burials were excavated, mainly in Wetwang Slack (446 burials) and in the parishes of Rudston and Burton Fleming (250 burials). With the discovery of five cart-burials between 1984 and 1987 to balance the more ordinary graves, it now seems that a reasonable sample of burials has been examined. Major problems remain: in particular it would be useful to examine more graves from the very beginning and very end of the sequence, but at the moment there is no obvious way of defining such burials prior to excavation. Instead, it has been decided to take a new approach to the Arras Culture by investigating its settlements in a research programme inaugurated in 1988. Two areas of settlement sampled during the Burton Fleming project (a pre-cemetery domestic site found in 1971 and a post-cemetery droveway settlement excavated in 1977) will be published along with the new programme.

Fig 2 Excavations in progress at Rudston in 1970, showing work on an area in a field, and the stripping of a length of the grass verges; burials R72 and R73 are in the foreground (photo: A L Pacitto)

The name 'Burton Fleming' was given to the square barrow excavation project organised and financed by the Inspectorate of Ancient Monuments (Ministry of Public Building and Works, subsequently Department of the Environment), but many of the barrows excavated were in fact in the parish of Rudston. In this report barrows are classified by parishes and numbered with the parish prefix: thus the Burton Fleming project comprises Burton Fleming barrows BF1 to BF64 and Rudston R1 to R208. The Garton Station and Kirkburn excavations, the reponsibility of the British Museum, produced 17 Iron Age burials (GS1–10, K2–8), and one Bronze Age burial (K9); Anglian burials from Garton Station and Kirburn will be published elsewhere.

The first trenches in the Burton Fleming project (1967 and 1968) were excavated by hand but subsequent areas, and lengths of grass verge, were cleared by Drott Tractorshovel (1969–75; Fig 2) or E200 Scraper (1976–8). The areas were fenced and compensation was paid to keep them available for excavation at any time in the year (usually June or July). The Garton Station and Kirkburn sites were stripped by the E200 Scraper and excavated after harvest. The late Mr G R Wilson, Sir Ian Macdonald (and Mr W W Gatenby), and the East Riding (subsequently Humberside) County Council gave permission for the Rudston excavations; the Burton Fleming sites were on the land of Mr T Harrison and Messrs T E Wells and Sons. At Garton Station the field was owned by the Crown Estate Commissioners and farmed by Messrs Ewbank, and at Kirkburn the land was the property of Mr J S Rymer. All landowners deposited the finds at the British Museum (Sir Ian Macdonald was keen that the ultimate ownership should be retained in the area, so he placed the finds from his land on permanent loan). Mr Gatenby, in particular, took a very active interest in the excavation of the burials and the subsequent settlement project; in his own fields and beyond he was a constant source of advice and encouragement. Apart from the farmers and landowners, many others contributed to the success of these operations, none more so than Kit Scuffham and family at the Bosville Arms, Rudston. At Garton and Kirkburn working conditions were vastly improved by the generosity of Mr Robert Traves, who provided some grand caravans, free of charge, that made us the envy of all visiting archaeologists.

Of the excavation team, A L Pacitto shared in the direction, took photographs (from the air as well as on the ground), and found cart-burials with the gradiometer; Sheelagh Stead successfully transferred from archaeologist to anthropologist at the start of the project in order to provide continuity in the treatment and study of the human remains; Valery Rigby played a relatively minor role in the field but provided an important contribution to the report. Supervision of the fieldwork was co-ordinated by Gillean Craig, Gerald Dalby, and Neil O'Loughlin; for the rest, we relied on a band of competent workers each capable of excavating, recording, and lifting a skeleton. Joanna Bacon played a major role in the preparation of the report, coordinating the work on Burton Fleming and Rudston and producing many of the drawings. Stephen Crummy drew most of the Garton Station and Kirkburn illustrations (some are the work of Karen Hughes), collated all the artwork for publication, and contributed to the interpretation of the finds. The major problem of metalwork conservation was tackled by an excellent team: for Rudston and Burton Fleming it was the Ancient Monuments Laboratory's responsibility, shouldered first by Josephine Ridgway (who was inspired to write a dissertation on the brooches; Ridgway 1973), then by Glynis Edwards and Jacqui Watson. Of the British Museum staff, Hazel Newey lifted and conserved the remains of the Garton Station wheels and three of her colleagues also worked in the field: Ruth Goldstraw and Simon Dove, who had to cope with lifting the Kirkburn mail and treating the finds in the museum, and Fleur Shearman, whose reports on organic remains are incorporated here. I am especially grateful to John Dent, who cooperated in this project and shared the results of his own; in particular, he invited me to join the excavation of the Wetwang Slack cart-burials and generously made the finds available for study in advance of his own publication.

IMS 1990

2 Cemeteries and barrows

The Iron Age burials published here were in graves cut into chalk gravel in the two main dry valley systems in the north-eastern part of the Yorkshire Wolds (Fig 3). The chalk Wolds have a scarp on the north and west and a dipslope to the south-east, and drainage is subterranean but for intermittent streams known as 'gypseys' (with a hard 'g') that flow when the water-table rises to the valley floor.

The longest gypsey has a well-defined course, the Gypsey Race, directed eastwards through the Great Wold Valley, turning south at Burton Fleming to Rudston and then eastwards again to the sea at Bridlington. Between Burton Fleming and Rudston there are level fields in the broad flat valley and every year the ripening crops reveal an amazing range of ancient settlements, burials, and ritual monuments (Fig 1 and Fig 3, 8–11). There are cropmarks galore – for the pedestrian as well as the aviator (Fig 4). The concentration of archaeological remains has become apparent partly because of the area's superb response to aerial photography and the convenience of a nearby air-strip (at Grindale, now closed), and partly as a reflection of the interest of archaeologists (not only in the present project; cf Dymond 1966); but the importance of the area is to some extent due to the magic of the Gypsey Race – running water is such a rarity on the Wolds. This might account for the Neolithic henge, four cursus monuments, and the monolith in Rudston churchyard – the tallest standing stone in Britain; and for the Iron Age it

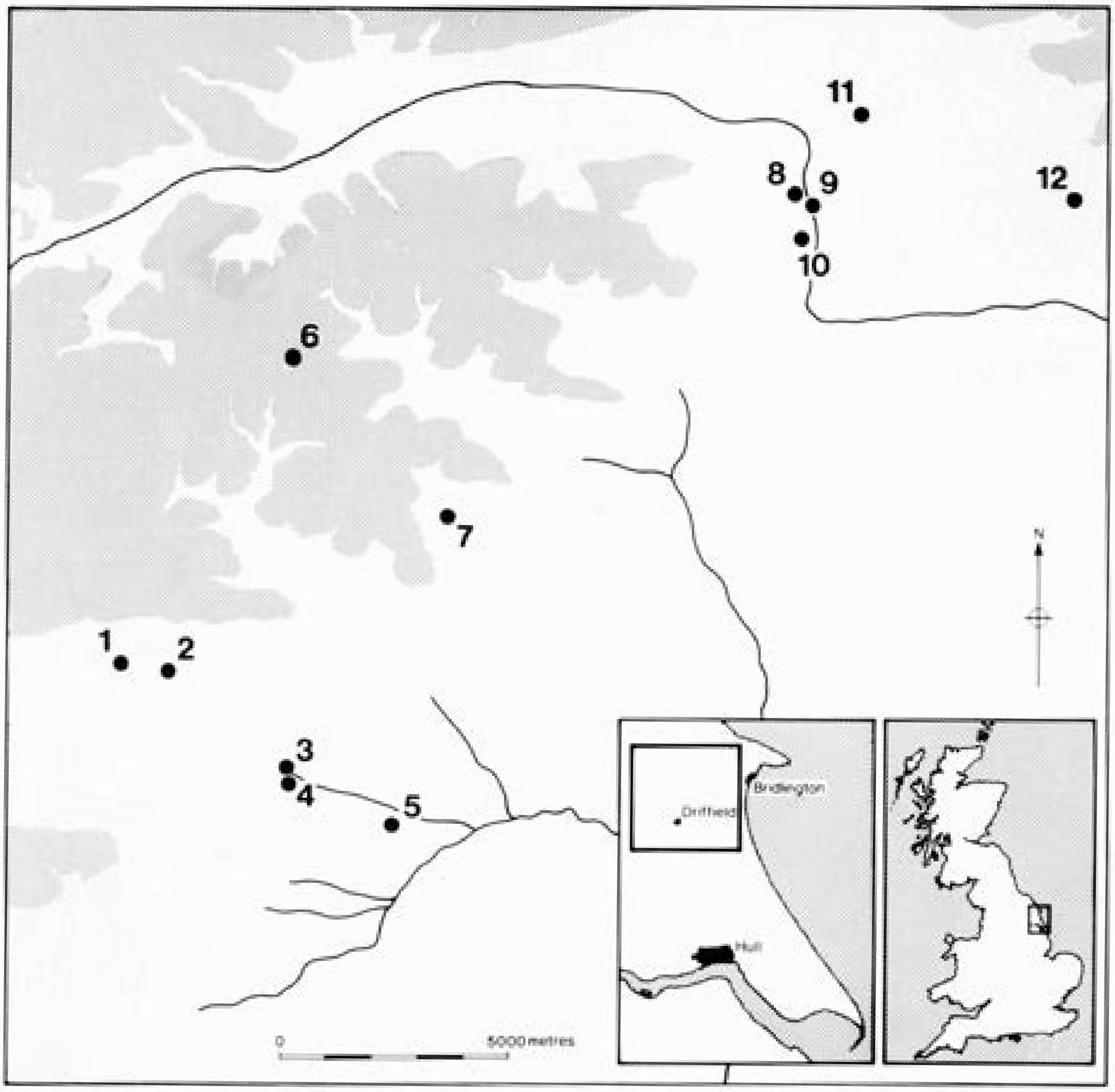

Fig 3 East Yorkshire, north and west of Driffield, showing the sites of excavated Iron Age burials: 1, Wetwang Slack; 2, Garton Slack; 3, Garton Station; 4, Kirkburn; 5, Eastburn; 6, Cowlam; 7, Danes Graves; 8, Burton Fleming (BF1–22); 9, Rudston (R190–208); 10, Rudston (Makeshift, R1–189); 11, Burton Fleming (Bell Slack, BF23–64); 12, Grindale (Huntow); the tone indicates land above 50m and above 100m

Fig 4 Rudston: cropmarks of square barrows photographed from a hydraulic lift; the barrow in the foreground, with a clear north–south orientated grave, is immediately west of R129 and R131 (photo: A L Pacitto)

could help to explain the huge concentration of burials – 250 have been excavated and are described here (R1–208; BF1–64).

South of Rudston the next major dry valley through the Wolds took the now defunct railway line from Driffield towards Malton (Fig 3, 1 and 2). It too has a gypsey, but only at its eastern end where it appears as one of the sources of the River Hull. The upper reaches of the valley floor are not responsive to aerial photography, being masked by deeper topsoil, but archaeologists working in advance of Messrs Clifford Watts' gravel quarry have recovered a wealth of ancient remains first in Garton Slack and then in Wetwang Slack. Again, Iron Age burials rank high in the list of discoveries. East of the quarry the valley floor is broader and there has been considerable success with air photographs, especially in the vicinity of the old railway station at Garton-on-the-Wolds, where there are more Iron Age burials, including 17 published here (GS1–10; K2–8).

All the barrows described in this report are now flat; many of them might have been levelled in the Middle Ages and are covered by rigg and furrow, but some seem to have been flattened even in Roman times (cf BF23–64, covered by Roman settlement).

Rudston: Makeshift

(Burials R1–189; TA 096692–095699; Figs 1 and 5, and in more detail Figs 7–13)

The first burials to be excavated were midway between Burton Fleming and Rudston, east of Springdale and west of Little Thorpe, centred in a field known as 'Makeshift'. That field seems to have been almost full of barrows. In plan the cemetery took the shape of a reversed L, with a southern branch leading west towards Springdale and an eastern branch spreading north alongside the Gypsey Race. On the south it had been bounded by a couple of ditches, one quite substantial, and there the barrows were tightly regimented in lines. To the west the main boundary ditch crossed the rectilinear plan of a settlement, bordered a further group of barrows (illustrated as a soilmark, Riley 1982, fig 13), and then became the southern ditch of a droveway whose northern ditch splayed out to the north to create a funnel (Fig 1). The plan suggests that the droveway led out from the valley (Springdale) into meadows – meadows in which square barrows are almost the only archaeological features visible from

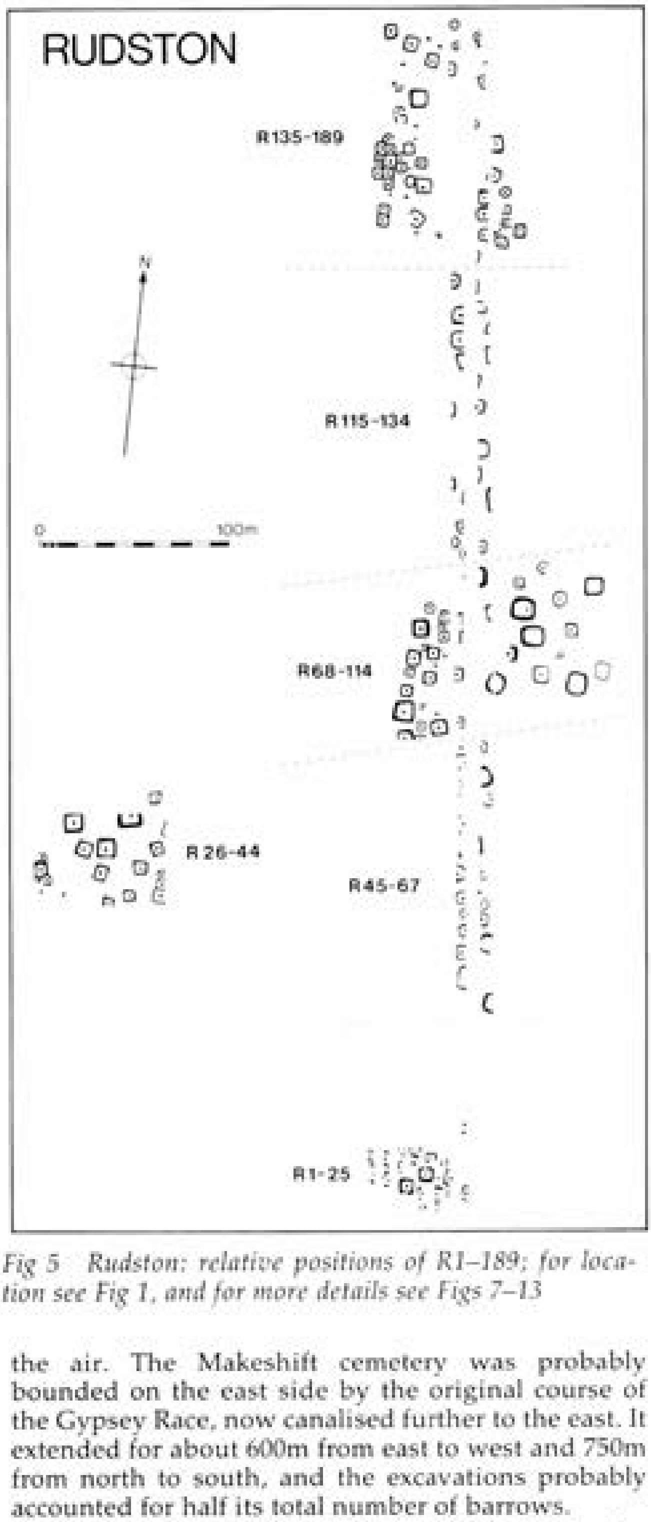

Fig 5 Rudston: relative positions of R1–189; for location see Fig 1, and for more details see Figs 7–13

the air. The Makeshift cemetery was probably bounded on the east side by the original course of the Gypsey Race, now canalised further to the east. It extended for about 600m from east to west and 750m from north to south, and the excavations probably accounted for half its total number of barrows.

The excavation of the cemetery commenced in the corner of the field to the south of Makeshift, where a particularly good St Joseph air photograph showed rows of barrows alongside the boundary (1967–8, R1–22). Further sample areas were excavated near the north edge of the Makeshift field (1969, R26–44) then to the north-east (1970, to the west of the road, R68–89, and 1971, to the east, R94–114). By excavating groups at well-spaced intervals it was hoped that any differences in burial rite and grave-goods would be emphasised. In 1972 a group of barrows was excavated further north, in the parish of Burton Fleming (Fig 1); then work in the Makeshift cemetery was resumed by trenching the grass verges along much of the east side of the road in 1973, and clearing areas at its northern end in 1974, east of the road (R177–88), and 1975, west of the road (R135–75).

In most places the soil cover was shallow, and when it had been stripped the barrow ditches were sharply defined, their relatively clear dark brown filling contrasting with the light chalk gravel of the Gypsey Race valley. In plan the silting could be distinguished in some of the wider ditches, showing how an original square mound must have gradually adopted a more circular plan: arcs of gravel spread across the middle of the ditch-fillings whilst clearer dark earth occupied the outside corners (Fig 6). The ditches varied considerably in size, from 0.85m deep and slightly more than 2m wide to slight stains or nothing at all. In the early seasons (1967–9) the ditches were simply sectioned, but in 1970 and 1971 most were completely emptied and several secondary burials were located; sherds, and occasionally an almost complete pot, were found in some of the ditches. Most of the ditch burials were associated with a distinctive type of barrow (R98, 103, and 109) that was not encountered in the other areas, and none of these secondary burials produced grave-goods, so when the northern part of the cemetery was excavated in 1974 and 1975 only the ditches of R149 (which had no central grave) were fully cleared.

In the Makeshift cemetery the sites of 154 barrows were completely or partly excavated; 16 of them were not uncovered to the extent that central graves could be located or excavated, but certainly in 11 barrows no central grave had survived. The typical barrow in the cemetery was between 4 and 5.4m square, but the smallest (R142) was only 3m across. The largest (R53 and 130, 10m or more across) were defined on the grass verges and their centres were not excavated – one was under the middle of the road. But central graves were not universal in large barrows; they were found in fewer than half of those barrows which were more than 7m across (in R32, 34, 38, 84, 102, 114, 119, and 169). Central graves were certainly absent in R65, 98, 103, 109, 113, 126, and 149, and probably absent in R48, 66, and 67 where the entire platforms were not exposed. Most barrows were not truly square: several had well-rounded corners, many corners varied from the right-angle, and barrow platforms were frequently slightly wider in one direction than the other. But R102 was exceptional in being markedly rectangular. There were a few round barrows, some with regular ring-ditches (R141, 176, and 179) and others less well-defined (R95, 101, 154, and 168, and perhaps R51 and 175). Burials described here as flat graves may have lost their barrow ditches in recent ploughing, for only the slightest trace of some ditches survived (eg R145, 148, 175, and 184). But there is a good case for regarding R8 as a true flat grave; although there was no hint of a surrounding ditch, it was evenly spaced in a row of graves each covered by a barrow and – more significantly – it was one of very few graves in this cemetery to have been disturbed by a later burial (R10). It seems likely that R10 was inserted into an apparent space in the barrow cemetery at a time when the position of R8 had been forgotten.

Fig 6 A square barrow (BF16) stripped to the surface of the gravel, showing the silting pattern as the mound has eroded into the ditch (photo: A L Pacitto)

The barrows at the south end of the cemetery (Fig 7) were closely grouped and arranged in three or four lines parallel with the boundary ditch. The ditch itself was about 2.5m wide at the bottom of the ploughsoil, and some 1.2m deep below ground level; its line was followed by a much slighter ditch on the north side, and then a clear band – possibly to accommodate a bank – before the lines of tightly packed barrows. In the most obvious space amongst the barrows were the flat graves R8–10. The rows so obvious in the field do not seem to extend to the east; on the grass verges here only one barrow was recognised.

In the second area to be excavated (Fig 8), more than 160m away from the first and on slightly higher ground, there was no hint of a linear arrangement of barrows, and the significance of any grouping is not obvious; apparently the cemetery extended in all directions. The ploughsoil was 0.15 to 0.25m deep and the subsoil 0.1 to 0.2m deep above the chalk gravel. Some of the largest barrows were found here; R32 and 34 were almost 8m across, and R38 was even larger. In the south-east corner a string of barrows (R42–4) had shared ditches, and on the west side there was a group with adjoining ditches. But neither in plan nor in section was it possible to determine the sequence of these ditches.

In the third area (Fig 10, west of the modern road) there seemed to be a linear arrangement of barrows roughly parallel with the Gypsey Race. A clear line on the west side (R68–91) was followed by a second row (R69–92) and perhaps even a third (R70–89 or 90). The largest barrow (R84, more than 8m across) had one very rounded corner, the central grave was orientated almost diagonally to the barrow, and there was a secondary burial near the south-east corner of the ditch.

The adjoining area (Fig 11, east of the modern road) was markedly different, with no hint of a linear layout. The barrows were scattered at random and varied in plan, the larger ones reaching the limits of what can be classified as square. Prominent here was a group of large barrows of irregular shape, between rectangular and oval, without central graves but with occasional secondary burials in the ditches: it included R103, 109, and 113; also R98 (the grave is surely too eccentric to be regarded as central), and perhaps also R93 whose centre was under the road, and R114, which had a very shallow central burial. There were two roughly circular barrows (R95 and

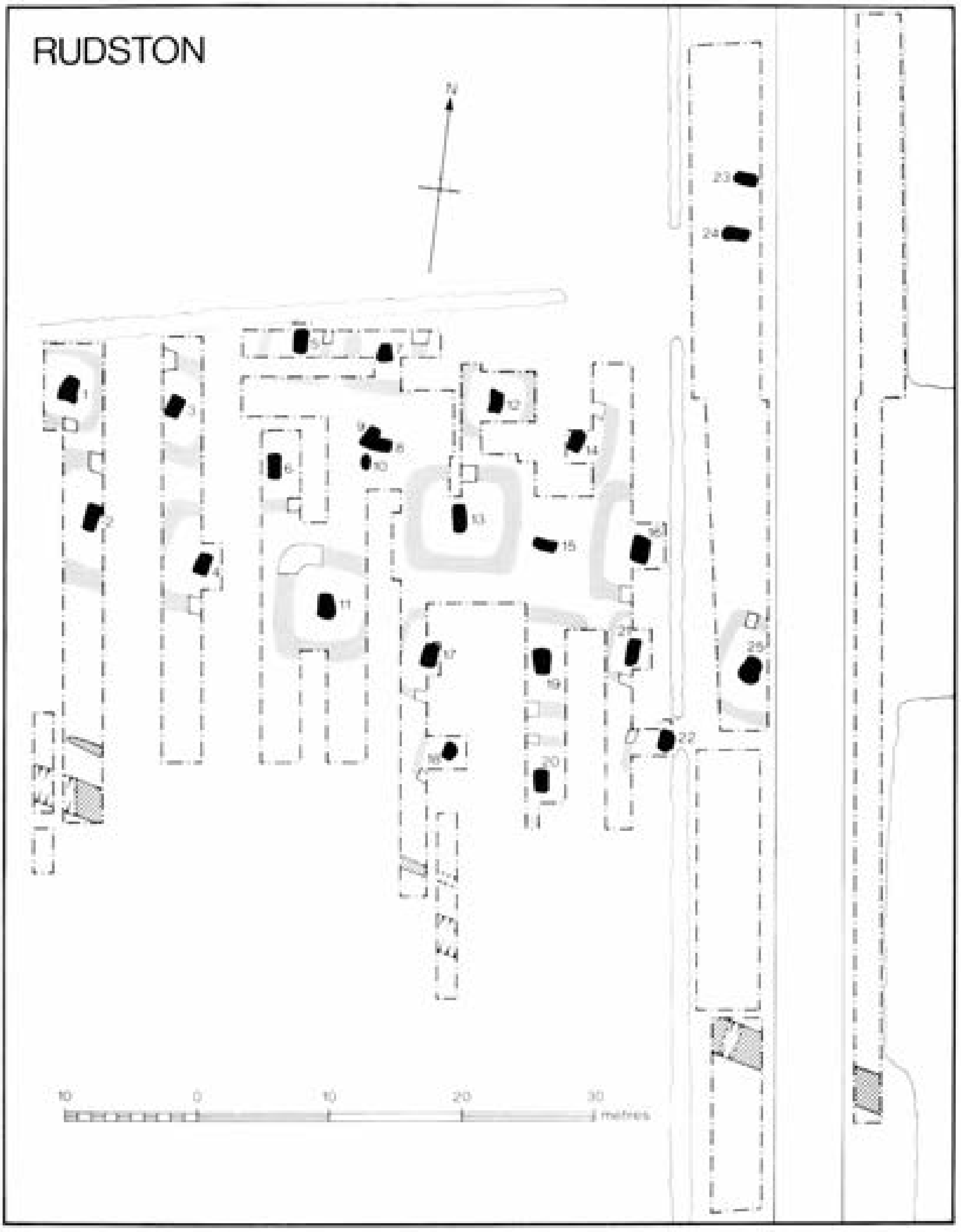

Fig 7 Rudston, R1–25; here, and in subsequent figures, unexcavated barrow ditches are shown in tone, and other unexcavated ditches are cross-hatched

101) whose builders had no regard for precision; they had shallow central graves and a secondary burial (R96) in one of the ditches. In the south-east corner of this site were the remains of an earlier domestic settlement – traces of a circular house and five pits – which will be published elsewhere.

The most northerly sample of the Makeshift cemetery comprised two areas on opposite sides of the road (sites adjoining the road were selected because of easy access, and they could be linked by the excavation of the grass verges). Here (Fig 13) the barrows concentrated in three groups, with considerable unused areas between them; much of the central area, especially the western grass verge and the adjoining part of the field, was free of burials. The first group, east of the road, had two rows of barrows; the second, at the north end, was dominated by a stepped row (R135–147) that crossed the road; and the third, in the south-west corner, was centred on a network of 11 barrows with shared ditches. Each group included small ring-ditches (R168 without a burial) and flat graves. But the very slight trace of a ditch adjoining R145 suggests that these apparently flat graves might well have been covered by barrows originally.

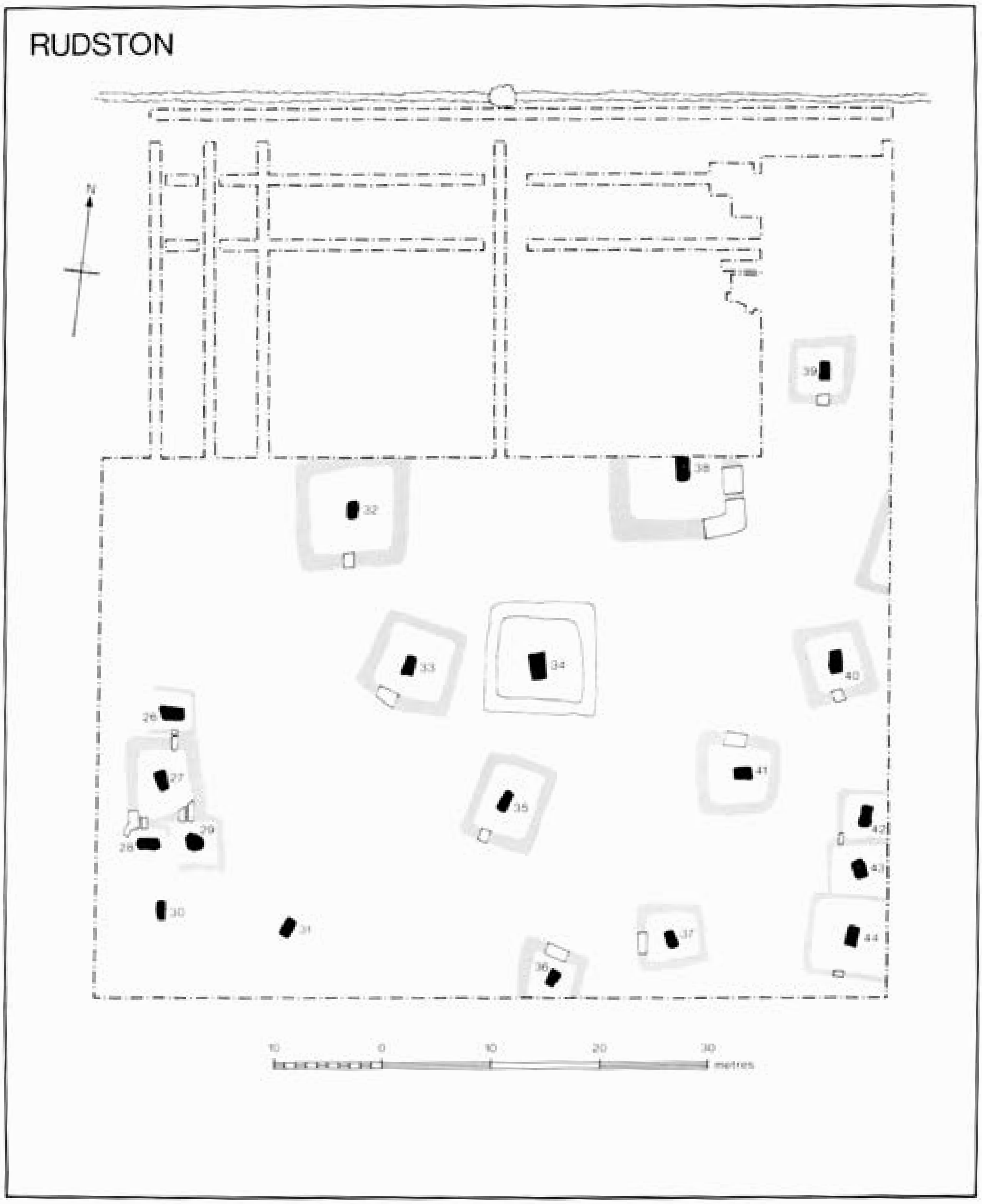

Fig 8 Rudston, R26–44

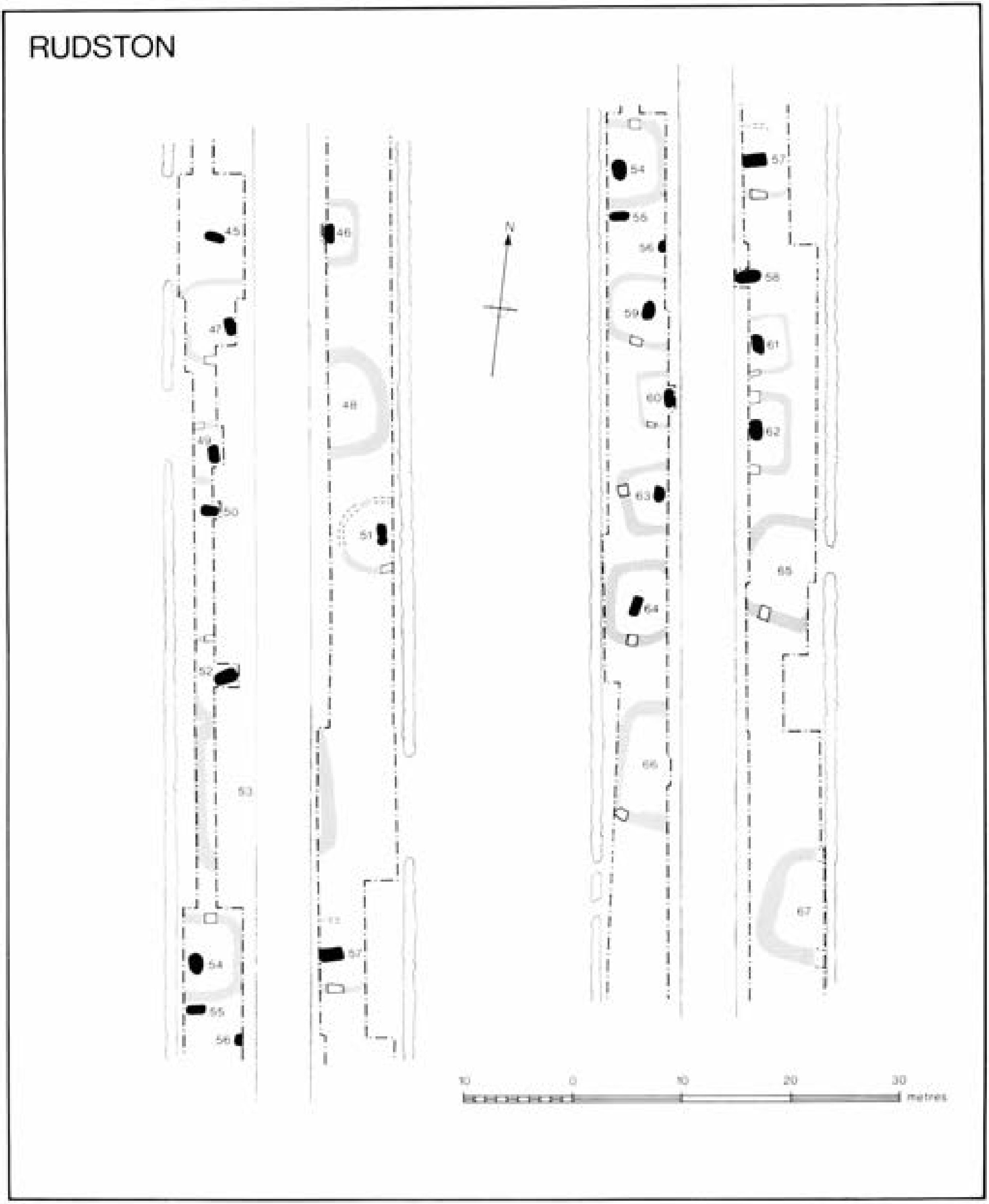

Fig 9 Rudston, R45–67

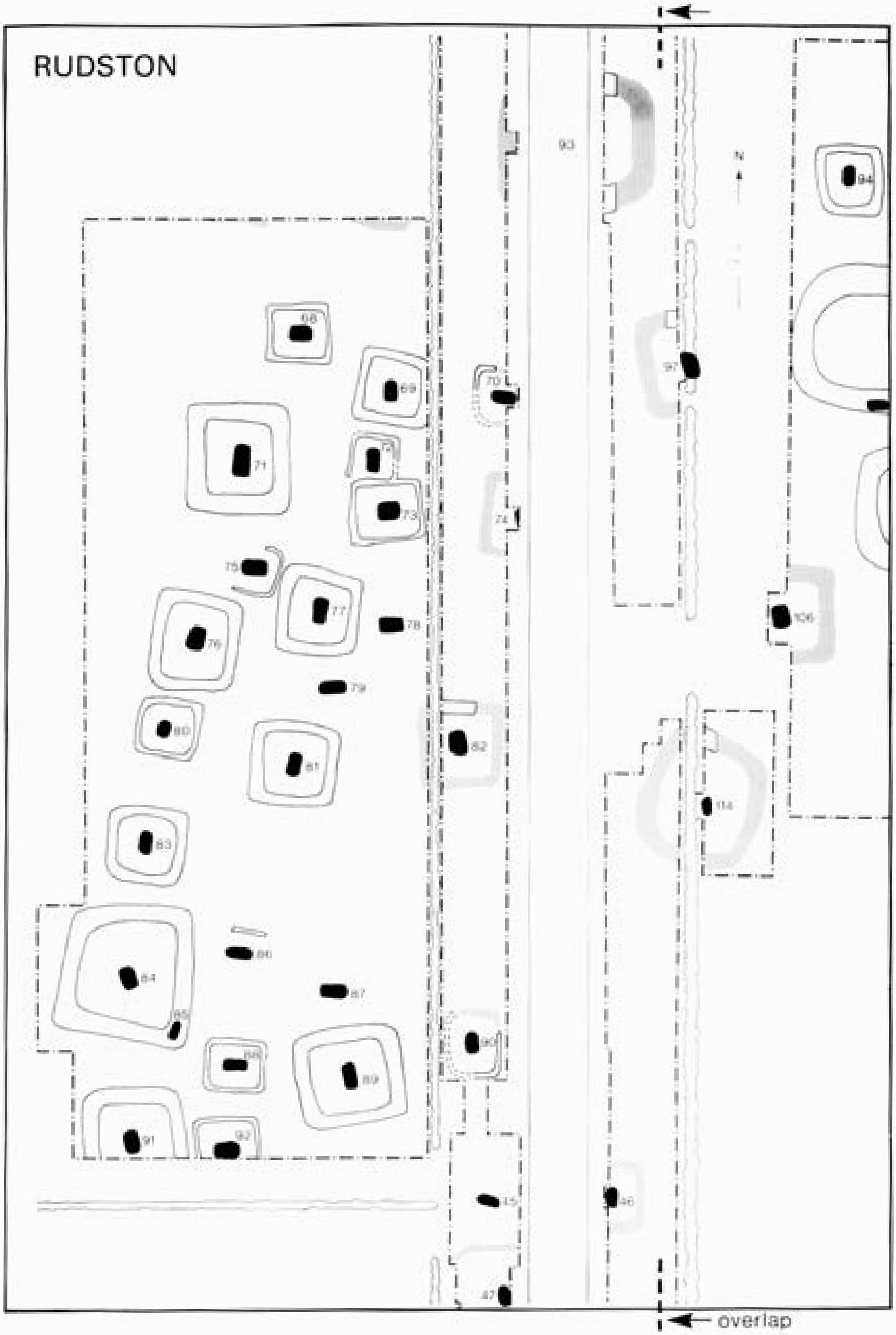

Fig 10 Rudston, R68–93, with some adjoining barrows

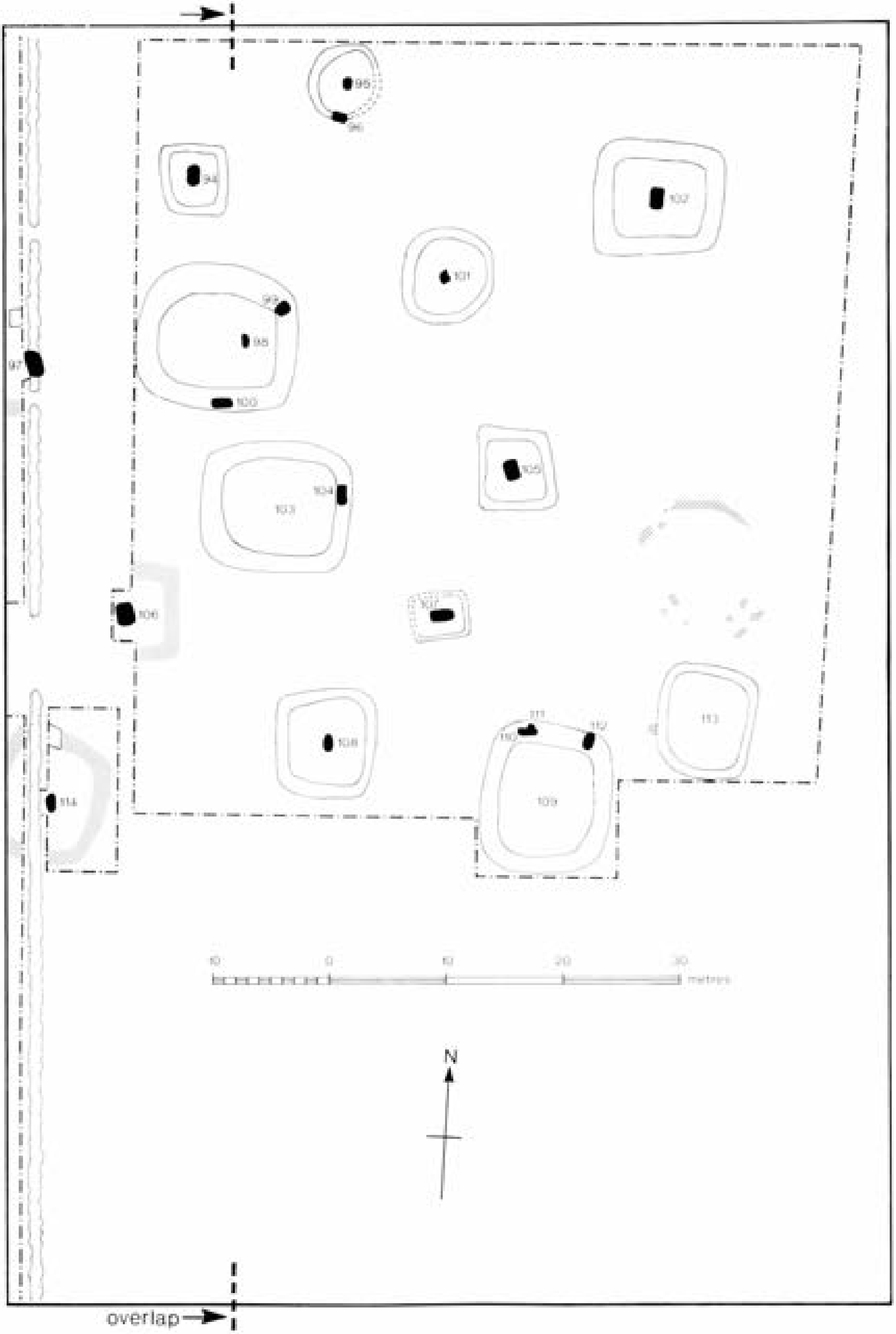

Fig 11 Rudston, R94–114

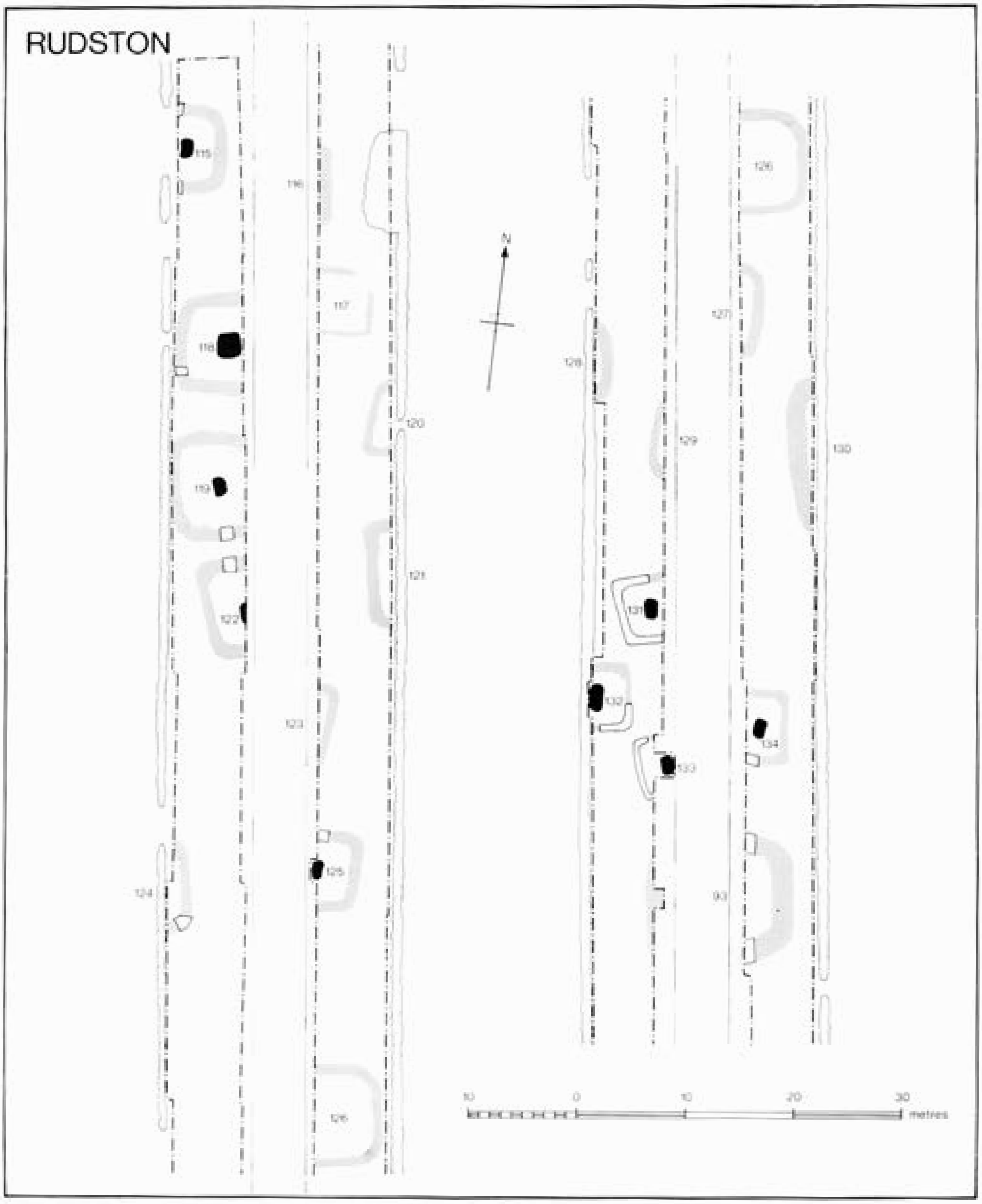

Fig 12 Rudston, R115–134, and R93

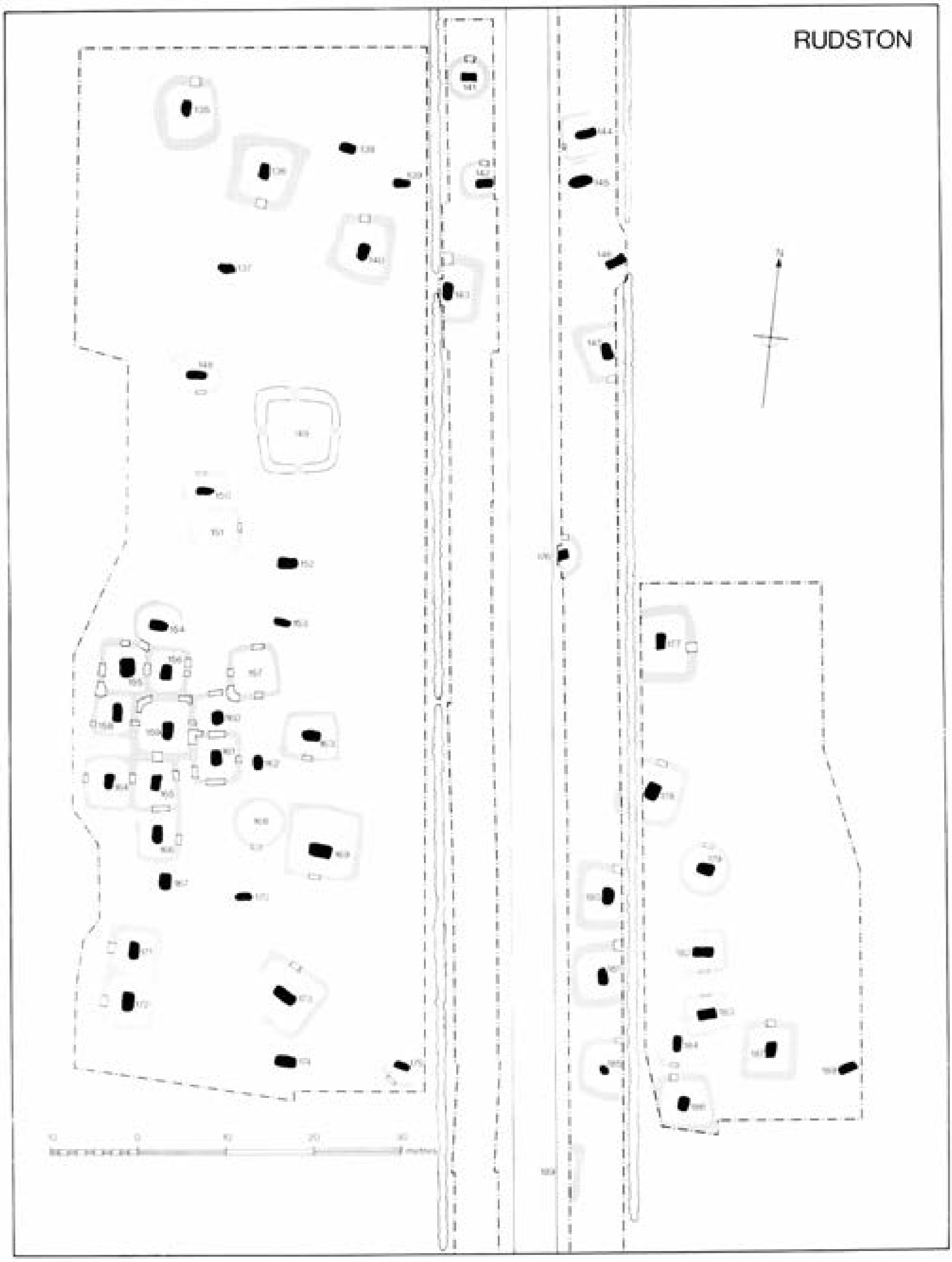

Fig 13 Rudston, R135–189

Rudston: Argam Lane

(Burials R190–208; TA 096702; Figs 1, 14, and 15)

This small group of burials was excavated in 1976. It was bounded on the south side by a pair of ditches, which further east formed the south side of a drove-way running alongside Argam Lane. Its situation was similar to that of the barrows in the south-west of the Makeshift cemetery; both appeared to have been in open ground immediately beyond a drove-way. In the Argam Lane group eight burials were close to and aligned with the boundary ditches, and two others may be regarded as starting a parallel row. There were no surviving ditches round R199–201, but they were evenly spaced and presumably had barrows originally. The northern boundary ditch was so close that it cannot have been contemporary, but the southern ditch seemed to bend slightly

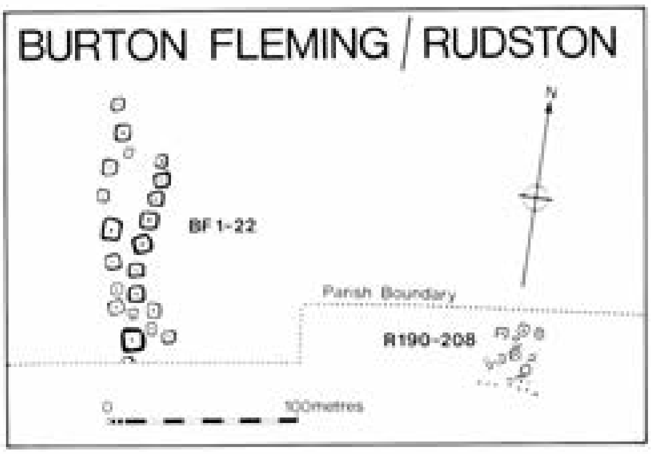

Fig 14 Burton Fleming and Rudston, relative positions of BF1–22 and R190–208; for location see Fig 1, and for more details see Figs 15 and 16

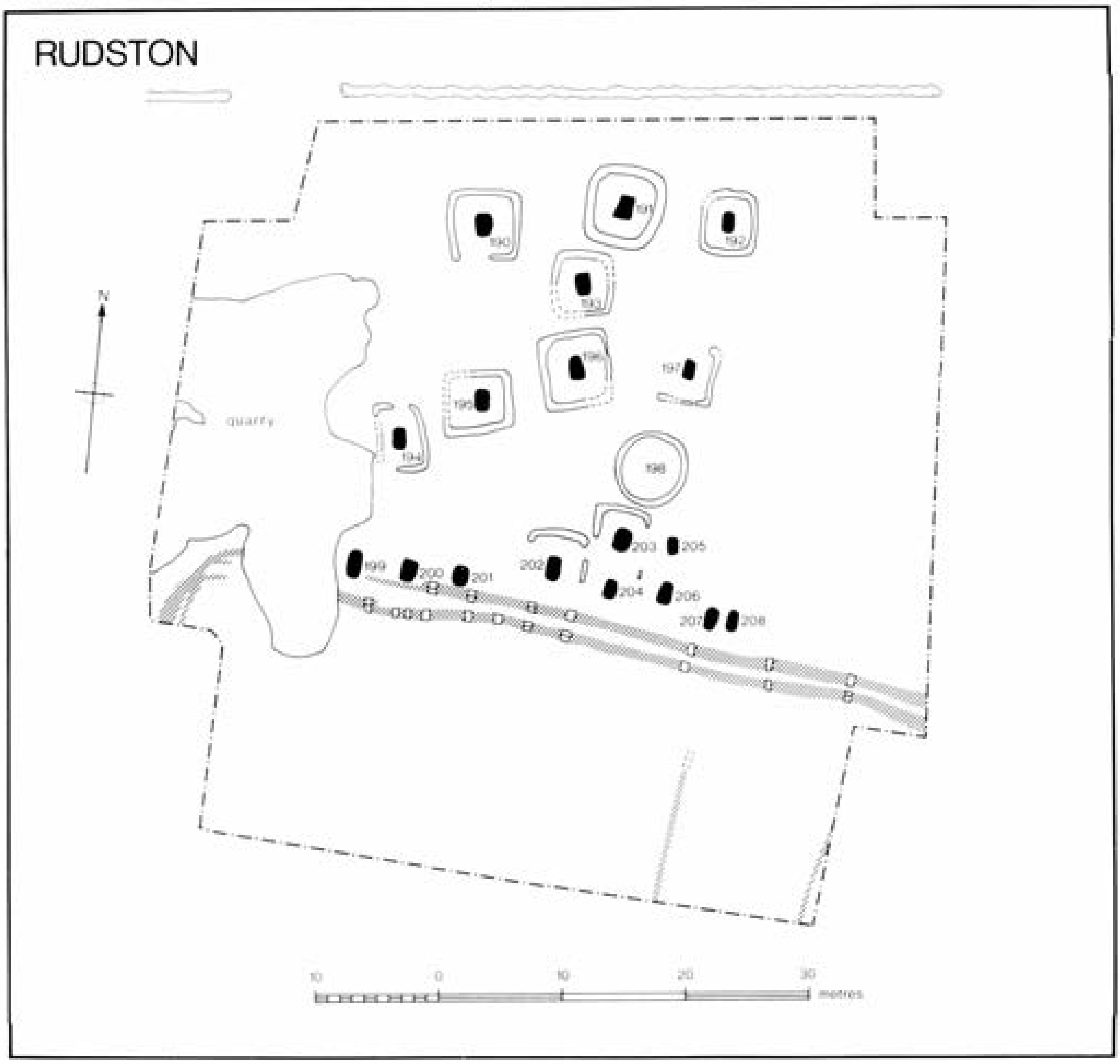

Fig 15 Rudston, R190–208

perhaps to accommodate barrows now lost. R202–6 had only two short lengths of ditch, but originally they may well have been linked in a network with shared ditches, like R154–66. But R207 and 208 were too near to one another to have been covered by contemporary barrows; they may have been flat graves, or perhaps one was in the ditch of the other's barrow. R198 was a ring-ditch lacking any burial. An extensive quarry, possibly Roman (but there is a large modern pit immediately to the west of it), occupied much of the west side of this site; it stopped short of the south-west corner where three cuttings of the boundary ditches turned to the south.

Burton Fleming: opposite Argam Lane

(Burials BF1–22; TA 094703; Figs 1, 14, and 16)

This group was cut by a modern field boundary, which is also the parish boundary between Burton Fleming and Rudston. Of the barrows visible on air photographs only four were in Rudston; the rest were excavated in 1972 (Riley 1988, no 15, shows the northern part of the site, BF1–10, in course of excavation). The 22 barrows excavated were all square, with central graves and no secondary burials in the ditches. They were ranged in two rows, roughly aligned with the Gypsey Race, with three barrows to one side (BF18, 19, and 21).

Air photographs show a pit-alignment crossing this barrow group just south of the excavated area and more or less parallel with the parish boundary. The coincidence of the two lines may suggest that the barrow group was earlier than both of them (for evidence for a Roman pit-alignment on the Wolds see Cardwell 1989).

Burton Fleming: Bell Slack

(Burials BF23–64; TA 106715; Figs 17 and 18)

An extensive droveway settlement starts to the west of Little Argam Farm. Its entrance, not a simple funnel like the Springdale and Argam Lane droveways, seems to have been blocked by later ditches (Fig 1). Air photographs (southern part Stead 1979, pl 7; Loughlin and Miller 1979, pl 5; Whimster 1981, fig 33) show the droveway bounded by occupation or cultivation plots extending some 1.7km, almost to the county boundary, up the centre of the gravel valley that forks into Bartindale to the north and Bell Slack to the east (cf Fig 3, no 11). Part of the settlement (TA 106715) was excavated in 1977; it was Romano-British, but almost devoid of artefacts apart from potsherds. The droveway settlement crossed two extensive groups of square barrows, about 400m apart; an area of the northern group, north of Argam Cottages, was excavated in 1978.

The 42 burials excavated were to the east of the droveway, and were crossed by Romano-British ditches and other features. In the central band of the site (north–south) the total soil cover was no more than 0.15m deep, but at the eastern limit of the excavation it was more than 0.6m. The very shallow soil accounts for the excellent air photographs in this area (Fig 18, cf Beresford and St Joseph 1958, fig 111). No rows of barrows could be discerned, although the overall distribution was aligned with the droveway (which in turn followed the alignment of the valley). Most of the barrows were of average size and well-spaced, but at the north end there was a network of burials with shared ditches (cf R154–66) and, judging from air photographs, this pattern continued further north. The large rectangular pit cut across the west ditch of BF33 seemed at first to have been a huge grave; it had been backfilled mainly with clean gravel, apparently soon after it had been excavated, and was empty but for a few sherds of pottery contemporary with the cemetery. The ring-ditch in the south-east corner of the site had no associated burial, and sherds (late Iron Age) from its filling suggested that it may have been a hut-circle rather than a barrow.

Garton Station

(Burials GS1–10; SE 982578; Figs 19, 20, and 22)

The Garton Station barrow cemetery was recognised and photographed from the air by J S Dent in the summer of 1984. It is at the east end of the gravel valley that stretches westwards as Garton Slack and then through Wetwang (Wetwang Slack) to Fimber; this is the route followed by the old Malton to Driffield railway line, and Garton's former railway station shares the field with the Iron Age cemetery. In October 1984 two particularly large squares seen on Dent's photographs were tested with the gradiometer, and both produced anomalies comparable with the Wetwang Slack cart-burials. In 1985 and 1986 an area of 3800 sq m was stripped and excavated.

There was considerable variety in the barrows/enclosures excavated. Of four large square barrows (8–12m) only one (R, Fig 20) had a central grave, and that was a cart-burial. Two others (B and M) lacked graves, and the third (A) had three Anglian graves near the centre. It is hard to believe that the Anglian GS11 could have avoided cutting any Iron Age burial on the original ground surface or in the body of the mound, but there was no hint of a disturbed burial in its filling. Nine small to medium-sized barrows, five square (C, E, F, T, and V) and four round (K, P, S, and W), had fairly large and deep Iron Age graves. This relatively high proportion of round barrows is unusual in an Arras Culture context, and the undoubted causeways in two of the ring-ditches are equally surprising. The round barrows are particularly interesting because each produced one of the unusual 'speared corpse' burials (p 33).

Enclosure L was not only the largest square on the site (16–18m across) but larger than any excavated square barrow. It was defined by a relatively shallow ditch (Fig 21, c–d), some 0.5m deep but up to 3m wide with an entrance in the middle of the west side. The silting in the ditch suggested that more filling had been derived from the inside than from the outside, but it was a shallow ditch for such a large

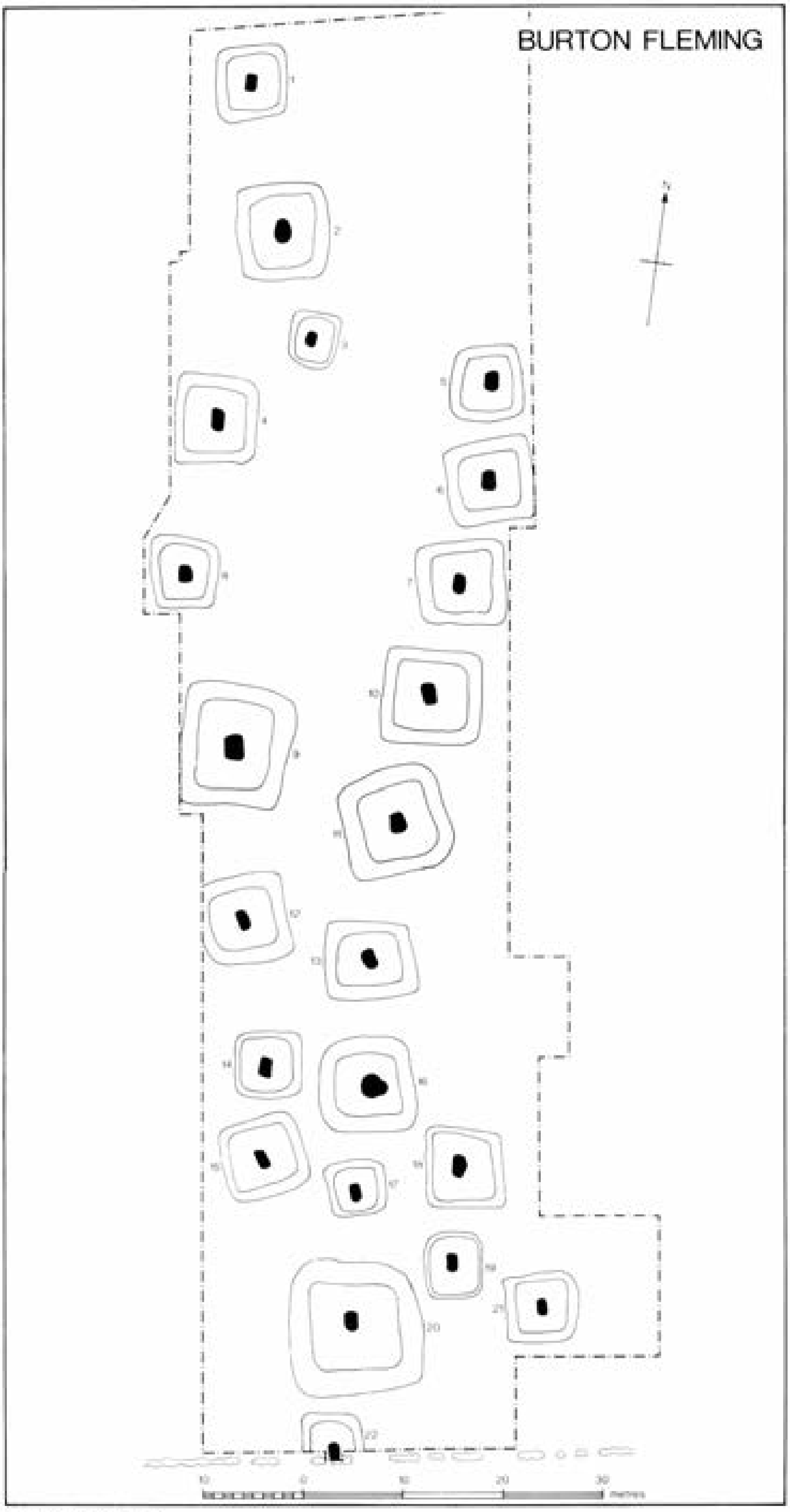

Fig 16 Burton Fleming, BF1–22

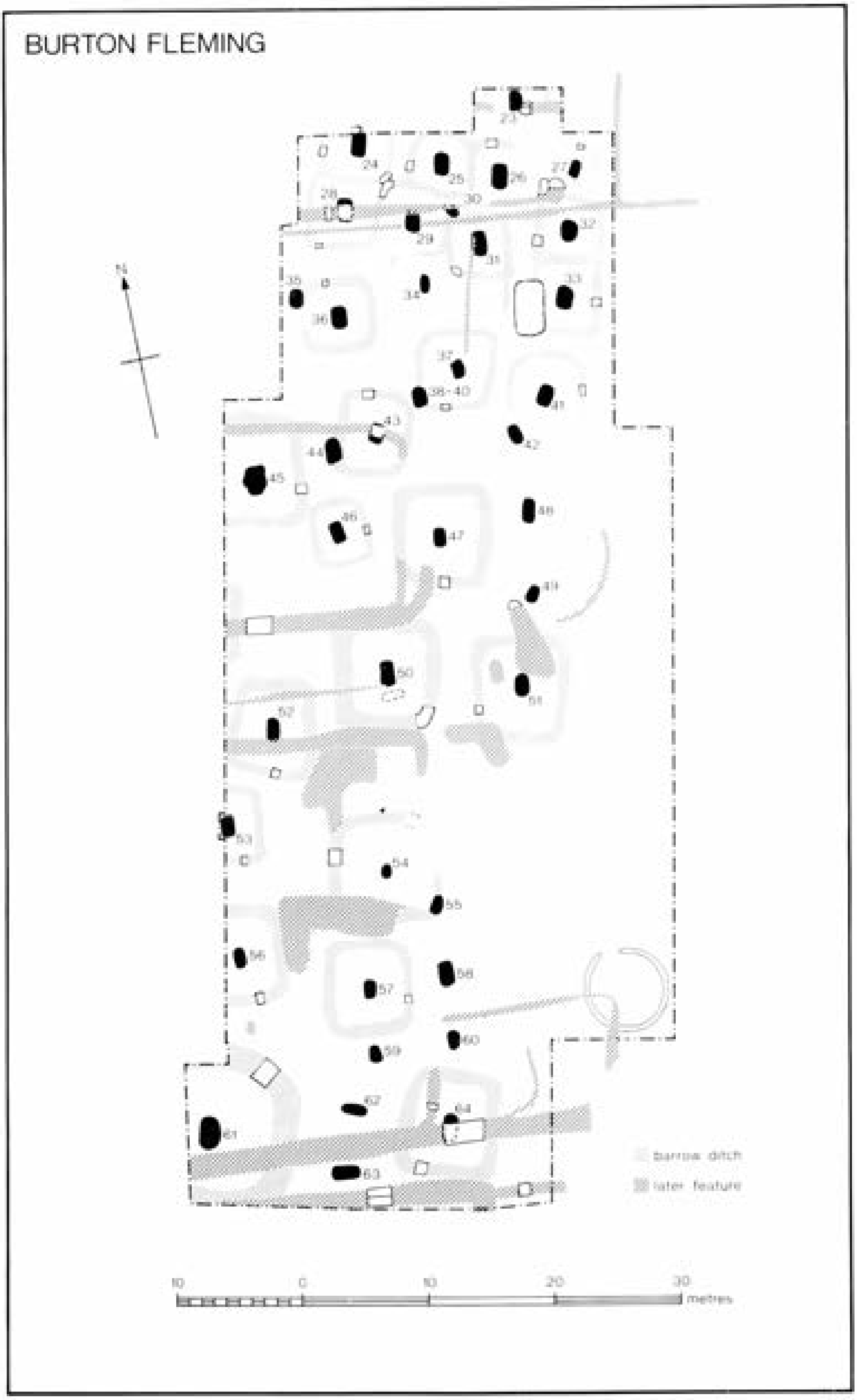

Fig 17 Burton Fleming, BF23–64; unexcavated barrow ditches are shown in tone; other unexcavated features (mainly Roman settlement) are cross-hatched

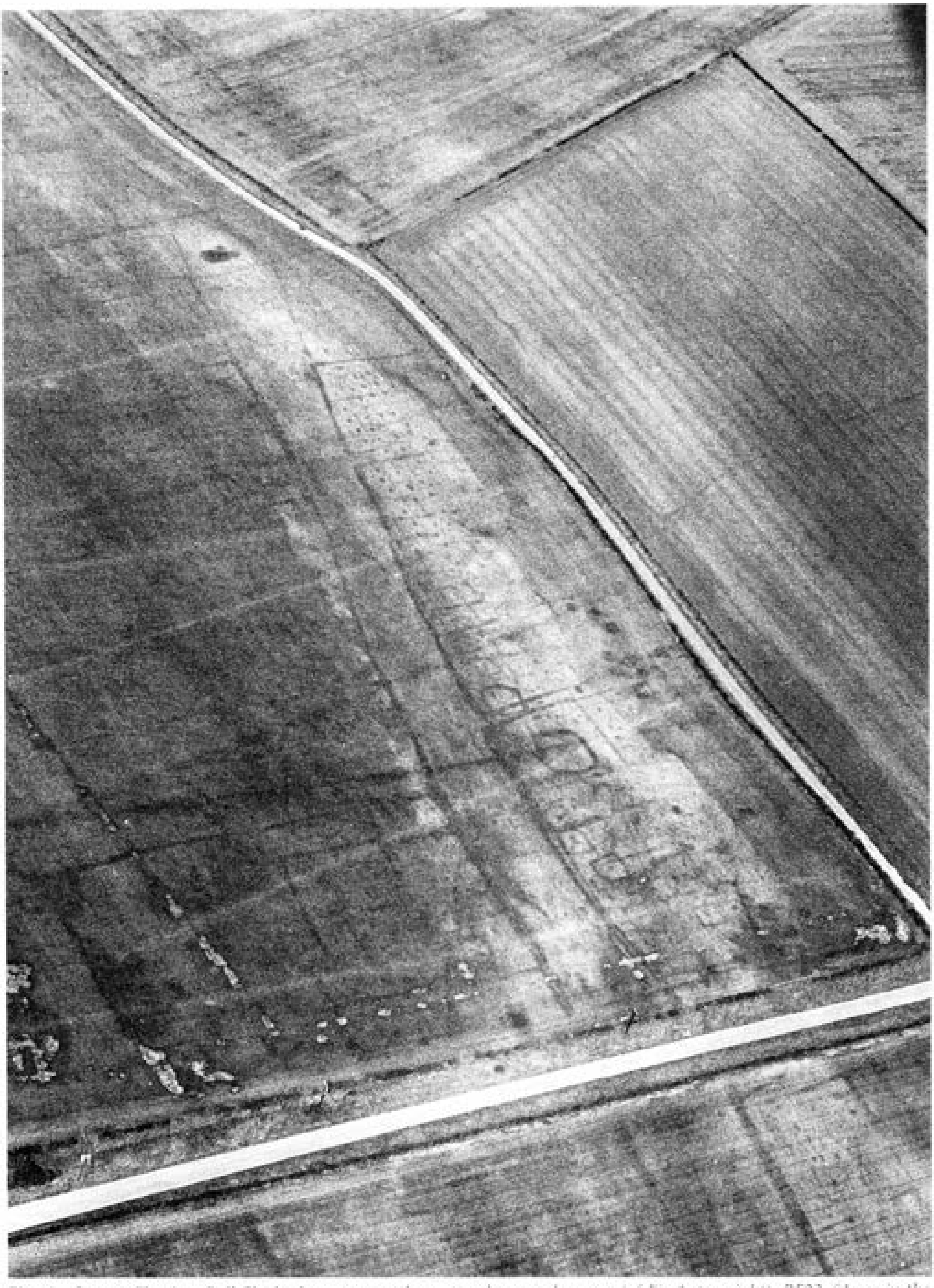

Fig 18 Burton Fleming, Bell Slack: droveway settlement and square barrows (cf Fig 1, top right); BF23–64 are in the centre of the picture (the largest barrow visible is immediately south of the area plotted on Fig 17)

enclosure so it seems unlikely that there had been a substantial central mound. Perhaps the whole of the interior had been slightly raised as a low flat mound, like some of the barrows still surviving in the cemetery at Scorborough (Stead 1975). But the causeway in the ditch suggests that access to the interior was needed, so there might have been an internal bank instead of a barrow. No Iron Age burial was found in the enclosure but there were two rows of Anglian graves, and an odd burial, also Anglian, orientated at right-angles to them. Five of the Anglian graves were between 0.55 and 0.75m deep below the gravel surface, which suggests that they had been excavated from the original ground surface rather than through the body of a mound. One Anglian grave (GS32) produced a gradiometer anomaly of cart-burial proportions; it was caused by a huge and well-preserved iron stand apparently designed to suspend the copper-alloy cauldron also found in that grave.

The squares H and J were most unusual. It seems that trenches, or ditches, had been excavated and then quickly levelled (they had not silted) before further ditches were excavated to define slightly larger squares on the same sites. At each stage there was a causeway in the middle of the west side (like the large Enclosure L) and in both features the east ditch in the first phase was reused in the second. Neither of these squares had a central burial, but H had three Anglian graves in the north ditch. The third square in this sequence, G, also had a causeway in the middle of the west side. It was in a slight hollow, which had allowed some of the original ground surface to survive. The shallow central burial was undoubtedly Anglian (it included the remains of a typical shield-handle) and there was no hint of an earlier grave.

The eight barrows and/or enclosures at the centre and north-east of this site pose a problem. Only one, the smaller Barrow C, had certainly covered an Iron Age grave and that barrow seems to have been cut by one of the others. None of the other seven (A, B, G, H, J, L, and M) had an Iron Age burial. Three (A, G, and L) had central Anglian burials; four (B, H, J, and M) lacked any central burial; and four (G, H, J, and L) are unusual in an Iron Age context in having causeways (but cf barrows K and W here, and 3 and 4 at

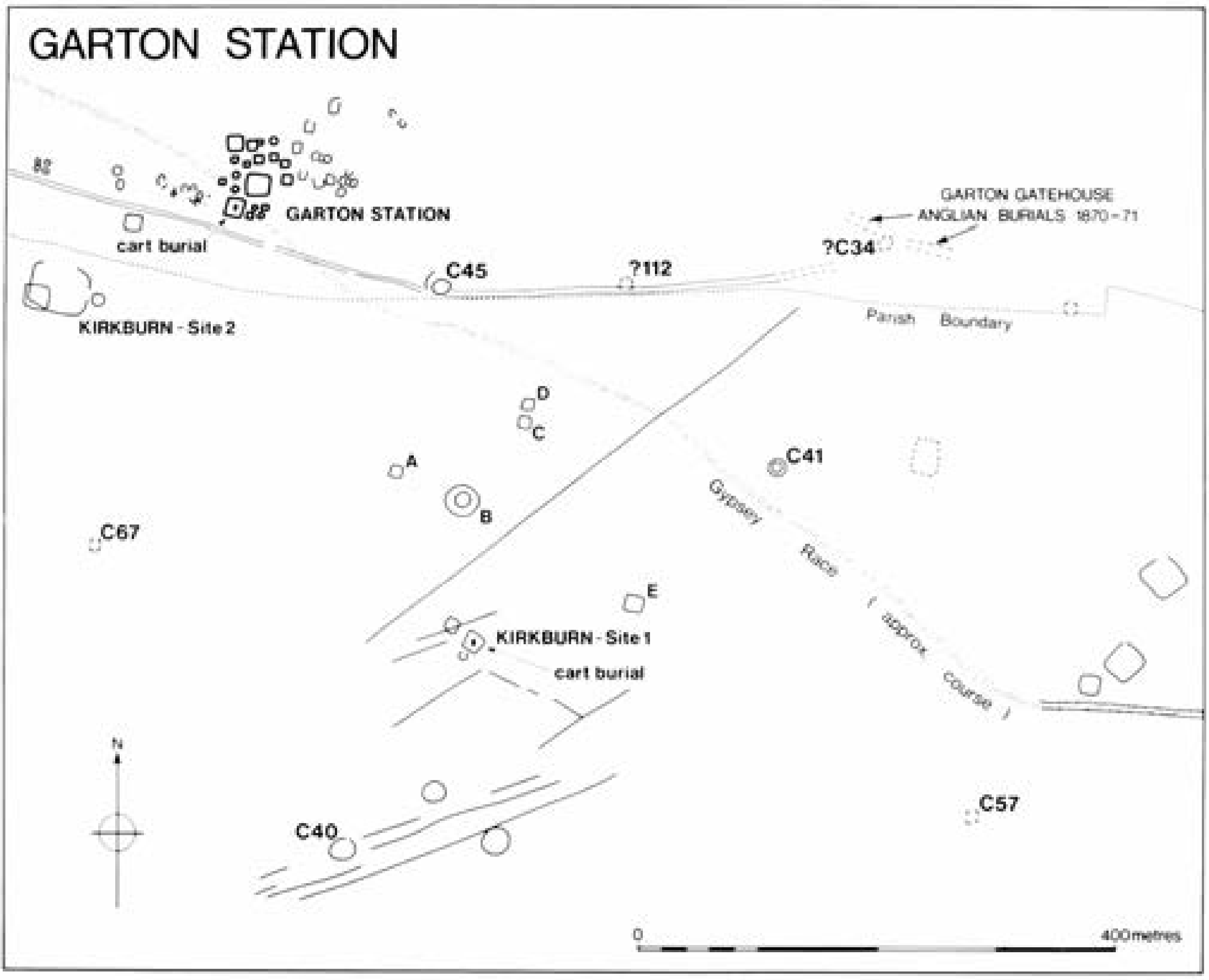

Fig 19 Garton Station and Kirkburn, showing the excavated areas and other features plotted from air photographs (based on a plan by the National Monuments Record); the numbered barrows were excavated by J R Mortimer

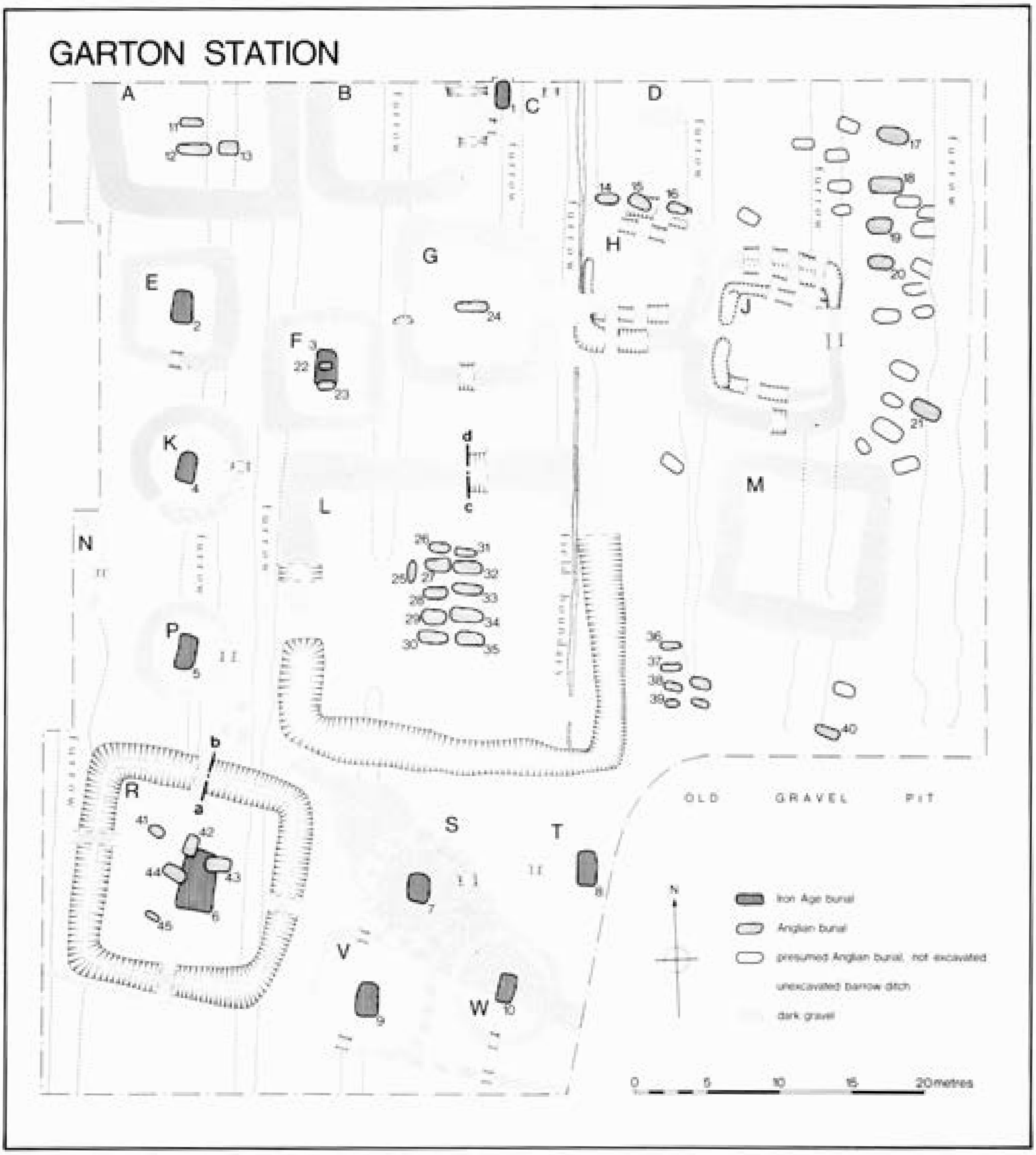

Fig 20 Garton Station: Iron Age (GS1–10) and Anglian (GS11–40) burials

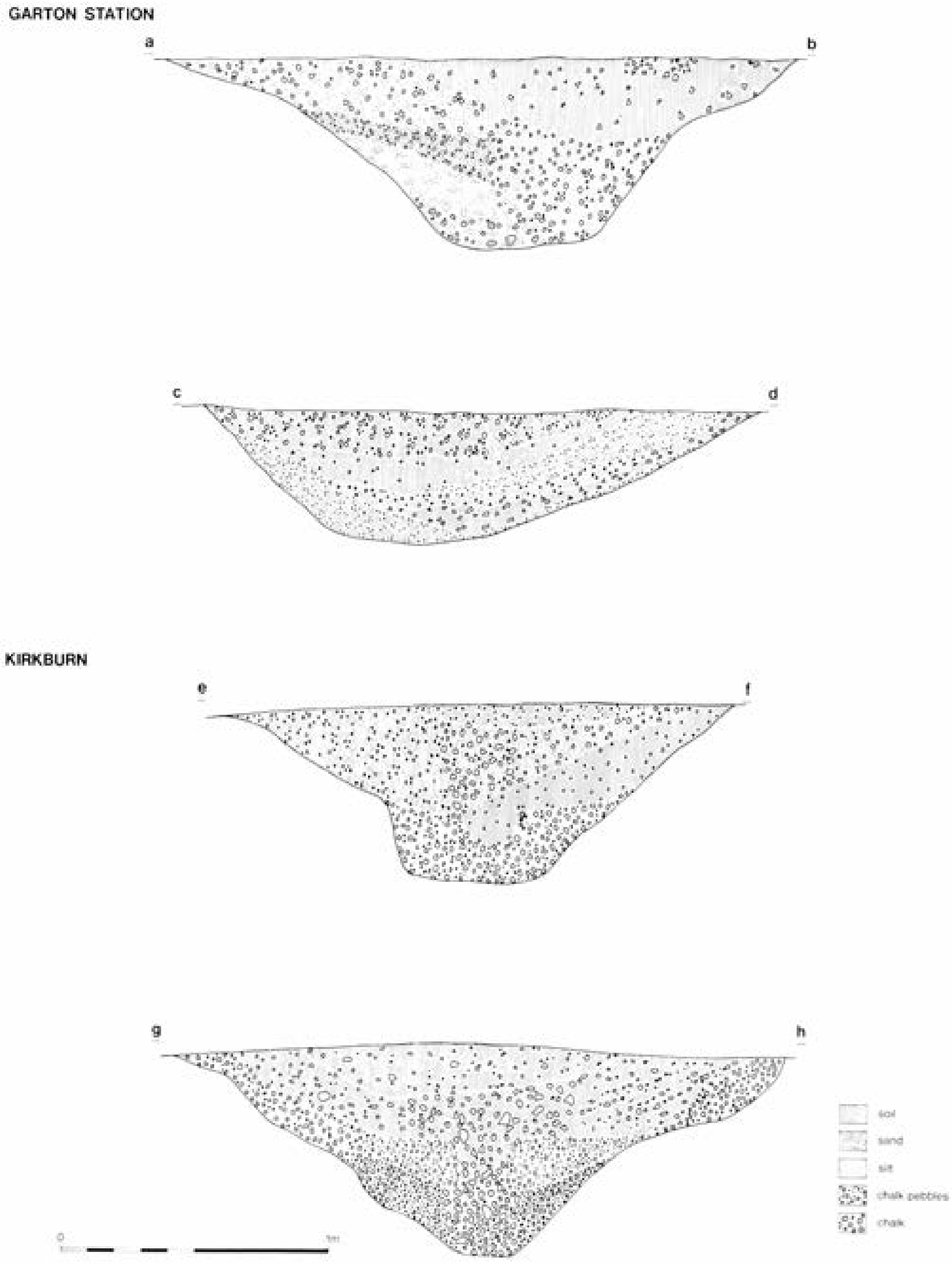

Fig 21 Sections through ditches: a–b, Garton Station cart-burial (GS6); c–d, Garton Station, Enclosure L; e–f, Kirkburn, Neolithic enclosure; g–h, Kirkburn, square enclosure; for location of sections, see Figs 20 and 24

Kirkburn). A few Iron Age square barrows from other sites lack surviving graves, perhaps because a burial on the old ground surface or in the body of the mound was lost when the barrow was levelled (Stead 1975, 9). That argument could be used for the larger barrows here, but there was no trace of a disturbed burial in the Anglian graves central to A, G (although very little survived of GS24), and L. There are many examples of Anglian burials inserted in or near prehistoric barrows or earthworks; on this site the undoubted Iron Age barrows F and R had secondary Anglians, and so did the barrow covering the cart-burial at Kirkburn (below). But the only reason for regarding A, B, G, H, J, L, and M as Iron Age is their square plan and their presence in an undoubted Iron Age cemetery. In plan (Fig 20) all the barrows seem grouped round the central enclosure; but that is due to the area selected for excavation. Considering this site alone, it seems conceivable that the Anglians extended the cemetery by erecting more square barrows or enclosures; but in a wider context the square barrows are so diagnostic of the Arras Culture, and Anglian secondary burials are such a feature of prehistoric earthworks in the area that it seems more reasonable to regard all the Garton Station barrows/enclosures as Iron Age.

Kirkburn

(Burials K2–9, Fig 19; site 1, SE 984574, Fig 23; site 2, SE 980577, Fig 24)

Following the Garton Station excavations the sites of several barrows to the west and south were surveyed by the fluxgate gradiometer in search of a second cart-burial. One barrow, in the field south of Garton Station, photographed from the air by J S Dent in 1980, looked particularly promising – it was large, and it had an obvious central grave. Unfortunately it was towards the centre of a huge field, remote from surveyor's landmarks, but this obstacle was overcome by Cathy Stoertz who provided an NMR plotting that pinpointed the grave with amazing accuracy. The gradiometer responded with a huge anomaly, and excavation located a cart-burial.

The Kirkburn cart-burial and neighbouring barrows were uncovered in an area excavation (site 1, 1900 sq m) in September 1987; at the same time an apparent square barrow and two larger enclosures were excavated in the north-west corner of the field (site 2, 2250 sq m), and several outlying barrows were investigated. The cart-burial (K5) had been under a barrow 12–12.5m square, with another (K6, 8m

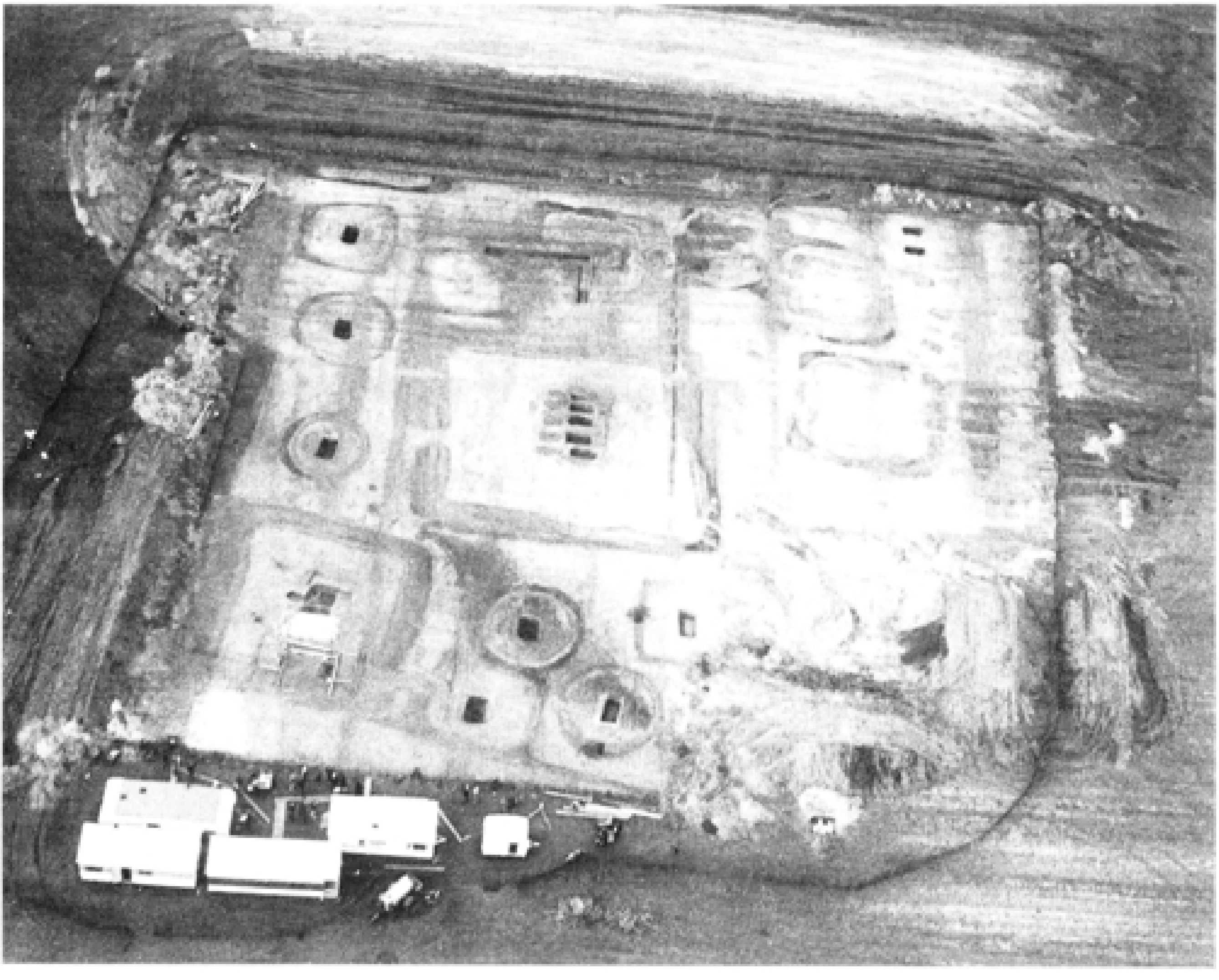

Fig 22 Garton Station: excavations in progress, 1985; the bed of the gypsey shows as a dark stain (cf Fig 20) (photo: A L Pacitto)

square) to the west of it and two small barrows to the south. One of the small barrows (K3) was perhaps more circular than square, and it had a causeway in the ditch on the north side; the other (K4) was roughly circular too, and had a causeway on the west side. Other archaeological features in this area include an undated quarry and adjoining ditch (z); a pair of extremely slight (but visible on air photographs) ditches crossing the site from south-west to north-east – one was observed on the barrow-platform of K6, suggesting that it was earlier than the barrow; and the furrows of medieval strip-fields at intervals of 5.5/6m and 10.5/11m. There was a secondary Anglian burial (K1) in the upper filling of the cart-burial.

The second Kirkburn site, in the north-west corner of the field (Figs 19 and 24), was first recorded on an air photograph taken by J K St Joseph (Fig 25). Just over half of the large oval enclosure fell within the excavated area; it was about 47m long, defined by a fairly wide shallow ditch 1.8 to 2.5m wide and 0.6 to 0.8m deep (Fig 21, e–f) with a 6m wide causeway in the centre of the east side. Lengths of the ditch on either side of the entrance were stripped in search of dating evidence, and a single Neolithic sherd was found. An attempt to locate the north ditch of the enclosure in a trial-trench was confused by three successive ditches adjoining the Green Lane (the parish boundary); none of them could be dated. The air photograph suggests that the enclosure would have been about 42m wide.

Towards the middle of this enclosure (about 1.5m south of the presumed centre, and 3.5m east) was a grave (K9) measuring 2.3 by 1.5m, with a skeleton 0.8m below the present gravel surface. It was orientated east–west, crouched, facing south, on its back with the left hand in front of the face and the right forearm across the body. An additional radius and ulna (apparently the forearm had been buried complete) were found over the legs. There were no grave-goods. The large grave had a remarkably clear and loose gravel filling which seemed to extend 0.3m below the skeleton. A radiocarbon date from the bone of the skeleton (1740–1620 cal BC at the one sigma level) suggests that it was Bronze Age (p 169).

The second enclosure was a 17m square surrounded by a ditch some 2m wide and 0.8m deep (Fig 21, g–h). The initial silting was fairly evenly balanced, but in the upper filling more material seemed to have accumulated from the inside, suggesting an inner bank or mound. Its size invites comparison with the large Enclosure L at Garton Station, but Kirkburn lacked an entrance. No grave was identified and no other feature was recognised within the square. An Urbs Roma coin and an Early Bronze Age sherd were found at the top of the ditch

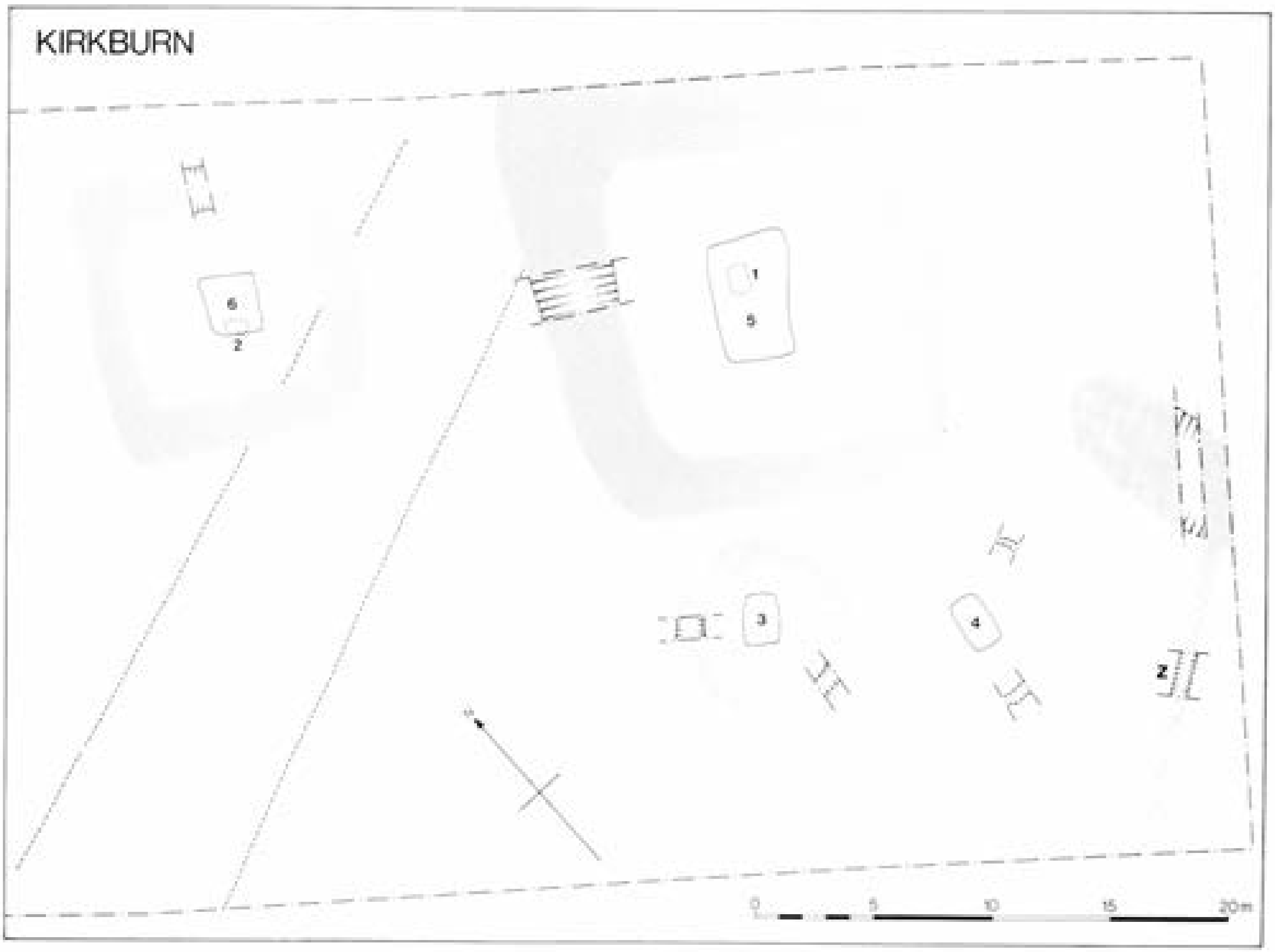

Fig 23 Kirkburn: plan of site 1

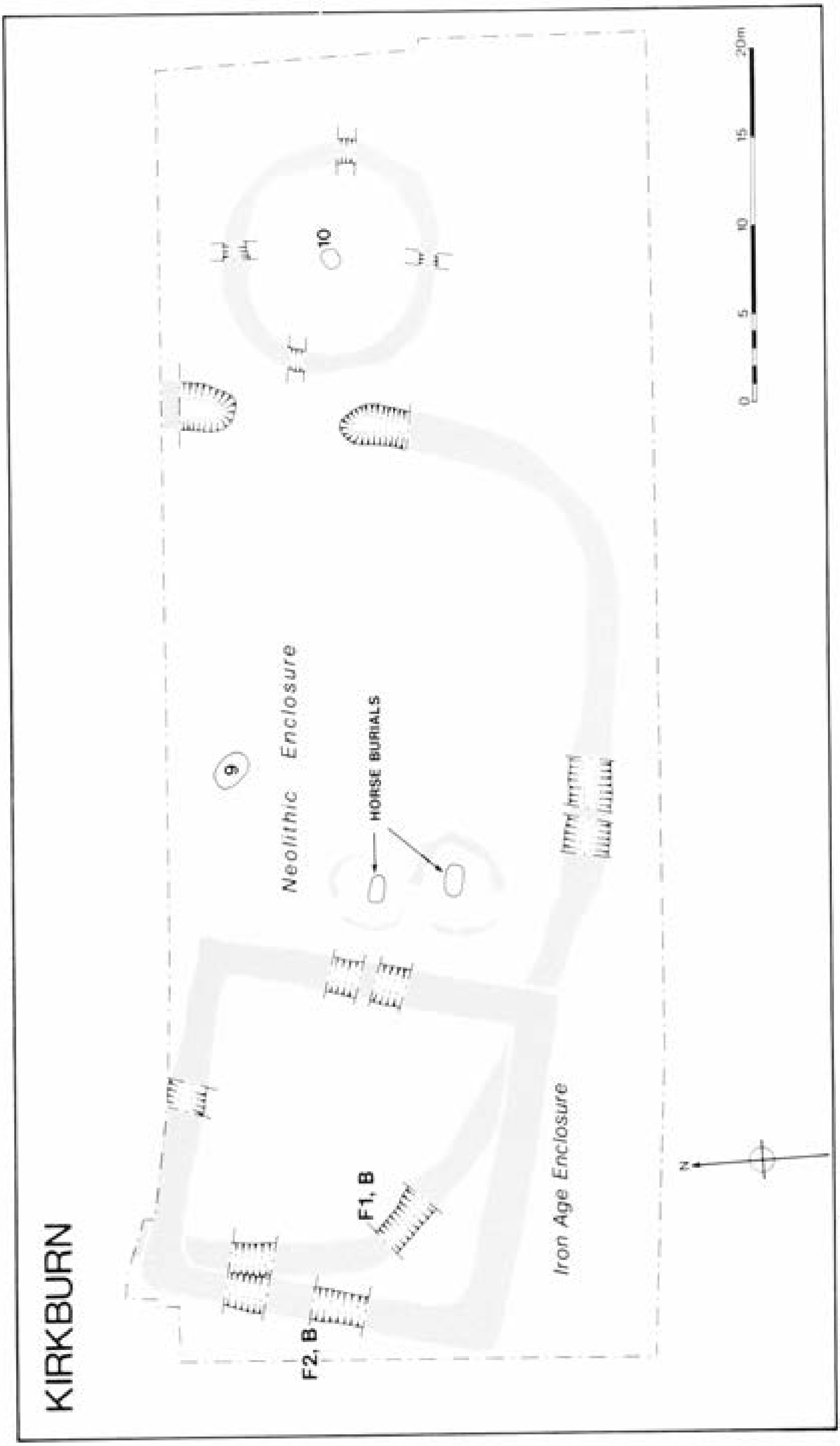

Fig 24 Kirkburn: plan of site 2

filling (when defining it, at the gravel surface), and two other sherds (one Neolithic and the other late prehistoric) were found when cutting sections (Neolithic and Bronze Age pottery identified by I H Longworth). The relationship between the two enclosures was clearly established, especially near the north-west corner where the square definitely cut the large oval enclosure. It seems likely that the oval was Neolithic, with a secondary Bronze Age burial in the centre; I A Kinnes comments on Neolithic parallels below.

Immediately east of the square enclosure, and within the Neolithic enclosure, were two adjoining slight ring-ditches (about 3.5×4.5m and 4.5×5m). The surviving traces were little more than stains, and even the stains had been dragged by the subsoiling ploughs that had wreaked havoc on this site. In the centre of each ring-ditch was a large shallow grave (2.2×1.4m and 2.1×1.2m, depth 0.3 and 0.4m), each with the skeleton of a horse in almost identical positions, orientated east–west, on the right side (Figs 24 and 90, and p 144). In the absence of artefacts, radiocarbon was used to establish the dates of the horses, and rather surprisingly it pointed to the early Roman period – the end of the first century or beginning of the second century AD (p 170). That is two or three hundred years later than the Iron Age burials in the vicinity and is not supported by any early Roman artefacts. Whether or not the square enclosure is contemporary with the horse-burials remains a matter of speculation.

When stripped, it was apparent that the feature east of the oval enclosure was a ring-ditch and not a square barrow. Perhaps ploughing had distorted the sides on the air photographs, and observers had also been misled because the obvious central pit and the size of the barrow were consistent with a square barrow (its identification as a square barrow was accepted by others, cf Whimster 1981, 325–6, though 'unusually rounded corners'; Loughlin and Miller 1979, 112). When first defined the central pit (K10) seemed rectangular, but this was due to a combination of subsoiling and animal disturbance. It soon resolved itself into a small circular feature and produced only two animal bones. Several Neolithic sherds were found in the ditch on the west side, so it seems likely to have been contemporary with the oval enclosure. Perhaps the barrow to the west of the enclosure (Mortimer's Barrow 79) was another element in this Neolithic complex. Its central grave had been removed before Mortimer's excavation, but ring-ditch, oval enclosure, and large barrow seem more or less aligned. Only 800m west of this site domestic Neolithic pottery has been excavated at Craike Hill (Manby 1958).

Beyond the area excavations four other square

Fig 25 Kirkburn: air photograph of site 2 (photograph: Cambridge University)

barrows were trial-trenched in 1987 and two graves were excavated, but there were no grave-goods (p 224; Fig 19, A, C–E).

Parallels for the Kirkburn Neolithic enclosure

by I A Kinnes

The most familiar format for the British Neolithic is the causewayed enclosure, located in a wide range of landscape settings but essentially unproven north of the Trent valley (Palmer 1976), although there are undated cropmark sites at Duggleby Howe, East Yorkshire, and Hasting Hill, Durham (Kinnes *et al* 1983; Newman 1976). More recently, allied circular enclosures such as Bury Hill and Broome Heath (Bedwin 1981; Wainwright 1972) have been added to the southern repertoire. There would appear to be a genuine north–south cultural distinction in the need for enclosures within the earlier Neolithic but, should the Kirkburn example be accepted, some further context must be sought.

In the south there are a few rectangular ditched enclosures which could be of relevance. Those at Hazard Hill and Hurst Fen lie within sizeable occupation spreads (Houlder 1963; Clark *et al* 1960), measuring 19×15m and 48×?m respectively. As with other sites, the ditches are slight and seem to lack formal entrances. It must be assumed that such enclosures represent one phase, and not necessarily the last, within prolonged activity, but function remains obscure. Etton Woodgate (Pryor *et al* 1985) lies adjacent to the causewayed enclosure and might be contemporary with it. It is the largest attested example of this class at *c* 75×60m and has a narrow access gap at one corner; the entire northern side appears to have been open or, at least, unditched. Again, an internal scatter of pits and postholes gives no real guide to function, and material from the ditch was sparse. Two enclosures are of exceptional size: the trapezoidal, open-ended example at Godmanchester (350×230m) and the rectangular, segmented version at Dorchester (150×50m). Both precede cursus monuments and might be seen as some form of aggrandised 'long mortuary enclosure' (inf McAvoy; Bradley and Chambers 1988).

Those at Sonning and Fengate (Slade 1964; Mahany 1969), 25×18m and 45×24m respectively, had continuous ditches and are conceivably allied to the long mortuary enclosure class (Loveday and Petchey 1982). Sonning was associated with Peterborough-style pottery and Fengate dated only by secondary Beaker material.

Beyond these few and ill-understood sites, rectangular formats, outside domestic structures and long barrows, are rare but recurrent, with mortuary or cult houses offered as a common interpretation. The examples at Windmill Hill, Barford C, and, perhaps, Padholme Road (Smith 1965; Oswald 1967; Pryor 1978) are all small (9×9m, 13×12m, 8×7m) and apparently associated with simple wooden structures.

Recently, at Plasketlands on the Solway Plain, an enclosure measuring 37 by 25m and defined by spaced large posts has been partly excavated. The relationship with a contiguous ovate ditched enclosure remains to be established. There were no secure material associations but three radiocarbon determinations span *c* 3100–2800 bc, GU 2571–3 (inf Bewley).

The abiding problem rests in the relative dating of the mass of rectangular enclosures known primarily from aerial survey. More often than not excavation provides an attribution to the late prehistoric and Romano-British periods but, although few, sufficient examples can be attested to allow for a significant Neolithic component. Beyond the need to extend this range there remain two critical problems. First, the purpose of such enclosures, furnished only with slight ditches and spatially not defining any distinctive activities, remains unknown. Secondly, Kirkburn would be the only known earlier Neolithic ditched example north of the Wash. Whilst it might be held that groups using Grimston-style pottery had no need for enclosures or resolved the need in other ways, it is worth recalling that the recent discovery of a causewayed enclosure at Donegore in the allied Lyles Hill province came somewhat as a surprise (Mallory and Hartwell 1984).

3 Burials

Cart-burials

No cart-burials were found in the excavations at Rudston and Burton Fleming, but the opportunity to redress this imbalance came in 1984 when their response to the fluxgate gradiometer was first recorded (p 159). Hitherto cart-burials had been found by chance, but in 1985 and 1987 an archaeological team set out to locate and excavate cart-burials at Garton Station and Kirkburn.

Garton Station

The Garton Station cart-burial (GS6, Figs 20, 26, and 122) was in an exceptionally large grave, 4m long by 2.4m wide (up to 2.7m wide at one end) when first defined, and 1.3–1.4m deep below the gravel surface. It was orientated north–south at the centre of the large Barrow R, 11–12m across, defined by a square-plan ditch some 2.5m wide and 0.7m deep (Fig 21, a–b). The barrow was almost in the course of the Gypsey Race, in an area that had been intermittently flooded in the recent past and presumably for many centuries. This may account for the compact and quite damp filling of the grave, which had had an unusual effect on buried woodwork. As the wood rotted cavities were created in the compact filling, and then clay was gradually deposited by water percolating through the filling; for much of the grave, buried wood had been replaced by sticky brown clay (p 155). Thus the outlines of the naves of the wheels and all the spokes survived as masses of clay, and in the same way parts of the lines of the pole and axle of the vehicle could be distinguished.

The line of the pole was central to the grave and at right-angles to the axle, suggesting that the T-plan frame had been buried as a single piece; the axle was represented by two lengths of clay, 0.7 and 0.3m long, with their ends 2.2m apart; the line indicating the pole was almost 1.3m long (with a single interruption), its front end being about 3m from the line of the axle. At the south end of the grave the two corners had been cut back to receive the ends of the axle, but interestingly this axle/pole frame had been suspended above the floor: the top of the clay representing one end of the axle was 0.38m, the other end 0.3m, above the floor of the grave, whereas the tip of the pole was represented by clay 0.2m above the floor sloping down to 0.1/0.15m at 1.25m from the tip (the layer of clay was usually about 20mm deep, and never more than 50mm). It seems that the corpse, orientated north–south and flexed on its left side, had been placed in the grave first, and then the framework of the vehicle had been lowered on top of it. The two wheels had been detached and set vertically in the north-west corner, between the pole and the side of the grave, a position without parallel in a Yorkshire cart-burial. The yoke had been placed

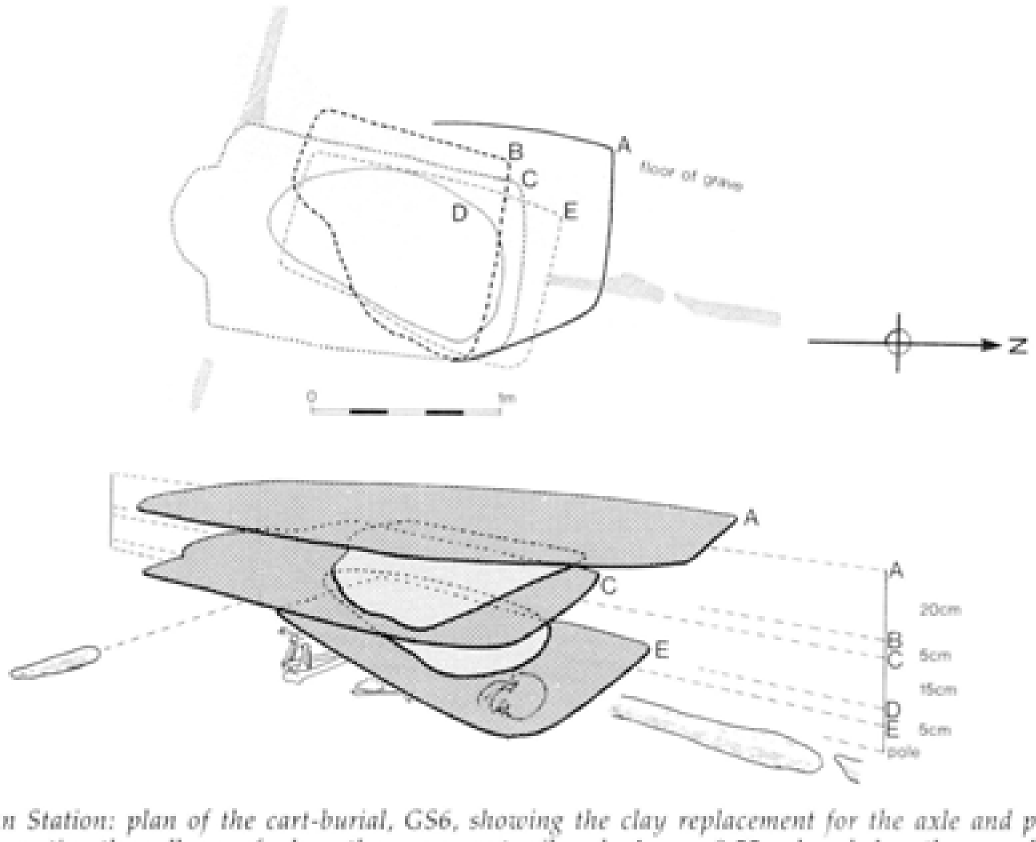

Fig 26 Garton Station: plan of the cart-burial, GS6, showing the clay replacement for the axle and pole, and the soilmarks representing the collapse of a box; the uppermost soilmark, A, was 0.55m deep below the gravel surface; see also the plan, Fig 122

behind the corpse, its line distinguished only by the row of five terrets. Alongside was a pair of linch-pins and a couple of horse-bits, and there were pig bones in front of the human skeleton and behind its shoulders. The grave-goods are catalogued below, pp 40ff.

In the immediate vicinity of the body, and above it, the grave filling was less compact and none of the buried woodwork had been replaced by clay like the spokes and the ends of the vehicle-frame. The looser filling here is probably due to the rotting of a great deal of organic material, which seems to have caused a fair amount of subsidence. Above the skeleton patterns of darker filling suggested that a rectangular box-like object had been buried (Fig 26). The first hint of this, a dark shape seen at a depth of about 0.55m into the grave (Fig 26, A), was carefully plotted and similar outlines were recorded at intervals down to 1m. Throughout, the darker filling within the shape contrasted with the lighter gravel surrounding it. There was no precise correspondence between the successively recorded shapes, although several had quite sharp angles. Initially a strong north-west corner was identified, and was repeated (but 0.55m further south) at 0.75m deep (Fig 26, B). At 0.8m four corners were clear, giving a rectangular shape 1.65m long by 1–1.1m wide, stopping on the line of the axle and placed centrally over the pole (Fig 26, C). Within the next 0.15m this had shrunk and its outlines had assumed a more rounded kidney-like shape (Fig 26, D). By 1m (when the clay representing the axles was revealed) a much smaller rectangle was defined, 1.4m by up to 0.85m, set slightly askew to the pole (Fig 26, E). Below that no clear shapes could be distinguished.

Kirkburn

The flattened square barrow covering the Kirkburn cart-burial (K5, Figs 19, 27, and 127) was very slightly larger than the one at Garton Station, 12×12.5m, and surrounded by a wide ditch sectioned in a single trench on the west side, where it was 3.2m wide and 0.9m deep. The grave was first seen as an area of dirty gravel surrounded by relatively clean chalk gravel, though it was difficult to locate the precise edges in the south-west corner and on the north side. When fully defined it was an enormous 5.2m long by 3.7m at the north end and 3.1m at the south. Some 0.15m below the gravel surface the skull of a secondary Anglian burial (K1) was uncovered; orientated south–north, crouched on its right side, the skeleton was accompanied by an iron buckle and knife. There was no hint of a grave for this secondary burial.

The Kirkburn cart-burial was on higher ground, away from the Gypsey Race, and there were no clay fillings to show the position of decayed woodwork. But there were soilmarks in the filling; they were more consistent than those at Garton Station, and they too suggested that a rectangular box-like object had been buried. The main grave was excavated in shallow spits, roughly 0.05m deep, and when each spit was finished the surface was photographed and, when necessary, planned. By 0.4m deep a curved filling-line was noticed just within the north side of the grave, and at 0.5m it had developed into the northern side of a huge pear-shape that covered much of the grave: broad and rounded at the north, sharply defined along the east side and less so on the west side, but losing definition at the narrower south end. By 0.6m this south end was clear, with fairly sharp right-angles at the south-east and south-west corners, and the same broad shape continued at the north end (Fig 27, A). Inside the rectangle was mainly dirty gravel; outside was relatively clean gravel. The whole of the grave-filling was extremely soft.

Through the next 0.2m (to 0.8m) the rectilinear south end of the soilmark maintained more or less the same shape, whilst the north end was progressively reduced in size, but with a marked bulge in the north-east corner (Fig 27, B, C). Between 0.8 and 0.9m the rounded north end of the shape disappeared, leaving a fairly clear rectangle whose north, east, and west sides remained fairly constant over the next 0.2m (to 1.1m), whilst the south side varied (Fig 27, D, E). At 0.9m there was a clear line from near the middle of the north side of the rectangle to the north side of the grave – a line that surely reflects the cart's pole. The 'pole-line' moved slightly to the east at 1m and still further at 1.1m (Fig 27, D–F), and at that stage another line, rather more vague, appeared 0.3–0.4m to the west. The only other feature noticed at 1.1m was the possible end of an axle, extending from the south-east corner of the rectangle. Thereafter to the base of the grave (1.25m) no clear shapes were observed, but finds were appearing thick and fast, beginning with the top of the east tyre at 0.95m.

The Kirkburn box-shape (Fig 27, E) measured about 1.2 by 1.9m, and its back was on line with the possible mark of an axle. If this soilmark represented the very end of the axle then its full length would have been only 1.8m. On the analogy of Garton Station there would have been room for a pole up to 3.8m long.

Unlike the Garton Station cart-burial, the Kirkburn wheels had been placed on the floor of the grave, almost touching one another, and supported by their hubs so that the tyres were angled, resting on the floor in the centre but well clear of it at the sides. In one sector the east tyre had a considerable amount of wood surviving (impregnated by iron salts) giving the full thickness of the felloe and the positions of three spokes; there were hints of three other spokes in the gravel filling of the west wheel. Each wheel had two broad copper-alloy nave-bands. The corpse had been laid over the junction of the two wheels, orientated north–south, on its back, with the legs flexed on the east side and the head facing east. The right arm was fully extended by the side, the left arm folded across the chest.

The corpse had been covered by a coat of iron mail, upside down and inverted, so that the hem was across the chest and the shoulders over the legs. There was a copper-alloy toggle under the south-east corner of the mail, and two others beyond it to the south-west. Two groups of pig-bones were found, one over the centre of the mail and the other to the north and north-west of the human skull. The wooden yoke had been placed on the west side of the corpse, as at Garton Station, its line marked by five

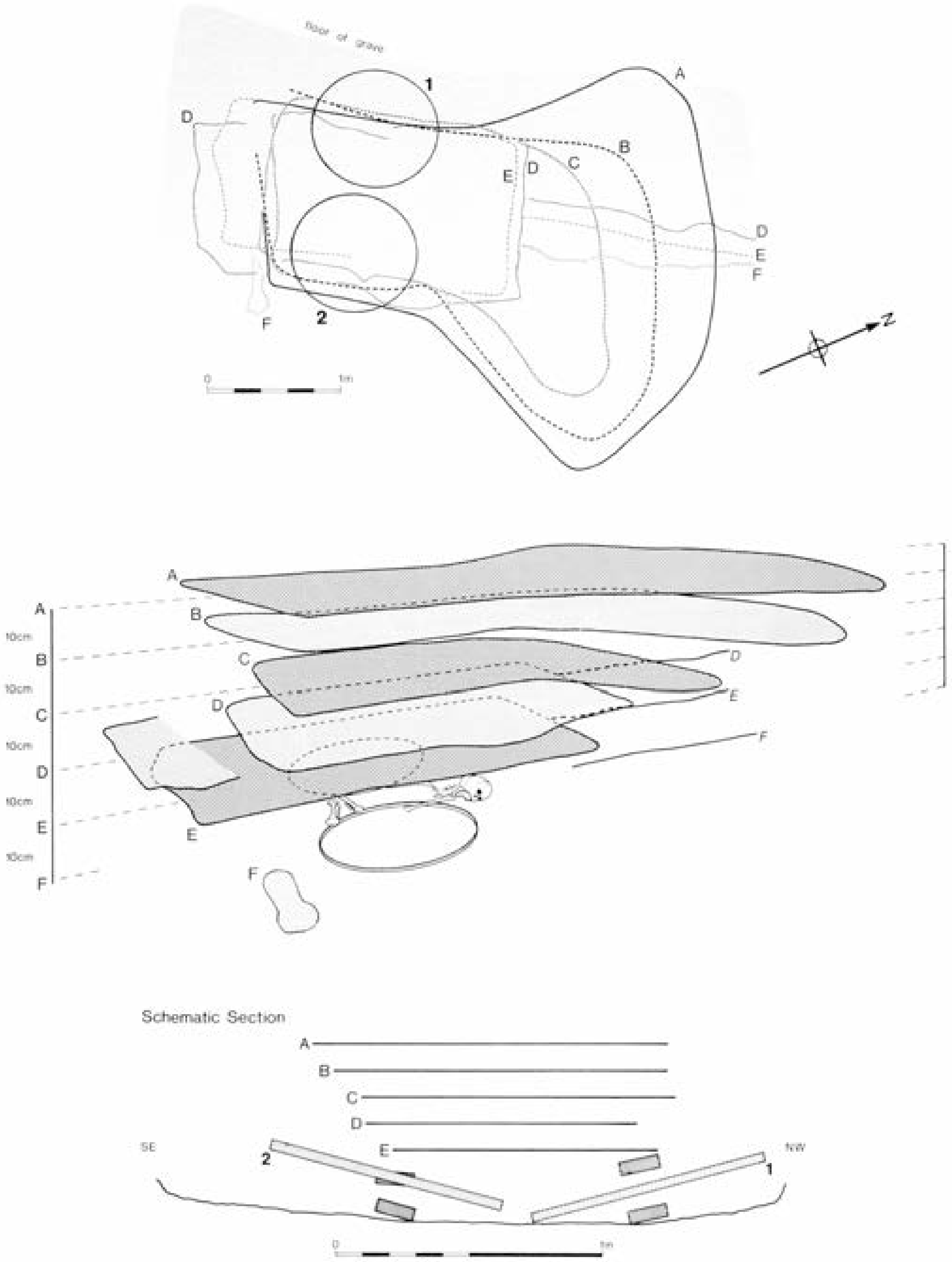

Fig 27 Kirkburn: plans and a schematic section of the cart-burial, K5, showing the soilmarks representing the collapse of a box; the uppermost soilmark, A, was 0.6m deep below the gravel surface; on the section, 1 and 2 represent the wheels (iron tyres and copper-alloy nave-hoops – see the plan, Fig 127)

terrets and by a large figure-of-eight strap-union at each end. Between the north end of the yoke and the human skull were two horse-bits, and beyond them to the north a curious D-shaped object made of an organic material, bound with copper-alloy and mounted with copper-alloy rings and studs. Some distance above the floor of the grave (0.2m at one side, 0.1m at the other), it may perhaps have been the lid of a box. There was a fine copper-alloy and iron linch-pin over each wheel, each with a miniature 'terret' adjoining. The grave-goods are catalogued below, pp 42ff.

Each of the six Yorkshire cart-burials excavated in recent years seems to have included the axle and pole of a cart, as well as the two wheels (Garton Slack: Brewster 1980, Stead 1984a; Wetwang Slack: Dent 1985a). Garton Station, Garton Slack, and Wetwang 2 had traces of both axle and pole; Wetwang 1 and 3 had axles, but the front ends of the graves had been destroyed; Kirkburn had a pole, and there was perhaps a hint of the axle. The pole-marks at Garton Slack and Wetwang 2 were similar in length (2.7 and 2.8m) but the excavators at both sites suggested that the poles themselves might have been slightly longer. The 3m pole represented at Garton Station could have been accommodated in the Wetwang 2 grave and is only slightly too long for Garton Slack.

The lines of axles have been recorded in five of the six recent cart-burials, and their lengths vary from 1.8 to 2.2m (Table 1). These are indirect measurements for the wooden axle, derived from soilmarks, cavities, and clay fillings, but they suggest a lack of standardisation. Certainly the Garton Station axle was at least 2.2m long, and that is 0.2m longer than Garton Slack whose one end is defined in metal. A 2.2m axle would not have fitted into any of the Wetwang graves; Wetwang 1 and 3 must have been less than 2m long.

As the pole, axle, and wheels were buried, then it would be reasonable to expect the body of the vehicle as well – and five of the six graves had traces of a large box-like shape in precisely the expected position. No box-shape was recorded at Garton Slack, but Brewster noted a 'sag of the grave infill...above the wheels and the inhumation (suggesting) that some form of canopy had existed over them' (Brewster 1971, 291). Perhaps a box had been buried at Garton Slack as well. The other five sites certainly had box-shapes, and they varied somewhat in size: Kirkburn and Wetwang 2 were comparable (1.8/1.9×1.2m), whilst Garton Station and Wetwang 1 (and perhaps Wetwang 3) were a little smaller (1.5/1.65×0.95/1.1m). Two of them were observed through a height of 0.5m, and one was even higher.

Table 1 Measurements (m) of soilmarks in the cart-burials

Site	*Axle*	*Pole*	*Box Length*	*Box Width*	*Box Height*
Garton Station	2.2	3.0	1.65	1.0/1.1	0.25/0.45
Kirkburn	?1.8	>3.8	1.9	1.2	*c* 0.5
Wetwang 1	1.8	-	1.5	0.95	0.57+
Wetwang 2	1.95	2.8	1.8	1.2	*c* 0.5
Wetwang 3	1.85	-	-	0.91/1.05	?
Garton Slack	2.0	2.7	-	-	-

But perhaps it would be more obvious to regard the box-shapes as coffins, although they are surprisingly large. This seems a reasonable idea when considering the graves in plan, because each skeleton is confined within a box-shape, but it is less convincing in section. Four of the box-shapes were observed above pairs of dismantled wheels. It seems that the wheels were buried first, and the corpse and yoke placed on top of them. The wheels always sloped inwards, resting on their naves and with the tyres touching the floor in the centre of the grave but resting well above the floor on the outer sides. The base of the box-shape must have rested on the tops of the naves – between 0.3 and 0.4m above the bottom of the grave (Fig 27). It might be argued that the corpse had been buried on a platform some 0.3m above the floor of the grave, and subsequently descended through a cavity when the platform collapsed. But there was no hint of the disturbance and disarticulated bones that would have ensued. In the fifth grave, Garton Station, the evidence was even more convincing. The axle and the end of the pole had been suspended above the floor of the grave, and the box shape was observed well above them, but the skeleton was on the very bottom. There the box cannot have been a coffin.

The widths of the box-shapes are consistent with their interpretation as the bodies of carts: they could have been accommodated quite comfortably over the axles and between the wheels. At Garton Station, Wetwang 1 and 3, and possibly at Kirkburn, the rear end of the box-shape was directly above the axle in the grave, and at Wetwang 2 it extended only a short distance behind. But the vehicle thus represented in plan, a long rectangular box-body with its back resting on the axle, is an impossible design. Far too much weight would be brought to bear on the ponies' backs; the vehicle would be extremely ineffective and could never have carried a load, and the pole is ridiculously short.

But the wheels had been detached from the vehicle, and the yoke had been unhitched, so perhaps the rest had been dismembered. This would explain the situation at Wetwang 2, where the box-shape was markedly askew to the axle/pole T-frame (Dent 1985a, fig 3). A detached box-body makes further sense: it could have been inverted and used as a canopy over the central part of the burial, resting on the framework of the axle and pole. In this situation there would have been a cavity around the corpse, and as the woodwork rotted and the canopy collapsed it would have been filled with soil and gravel from the upper layers. That seems a convincing explanation of the recorded soil patterns – more convincing than seeing them as the filling of an open-topped box. (The same idea was considered at Garton Slack: 'some form of canopy...could have been in fact the coachwork inverted over the remainder of the dismantled vehicle' (Brewster 1971, 291; cf 1975, 112); but the filling that suggested this was later 'attributed to the rotting and settling of the body and the wooden remains of the dismantled coachwork and not to any structures placed as a canopy over the body'. Even the possibility of grave-robbing was considered (Brewster 1980, 385).) There is no suggestion that the upright sides of the box were other than rectilinear, although arcaded sides could have been accommodated in some of the graves; and if the front end rested on the pole then it is likely to have been more or less as high as the sides – and that could have been up to 0.5m. At Garton Station there is a suggestion in the soil pattern that the back (as buried) was open; whether that was the back or front as used is another matter.

As so much of the vehicle had been dismantled, it cannot be assumed that the axle and pole were articulated when buried. Indeed, it might be expected that the pole would go with the box-body, because in most ancient carts it seems to have been an integral part of the platform (Piggott 1983, 206, 217). The plan of the Wetwang 2 cart-burial is particularly instructive, because it suggests a relationship between the axle and pole, but with the box-body on a slightly different orientation: here the pole must have been separate from the box (Dent 1985a, fig 3). In all the burials the pole extends for only a short distance in front of the box; if it had been part of the construction of the box then the full length of the pole was not represented in the grave. On the other hand, in three of the four graves where soilmarks representing both axle and pole were recorded, they were more or less at right angles to one another; in the fourth (Garton Slack) the angle was only very slightly different. In all graves the axle and pole could have been buried together, linked in a T-plan frame, and they could have been buried complete. The reconstruction of a Yorkshire Iron Age cart is further discussed below (p 58).

Burials with weapons

In continental La Tène cemeteries men were occasionally buried with a complete set of weapons – sword, shield, and spears – presumably to indicate their status as warriors. In the Yorkshire graves this arrangement is more unusual; instead, some graves have only a single item of military equipment – a sword (R107, 139, and 182), a dagger (R87 and 153), a spearhead (R50, 94, 140, 152, 170, and BF63), a shield (R148), or, indeed, even a mail tunic (K5). It may be that the one piece was sufficient to indicate the status of a Yorkshire warrior, or perhaps the grave offering had other significance.

The most usual association of weapons in a Yorkshire grave is a combination of sword and spearheads; but several of these groups were not deposited as working sets of weapons. It is very clear that many of the spearheads were buried not as grave-goods in the usually accepted sense, but as the remains of a ritual carried out during the burial ceremony. The best examples are from the four graves at the centres of small circular barrows at Garton Station. GS10 is an extreme case, with 14 spearheads in the grave: six of them had obviously been driven into the corpse, and the others were scattered around it. But they were not neatly grouped; it seemed that they had been hurled into the grave. There were 11 spearheads in comparable positions in GS7. Four had been driven into the waist and one into the chest, there were three around the skeleton, and three in the filling of the grave, grouped together and still standing vertically about 0.2m above the skeleton's waist. In GS5 there was a slight variation, with three bone missile points in the skeleton alongside four iron spearheads; whilst GS4, where the skeleton had been covered by a shield, had one spearhead on the floor of the grave and two about 0.8m above the skeleton, found when the grave was first defined.

This remarkable burial rite was not restricted to Garton Station. In the adjoining field, K3 had three spearheads driven into the filling just above the level of the skeleton. Further away, at Rudston, R174 had seven iron spearheads and two bone points scattered among and around the bones, R154 had the tips of two spears jammed between the arms of a pair of blacksmith's tongs, their sockets at opposite sides of the grave, and R146 had one, point down, just in front of the face, and a bone missile point in the chest. Single spearheads were found in R50, alongside the skeleton but well above the level of the bones, in R144, near the feet but pointing towards them, and in R170, in the grave filling, pointing down towards the skeleton. All the aforementioned examples had spearheads pointing down into the grave, or flat on its floor. Three other Rudston graves had spearheads pointing upwards. R140 had a weapon piercing the superior ramus of the right pubic bone; when found it was pointing out of the grave, but its unusual position is due to the collapse of the pelvis, and when the corpse was intact the thrust would have been downwards. But R152 (one of two skeletons sharing a grave) had been speared from behind and the missile was embedded in its chest (Fig 28); and in R94 the spear had also entered from the back. Here the corpses had been speared before being buried in their graves.

At Rudston, alongside these 'speared corpses' were other burials where spearheads seemed to have been deposited as grave-goods in the normal way. In particular, R24 and 57 had sword and spearhead in very comparable positions: the sword over the body, on the left side, and the spearhead pointing into the corner of the grave near the left foot. A Burton Fleming grave (BF63) had a spearhead in exactly the same position but accompanied by a knife instead of a sword. But these are exceptional; most of the spearheads were with 'speared corpses' and all were insubstantial weapons possibly intended solely for the burial ritual (p 75). All the skeletons with spearheads were males, apart from R57 which had contra-indications.

Other sites in eastern Yorkshire share the same rite. At Wetwang Slack one of the cart-burials included a collection of seven spearheads scattered around the skeleton (Dent 1985a, 88). The Grimthorpe burial recorded by J R Mortimer (1905, 150–2) seems to have been another example, with a single iron spearhead and no fewer than 16 bone points (p 78). Another burial recorded by Mortimer (ibid, 237) surely falls into the same category; it was discovered during the construction of the railway line west of Garton Station (about 600m from the 1985 cart-burial) in 1865. 'Behind the skeleton were

Fig 28 Rudston: R152, showing the tip of a spearhead (arrowed) which has been thrust into the corpse's back and is pointing through the ribs (see also Fig 32) (photo: A L Pacitto)

seven iron spearheads...in a row, reaching from the back of the head to the hips' (ibid; two are illustrated, pl lxxx, figs 599 and 600). Mortimer classified this grave as Anglo-Saxon, and Swanton (1973, 15, 141; 1974, 53 – he examined three of them) was happy to include the spearheads in his corpus. But in view of the recent discoveries they seem more likely to have been Iron Age. Finally, there are two single spearheads perhaps with speared corpses: one on the chest of a skeleton excavated by C and E Grantham at Garton Slack (Dent 1983a, 11, burial 8, fig 8, I) and the other in the stomach region of a female at Wetwang Slack (Dent 1983b, 125).

Other burials

The majority of the graves were orientated north–south, and skeletons were usually crouched, sometimes contracted, and occasionally flexed (p 185 and Fig 100). This rite accounted for 196 of the 253 undisturbed burials: 78% of all those excavated, and 97% of those outside the Makeshift cemetery. Overall, it was normal for the skeleton to be on its left side, orientated with the skull at the north end of the grave, facing east (132 examples). Next in popularity, though far less common, was the same position but with the opposite orientation: skull at the south end, facing west (37 examples). The reverse positions, with the skeleton on its right side, were much more unusual: skull at the north end facing west (19 examples), and skull at the south end facing east (only 8 examples). All but one of the 36 pots and 64 brooches were found with these burials, as well as all the 14 rings or beads and the 8 bracelets.

The other main category of burial, orientated sharply at 90° to the norm, was virtually limited to the Makeshift cemetery. There, 54 burials were orientated east–west, whereas elsewhere there were only two at Bell Slack (BF62 and 63, side by side) and one atypical example at Kirkburn (K2, high in the filling of another grave). Apart from their orientation, these burials differed from the others in being extended (31 examples) or flexed (17 examples); only 7 were crouched. The sole contracted east–west burial was a curiosity buried across the width of its north–south orientated grave (Fig 29). The difference between the two types of burial was also apparent in the grave-goods, because only one of those in an east–west grave had a brooch, and only the oddity at Kirkburn had a pot. Instead, ten had swords, nine had spearheads, four had shields, three had tools, two had knives, and three had spindle-whorls. The difference is even further emphasised by the deposits of animal bones: north–south burials were accompanied by legs of lamb, whereas east–west burials had various cuts of pork (p 177).

Fig 29 Rudston: R177, skeleton across the width of a normal north–south grave (photo: A L Pacitto)

A glance at the associated grave-goods in the Makeshift cemetery might suggest that the difference in the two types of burial related to the sex of the defunct: pots, brooches, and bracelets would seem appropriate to women, whereas swords, spearheads, tools, and knives suggest men. But examination of the skeletons confounds this approach. The case for a chronological distinction is much more impressive. There is a suggestion, in several parts of the Makeshift cemetery, that east–west burials were accommodated within an arrangement of north–south graves (eg R68–92, Fig 10, and R26–9, Fig 8). More significant is the east–west R8, which was dug into the grave of the north–south R9 (Fig 7) – the only firm stratigraphical relationship between the two types of burial. Consideration of the grave-goods supports the notion of a chronological distinction: the only brooch with an east–west burial is the only La Tène III brooch from these excavations, and four of the swords have straight hilt-ends characteristic of La Tène III. Nowhere in the cemetery is there any suggestion of a north–south grave later than one with an east–west orientation, and no north–south burial has distinctive La Tène III metalwork. Within the Makeshift cemetery there seems a sound argument for a chronological distinction between the two types of burial, and the two graves at Bell Slack do not affect the argument.

The vast majority of burials were more or less central under a mound raised by excavating a ditch. Several of the surviving ditches were extremely slight (especially R145, 148, 175, and 184, Fig 13; and R202–4, Fig 15) and it seems probable that some, perhaps most, of the apparent flat graves were originally covered by barrows. It might be argued that R9 was exceptional, for it seems unlikely that there was any trace of a barrow when R8 was interred; and R207 and 208 are too close to have been covered by separate adjoining mounds, though one could have been in the ditch of the other's barrow. Some burials were certainly in secondary positions in barrow ditches, an unusual practice concentrated in two groups: R99, 100, 104, and 110–12 (none of the mounds had surviving primary burials) in the middle of the Makeshift cemetery (Fig 11), and BF30, 35, 38–40, 44, and possibly 42 in the northern part of Bell Slack (Fig 17). Otherwise there were only two ditch burials, R85 and 96. R98 seems likely to have been a secondary burial – it was a shallow insignificant grave markedly off-centre to an impressive barrow; and K2 is undoubtedly secondary to K6.

Whereas the barrow ditches were immediately apparent after the topsoil had been stripped, their distinctive brown filling contrasting sharply with the whitish chalk gravel, the graves themselves were less obvious. Some had been filled with a mixture of earth and gravel, whilst others were essentially of unmixed gravel, though sometimes with a thin outline of dark earth. The filling depended on available material, so deep graves surrounded by impressive ditches tended to have gravel whereas graves in slight barrows had earth. Many of the east–west graves in the Makeshift cemetery had predominantly earth fillings. To some extent this affected the condition of the skeleton, for bones were better preserved in gravel than in earth. Some deep graves in impressive mounds were filled with gravel in the upper part but not at the bottom, because there had been a tendency to put earth immediately over the corpse.

Occasionally the mixed filling preserved clear evidence that the body had been buried in some kind of coffin (Fig 30). The wood itself had never survived, but rarely its line was represented by a narrow band of dark earth. More often the position once occupied by wood was betrayed by a sharp line in the filling, with clear gravel on the one side and earth or earth and gravel on the other. In one grave, R91 (Fig 109), the sherds of a broken pot had been deposited against the end of a coffin and clearly preserved its line. There had certainly been coffins in 15 graves, and there were possible traces in four others; one of the possible examples was in the Rudston Argam Lane group, but all the other coffins were in the Makeshift cemetery. The surviving traces represented the ends and sides, never the lids or bases; the coffins had been constructed entirely from organic materials – no nails or metal brackets had been used. Nowhere was a complete outline preserved, but there was sufficient to get measurements of several plans: the smallest (R91) measured 0.95m by at least 0.45m; the largest (R34) was 1.5m by 0.7m; and the average measurements were 1.2m by 0.6m. Traces of the largest coffin were first noticed 0.5m above the floor of the grave and two others were seen 0.4m high, but most were recorded only in the lowest 0.2m. Those skeletons that were contracted and buried on their sides had been confined to an even smaller space than that enclosed by the smallest coffin, and it seemed likely that they had been tightly bound. But most graves with contracted or crouched skeletons were comparatively large, and would have allowed a much more relaxed position for the corpse.

There were four double burials, with adult skeletons side by side in the same grave; two of them were orientated north–south (R118 and BF61) and two were east–west (R73 and 152). R73 had the skeletons of two women, one crouched and the other extended (Fig 31); in R152 both skeletons were extended and one (a male) had a spearhead in the ribs (Fig 32, cf also Fig 28); BF61 had only a few surviving bones from a flexed skeleton (possibly female or sub-adult) with brooch, bracelet, beads, and ring, accompanied by the crouched skeleton of a woman; and R118 had two female skeletons, one crouched and the other contracted, on their left sides but with opposite orientations, one with a brooch and the other with a pot. There were two adults in R51 as well, but one of them had been swept away (at a stage when some bones were still articulated) in order to accommodate the other.

Children were rarely encountered and were central burials in only two barrows. The crudely-defined round barrow R95 had the grave of a 2–3-year-old child in the centre, and there was a shallow central grave in R185 with two superimposed skeletons of children (aged 2–3 and 4–6); above them two leg bones from an adolescent survived from a subsequent burial or possibly an earlier one disturbed by the children's grave. Two children were found in secondary positions in barrow ditches (R111 and

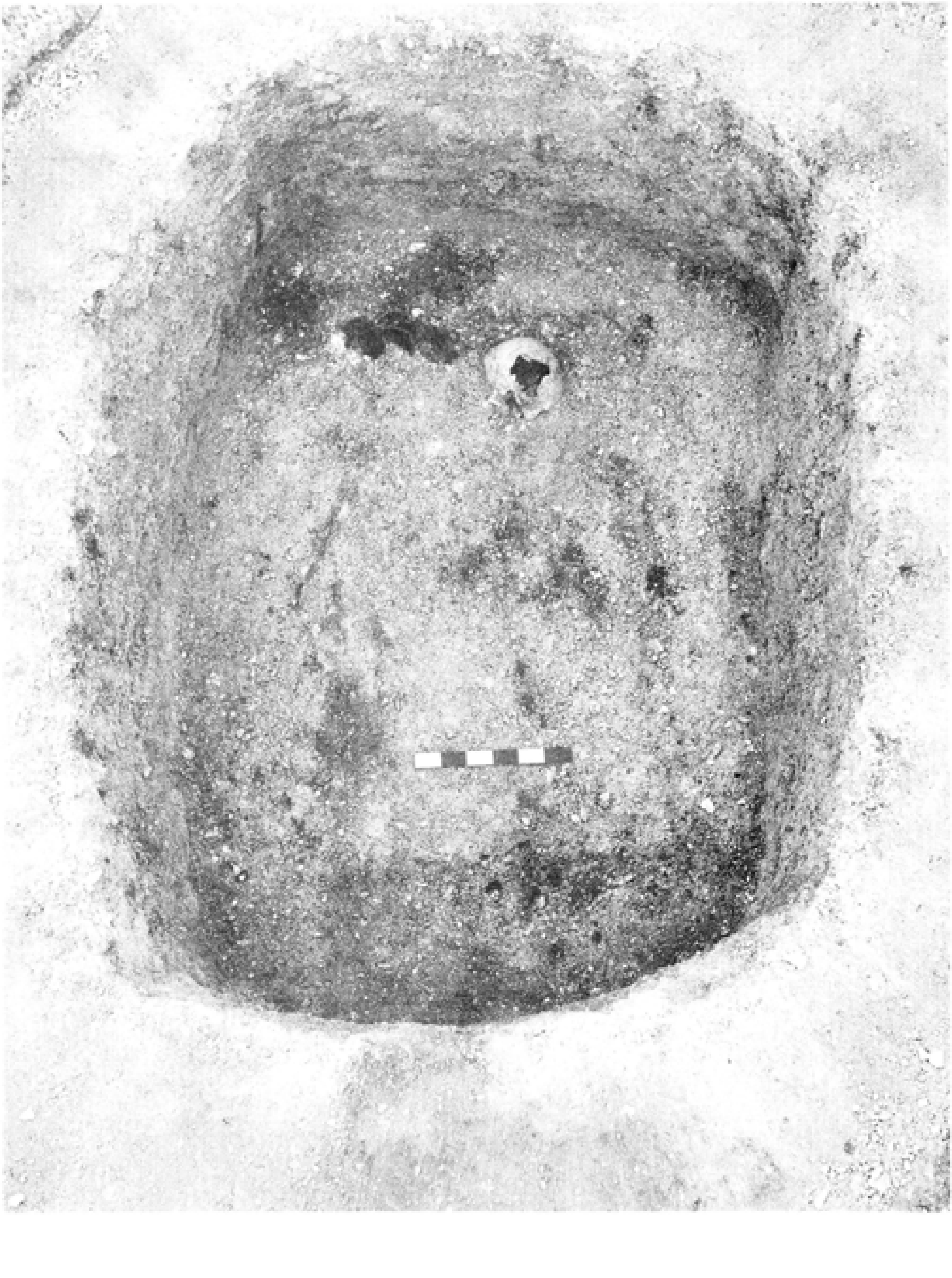

Fig 30 **Rudston:** *R32, showing the outline of a coffin (photo: A L Pacitto)*

Fig 31 Rudston: R73, a double burial (photo: A L Pacitto)

BF39), but cut by later graves of adults, and one (R10) might have been in a secondary position to a burial (R9) not covered by a mound. At Kirkburn the skeleton of a newborn child was buried with a young woman (K6), and in a secondary burial in the upper filling of that grave there was a woman with the remains of a foetus. The scarcity of children suggests that they were normally buried elsewhere, or in the mound over an adult burial, where any trace would have been lost long ago. Perhaps the pots found in ditches relate to such burials. Certainly there is a record of a child's grave in a surviving barrow at Danes Graves (Barrow 15, Stead 1979, 100; cf Greenwell 1865, 110).

Fig 32 Rudston: R152, a double burial, with a spearhead in the chest of the skeleton on the right (see Fig 28) (photo: A L Pacitto)

4 Grave-goods

Cart-burials

Finds from the earlier Yorkshire cart-burials are described in Stead 1979, with full references. For the Garton Slack cart-burial Stead 1984a is more accessible than Brewster 1980 (which is in microfiche). There are interim reports on the 1984 Wetwang Slack cart-burials (especially Dent 1985a).

1 Wheels

Garton Station (Fig 33)

The Garton Station wheels had been standing upright, leaning against the side of the grave. Most of the wooden parts had been replaced by clay (p 155). The remains of the two wheels – the iron tyres, the clay, and the gravel between the 'spokes' – were lifted in a single block, encased in a mass of expanding polyurethene foam. The block was then transported to the museum where its excavation was completed (Fig 34); the clay parts were moulded in plaster and replaced by fibreglass suitable for display. Meanwhile, the sides of the grave were carefully recorded and a full-scale reconstruction of the burial was built, faced with gravel from the original site. The reconstruction was displayed in 'Archaeology in Britain since 1945' at the British Museum (1986) and then in 'Treasures of Yorkshire and Humberside' at the Yorkshire Museum (1989).

(i) *Tyres* 1, GW/KC, east; 2, GW/KD, west

The Garton Station tyres are distorted, and one is broken, but they seem to have measured about

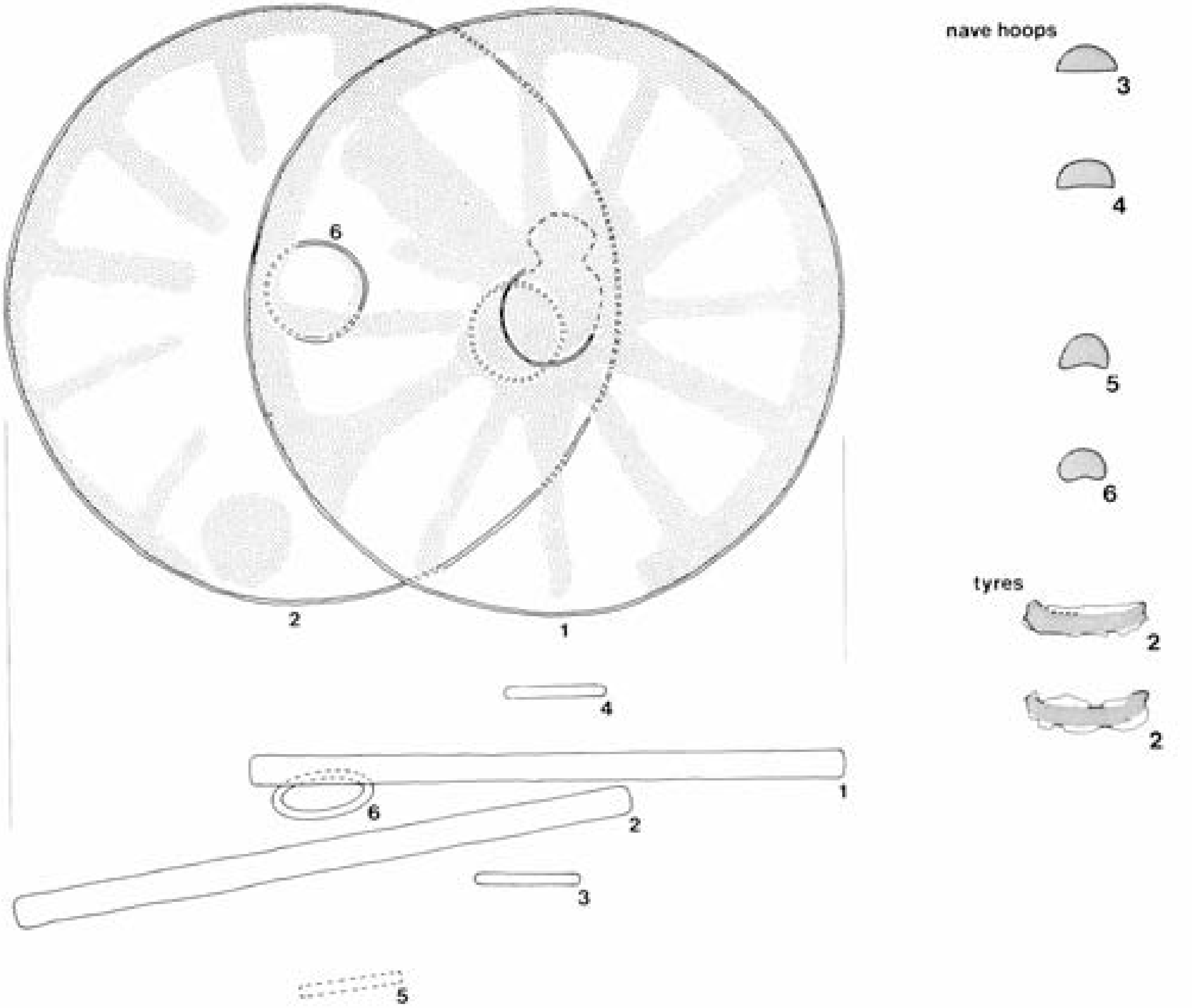

Fig 33 Garton Station, GS6: the wheels, as excavated, standing upright, with tone to represent the clay replacement of the wooden parts; nave-hoop 6 had been moved by wheel 1; nave-hoop 5 was not recorded relative to the other remains; plans (1:10), sections (1:2)

900mm in diameter. They are badly corroded, about 36mm wide and 6mm thick, rounded in section on the outside and markedly downturned at each edge on the underside.

(ii) *Nave-hoops* 3 and 4, GW/KG and KH, east; 5 and 6, GW/KE and KF, west

The four iron nave-hoops are D-shaped in section, 14 to 16mm wide and about 128mm in internal diameter. They are heavily corroded and all have replaced wood on the inner face. They resemble the nave-hoops from the Charioteer's Barrow, Arras, Wetwang 3 (narrower – ranging down to 7mm), two from Wetwang 1, and one from Garton Slack.

(iii) *Remains of wooden parts*

The approximate shape of the wooden parts of the wheels survived as clay fillings within the gravel. The clay had occupied cavities some 45mm in diameter on the lines of 12 spokes (no taper could be distinguished), and some 60mm in diameter for the felloes. It might be argued that wheel 1 had been dished – the spokes at the hub were 20 to 30mm inset from the level of the tyre – but this could have been caused by distortion as the woodwork collapsed. The nave of wheel 1 seems to have broken through the spokes of wheel 2 (its west hoop, 3, was west of the tyre of wheel 2), but its two nave-hoops seemed to be intact relative to one another: they were 280mm apart between centres, but hoop 4 was 120mm whereas hoop 3 was 160mm from a line through the centre of the tyre. The clay filling of its nave projected 60mm beyond hoop 4 (Fig 34). The nave of wheel 2 was not lifted intact (hoop 5 was inadvertently separated when the wheels were lifted in a block); the only recorded measurement is the distance between the angled hoop 6 and the tyre (centre to centre): 90mm, considerably less than the corresponding measurement for wheel 1.

The felloes were also represented by slight traces of mineral preserved wood (*Fraxinus* sp, ash) on the insides of the tyres; in one place on tyre 1 there was a clear straight line, apparently indicating a butt-joint in the felloe. Mineral preserved wood from the naves has also been identified as *Fraxinus* sp, ash.

Fig 34 Garton Station, GS6: the wheels in course of excavation in the British Museum (photo: British Museum)

Kirkburn (Fig 35)

(i) *Tyres* 1, KR/CC, west; 2, KR/CB, east The two iron tyres, found flat on the floor of the grave, are very comparable in size: 900mm in diameter (tyre 1 distorted to a rather oval shape, 890×910mm), 34mm wide, and 6–7mm thick. Corrosion and replaced wood obscure the precise section, but tyre 1 seems slightly more worn, and appears to have slight flanges on the underside.

(ii) *Nave-hoops* 3 and 4, KR/AX and DH, west; 5 and 6, KR/CD and DG, east

The four copper-alloy nave-hoops have an internal diameter of about 130mm (all are slightly distorted). They are 50mm wide, shaped from metal sheet, with a central cordon 10mm wide; the overlap (mainly 10–12mm, but up to 17mm) is secured by four copper-alloy nails with globular heads; complete nails range from 21 to 25mm long. One nave-hoop (no 3, Fig 35, 4) has been reused. A line of four holes in one end of the hoop corresponds with four notches in the other end, and shows where it was originally secured. In its second phase it was expanded to fit a very slightly greater diameter: one end was trimmed, but not in a straight line; it was cut in arcs linking the old nail-holes (which became the four notches), creating slight tags to receive the second-phase nails. This hoop was also repaired, with an iron strip on the inside, attached by iron nails at either side of a split in the copper-alloy hoop. The Kirkburn nave-hoops are similar to those from the Lady's Barrow, Arras (40–6mm wide, with an iron hoop under the cordon), Wetwang 2 (42–4mm wide), and Cawthorn Camps (*c* 30mm wide).

(iii) *Remains of wooden parts*

Both tyres have mineral-replaced wood from the felloes round the inner surfaces, tyre 2 having a particularly substantial stretch, some 560mm long including the full section of the felloe about 35mm wide and 38mm deep (but doubtless shrunk). Within that 560mm length is a butt-joint and the remains or traces of three mortice-holes for spokes, with the wood of the felloe markedly swelling around them. Part of the tongue (tenon) of one spoke survives (Fig 35, A); it is rectangular and measures 18mm (across the width of the felloe) by 14mm, being slightly shrunk within the mortice-hole.

Unfortunately this well-preserved evidence does not give a complete picture of the construction of the wheel. The three mortice-holes are not equidistant: spokes A and B are at an angle of about 30° whereas B and C are at about 27°. The former angle is consistent with a 12-spoke wheel whereas the latter is nearer to a 13-spoke wheel (which would have had spokes at an angle of 27.7°). The butt-joint in the felloe is beyond spoke C and at an angle of about 13° to it. Perhaps the most significant evidence surviving is the clear fact that the spoke tongues do not penetrate the entire thickness of the felloe: all three mortice-holes stop about 15mm from the outside. This suggests that the felloe of wheel 2 was constructed from a single length of wood (see below). The felloe of wheel 1 may well have been similar: the very clear straight break of a single butt joint survives where the felloe remains are still 27mm deep. There is no hint of any dowel or felloe clamp to secure it.

The wheels from Garton Station and Kirkburn are as large as any from a Yorkshire cart-burial, comparable with Wetwang 1 (900mm) and slightly larger than all others (*c* 700–890mm). The Kirkburn tyres are marginally narrower than any other from Yorkshire. The Garton Station wheels had twelve spokes, the same number observed in soilmarks at Garton Slack and Wetwang 3 and represented in cavities at Wetwang 1. The surviving positions of three spokes on one of the Kirkburn wheels suggest either a 12-spoke or 13-spoke wheel.

The felloes of La Tène and Roman wheels were made in two different ways. Some were constructed from a single piece of wood bent into a hoop and joined with either a butt joint or a scarf joint. Others had a felloe in several segments (usually six), dowelled together, with two spokes in each segment. The single-felloe occurs on surviving or recorded wooden wheels from Iron Age contexts at La Tène (Vouga 1923, 92, fig 9) and Dejbjerg (the latter with a scarf joint; Kossack 1971, 144, fig 28), and on Romano-British wheels from Newstead and Bar Hill (with butt joints). On the continent other wheels of this type are shown by metal felloe-clamps used to secure scarf joints (Piggott 1983, 215). The multi-felloe is represented by the wheel from Holme Pierrepont, Notts, and others from Newstead and Bar Hill (for references see Table 2). Holme Pierrepont may be particularly relevant because it is relatively near east Yorkshire and could be contemporary with the cart burials (but the dating is not conclusive – the wheel was immediately next to a canoe dated by radiocarbon to 2180±110 BP, ie about 400–100 BC). These three multi-felloe wheels had six segments and twelve spokes, consistent with most of the evidence from the Yorkshire cart-burials. But if wheels of this type had been buried in the Yorkshire graves, then the six joints left surprisingly little trace in the mineral-preserved wood on the insides of the tyres. All the surviving tyres from Yorkshire cart-burials have been carefully examined, but straight breaks in the wood have been seen only on tyres from Wetwang 2, Garton Station, and Kirkburn – and only once on each tyre. On all these tyres the wood-grain is relatively well preserved where further joints in a multi-felloe wheel would be expected, but there is no hint of them; several of the other recently excavated tyres have considerable lengths of mineral preserved wood but no sign of a joint.

More significant is the evidence of the mortice-holes for the spoke-tongues at Kirkburn: they do not penetrate the entire thickness of the felloe – and this seems to be a feature of the single-felloe wheel. Certainly the Dejbjerg and Newstead single-felloe wheels have spoke-tongues like this (Kossack 1971, 144, fig 28; Piggott 1965, 245, fig 137). The felloes of all multi-felloe wheels are completely perforated for the spoke-tongues; this is the case at Holme Pierrepont, is specifically recorded at Newstead and Bar Hill, and is a feature of all recent examples. When a

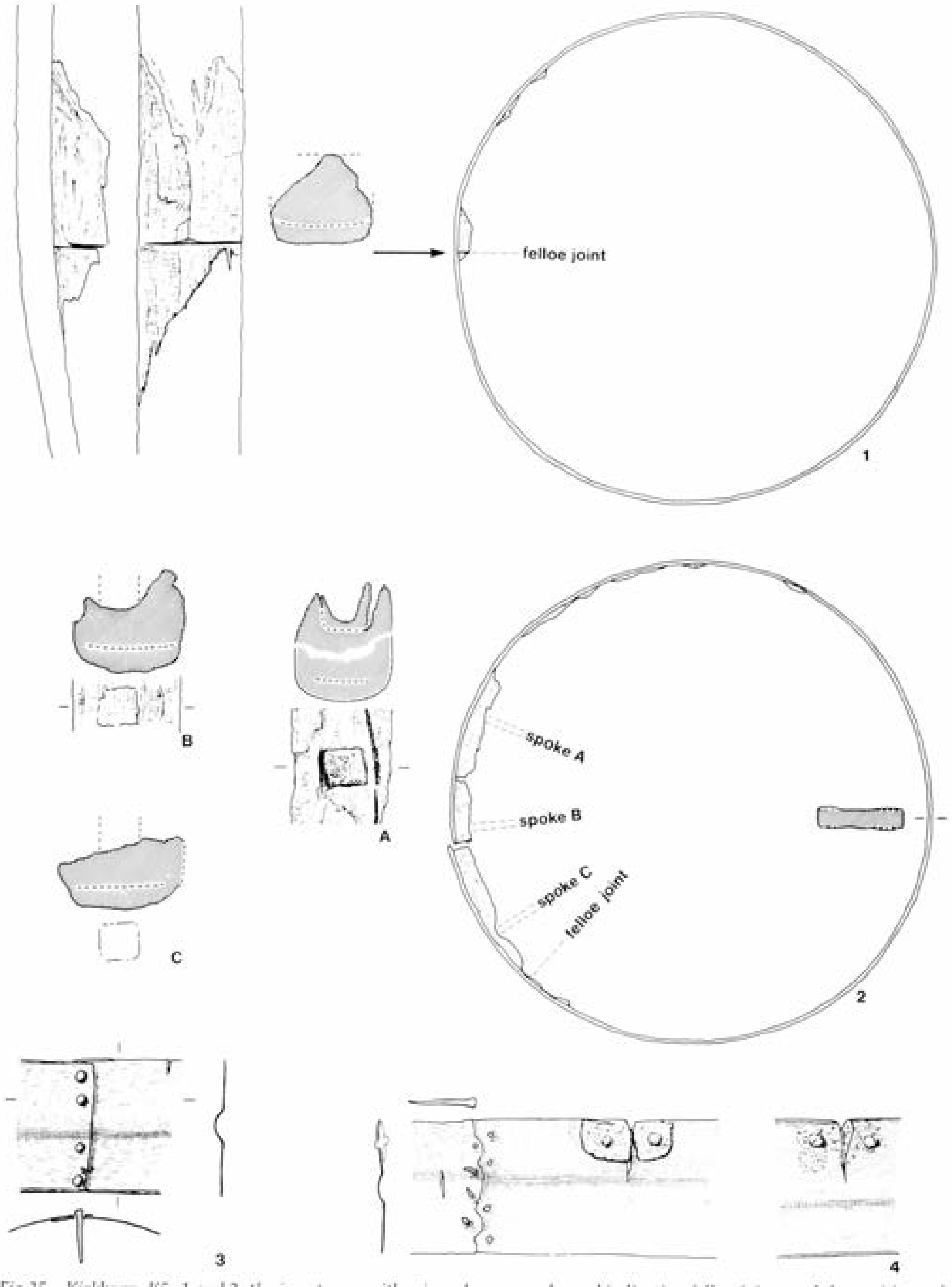

Fig 35 Kirkburn, K5: 1 and 2, the iron tyres, with mineral-preserved wood indicating felloe-joints and the positions of spokes; 3, detail of a copper-alloy nave-hoop, showing its joint; 4, detail of a copper-alloy nave-hoop, showing the joint, rivet-holes of a previous joint, and an iron patch; 1 and 2 (1:10), others (1:2)

Table 2 Measurements (mm) of Iron Age and Roman wheels from Britain

Site	*Wheel diameter*	*Felloe*	*Spokes*	*Nave length*	*Nave diameter at hoop*	*Date*	*References*
Garton Station	900	-	12	?400	128	Iron Age	
Holme Pierrepont	870	6-part	12	360	150	Iron Age	Musty and MacCormick 1973; Stead 1979, fig 13
Glastonbury X43	-	-	12	330	135	Iron Age	Bulleid and Gray 1911, 328
Glastonbury X59	-	-	-[a]	330	150	Iron Age	Bulleid and Gray 1911, 336
Glastonbury X63	790 + felloe	-	12	350	140	Iron Age	Bulleid and Gray 1911, 337–8
Newstead 1 and 2	915	single	11	395	150	Antonine	Curle 1911, 292 (pit XXIII)
Newstead 3	1040	6-part	12	405	-	Antonine	Curle 1911, 294 (pit LXX)
Bar Hill 1	875	single	11[b]	370	160	Antonine	Macdonald and Park 1906, 94
Bar Hill 2	965	6-part	12	-[c]	-	Antonine	Macdonald and Park 1906, 99
Ryton	985	presumably single	9	395	145	unknown	Piggott 1949

The measurements are taken from the publications, and where necessary are converted into metric

Key: a, an unfinished nave; b, 10 spokes, according to Bulleid and Gray 1911, 339; c, the nave 'was solid, and the axle revolved with the wheel'.

wheel of this type is made, the spoke-tongue is inserted right through the felloe and its end is notched to receive a wedge to tighten the joint (Sturt 1948, 107; Jenkins 1961, 68). So the Kirkburn evidence indicates a single-piece felloe. The only surprise is the absence of a metal clamp, which was used on the continent (for scarf joints) and at Newstead (for a butt joint). But there is no record of a metal clamp on the single-felloe wheel from Bar Hill nor on the undated single-felloe wheel from Ryton (though there seems to have been only the slightest trace of any metal surviving on that wheel). One of the wheels from Danes Graves has a possible metal felloe-clamp (Stead 1979, 41), and there is a convincing example from Wetwang 2 (Dent 1985a, 88).

Wheel 1 from Garton Station provides the most reliable evidence for the length of a Yorkshire nave: 280mm between nave-hoop centres and a projection of perhaps 60mm beyond suggests an overall length of about 400mm. This is comparable with the length of the Roman naves from Newstead and an undated example from Ryton, but slightly longer than those from Holme Pierrepont and Glastonbury (Table 2).

2 Linch-pins

Garton Station (Fig 36)

1 (GW/JN) Max length 140mm, ring-head diam 43mm
2 (GW/JK) Max length 154mm, ring-head diam 50mm

A pair of iron linch-pins, corroded together in the grave (Fig 122, 7 and 8), have ring-heads and long curving shanks; each has a perforation through the shank, just below the ring-head.

Between the two linch-pins – corroded onto the shank of no 1 but touching the ring of no 2 – is a small iron ring, 28×24mm. It adjoins the perforation in the shank of no 1 and is surely similar in function to the miniature terrets in the Kirkburn cart-burial (see below). Mineral preserved skin product with animal fibres, observed on the small ring and on the foot of the shank of no 2, may be the remains of a thong.

The Garton Station linch-pins are unlike any others from Yorkshire, but can be matched by a pair from a cart-burial group at Jonchery-sur-Suippe, Marne (Stead 1965a, fig 16, 3; Musée des antiquités nationales 27728).

Kirkburn

(i) (KR/AY) An iron and copper-alloy linch-pin, length 119mm (Fig 37)

The iron shank is rectangular in section, *c* 15×10mm, and the two copper-alloy terminals are 55–57mm apart (the lower terminal slopes). The upper terminal has been perforated (one end now blocked by iron corrosion), the hole being defined at each end by an arch in high relief. Between the two arches, on one side only, is the outline of a pelta-like motif with a central raised ring enclosing seven dots – a 'berried rosette'. On the top of the upper terminal is a relief triskele motif, terminating in 'bird heads', surrounded by a raised beaded border. The lower terminal ends in a decorated disc, a smaller version of the design on the top. The bottom of the upper terminal is very slightly worn.

Corroded onto the top of the shank (Fig 37, 3) was a copper-alloy 'miniature terret', width 32mm (Fig 37, 2). Rounded on one side, quite flat on the other, it was designed to take a strap or thong, no more than 7mm wide. At one point opposite the strap-bar there is a quite marked wear-facet.

(ii) (KR/BM) An iron and copper-alloy linch-pin very similar to KR/AY, length 120mm (Fig 38)

The exposed iron shank is 55–56mm long, rectangular in section, 13/14×11mm, and markedly off-centre to the upper terminal. The upper terminal is slightly lop-sided, its perforation is clear of corrosion, and there are wear-facets at two points on the edge of the upper disc (arrowed in illustration). The terminals

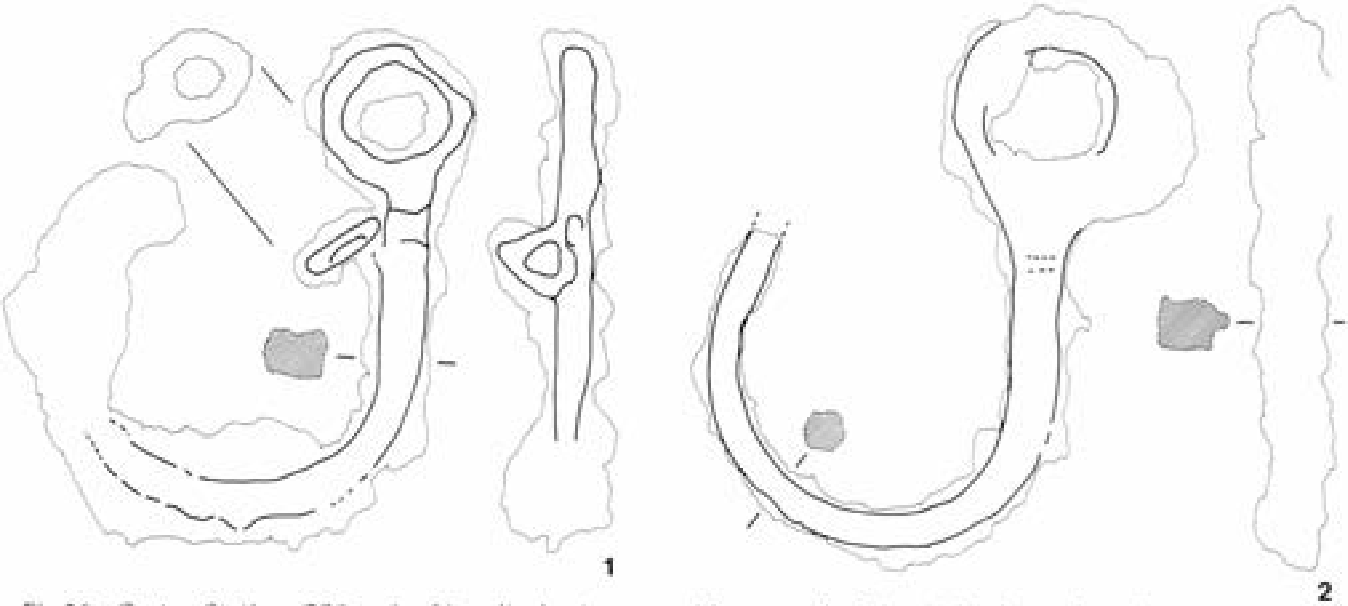

Fig 36 Garton Station, GS6: pair of iron linch-pins, one with an attached ring (1:2); drawn from X-rays

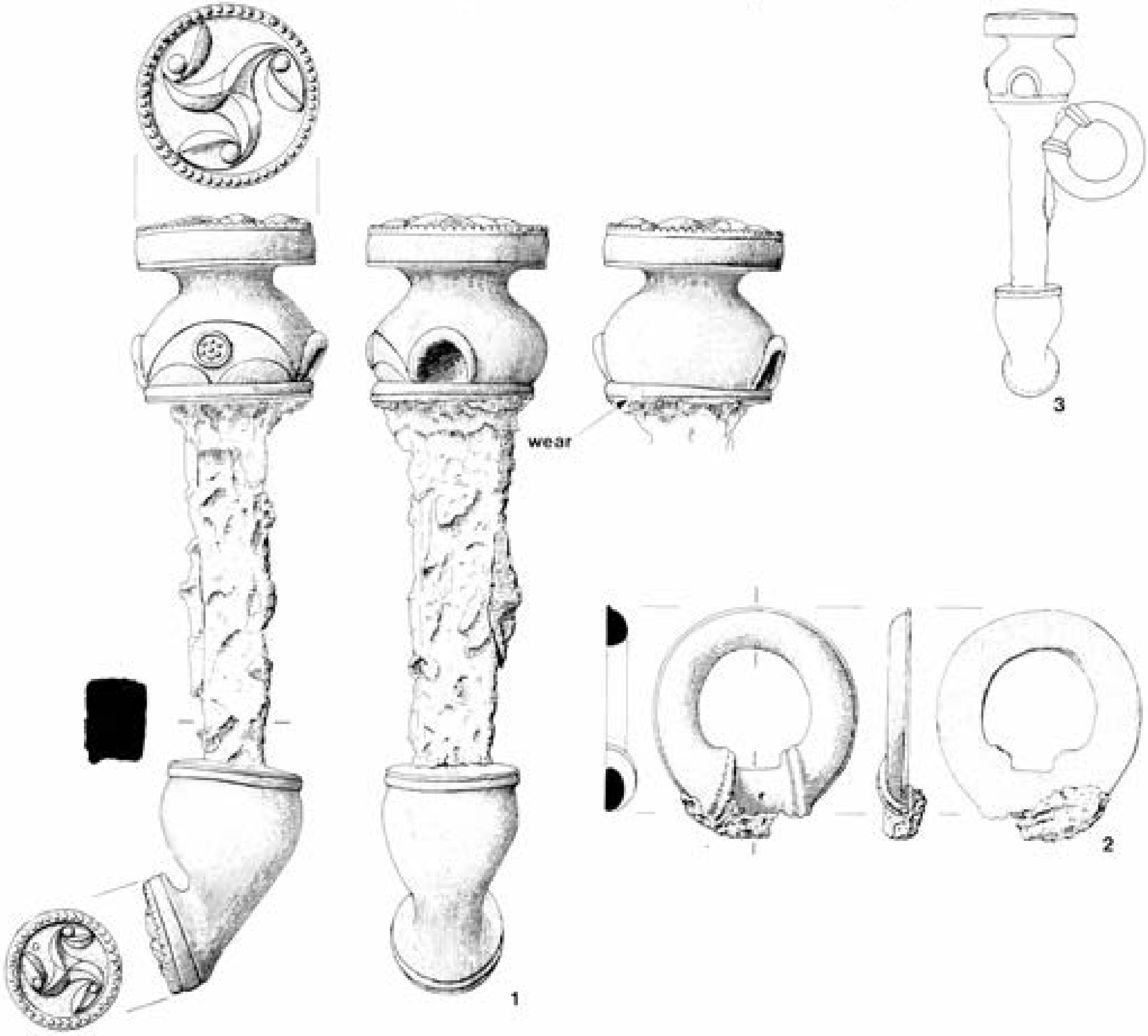

Fig 37 Kirkburn, K5: 1, copper-alloy and iron linch-pin; 2, copper-alloy 'miniature terret'; 3, sketch showing 1 and 2 as found; 1 and 2 (1:1), 3 (1:2)

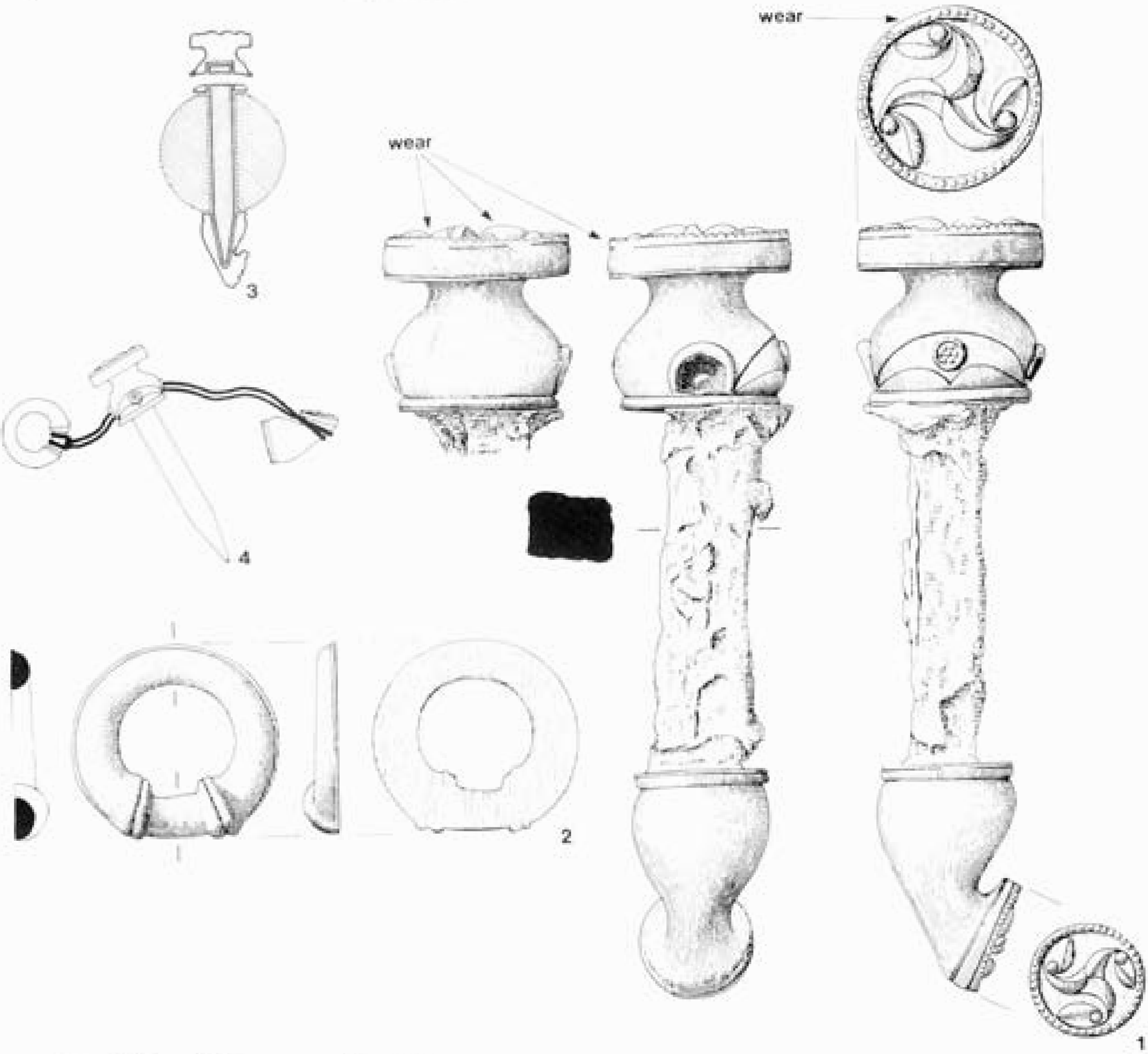

Fig 38 Kirkburn, K5: 1, copper-alloy and iron linch-pin; 2, copper-alloy 'miniature terret'; 3, sketch showing linch-pin in axle, in section; 4, sketch showing 'miniature terret' attached to linch-pin; 1 and 2 (1:1), 3 and 4 (1:2)

are decorated like KR/AY. There is a strip of mineral preserved animal skin with fibres/fur round the top of the iron shank.

A copper-alloy miniature terret (KR/BL, Fig 38, 2), found near the upper terminal of this linch-pin, is very similar in size to the one corroded onto KR/AY, but has no wear-facets.

The Kirkburn linch-pins belong to a well-known type (Spratling 1972, Group III – vase-headed linch-pins) already represented in the Arras Culture by an undecorated specimen from the King's Barrow. Elsewhere in southern England several decorated examples are known, including one from Owslebury, Hants (Collis 1968, pl xii), and the type was manufactured at Gussage All Saints (Foster 1980, 18). The close association between miniature terrets and vase-headed linch-pins at Kirkburn is surely no coincidence, and indeed it can be matched at Coll-fryn, Powys (Spratling forthcoming) where a miniature terret had been fused by intense heat to the head of a linch-pin. The two types were found in the King's Barrow, Arras, and were also associated at Trevelgue, Cornwall ('found together' in the fallen debris of the wall of a hut; Ward Perkins 1941, 65). A very different linch-pin at Garton Station had a small iron ring in a comparable position (Fig 36).

The way in which the Kirkburn linch-pins were made and used is not at all obvious. The square-section shank was presumably intended to fit tightly into the perforation in the axle, and it must have been possible to detach it easily to remove the wheel. As the copper-alloy terminals are considerably larger than the shank, only one of them could have been cast-on and the other must have been slotted-on when the linch-pin was in position. At first sight it might seem that the foot would have been cast-on and the head then slotted-on and secured by a peg through the perforation in the head and the shank.

But further consideration suggests a more complicated arrangement. The perforation through the shank must have had some other function, because it is a regular feature of linch-pins made entirely of iron (cf Garton Station, above); and X-rays show that the head of the Kirkburn shank is straight, whereas the foot tapers and might be better suited to receive a slotted-on terminal (Fig 38, 3). If the perforation through the head was not needed to secure the shank, perhaps it received a thong to which the miniature terret was attached. This would have helped to secure the lower, slotted-on terminal (Fig 38, 4) whose moulding might have been designed for the purpose. Lashed in this way, the linch-pin would not dislodge accidentally, and could be quickly untied to remove the wheel. In general this seems a reasonable explanation, but in detail the precise position of the miniature terret is obscure: it could have secured one end of the thong and adjoined the head of the linch-pin, but there are no wear facets to support this interpretation; its flat back could have been inset in the axle; or, perhaps more likely, it could have linked two lengths of thong, to give purchase when tying the knot.

3 Yokes

Garton Station

The yoke was represented by a line of five terrets (Fig 42), the central one being larger and more elaborate than the others.

1–4 Four similar terrets (Fig 39, 1–4): 1 (GW/JJ) width 59mm, height 49mm; 2 (GW/JG) width 60mm, height 51mm; 3 (GW/JH) width 59mm, height 51mm; 4 (GW/JM) width 60mm, height 52mm; strap-widths (measured on the inside of the strap-bars, between the terminal mouldings) 23, 26, 24, and 24mm respectively

These terrets are entirely cast in copper-alloy. Their terminal mouldings each have a deep central groove and there is slight, shallow decoration on the outsides of the loop. A central line round the edge divides to create three elongated panels; those at the sides have a central low-relief ring-and-dot whilst the panel at the top has two similar, slightly smaller, adjoining rings-and-dots within a large circle. One of the strap-bars (JG) has a central scratched X. All four terrets (and the large terret, no 5) had traces of mineral preserved leather/skin thongs on the strap-bars, but there was no hint of wood.

5 The large terret (Fig 39, 5, GW/JI) width 92mm, height 72mm; strap width (internally) 46mm

It has a wide, flat, down-curved iron bar on to which a decorated copper-alloy loop has been cast. The copper-alloy loop has moulded terminals, three settings with applied ornament, and two pairs of relief ornament. The three settings hold domed discs of (apparently) bone, highly polished and secured by copper-alloy rivets whose shanks penetrate to the inner surface of the terret and whose large circular heads have a raised border and dots ('berried rosettes'; two have dots of the same size – six surrounding one in the centre – and the other has nine surrounding a larger central dot). A groove round the circumference of the terret (interrupted by the upper pair of relief ornaments) links the settings and expands to enclose them. The cast relief ornaments are constructed of rings enclosing two dots, lobes, and trumpet motifs. The lower pair, between the side settings and the terminal mouldings, have rings and double dots of unequal size, with a single lobe springing from the smaller ring and touching the larger, superimposed on two trumpet motifs – the whole design in the shape of a reversed S. The upper pair of relief ornaments have small rings and double dots of the same size in an arrangement like the first pair but with two additional lobes. The upper pair are not matched exactly: one of the ring and double dot motifs is arranged the opposite way to the other three.

There are no close parallels for the Garton Station terrets. Their nearest relatives are probably those from Wetwang 2, and they should be considered with Spratling's 'knobbed terrets with domed knobs' (1972, Group IXA), a type that seems to have had a long life and is well represented in north Britain (MacGregor 1976, 46–7, 69–70, and map 10).

Kirkburn

The yoke was represented by a line of five terrets with a strap-union beyond the line at each end (Fig 42).

1–5 Five terrets (Fig 40): 1 (KR/AS) width 64mm, height 49mm, 10 lip mouldings; 2 (KR/AT) width 59mm, height 47mm, 9 lip mouldings; 3 (KR/AV) width 57mm, height 47mm, 8 lip mouldings; 4 (KR/AW) width 61mm, height 50mm, 10 lip mouldings; 5 (KR/AU) width 75mm, height 57mm, 11 lip mouldings; strap-widths (internally) 27, 18, 21, 22, and 31mm respectively

The five terrets are of similar design; no 5 is much larger, and the others differ slightly in size. Each has a corroded iron strap-bar, straight or down-curved, with a cast-on copper-alloy loop; the larger terret has a thinner, flatter strap bar, slightly down-curved. There are deeply moulded terminals at either side of the bar and 8 to 11 equally massive lip-motifs round the circumference.

The Kirkburn terrets are quite similar to, but more massive than, those from the King's and Lady's Barrows at Arras (Stead 1979, 50, fig 17, nos 2–4). The type is known from southern England (Spratling 1972, Group V) where it always has a copper-alloy strap-bar (the Yorkshire examples have iron bars), and it was manufactured at Gussage All Saints (Foster 1980, 11, Variety XII).

6 and 7 Two strap-unions (Fig 41): 1 (KR/BD) 52×52mm; 2 (KR/BE) 54×54mm; they would have taken straps 20 to 21mm wide

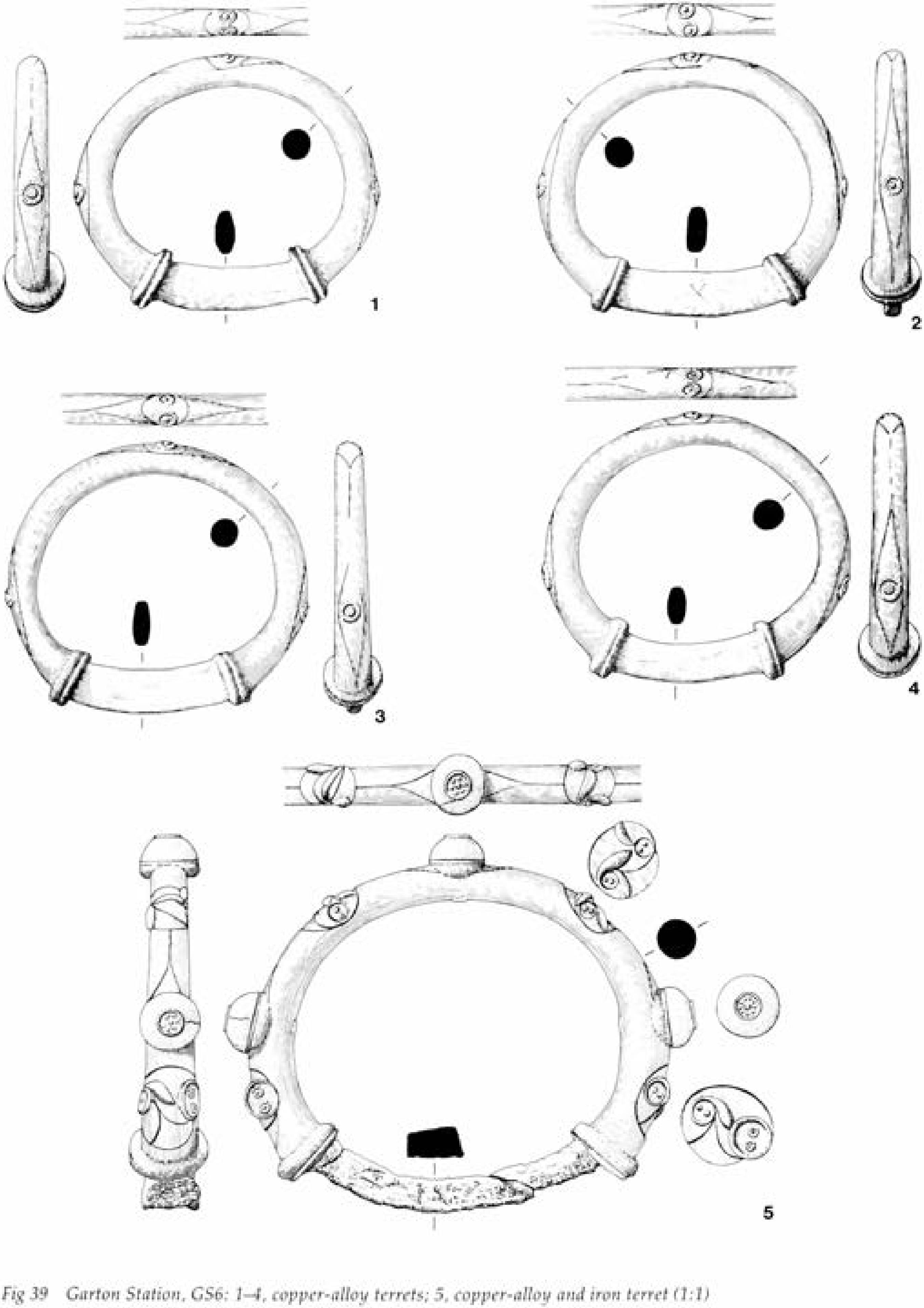

Fig 39 Garton Station, GS6: 1–4, copper-alloy terrets; 5, copper-alloy and iron terret (1:1)

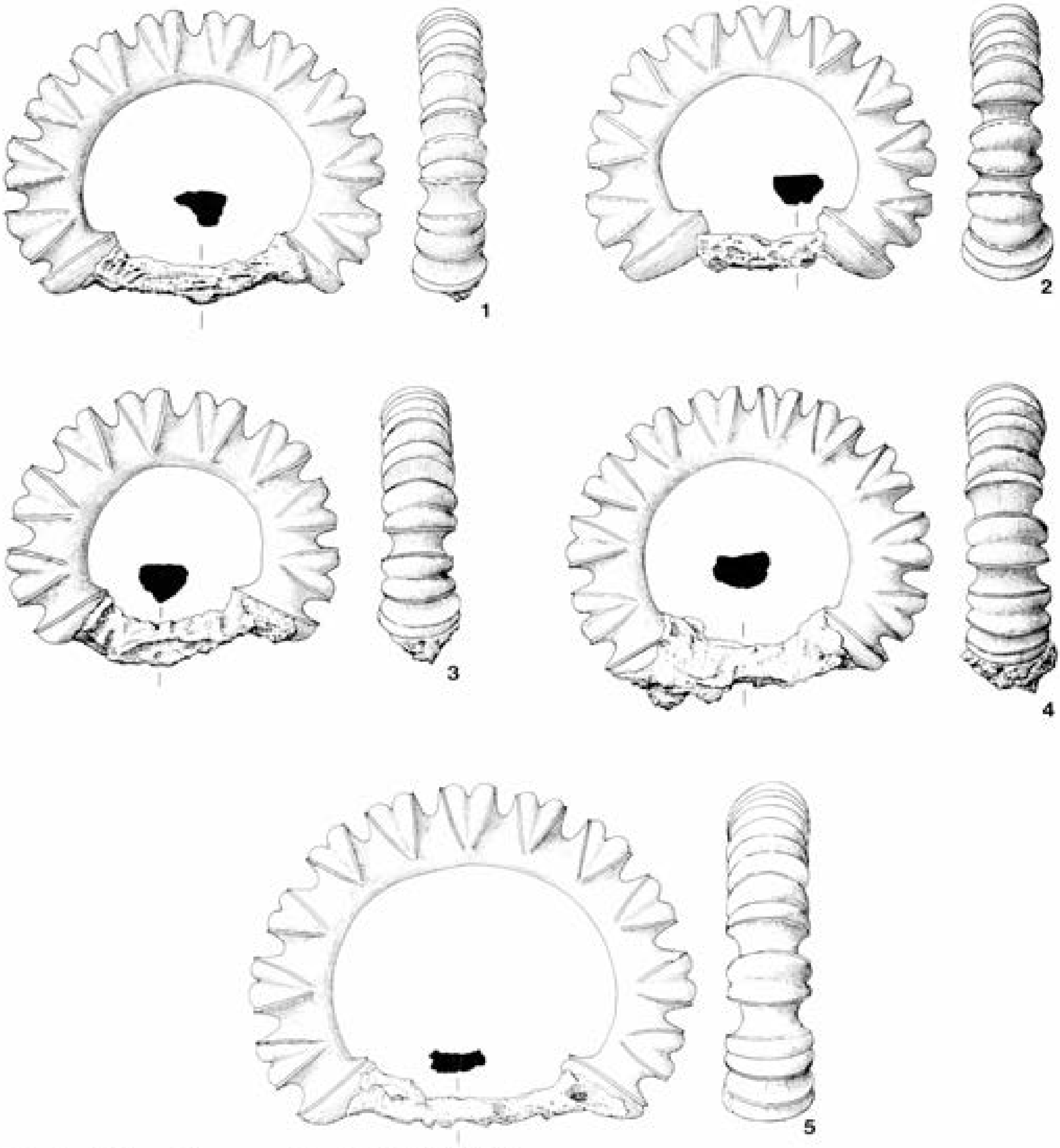

Fig 40 Kirkburn, K5: copper-alloy and iron terrets (1:1)

The two figure-of-eight strap-unions are cast in copper-alloy. Each has two linked rings with off-centre perforations bordered by raised dots within a lunate moulding (on no 2 the moulding is an asymmetric ring). At the sides strap-bars of circular section are attached to the rings by their terminal mouldings, with raised dots round the front. The ends of the mouldings have concentric-ring ornament. The linked rings are plain and flat on the reverse.

The Kirkburn strap-unions are quite similar in design and in their position in the grave to the two slightly smaller examples from the Garton Slack cart-burial (Stead 1984a, 32, nos 15 and 16). Clearly they were attached to the ends of the yoke (Fig 42) and presumably used to adjust the girth. For strap-unions in general see Taylor and Brailsford 1985, where the Garton Slack examples are illustrated in pl 5b.

All six cart-burials recently excavated had yokes represented by lines of five terrets (one had been lost at Wetwang 3 when the end of the grave was damaged) and two – Garton Slack and Kirkburn – had had strap-unions suspended from the ends of the

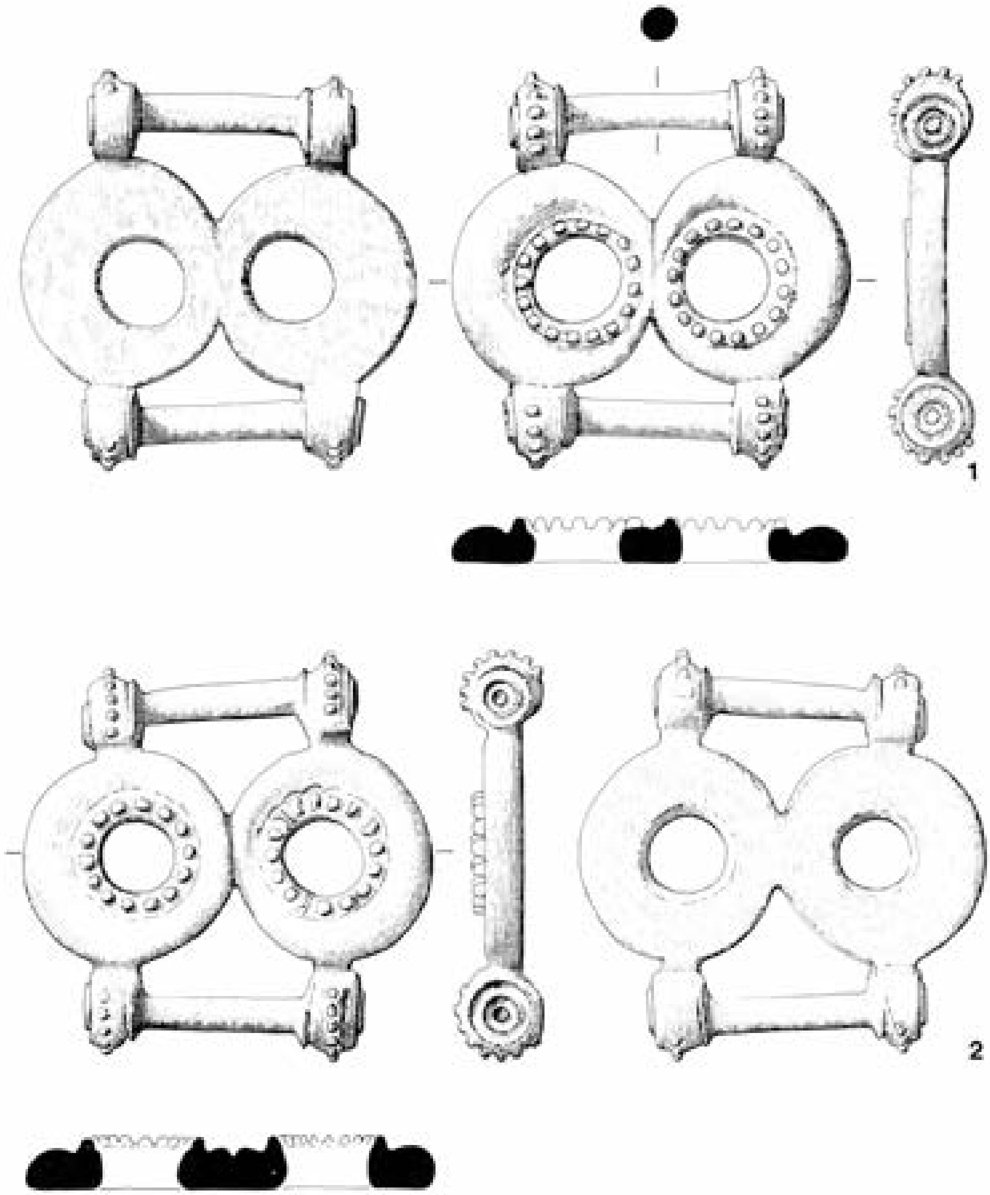

Fig 41 Kirkburn, K5: copper-alloy strap-unions (1:1)

yokes. This provides further confirmation that a set of British Iron Age terrets comprised five pieces, the central one being larger than the others. The spacing between the terrets is fairly uniform (Fig 42) and leaves no doubt that they were firmly attached to the yoke in the grave. This is particularly interesting with regard to the large terret; hitherto it was assumed to have occupied a central position along the line of the pole, but it could have been central to the yoke, or attached to the end of the pole, or the front of the carriage (Stead 1979, 52). The recent excavations show that the central terret was strapped to the yoke even when the yoke had been detached from the pole. The two pairs at the sides were for the reins, and the central terret presumably housed the straps or thongs that helped to secure the yoke to the pole.

Measurements of the spacings between terrets in six graves should give some idea of the size of a Yorkshire Iron Age yoke. The main problems here are that the terrets could have moved slightly as the yoke disintegrated; the yoke could have been upright or on its side; and the yokes in the six graves need not have been the same length. The line of terrets at Wetwang 3 is incomplete; Wetwang 2 seems to have a terret out of position (2 and 3 are too close together) and so does Garton Slack (3 and 4 are too close). But the terrets from Garton Station, Kirkburn, and Wetwang 1 are at intervals that suggest little movement after deposition: Garton Station and Wetwang 1 are 1m apart in overall length and Kirkburn is 960mm. It seems that a typical Yorkshire yoke had terrets at intervals of 0/300/500/700/1000mm, measurements that correspond almost exactly to those taken from a wooden yoke found at La Tène (Fig 42; Vouga 1923, 95, pl xxxv, but this yoke may have been used for oxen rather than ponies).

The position of the yokes gives some hint of the ritual and rules that must have been observed at the funerals. Without exception those found in the

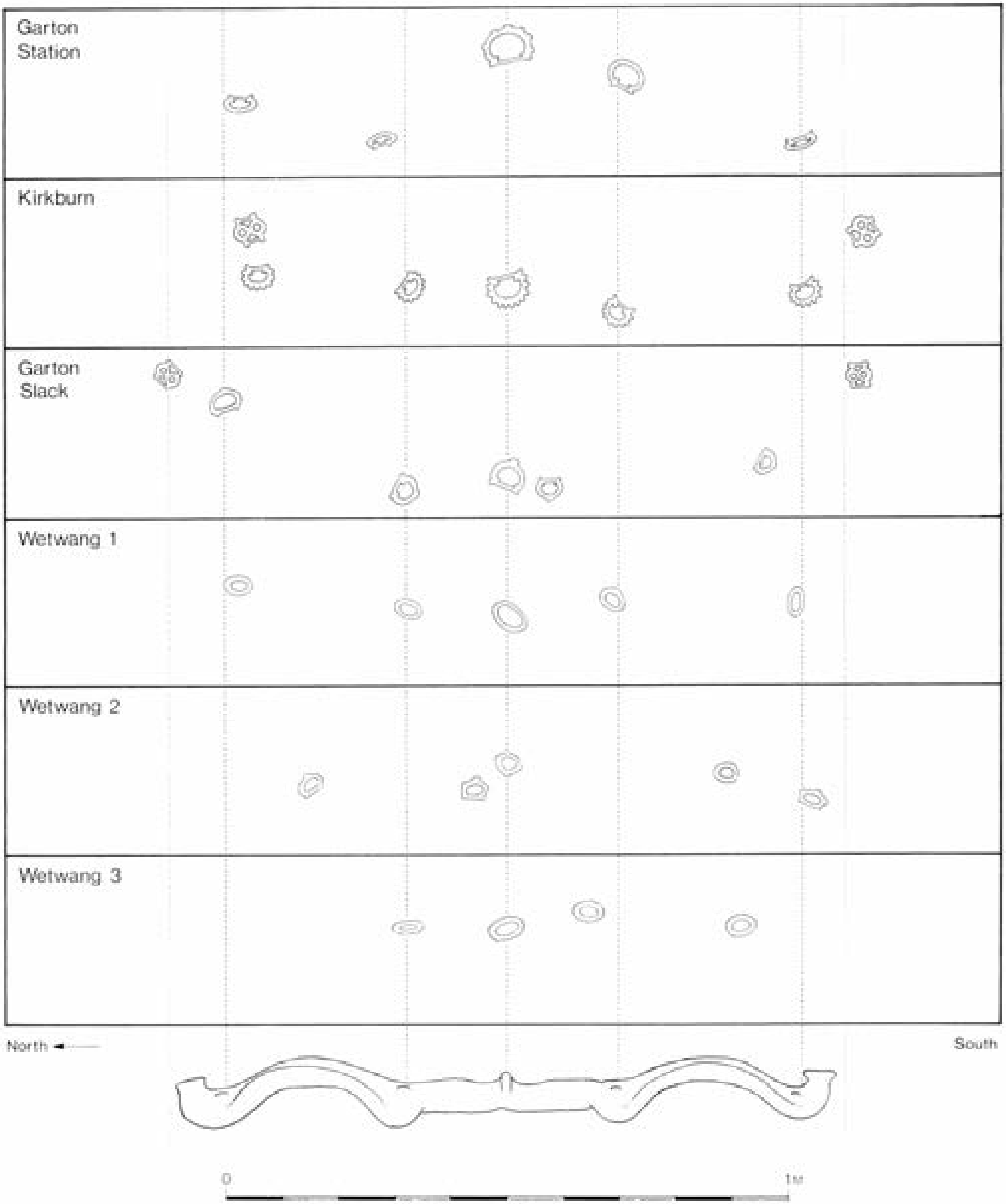

Fig 42 Relative positions of terrets and strap-unions in six Yorkshire cart-burials, with a yoke from La Tène drawn at the same scale

recently excavated graves had been placed alongside and to the west of the body, usually behind the skeleton, though at Wetwang 1 the skeleton faced the yoke. At the five sites where the wheels covered the floor of the grave the yokes had been buried on top of the west wheel. At Garton Station the yoke was in the usual place relative to the body, even though the wheels were in an exceptional position. It may well have been that the yoke occupied the same position in the King's Barrow, Arras (Stillingfleet 1846, 29), and it was in a comparable position at Danes Graves (Stead 1979, fig 5; the orientation of the Danes Graves cart-burial is confusing – note that Mortimer's plan has 'west' at the top of the page).

4 Horse-bits

Garton Station

Two iron horse-bits (Fig 43): 1 (GW/JL) rein-rings 89mm diam and 94×85mm; rein-rings and loops length 124 and 119mm; central link length 72mm; overall length *c* 280mm; 2 (GW/JP) rein-rings c 92mm diam and 93×87mm; rein-rings and loops length 125 and 124mm; central link length 82mm; overall length *c* 290mm; firmly corroded as deposited in the grave, but drawn out for clarity in Figure 43

They are 'loop link snaffles' (Palk 1984, 20, 58) whose

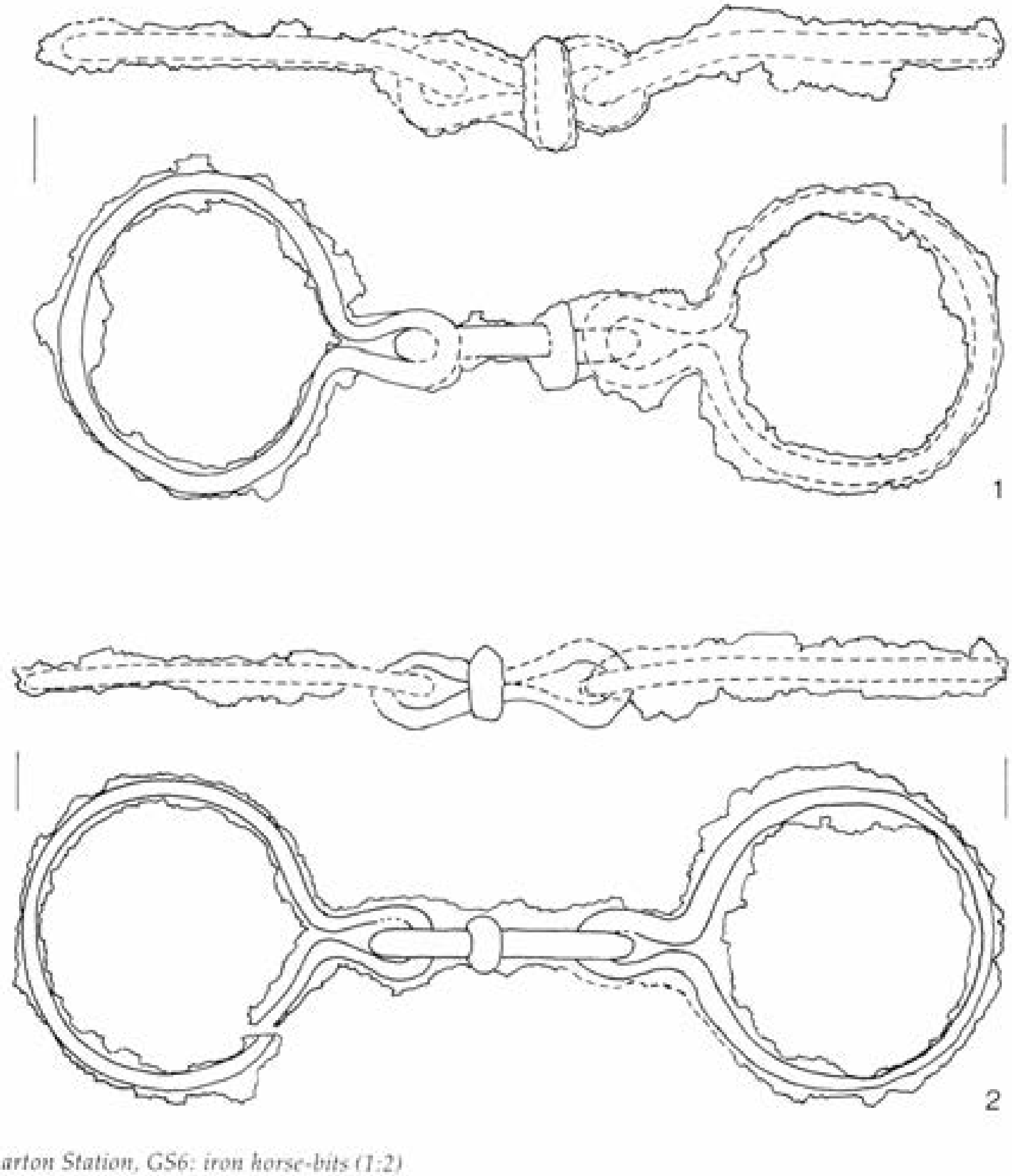

Fig 43 Garton Station, GS6: iron horse-bits (1:2)

rein-rings have a loop at one side. The loop functions as the side-link in a three link bit, and is set at a slight angle to the rein-ring. The central link has been waisted to create two loops, with an iron collar round the waist.

There is only one other horse-bit certainly of this type, from Llyn Cerrig Bach. Its loops are more sharply angled to the rein-rings, and its central link lacks the collar (Fox 1946, 83, pl xxviii, no 56). Palk (1984, 58) suggests that the Madmarston bits might have been similar. The angle between loop and rein-ring at Garton Station (more marked at Llyn Cerrig Bach) invites comparison with the fixed angle of side-links to rein-rings at Kirkburn and Arras (see below).

Kirkburn

Two copper-alloy and iron horse-bits (Fig 44): 1 (KR/BF) rein-rings 65×74mm and 65×76mm; side-links length 49 and 52mm; central link length 55mm; overall length (as drawn) *c* 217mm; 2 (KR/BH) rein-rings 66×73mm; side-links and central link length 54mm; overall length (as drawn) 213mm; corroded in the position in which they were deposited in the grave but drawn out for clarity in Figure 44

They are three link bits, or double-jointed snaffles (Palk 1984), with the central link in iron – a double loop with a collar round the middle like the Garton Station bits – and the side-links in iron and copper-alloy. The side-links have been formed by forging an iron ring with a stem and then casting the copper-alloy bulbous terminal on to the stem. The rein-rings are of iron encased in copper-alloy (a split all the way round on the inside), and were never intended to move within the side-link, to which they were fixed at a marked angle: 156/158° (no 1) and 150/159° (no 2). The bulbous terminal must have been cast-on to both the rein-ring (already encased in copper-alloy) and the iron stem of the side-link in the same operation (each terminal has a patch adjoining the inside of the rein-ring on one side only: in Fig 44, 1, the patch on the left terminal is shown in the side view and the patch on the right terminal is shown in plan). Radiographs confirm that the iron core of the

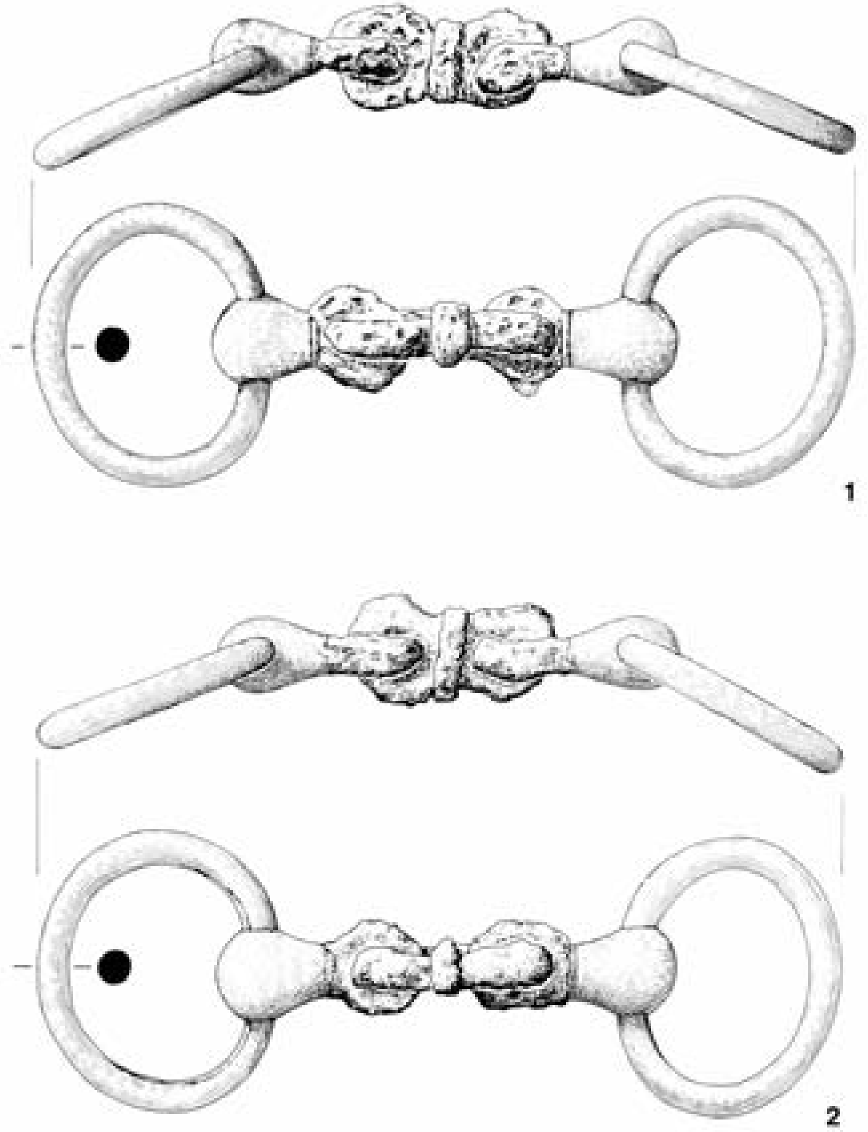

Fig 44 Kirkburn, K5: copper-alloy and iron horse-bits (1:2)

side link is separate from the core of the rein-ring; it was not constructed like the loop-link from Garton Station. When both side pieces had been made, they would have been linked with the central double-ring in iron.

The overall design of these bits, especially the fixed angle of the rein-rings to the side-links, invites comparison with those from the King's Barrow and Lady's Barrow at Arras, where the angles of rein-rings to side-links were 152° and 145°. The Kirkburn bits lack the stop-studs on the rein-rings at either side of the side-links (such features would have had no function on a bit with a fixed ring, but they nevertheless appear on the Arras bits), and have iron and copper-alloy in the links – the Arras bits employed iron only in the core of the rein-rings. The closest parallel for the construction of the Kirkburn side-links is Wetwang 2, whose central link was also in iron but with a copper-alloy collar; but the rein-rings of the Wetwang 2 bits were free to move within the side-links. Perhaps the fragmentary Ulceby bit (Palk 1984, 38–9) was constructed in the same way; its broken side link is in part hollow and could have lost an iron component. The Garton Slack bits (Stead 1984a, 32; Palk 1984, pls i–iii) also have three links, but are made entirely of iron and had free-moving rein-rings.

5 Mail tunic from K5

The mail tunic had been draped over the corpse, face down and inverted (Figs 45 and 127). The hem of the skirt had crossed its chest and the shoulder-flaps had been draped over its legs. In the ground the mail was longer on the west side (0.92m) than on the east (0.85m) because the east side had sunk between the knees and the chest whereas the west side was fairly level over the hips; its width was about 0.48m.

As it had corroded some areas had fragmented, while others had formed a solid layer over the skeleton, in places delicately bridging voids where the body and clothing had decomposed. The fragility of the remains, and the voids, were hazards enough, but another problem faced the excavators and conservators. In such a rich grave there might well have been other artefacts masked by the mail; the warrior would surely have had a sword, perhaps even a shield, and it was possible that the corpse had been speared (p 33). The gradiometer and metal detectors were regularly used to give forewarning of metal artefacts, but here the response of the mail and tyres rendered them useless. Field radiography was impossible in such a complex situation, even if it had been available. A Malton veterinary practice generously lent and operated a portable Ultrasound Scanner, but the results were negative. Block-lifting was out of the question: there were too many voids, complicated by the underlying skeleton and tyres, and the possibility of other artefacts as yet undiscovered. Instead, it was decided to consolidate and lift the mail, leaving the skeleton and any other artefacts in the ground (for a full account of the conservation and lifting see Dove and Goldstraw forthcoming); the operation was successful and the mail was moved to the museum for further conservation. In the event, the only artefact under it was a small copper-alloy toggle.

Although complete when buried, the mail tunic is now badly corroded and partly fragmented; it can never be restored to its original state, but conservation and radiography have revealed full details of its construction. Each link is a ring 8.2–9.2mm in external diameter, constructed from iron wire 1.5–1.9mm thick; each is butt-jointed and linked with four other rings (Fig 45, d). As found, the tunic comprised two superimposed layers of mail, the front and the back, with a single layer for the shoulder-flaps extending from the back. There was no hint of leather or fabric between the two layers, and no indication of organic binding at the collar, hem, or sleeve. Some mineralised fabric on the underside was all that remained of the covering or clothing of the corpse (p 122).

When worn, the shoulder-flaps were secured by their studs, which engaged the hooks of a breast-fastener attached to the front of the mail (Fig 45, e). Each shoulder-flap had a main stud (Fig 45, a and b): its deep head, 24mm in diameter, was slightly concave on top and the shank was 27–30mm long. There were two circular iron washers on the shank, a larger one (29–30mm in diameter) in the centre and a smaller one (22–25mm in diameter) at the back. The shank passed through the mail, which was secured between the two washers, and the breast-fastener would have been hooked onto the shank between the larger washer and the head. In one of the shoulder-flaps (the left one, as worn) there was a second stud (Fig 45, c) with a very similar dished head but a short shank and only one washer (about 20mm in diameter); the shank went through the mail, with the head on the front and the washer on the back. The function of this second stud is unknown: it could have secured a cloak, or perhaps it was merely decorative (but there was no hint of a corresponding stud on the right shoulder-flap).

The breast-fastener (Fig 45, f, length 197mm) is a length of iron with hooked S-shaped terminals. The central part is recessed, and attached to the mail by a stud like those in the shoulder-flaps with a dished head 23mm in diameter and 8mm deep; its shank passed through the links and was secured on the underside over a large thin washer about 42mm in diameter. The fastener would have been held partly by the rivet and partly by clamping the mail between the strip and the washer.

Mail is known from a mumber of Iron Age and early Roman contexts, and its links were made in three ways: butted, as at Kirkburn; riveted, where the butt ends were overlapped, flattened, and riveted together; and whole, punched from iron sheet (and used in combination with one of the other methods). Usually the rings were linked in a four-in-one arrangement, as at Kirkburn, and indeed that seems to have been the normal practice in other periods (Burgess 1953a; 1953b). The only other Iron Age mail from Yorkshire comes from the Stanwick hoard, deposited about the middle of the first century AD, perhaps just in advance of the Roman conquest (MacGregor 1962, 28 and nos 117–20). Further south, mail has been found in two British cremation buri-

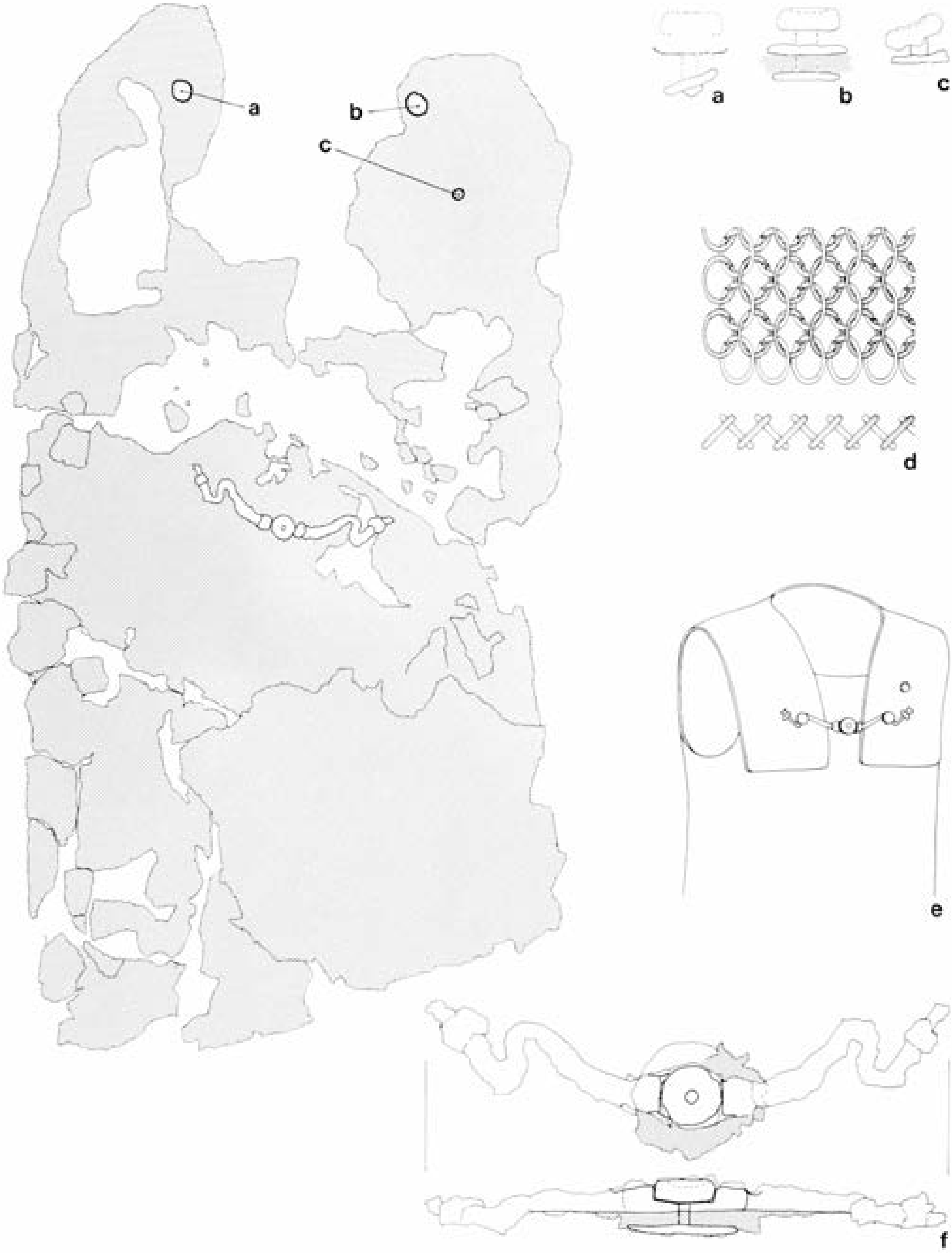

Fig 45 Kirkburn, K5: *mail tunic after conservation (the underside as excavated); a and b, studs in the shoulder flaps; c, a smaller stud in the same shoulder flap as b; d, detail to show the construction of the mail; e, sketch showing the fastening of the shoulder flaps; f, breast-fastener from the centre of the mail; on a–c and f the mail in section is represented by tone. Scales: mail tunic (1:5); a–c and f (1:2); d, approximately full size*

als, at Lexden (after *c* 17 BC; Foster 1986, 82–8) and Baldock (not yet fully published, but roughly contemporary with Lexden; Selkirk 1983, 72). Other finds that might have been pre-Roman are from the Woodeaton temple site (but unstratified, so possibly Roman; Jope 1957) and Maiden Castle (from a 'Belgo-Roman' level, but perhaps from ceremonial dress rather than mail; Wheeler 1943, 284). Hitherto, then, dated examples of mail in Iron Age Britain have been confined to a late stage in La Tène III; Kirkburn is two centuries earlier. In construction, Kirkburn uses the simplest technique – butted links. The Stanwick mail (examined by Spratling 1981, 14, note 21) was also made of butted links, but the others had rows of riveted links alternating with whole links (at Lexden and Woodeaton, examined by Jope 1957) or butted links (Baldock). Presumably the inclusion of whole or riveted links would offer more resistance to weapons than simple butted links.

On the continent the most interesting comparisons come from the metalwork deposit at Tiefenau, in Switzerland (Müller 1986) and from a cremation grave at Ciumeşti, in Romania (Rusu 1969). Only fragments of these continental mail tunics survive, but they are constructed from butt-ended wire as at Kirkburn. The conserved Tiefenau fragment has larger links (13mm in diameter) made from 1mm thick iron wire, and each is linked with six others to produce a particularly close-knit fabric (for which the larger rings would have been essential). At Ciumeşti most of the links are about the same size as at Kirkburn (8.5–9.2mm in diameter), made from wire 0.8–1.8mm thick (some are finer, 7.2–7.5mm in diameter, from wire 1.2–1.4mm thick), arranged in a four-in-one system exactly the same as at Kirkburn; the comparable studs were elaborately decorated. The Ciumeşti grave has been dated to a late stage in La Tène I, but the Tiefenau find has La Tène II and III artefacts, including Nauheim brooches. Small fragments of mail from a warrior-burial (?late La Tène I) at Horný Jatov - Trnovec nad Váhom, Slovakia, have not been studied in detail (Benadik *et al* 1957, 32 and pl x). The deposit of artefacts at Hjortspring, Denmark (Rosenberg 1937; Jensen 1989), interpreted as the equipment of a defeated army, included between 10 and 20 sets of mail, but they had been reduced to little more than rust-stains. Recent radiocarbon dates suggest that the Hjortspring material was deposited in the second half of the fourth century BC.

The Kirkburn burial joins a select group of finds from Denmark, Czechoslovakia, and Romania that date from the latter part of La Tène I and include the earliest mail from Europe. Although not well preserved, the Kirkburn mail is certainly the most complete survivor of the group.

A fine stone statue of a Celt wearing a mail tunic was found at Vachères and is now in the Musée Calvet at Avignon; it probably dates from the first century BC or AD, and is Roman rather than Celtic in style, but the warrior wears a torque (Benoit 1955, pl lxiii; Robinson 1975, 164, pl 461). The shoulder-flaps seem to have been bound in leather, and the end of a breast-fastener protrudes from under a cloak. Below the breast-fastener each shoulder-flap has a stud with concave head, as at Kirkburn. Some of the Entremont statues may also represent Celts in mail tunics, with prominent breast-fasteners (Benoit 1955, pls xlvi, xlvii, and lv; Robinson 1975, pl 462). It may be that the Celts invented mail; certainly Varro (*De Lingua Latina*, v, 116), writing in the middle of the first century BC about the origin of Latin words, implies that the Romans adopted mail from the Celts.

6 Miscellaneous objects from K5

Copper-alloy toggles (Fig 46)

1 (KR/AR) 24×24mm

A pair of linked rings, with a triangular strap-loop on the back. Both rings and triangle are rounded on the outside and flat on the inside.

2 (KR/AQ) length 29.5mm

A pair of linked spheres, each with a flat disc at the end, and a small curved strap-loop.

3 (KR/DD) length 19mm

A pair of adjoining domes, with a rectilinear strap-loop grooved on the back and sides.

The three toggles were found more or less in a straight line at the foot of the grave. Nos 1 and 2 were about 0.3m apart and no 3 was roughly 0.5m away. The precise position of no 3 is unknown; it was under the south-east shoulder of the mail and was dislodged when the mail was lifted. Although nos 1 and 2 were near the end of the yoke, there is no reason to suppose that they belonged to harness, or to vehicle fittings. Such pieces are usually classified as dress-fasteners (Wild 1970b): no 3 might have been related to the fabric that left its imprint on the mail, and the other two could have been on clothing piled at the feet of the corpse. The only comparable piece from an Arras Culture grave was found nearby at Eastburn (Stead 1979, 86). There was a toggle with horse-bits in the Ringstead hoard (Clarke 1951, 222, pl xix, c).

Copper-alloy fittings, possibly from a lid (Fig 47)

(KR/BU) A copper-alloy binding, forming a D-shaped frame, 156×120mm

Within the frame is a symmetrical arrangement of three semi-tubular rings, six dome-headed studs, and three eyelets. These copper-alloy fittings had been attached to a base about 5mm thick; presumably it was made of wood, although there is little direct trace. The semi-tubular rings (diam *c* 41mm) were attached by copper-alloy nails, four in one and three in the others; within them is a compact blackish filling and there is a very similar deposit in some of the domes. Samples analysed by Fourier transform Infra-reds showed that the filling contained clay and wax; a spectroscopic examination gave a spectrum comparable with a bituminous material. Two of the

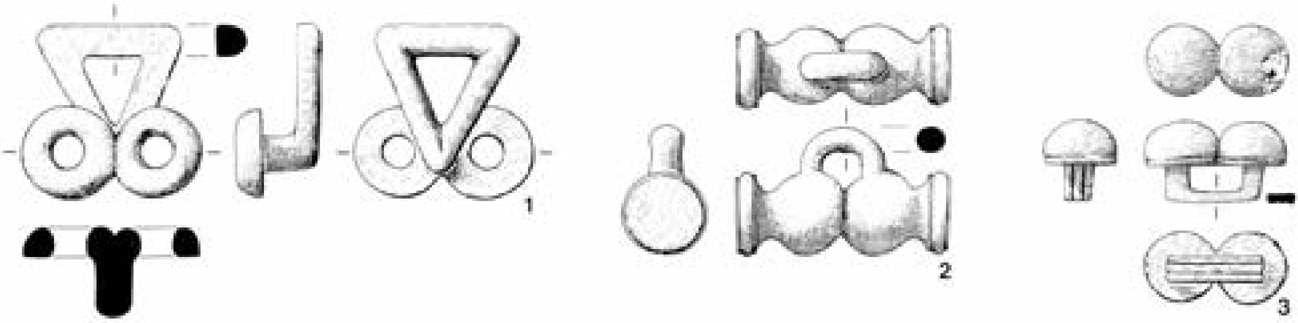

Fig 46 Kirkburn, K5: copper-alloy toggles (1:1)

eyelets (copper-alloy cylinder-rivets) were found within the straight side of the frame and the third was central to the curved side.

The D-shaped frame was found slightly above the floor of the grave, and was sloping: the straight edge was 200mm above the floor and the curved edge 120mm. This position suggests that it might have been the lid of a box or, considering its curved side, a basket. The two eyelets on the straight side could have functioned as hinges, and the third could have served as part of a fastener. A couple of reconstructed baskets from a late Roman grave at Dorweiler, near Bonn (Haberey 1949) give some idea of how such a lid might have operated. Nearer home, a pair of incomplete copper-alloy objects from the Ringstead hoard are strikingly similar in plan, comparable in size, decorated with semi-tubular rings, and fitted with eyelets (Clarke 1951, 219–22, pl xviii).

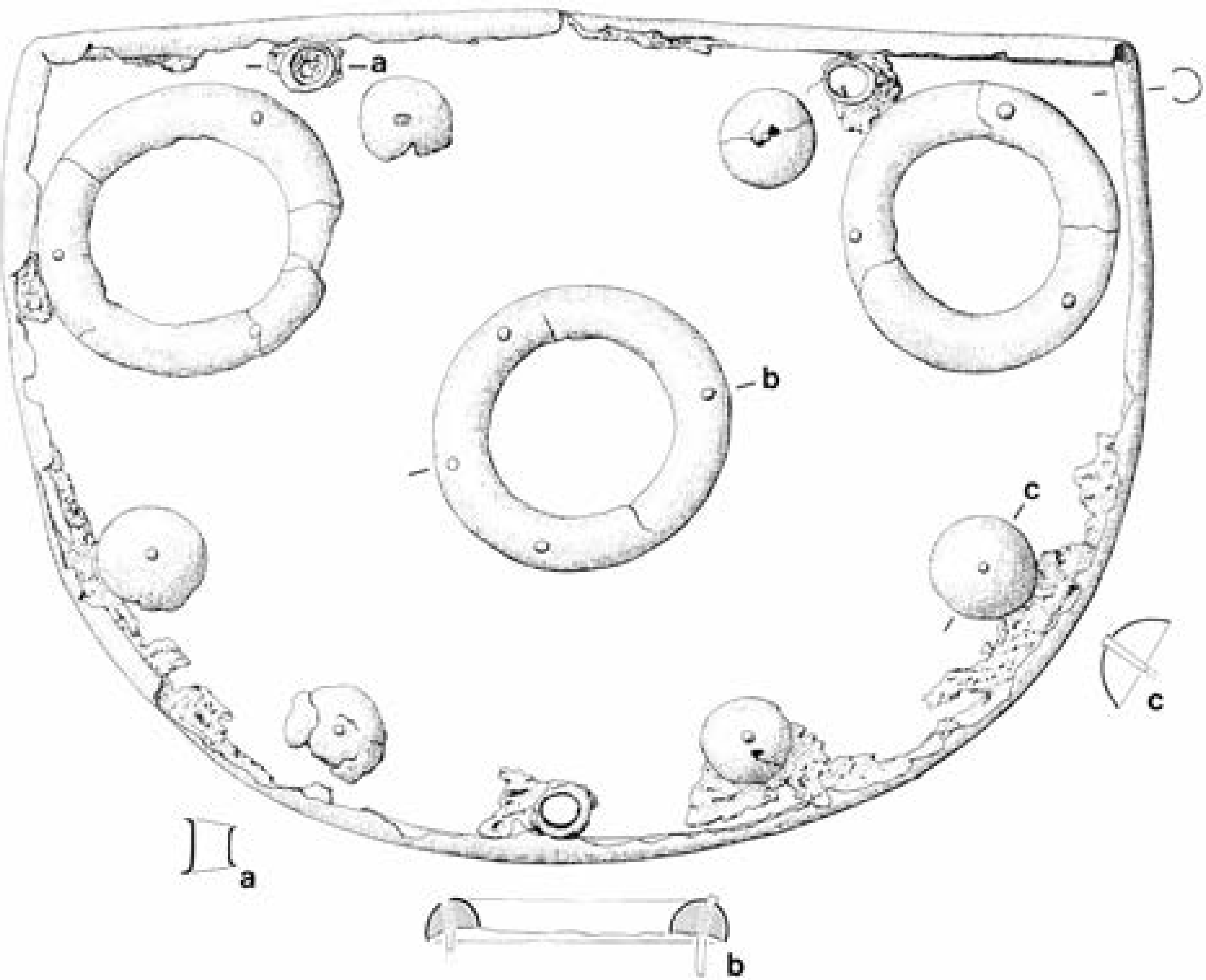

Fig 47 Kirkburn, K5: copper-alloy fittings of a ?wooden lid (1:1)

Reconstruction of a Yorkshire Iron Age cart

Any discussion of the reconstruction of a Celtic cart or chariot must start with Fox's work on the remains from Llyn Cerrig Bach. The quantity of vehicle fittings and harness found there prompted him to attempt a reconstruction of an Anglesey, or British chariot; inevitably the Llyn Cerrig Bach material was lacking in several respects, which Fox made good by reasonable borrowings from other British and continental sources, and by intelligent guesswork. He was well aware of the weaknesses: 'it solves no problems but it is hoped that it will focus attention on them; they would readily be elucidated if an undisturbed chariot burial could be found in Britain and excavated scientifically' (Fox 1946, 27). That, of course, was too optimistic.

Even before the recent excavations in Yorkshire, 40 years' research had modified the Llyn Cerrig Bach chariot, whose scale plan was first published in 1946 (ibid, fig 13; it did not appear in the 1945 interim report). By 1947, when Fox gave a Presidential address to the Society of Antiquaries, slight modifications had been incorporated in a model that was there displayed and subsequently exhibited at the National Museum of Wales (Fox 1947, 117–19, pls xvii and xviiib; the model, at ⅛ scale, was made by H R Waiting, of Slough). A much larger version (½ scale), made for the 1951 Festival of Britain Exhibition (catalogue no D220, constructed by E G Adsetts, London SW3) was presented to the British Museum and is now on loan to Leicester Museum. Modifications were incorporated in a revised version of Fox's drawing published by Frances Lynch in 1970 (fig 86) and subsequently Colin Williams made a second model for the National Museum of Wales, and his plans were published for the benefit of modelmakers (Williams 1978). The following year the British Museum commissioned a slightly different version from David Wray, of Berkhamstead, and that is still on display (eg Stead 1985a, fig 79). Full-size replicas of Celtic chariots have been constructed for televison companies on at least two occasions, but have never been published in detail; one, made solely for display by a BBC Schools television programme (Coles 1973, pl 1; Ritchie and Ritchie 1985, figs 13–15), is now in the Royal Museum of Scotland; another made by Thames Television in the 1970s (at a cost of about £1000) was road-tested: according to the TV Times its realistic maximum speed was 18mph although the makers claimed 25–30mph. A full-scale replica incorporating the findings from the recent Yorkshire excavations is currently under construction for Hull Museums.

In addition to the models, replicas, and detailed plans, two interesting sketch-plans have been published, one by Piggott (1983, fig 129), showing a further development of the Llyn Cerrig Bach model, and another by Greene (1972, fig 16), suggesting a quite different Irish vehicle (a carpat) based not on the Llyn Cerrig Bach model but derived independently from Irish written sources.

The changes to these reconstructions of chariots over the last 40 or so years are best seen by considering the parts individually. At the same time, the evidence will be considered for a reconstruction of a Yorkshire Iron Age cart.

Wheels The diameters of wheels and naves are known from several metal tyres and nave-hoops, and are not in dispute; the evidence for the length of the naves is discussed above (p 44). Metal felloe-clamps were used on the original Llyn Cerrig Bach model and subsequent versions, but only one of the 12 wheels from the recent Yorkshire cart-burials (Wetwang 2) has a convincing example. Nonetheless, the evidence does seem to favour a single-piece felloe (p 42) and, like the original Llyn Cerrig Bach model, it has 12 spokes. Linch-pins are fully discussed above (p 44).

Splinter bar and traces The original Fox model had a 'swingle-tree' with trace-loops at the ends. Lynch (1970, 263) doubted this feature but left its dotted outline on her drawing; it is retained on Williams' model. Greene keeps the wooden bar (no trace-loops are shown) on his carpat, but, perhaps significantly, he has no Irish name for it. Piggott (1983, 211) rightly dismisses traces and points out that the 'swingle-tree' taken by Fox from Jacobsthal is in fact a splinter bar. There is no evidence for splinter bar, swingle-tree, or traces in the Yorkshire graves.

Yoke Fox's yoke had only two terrets, whereas there are five in a full set. Stead (1965b, 260) ranged the four smaller terrets along the yoke, and this has been followed in subsequent reconstructions; the position of the larger terret was assumed to be central to the pole, but its attachment to the centre of the yoke – presumably to hold the lashing attaching it to the pole – was not established until the excavation of the recent Yorkshire burials. The Garton Slack and Kirkburn burials show that strap-unions were suspended from the ends of the yoke, presumably to adjust the girth. It may be that Celtic carts, like Greek carts (Spruytte 1983, 52–3), used dorsal yokes positioned behind the ponies' withers, secured by a girth and with a breast collar to provide the traction (ibid, figs p 14, bottom, p 21, left). But the slight iconographic evidence is ambiguous: neck yokes could well be represented at Padua (Frey 1968) and Civita Alba (Stead 1965b, 263, fig 4), and perhaps also at Chiusi (ibid, fig 5). On the other hand, all representations of Celtic vehicles have the axle central to the platform, and that is consistent with the use of a dorsal yoke (Spruytte 1983, 41 and 52).

The first Llyn Cerrig Bach model had 'hand-holds' surmounted by 'chariot-horns' or 'horn-caps'. Stead (1965b, 261–2) doubted the relevance of horn-caps to a vehicle, and Piggott (1969) transferred them to the ends of the yoke, where they appear on Lynch's and Williams' models. Spratling (1972; 1979, 134) reiterated their irrelevance to vehicles (see also Piggott 1983, 219; Stead 1984b, 63), and certainly none have been found in the Yorkshire graves.

Some wooden yokes have been preserved in waterlogged contexts, including one from La Tène, but 'no surviving La Tène or broadly contemporary yoke can be assigned to horse traction with any confidence' (Piggott 1983, 218). The spacing of terrets from the Yorkshire graves is consistent with a yoke like that found at La Tène (Fig 42).

Pole Fox used an iron fitting from Llyn Cerrig Bach as the end of the pole for his reconstructed vehicle (Fox 1946, 92, no 99); this identification is generally accepted (eg Piggott 1983, 217) although it cannot be proved beyond doubt. A copper-alloy fitting from the Charioteer's Barrow, Arras, may have been a pole-terminal (Stead 1979, 53) but the iron cylinder from Garton Slack came from the axle, not the pole (Stead 1984a, 35). There are no pole fittings from the more recent Yorkshire graves, but at Garton Station a 1.25m length of pole had been replaced by clay. The top of this clay was 0.2m above the floor at the end of the grave and it sloped down slightly to 0.1/0.15m towards the middle of the grave. Clay representing the axle was 0.3 to 0.38m above the floor of the grave. These clay bands are not consistent with a straight pole: they suggest a pole with either a curve or a double-bend (Fig 48). The latter (Fig 48, b) would fit reasonably in the other Yorkshire cart-burials, allowing the corpse to nestle under the curve of the pole. A pole of this shape seems to have been buried in the cart-burial at Grosbous-Vichten, Luxemburg (Metzler 1986).

The length of the pole and its height above the ground (hence its shape) are related to the size of horse or pony that pulled the vehicle. With little evidence from Llyn Cerrig Bach (a single radius from a horse), Fox (1946, 25 and 97) opted for a pony 11.5 hands high; Piggott (1983, 217) suggested that it would have been larger. The evidence for ponies from Yorkshire cart-burials is little more impressive than that from Llyn Cerrig Bach. Stillingfleet (1846, 29) measured the horses from the King's Barrow, Arras: 'from the sizes of their leg bones, these horses were of unequal height; but probably, neither of them reached thirteen hands'; Legge, in Stead 1984a, 41, examined the surviving metacarpal and metatarsal which suggested standing heights of 1.32 and 1.3m at the withers (= 13 hands). The evidence from the Yorkshire graves suggests that the pole extended for almost 3m in front of the axle (p 32). How it was attached to the axle is uncertain; presumably it was pegged on top of the axle, and doubtless the two pieces were braced. The T-frame is a regular feature of the Yorkshire graves, whereas wheels, yoke, and apparently box-body could be dismantled, so this joint seems to have been the most permanent feature in the construction. The separation of pole from box-body is particularly significant when viewed in a wider context, because the pole has always been regarded as an integral part of the platform of an ancient cart (Piggott 1983, 207, 217).

Axles In the Llyn Cerrig Bach reconstruction, Fox (1946, 25 and 93) used a 41/2ft (1.37m) wheel-track with an axle about 1.75m long, which is less than those in the Yorkshire graves. The Yorkshire axles were of different lengths: Garton Station seems to have been at least 2.2m; Garton Slack, with one end defined in an iron case, was about 2m; and the Wetwang Slack axles must have been slightly shorter. The relationship between the length of the axle and the wheel-track cannot be assessed accurately because of two unknown factors: the length of the nave and the distance between the linch-pin and the end of the axle. These measurements, like the axle-length, need not have been standardised. The only clues provided by the Yorkshire cart-burials are the suggested 400mm-long nave from Garton Station (p 44, associated with the longest axle), and the metal axle-binding at Garton Slack that shows the end of the nave to have been at least 40–50mm from the end of the axle. Measurements from other British wheels (Table 2) suggest that the Garton Station nave is exceptionally long – 330 to 360mm would seem more likely. No other British evidence relates to the extension of the axle beyond the nave: in his demonstration of wear on a linch-pin Spratling (1972, fig 41) guessed a length of a little more than 40mm; Anstee (in Musty and MacCormick 1973, 277) thought that at least 70mm would have been needed.

Bodywork There is little solid evidence for the bodywork of a British chariot or cart. Clutching at straws, Fox used the depiction on a Remic coin for his Llyn Cerrig Bach model, and both Piggott (1952) and Stead (1965b, 262–5) found supporting continental evidence. Frey (1968) altered the picture with the publication of a stela from Padua depicting a Celt in a vehicle with double-arcaded sides – a modification adopted by Lynch, Williams, and the British Museum model. The wickerwork sides of Fox's model, criticised by Greene (1972, 60 and 63), were retained by Lynch but omitted from subsequent versions. Piggott's sketch (1983, fig 129) set the centre of the platform well in front of the axle (although the Paduan stela seems to have the centre-line very slightly behind the axle). All other models have the centre of the platform directly over the axle.

The Llyn Cerrig Bach model was given a body open at the front and back, on the basis of Caesar's description, the Remic coin, and French burials (Fox 1946, 27; 1947, 119). The evidence is flimsy and it has been criticised (Stead 1965b, 262; Piggott 1983, 208–11) but not dismissed; all reconstructions (except Greene's) retain this feature.

The size of the platform was established from the track of the vehicle and the fact that iconographic evidence suggested a length very little more than the diameter of the wheels. All reconstructions (again with the exception of Greene's) have a platform about 1m square. The original Llyn Cerrig Bach model had a wooden platform, retained by Williams but not by Lynch, who substituted stretched hide 'to reduce some of the inevitable bumping and jolting'. Piggott argued that 'Fox's vehicle is certainly too heavy a piece of carpentry' and he too wanted a leather strap-work platform along the lines of ancient Italian and Egyptian chariots (Piggott 1983, 208–9 and fig 129). Indeed, Spruytte (1983, 25) claims that all ancient chariots had platforms of tightly strung interlaced hide strips.

Most, perhaps all, of the recently excavated Yorkshire cart-burials produced evidence for a box-like structure buried in the grave, and this seems likely to

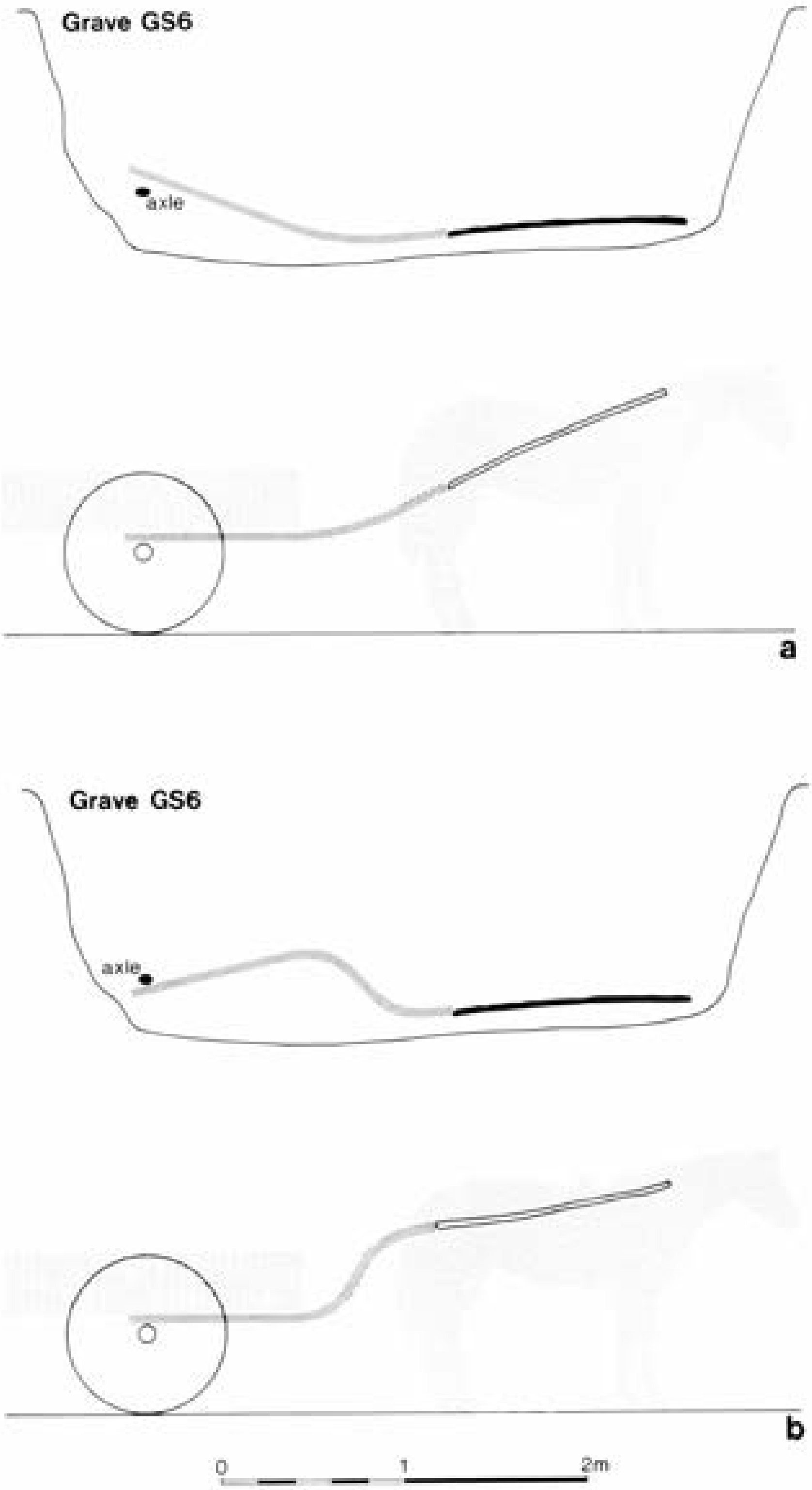

Fig 48 Sections of the Garton Station cart-burial (GS6) showing where clay had replaced wood in a length of the pole and axle (axle in section), with alternatives for the original profile of the pole; the conjectural lengths of pole are shaded

have been the body of the vehicle, detached from the axle and pole and inverted over the burial (p 32). Much longer than the conventional 'Celtic chariot' two of these box-bodies were around 1.8/1.9m × 1.2m and two others about 1.5/1.65m × 0.95/1m; in one instance there is just a hint that the floor was planked along the length of the vehicle (cf the soilmarks illustrated in Dent 1985b, 48). The boxes were made solely of organic components, using carpentry joints or lashings; no metal was used in their construction. The soilmarks, observed for a depth of 0.5m in two examples and slightly more in a third, were quite sharply rectilinear and are unlikely to have been formed by a body with curved sides; it seems much more likely that a true box, with straight sides, was represented. At Garton Station there was a hint of an open end, but as the box-body is interpreted as detached then the open end could have been front or back.

The vehicle in the Yorkshire graves seems to resemble Greene's carpat, which was not specifically a war-chariot but was used to transport privileged people, including the warrior travelling to and from the battlefield (Greene 1972, 61–3, 70–1). Greene argues that it was a light wooden vehicle with two seats in tandem; his sketch (ibid, fig 16) has no scale but suggests a simple box-body some 1m wide by 1.8m long with straight sides about 0.5m high, open at the front, with the charioteer sitting on the front seat and his feet resting on the pole. Greene quotes literary sources for the carpat being readily dismantled (ibid, 63) which corresponds with archaeological evidence for other ancient vehicles (Piggott 1983, 206) including those from the Yorkshire graves.

Such a vehicle seems to have been used in funerals in Yorkshire in the second and third centuries BC. Before the recent excavations it was strongly argued that this was not a chariot – certainly not a war-chariot – because it was never associated with weapons (Stead 1965b, 259); now, two of the recent cart-burials have produced swords in scabbards and a third included a coat of mail. But perhaps this makes little difference: certainly 11 of the 14 reasonably recorded cart-burials in Yorkshire did not have weapons or armour. The vehicle from the Yorkshire graves seems to have been a simple light cart with little in the way of suspension; it would have given an extremely bumpy drive. In chariots, which would be driven at speed, this disadvantage was partly offset by hide platforms. The Yorkshire cart envisaged here is not designed for speed, but would be quite capable of a fairly stately progress. If the bodywork could have been removed so easily, then the T-frame and wheels might have been used for other purposes; perhaps a much lighter body or platform would have been attached to convert it into a war-chariot.

Doubtless two-wheeled vehicles of other designs were used by the Celts, in Yorkshire and elsewhere (Piggott 1983, 208), and there is no reason why the Yorkshire cart should resemble vehicles in European burials. But it is interesting to note that in one recently excavated and well-recorded cart-burial, at Grosbous-Vichten, Luxemburg, there was a rectangular structure with measurements very similar to the Yorkshire boxes (Metzler 1986). Some 1.1m wide and 2m long, one end seems to have rested on the axle, as in Yorkshire, and the other end on the pole. The excavator interpreted the box as a wooden chamber constructed over part of the grave and covering a conventional light chariot whose bodywork had left no trace but whose pole was exactly the same shape as the one from Garton Station (ibid, fig 4). Metal fittings on the axle were explained ingeniously as a means of suspension (ibid, fig 10, the interpretation acknowledged to Polenz, cf also Haffner and Joachim 1984, 75 and note 10, who illustrate several of these fittings in their fig 8; there is now a model of a chariot incorporating this interpretation, cf Duval 1989, 35), but it is worth considering an alternative possibility, that the 'chamber' was in fact the dismantled and inverted box-body of a cart only a little longer than those in Yorkshire; the metal fittings, certainly attached to the axle as in other continental burials, could have helped to secure the box-body.

Other burials

Most artefacts are illustrated in the grave-groups (Figs 101–127); only ungrouped artefacts are illustrated in the body of the text.

1 Shields

A Metal fittings from wooden shields

1 R148 (Fig 49) An iron cover for the boss and spine, and some small fragments of binding from the edges. The central part was *in situ* and face upwards, but for reasons unknown the other fragments were widely scattered and gave no indication of the original size of the shield.

a (FD/DE, DF; Fig 49, 1) The boss, formed of two linked convex discs, each nailed near the junction; from their ends semi-tubular strips project to cover the spine

b (FD/DD, DK; Fig 49, 2) Two joining fragments from the lower spine-cover, with a single nail through it; though found some distance away at the edge of the grave they join no 1 to complete the cover of the lower spine

The main piece (1 and 2) is now 275mm long, but most of the upper spine-cover is lacking. If symmetrical the full length would have been 350mm.

c (FD/DC; Fig 49, 3) A small fragment probably from the upper spine-cover, but found near the head of the left femur; length 30mm; three smaller fragments in the upper filling of the grave

d (FD/DL; Fig 49, 4) A piece of binding, presumably from the edge of the shield, found in the upper filling of the grave; length 19mm, it had bordered wood 5mm thick

e (FD/DB; Fig 49, 5) Small piece of binding, found over the bottom of the left femur; length 11mm, it had bound wood 5–6mm thick

f (FD/DE; Fig 49, 6) Short length of binding, with a nail through it; found near the central boss, and lifted in the same block; length 35mm, but the wood only 3mm thick

Mineral preserved organic material includes both leather and wood, with the leather between the wood and the iron, suggesting that the shield was leather-covered. All the wood samples examined appear to be of the same species – *Acer* sp (maple),

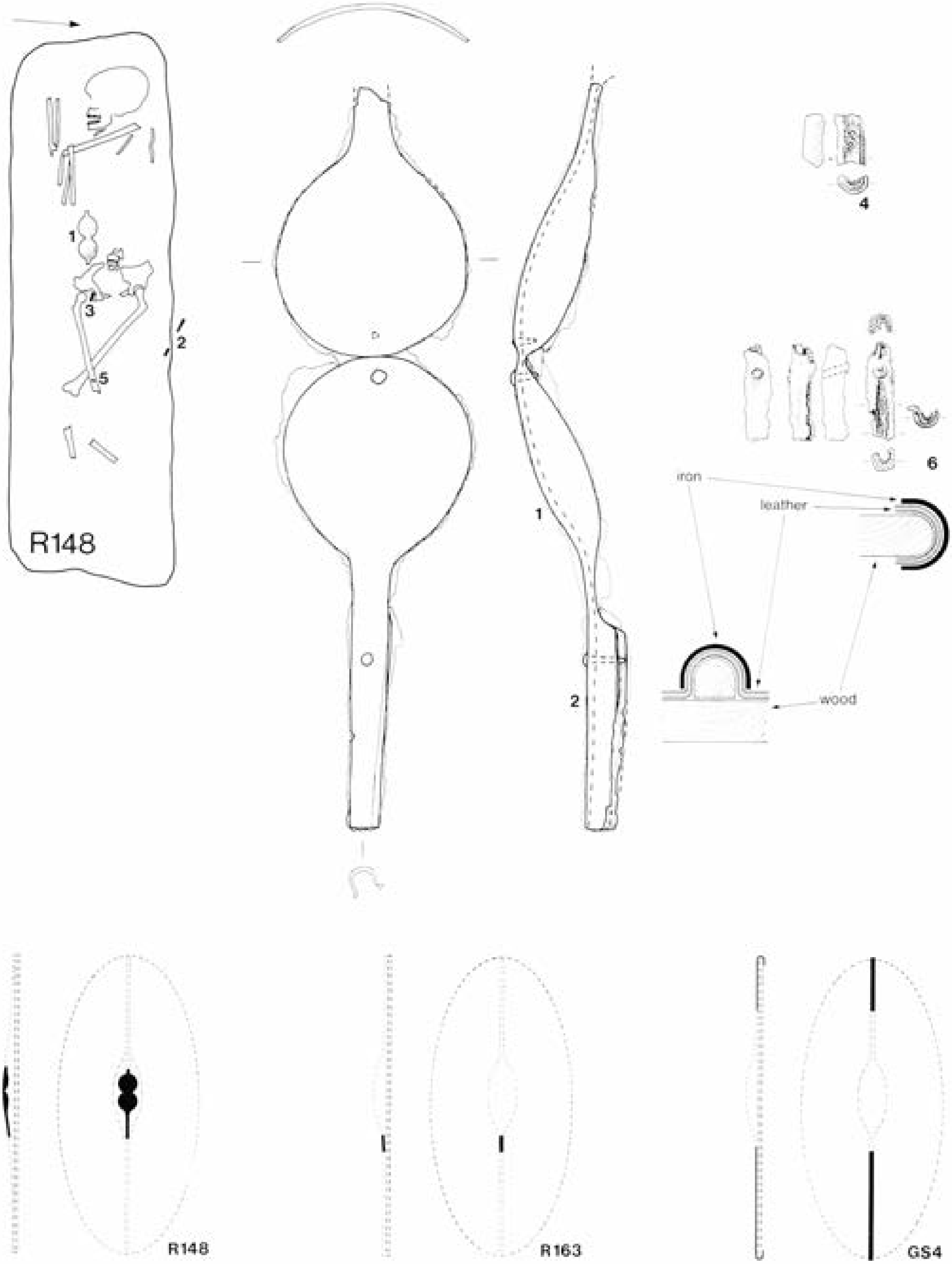

Fig 49 Shields: plan of R148 (1:20) and iron remains from the shield (1:2), with schematic sections (not to scale) showing the relationship between the iron, leather, and wood; also sketches to show where the iron boss and spine-covers in R148, R163, and GS4 would have been attached to shields

Prunus sp (cherry), or *Tilia* sp (lime) – although maple seems more likely.

2 R163 (FD/DG; Fig 113, 2) A short but complete length of semi-tubular iron, length 118mm, attached to wood by an iron rivet in each end. These remains, and their position in the grave, are consistent with the iron having covered part of the spine of a shield (Fig 49, bottom row, centre). The grain of the replaced wood in the groove shows that two pieces were linked: (a) presumably the spine, covered by the semi-tubular strip, the grain running along its length, and increasing in depth from 16mm at one end to 26mm at the other; and (b) presumably the board, only 5mm thick, to which piece (a) had been attached – the wood-grain of (a) and (b) crossed at right-angles. There was leather between the wood and the iron. The wood of the spine is possibly *Betula* sp (birch) but the wood of the board could not be identified. (A piece of extraneous wood on the sword from this grave was identified as *Quercus* sp, oak.)

3 GS4 (GW16) Two lengths of iron from the spine of a shield (Fig 49, bottom row, right)

a (GW/HO; Fig 121, 2) Length 390mm. A slightly curved semi-tubular length of spine-cover, tapering from about 26mm wide near the middle to 18mm wide near the end. It is folded over the end of the shield and terminates on the back in a flat circular disc some 30mm in diameter. A rivet, centred 28mm from the end, secures the spine-cover to the shield, passing through the centre of the disc; there is a second rivet near the middle of this piece and a third (GW/HQ, broken) centred about 12mm from the other end.

b (GW/HP; Fig 121, 1) Length 195mm. A much shorter (but complete) piece constructed in the same way, but with only two rivets. The terminal disc is larger, 38×42mm, and its rivet is centred some 40mm from the end of the shield. The rivet at the other end is now lost, but there is a rectangular hole for it, centred 23mm from the end.

In the grave the ends of the two lengths of iron were 1.12m apart, which gives the full length of the shield down the centre. The longer piece was found over the legs, the shorter piece over the skull, and there was a gap of 550mm between the two. Mineralised wood from the spine has been identified as *Alnus* sp (alder), and there are possible organic remains (leather/skin) between the wood and the iron.

The iron fittings from these three graves covered the spines of leather-covered wooden shields, but they covered different parts of the spines. R148 had the boss and adjoining parts of the spine covered for a total length of perhaps 350mm. In this respect it resembles the remains from St Lawrence, Isle of Wight (Jones and Stead 1969), where the length is 368mm; but the ends of the St Lawrence cover are closed – the spine was no longer than the cover – whereas the Rudston cover is open at the only surviving end and could have fitted a much longer spine. However, the shape of the St Lawrence cover is normal, designed to cap the entire spindle-shaped boss, whereas the waisted, figure-of-eight shape of the Rudston piece is without parallel.

The iron remains from the Garton shield are complementary to those from R148; curiously they leave the boss uncapped and cover the ends of the spine instead. This arrangement, too, seems to be without parallel. Perhaps the boss was capped originally and the cover was removed before burial; but even so the remains are unique. There is no reason to suppose that the iron fittings moved after deposition in the grave, so the full length of the shield is known: 1.12m. This is surprisingly long compared with most surviving shields or shield covers from Britain – Clonoura (admittedly undated) 570mm, Battersea 777mm, and Chertsey 836mm – but slightly shorter than Witham (1.13m). The wooden shields from La Tène itself ranged from 1.04 to 1.1m (Vouga 1923, 61), and there is a much longer example, though not certainly pre-Roman, from the Faiyum (1.28m). The unequal lengths of spine-cover on the Garton shield suggest that the boss had been nearer to one end than the other; the boss of the Witham shield is offset in this way.

The single short length of spine-cover from R163 is best matched in one of the cart-burials from Wetwang Slack (Wetwang 1) where a shield was represented by two similar short lengths of spine-cover, 350mm apart, leaving the central boss uncovered as on the shield from Garton Station.

B Possible wooden shields without metal fittings

There is a suggestion that three of the graves with swords also had wooden shields without metal fittings. The evidence is provided by iron spearheads used in the ritual killing of 'speared corpses' (p 33). Wood surviving in the corrosion products on the iron blades showed that they had been driven into wooden boards. In two graves (R174 and GS10) the wooden board had been on top of the corpse, in the same position as the shields in R148, R163, and GS4; and one of those boards (GS10) had been covered in leather like the shields from R148 and R163. In a fourth grave (GS5) two spearheads had also penetrated wood covered with leather; there was no sword there, but R148 and GS4 had definite shields without swords.

1 R154 (Fig 112) The two spearheads in this grave were broken, with their sockets some distance from the blades. One of them (no 3) had penetrated wood which survived on the socket, found at the very edge of the grave. The wood is about 15mm thick and was *Salix* sp (willow) or *Populus* sp (poplar).

2 R174 (Fig 114) Five of the eight iron spearheads in this grave (four of them bent or broken) had penetrated a wooden board about 15mm thick. One of the blades had passed right through, leaving the socket jammed in the wood. Two of them were on top of the left femur, showing that the board had certainly been above the body. On one of the blades (no 3) the wood was identified as *Alnus* sp (alder), on

another (no 7) it was probably *Alnus* sp, and on three more (nos 4, 5, and 9) it was possibly *Alnus* sp; another blade (no 8) had wood on one side only, possibly *Salix* sp (willow) or *Populus* sp (poplar). Nos 8 and 9 had fleece on the blades, and no 3 had possible fleece remains between the wood and the iron. Perhaps a wooden shield had been covered with fleece.

3 GS5 (Fig 121) Of the four iron spearheads in this grave nos 2 and 4, both found near the pelvis, had wood traces. No 4 was a particularly good example with two different pieces of mineral preserved wood on the blade. The more complete piece, nearer the point of the blade, was 16mm thick and had layers of leather on each side, presumably from the board of a shield; the other, less well preserved, was either a dislodged fragment or conceivably part of a boss. The wood has been identified as *Alnus* sp (alder).

4 GS10 (Fig 124) Fourteen spearheads had been used in the 'killing ceremony'; six of them were found amongst the bones, and the others were nearer the sides of the grave. Of the six amongst the bones, four had been driven into wood in the area of the ribs; two were still standing vertically when excavated. The mineral preserved wood was 5–6mm thick and on three of the blades (nos 5, 7, and 8) had clearly been covered with leather on both sides. None of the eight spearheads around the body had wood remains on their blades.

The shields were made from wooden boards with wooden bosses and spines, covered in leather or fleece, and three of them had iron fittings. The mineralised wood from three boards (R154, R175, and GS5) was 15–16mm thick but three others were much thinner; R148 was 5–6mm thick in two places, and only 3mm thick at one point. All these measurements, however, were taken at the edge, which could have tapered slightly; the board of R163 was 5mm thick at a point where it was covered by the spine, and GS10 was only 5–6mm thick at random points on the board. The mineralised remains of wood are slight, and it is possible that some have shrunk and do not necessarily represent the original thickness of the boards. Alder was used in the boards of R174 and GS5, willow or poplar in R154 and perhaps in R174, and maple (or cherry or lime) in R148. Birch was used for the spine of R163, and alder for the spine of GS4. R148, R163, and possibly GS4 had leather over the spine, covered by iron; R148 had leather at the edges of the board, covered in part by iron binding; on GS5 and 10 there was leather on both sides at random points on the boards, and R174 seems to have been covered with fleece.

One other grave with a 'speared corpse' (GS7) had iron spearheads driven into wood, but there was no evidence that the wood had been over the corpse, no sign of leather covering the wood, and no other weapons in the grave. Elsewhere wooden or leather shields could have disappeared without trace. Of the 12 swords published here, only one was found with a certain shield, and two were with possible shields; one certain shield was in a grave without weapons.

2 Swords and scabbards

It is now 40 years since Piggott (1950) published his classification of British Iron Age swords and scabbards, and in that time there have been many new discoveries and several old finds have been reassessed. As with brooches, British Iron Age swords and scabbards can be related to the continental classification, but often the relationship is remote. In southern England there are a few typical La Tène I swords and scabbards (Stead 1984b), La Tène II comparisons are not close, but there are some with obvious La Tène III features (eg Piggott's Group V). North of the Humber the continental link is further removed. The differences are particularly marked when the length of the blade is considered: continental La Tène I blades can vary between 400 and 700mm long; La Tène II blades are usually over 600mm and under 800mm; La Tène III blades can extend to 900mm. But north of the Humber, with the sole exception of the North Grimston sword (its blade more than 740mm long), there is none longer than 620mm.

It is easier to classify scabbards than swords, because they have more diagnostic features, so the Yorkshire swords in metal scabbards should form the basis of any classification. Three groups may be recognised. First, three scabbards (Kirkburn and the cart-burials Wetwang 1 and 3) with open chape-ends, a distinctive La Tène I feature, and campanulate scabbard-mouths; all have decorated front-plates and might date from the third century BC. Second, two scabbards (Bugthorpe and Grimthorpe, Piggott's Group III) whose chape-ends are much more developed (with lipped terminals), and whose scabbard-mouths are campanulate and pointed in shape; Bugthorpe has a decorated front-plate and they presumably belong to the first century BC (Stead 1985b, 31). Third, a group of scabbards (Piggott's Group IV, Brigantian type) represented in Yorkshire by examples from Flasby and Cotterdale, whose chape-ends are still further advanced typologically (the lip terminals dominate) and whose scabbard-mouths are usually straight (but Stanwick is campanulate); they seem to belong to the first century AD.

Swords without metal scabbards usually have only one diagnostic feature related to this classification: most have metal hilt-ends, which reflect the shape of the mouth of the scabbard. Examples from Rudston and Garton Station are illustrated diagrammatically in Figure 50, where they are compared with the mouths of metal scabbards from Yorkshire. The sample is too small to assess the significance of the variation in campanulate shapes, but the straight hilt-ends in the Rudston Makeshift cemetery do have important chronological implications. It would be rash to conclude that all these swords belong to the first century AD; on the continent, and perhaps in southern England, straight-mouthed scabbards occur in the previous century, but they certainly seem to be unknown before La Tène III. All the Rudston swords come from the distinctive east–west burials, and the only brooch from one of these graves was a La Tène III form.

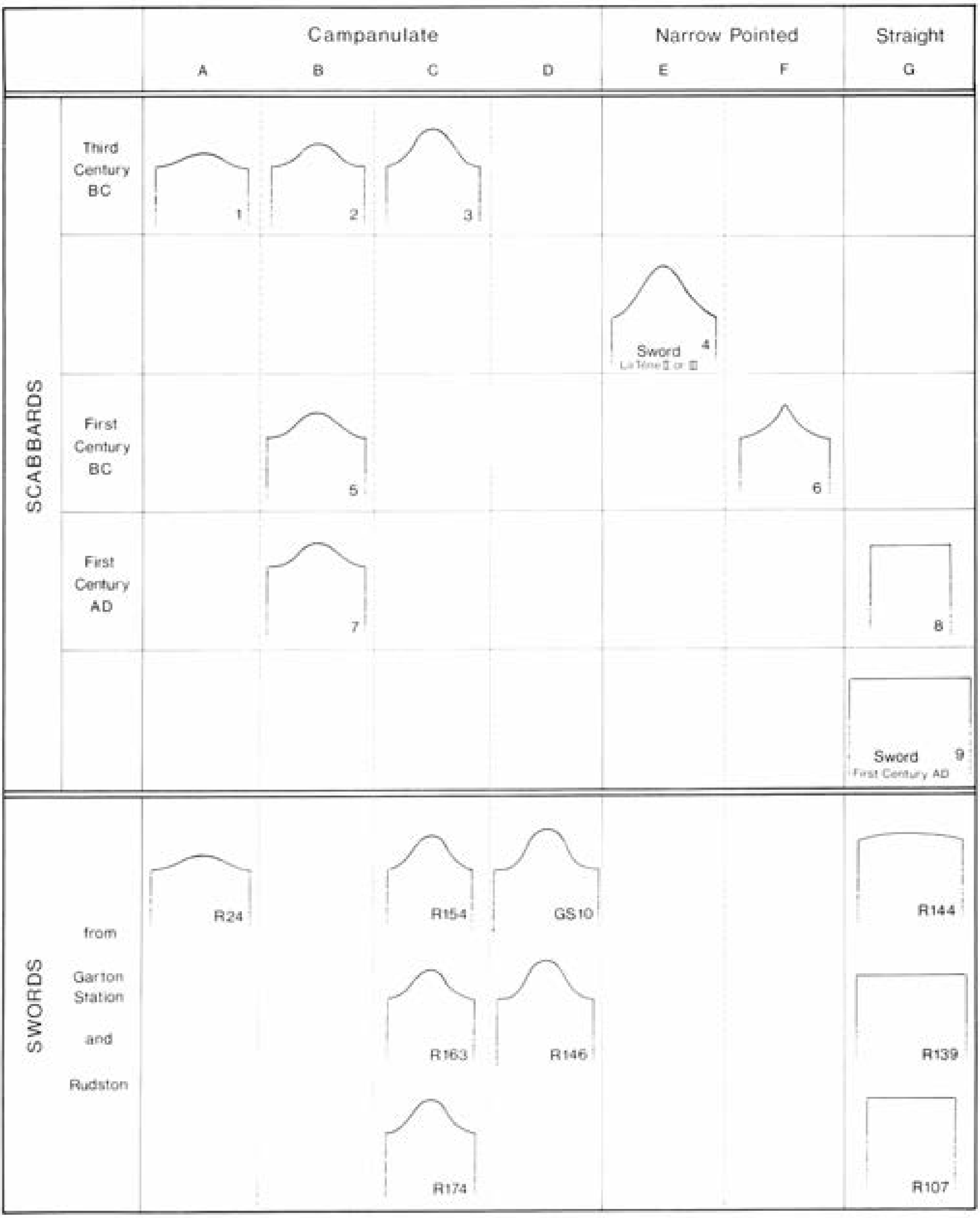

Fig 50 Diagram to show the shapes of scabbard mouths, drawn from the scabbard (nos 1–3 and 5–9), otherwise from the hilt-end of the sword (which reflects the shape of the scabbard mouth): A–D – de Navarro 1972, 23, type A2: A, subcampanulate; B and C, normal campanulate forms (B, relatively low; C, relatively high); D, high campanulate form; E, ibid, type B; F, ibid, subtriangular form; G, La Tène III horizontal mouth; numbered examples: 1, Wetwang Slack, cart-burial 3; 2, Wetwang Slack, cart-burial 1; 3, Kirkburn; 4, North Grimston long sword; 5, Bugthorpe; 6, Grimthorpe; 7, Stanwick (hoard); 8, Cotterdale; 9, Stanwick (Wheeler excavations)

A The Kirkburn sword and scabbard (K3, Figs 51–3)

This complex sword and scabbard was conserved by Simon Dove and X-rayed by him and by Janet Lang. The following account incorporates their findings and observations made by Stephen Crummy, who drew the illustrations.

Sword The sword is corroded into its metal scabbard, so details of the blade are obscure: length *c* 697mm, blade length *c* 560mm, width *c* 40mm at the top; it seems to taper for a little over a third of its length.

It has a magnificent handle (length 137mm), virtually complete, made in three parts which are slotted over the tang. The first part, at the top, is the pommel, made of ?horn capped by an iron frame some 9mm deep and 57mm wide in the form of a horizontal strip with down-curving arms and surmounted by an iron washer and then a short iron tube. There must be vertical perforations through the iron components to allow them to slot over the tang with the pommel. Within the short iron tube the tang itself is perforated to take an apparently iron rivet terminating in large domed discs on the front and back of the pommel. The two arms of the frame curve downwards over the edges of the pommel to embrace four more discs, two at each side and apparently linked by central rivets. Two further discs are attached to the middle of the pommel, front and back, below the centre of the frame; there is no indication that the tang is perforated here, so perhaps they are separately pinned. The central part of the iron frame, below the ring-head, is decorated front and back with a cut-out panel inset with red 'enamel'. The panel at the back is somewhat obscured by corrosion, but seems to have been in the form of three adjoining triangles, exactly the same as the front panel. The ends and top of the frame also carry panels of inset 'enamel' (Figs 51 and 52, a and b) including a circular motif with central concave-sided triangle at each side at the top, and a crescent and possibly a running-dog design over the arms of the pommel – but very little of it survives.

The four discs (diam 15–17mm) decorating the front of the pommel are constructed in the same way: the large hollow domed iron head of the rivet/pin rests in a saucer-shaped copper-alloy washer, and the iron surface has been neatly filed to a network pattern in order to key red 'enamel', which is preserved only in patches. On the back of the pommel the lower disc is exactly the same as those on the front, but thrown out of position by corrosion; if it had been pinned rather than riveted it would have been less secure than the others. The other three are domed washers to secure the ends of the rivets – a copper-alloy washer at the top and iron washers at the sides, all resting on flat or saucer-shaped iron washers.

Below the pommel is the grip – the second part of the handle – formed from a hollow iron tube 71mm long and consistently slightly more wide than deep – 19×16mm at the top, 20×15mm at the bottom – but expanding to 24.5×21mm in the middle. X-rays show the tang within, and presumably there was some organic packing between it and the tubular grip. The whole of the outer surface of the grip is decorated with panels chiselled into the iron and in-filled with red 'enamel'. On the front the design is quartered, with matching panels in the top left/bottom right and vice versa. The simpler design comprises three vertical rows of arcading; the more complex is a broad curving band pointed at each end and enclosing two crescents, one smaller than the other, facing in opposite directions and each encircling a dot (Figs 51 and 52, c). The back of the grip, now with a central vertical split, is decorated with horizontal strips of red 'enamel' between alternating broad and narrow bands of iron decorated with vertical ribs.

The third part of the handle – the guard – is made of horn, and much of it is still intact, with the grain running across the width of the handle. Judging from the radiographs the guard terminates in an iron hilt-end, a broad strip that follows the mouth of the scabbard and, like the frame of the pommel, has curving arms each enclosing a pair of discs. Again like the pommel, the broad curved ends of the arms have been inset with red 'enamel', but the design cannot now be distinguished (Figs 51 and 52, d). In the centre the horn is decorated front and back with a further pair of discs to match those on the pommel. The three discs on the front of the guard and the central disc on the back are constructed like those on the front of the pommel (copper-alloy saucer-shaped washer, hollow domed iron head keyed for red 'enamel'); the central discs have been separately pinned, but the side discs are riveted and have domed copper-alloy washers resting on flat or saucer-shaped iron washers at the back.

Handles rarely survive on La Tène swords, and the Kirkburn handle is undoubtedly the finest example of its kind from Europe. The nearest parallels are the two from Wetwang Slack, which have similar arrangements of discs but lack the decorated grip. The swords from R24 and from Thorpe Hall (Stead 1979, 62–3) would have had similar arrangements of discs, and there are a very few examples from Europe (eg Hochscheid, in the Hunsrück hills, Haffner 1977, fig 5; St Etienne-au-Temple, in Champagne, Reinach 1908, 45, pl xxv, no 13106).

Scabbard The Kirkburn scabbard has a copper-alloy front-plate overlapped by an iron back-plate, length 592mm, width 44mm at the top. Its mouth is campanulate and quite high (about 14mm) and below it, riveted to the front-plate, are two decorative discs similar to, but slightly larger than, those on the handle (domed iron head, keyed for red 'enamel', in a copper-alloy saucer-shaped washer) but slightly larger.

The copper-alloy front-plate is in two parts, joined on a line through the centre of the discs at the top of the chape. The two pieces carry a similar design, a scroll with tendrils alternating to right and left, but its continuity is broken at the join and the infilling and execution of the two parts is quite different. The tendrils spring from curved triangular shapes regularly spaced along the scroll, and they have curved triangular terminals. On the upper part all the trian-

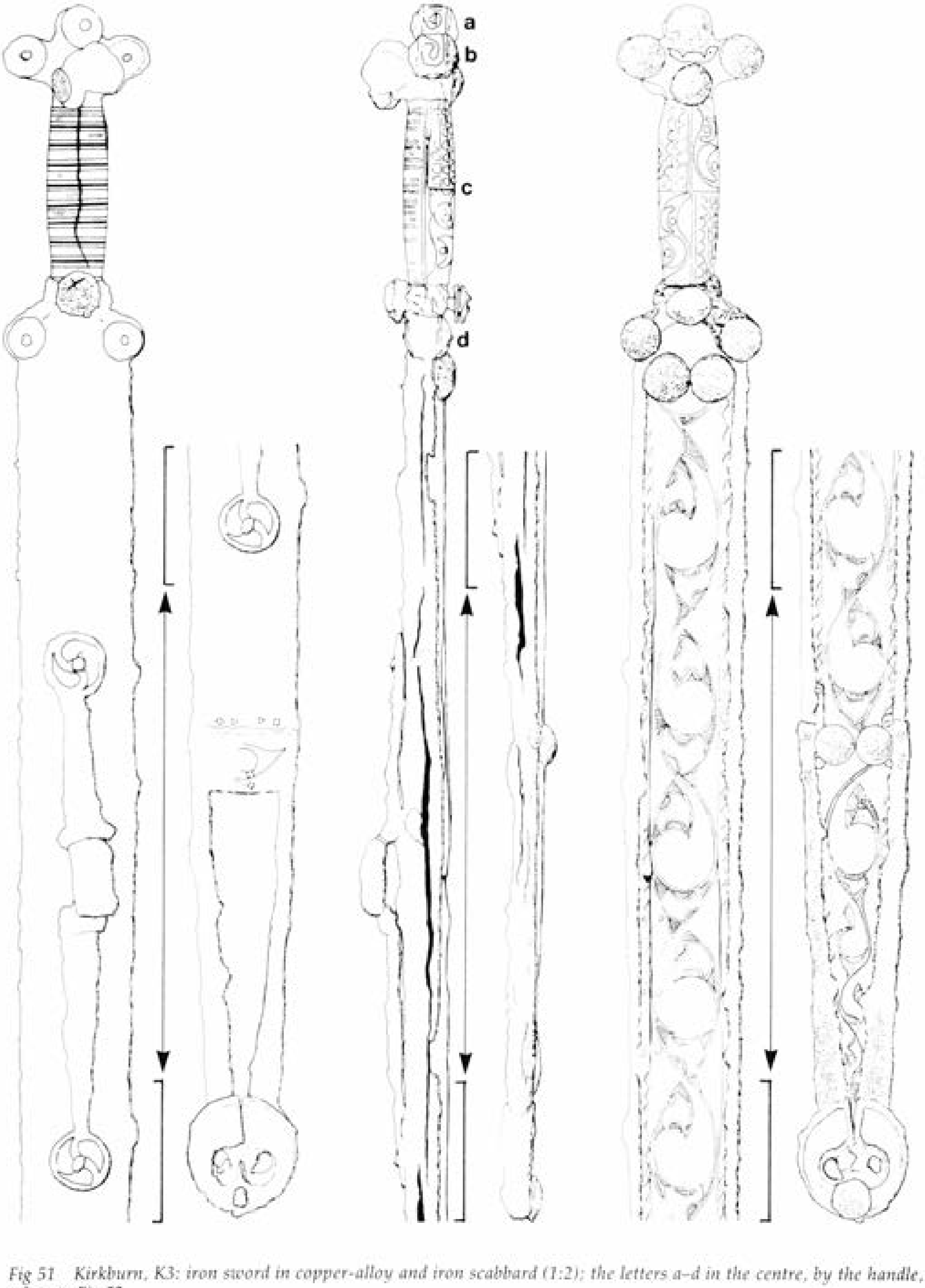

Fig 51 Kirkburn, K3: iron sword in copper-alloy and iron scabbard (1:2); the letters a–d in the centre, by the handle, relate to Fig 52

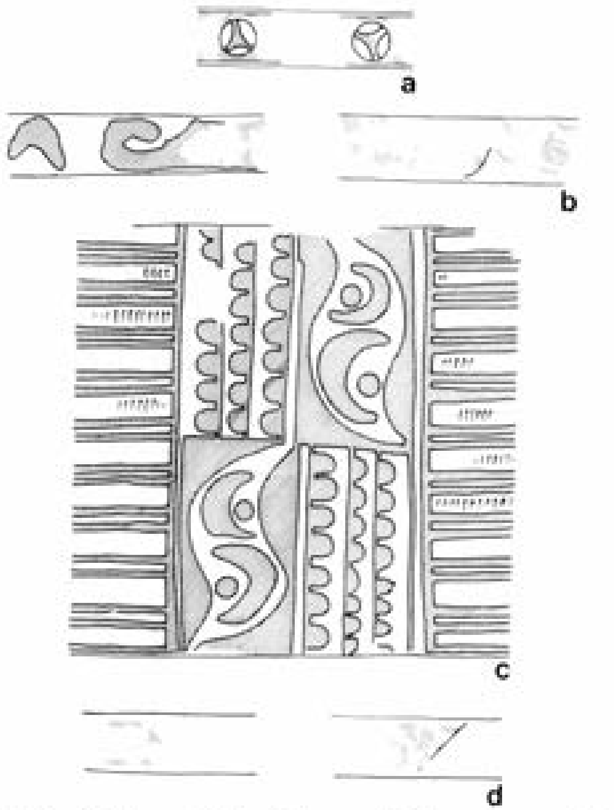

Fig 52 Kirkburn, K3: red 'enamel' decoration on the handle of the sword, curved surfaces flattened out; approximately full size

gular shapes are infilled with fan-shaped voids with a simple hatched background; two elements of the background each have two 'petals' and hatching instead, a third is stippled, and two others are blank. On the lower part of the scabbard-plate (within the chape) the execution of the design is cruder and the infilling quite different – a mixture of variously shaped voids, some stippled, and hatched backgrounds. Throughout there is a defined border occupied by a zig-zag or wavy line with a line of single-dot infillings on the inner side. At the very bottom, within the chape-end, these border motifs merge to form a diamond-shape.

The junction between the two lengths of plate is covered on the front by vertical repair-strips riveted to each part, at either side. The front-plate has split in several other places, along the line defining the border. In part this occurred in antiquity and was repaired by three cross-strips riveted on the inside; the heads of the rivets are quite crudely finished on the decorated surface.

The iron back-plate overlaps the front-plate for most of its length, possibly stopping at or just below the top of the chape. Below that the situation is obscured by the chape, but the scabbard would have been the stronger if the overlap had continued towards the tip. That part of the scabbard level with the top of the chape must have been subject to stress, for the back-plate, like the front-plate, had broken there. The straight break in the back-plate had been repaired by overlapping the surviving edges (top over bottom) and securing the joint with a line of four iron rivets.

The chape, 192mm long, is of iron, its edges on the front stopping above the line of the top of the two discs, and on the back rising very slightly above the top of the bridge. The discs are not clamps, but independent studs riveted to the front plate and constructed like the discs on the hilt – a domed iron head filed to key 'enamel' and set in a copper-alloy saucer-shaped washer. On the front (but not the back) the full length of the chape binding has been filed to a network, like the discs, and was once covered in red 'enamel'. On the back the deep iron bridge is decorated with a panel of red 'enamel', pointed on the right, obscured by corrosion on the left, and leaving a circle in the centre. The heavy round chape-end, 45mm deep and 43mm wide, is neatly shaped and has been recessed on the front so that almost the entire surface could be filled with red 'enamel'; only a narrow border of iron would have been visible. In the centre, at the bottom, is yet another disc with domed iron head keyed for 'enamel', in a saucer-shaped copper-alloy washer. On the back the chape-end seems to be flat but for a slight dome marking the end of the rivet attaching the front disc. X-rays suggest that the chape was made in two pieces: (1) the binding and bridge, and (2) the chape-end. The two pieces were riveted together with two rivets through the top of the chape-end secured in grooves in the bottom of the binding. It seems that the chape was then riveted to the back-plate, which is an unusual feature because La Tène chapes were normally slotted over both plates and could be removed quite easily. However, the Kirkburn back-plate has two rivet-holes covered by the chape-bridge. They are central to the scabbard, one above the other about 4mm apart, and the lower one is much more dense on the X-ray, suggesting that it alone is occupied by a rivet. Their spacing is consistent with successive holes, the lower replacing the upper when the back-plate was shortened by overlapping the break and fixing it with the four rivets (see above). A rivet here would have attached the chape bridge to the back-plate, passing through the bridge just below the 'enamelled' panel. At the bottom the back-plate was secured to the chape-end by another rivet.

The suspension-loop is well down the back-plate, its centre about 213mm below the mouth of the scabbard. The loop is about 17mm wide and the space below it is about 26mm long; including the loop-plates the entire fixture is 216mmm long. The long narrow loop-plates, the upper much shorter than the lower, taper towards the ends before terminating in circular plates 22–23mm in diameter, each decorated with a triscele with red 'enamel' filling. There is a central rivet (with raised head) in each circular terminal, and another rivet at the start of each loop-plate, adjoining the loop. The mineralised remains of a length of thong are associated with the suspension-loop (perhaps wound round it); the presence of hair/fur shows that it was made of animal skin rather than leather.

Red 'enamel', or glass, is used in two ways on the Kirkburn sword and scabbard. On the handle of the sword, the chape-end and the bridge of the chape, and the circular plates of the suspension-loop, shal-

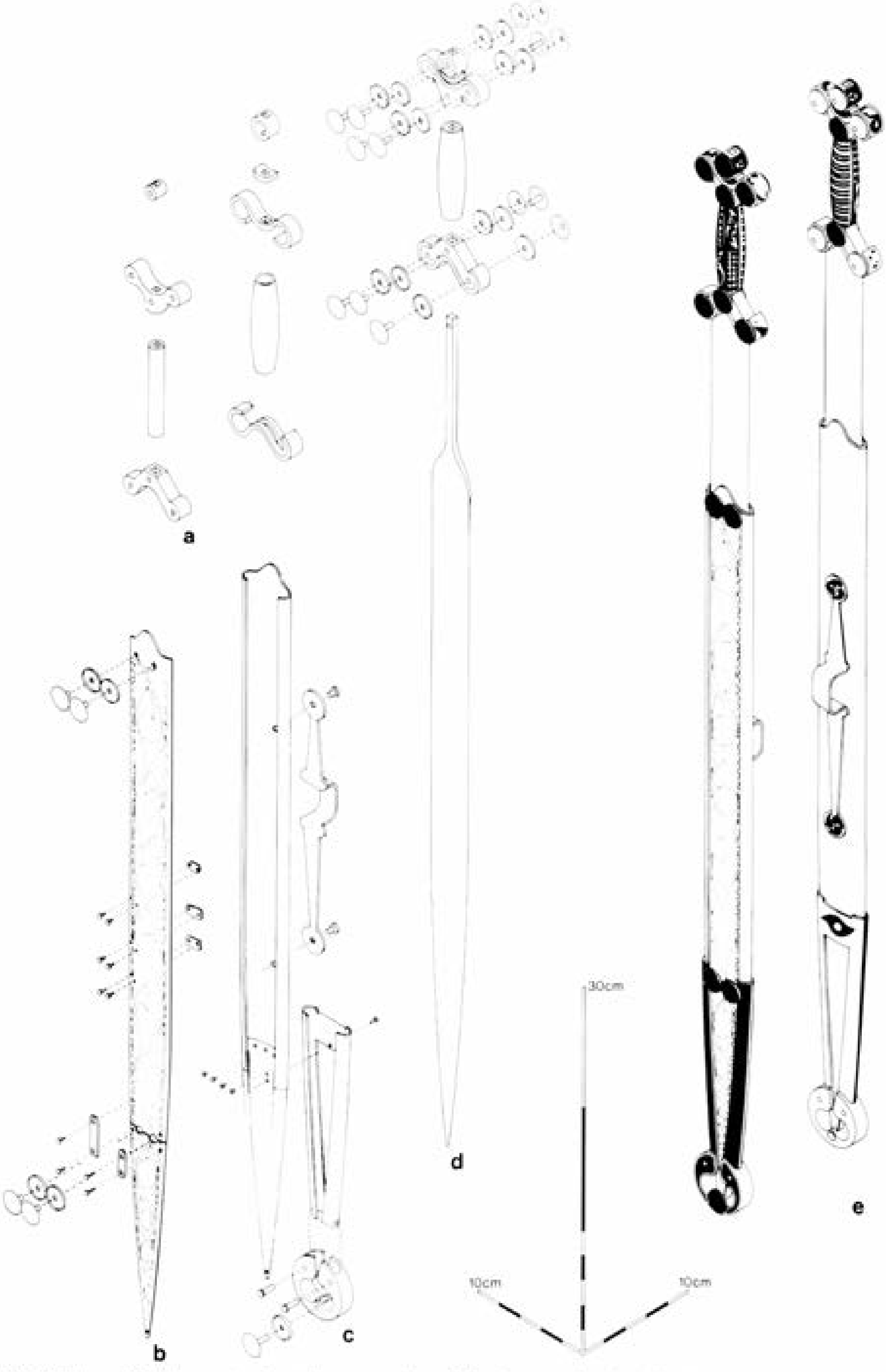

Fig 53 Kirkburn, K3: diagram to show the construction of the iron sword and scabbard: a, organic components of the sword handle; b, copper-alloy front-plate of the scabbard; c, iron components of the sword handle and iron back-plate of the scabbard with suspension-loop and chape; d, iron sword, with all the components of the handle; e, the front and back of the assembled sword and scabbard, also showing the extent of the red 'enamel'

low panels of various shapes were chiselled out and filled with a thin layer of 'enamel'. On several of the domed studs and the frame of the chape the iron was filed in tight networks to key a thin covering of 'enamel'. The Wetwang Slack swords and scabbards have similar keyed domed studs: Wetwang 1 also has traces of 'enamel' in a panel on the chape-end, and on Wetwang 3 the chape binding has been filed horizontally to key 'enamel'. The 'bean-can' from Wetwang 2 uses 'enamel' in a different way: domed roundels are riveted to the top and bottom, as on some of the Burton Fleming and Rudston brooches (p 164). But the panels of 'enamel' and the keyed iron surfaces are apparently without parallel at this time in Britain, although both occur later (but in copper-alloy, not iron); 'enamelled' panels are frequent in the first century AD, and keyed domed studs occur on the helmets from Waterloo Bridge and the Meyrick Collection (Fox 1958, pls 27b, 62c).

On the continent, red 'enamel' was used on Celtic objects certainly as early as the fourth century BC. It is set in copper-alloy on the Basse-Yutz flagons, as domes in the stoppers and in grooves elsewhere (Megaw and Megaw 1990), and it features in panels cut in iron on the Amfreville helmet (Kruta 1978). 'Enamel' was also used on lesser La Tène I objects, especially in Switzerland (eg Müller 1985).

B Other iron swords

a Swords with campanulate hilt-ends

Of the six swords with campanulate hilt-ends, three have relatively long and wide blades (R24, R146, and GS10: 592–620mm long, 45–48mm wide), two are shorter and narrower (R163 and R174: 442–485mm long, 36–38mm wide), and one is extremely short (R154: 320mm long, 34mm wide). None of the blades has a mid-rib or median ridge, but all are thickened in the centre. The blade of R163 tapers for between a third and a quarter of its length to a relatively long point; R154 is also pointed, tapering for about a fifth of its length; GS10 has a short sharp point; R24 is relatively broad and rounded; R146 and R174 were perhaps more pointed than rounded, but they are badly corroded. Apart from R174, which seems to have a thin iron strip on one side only, they all have typical La Tène iron campanulate hilt-ends; R24 is quite low but the others are medium to high. The tangs were rectangular or square in section, though some seem circular where corrosion products have invaded the organic handles. One of the features of these swords is the survival of parts of the handles (Fig 54) in the form of mineral-preserved organics (horn, antler, and wood); these remains have been carefully studied by Jacqui Watson. The most elaborate is R24, whose handle was constructed from three pieces of horn, slotted over the tang and separated by iron washers. The pommel and guard have cross-grain and were ornamented with copper-alloy discs; the grip has vertical grain and was inset with copper-alloy strips. The handle of R174 has the same three horn components, but with vertical grain on the guard and without the metal washers. R154 was similar, but with a longer grip and perhaps a washer between grip and guard. In contrast, GS10 had a two-part handle, with two equal lengths of horn separated by a central iron washer, and R163 seems to have been made in the same way, but without the washer.

1 R24 (FN/BP) Length 752mm; blade length 598mm, but the tip flaked (and perhaps rounded rather than pointed); width *c* 45mm at the top. Low campanulate iron hilt-end about 11mm high (with replaced fabric on one side), and a well-marked button on the top of the tang. The handle was horn, in three parts separated by two quite thick (3–4mm) iron washers, about 60mm apart, with three vertical copper-alloy strips between them. The strips terminate in tongues fitted in slots near the edges of the washers, and they must have been inset in the surface of the horn grip. Above the upper washer the tang was perforated twice to take iron rivets through the pommel; they may well have had copper-alloy disc-heads like those on the guard (there are copper-alloy traces on the surviving ends of the rivets). Below the lower washer iron pins were attached to the centre of the guard, front and back, and each was surmounted by a copper-alloy disc-head (conceivably there is only one iron shank, a rivet through the tang, but if so then the heads have slipped). A comparable disc-head, but on a copper-alloy shank (?with an iron sheath), survives over one shoulder, where it would have been attached to the horn guard, and a separate short copper-alloy pin may be the shank for its partner over the other shoulder. For a radiograph of this handle see Stead 1979, pl 8c; for the scabbard see p 74 below, no 1.

2 R146 (FA/BZ) Length 778mm; blade length 620mm; width *c* 48mm at the top. High campanulate iron hilt-end, 16–18mm high; end of tang chipped, no hint of washers. Horn handle, grain parallel with the tang, but too little survives to determine details of construction. For the scabbard, see p 74 below, no 5.

3 R154 (FD/BW) Length 450mm; blade length 320/318mm; width *c* 34mm at the top. A campanulate iron hilt-end, 12mm high, extending well beyond the blade (58mm wide). The top of the tang is burred, apparently over a washer; there is a copper-alloy shank in the tang just below, and another (FD/BX, loose) was found near the hilt-end. The horn handle is in three parts, with divisions about 35mm and 90mm (possibly with a washer) from the top; the pommel had cross-grain and the grip and guard vertical grain. There is little taper until the final quarter of the blade, which is sharply pointed. For the scabbard see p 74 below, no 6. Markedly shorter than the other swords considered here, this weapon is even shorter than the anthropoid-hilted sword from North Grimston (Stead 1979, 61) whose blade is 390mm long.

4 R163 (FD/DH) Length 615mm; blade length 485mm; width *c* 38mm at the top. Low campanulate iron hilt-end, 12mm high; tang burred at the top, no

surviving washer. Horn handle, in two parts. For the scabbard see p 74 below, no 10.

5 R174 (FD/AE) Length 573mm; blade length 442mm; width 36mm at the top. Fragmemts of an iron hilt-end define a high campanulate shape, about 15mm high. The tang terminates in a pronounced button surmounting a 4mm deep washer; there are clear divisions in the three-part horn handle but no washers. For the scabbard see p 74 below, no 7.

6 GS10 (GW/GS 21) Length 740mm; blade length 592mm; width 48mm at the top. High campanulate iron hilt-end, 15mm high; tang burred at the top; horn handle, in two parts, with a single iron washer exactly halfway down the tang. For the scabbard see p 74 below, no 11.

b Swords with straight hilt-ends

The four swords with straight hilt-ends have blades 445–515mm long and 36–48mm wide. Two of them have relatively long sharp points: R144, which seems to taper for about half of the blade, and R182, which tapers in the final quarter. The other two have little taper, R139 coming to a rounded tip and R107 being damaged at the end. There are no median ridges, and R107 has a particularly thin blade. Only R144 has an iron hilt-end, but the straight ends to the handles of the other three can be seen in the surviving traces of organic materials. Two of these weapons have three-part handles (Fig 54): R139 has pommel and grip in antler and guard in horn, with washers separating the three, while R182 has a very short antler grip between the long pommel and guard in horn. R144 had a horn handle, possibly in two parts like GS10, but without a washer; and R107 is unique in having a wooden handle, apparently in one piece.

1 R107 (FB/AQ, Fig 55) Broken – the 42mm tip is separate and does not join. Length *c* 500 (+42)mm; blade length *c* 402 (+42)mm; width 38mm at the top. No metal hilt-end, but a clear straight end to the handle. The top of the tang has flaked, and there are no washers. Substantial remains of the grip-cum-guard, in one piece, probably made of oak, *Quercus* sp. The blade, which is relatively thin, has little taper and the tip is damaged. The shoulders slope steeply and X-rays show the lines of the tang projecting well down into the blade. For the scabbard see p 74 below, no 9.

2 R139 (FD/CT, Fig 55) Length 632mm; blade length *c* 505mm; width *c* 36mm at the top. There is a marked horizontal division in the organic remains between the handle and the scabbard, but no metal hilt-end. The tang is burred at the top, and has two washers, 36mm and 92mm from the top. The pommel is antler (cross-grained, front to back) and some original surface suggests that it was fairly narrow (13mm). The grip is also antler, but the guard is horn. There is little taper to the blade, which has a rounded tip. For the scabbard see p 74 below, no 3.

3 R144 (FA/CC) Length 647mm; blade length 515mm; width *c* 48mm at the top. There is a fairly straight iron hilt-end and the remains of a button on the top of the tang. The handle was horn, with a possible break in the middle but without a washer. The blade tapers gradually for about half of its length. For the scabbard see p 74 below, no 4.

4 R182 (FA/AN, Fig 55) Length 632mm; blade length 495mm; width *c* 41mm at the top. A well-preserved but extremely short (28mm) antler grip, facetted at each end to allow two lengths of horn to overlap, but without washers. There is no metal hilt-end, but apparently a fairly straight line in the organic remains between the hilt and the scabbard. The top of the tang is burred over a chipped washer. For the scabbard see p 74 below, no 8.

c Unclassified

1 R57 (FN/BR) Incomplete – lacking most of the tang (not a recent break, and no hint of the missing piece in the grave). Surviving length 452mm; width 38mm at the top. No trace of hilt-end or scabbard-mouth. The blade has more or less parallel sides and the tip seems to have been pointed. For the scabbard see p 74 below, no 2.

d Daggers

1 R87 (FG/BX) A corroded iron blade, crudely shaped but presumably a dagger, with a bone handle. Found alongside the right arm, in precisely the same position as the dagger in R153. Length 315mm (including handle); blade length *c* 245mm; width 25mm maximum. Possible traces of a leather sheath.

2 R153 (FD/CR, Fig 55) A badly corroded dagger, possibly lacking the top of the tang and perhaps damaged at the tip of the blade, which is surprisingly blunt for a dagger. Surviving length 300mm; blade length *c* 215/218mm; width 29mm at the top. The shoulders are rounded and the blade tapers gradually to the now slightly rounded tip. Organic material on the tang may be the remains of a horn hilt, and the blade appears to be covered in fleece.

C Wood and leather scabbards

Details of the organic scabbards have been preserved in corrosion products on the blades, which is some compensation for the very poor condition of the swords from the Yorkshire burials. The typical scabbard was made of both wood and leather, and it seems that the method of construction has been hitherto unrecorded. The main framework is a length of wood shaped to cover one side of the blade and recessed to grip its edges; apart from the edges there was no wooden cover to the second side of the blade (Fig 56). Thus it resembled the shape of a metal scabbard-plate with overlaps, but the metal version would have clasped a second (overlapped) scabbard-plate. The Yorkshire scabbards were finished by covering the wooden frame with leather or fleece; there was no metal component. Presumably the open side of the frame was at the front of the scabbard, so

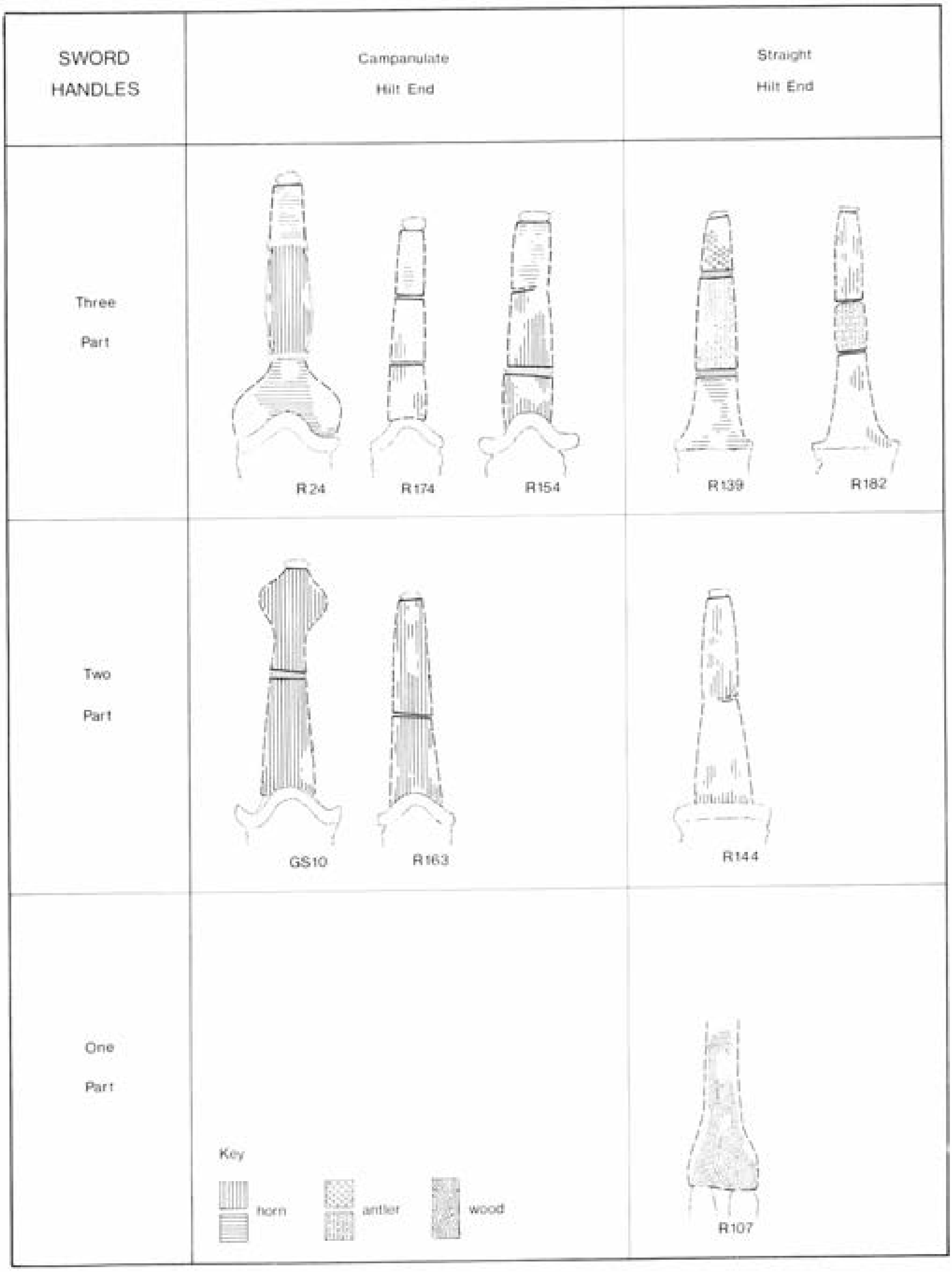

Fig 54 Diagram to show the construction of sword handles at Garton Station and Rudston

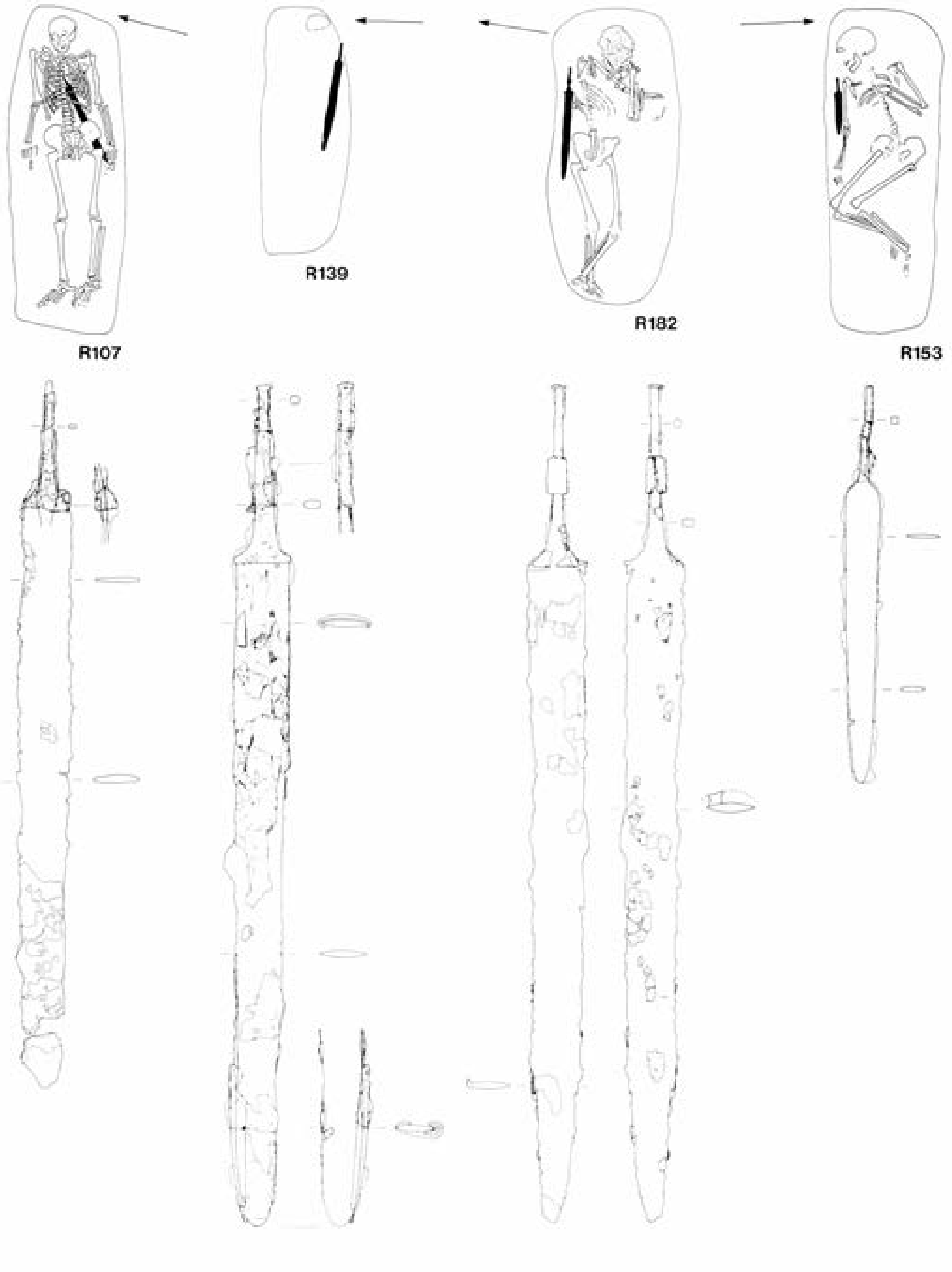

Fig 55 Rudston: iron swords and dagger unassociated with other grave-goods (1:4); grave-plans (1:30)

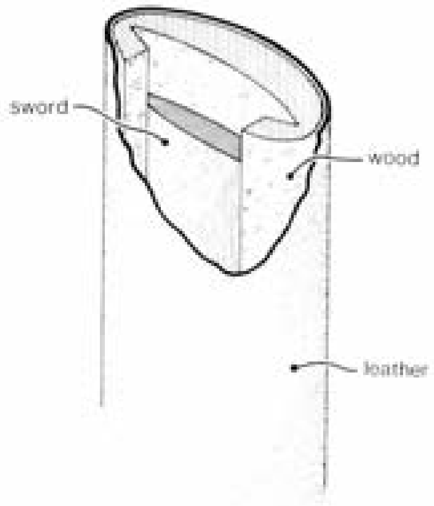

Fig 56 Sketch to show the construction of a typical Rudston scabbard

that the solid side could have been attached to a strap or belt; but no strap-fittings were observed.

The following eight scabbards were certainly constructed in this way:

1 R24 *Salix* sp (willow) or *Populus* sp (poplar); leather cover sewn at one edge for a length of at least 48mm (?a repair)

2 R57 *Fraxinus* sp (ash); near the bottom at the back the wood was at least 11mm thick in the centre; on the front the cover was fleece, with the fur side towards the blade, with another piece of wood (?extraneous) on the outside of the fleece, impossible to identify the species

3 R139 *Corylus* sp (hazel), covered with leather; at the bottom, along one edge, two strips of iron inserted (?perhaps a repair or reinforcement to the scabbard)

4 R144 *Alnus* sp (alder), with leather on the back and possibly fleece on the front where the blade is infested with pupae cases – perhaps the larvae ate most of the fleece; leather overlapping the iron hilt-end, perhaps from something other than the scabbard

5 R146 *Fraxinus* sp (ash); no evidence for leather cover

6 R154 *Alnus* sp (alder); only a little survives, but it does include a recessed edge

7 R174 Wood not identified; leather cover on both sides; there may have been a bordering groove on the wood at the back

8 R182 Possibly *Salix* sp (willow) or *Populus* sp (poplar); covered with leather

The following three scabbards may have been of different construction:

9 R107 Some skin on the blade, perhaps from the scabbard; the scale patterns on the hairs have been covered by consolidants so cannot be identified

10 R163 *Acer sp (maple)*, *Tilia* sp (lime), or *Prunus* sp (cherry); there is wood on both sides of the blade, and it is relatively thin; no evidence for a leather cover; an extraneous piece of wood, *Quercus* sp (oak), on one side

11 GS10 Traces of mineral-preserved organics (skin/leather and a little wood) on the blade; some of the wood is at the edge of the blade and may have come from a scabbard, but there are no details of construction

All twelve swords and the two daggers may well have been deposited in scabbards, and some of them may have been buried as worn. K3 is exceptional, the handle of the sword near the skeleton's feet, the scabbard upside down and well removed from the bones. All the other swords were close to or amongst the bones and all had the handles at the head of the grave. The sword in R107 was under an extended skeleton (Fig 55), and might have been worn in that position because swords are depicted on the backs of contemporary chalk figurines found in East Yorkshire (Stead 1988). In R144 the sword was on top of the skeleton, but the skeleton was face down in the grave, so again the sword might have been worn on its back. The only crouched skeleton with a sword, GS10, had its weapon alongside the body but behind the back, so it too could have been worn in the same way. R24 was alone in having a sword over the bones on the front of a skeleton. All the others were found near one or other of the arms. Four were on the right side (R146, R154, R174, and R182) and three were on the left (R57, R139, and R163). Four had the top of the blade in line with the middle of the humerus (R57, R139 apparently, R146, and R182) whereas three were slightly lower (R154, R163, and R174). The two daggers were in very similar positions, just outside and parallel with the right humerus.

3 Spearheads

Iron spearheads

British Iron Age spearheads have never been subjected to detailed study and are rarely found in any quantity. Apart from those published in this volume grave finds are rare, there are few stratified examples from settlements, and stray specimens are easily confused with later pieces, especially Anglo-Saxon (for Anglo-Saxon spearheads see Swanton 1973; 1974). On the continent the most recent work on Iron Age spearheads is Rapin's detailed study of the large Gournay deposit (with comparanda) in Brunaux and Rapin 1988 (especially 103–4, 133–4, figs 49, 50, 66). The spearheads from the Yorkshire graves differ markedly from the continental versions in that the socket hardly extends into the blade, which is either flat or only slightly thickened in the centre. Nearly all the Gournay spearheads have a sharp median ridge the full length of the blade; Rapin's nos 1714–15 are exceptional in having only a slight median ridge, but no 1724 alone is comparable with the Yorkshire examples (ibid, pl xlvi).

The variation in the form of the Yorkshire spearheads may be demonstrated by dividing them into two groups according to the shape of the blade (Fig 57): A, with a relatively low maximum width and B, with a higher maximum width. The classification was established visually, considering all the spearheads together, and it came as a surprise to find that the Garton Station and Kirkburn examples were thus distinguished from those in the Rudston and Burton Fleming cemeteries. Of the 21 spearheads classified as Group A, 18 are from Rudston and Burton Fleming; of the 30 Group B specimens all but one are from Garton Station or Kirkburn. This may perhaps be due to some chronological factor (the Garton Station and Kirkburn pieces could be earlier than most of the others) or it could represent slightly differing traditions amongst blacksmiths serving neighbouring communities. The material has been further subdivided according to the relative lengths of blade and socket, but here the percentages from all sites are very similar. The majority of the Yorkshire spearheads are quite small, ranging from 60–140mm in overall length; only four are longer (nos A2, 6, and 9, 160mm, 230mm, and 168mm, and B1, now 170mm).

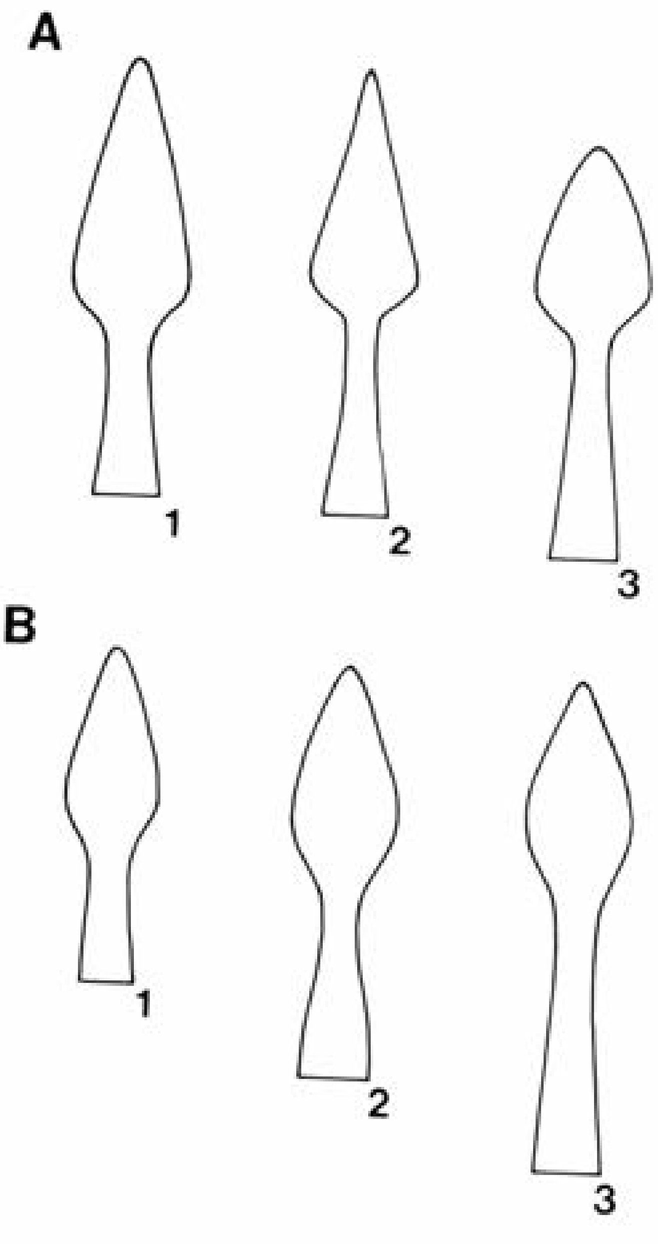

Fig 57 Sketches showing spearhead blades of two different shapes (A and B), with different proportions in the length of blade to socket (1–3)

Most of the sockets were forged into a complete cone, but some were divided (eg A11, 12, B9, 12, 14, 15, C2) and several of the seams can be distinguished. Slightly more than half have traces of the shaft surviving as mineral preserved wood in the socket: a dozen examples were identified (certainly or possibly) and most were from coppiced willow (or poplar) and hazel; two were ash. Many of the sockets are perforated for a rivet or nail to secure them to the shaft. Normally the perforations are at the sides, under the wings of the blade, but one example (A1) has holes in the opposite plane, and some are halfway between the front and side (eg A9, B13, 24). Occasionally perforations cannot be identified because of the corroded surface (even with the aid of X-rays), and sometimes only one can be distinguished (conceivably this is an original feature). Some Rudston and Burton Fleming spearheads have surviving iron rivets or nails in these holes: two have rivets (A10, 16), three certainly or probably have single bent nails (A4, 6, 20), and the head of an iron nail can be distinguished on A18. In contrast, only one Garton Station spearhead (B5) has a surviving iron nail and there are no iron rivets. One of the Garton Station specimens has had the socket secured by a bone peg (B14), and others may have employed wood; eg B21 has two clear holes in the socket and considerable remains of the shaft, but no hint of an iron nail or rivet on X-ray, and B15 has a cavity in the surviving shaft in line with the hole in the socket. Certainly wood was used to peg spearheads from a Wetwang Slack cart-burial.

Lacking a mid-rib or median ridge these Yorkshire spearheads were insubstantial weapons whose blades would have been liable to bend; their presence here in the graves with 'speared corpses' (p 33) allows the possibility that they were made solely for the burial ritual and not for warfare or hunting. Several of them had been bent in antiquity, presumably in the course of the 'killing ceremony'. In R154 the tips of the two spearheads were broken and separated from the sockets, five bent blades were found in R174, two in GS7, and one in GS4, and the socket of B16 in GS10 was broken and distorted. In four of these five graves the spearheads could have been damaged by hitting substantial wooden objects. Those in R154, R174, GS5, and GS10 penetrated possible wooden shields (p 63); a wooden object had also been penetrated by spearheads in GS7. There were textile remains on a spearhead from R174 (A5), and possibly from R94 (A1).

A Flat blades, with relatively low maximum width

Blades considerably longer than the sockets:

1 R94 (FB/AZ, BA, Fig 58, 2) Length 105mm (blade 65mm, socket 40mm); width ?20mm; socket diam 17mm. Single hole, almost 90° to normal. The blade and outside of the socket are covered in a variety of organic material including bone, pupa cases, possible textile, and straw.

2 R152 (FD/CP, Fig 58, 3) Length 157mm (?160mm; blade ?105mm, socket 55mm); width 38mm; socket diam 19/20mm. Lacking the tip; no trace of the shaft; the end of the socket appears to be covered in hairs or fleece. This was the only spearhead pointing out of the grave, Fig 28; the socket rested on the floor of the grave and may have been covered by clothing or a shroud.

3 R154 (FD/BZ) Two pieces that do not join, found separately in the grave; socket 50mm, socket diam 17/18mm. A fragment of *Fraxinus* sp (ash) in a corrosion bubble inside the socket; the socket opening is covered with organic material. Wood on the outside of the socket seems to have been penetrated by the socket and may have been part of a shield (p 63).

4 R154 (FD/CA) Length 92mm (?110mm; blade ?55mm, socket 45mm); width 20mm; socket diam 15mm. Straw in the socket, over the end, and on the outside; possible bent nail in socket

5 R174 (FD/AG) Length 80mm; width 35mm. Only the blade survives – very thin, bent, and slightly twisted, with markedly angled shoulders; textile and possible hair on one side of the blade

6 R174 (FD/AN) Length 230mm (blade 140mm, socket 90mm); width 37mm; socket diam 21mm. Bent iron nail in socket; tip of blade has penetrated wood (but the grain in different directions on the two sides, and possible fleece between the wood and iron) and broken before corrosion

7 BF63 (FZ/BA) Length 117mm (blade 77mm, socket 40mm); width 30mm; socket diam 18mm

8 GS5 (GW/HG) Length 106mm (blade 63mm, socket 43mm); width 29+mm; socket diam 16/20mm. Shaft remains; socket and blade chipped

9 GS7 (GW/FV) Length 168mm (blade 116mm, socket 52mm); width 33mm; socket diam 19mm. Shaft remains; single hole towards front of socket

Blades only slightly longer than the sockets:

10 R140 (FD/CK) Length 90mm (?100mm; blade ?52mm, socket 48mm); width 32mm; socket diam 20mm. Lacking tip; socket broken. A fragment of wood from the shaft, *Salix* sp (willow) or *Populus* sp (poplar), but the end of the socket covered with skin

11 R144 (FA/CD) Length 62mm (blade 35mm,

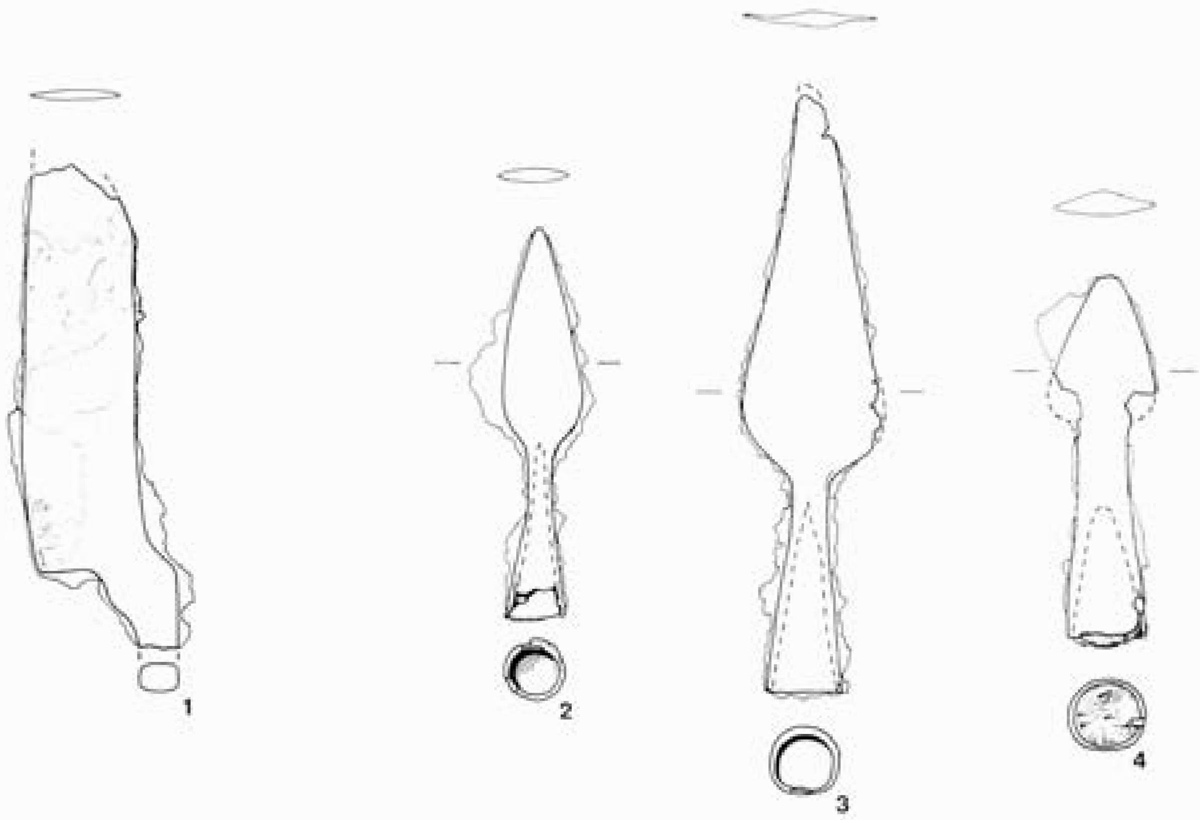

Fig 58 Rudston: iron objects unassociated with other grave-goods: 1, knife, R45; 2–4, spearheads, R94, R152, and R170 (1:2)

socket 27mm); width ?22mm; socket diam 11mm

12 R174 (FD/AJ) Length 123mm (blade 67mm, socket 56mm); width 31mm; socket diam 18mm. Divided socket; iron rivet quite high (22mm from the end). Wood on blade, one side only; possibly *Salix* sp (willow) or *Populus* sp (poplar)

13 R174 (FD/AQ) Length 90mm (blade 45mm, socket 45mm); width 24mm; socket diam 15/16mm. No trace of wood in the socket. Blade bent and broken where it has penetrated wood possibly from a shield (p 63)

14 R174 (FD/AM) Length 92mm (blade 47mm, socket 45mm); width 18mm; socket diam 13/14mm. Divided socket; quite sharp shoulders; possible wood remains in the socket

Blades shorter than the sockets:

15 R24 (FN/CE) Length 106mm (?108mm; blade ?41mm, socket 67mm); width ?26mm; socket diam 17/19mm. Lacking tip; socket chipped; socket wrapped, with an overlap; shaft remains, *Corylus* sp (hazel)

16 R57 (FN/BS) Length 76mm (?85/90mm; blade ?40+mm, socket 46mm); width 25mm; socket diam 16/18mm. Lacking tip; shaft remains, possibly *Corylus* sp (hazel) made from coppiced timber; iron rivet

17 R146 (FA/CA) Length 79mm (blade 39mm, socket 40mm); width 29mm; socket diam 15mm. Shaft remains, *Salix* sp (willow) or *Populus* sp (poplar) made from coppiced timber

18 R170 (FD/BM, Fig 58, 4) Length 98mm (blade 43mm, socket 55mm); width 28mm; socket diam 19/21mm. Rivet- or nail-head; coppiced wood in socket, *Corylus* sp (hazel)

19 R174 (FD/AL) Length 114mm (blade 52mm, socket 62mm); width 31mm; socket diam 19mm. Blade bent where it has penetrated wood about 12/13mm thick, probably *Alnus* sp (alder)

20 R174 (FD/AO) Length 73mm (?85mm; blade ?35mm, socket 50mm); width 23mm; socket diam 19/20mm. Socket apparently divided at bottom; X-rays suggest bent nail. Coppiced wood in socket, *Salix* sp (willow) or *Populus* sp (poplar), and possibly leather between the wood and iron. Wood on one side of the blade, and a piece of fleece, possibly from a shield (p 63)

21 GS10 (GW/GP) Length 84mm (blade 32mm, socket 52mm); width 25mm; socket diam 16mm. Hole in socket; some wood on outside of socket, in line with it

B Flat blades, with higher maximum width

Blades longer than sockets:

1 GS4 (GW/CQB) Length 77mm; width 20mm. Only the blade survives

2 GS7 (GW/FR) Length 124mm (?126mm; blade ?74mm, socket 52mm); width 20mm; socket diam 14/16mm. Lacking tip; two holes in socket; shaft remains; has penetrated wood 8mm thick

3 GS7 (GW/HR) Length 91mm (blade 58mm, socket 33mm); width 23mm (?25mm); socket diam 15/16mm. Socket and edge of blade chipped; one hole in socket; bent blade

4 GS7 (GW/FM) Length 85mm (blade 53mm, socket 32mm); width 23mm; socket diam 16/17mm. Shaft remains

5 GS10 (GW/GK) Length 140mm (blade 88mm, socket 52mm); width 32mm; socket diam 17/18mm. Iron nail in socket; shaft remains, possibly *Fraxinus* sp (ash)

6 GS10 (GW/GH) Length 115mm (blade 70mm, socket 45mm); width 29mm; socket diam 16/18mm. One hole in socket

7 GS10 (GW/GQ) Length 87mm (blade 54mm, socket 33mm); width 27mm; socket diam 18/20mm. One clear hole in socket; possible shaft remains; has penetrated (at the junction of socket and blade) wood 12mm thick with leather on both sides of the wood

8 GS10 (GW/GN) Length 66mm (blade 38mm, socket 28mm); width 15mm; socket diam 14mm. Socket broken at one side

9 K3 (KR/AI) Length 170mm (?180mm; blade ?110mm, socket 70mm); width 28mm, socket diam 22mm. Lacking the tip; divided socket; one hole; shaft remains

Blades slightly longer than sockets:

10 GS4 (GW/CQA) Length 71mmm (?80mm; blade 40mm, socket 40mm); width 20mm. Damaged socket; bent blade

11 GS5 (GW/HJ) Length 94mm (blade ?52mm, socket ?42mm); width 25mm; socket diam 18/19mm. Possible hole in socket; possible shaft remains; has penetrated wood, *Alnus* sp (alder), 16mm thick with leather on both sides, and a second piece of wood (adjoining, on the side nearer the socket)

12 GS5 (GW/FO) Length 111mm (blade 59mm, socket 52mm); width 28mm; socket diam 18/19mm. Bottom of socket divided; one hole in socket; shaft remains

13 GS7 (GW/FU) Length 134mm (blade 74mm, socket 60mm); width 28mm; socket diam 20mm. Hole in socket, towards the front

14 GS7 (GW/FQ) Length 100mm (blade 53mm, socket 47mm); width 19mm (?22mm); socket diam

17/18mm. Socket divided and has two holes; a small bone peg, 10mm long but lacking the head, was found in it and was presumably used to peg it to the shaft

15 GS7 (GW/FX) Length 133mm (blade 63mm, socket 70mm); width 27mm; socket diam 20mm. Divided socket; one hole and adjoining cavity in shaft remains

16 GS10 (GW/GR) Length 72mm (?75mm; blade 39mm, socket 36mm); width 20mm. Tip broken; socket broken and distorted; one hole in socket; has penetrated wood at least 6mm thick, with leather on one side of it

17 GS10 (GW/GO) Length 111mm (?115mm; blade 60mm, socket 55mm); width 24mm; socket diam 19/20mm. One hole in socket; has penetrated wood at least 8mm thick, with leather on both sides

18 K3 (KR/AJ) Length 105 (?110mm, blade ?60mm, socket 50mm); width 27mm; socket diam 19mm. Lacking tip; one hole in socket; shaft remains

19 K3 (KR/AM) Length 108mm (blade 54mm, socket 54mm); width 20mm; socket diam 21mm. Chipped socket; two opposing nails in socket; shaft remains

Blades shorter than sockets:

20 R174 (FD/AP) Length 113mm (?115mm; blade ?45mm, socket 70mm); width 23mm; socket diam 19/20mm. Lacking tip. Coppiced wood in socket, *Salix* sp (willow) or *Populus* sp (poplar). The blade, which had some fleece folded over one edge, had pierced another piece of wood, possibly from a shield (p 63)

21 GS4 (GW/HN) Length 87mm (blade 32mm, socket 55mm); width 18mm; socket diam 16/17mm. Two holes in socket; shaft remains

22 GS5 (GW/HK) Length 94mm (?98mm; blade ?40mm, socket 58mm); width 21mm; socket diam 18mm. Possible hole in socket; probably penetrated wood 12mm thick (survives on one side of the blade only)

23 GS7 (GW/FN) Length 109mm (blade 43mm, socket 66mm); width 22mm; socket diam 16/17mm. Tip bent; two holes in socket; shaft remains

24 GS7 (GW/FS) Length 90mm (blade 34mm, socket 56mm); width 16mm; socket diam 17/18mm. Hole towards front of socket

25 GS7 (GW/FP) Length 62mm (blade 30mm, socket 32mm); width 16mm; socket diam 17mm. Two holes in socket

26 GS10 (GW/GG) Length 96mm (blade 46mm, socket 50mm); width 23mm; socket diam 17mm. One hole in socket; shaft remains, probably Salicacae, *Salix* sp (willow) or *Populus* sp (poplar)

27 GS10 (GW/GM) Length 93mm (blade 35mm, socket 58mm); width 20mm; socket diam 15mm. Shaft remains

28 GS10 (GW/GJ) Length 75mm (blade 31mm, socket 44mm); width 15mm; socket diam 15/16mm. Shaft remains

29 GS10 (GW/GI) Length 69mm (?75mm; blade ?31mm, socket 44mm); width 17mm; socket diam ?14mm. Lacking the tip; two holes in socket

30 GS10 (GW/GE) Length 60mm (blade 27mm, socket 33mm); width 15mm; socket diam 14mm. Socket chipped; one hole; shaft remains

C *Miscellaneous blades of distinctive shapes*

1 R50 (FG/DT) Length 122mm (blade 75mm, socket 47mm); width 45mm; socket diam 17mm. An exceptionally wide blade; hole in socket. Shaft from coppiced sapling, *Corylus* sp (hazel)

2 GS7 (GW/FW) Length 74mm (blade 24mm, socket 50mm); width 18mm; socket diam 14/15mm. Sharply carinated blade; slightly divided socket; one hole; shaft remains

3 GS10 (GW/GF) Length 84mm (blade 40mm, socket 44mm); width 21mm; socket diam 14mm. Sharply carinated blade; shaft remains, *Populus* sp (poplar) or *Salix* sp (willow)

4 GS10 (GW/GL) Length 98mm; socket diam 18mm. Possibly a ferrule – there does not seem to be a blade (though a lump of corrosion at one side confuses the issue); a possible hole in the socket; shaft remains

Bone points

Six bone missile points were associated with iron spearheads in three graves, and seemed to have been used for the same purpose – they had been thrust into 'speared corpses'. They are shaped from sheep metatarsals, with one end pointed and the other hollowed to form a socket; in the only complete example there are two facing perforations across the socket through which it would have been nailed or pegged to a wooden shaft. Identical bone points were excavated in the Grimthorpe grave: 'six or eight...were found distributed on the top of the interment the whole length, and others, making sixteen in all, were found below and around the remains' (Mortimer 1905, 151). Mortimer correctly identified them as 'lance-heads', an interpretation doubted by Stead 1968, 170 (where 11 of the 13 surviving points are illustrated, fig 16). At Grimthorpe, too, an iron spearhead was found in the grave, and it is perhaps significant that its blade was broken, like some of those at Rudston and Garton

Station; perhaps it, too, hit the shield that was buried in the grave. There were 31 bone missile points along with 138 iron spearheads in the deposit at Hjortspring, on Als, Denmark (Rosenberg 1937, 44–5, 106), some of them still on their shafts (ibid, fig 24, nos 492 and 496).

1 R146 (FA/CK) Length 102mm; a complete bone point, with two facing perforations in the socket

2 R174 (FD/AH) Length 85mm; incomplete, lacking the socket

3 R174 (FD/AK) Length 58mm; shank only, lacking both tip and socket; a small perforation near the socket may be recent damage

4 GS5 (GW/HI) Length 89mm; incomplete, lacking the tip; a single perforation in the socket

5 GS5 (GW/HM) Length 64mm; incomplete, lacking the tip

6 GS5 (GW/HL) Eroded fragments, including two lengths 35mm and 37mm

4 Tools

by Vanessa Fell

Burial R87 (Fig 108)

1 (FG/BY) Length 73mm (almost complete); weight 43g (corroded); Fig 108, R87, 2

Iron hammerhead with a rectangular face and a square face. The large oval eye retains part of the mineralised *Buxus* sp (box) handle and two iron wedges. There is a corresponding expansion in the sides around the eye, and the front and rear are angled. The rectangular face, a straight-pein measuring *c* 7×10mm, is fractured at the edges and tip of the face. The other face is 8mm square and burred at the edges.

Many Iron Age hammers are arched, as is this one, and all have elongated eyes. A combination of face shapes is normal although straight-peins are much less common than cross-pein or square faces. This example is similar in overall form to the two hammers from Hod Hill, A8 with a straight-pein and a square face, and A7 with a straight-pein and a cross-pein (Manning 1985, 6, pl 2), and to Glastonbury Lake Village I90, with a square face and a cross-pein (Bulleid and Gray 1911, fig 48; 1917, 380–1).

Burial R141 (Fig 110)

1 (FN/BF) Length 68mm (incomplete); length of tang 28mm; diam (max) 5mm; Fig 110, R141, 2

Iron file, tapering, round section, the cuts extending over *c* two-thirds of the circumference. The ridges are well defined and are raked forwards to the tip, *c* 5–6 per cm. The tang retains traces of the wooden handle, possibly *Buxus* sp (box).

A file of this form and cut would probably have been used for enlarging or finishing perforations or recesses in materials such as wood or horn. Files cut on a convex side are not uncommon, eg from Meare Village West (Gray and Bulleid 1953, 238, I27, I39) and Gussage All Saints (Fell 1988, fig 1, nos 8, 9, 12), all more finely cut than the Rudston file. Coarse-cut files are known but are larger and most are cut on a flat side.

2 (FN/BF)Length 102mm; length of blade 56mm; Fig 110, R141, 3

Broad iron blade; the straight edge is in line with the tang, the blunt tip at right angles to the edge forming a beak. The tang retains part of the *Fraxinus* sp (ash) handle and a horn collar which overlaps the wood. Traces of a leather sheath are preserved on the broadest part of the blade, overlapping the horn collar.

This may have been a leaf-knife (cf Manning 1985, 56–8, particularly F58) or a blade for another function.

3 (FN/BF) Length 76mm; length of tang *c* 24mm; Fig 110, R141, 1

Tapering iron tool, ?awl, 4mm in diameter at the tang junction. Accretions obscure the form of the tip. Traces of wood on the tang, poorly preserved but likely to be one of *Alnus* sp (alder), *Corylus* sp (hazel), *Populus* sp (poplar), or *Salix* sp (willow).

4 (FN/BE)Length 140mm (incomplete); Fig 110, R141, 4

Antler tine, fractured at the broad end. The original surface has decayed and there is no evidence of rivets, nor of use indicated by polish or wear. This may have been a tool such as a burnisher, or a handle, but not for the three tools in this group, all of which had wooden handles.

Burial R154 (Fig 112)

1 (FD/BY) Length 513mm; length of jaws (to rivet) 110mm; Fig 112, 5

Iron tongs with bowed jaws and extended gripping faces which are closed to within 4mm at the tips. The handles are rectangular-sectioned near the rivet and round in section thereafter. Mineralised textile is present on the upper side (as excavated) of the handles and there is a lump of iron slag on the other side near the rivet.

These tongs are more slender than other Iron Age examples and the gripping faces are longer; compare for example the pair from Garton Slack (Brewster 1975, 112; 1980, 364–5, fig 218, pl 69) and five from Waltham Abbey (Manning 1985, 8, pls 2–4, nos A11–A15).

2 (FD/CD) Length 90mm; Fig 112, 6

Flat iron plate, tapering in width at one end, with three equidistant rounded perforations along the length. Traces of mineralised textile are preserved on one surface.

At excavation the plate was adjacent to the inside of one of the handles of the tongs near the rivet. The holes are large enough to have allowed the plate to fit over the ends of the handles, and its purpose, suggested by association with the tongs, was probably a coupler to clamp the handles together. The more usual form of coupler is a ring or loop, often attached to one handle. No other British Iron Age tongs have been found with couplers, though a ring coupler occurs at Manching (Jacobi 1974, pl 3, 15). The use of a plate coupler is demonstrated by tongs from Cirencester (Manning 1985, 6), also with three holes.

3 (FD/CB) Length 82mm; Fig 112, 4

Slender iron ?hammerhead, narrow with straight sides at one end, expanding about a rectangular eye towards the other. Both ends are rounded and may be slightly angled or worn; neither appears to be burred. Mineral preserved wood in the eye, one of the Pomoideae family such as *Malus* sp (apple), *Pirus* sp (pear), or *Crataegus* sp (hawthorn).

The presence of the wood suggests that this was a hafted implement or tool rather than a fitting. If this identification is correct, the slender form would preclude its use other than for very light work. A not dissimilar tool but with straight sides, described as a hammer, was found at Tumulus de Celles, France (Pagès-Allary *et al* 1903, 397, fig 23), the longer arm terminating in five fine points, the other plain.

5 Iron knives

(see also the knife from R141, p 79)

1 R45 (FN/BQ, Fig 58, 1) Length 129mm, broken at both ends. Straight blade, and straight back angled towards the (broken) point; stepped tang. Mineral preserved wood (*Salix* sp (willow) or *Populus* sp (poplar)) on the blade, possibly from a case; cf Manning 1985, 116, type 17, but the Rudston example is unusual in having the tang stepped up from the blade

2 R50 (FG/DZ; Fig 106) Length 139mm, tang broken at end. Straight blade and straight back. Some mineral preserved wood on the tang but too degraded to identify; cf Manning 1985, 114, type 11A

3 BF63 (FZ/AP; Fig 120) Length 132mm, tip of tang possibly broken. Long narrow curved blade and remains of mineral preserved organics on the tang (probably horn). The end of the handle is sharply defined, apparently with an iron washer; cf Manning 1985, 118, type 23, especially Q67 and 70; an Iron Age type that continues into Roman times

The four knives are of different types, but all were found with east–west burials. All were on the right side of male skeletons (R141 had contra-indications for sex, but was accompanied by a collection of tools): R50 under the right hand, by the right shoulder; R141 and BF63 to the right of the chest; R45 at the waist, by the right elbow.

6 Brooches

Most of the brooches are of iron, and many are badly corroded. They have been drawn to show the present outlines as well as features visible on radiographs. The true spring is extremely rare, and the three-coil mock-spring is common (Fig 59, A; cf Stead 1979, 68). Such brooches were made in two parts: (1) the bow, terminating in a normal foot at one end and a bow-ring at the other; (2) the pin, with two pin-rings linked by an external chord. The two parts were joined by placing the bow-ring between the two pin-rings and inserting a solid or cylindrical rivet. The brooches excavated before 1975 were conserved by Josephine Ridgway, and those found before 1973 were included in her excellent thesis (Ridgway 1973); subsequent discoveries were conserved by Glynis Edwards.

Unless otherwise noted, all the brooches are iron.

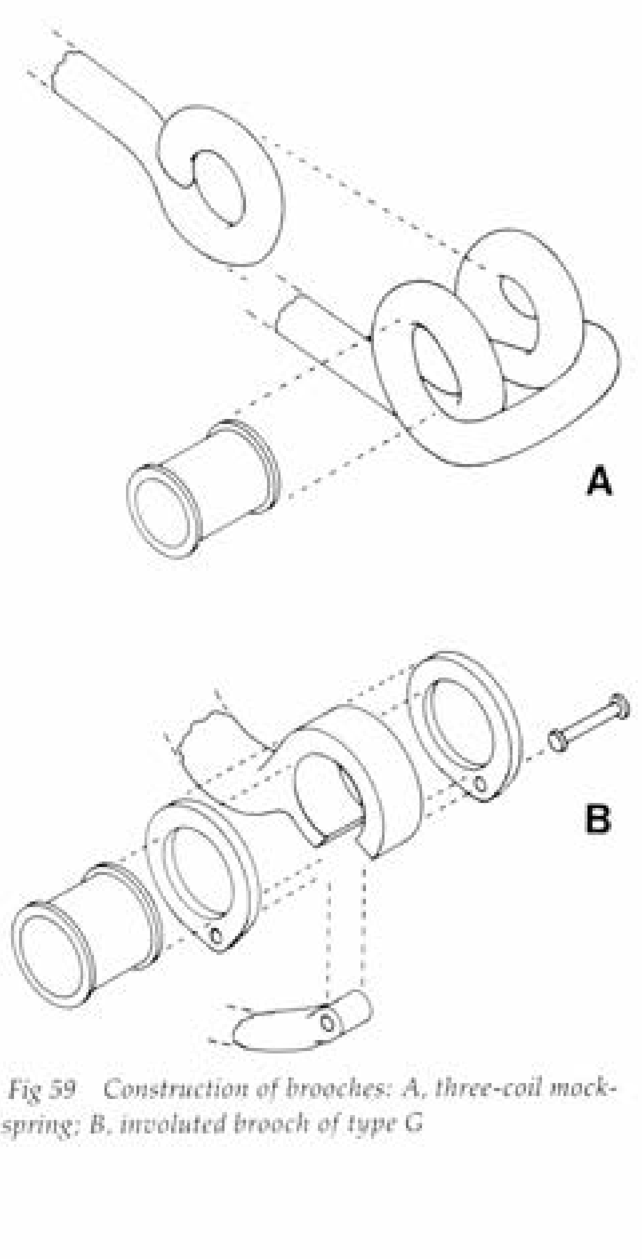

Fig 59 Construction of brooches: A, three-coil mock-spring; B, involuted brooch of type G

A Arched bow brooches

(=Dent 1982, 441, Group 1): 1–3, La Tène I forms; 4 and 5, La Tène II forms

1 BF61 (FZ/BH) Length 52.5mm; copper-alloy

It may have had a genuine spring originally (nine coils and an external chord) but if so it was given a replacement-pin with one coil, hinged on a copper-alloy rivet passing through all the coils. The pin goes over the central rivet; in a true spring it would go under the rivet. The foot-disc has a central perforation with concentric grooves; the catch-plate has engraved or chased ornament (Stead 1979, 94, fig 36, no 1).

The most comparable local brooch, from Cowlam (Stead 1979, 64–5), was classified by Hull and Hawkes (1987, 78, 84–6, no 2930) as their Type 1A and regarded as a possible import, subsequently modified. This Burton Fleming brooch has a very similar foot and a bow only slightly more splayed, but a much smaller and longer 'spring': Hull and Hawkes (ibid, 98–9, no 4374) classified it as Type 1Ba, where it sits awkwardly alongside the very distinctive 'Wessex' type.

2 R84 (FG/BV) Length 75mm

Possibly a true spring originally (four coils and an external chord), but like A1 it now has a pin hinged on a solid rivet (this one is iron) through the coils of the spring and, also like A1, the pin passes over the rivet. There was no hint of the foot of this brooch in the grave, so perhaps it was used in this cut-down form. The bow is more splayed than A1, and would be accommodated in Hull and Hawkes' Type 1Bx (ibid, 87–91).

3 R178 (FA/BH) Length 59mm

The construction is not clear on radiographs, but it must be a three-coil mock-spring, with a cylinder rivet. Two slightly concave copper-alloy washers, at the ends of the cylinder rivet, are linked by a long thin rivet which has supported an applied imitation 'enamel' knob at each end. The large foot-disc is surmounted by a flat copper-alloy disc (attached by four rivets) and has been capped by a large applied knob of imitation 'enamel' (now decayed) secured by a copper-alloy rivet. Radiographs suggest that the end of the foot and end of the catch-plate have had a copper-alloy cover.

Another iron bow brooch, apparently from Yorkshire, should be noted here. In the Yorkshire Museum it is grouped with finds from the Heworth Anglian cemetery, an unlikely provenance for a La Tène I iron brooch; perhaps it came from the nineteenth-century excavations at Arras or Danes Graves (this brooch is to be published in Eagles forthcoming).

The very large applied knob recalls elaborate brooches of Münsingen type (Jacobsthal 1944, 129) which occur towards the end of La Tène I in the Münsingen cemetery (eg Münsingen graves 149, with a La Tène II brooch, 156, and 171; Hodson 1968). For a rather similar British example see the brooch from Trevone, Hull and Hawkes 1987, 104 and pl 32, no 6888 (type 1Bb).

4 R39 (FM/CV) Length 114mm

Apparently a three-coil mock-spring, with an iron rivet (?solid or hollow) through the coils which has secured a large imitation 'enamel' knob at each end (only one survives). On the foot a larger imitation 'enamel' knob, with the remains of decoration, is attached by an iron rivet. The foot-disc has a finial attached to the bow by a collar (Stead 1979, 66, fig 23, no 2; hence Hull and Hawkes 1987, 143–4 and pl 41, no 3800, type 2Ba; the X-ray showing the collar was taken subsequently).

Similar in construction to A3, but with the addition of a collar – the distinguishing feature of the La Tène II brooch. Like A3, this brooch could belong to the third century BC.

5 BF56 (FZ/CE, Fig 60) Length 73mm

Three-coil mock-spring with iron cylinder rivet. Globe element on the foot instead of a disc, with a long finial clasped to the bow by a collar (Stead 1979, 94, fig 36, no 2).

Published in Hull and Hawkes 1987, 139–40 and pl 40, no 4377 (type 2Ab). This brooch is unique in Yorkshire in having a globe element; on the continent the globe is at least as common as the disc.

B Flat bow brooches

La Tène I forms

1 R102 (FB/AR, Fig 60) Length 75mm

Three-coil mock-spring; apparently a solid rivet. The large (19mm diam) imitation 'enamel' knob has been attached by a copper-alloy rivet with large domed head.

2 BF20 (FR/AA, Fig 60) Length 88mm

The longish spring seems to be a true spring – thus unique in this cemetery – apparently with four coils and certainly with an external chord. This end of the brooch is obscured by magnificently-preserved textile. The small disc-foot carries a cup-shaped setting for an 'enamel' knob.

C Long flat bow brooches

La Tène II forms

All these brooches have three-coil mock-springs, and foot-discs whose finials seem to be attached to the bow by collars. Most of the iron brooches are badly corroded and details are obscure; some collars are obvious despite the corrosion, some have been revealed by selective cleaning, and others have been shown by X-rays. However, some brooches have a

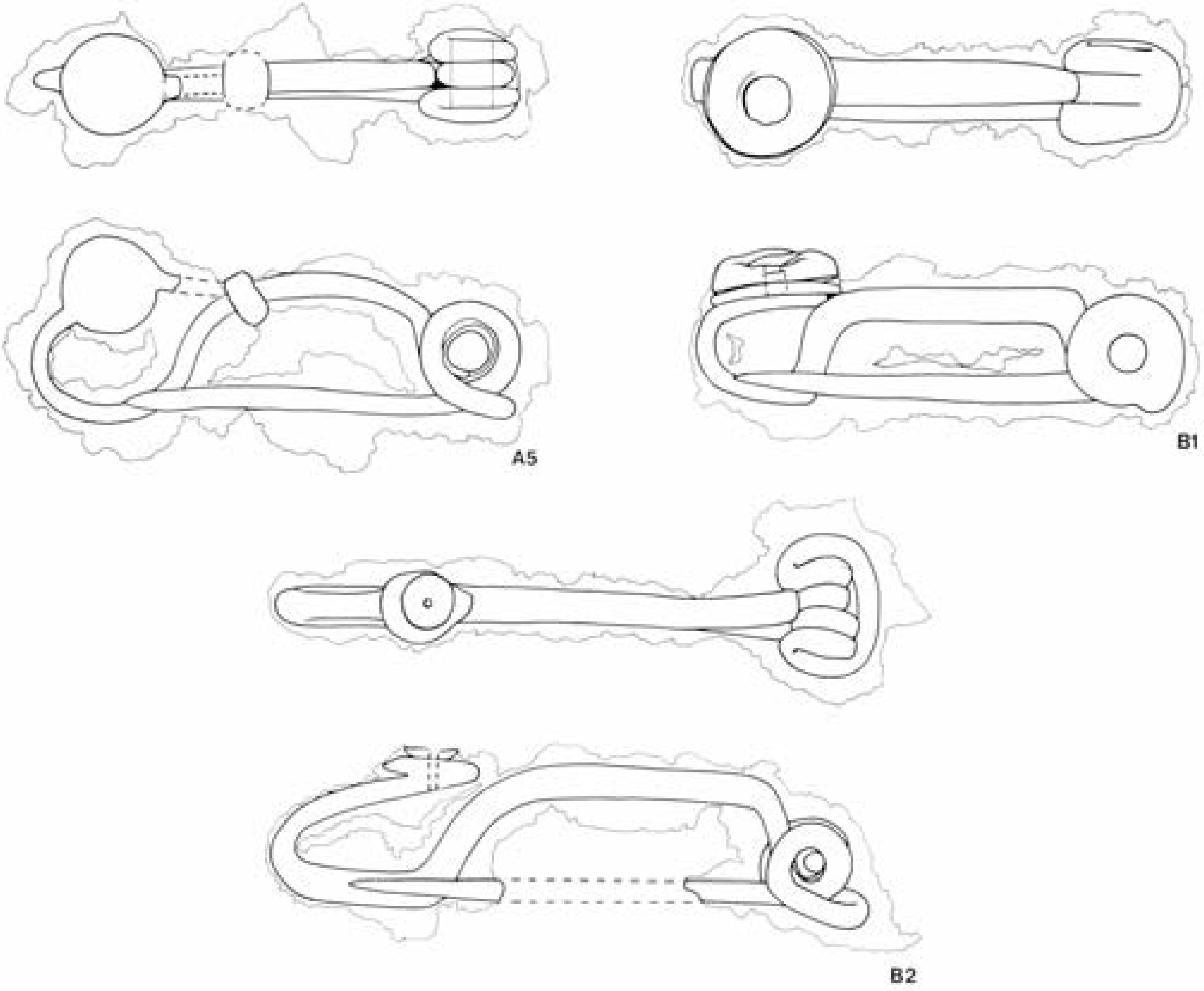

Fig 60 Iron brooches with arched bow and flat bow, types A and B (1:1)

collar obvious on the object itself but not on the X-ray (C4) and vice versa (C6), so it is possible for a brooch to have had a collar that cannot now be detected. No Yorkshire brooch of this type has an undoubtedly free foot, but they do occur elsewhere (eg Mount Batten, Plymouth, Cunliffe 1988, 24, fig 15, 1).

Type C is most clearly seen in its copper-alloy versions (C1, below, and one from Sawdon, Stead 1979, 66, fig 24, 2). The brooch from Huntow (ibid, fig 24, 1) is presumably a precursor of the type, with shorter bow, slanting foot, La Tène II collar, and, apparently, a true spring. The nearest approach to type C in the Hull and Hawkes classification is their 2Ab, but that includes some quite different brooches (eg their 4377, which is A5 here). Brooches that would be classified here as type C are included in Hull and Hawkes types 1Ca (3102, Danes Graves), 1Cb (7868, 0728, and 8072, Wetwang Slack; 4375, which is C2 here), and 2Aa (7888, Wetwang Slack) as well as 2Ab.

Type C brooches vary from 65 to 106mm long, with the sole exception of the short C22.

(i) Cylinder rivets through the head

Most examples have bow- and pin-rings of circular section; C5 and 14 have flat rings.

1 BF10 (FR/BU) Length 77mm; copper-alloy

Cast decorated bow, with the bow-ring diagonally grooved. A small circular disc on the foot, surmounted by a cup-shaped setting attached by two rivets and seating an applied 'enamel' knob; well preserved collar cast with the disc and subsequently clasped to the bow. The bow- and pin-rings are linked by a cylinder rivet whose ends are covered by applied knobs of 'enamel' linked by a long thin rivet. The entire head of the brooch is covered with replaced fabric. The cast decoration on the bow comprises a central 'eye' motif from which two broad grooves (bordered by finer grooves) run diagonally across the top of the brooch; all the rest of the bow is neatly ribbed.

2 R2 (FE/AP) Length 79mm

The long oval foot-disc projects slightly backwards, and there is no sign of a collar.

3 R83 (FG/BR) Length 1O6mm

4 R91 (FG/CF) Length 92mm

Cleaning has revealed the three-coil mock-spring mechanism particularly clearly. The foot-disc has an off-centre rivet-hole (no surviving knob), and the collar can be seen on the object but not on the X-ray.

5 R180 (FA/AL) Length 73mm

A variety, possibly originally of this type and then modified. The catch-plate is extremely short and there is no foot – perhaps the filed-down version of a normal type whose original foot was broken. The pin now seems to extend beyond the catch-plate and it is not pointed – its end is squared.

6 BF2 (FR/CS, Fig 61) Length 65mm

7 BF5 (FR/CC, Fig 61) Length 98mm

Small foot-disc with a long projection beyond and a probable collar.

8 BF6 (FR/CG) Length 88mm

The collar, just visible on X-ray, clarified by cleaning.

9 BF9 (FR/BN) Length 92mm

A relatively large foot-disc, and the section on X-ray shows a domed shape suggesting a replaced 'enamel' knob (but no hint of a rivet to attach it). Apparently no collar.

10 BF13 (FR/BD, Fig 61) Length 81mm

11 BF14 (FR/AY, Fig 61) Length 82mm

12 BF15 (FR/AJ, Fig 61) Length 85mm

13 BF18 (FR/AO) Length 73mm

Slightly down-turned bow.

14 BF19 (FR/AD) Length 91mm

Copper-alloy cylinder-rivet; relatively large foot-disc, diam 2Omm.

(ii) Solid rivets through the head

Most examples have flat rings; C16 and 20 have rings of circular section.

15 R4 (FE/AX, Fig 61) Length 95mm

Bow slightly down-turned. A knob of 'enamel' (or imitation 'enamel') has been attached to the foot-disc by an iron rivet with domed head, and perhaps an iron washer below the head and on top of the knob. The corroded knob is indistinguishable from iron corrosion. Apparently no collar.

16 R118 (FN/BK, Fig 62) Length now 72mm

Fragment, lacking the foot.

17 BF4 (FR/BX) Length 83mm

Cleaned to reveal the 'spring' mechanism.

18 BF7 (FR/BH, Fig 62) Length 83mm

A slightly hollowed setting for an applied knob seems to have been attached to the foot-disc by two rivets (cf C1). Apparently no collar.

19 BF11 (FR/BM) Length 73mm

Bow slightly down-turned. On both object and radiograph there is a suggestion of a central rivet on the foot-disc, but no indication of a collar.

20 BF53 (FZ/DK, Fig 62) Length now 37mm

Fragment, lacking the foot.

(iii) Unclassified – the head is missing

21 BF1 (FR/CO, Fig 62) Length 62mm

Fragment, lacking the spring. Apparently no collar.

(iv) Atypical

Instead of having rings constructed in the usual way, they were made as solid discs and then perforated to be linked by a small solid rivet. The involuted type H brooches were also made in this way.

22 R34 (FM/CU, Fig 62) Length 52mm

D–J Involuted brooches

Derived from type C, it seems very likely that all involuted brooches are of La Tène II construction (some are technically La Tène III, with the foot in one with the bow). The most likely candidate for an involuted brooch with free foot is that from Trevone (Hull and Hawkes 1987, 158), but the foot is broken. Hull and Hawkes recognise two main varieties, gently involuted (2Ca) and tightly involuted (2Cb) corresponding roughly with Dent's long and short involuted brooches (Dent 1982, 441–4), and with the sequence D, E, and F here; G, H, and J are separate distinctive forms. At Wetwang, Dent was able to confirm the typological sequence flat bow–long involuted–short involuted, in a series of graves related by stratification. In terms of the types distinguished here, Wetwang Slack had D following C twice; F following C, C/D, and D; and J following F twice; thus supporting the typological sequence C–D–F–J.

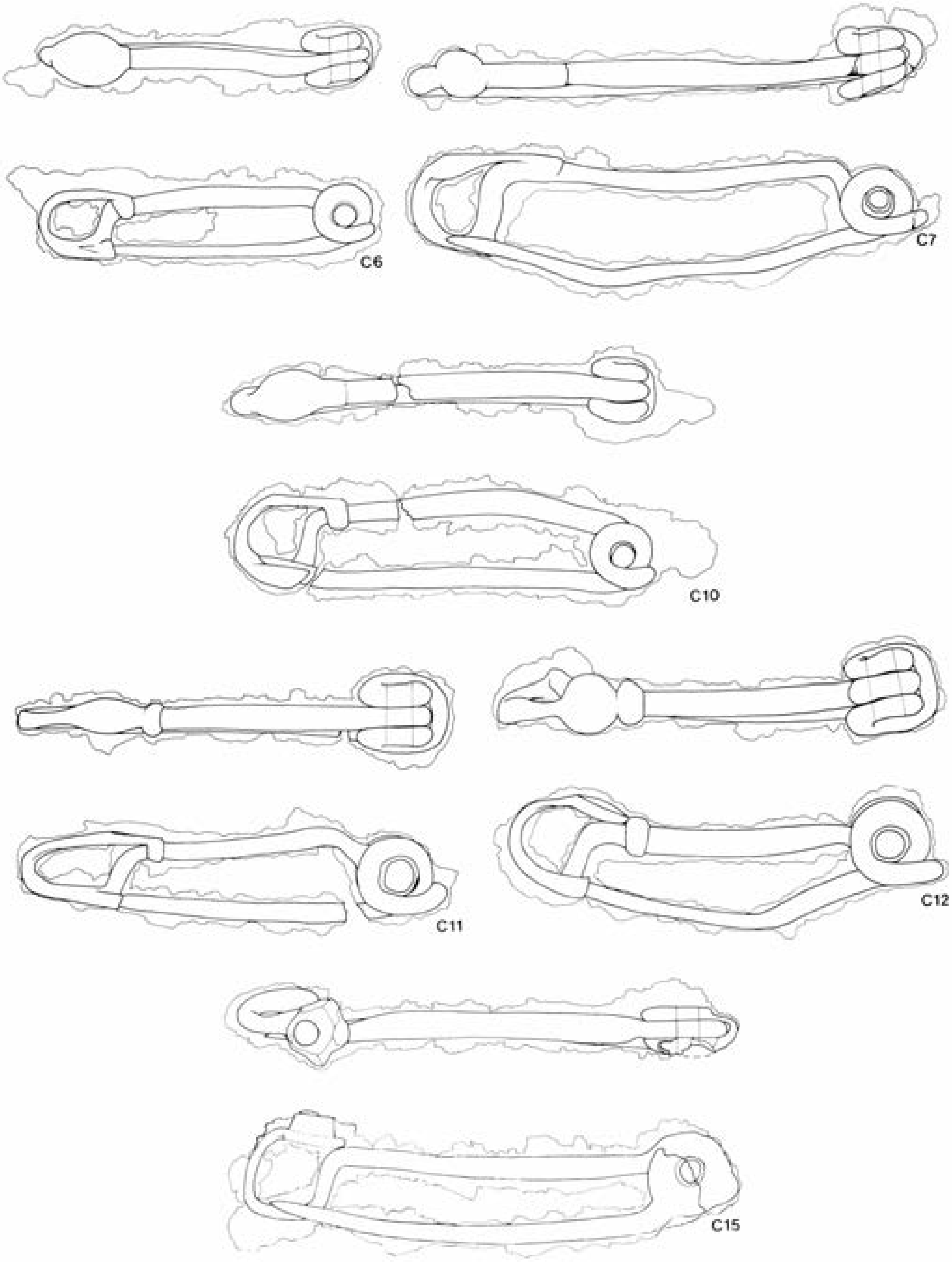

Fig 61 Iron brooches with long flat bows, type C (1:1)

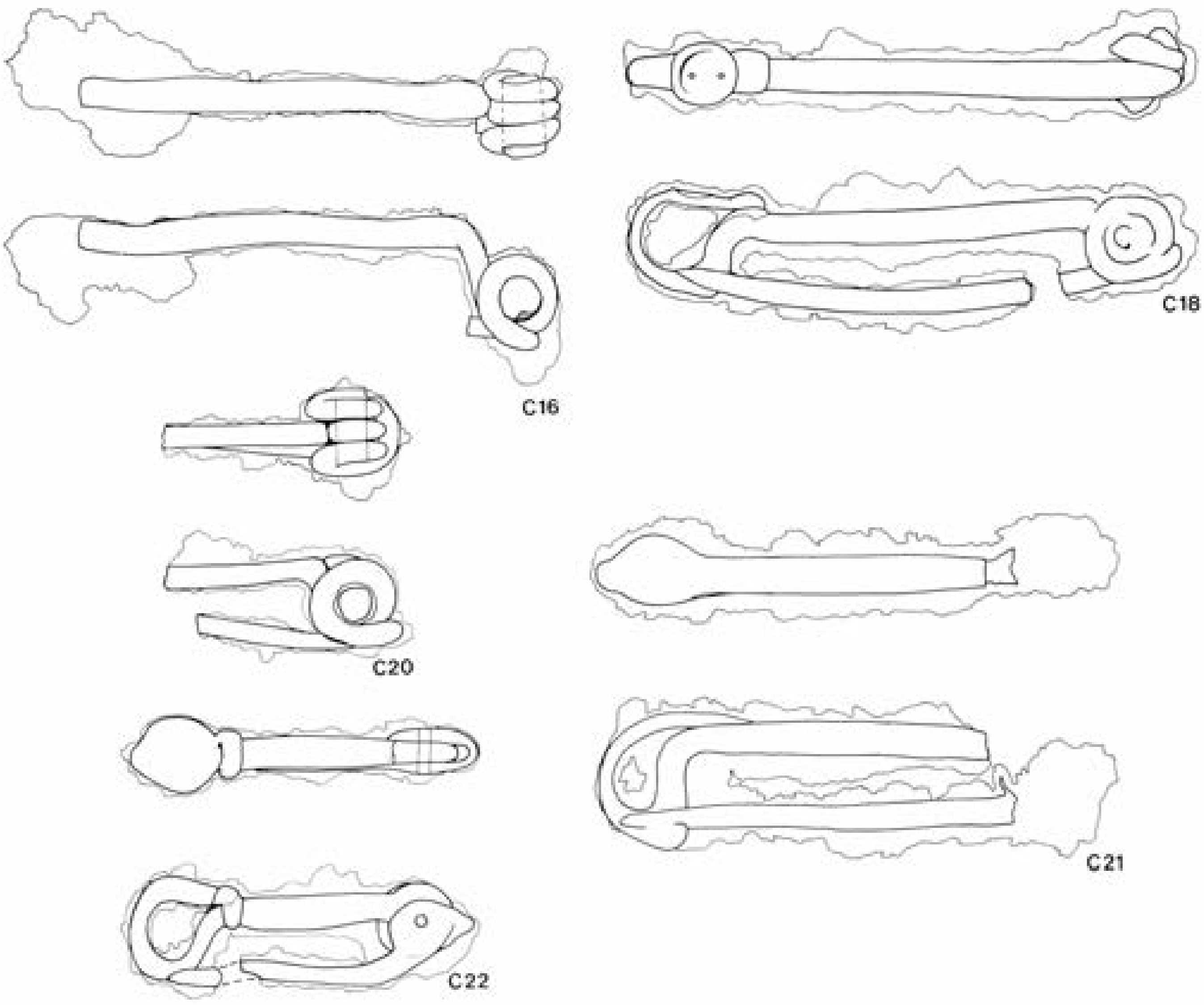

Fig 62 Iron brooches with long flat bows, type C (1:1)

D Long involuted brooches

Length 62–82mm; small flat foot-plates clasped to the bows, three-coil mock-springs, and cylinder-rivets

1 R36 (FM/DB, Fig 63) Length 82mm

Some copper-alloy corrosion products above and below an iron foot-disc. Collar clear on X-ray (?copper-alloy).

2 R46 (FB/BD) Length 68mm

Possibly an 'enamel' (or imitation 'enamel') knob on the foot, but it is obscured by corrosion and there is no hint of a rivet.

3 R69 (FG/AD, Fig 63) Length 74mm

Just the hint of a collar on both object and X-ray.

4 R97 (FB/AY, Fig 63) Length 62mm

Small cylinder rivet, no sign of external chord; collar clear on object but not on X-ray.

5 R106 (FB/BF) Length 62mm

E Shorter involuted brooches

Length 30–56mm; foot-disc decorated with 'enamel' knob; usually a humped 'stop' at the head of the bow; cylinder rivets

1 R22 (FL/CX) Length 51mm

Applied ornament (attached by copper-alloy rivet to iron foot-disc) is in two parts: at the bottom, a ring formed of two arcs of coral (identification confirmed, 'almost certainly coral', by Dr Brian Rosen), surmounted by a knob of red 'enamel'. No 'stop' on the bow.

2 R27 (FM/BM) Length 43mm

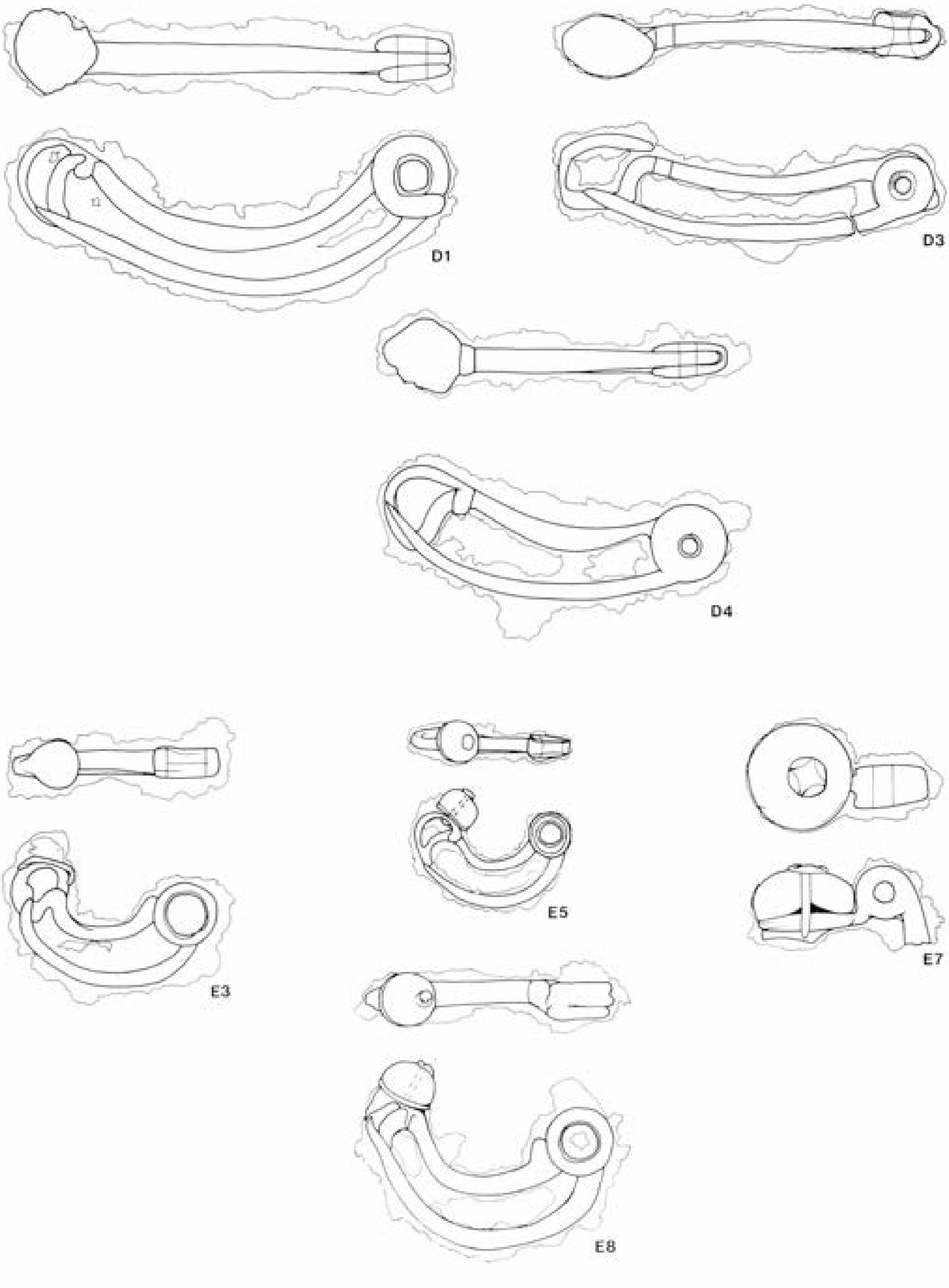

Fig 63 Iron involuted brooches, types D and E (1:1)

Copper-alloy foot-disc and rivet but the applied knob does not survive. ?Copper-alloy cylinder rivet; very narrow head.

3 R60 (FN/AC, Fig 63) Length 39mm

Remains of an imitation 'enamel' knob on the foot.

4 R71 (FG/AH) Length ? (fragments do not join)

In two parts, with some of the bow missing. ?Copper-alloy cylinder rivet.

5 R76 (FG/AX, Fig 63) Length 30mm

Copper-alloy foot-disc and rivet, and copper-alloy on the end as far as the catch-plate. ?Copper-alloy cylinder rivet. No 'stop' on the bow.

6 R140 (FD/CM) Length 56mm

Iron rivet on foot, but now lacking the applied knob.

7 R199 (FH/AT, Fig 63) Length 32mm

Atypical. Tightly involuted brooch with the large foot-disc touching the 'spring' (cf F4). 'Enamel' knob attached by copper-alloy rivet with large decorated head.

8 BF41 (FZ/BF, Fig 63) Length 48mm

F Involuted brooches without applied 'enamel' knobs; cylinder rivets

Length 28–39mm, with one exception (F5)

(i) Relatively wide foot-plates

1 R35 (FM/CG, Fig 64) Length 39mm

2 R190 (FH/BF, Fig 64) Length 39mm

?Some trace of a knob on the foot, obscured by corrosion.

3 R194 (FH/AV, Fig 64) Length 33mm

4 R202 (FH/AU, Fig 64) Length ?35mm

A humped 'stop' at the head of the bow.

5 BF29 (FZ/BY, Fig 64) Length ?52mm

(ii) Narrower foot-plates

6 R13 (FL/AM) Length ?28mm

7 R25 (FN/AQ) Length 31mm (main fragment)

Head with ?copper-alloy cylinder rivet; fragment of foot.

8 R82 (FG/CK) Length 36mm

Thin flattened copper-alloy foot and collar; some copper-alloy on the catch-plate; copper-alloy cylinder rivet.

9 R134 (FB/AF, Fig 64) Length ?36mm

10 R195 (FH/BE, Fig 64) Length now 35mm, lacking foot

Copper-alloy collar.

11 BF31 (FZ/AK, Fig 64) Length 39mm

G Involuted brooches with hinged pins mounted within the head

(ie not on 'tags' suspended below the head). In the copper-alloy version it would have been easy to cast the cavity in which the head of the pin and its hinge are housed, but iron examples must have been made in a different way. Some of the iron versions (especially G3 and 4) have very clear cylinder rivets, even though the pins are hinged below. It seems that the rivets linked three rings in the head: the central ring (forged in one with the bow) would have been open at the bottom, creating the cavity for the head of the pin; the complete outer rings would have formed the sides of the cavity (Fig 59, B).

1 R32 (FM/BR) Length 48mm; copper-alloy

The head of the brooch is a ring, deeper at the bottom than the top, and through the deepest part is a vertical perforation (penetrating the inner surface as well) to take the head of the pin, which is pivoted on a rod crossing the perforation. The bow is undecorated but for a rounded 'stop' beyond which the head of the brooch has a waisted moulding on the top, terminating in a tubular cross-moulding at the back. The catch-plate is moulded with a central deep lip motif, and it terminates in a disc deeply grooved for keying a knob of 'enamel' (which is also riveted). There is no collar.

2 R20 (FL/CK) Length 62mm

The hinged pin is visible on some of the radiographs, and the collar is clear on all. At the sides of the head are saucer-shaped copper-alloy washers, linked by rivets; the central rivet (which presumably secured applied 'enamel' knobs set on the washers) is now lost but on both sides of its hole are surviving (?copper-alloy) rivets.

3 R37 (FM/DG) Length 25mm (head only)

A clear cylinder rivet, but nonetheless the pin is hinged below – very clear on the object as well as on X-ray.

4 R40 (FM/DF, Fig 65) Length 25mm (head only)

Copper-alloy cylinder rivet but hinged pin very clear on X-ray.

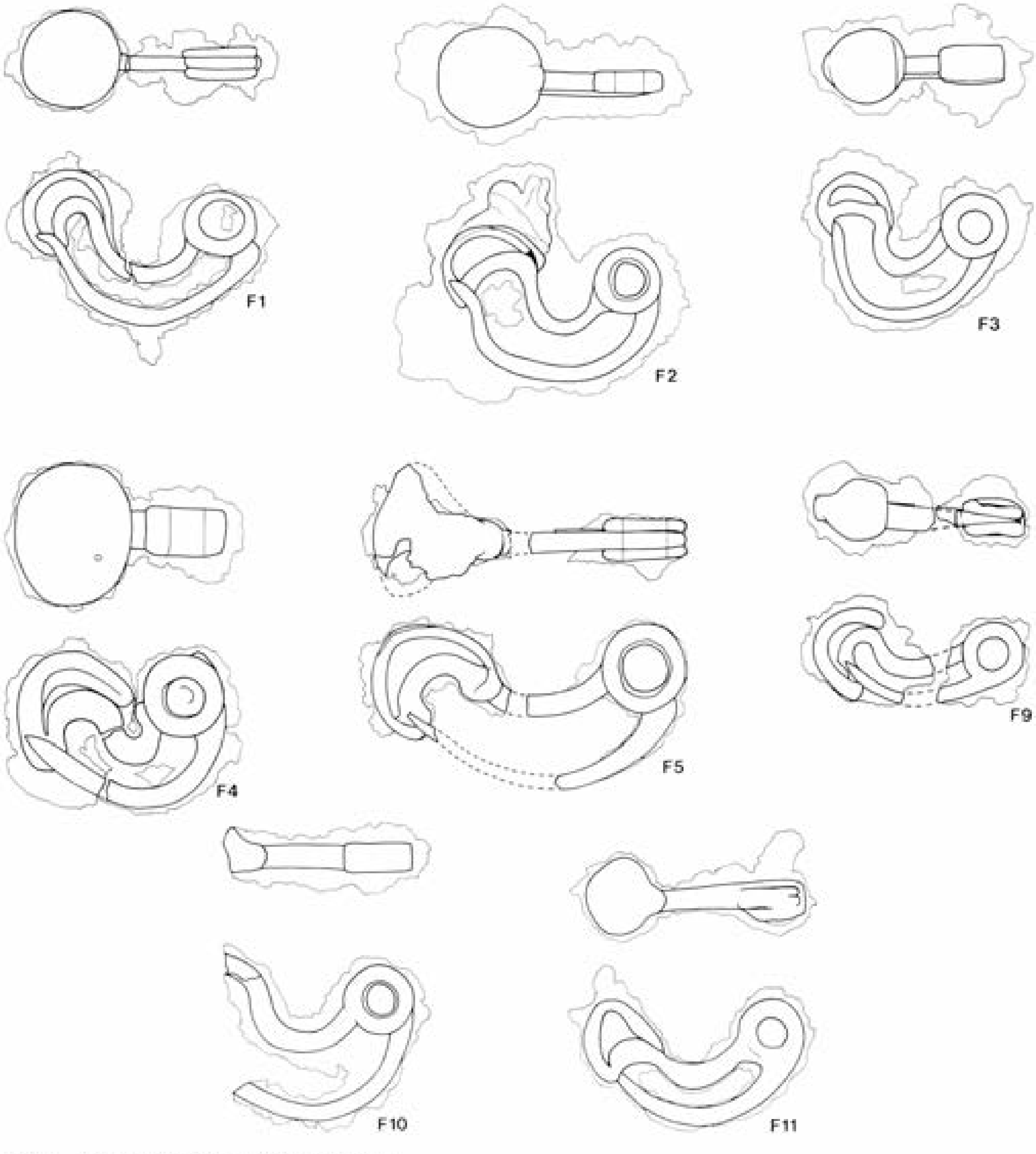

Fig 64 Iron involuted brooches, type F (1:1)

5 R143 (FA/CO) Length 37mm

The detail is very clear on the X-ray, with a well-marked collar.

H Involuted brooches whose mock-springs have three flat discs instead of rings, and a small solid rivet instead of a cylinder rivet

1 R7 (FE/BH, Fig 65) Length 4Omm

Copper-alloy foot-disc, and copper-alloy also on the catch-plate and end, but there is certainly an iron core at the end ?wrapped with copper-alloy.

2 R77 (FG/BL, Fig 65) Length 38mm

J Short involuted brooches with applied ornament on broad feet

In the head are two copper-alloy washers, presum-

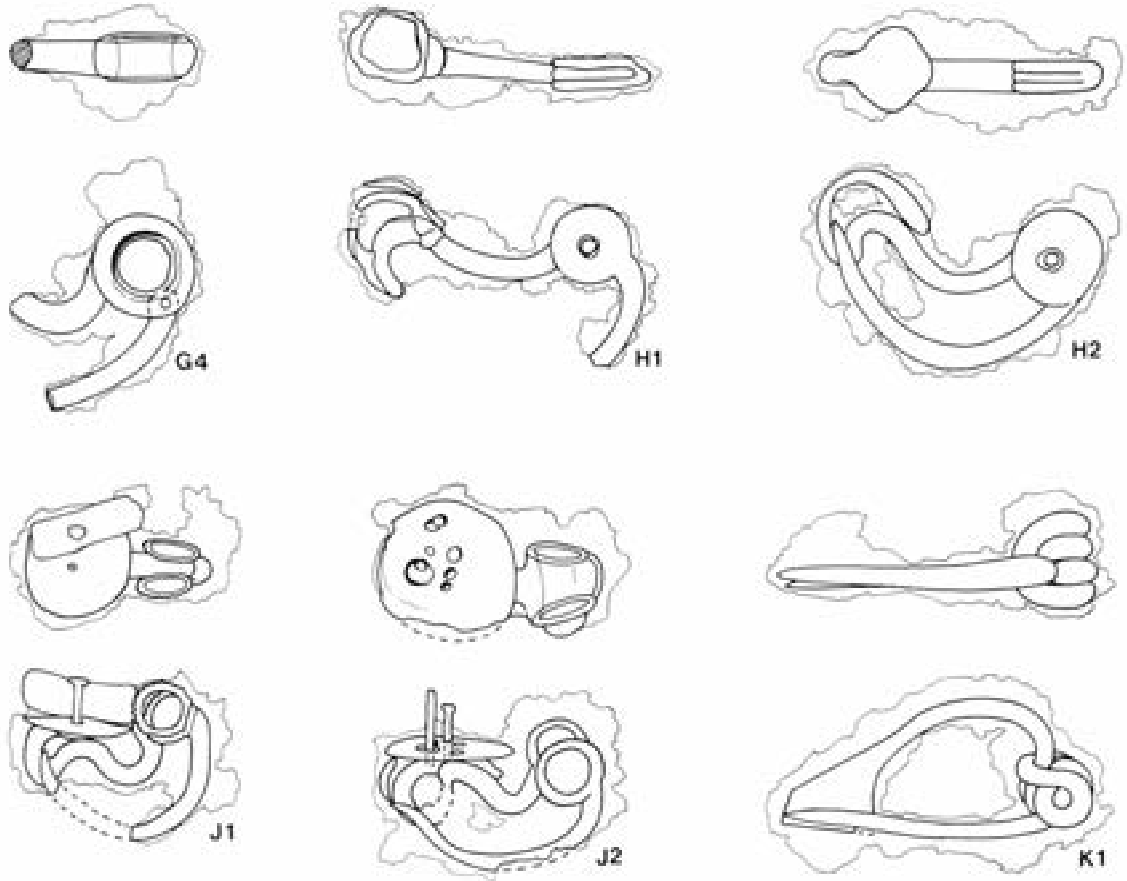

Fig 65 Iron involuted brooches, types G–J, and an iron La Tène III brooch, type K (1:1)

ably at each end of an iron cylinder rivet (?with applied knobs beyond).

1 R201 (FH/AS, Fig 65) Length 25mm

Possible remains of coral (only a shell of iron salts, but it has the shape of a length of coral) attached to the iron foot-disc by a copper-alloy rivet. A rivet-hole in the centre of the disc would have attached another, and the positioning suggests that there might have been a third, but neither rivet nor hole survives. The copper-alloy washers have neatly notched borders.

2 R206 (FH/AA, Fig 65) Length 29mm

A thin copper-alloy plate attached to the iron foot-disc; two copper-alloy rivets survive, but no applied ornament is left. Remains of an applied knob attached to one of the copper-alloy washers in the head.

K La Tène III brooch

1 R175 (FD/AB, Fig 65) Length 45mm

Four-coil spring with internal chord, quite high rounded bow, and solid catch-plate. The copper-alloy version of this brooch is common in the middle and second half of the first century AD, but the iron version can be earlier (eg Hull 1961, 167). In Feugère's classification, the Rudston brooch would belong to type 4 (Feugère 1985, 200–3); his no 357 is the closest example illustrated (type 4a1a) and he suggests overall dates of 80/60–20/10 BC for the type (excluding late variants). Hawkes published the Burton Fleming brooch in Hull and Hawkes 1987, 169 and pl 50, no 0000 (sic), and suggested that it could be as early as the middle of the first century BC. But there is a very similar iron brooch from Grave 440 at King Harry Lane (Phase 2 = AD 30–55; Stead and Rigby 1989, 96, type T1).

L Penannular brooch

1 R11 (FL/BR) Diam 23mm; pin length 36mm

A copper-alloy brooch, with expanding terminals and highly arched pin.

Ten penannular brooches are now known from the Arras Culture (to the seven in Stead 1979, 71, add two from Wetwang Slack, Dent 1982, fig 4, graves 166 and 230, and one from Garton Slack, Dent 1983, 12, fig 8K) and all but one seem to belong to Fowler (1960) types A and Aa (cf also a more recent list in Simpson 1979, 320, where the Burton Fleming example is listed as Hull no 8150; and others from Meare East in Coles 1987, figs 3.10–16); the exception, from Garton Slack, seems to be Fowler type D. There is some evidence from both Huntow and Wetwang Slack for the occurrence of penannular brooches relatively early in the

Arras Culture sequence. The pair from Huntow (Stead 1979, 36, 102) came from the same barrow – and presumably the same grave – as the La Tène II brooch that may have been a precursor of type C (p 82). At Wetwang Slack the two penannular brooches are relatively early in the sequence (Dent 1982, 441); both are stratified earlier than type D brooches (166 earlier than 171; 230 earlier than 233; ibid, fig 3). In contrast to the more common Arras Culture brooches, penannulars are also found in domestic contexts in the area. There was one (Fowler type A) with a simple swan's neck pin in a pit at Burton Agnes (Stead 1971, 36 and 39, where the parish is given incorrectly as Kilham), whilst at Garton Slack two penannulars are recorded with settlement debris, one in a ditch (Challis and Harding 1975, ii, 18, fig 33, no 8) and the other in a pit (Dent 1983, 4). There is a suggestion that these domestic contexts might be earlier than most, if not all, of the Arras Culture burials.

Brooches were always found singly, usually in the vicinity of the head and shoulders. It may be that the corpse was buried in a shroud pinned near the head, but on balance this preferred position rather suggests that a garment, perhaps a cloak, was secured at the shoulder. Bracelets and knobs seem to have been worn as in life, so it is reasonable to expect the same for brooches. Certainly brooches were worn by both men and women, but there is a curious imbalance when specific brooch types are considered (Table 3). The earlier examples (A and B) were found with men; there were far more type C with women; and although involuted brooches in general are fairly evenly distributed, the 'enamel' decorated type E seems to have been favoured by women and the plainer type F by men.

Two brooches have associations useful for chronology: G5, from R143, found with a pedestalled pot that probably belongs late in the second century BC (p 101); and C2, from R2, with a glass bead that Henderson dates early La Tène II (p 92). But there are also clear chronological implications in the limited range of brooches in two of the smaller burial groups. Burials BF1–22 produced 15 brooches (one type B and the rest type C) all preceding the introduction of the involuted brooch, whereas the neighbouring group R190–208 had seven brooches of developed involuted types. Interestingly there is a suggestion of family links within both these groups (p 134).

7 Bracelets

A Copper-alloy bracelet with mortice and tenon fastening

1 BF11 (FR/BZ) Diam 58×59mm

The mortice hole in an elaborately moulded terminal with two knobs of coral attached by copper-alloy rivets. There is a precisely similar moulding (with coral) on the opposite side of the bracelet.

Table 3 Occurrence of brooch types with sexed skeletons

	A	B	C	D	E	F	G	H	J	K	L	*Totals*
Male	4	2	5	1	2	8	3	-	-	1	-	26
Female	-	-	12	4	6	2	1	1	2	-	1	29

Bracelets with mortice and tenon fastenings were found with Arras Culture burials at Cowlam, Arras, and Wetwang Slack (Stead 1979, 73; Dent 1982, 444), including two with matching moulded settings at the front and back (Arras W24 and Wetwang Slack grave 160).

B Copper-alloy bracelets with overlapping terminals

1 R119 (FN/AA, Fig 66) Diam 57×58mm

Terminals crudely moulded.

2 and 3 BF10 (FR/BS, BT) Diam 59×64mm; 57×58mm

Not an exact pair; each has a length of low-relief ornament, one with a trumpet-motif and then a lobe, and the other with an elongated trumpet-motif.

4 BF61 (FZ/BJ) Diam 61×67mm

A knobbed bracelet, with the knobs quite widely separated.

Bracelets with overlapping terminals occur in Danes Graves 2 and Arras A12 (Stead 1979, 75). No 4, the knobbed bracelet, may also be compared with examples from Cowlam, Arras, and Raisthorpe (ibid, 73–7).

C Jet and shale bracelets

1 R2 (FE/AQ) Diam 67mm

A small shale bracelet, about 20mm deep.

2 R59 (FN/AF, Fig 66) Diam 82×84mm

A fine jet bracelet, 33–38mm deep, with cordoned edges.

3 BF9 (FR/BY) Diam 83mm

A similar shale bracelet, 28–30mm deep, with worn cordoned edges.

Only one other shale bracelet has been found in an Arras Culture grave, and that is now lost (Danes Graves 2; Stead 1979, 75).

Four of the seven skeletons with bracelets were female (including probably and possibly female); one had contrary indications and the remains of the other two were too badly preserved to be sexed. All wore their bracelets on their arms (in contrast, one of

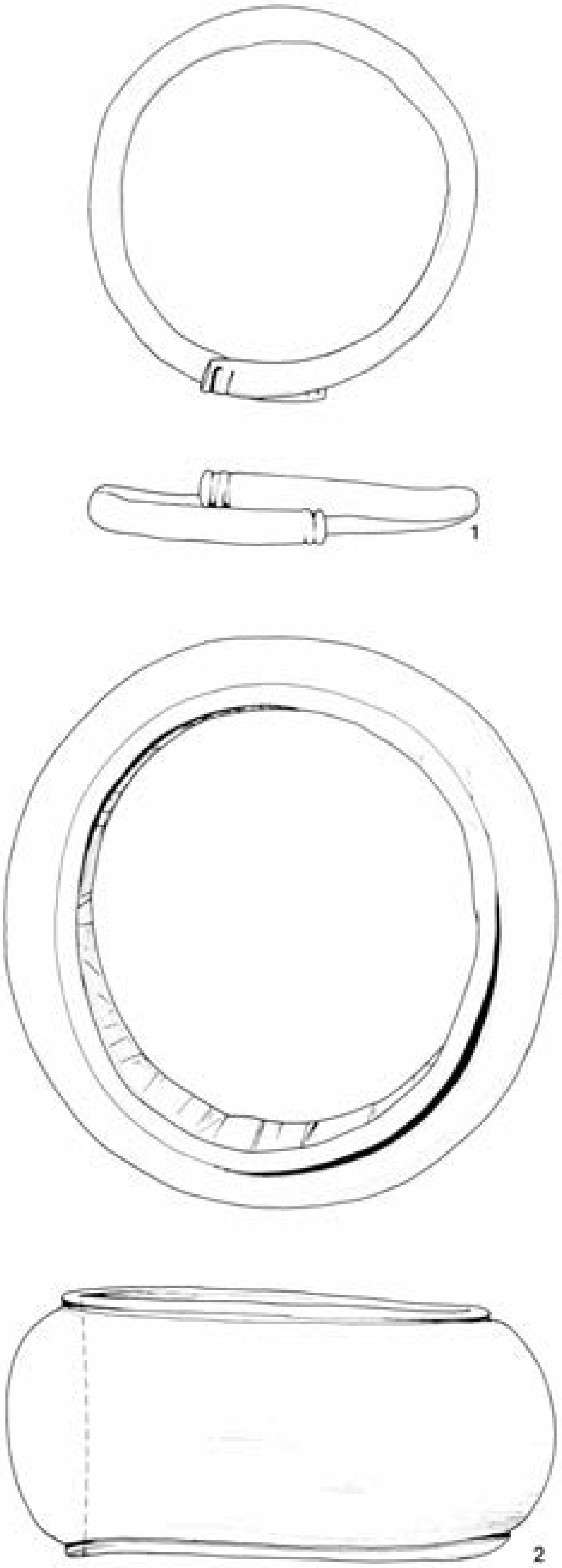

Fig 66 *Bracelets: 1, copper-alloy bracelet from R119; 2, jet bracelet from R59 (1:1)*

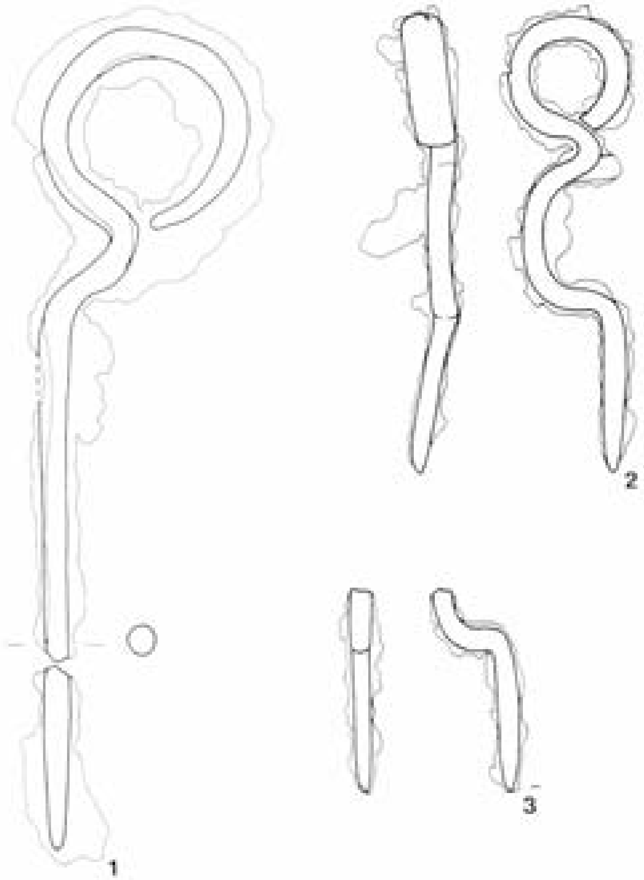

Fig 67 *Iron pins: 1, R64; 2 and 3, R38 (1:1)*

the Arras burials had an anklet; ibid, 98, A12) and probably on their forearms (only BF61a is uncertain). BF10 had a pair, one on each forearm; R2, R119, and BF9 had single bracelets on the left forearm; BF11 had one on the right forearm; and with R59 it was unclear whether the bracelet was on the left or right forearm.

Judging from the associated brooches, bracelets were relatively popular in the earlier stages of the Arras Culture and then went out of fashion. At Rudston and Burton Fleming they were associated with brooches in five graves: one brooch was type A and four were type C. Elsewhere the only brooches with bracelets were type A: Arras (Stead 1979, 98, A4), Cowlam (ibid, 99, Barrow L), and Wetwang Slack (Dent 1982, 444, grave 160). Where they occur in later graves, bracelets are usually of iron (Dent 1983a, 6, fig 8F) although the copper-alloy example from Eastburn is typologically late (Stead 1979, 75, 77).

8 Pins

All pins are iron.

1 R64 (FN/BC, Fig 67) Length 107mm

Ring-headed pin in two pieces.

2 R38 (FM/EH, Fig 67) Length 61mm

Small ring-headed pin.

3 R38 (FM/EJ, Fig 67) Length 29mm

Fragment from a small ring-headed pin, like no2, and a further fragment of pin shank (FM/EK), length 15mm.

4 R39 (FM/CW) Length 27mm

Curved fragment broken at both ends, possibly from a small ring-headed pin; conceivably from a brooch – an arched bow brooch of La Tène II type was found in this grave.

Ring-headed pins have not been studied as a type for over 50 years (Dunning 1934). They rarely occur in graves; one comparable to no 1 was found with a small ring-headed pin in grave 286 at Wetwang Slack (associated with a type C brooch, and stratigraphically earlier than a type D brooch; Dent 1982, figs 3–6). There are two more elaborate swan's-neck copper-alloy pins from Arras Culture graves at Danes Graves and Garton Slack, a third probably from Sawdon but not necessarily from a grave (Stead 1979, 77–8), and an iron, gold, and coral pin from cart-burial 2 at Wetwang Slack. Other ring-headed pins are known from domestic contexts in the area, at Burton Agnes and Garton Slack (Stead 1971, 36, fig 6, no 1; Dent 1983a, 4, fig 4, no 3).

Small ring-headed pins with a double-bend in the shank (as no 2) were included by Dunning (1934, 276) within the main type; those whose heads were in the opposite plane he distinguished as involuted pins (ibid, 278–80). A small iron ring-headed pin was found in grave 286 at Wetwang Slack (see above), and there was an iron involuted pin in grave 145 at the same site.

9 Rings and beads

A Metal

All are copper-alloy except no 4 which is iron.

1 R54 (FG/DN, Fig 68, 1) Diam 13×16mm

Ring with overlapping terminals, the ends slightly enlarged.

2 R183 (FA/AH) Diam 19×21mm

Ring with overlapping terminals, grooved across one end.

3 R193 (FH/BH) Diam 11–12mm

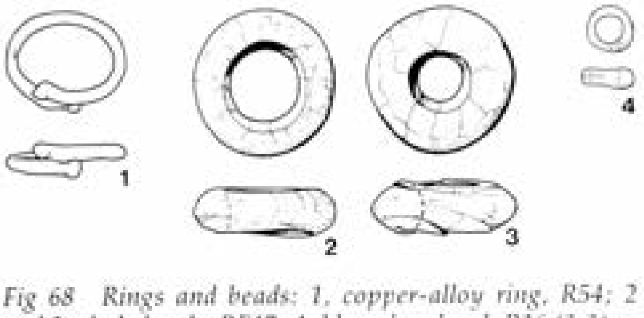

Fig 68 Rings and beads: 1, copper-alloy ring, R54; 2 and 3, shale beads, BF47; 4, blue glass bead, R16 (1:1)

Small ring.

4 BF19 (FR/AH) Diam 19×17mm

Iron ring with overlapping terminals.

5 and 6 BF61 (FZ/AZ, AY) Diam 14–15mm

A pair of beads.

7 GS7 (GW/HD) Diam 21mm

Ring constructed from a band 4.5mm deep in the centre, tapering almost to points at either end (one end broken); the terminals lap the band spirally. The centre of the band is simply decorated with bordering ribs.

8 K6 (KR/CM, Fig 69, 3) Diam 38–9mm

Hollow ring made from two semi-tubular halves joined together by three copper-alloy rivets; organic material both inside and out.

B Jet and shale

1 and 2 BF47 (FZ/CT, CS, Fig 68, 2 and 3) Diam 19mm

Two shale beads; similar external diameters but very different perforations.

3 BF61 (FZ/BP) Diam 29mm

Shale ring.

4 K6 (KR/CP, Fig 69, 4) Diam 34×36mm

A fine jet ring shaped for suspension.

C Glass beads

Descriptions by Julian Henderson

1 R2 (FE/AO) Diam 6–7mm

Globular translucent cobalt blue glass bead with wave decoration around the medial line of the body at the perimeter. The decoration is a wavy groove which will have held decorative glass which has fallen out. Early La Tène II.

2 R16 (FL/CJ, Fig 68, 4) Diam 6–7mm

Globular translucent cobalt blue glass bead with the remnants of a wavy groove in the surface, as no 1.

3 R193 (FH/BJ) Diam 8mm

Globular translucent cobalt blue glass bead. Late La Tène II.

4 BF19 (FR/BC) Diam *c* 11mm when complete

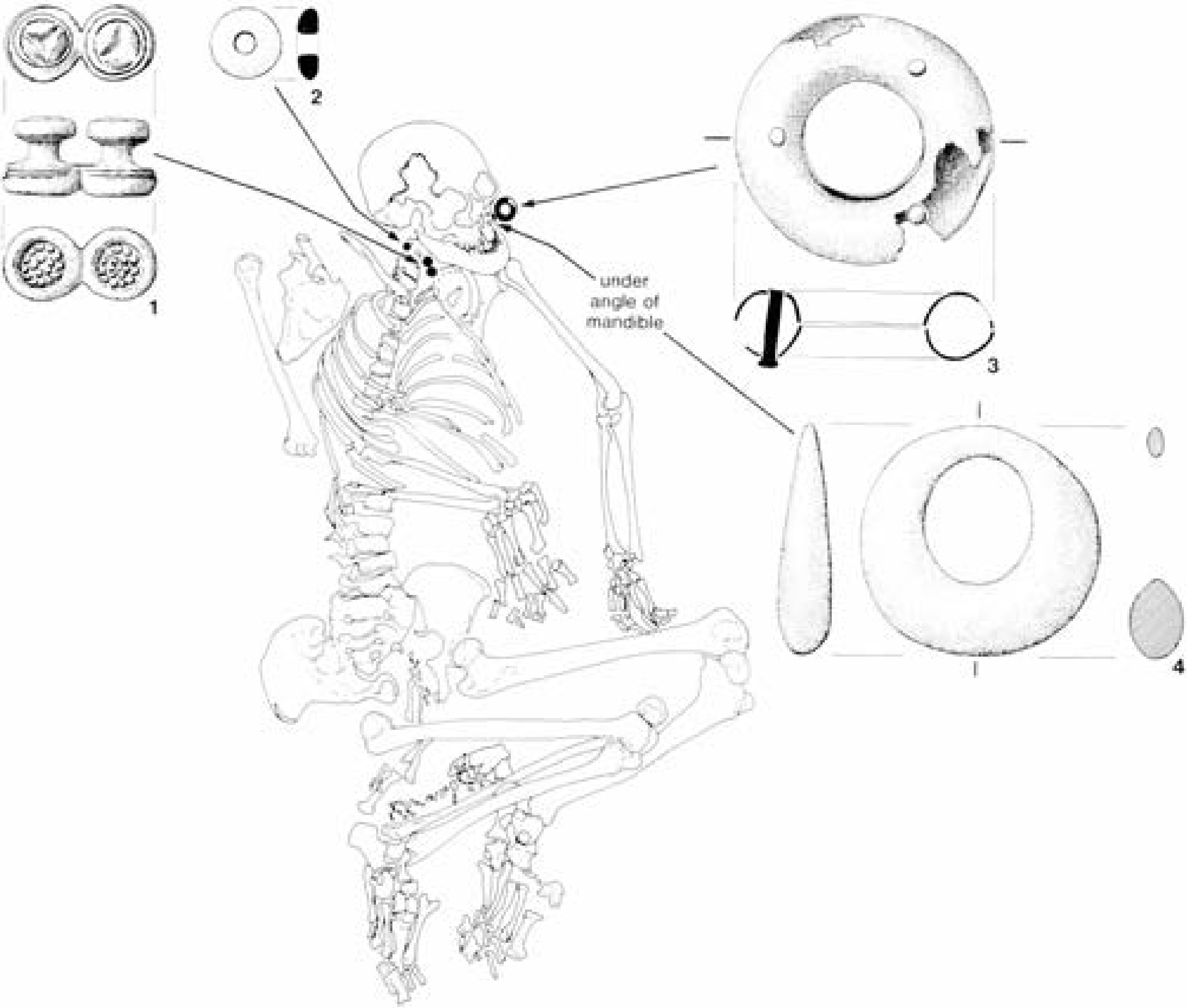

Fig 69 Kirkburn, K6, plan (1:10): 1, copper-alloy double-stud; 2, amber bead; 3, hollow copper-alloy ring; 4, jet ring (1:1)

Half an opaque yellow globular bead with grooves forming crossed waves impressed in the surface around the medial line of the bead (for the chemical analysis of the glass beads see p 167).

D Amber bead

1 K6 (KR/CO, Fig 69, 2) Diam 10.5mm

A yellow bead; Julian Henderson and Ian Freestone reject it as a glass bead and suspect that it is amber.

A8 was found with another ring (B4), a bead (D1), and a copper-alloy stud (p 94) near the skeleton's skull (Fig 69). The four items were in two groups: A8 was above B4 near the left condyle of the mandible, whilst D1 and the stud were together near the right side of the mandible. The separation of the two groups suggests that the rings and bead were not strung on the same necklace. A8, B4, and D1 could have been ear-pendants, or A8 and the stud could have been attachments to a cap or some other garment.

It is possible that most of the small rings and beads were ear-pendants; all were found in the vicinity of skulls either in pairs (which were always separated) or single examples: pairs – A5 and A6, A3 and C3, B1 and B2, perhaps A4 and C4 (but less than half of C4 survives and it was some distance from the skull); singles – C1, C2, and C4. The pair in BF19, an iron ring and less than half of a glass bead, are unlikely to have been ear-pendants. Of the eight skeletons with these beads and small rings, five were female, one had contra-indications, and two could not be sexed. There is a marked contrast between the occurrence of beads at Rudston and Burton Fleming on the one hand, and Wetwang Slack on the other: at Wetwang there were ten necklaces each with large numbers of beads, while only one grave had a pair of beads and four had single beads (Dent 1982, fig 7).

Three of the other rings were toe-rings (A2, A7, B3; one worn by a male), and one (A1) was in a curious position behind the back; its function is unknown.

The most interesting ring is A8, from Kirkburn, because it belongs to a distinctive and well-known continental type. Such hollow rings have been studied in great detail by Raftery (1988); the Kirkburn example is typical of his Group 1 in construction, size, and the number of rivets used. Raftery lists 47 examples; they were in use by the end of the fifth century BC and were obsolete by the end of La Tène I (ibid, 4–6). More common with male than with female skeletons, they are often associated with swords but seem too flimsy to have been used in the suspension of the scabbard. Group 1 rings, and the more common Group 2, are sometimes found with female skeletons and as often as not are in the area of the pelvis, so the position of the Kirkburn example is atypical. Three skeletons from Hochscheid had Group 1 rings suspended on torques. It seems likely that these rings were pendants (though some seem to have been sewn to garments, and note the 'lid' from K5, p 56); some scholars regard them as magic amulets. But whatever its function, the Kirkburn ring is undoubtedly an outlier of a well-defined continental type, and there are others from Lisnacrogher. Many objects are loosely claimed as continental imports but very few will stand detailed criticism (cf Stead 1984b), but there is a very strong case for regarding the Kirkburn ring as one of the few: an import, and a La Tène I import, at that.

10 Miscellaneous objects

Copper-alloy double-stud

K6 (KR/CN, Fig 69, 1) Length 23mm

A linked pair of studs, cast together; each has at one end a pattern or raised dots, an elaborate 'berried rosette' with respectively five and seven dots in the centre, and at the other end a trilobate motif in a circle.

Found over the neck of a female skeleton, to the right of the mandible. Possibly used to fasten the neck of a garment, or secure the strap of a cap. Both decorative motifs occur on the Ringstead horse-bits (Clarke 1951, pl xvii).

Remains of two bone toggles

R174 (FD/AF, Fig 114, 12 and 13) Length 24mm

About half of a bone toggle, tubular with a crude cordon at each end and perforated across its width.

Found with the end of another (diam 15×14mm) at the waist of a male skeleton. Perhaps they were dress fasteners.

Chalk spindle-whorls

1 R92 (FG/CL, Fig 70, 1) Diam 46×48mm

2 R145 (FA/CB, Fig 70, 2) Diam 48×50mm

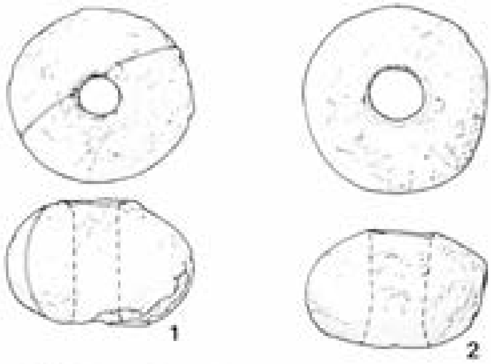

Fig 70 Chalk spindle-whorls: 1, R92; 2, R145 (1:2)

3 R183 (FA/AG) Diam 54×57mm

Less deep and better finished than the other two.

The three spindle-whorls were found with extended skeletons, and two (nos 1 and 3) were in identical positions in the grave, on the level of the skull, beyond the right shoulder (Fig 115, R183). The third spindle-whorl was also on the right side, but at waist level. Only one was found with another artefact, a toe-ring in R183. One of the skeletons was female and the others were probably female (ages 17–25, 35–45, and over 45), which is hardly surprising because spindle-whorls are usually regarded as female artefacts (eg Bantelmann 1972, 108). But at Whitcombe, Dorset, a spindle-whorl was in a man's grave with a sword and tools; there it could have been a flywheel on the spindle of a pump drill (Aitken forthcoming).

Miscellaneous fragments of metal, unidentified

1 R29 (FM/BU, etc) Iron

2 R37 (FM/DV, etc) Iron

3 R87 (FG/BK) Iron

4 R174 (FD/AD) Length 16mm

Small piece of folded copper-alloy sheet.

5 R193 (FH/BL) Iron

6 BF19 (FR/BB) Iron

11 The pottery

by Valery Rigby

Thirty-five pots from the Rudston and Burton Fleming cemeteries and one from Kirkburn had been deliberately buried as grave goods, while considerable parts of nine others were recovered from barrow ditches. Twenty-nine vessels from the Makeshift cemetery, Rudston, comprise by far the largest sample from any cemetery of the Arras Culture yet excavated (Stead 1979, 83). Because 21 were associated with brooches, this group is doubly significant. It provides the best opportunity yet for the detailed examination of the forms, fabrics, and fabrication methods to assess whether or not the nucleus of a typological and a chronological framework for Arras Culture pottery can be constructed.

Pots have also been found in Arras Culture cemeteries at Danes Graves, Eastburn, and Wetwang, and in barrow ditches at Cowlam and Wetwang (Stead 1979, 83–4; Dent 1982; Stead 1986, 6, Barrow B). All of the surviving vessels have been examined and recorded using the system established for the Makeshift cemetery to provide comparative data.

In cooperation with Dr I C Freestone of the Research Laboratory at the British Museum, a long-term programme of petrological and typological analysis of prehistoric and Roman pottery from settlements and cemeteries in Humberside and North Yorkshire is in progress. The methods used in the preparation of this report aim to integrate previous and current work in a flexible system, which can be extended as necessary and applied to pottery from any site at a level appropriate to the stage of processing and research reached.

The fabric groups

Petrographic analysis of 150 handmade pots from ten sites around and north of the Humber estuary has defined seven basic fabric groups according to the type and source of the aplastic temper. These groups are relatively easy to recognise in the hand specimen so they have been adopted to provide the basic framework of a regional fabric classification, applicable at any stage of processing and without thin-sectioning being essential to check results. The seven fabric groups are tempered respectively with flint, erratics, calcite, shell, sand, grog, and vegetable/organic matter. An eighth group, vesicular, is essential to complete the framework and include fabrics where the original aplastic temper has been burnt or leached out, leaving the surfaces pitted with unidentifiable voids. Sometimes the size, shape, and configuration of the voids indicate the identity of the original tempering agent, but usually there can be no certainty.

Composite fabric groups occur where more or less equal amounts of two or more different types of temper have been used; they are given composite names. Where applicable, the fabric groups can be subdivided according to specific criteria established by macroscopic examination or petrographic analysis; for example, the erratic fabric group has been divided by specific rock type (see Chapter 10a).

There are discrepancies in the detailed results produced by different methods of analysis. Some inclusions identified in thin section have not been distinguished in the hand specimen. Conversely, inclusions recognisable during macroscopic examination have not been sampled by the small area of a thin section. Because of the problem of sampling error, no attempt has been made to quantify the proportions of different temper types in mixed fabric in the petrographic report.

Of the eight basic fabric groups, only two, erratic and calcite, have been identified in the funerary vessels from the Rudston and Burton Fleming cemeteries. There is also one definite composite group, organic erratic.

The clay

With just a single exception, clay matrices lack any notable distinguishing characteristics. They are essentially non-micaceous, without glauconite or other regular pelletised argillaceous inclusions.

Six exhibit sparse, very fine, glittering inclusions described in the catalogue as fine mica; all belong to the erratic fabric group. Four others include occasional measurable platelets of muscovite, about 1mm long; one pot belongs to the calcite fabric group and the others to the erratic. Fabrics with sparse but large mica inclusions have been identified in settlement material at Rudston Roman Villa, Wetwang, and Scarborough (pers obs). Highly micaceous fabrics are notably rare at any period.

The exceptional vessel is from Burial R84. Its clay matrix is characterised by the presence of common glauconite pellets, 0.1–0.2mm in diameter, which act as an aplastic temper during firing. The glauconite is unweathered and so a geological source must be sought: Speeton Clay, an outcrop of the Lower Lias occurs just north-west of the Rudston and Burton Fleming cemeteries, and could have provided a nearby source. The pot is incomplete and so unclassifiable, but there is nothing in its size or fabrication methods to mark it out from other vessels in the cemeteries. Associated with one of the earliest brooches in the Makeshift cemetery, it may perhaps represent the survival of different fabrication methods belonging to the earlier Iron Age when glauconitic clay, being naturally tempered, was preferred and deliberately sought by potters.

The clays vary in texture from very fine-grained, dense, and smooth to fairly sandy, where a sand fraction is visible as white quartz grains. It is not possible to determine whether the sand was added as temper or is natural to the clay. It may be significant that erratic or calcite temper is rather sparse in sandy textured fabrics, which suggests that the sand was an added temper or, if a natural constituent of the clay, was at least recognised by the potter as functioning as a temper. The extremes are rare (two smooth and seven sandy), and the majority are intermediate. Generally, calcite-tempered ware (CTW) feels smoother to the touch than erratic-tempered ware (ETW), and this difference does have a demonstrable analytical basis (p 162). However, judgement of texture may be affected by the abraded and vesicular condition of the surfaces of CTW which then appear softer to the touch.

On the basis of the few available characteristics, at least five different clay sources were used for funerary vessels in the Rudston and Burton Fleming cemeteries. No systematic and consistent correlation of matrix characteristics with any other significant feature was observed.

The temper

Erratic (ETW) The term erratic-tempered ware (ETW) was coined because the most satisfying simple explanation of the variability of geologically non-local rock temper identified in vessels from the Yorkshire Wolds is that the temper was derived from erratic boulders in the glacial and fluvial drifts (see Chapter 10a; Rigby 1986). While the actual parent rocks were not local, the boulder material from which the temper was produced was available locally.

To superficial examination, examples of ETW from the Rudston and Burton Fleming cemeteries form a homogeneous group of handmade vessels regardless of the specific rock used for the temper. This implies that the same techniques of clay and temper choice and preparation, and of vessel-shaping, finishing, and firing were employed to produce similar shapeless, characterless, plain vessels.

The shape and size of erratic grits acceptable to potters of the Arras Culture were extremely varied, unstandardised, and coarse. Typically the temper comprises irregularly shaped, angular, sub-angular, and sub-rounded lumps, between 2 and 6mm in diameter, with a high proportion over 4mm, and occasional pebbles of 10mm. The shape- and size-range suggest that fragmentation was by heating and quenching boulders and pebbles, and that no subsequent crushing of the resulting debitage occurred (p 163). Some of the smaller inclusions, which are sub-rounded and abraded, were reduced by natural processes and therefore may be intrinsic to the clay.

The erratic fabric group has been subdivided by specific rock type; whether this was done by petrographic analysis or macroscopic examination is indicated in the text. The detailed descriptions are in Chapter 10a, pp 162–4.

Erratic-tempered fabrics were first recognised by the writer in 1969 in the Makeshift cemetery, when it became obvious that several pots were tempered with unidentified light and dark rock fragments and not the expected calcite. Subsequently, similar occasional sherds from other sites were recognised. In 1982 the first petrographic analysis identified a variety of igneous and metamorphic rock tempers which were all geologically non-local to the Wolds. The results when tabulated showed that almost two-thirds of the funerary vessels in the Makeshift cemetery had been tempered with geologically non-local rock types, and only the remaining one-third with the predictable, traditional, geologically local calcite.

Three different methods of obtaining rock temper can be postulated: primary, where the rock was quarried directly from geological strata; secondary, where already fragmented boulder material occurred in superficial geomorphological deposits; and tertiary, where existing stone artefacts were broken up for reuse. In theory, the rock tempers identified in the Rudston and Burton Fleming cemeteries could have been obtained by any one, or a mixture of all three, methods.

At its simplest, if only the primary method is envisaged, then the petrography indicates that the majority of pots in the Makeshift cemetery had been brought in from various different sources in the North Yorkshire Moors, Cumbria, and Scotland, and imported from Scandinavia by what must have been complex trade and exchange systems. Such a hypothesis seems fundamentally unlikely. While occasional non-local products, even imports, have been identified in prehistoric pottery assemblages, there is no comparable proportion to the 60% in the Makeshift cemetery. Moreover, in a region with clay and temper easily available locally for pot making, there is no obvious reason to bring in pottery from such distances to satisfy the practical requirements of the communities of the Gypsey Race valley, particularly when the artefacts were plain, basic, and unattractive. However, the pots may have functioned as transport containers so that their distribution was incidental and it was their contents which were the desired products.

The pots need not have had a practical everyday function, for it is possible that some facet of the funeral rite required the provision of a non-local pot for the 60% of the population qualified for burial in the Makeshift cemetery. If they were incomers, then perhaps their funerary pots had to originate at their place of birth. Such a scenario would require a fair degree of population mobility, and would be expected to lead to the introduction of new pot types and fabrication techniques.

An alternative explanation could be that rock was brought in rather than finished pots, perhaps as ballast, or as part of a 'return load'. Then the actual pot-making process took place locally regardless of the origins of the temper. Rock, although heavier, is not as bulky as pots and does not present the major problem of fragility. Furthermore, a comparatively small amount of rock could provide temper for a considerable number of pots.

Finally, there may not be a single, uniform explanation which accounts for all rock-tempered pots in the Rudston and Burton Fleming cemeteries. Whatever their initial source and function, some rock-tempered pots were commonly selected as grave-goods and the simplest explanation of the types and variety of rock temper in the Rudston and Burton Fleming cemeteries is that all was locally derived, from secondary and even tertiary sources, and comprised principally erratic boulders. All the pots in ETW can be defined as local products and this explains why there is no significant typological difference between the erratic and calcite fabric groups (Figs 74 and 75).

Calcite (CTW) Calcite-tempered ware (CTW) includes both white, crystalline, sparry calcite, and opaque chalk. Because chalk is present in most examples, at least as a minor component, the classification does not attempt to distinguish between them systematically although, unless stated otherwise, the major component of the temper is crystalline calcite.

The calcite is sharply angular and appears to have been crushed to achieve a fairly standardised size range by reducing or removing fragments greater than 4mm in length. In marked contrast to ETW, a high proportion of grits are less than 2mm in length. Geologically, calcite occurs in a crystalline state redeposited in cavities in chalk and limestone where it has precipitated out of calcareous ground water. Such deposits are difficult to predict and locate, except where the parent rock outcrops. It is therefore difficult enough to envisage how regular supplies of calcite were obtained for use as temper in the prehistoric period, but it becomes a major problem when the large-scale output of CTW in the Roman period is considered. In the latter period at least, it is likely that the calcite was a by-product of a major extractive process, such as the quarrying of chalk for lime-burning or marling.

The chalk inclusions are more variable in shape and size, occasionally reaching 10mm, and many may have been incidental to the raw materials of pottery making. However, the temper of the jar found in the ditch of Burial BF37 is recognisable as water-worn, sub-rounded, fine chalk gravel. Where 'gravel' has been observed in the temper, it is noted in the fabric description of the catalogue entry.

Twelve pots from the total of 35 found in burials and barrows of the Makeshift cemetery had been tempered with calcite. Although the typological range is more limited than that of the erratic fabric group, it is essentially the same, and there is therefore no compelling reason to consider that different sources of supply were involved. They may be a chronological difference, for two examples of CTW were found with La Tène I brooches, but no ETW. It may also be significant that one of the two was made from a glauconite clay, and could represent the survival of techniques from a period when rather different fabrication methods were employed and a naturally tempered clay preferred.

Despite the high proportion of ETW in the Rudston and Burton Fleming cemeteries, it is by no means common elsewhere. There are two examples at Danes Graves, in a surviving sample of ten (or eleven) pots, two at Eastburn and one at Kirkburn, possibly part of the same extensive cemetery, but none at nearby Garton Station or Garton and Wetwang Slack. The sample is small and may not be representative, but it could reflect the comparative availability of erratics and calcite in different localities. Rudston and Burton Fleming lie in the valley of the Gypsey Race which flows east directly to the sea. Wetwang and Garton Slack are in another chalk, gravel-filled, dry valley forming part of the catchment area of the River Hull, which flows south into the Humber estuary, with Kirkburn and Eastburn sited further downstream. Danes Graves lies between the two areas (Fig 3).

No vessel belonging to the erratic fabric group has been found with a La Tène I brooch in an Arras Culture cemetery; superficially, therefore, it seems that the use of erratics was limited to the period of La Tène II brooches, ie from the mid third century BC, while the calcite fabric group can be traced back at least into the late fourth century BC in the Makeshift cemetery and the early fourth century at Cowlam. However, both fabric groups were produced over a much longer period.

In the area between the Humber and the Tees, ETW is not just confined to certain Arras Culture cemeteries. A number of Bronze Age funerary vessels, Collared Urns and Food Vessels, were tempered principally with erratics, eg Cowlam, Rudston, Hutton Buscel, Kilham, Fylingdales, and Catfoss (Kinnes and Longworth 1985, Barrow 56, Burial 4; 63, Burial 10; 157, Burial 5; 234, Burial 10; 271, Burial 2; McInnes 1968). Castle Hill, Scarborough is located on the cliff edge of the North Yorkshire Moors, and the local temper could therefore be basaltic whether quarried specifically or, more likely, retrieved from secondary sources, breccia and erratics. The vesicular fabric group (calcite or shell) is, however, predominant, while the erratic fabric group forms just a minor component in a group of sherds associated in a pit with a Late Bronze Age sword, provisionally dated to the eighth century BC (excavated for the Inspectorate of Ancient Monuments by A L Pacitto in 1980; S Needham, pers comm).

At Heslerton, North Yorkshire, a single sherd of ETW occurs in a pit group otherwise comprised of vesicular/calcite fabrics (Rigby 1986, Feature IF98, fig 62, AA10). This sherd can be associated, at second hand via pottery styles, with Hallstatt C razors and fragmentary iron objects found at Staple Howe, North Yorkshire, where virtually all sherds are in the calcite fabric group, and ETW has yet to be identified (Brewster 1963, figs 61–3, 65; Rigby, pers obs). A similar situation appertains to related pottery assemblages at Devil's Hill, Heslerton (Stephens 1986). The calcite fabric group predominates also at Grimthorpe, where there is only a single vessel in ETW, a large, plain, poorly finished rimless jar, Arras Culture type (Stead 1968, fig 8,25). There the radiocarbon dates are 1100–840 BC and 820–560 BC, yet the metalwork is confined to fragmentary iron objects, including nails (ibid, fig 10,4–7).

In the assemblages of the first half of the first millennium BC so far discussed, the calcite or vesicular fabric groups predominate, and the erratic fabric constitutes at best only a minor component. This is not surprising for those sites which are located on and around the edge of the Wolds, but it is unexpected for a site like Scarborough, which is within easy reach of basaltic rock, both outcrops and breccia, and much more distant from sources of calcite and fossil shell. It appears, therefore, that of the Arras Culture cemeteries excavated, Danes Graves and Wetwang were maintaining the same long-established tradition, with its dependence on calcite temper, but at Rudston and Burton Fleming a marked change occurred, at least from the mid third century BC, when erratic temper was preferred.

Recent excavations of settlements in the north-easterly area of the Wolds, in the adjacent parishes of Rudston, Burton Agnes, and Kilham, have produced interim results which suggest that here, at least, the preference for erratic tempered pottery developed before the third century BC (excavations undertaken for the Trustees of the British Museum by I M Stead). Pit groups which predate Arras Culture pottery are typically comprised of ETW, with little or no CTW. The research is still in progress and results are tentative and subject to major reinterpretation.

At Thorpe Thewles, Cleveland, an Iron Age settlement situated north of the Tees, dolerite and quarzite tempers of the erratic fabric group comprise almost 99% of the assemblage examined, with the vesicular

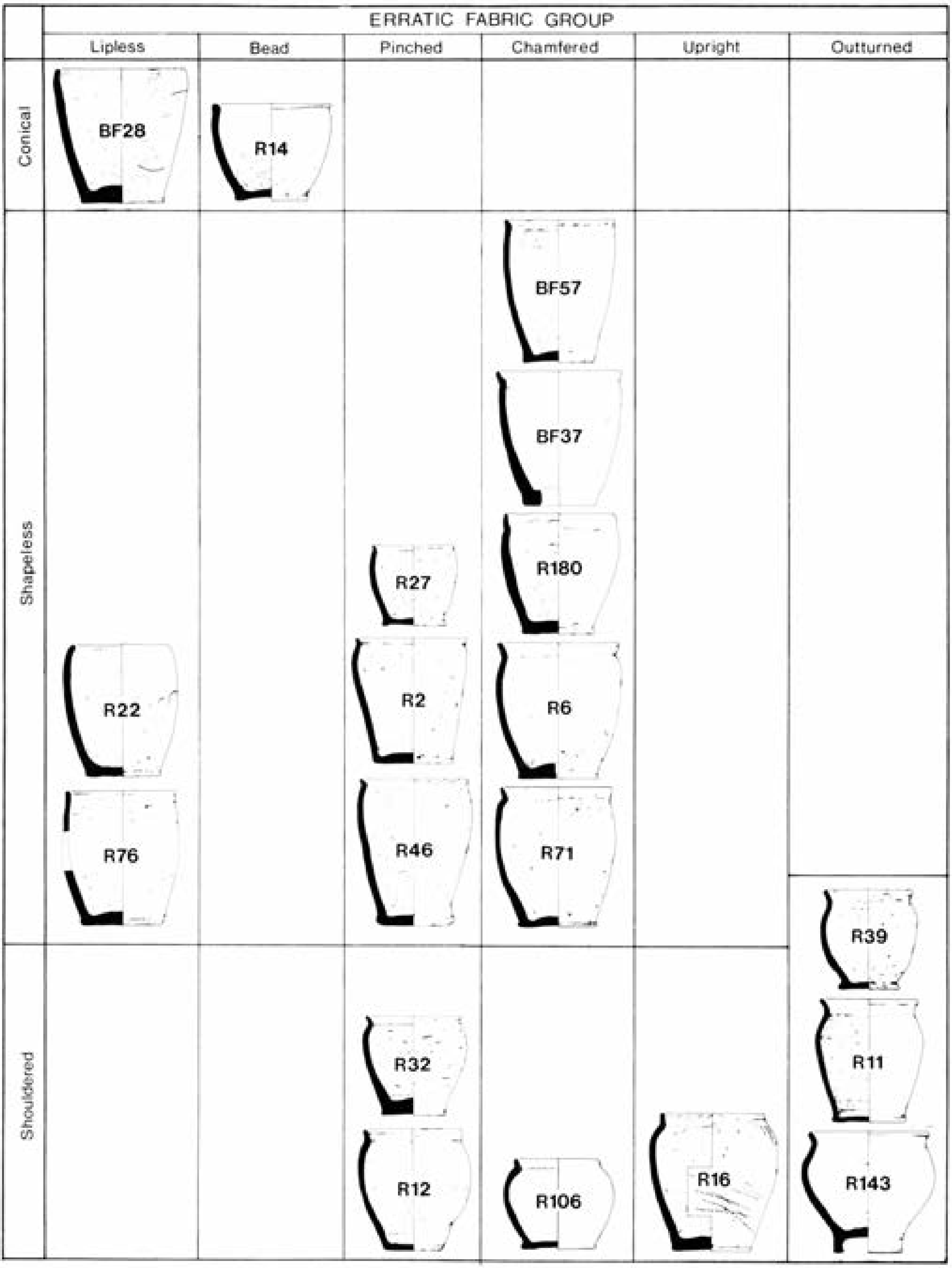

Fig 71 Typological classification of the most complete pots in the Erratic Fabric Group from graves and ditches

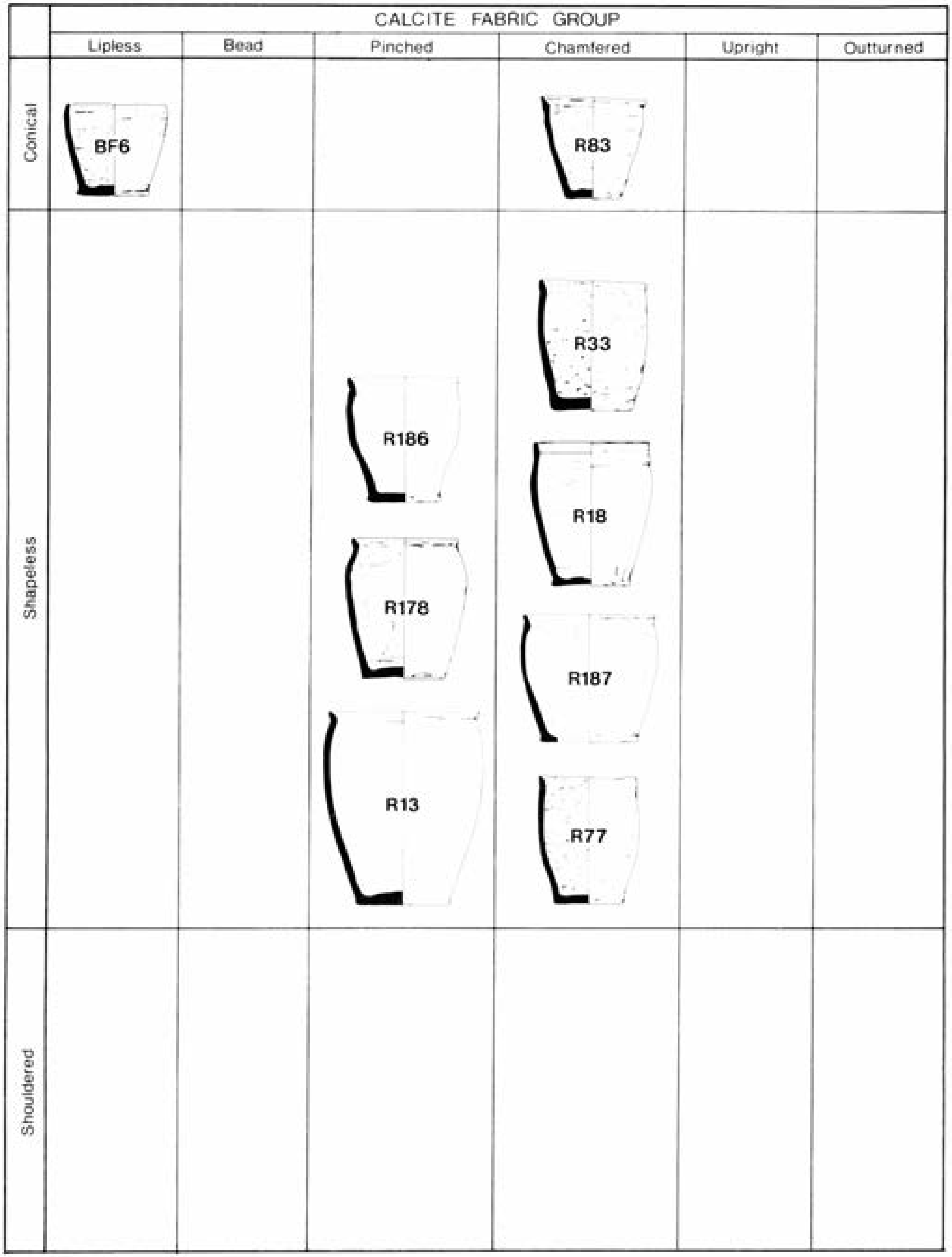

Fig 72 Typological classification of the most complete pots in the Calcite Fabric Group from graves and ditches

fabric group accounting for the remainder (Swain 1987, 63). There are two alternative sources of rock for the temper, erratics in the glacial till or the Cleveland Dyke which outcrops no more than 10km to the south. Potters may well have preferred to use the already quarried erratics of the former. Thermoluminescence has distinguished two periods of pottery centred on 500 BC and 135 BC (Bailiff 1987, 72). Although well beyond the Wolds, Thorpe Thewles does provide some indication where and when an impetus for erratic-tempered pottery could have emerged.

Shell (STW) No fabric entirely tempered with recognisable shell fragments was identified in any pot from the cemeteries. STW has rarely been found on the Wolds, although occasional vessels have been found in settlement material of late Iron Age date at Rudston Roman Villa and Wetwang. It is common on both sides of the Humber estuary at Dragonby, Old Winteringham, Winterton, Brantingham, and Brough. The source of fossil shell is the Liassic Clay which underlies the Chalk.

Flint No fabric tempered with recognisable flint fragments was found in the cemetery, although worn residual sherds were recovered from the filling of graves and barrow ditches.

Sand No fabric tempered exclusively with quartz sand has been identified in the cemeteries. There is an appreciable sand fraction in the clay matrix of six jars in the erratic and two in the calcite fabric groups. It may have been a naturally occurring component of the clay, or added as temper.

Grog No fabric entirely tempered with crushed fired ceramic has been identified in any cemetery of the Arras Culture. There are occasional argillaceous fragments and pellets, but they are too sparse to be classified as added temper. One wheelthrown rim sherd was found in settlement material at Burton Fleming.

Organic Occasional fragments of organic matter are present in most jars from the cemeteries as matt black, elongated, stalk-like inclusions up to 10mm in length, but there is no exclusively organic tempered fabric.

The size, shape, and frequency of voids in the fabric of the jar from Burial R37 are perhaps best interpreted as being caused by chopped vegetable matter, burnt out during the firing process or subsequent cooking. The voids tend to be concentrated at the surfaces, rather than in the fabric. A possible explanation is that the clay was shaped into the base disc and body strips on a surface liberally coated with chopped vegetable matter which therefore adhered mainly to the surfaces. Overlapping and luting strips together then introduced some organic fragments into the fabric. It has been proposed that organic matter was added to clay in order to absorb excess water and assist the drying process. However, a high carbonaceous content also promoted the firing process when its oxidation produced additional heat, so that the potter may have had two aims.

Vesicular The fired clay matrix is more or less densely pitted with voids, which measure anything up to 10mm and give a corky appearance to the fabric. It is also very light in weight. Two main fabric groups are particularly prone to this type of deterioration. The first and largest group comprises calcareous tempers, calcite (chalk), limestone, and shell. A combination of firing and burning above 650°C, domestic processes like grinding and fermentation, and natural processes of abrasion with the circulation of acid groundwater weaken and leach out some, or all, calcareous inclusions. The process begins at the surface with the finest grits, and then extends to larger inclusions and into the core of the fabric. Organic and vegetable matter is the second vulnerable group. Because certain types of carbonaceous matter oxidise between 300° and 800°C, much can be burnt out during the actual firing process resulting in the sieve-like fabric of, for example, the jar in Burial R37. The size and shape of the voids can be used to distinguish between the two main groups and occasionally even to separate calcite and shell.

None of the funerary vessels is in an exclusively vesicular fabric, although several burnt and fragmented sherds from a large jar occurred in the upper filling of Burial BF8.

The forms

The typological information may have been reduced because 11 of the 35 funerary vessels and five of the nine pots from barrow ditches were lacking upper body and rim sherds. It has been difficult to establish meaningful criteria for a collection of shapeless, featureless, plain, and ineptly made vessels upon which potters apparently expended only the bare minimum of effort. Their results satisfied the functional requirements of the burial rite, but it is doubtful that they would have satisfied normal domestic requirements.

A threefold classification of rim, body, and base shape has been adopted (see Table 4). The three-component code is appended to a keyword descriptive title combining body shape with either rim or base shape, depending upon which is the more

Table 4 Typological classification of the pottery

Body shape	1	conical
	2	shapeless
	3	shouldered
Rim shape	A	lipless
	B	bead
	C	pinched
	D	chamfered
	E	upright
	F	outturned (necked)
Base shape	1	trimmed, simple
	2	slightly splayed, the result of fabrication method
	3	splayed
	4	slight footring
	5	tall, conical applied pedestal

significant. The resulting classification of the 28 most complete vessels from graves and ditches is illustrated in Figures 71 and 72. It has been divided into the two fabric groups to provide a comparison of the range of typological detail in each.

The calcite fabric group is more restricted than the erratic, with only three of the common rim shapes represented, and with no examples of the shouldered body shape or hollow pedestalled foot. Some of these gaps may originally have been occupied by the five incomplete vessels in calcite-tempered ware.

No clear chronological development can be distinguished in the typology of the pots from the Makeshift cemetery. Figures 73 and 74 illustrate classifiable pots with their associated brooches, according to the proposed brooch sequence. It begins with Burial R178, where a La Tène I brooch was found with a typical pot, which has a shapeless body, narrow pinched rim, flat base, and plain surfaces. The framework establishes the pinched rim (C) therefore as both early, predating the mid third century BC, and common, with six examples. Three other shapes, lipless (A), chamfered (D), and outturned (F), are comparatively common, but are entirely confined to burials with La Tène II brooches which can scarcely predate the mid third century. The rare bead (B) and upright (E) rims were not accompanied by brooches, and so do not appear in Figures 73 and 74. Since both belong to the same fabric group, and their respective burials, R14 and R16, occur in the most concentrated cluster of burials containing La Tène II brooches, there seems no compelling reason to consider them as other than contemporary with the more common shapes.

Probably the earliest jar with a pinched rim found in an Arras Culture cemetery also belongs to the calcite fabric group. It occurred in the primary filling of the ditch of Greenwell Barrow 50, at Cowlam, North Humberside (Stead 1986, Barrow B,6; Kinnes and Longworth 1985, Cowlam Barrow 50). Amongst the grave goods was a La Tène brooch in bronze which is typologically early, and datable to the early fourth century BC. The stratification of the pot implies that it was at least contemporary with, if not earlier than the burial.

One pot in the Makeshift cemetery stands out from the rest: although rather shapeless, the bowl has a tall, hollow pedestal foot while the inner and outer surfaces are finished with zones of horizontal and vertical burnishing (Burial R143, Fig 71). It occurs late in the chronological sequence of Figure 74 with a small, tightly involuted brooch which is likely to date to the late second or first century BC. This burial was in an area of the cemetery where pots were otherwise absent.

Although no similar pedestalled vessel is known from any other Arras Culture cemetery, there is an example in a burnished sand-tempered fabric from an Iron Age settlement at Winestead, North Humberside. There is also at least one at Dragonby, South Humberside, in a typical local shell-, grog-, and sand-tempered fabric (Elsdon and May 1987, fig 24, 1545). Necked bowls with zonal burnishing are something of a feature of late Iron Age pottery in eastern England, and examples are known from Rudston Roman Villa and Dragonby, and from Little Waltham and Mucking, Essex. At Little Waltham examples are first identified in Period III contexts and attributed to the late second to mid first centuries BC (Drury 1978, fig 50, 254). They occur in ceramic stages 2–3, predating the introduction of wheelthrown pottery, at Dragonby, where they are dated to the late first century BC (Elsdon and May 1987, chart 2, p 17). The Rudston examples were not usefully stratified, although the smaller version was found in the primary filling of one of the major ditches (Rigby 1980, fig 35, 87). A date between the mid second and mid first centuries BC therefore seems appropriate for the pedestalled bowl in Burial R143. While it could be the latest pot in the Makeshift cemetery, it may still be the earliest pedestalled vessel to have been found in an Iron Age burial in Britain.

There are no wheelthrown late Iron Age pots in any Arras Culture burial. Moreover, no handmade vessel exhibits any features typically associated with the effects of the introduction of wheelthrown techniques – grog temper, a markedly S-shaped profile, and the use of grooves, offsets, or cordons to define and emphasise the shape. There is no suggestion that even a turntable had been introduced to assist the potter's craft. At Dragonby, where the production of wheelthrown vessels is considered to have begun late in the first century BC in ceramic stage 6, such effects are apparent even in ceramic stage 1, considerably before wheelthrown vessels show up in the pottery record. A similar sequence to that at Dragonby can be postulated for the north bank of the Humber, judging by recent finds of cordoned pedestalled jars at Brantingham, Humberside (Dent 1989). Whether or not the same sequence will apply to settlement on the Wolds remains to be determined.

Four vessels from Rudston Villa suggest some degree of interaction between the Humber estuary and the Wolds. The source of a carinated and cordoned bowl in shell-tempered ware must lie outside the Wolds, most likely near the Humber (Rigby 1980, fig 58,366). The others are handmade vessels, with cordons at the neck base, in sandy fabrics which could well be local products (Rigby 1980, figs 37,122, 46,211, 58,364). The first, a very large storage jar, was associated with Arras Culture pottery of the calcite fabric group and Fabrication Category 2, and also a white pipeclay flagon manufactured in Gaul between *c* AD 20 and 65, which suggests that Arras Culture forms may have continued into the first century AD. The others were not usefully stratified. Related cordoned vessels have now been identified amongst settlement material at Burton Fleming and also at Kilham (excavated by I M Stead for the Trustees of the British Museum). The sample remains small so that the absence of examples in Arras Culture cemeteries is open to a variety of cultural and chronological implications.

The pots from the Cowlam, Danes Graves, Eastburn, and Wetwang cemeteries have been classified with the very limited typological scheme adopted for the Makeshift cemetery, so that it has proved successful in characterising what can be termed Arras Culture pottery. Figures 73 and 74 represent the

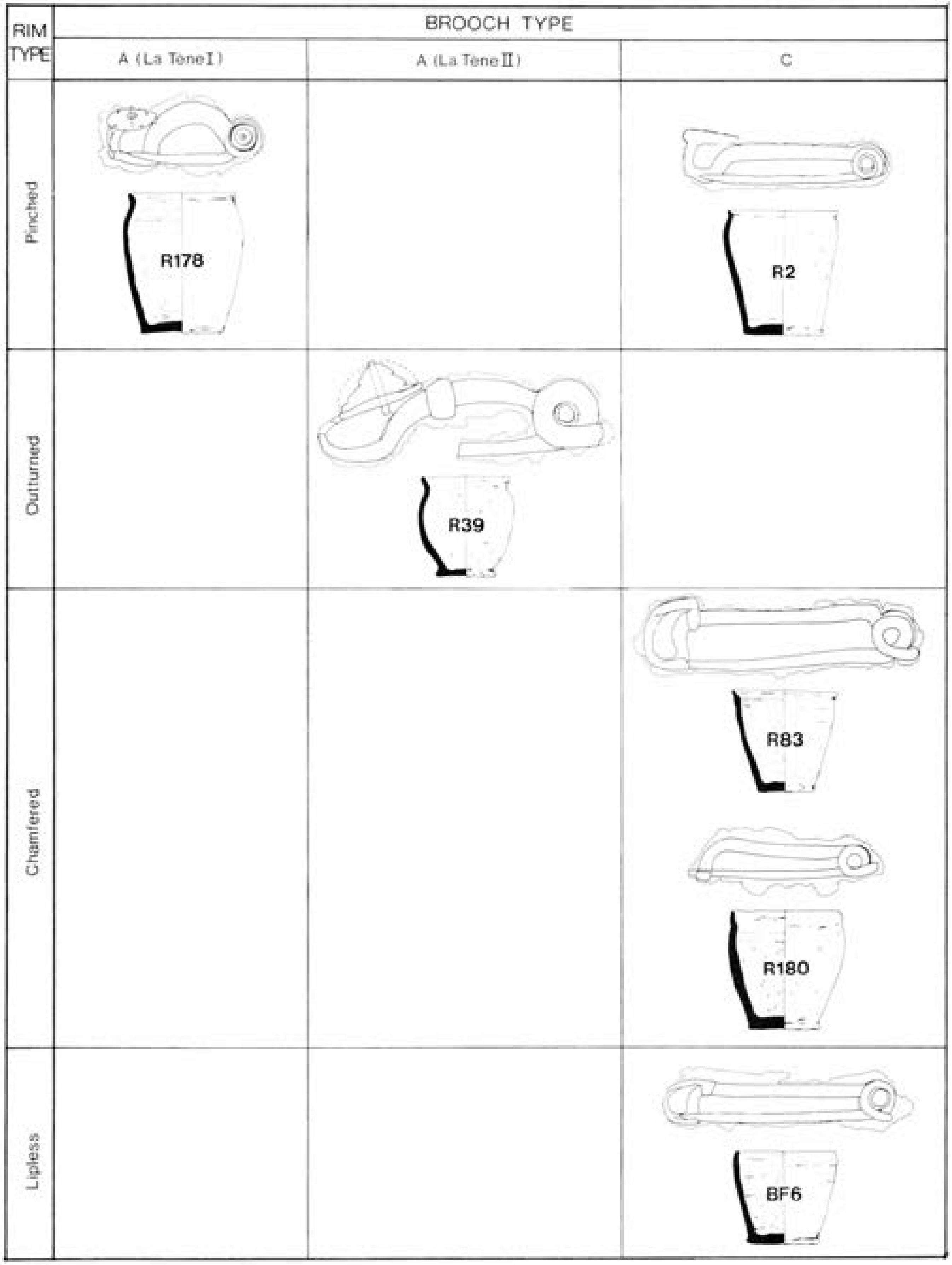

Fig 73 Classifiable pots with associated brooches (A–C)

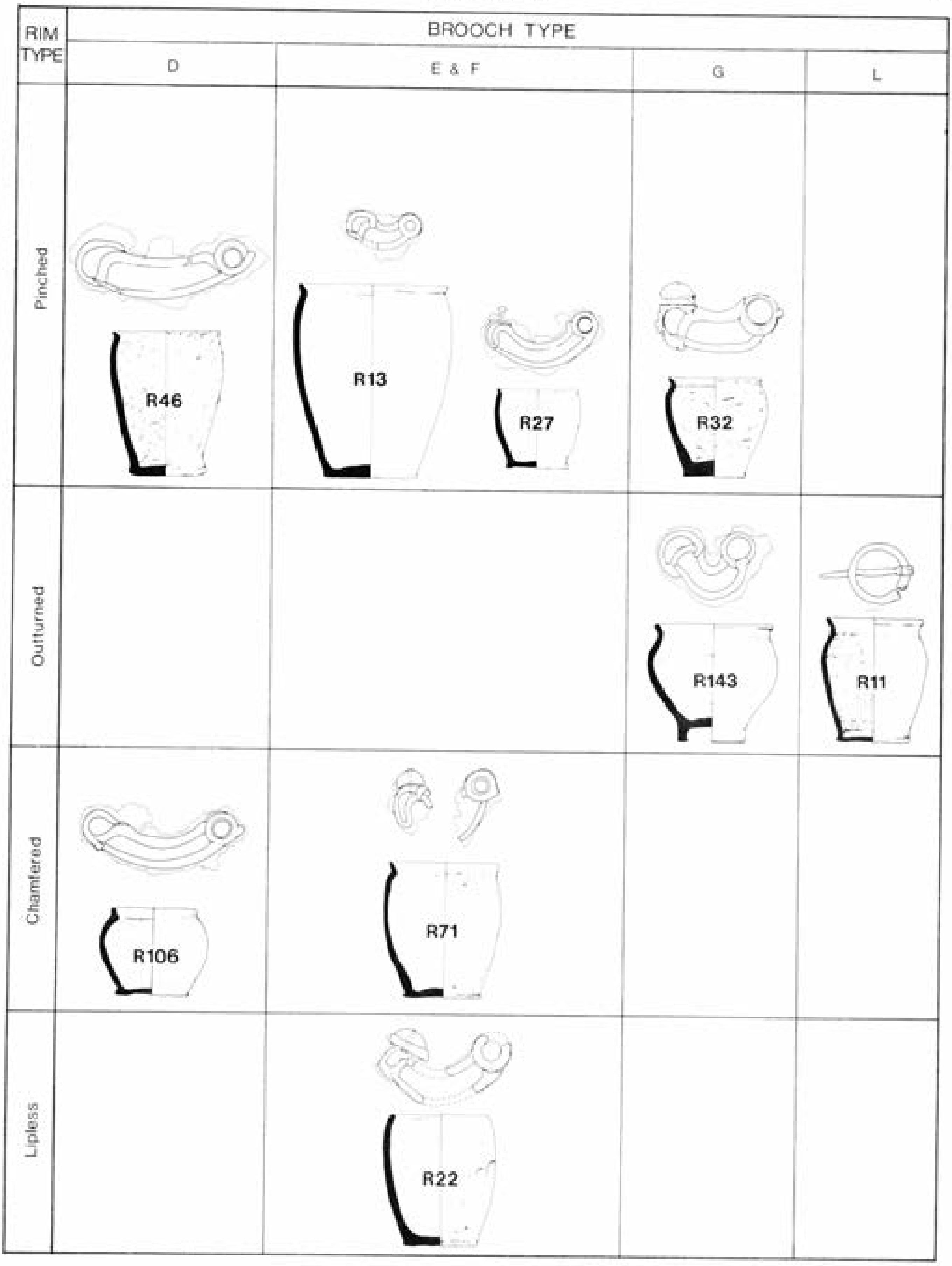

Fig 74 Classifiable pots with associated brooches (D–L)

estimated timespan of this pottery, from the late fourth to the early first century BC. The pinched rim jar from Cowlam may extend the period into the early fourth century BC, thus raising the possibility that Arras Culture pottery predates the introduction of the Arras Culture burial rite.

Fabrication techniques

The broken pots have provided considerable information about the raw material and fabrication techniques used by potters of the Arras Culture to produce funerary vessels. It appears that the local availability of raw materials was more important than specific properties, while methods were simple and required no special equipment or tools. There is no indication that even a simple turntable was used to assist in shaping or finishing, or that any sort of kiln structure was used for firing. However, these methods may only have been employed to make funerary vessels; they need not have been used for all pots, nor even for just a limited range of domestic pots.

The choice and preparation of raw materials

There is no evidence that any particular geological clay was preferred. The identification of one example of glauconite clay which has natural tempering and good handling characteristics simply highlights this lack of preference. In thin-section the clays are very variable and had not been subjected to any major phase of preparation, such as levigation.

The size range and frequency of temper in both erratic and calcite fabric groups imply that it was used to counter thermal shock during bonfire firing, rather than to improve the handling characteristics of the clay. Judging by the potting quality exhibited as a whole by the erratic fabric group, erratic temper made shaping and finishing more difficult. As the pedestalled bowl in Burial 143 demonstrates, it was possible to achieve a smooth, glossy, burnished finish if the temper size was limited and time and effort expended. However, judging by all other examples, potters were apparently not prepared to spend the time, or lacked the knowledge to produce well-finished vessels.

With a proportion of erratic temper regularly in excess of 5mm, potters were more or less obliged to produce a minimum wall thickness of about 10mm regardless of pot size in order to limit the number of inclusions protruding through both the inner and outer surfaces; as it was, many protruded through one surface. Moreover, unless the clay had inherently good plastic qualities, the large inclusions would have been an additional factor limiting the success of the shaping and finishing processes.

The calcite appears to have been crushed rather than heated and quenched like the erratic temper. Potters exercised more control over the size range and probably reduced grits greater than 4mm by extra pounding. Crushing also enabled a high proportion of temper below 2mm to be produced and this, coupled with its angular, rhombic shape, allowed for a more even and tidy mixture of temper into the clay. While it may not have positively improved the handling properties of the clay, calcite temper was less of a hindrance to the basic shaping and finishing processes.

Shaping

Where the evidence survives, the base was a separate disc of pressed out clay. The lower body wall was luted onto it, at right angles, leaving a narrow margin around the outside edge. The inner surface of the body was spread towards the centre of the base, thickening it considerably. The outer margin of the base disc was folded up over the outside of the body wall, and luted onto it to ensure a secure join between body and base. Some potters squeezed the clay to produce a channel around the base, eg R71, R91, and BF28, or a recess around the lower body-wall, eg Rll and R32. Left untrimmed, this method of attaching the base produced a more or less markedly splayed base. In no more than four cases, Rll, R18, R27, and R37, can the splayed base be considered as a definite typological feature rather than a result of the fabrication technique. Seven pots have trimmed, smooth base angles, five of which belong to the calcite fabric group.

A variation of this technique was used for the bowl in R143. The usual separate base disc was luted into position, then the footring was applied to its underside and the joins were carefully smoothed over and concealed. When the pot was broken sometime before being placed in the grave, base disc and footring separated from the body along the luting lines.

Flattened strips of clay 30–40mm wide were luted together horizontally to form the body of the vessel. Since the pots were wide-mouthed and bucket-like inside and lacking in shape outside, with little difference between the diameter of mouth and maximum girth, no serious shaping problems were posed by this method. Evidence of pleating into the neck and base constrictions has survived on some vessels, most notably in R39, perhaps the most ineptly made pot from any grave of the Arras Culture. Traces of horizontal, squeezed luting lines survive in the profile of the pot from the ditch of R91. Individual finger depressions survive below the angle of the rim chamfer of the jar in BF37. Any additional shoulder shape was due either to thickening the body wall on the outside, or reducing the wall thickness at the neck.

Equally simple techniques of folding and luting were used to produce the typical rim shapes. The lip edge of the barrel jar in R22 was finished off by smoothing the clay vertically and spreading it from the inner to the outer surface, forming an uneven ridge. The direction of smoothing was reversed to produce the bead rim of the bowl in R14. The rim edge was folded over and luted onto the inner wall to produce the chamfered rim shape which is one of the more characteristic features of Arras Culture pots. As its name implies, a pinched rim was formed by pinching and turning a narrow collar of clay at the mouth edge. The upright rim of R16 was produced from a separate piece of clay luted on to the shoulder.

The outturned rims of RII, R39, and R143 show no effects of pinching or folding. They were probably created when pots were turned over, to rest on the rim, and pressure was applied.

Surface finish

The 'finish' of each vessel has been defined as the final treatment, if any, given to both the inner and outer surfaces, before firing. Considerable variation has been observed ranging from the 'unfinished', with many inclusions protruding through either surface, to a single vessel with glossy burnished surfaces inside and out, which qualifies as a 'fine ware'. In between these extremes a pattern emerges where the inner surface was smoothed off, leaving the inclusions visible, while the outer surface was treated to mask the inclusions. The method was to produce over the outer surface a slurry of wet clay which covered the temper like a slip. The slurry finish was either left without further treatment resulting in a rough uneven and matt finish, or, occasionally, was deliberately smoothed or burnished to produce a more even, glossy result.

There is a correlation between fabric group and quality of finish, with vessels in CTW generally receiving more satisfactory finishes than those in ETW.

In terms of temper size, wall thickness, overall shaping, and finishing there is an observable distinction between the erratic and calcite fabric groups. At least 28 vessels in the former share the same characteristics of thick wall, asymmetrical shape, and coarse more or less unfinished surfaces with protruding temper, comprising Fabrication Category 1. Six examples in the latter exhibit much better fabrication techniques: they are definitely thinner-walled, about 5mm, are more symmetrical, and their surfaces are well finished, Fabrication Category 2. It is impossible to decide how far this improved quality reflects the inherent advantages of calcite over erratic temper, better fabrication techniques, more skilful potters, or a combination of all factors.

There are important exceptions, however. Eight jars in the calcite fabric group had been shaped, finished, and fired in the same way and to the same standard as Fabrication Category 1, which suggests that different tempers were interchangeable. One vessel in the erratic fabric group, the pedestalled bowl from R143, had been made to the standard of Fabrication Category 2, demonstrating that even if there were inherent handling problems in ETW they could be overcome by technique and time.

Nineteen vessels from the Danes Graves, Eastburn, and Wetwang cemeteries have been examined; four are in ETW and the rest in CTW. Although two pots in CTW from Wetwang and one in ETW from Danes Graves are markedly thin-walled, they were so poorly shaped and finished that they do not qualify for inclusion in Fabrication Category 2. Otherwise, all pots definitely belong to Fabrication Category 1.

Judging by the current sample, Fabrication Category 1 established the norm for Arras Culture pottery of both the erratic and calcite fabric groups.

Firing

Two vessels had been so poorly fired that, although complete circuits were placed in the grave, subsequent soil compaction had distorted them (R46 and R186). Those in other burials did retain their original shape, but appear to be scarcely harder fired. Because their fabrics are so friable it has been difficult to estimate how complete they were at the time of burial.

Other characteristics besides friability suggest that firing temperatures were low, possibly because firing time was too short. Twelve have a thick black sooty core which sometimes extends to include the inner or outer surface. Surface colours are dull, variegated, and contaminated with extensive sooty patches to the extent that it is not possible to decide whether oxidation (orange), reduction (grey), or fuming (black) was intended. It may be that the potters had no such specific result in view.

Ethnographic and experimental firing has demonstrated that the temperature and conditions produced in a surface bonfire are adequate to fire prehistoric and Roman pottery which has been tempered with sufficient aplastic inclusions to withstand the shock of the rapid temperature rise characteristic of this method. Bonfires which reach temperatures in excess of 600° culminate naturally in a phase of oxidation, as fuel falls away from pots and their surfaces are exposed to oxygen in the air. To prevent or reverse this phase, pots must be cooled in a carbon- rich and oxygen-poor atmosphere. By positioning pots mouth-up, mouth-down, or horizontally, potters can also control the firing of the inner and outer surfaces.

Since it is comparatively simple to oxidise a pot, it must be significant that only three pots were fired at a sufficiently high temperature to have reasonably well-oxidised surfaces, approaching a clear orange-red colour. Seven can be defined as oxidised with some degree of certainty, but the colours are duller, yellow-buff and orange-brown, and there are still extensive grey patches. The remainder were more or less severely underfired in dubious firing conditions. Several different causes could be involved: low firing temperature owing to wet or inadequate amounts of fuel, insufficient firing time for such thick-walled vessels, or the position of pots in the fire. Whatever the cause or causes, it is clear that neither the potter nor the 'consumer', presumably the family of the deceased, was concerned. As long as a pot was fired sufficiently to allow it to function in the funerary ritual, its colour and long-term durability were immaterial.

It is debatable whether or not such friable pots would have been equally acceptable if a domestic function was intended, and it is tempting to assume that domestic pottery was fired more adequately.

Size and capacity

A notable feature of vessels found in cemeteries of the Arras Culture is their limited size range. Moreover, for a group of such poorly crafted pots, the external dimensions are remarkably consistent.

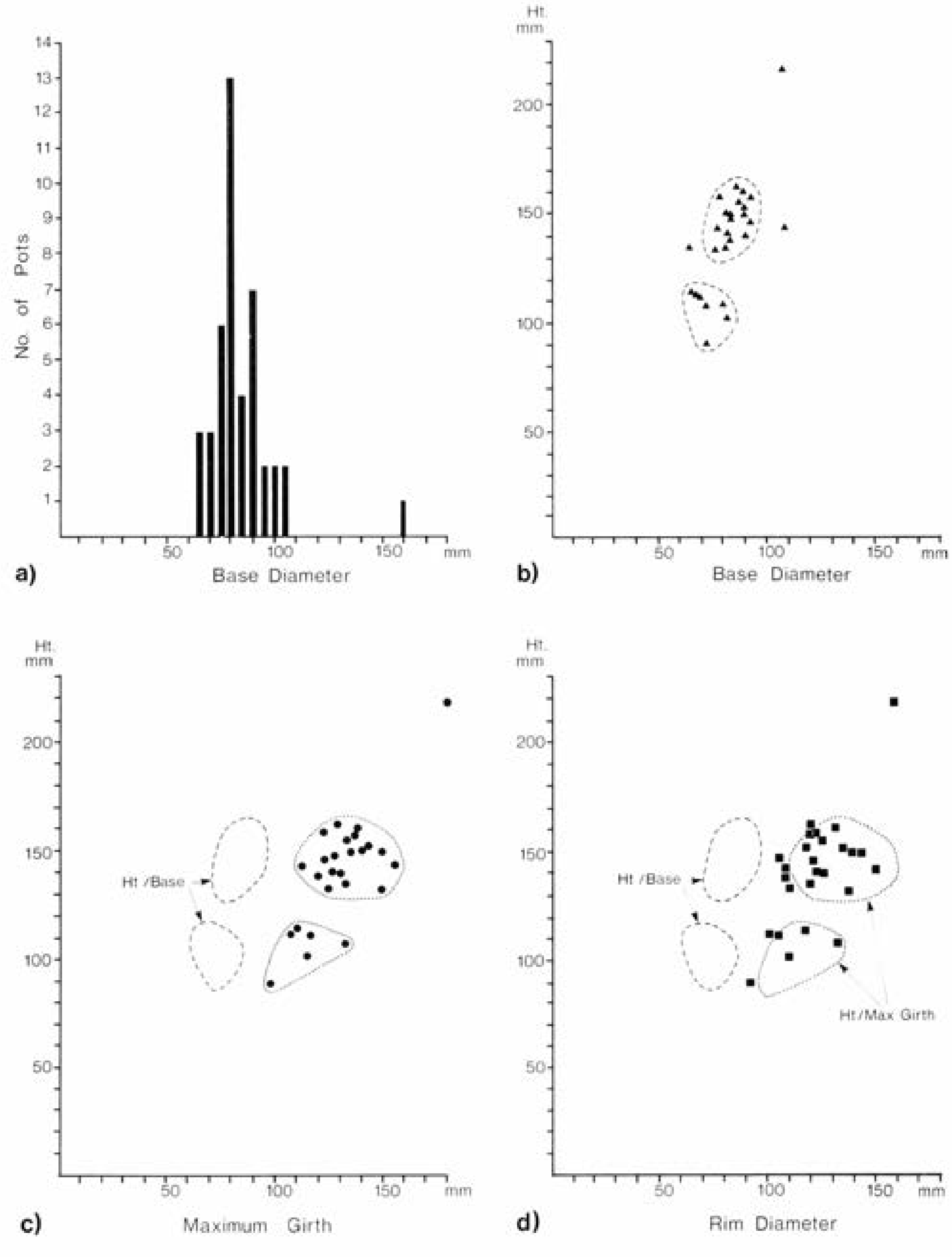

Fig 75 Rudston and Burton Fleming: a, incidence of base diameter of 43 measured pots (rounded to the nearest 5mm); b–d, comparison of the height with the base, maximum girth, and rim diameter of 36 measured pots

The diameters of 41 of 43 surviving bases fall within the overall range of 65–105mm (Fig 75, a). The mean diameter is 85mm, or about a palmspan, and 32 vessels are within a 10mm range of this value, which means that they vary by no more than the thickness of the vessel wall. The base of one vessel, from R13, is just in excess of 105mm, and it is the largest pot for which a complete profile can be restored. Finally, there is the base of an exceptionally large vessel in R82, with a diameter not far short of twice the mean, at 160mm.

When base diameter is plotted against height, two groups and a single oddity emerge from the 36 vessels which are sufficiently complete to be included in the study (Fig 75, b). Six pots are squat, between 90 and 110mm in height, a handspan, while 29 fall within a 30mm range, between 130 and 160mm. The single pot is much taller, at over 210mm, or about twice the height of the squat group.

Within the main squat and intermediate groups, base, shoulder, and rim diameter retain about the same proportions (Fig 75, b–d). Base diameters are more standardised than other dimensions, and are all within a range of 20mm, the height range is about 30mm, and the shoulder about 40mm, while the rim diameter is most variable, with a range of about 45mm.

Using the proportions of the largest complete vessel in R13, it is possible to estimate the size and capacity of the exceptionally large vessel in R82. With a base diameter of 160mm, its height would have been at least 320mm and its maximum girth at least 240mm. Such dimensions belong to a storage jar rather than the conventional cooking pot.

The Makeshift cemetery has produced evidence for a range of four sizes, with an approximate dimensional relationship. If the size groups are numbered 1–4 in ascending order, then the 'tall', size 3, is about twice the height of the 'squat' group, size 1, while the 'storage jar', size 4 is about twice the height of the 'intermediate' group, size 2.

If the dimensions of the four size groups are related, then their capacities should be related also. The dimensions, weight, and capacity of five pots could be measured and the results are summarised in Table 5. Using the results as a basis, the approximate capacities of sizes 3 and 4 can be estimated at about 2.5 and 5 litres respectively; such a range would have been very useful in a domestic situation. When the capacities are converted from liquid to solid contents then the relative equivalents are 1.7 and 3.4 kilos of ground flour and just short of 1 and 2 kilos of grain.

When estimating capacity of the smaller sizes, the effect of wall thickness on empty weight and capacity is considerable. The shapeless jar from R33 has a capacity of 75cl to the rim chamfer, yet its external dimensions are marginally greater than those of the pinched rim jar in R2, which has a capacity of a scant litre. However, while the former is thicker walled than usual, the latter is marginally thinner walled, and the combined result is a difference of 13% in empty weight and 25% in capacity. If the pots ever functioned as containers for marketable produce, the consumer had to be very wary; the external dimensions did not give a full and accurate picture of the capacity.

Table 5 The dimensions, weight, and liquid capacity of five measured vessels

Burial no	*Dimensions (mm)*				*Weight (g)*	*Measured capacity (litres)*
	Base	*MG*	*Rim*	*Height*		
BF6	82	116	110	101	402	50cl
R83	65	110	118	115	368	50cl
R33	94	124	121	146	828	75cl
R2	90	130	125	140	750 (approx)	1 litre (scant)
R16	89	143	120	151	800 (approx)	1 litre +

The choice of a limited range of comparatively small vessels appears deliberate. There is sufficient width and depth to accommodate a larger size in the respective graves, but only one complete 'tall' vessel (size 3) was chosen. One factor which perhaps limited the minimum pot size may be deduced from the role of the funerary vessel as container for part of the foreleg of a sheep. To enclose either the bare humerus bone or an equivalent joint of meat for cooking or preserving, the pot had to be at least 130mm deep, a dimension which accords fairly well with the known funerary vessels. But incomplete pots, with between a quarter and three-quarters of the upper body missing, were also accompanied by a sheep humerus, so it appears that the funerary vessel did not have to enclose the bone or joint completely, and this factor alone did not therefore govern the accepted minimum size.

The pots from the Cowlam, Danes Graves, Eastburn, and Wetwang cemeteries fall within the squat and intermediate size group but the Kirkburn pot approaches storage jar size (4). It is difficult to assess just how representative of domestic pottery the size and capacity range of funerary vessels may be and how significant the relative frequency of each size is. If the collection from the Makeshift cemetery is representative, then few pots greater than 160×160mm were made. The ratio of storage jars to the most common 'intermediate' jars may have been as low as 1:35. While this may show that the supply of storage jars was small and could therefore have important implications for assessing agricultural production and food storage methods, it does not make allowances for functional differences in survival time. Large, immobile storage vessels would survive longer than small, portable drinking and cooking vessels, so while there would have been a fairly constant output of smaller vessels, this would not be necessary for storage jars.

Pottery as grave-goods

Pottery was found in 29 graves in the Makeshift Cemetery, making it the second most popular artefact type. Three invariable characteristics can be distinguished apparently circumscribing the type of grave and the number and type of grave-goods in these burials. Firstly, pots are confined to burials orientated north–south and surrounded by rectangular ditched enclosures; none was found in any east–west burial. Secondly, only a single vessel was ever placed in any grave; R91 deviates slightly in that pots are represented in both the grave and the ditch.

Table 6 Grave-goods associated with pots in the Rudston and Burton Fleming cemeteries

Sex	*Pot, brooch, sheep humerus, other*	*Pot, brooch, sheep humerus*	*Pot, brooch*	*Pot, sheep humerus, other*	*Pot, sheep humerus*	*Pot*	*Total*
F	-	5	1	-	2	-	8
Fp	-	2	2	1	1	-	6
?F	-	2	-	-	-	-	2
C	2	1	1	-	2	-	6
?M	-	1	-	-	-	-	1
Mp	-	2	-	-	-	1	3
M	-	5	-	-	-	2	7
?	-	1	-	-	1	-	2
Total	2	19	4	1	6	3	35

Finally, the range of associated grave-goods is very limited: pots are associated with brooches, bracelets, beads, and sheep humeri, but never with weapons, tools, or blades. The obvious explanation, that pots were female grave-goods, cannot apparently be substantiated, for seven females and six males are accompanied by pots, and their grave-goods conform to the same pattern. The Makeshift rules apply elsewhere at Rudston and Burton Fleming, and equally at Danes Graves and Eastburn. One exception has emerged. In K2 at Kirkburn, the bodies of a female and child which were accompanied by a pot were orientated east–west.

Table 6 demonstrates that the figures for all Rudston and Burton Fleming cemeteries show a similar pattern to the Makeshift cemetery: pots accompanied eight definite females compared to seven males, with possible totals of 16 and 11 respectively. This is not unexpected, since pots are present in both female and male burials in those areas of France and Belgium where inhumation rites were also practised in the Iron Age; other classes of grave-goods are more likely to be sex specific. It is therefore rather unexpected that, of nine pots found in barrow ditches, seven belong to more or less certain female burials, but only one to a ?male burial; the other is uncertain since the ditch is shared between a probable female and a possible male.

Typological study of pottery from the Iron Age cemetery at Tinqueux (Marne) implied that while the presence/absence of pots was not gender specific, the actual vessel-shapes were (Flouest and Stead 1981). Angular pots, both tripartite and bipartite carinated, were found in female burials, while round-bodied pots were associated with males. Subsequent research showed that this distinction did not apply to other contemporary cemeteries and was therefore likely to be a result of a sampling error. There are no such simple, clear-cut shape differences in pottery of the Arras Culture so it is difficult to test the hypothesis that there were male and female pot shapes. No distinction in typology or fabric groups has been observed, although a much higher incidence of incomplete vessels has been noted in male graves.

Estimating the age and sex of skeletons is extremely difficult, and more so when the bones are in a poor state of preservation. In such circumstances, the possibility cannot be entirely ruled out that pots were specifically female grave-goods in Arras Culture burials. The detailed statistical analysis presented in Chapter 10a, however, appears to support the hypothesis that pots were not sex specific, for the identification of definite and probable males seems secure which means that at least ten were accompanied by pots. Methodologically, identifications are weighted in favour of females so that if the ?male and half of the ?females and contra-indications are presumed male, then the female:male ratio is more balanced, with 16 male and 19 female burials accompanied by pots.

No single rule governing the condition of pots to be placed in graves can be deduced from the Makeshift cemetery. Table 7 summarises the condition of all pots from graves and ditches. They can be divided into two groups according to their estimated condition at the time of burial: the first comprises those which have a complete base circuit and could therefore 'stand', the second those which were already fragmented. The former includes both whole and incomplete vessels, lacking anything from a single rim sherd to an entire upper body circuit. The latter additionally includes vessels which had been broken elsewhere and only a selection of sherds recovered for burial. Their condition is scarcely better than pots found in the barrow ditches, suggesting that both had suffered the same sequence of events. In grave BF19 the most vestigial burial pot recovered, comprising two sherds placed carefully on the floor of the grave, was found with a bead dated to after the second century BC (p 169). Such an association makes this one of the latest burials with a funerary vessel, and may indicate that the significance of a pot in the rite had diminished.

The condition of burial pots from Danes Graves, Eastburn, and Wetwang is almost as variable as those from the Rudston and Burton Fleming cemeteries. Because of conservation it is difficult to be certain, but four comprise just base and lower body circuit, three are standing pots lacking a rim sherd, while the rest had been fractured and lack anything from a single rim sherd to a considerable profile section. It appears therefore that the same factors applied in all cemeteries where pots were included among the grave-goods.

There is a recurrent tradition in prehistoric and historic periods of the mutilation or breakage of ritual objects, for symbolic reasons or simply to prevent their recovery and reuse. Such a tradition can be invoked to account for the condition of about two-thirds of the pots in the Makeshift cemetery and elsewhere. A considerable proportion is still excluded, and for this a different explanation must be sought. Since no other artefact type was systematically rendered unusable, it is possible that in Arras Culture burials the condition of the pottery is incidental, the result of a number of different complex ritual and extraneous archaeological factors.

Of the 29 pots, 21 were associated with brooches. Perhaps more significantly, 24 either contained or were in close proximity to an animal bone, very precisely the left humerus of the sheep. As can be seen in Table 7, the bone could be 'contained' in a standing or fractured vessel; whether it was complete or in fragmentary condition at the time of burial was immaterial.

Overall, the proportion of burials in the Makeshift cemetery containing pots is low, approximately one in six, although this appears to be the highest of any cemetery. When plotted on the site plan, these burials are not spread evenly throughout the cemetery area; there are marked clusters with sporadic isolated examples between. Even if allowance is made for the fact that the density of barrows is also variable, the clusters still remain, with the most notable in the area of R1–25 (Fig 7). Judging by the inventory of barrows and grave-goods, similar clustering may also have occurred at Danes Graves (Stead 1979, 99–101).

Pots are never universal in Arras Culture cemeteries, but they are significant grave-goods at Rudston, Burton Fleming, Danes Graves, and Eastburn. They are most common in the Makeshift cemetery at Rudston, where they are one of the most popular artefact types, and they are almost equally so at Danes Graves. In contrast, they are noticeably rare at Wetwang, where only a single pot was recovered from a grave in the most extensive Arras Culture cemetery yet excavated, with over 400 recorded burials, and Kirkburn, while they are absent from graves at Cowlam and Garton Station. If the type of burial rather than just the cemetery area is considered, then there is a very important class in which no pot has been found, and that is cart-burials.

The Cowlam and Makeshift cemeteries demonstrate that there are chronological factors to be considered. No pots occur amongst the grave-goods in the earliest burials at Cowlam, nor in the latest phase of east–west burials in the Makeshift cemetery. They occur most commonly with La Tène II brooches in the period between the mid third and early first centuries BC. Hence chronology alone cannot explain the scarcity of pottery at Wetwang where the range of La Tène II brooches and the blue glass beads show that this cemetery was in common use just at the time when pots were at their most popular as grave-goods elsewhere (p 180). A simple geographic explanation seems unlikely since the distances involved are not great, particularly between Wetwang and Kirkburn/Eastburn, which are in any case located in the same catchment area of the River Hull.

The function of the nine pots found in the barrow ditches is enigmatic. Their condition as summarised in Table 7 differs little from that of pots buried as grave-goods. It is tempting to see them as having a significant function in burial rites which took place within the cemetery area.

Six examples were found in the Makeshift cemetery, all in areas where pots occurred as grave-goods, and four in the ditches of more or less adjacent barrows (R71, R77, R80, R91). R91 is unique, having

Table 7 The condition of pots at the time of burial in graves and ditches

Burial no	*Pot condition*	*Sheep humerus*	*Brooch*	*Other grave-goods*	*Sex*
1 Standing vessels					
R2	complete circuit	x	x	x	C
R14		x	x	-	Fp
R27		x	x	-	F
R33		x	-	-	F
R46		x	x	-	Mp
R71		x	x	-	F
R106		x	x	-	F
R178		x	x	-	Mp
R11	rim sherd(s) missing	x	x	-	?F
R13		x	x	-	?
R16		x	-	x	Fp
R22		-	x	-	Fp
R83		x	x	-	Fp
BF6		x	x	-	F
R25	upper body missing	x	x	-	M
R82		x	x	-	M
R84		x	x	-	M
R118a		x	x	-	F
BF4		x	x	-	C
R186	profile section missing	x	-	-	C
R20	profile section and upper body missing	x	x	-	M
2 Fractured vessels					
R6	complete circuit	x	-	-	F
R12		x	-	-	?
R18		x	-	-	C
R32		-	x	-	C
R180		-	x	-	F
R143	rim sherd(s) missing	x	x	-	M
Ditch R76					(F)
Ditch R77					(Fp)
Ditch BF28/9					(?)
Ditch BF57					(F)
R37	upper body missing	x	x	-	?F
R91		-	x	-	Fp
R39	profile section missing	x	x	-	?M
R187		-	-	-	M
BF37		-	-	-	?M
R204	profile section and upper body missing	-	-	-	M
BF18		x	-	-	Fp
Ditch R4					(F)
Ditch R34					(Mp)
Ditch R80					(F)
Ditch R91					(Fp)
Ditch BFII					Fp)
BF19	body sherds only	x	x	x	C

an incomplete pot both in the grave and in the barrow ditch.

The phenomenon is repeated at Cowlam and Wetwang. When excavated in 1968, the primary silt of the ditch of Greenwell Barrow 50 produced the substantial part of a shapeless jar with pinched rim in CTW (Stead 1986, Barrow B, 6; Kinnes and Longworth 1985, Cowlam Barrow 50). The grave-goods include a La Tène I brooch of early fourth-century date, making it the earliest identified example and suggesting that the use of a pottery vessel in the burial rite may have predated its acceptability amongst the grave-goods. Three virtually complete pots and substantial parts of two others were recovered from barrow ditches at Wetwang. Here, although less than 20km from the Makeshift cemetery, pots were never accepted as grave-goods, so it is unexpected that even a few found their way into barrow ditches. It has been proposed that the pot was placed on the barrow above the back-filled grave and was soon dislodged, broken, and silted into the ditch; however, it could equally have been deliberately broken after a libation was poured. The scarcity of examples suggests that, whatever their function, pots figured rarely in the burial rite.

Pots found in Arras Culture burials are absolutely simple and basic containers, made with a strictly limited function in mind, so that the least time and effort was expended on them. They are minimum input vessels, and as such are in marked contrast to earlier funerary vessels, like Beakers, Collared Urns, and Food Vessels of the late Neolithic and Bronze Age. While the fabric preparation, fabrication methods, and firing skills of earlier potters may not always have been superior, just different, there was much more commitment of time and effort into the finished appearance of a vessel, particularly the surface treatment and decoration of the exterior. From this it can be deduced that, both practically and symbolically within the burial rite, pots were more highly prized in the late Neolithic and Bronze Age than in the middle Iron Age.

Not all Food Vessels, however, were highly decorated. There is a strain of small, plain, shapeless vessel, rimless or with a narrow chamfered rim, which may be the result of a more puritanical train of thought, and which can easily be accommodated within the typological definition of Arras Culture pots. These vessels are from various burial grounds – Garton Barrow 26, feature A, Goodmanham Barrow 121, Burial 2, Hutton Buscel Barrow 160, Burial 1, and Heslerton Barrow IR (Kinnes and Longworth 1985; Powlesland *et al* 1986, fig 34, 104 AB). At Catfoss, large but similarly basic and plain vessels were used as cremation urns (McInnes 1968, figs 2–4). They demonstrate that when potters of different cultures and periods aim to turn out absolutely basic, minimum input vessels, the results may be almost indistinguishable because the repertoire of body, rim, and base configuration is so restricted.

The distribution and chronology of Arras Culture pottery

The pots found in Arras Culture cemeteries are sufficiently limited and coherent in their typology, fabric, and fabrication method to be termed Arras Culture pottery. They are simple, featureless vessels, made from local materials for a limited function. These minimum input vessels differ markedly in concept from the highly decorated funerary vessels of the late Neolithic and Bronze Age, although there is a limited group of small, plain, shapeless vessels which share some typological traits with Arras Culture pots.

Pots were acceptable grave-goods in the Makeshift cemetery from the late fourth century BC. A find from Cowlam suggests that Arras Culture pottery had already evolved by the mid fourth century, possibly even before the Arras Culture burial rite itself was introduced. The latest vessel in the Makeshift Cemetery, in R143, can be tentatively dated to the late second or early first century BC. However, pots appear to have lost favour as grave-goods before this cemetery was finally abandoned.

Arras Culture pottery has so far been defined and characterised entirely from funerary vessels found in cemeteries of square barrows concentrated in a limited area of the Yorkshire Wolds. There are other cemeteries which have not been investigated, and it remains to be demonstrated whether or not they also contain Arras Culture pottery in the graves or if this particular ritual was very localised. Further, the question remains whether or not Arras Culture pottery was limited exclusively to funerary use and that contemporary domestic pottery was different in form and fabrication methods; the fabric groups have proved to be represented in both burials and settlements (see pp 95ff).

No excavated settlement within the region of the Wolds has produced an extensive assemblage of Arras Culture pottery. Five vessels, all in CTW and Fabrication Category 2, have been identified in groups from hut circles belonging to the Iron Age settlement which predated the construction of Rudston Villa (Rigby 1980, fig 37, 118, 120–1, 123–4). The group from a semicircular trench, feature 3, includes sherds from an imported white pipeclay flagon with a date range of AD 20–65. There is also a necked and cordoned jar which cannot be earlier than mid first century BC (ibid, fig 37, 122). A third group comprising two almost complete vessels was found in the primary filling of one of the major ditches (ibid, fig 29, 19–21). Although in CTW, two of the three pots definitely belong to Fabrication Category 2. The middle and upper layers include Antonine samian and wheelthrown, sand-tempered vessels, but there was a marked difference between the forms, fabrics, and fabrication techniques of the handmade vessels in the lower and upper layers. In addition, three unstratified vessels belong to the erratic fabric group (ibid, fig 58, 367–8, 370).

Other examples and small groups have been found at Scarborough, Wetwang, and Burton Fleming, and more recently at Burton Agnes, Rudston, and Kilham; both CTW and ETW are represented. Fieldwalking around Wharram Percy has produced Arras Culture types but all apparently belonging to the calcite fabric groups; no ETW has been recorded (Hayfield 1987, figs 15,1, 28,88, 66,198–202). There is sufficient evidence from settlements to demonstrate that Arras Culture pottery was not just confined to funerary use.

Beyond the Wolds, Arras Culture burials have also been identified, although very few have been investigated, and similarly occupation sites in Holderness (the Morfitt Collection), the Vale of York, and the North Yorkshire Moors have produced sherds which fall within the definition of Arras Culture pottery. An extensive assemblage from an Iron Age settlement at Grimsby demonstrates that its production extended south of the Humber (access to the pottery from Weelsby Avenue excavation kindly provided by J Sills). How far south and west it reached remains to be established, for none has been identified at Dragonby, Old Winteringham, or Winterton.

Beyond the North Yorkshire Moors much of the non-Roman pottery from the settlement at Thorpe Thewles, Cleveland, can be classified using the Makeshift typology (Swain 1987, figs 44–7). Moreover, the erratic fabric group is predominant while the fabrication techniques are typical of Fabrication Category 1. The pottery of the Arras Culture cemeteries is apparently embedded in a technology and typology which was current over a much more extensive area than the Wolds in the Iron Age.

Individual sherds from vessels which on the grounds of their typology and fabrication methods qualify as Arras Culture pots have been found in assemblages of the first half of the first millennium BC at Grimthorpe, in the upper layers of the ditch, Heslerton, unstratified, and Cowlam in surviving mound material (Stead 1968, fig 7,17; Rigby 1986, find recorded but not published; Kinnes and Longworth 1985, Greenwell Barrow 51,15). Their presence is open to various interpretations, one of which is that Arras Culture forms were in use in the region before the fifth century BC and thus before the Arras Culture burial rite had been introduced.

The practice of including a pot among the grave-goods ceased before the introduction of the east–west burial rite to the Makeshift Cemetery. The latest burial of the north–south rite, R143, dates to the late second or early first centuries BC. A group from Rudston Villa suggests that Arras Culture pottery continued to be made into the first century AD, in which case it survived the abandoning of the Arras Culture burial rite.

It appears that Arras Culture pottery may not be uniquely tied into the chronology of Arras Culture burial rites. Typology, fabrics, and fabrication methods provide evidence for continuity with early Iron Age if not late Bronze Age settlements in the region of the Wolds and beyond. Innovation was limited to the actual burial rite, while Arras Culture pottery was firmly embedded in the ceramic tradition of a much more extensive area of northern Britain over a longer period.

The catalogue

All funerary vessels have been included in the catalogue, and even fragmentary pots have been illustrated provided there is a measurable diameter and some degree of recognisable shape.

Each pot has been classified by form and fabric. There is also a detailed description of the fabric based on the superficial examination of sherds in the hand, with the assistance of simple magnification and a binocular microscope. Twenty-nine vessels were thin sectioned, and the results of the macroscopic and microscopic examination checked and integrated. The full results of the petrographical analysis are published in Chapter 10a.

The aplastic temper (or voids) is sufficiently coarse to be visible and measurable at the surface and in the fracture, and for the size range of typical inclusions to be established. Various attempts were made to quantify manually the amount and proportion of grades of temper in each vessel, but none was satisfactory. The final method adopted was to compare each vessel with typical examples of sparse, medium, and dense tempering in its relevant fabric group. Two others evolved during processing.

The catalogue entry also includes a descriptive assessment of the texture and appearance of the clay matrix, how the inner and outer surfaces of the vessel had been finished, and in what conditions it was fired. Any significant deterioration in the condition of the fabric has been noted. During processing, an apparent close correlation between fabric group and ceramic technology was observed, and so the quality of potting technique has been assessed using the criteria of vessel symmetry, wall-thickness relative to size, and success of the surface finish in masking the temper.

Finally, as part of the study of the burial rite, since not all funerary vessels were complete when discovered, their present degree of completeness has been assessed, and their original state at the time of burial estimated.

Vessels found in burials

R2 (FE/AM 2; Fig 101) Shapeless jar, pinched rim 3D2. Fabric group: Erratic. In the hand specimen, medium density basalt temper: sub-angular, irregular dirty white and dark grey mottled lumps, ranging in size to 5mm. Fine-grained matrix. Surface finish: roughly smoothed inner and outer surfaces, temper not masked. Weakly oxidised; grey core, patchy brown and grey surfaces; sooty patches on interior. Potting quality: typical of erratic fabric group. Condition: complete base and body circuit restored, some small rim sherds missing. Probably in this state when buried since fracture edges abraded and no matching rim sherds in the filling of the grave.

R6 (FE/BY 7; Fig 76) Shapeless jar, chamfered rim 3E2. Fabric group: Erratic, orthopyroxene basalt. Sparse to medium density, worn, sub-angular dirty white translucent lumps, ranging in size to 4mm. Fine-grained smooth matrix with occasional fine mica and organic matter. Surface finish: inner surface roughly wiped with diagonal strokes, temper visible; masked outer, rough and uneven. Uncertain firing: dark grey core, weakly oxidised dark brown surfaces almost totally obscured with sooty black patches. Potting quality: typical of erratic fabric

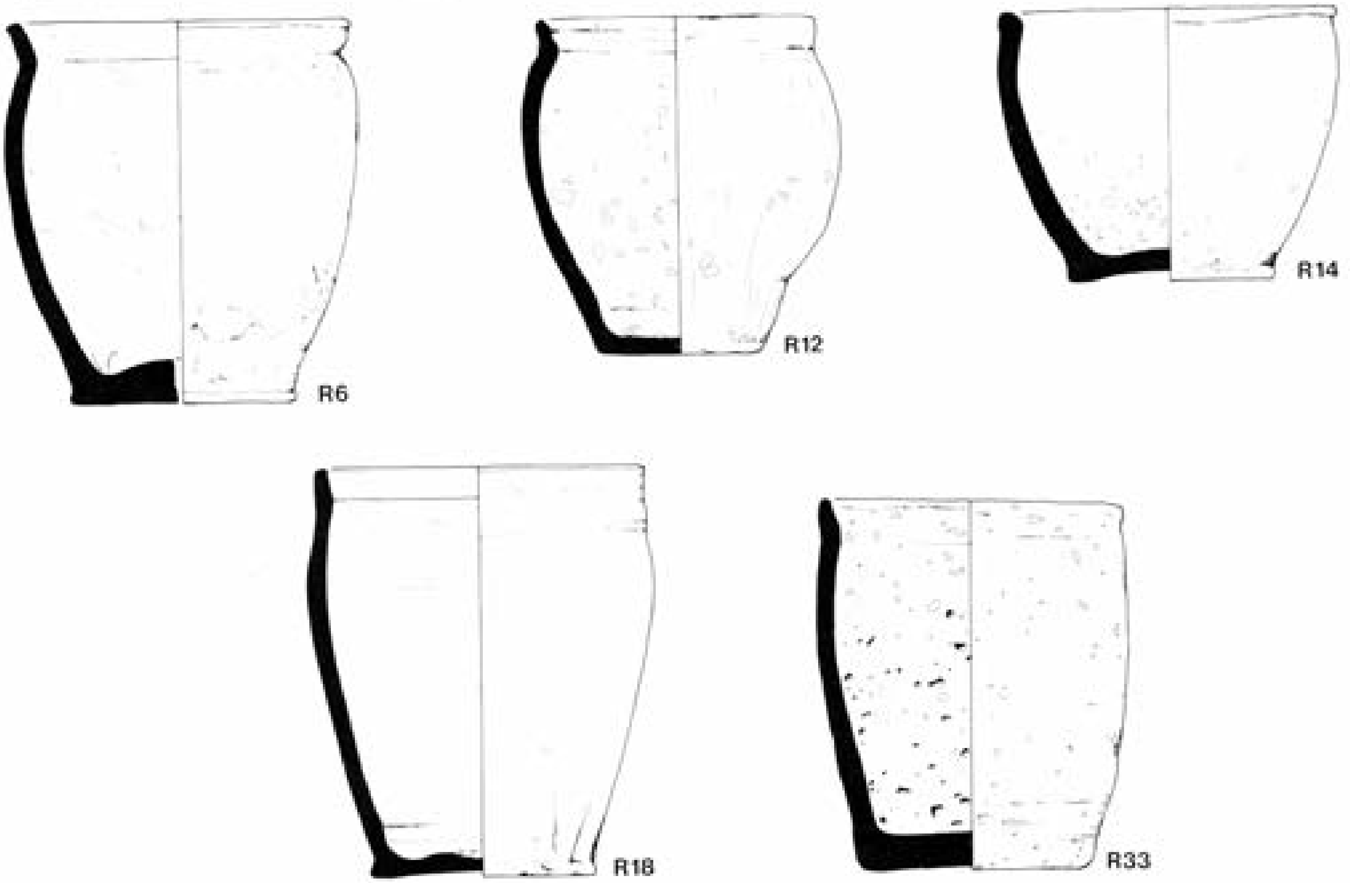

Fig 76 Rudston: pots in graves, not associated with other grave-goods (1:3)

group. Condition: restorable to almost complete circuit, except for single rim sherd. Probably in this state at the time of burial, since no matching sherds were found in the grave filling.

R11 (FL/BO 3; Fig 101) Shouldered jar, out-turned rim 4G2. Fabric group: Erratic, granite. Sparse–medium density, sub-rounded, light brown and grey grits, ranging in size up to 4mm. Also occasional lumps of basalt. Fine-grained matrix with sparse mica platelets up to 1mm in length. Surface finish: wiped inner, with abraded and vesicular patches; masked outer. Underfired: incompletely fumed grey-black ware, weakly oxidised brown patch on exterior. Potting quality: thinner walled than is usual for erratic fabric group, otherwise typical. Condition: complete base and body circuit restored, some rim sherds missing, possibly owing to the friable state of the fabric.

R12 (FL/AF 1; Fig 76) Shapeless jar, chamfered rim 3E1. Fabric group: Erratic, olivine basalt. Sparse, irregular, sub-angular mottled grey lumps, mainly between 2 and 5mm, occasionally up to 10mm. Sandy matrix. Surface finish: wiped inner; masked outer, larger inclusions still protrude. Uncertain firing: dark grey core and inner surfaces, weakly oxidised, brown outer surface with extensive grey and sooty patches over rim and upper body. Potting quality: typical of the erratic fabric group. Condition: complete circuit restored, but some small rim sherds missing, possibly owing to the friable state of the fabric.

R13 (FL/AA 2; Fig 102) Shapeless jar, pinched rim 3D2. Fabric group: Calcite. Medium density angular white translucent calcite, generally less than 2mm in length, and sub-rounded opaque white chalk gravel. Sandy matrix, with sparse mica platelets up to 1mm in length. Surface finish: smoothed inner; masked outer, carefully executed to produce an even finish. Comparatively hard-fired: oxidised, grey core, orange-brown surfaces, with grey and sooty patches inside and out. Potting quality: typical of the calcite fabric group which is considerably better than the erratic group. Post-firing treatment: at least one hole, 4mm in diameter, cut below the rim; definitely no matching hole on opposite side of pot, so not for suspension. A second hole may have been cut alongside the first, to bind an incipient crack, but the relevant sherd was lost in antiquity. Condition: complete base and body circuit restored. Incomplete pot placed with the burial.

R14 (FL/BS 5; Fig 76) Shapeless bowl, bead rim 3C2. Fabric group: Erratic, dolerite. Heavily tempered with angular dark grey and black mottled fragments, generally about 2mm in length, occasionally up to 6mm. Fine-grained matrix. Surface finish: roughly wiped inner, now abraded so that grits protrude markedly; masked outer. Underfired: weakly oxidised, black core, orange-brown surfaces, with extensive grey and sooty patches, particularly on the outside. Potting quality: typical of the erratic fabric group. Condition: complete circuit restored, some rim fragments missing, probably owing to the friable state of the fabric.

R16 (FL/BZ 4; Fig 102) Shouldered jar, upright rim 4F2. Fabric group: Erratic. In the hand specimen, heavily tempered with irregular, sub-angular brown grits ranging in size up to 5mm. Fine-grained matrix. Surface finish: wiped inner, masked outer, rough and uneven. Decoration: two areas of randomly placed cord impressions on the lower body and at the rim; not a systematic, repeated pattern. Oxidised: grey core, orange-brown surfaces with extensive sooty patches. Potting quality: typical of the erratic fabric group. Condition: complete and standing pot, but one large rim sherd missing, fracture edges abraded. The pot was in this condition when it was buried, for no rim sherds were found in the grave.

R18 (FL/DB 12; Fig 76) Shapeless jar, chamfered rim 3E2. Fabric group: Calcite. Medium density angular white translucent calcite and sub-angular opaque chalk, ranging in size up to 2mm. Fine-grained matrix, with organic matter. Surface finish: abraded and vesicular inner surface, wiped horizontally; masked outer, vertically smoothed. Underfired: weakly oxidised brown ware, grey patches inside, extensive sooty patches outside. Potting quality: typical of calcite fabric group. Condition: complete base and body circuit restored, but one-third of rim circuit missing; the friable state of the fabric may account for the missing sherds.

R20 (FL/CL 9; Fig 102) Jar, unknown form. Fabric group: Calcite. Sparse sub-angular opaque white chalk, ranging in size up to 5mm. Fine-grained matrix, with organic matter. Surface finish: both surfaces smoothed off vertically. Weakly oxidised: dark grey core, red-brown surfaces with grey and sooty patches. Potting quality: typical of erratic rather than calcite fabric groups. Condition: about three-quarters of base and body circuit restored; no sherds found in the grave, so this vessel was far from complete when buried.

R22 (FL/CY 13; Fig 103) Barrel-shaped rimless jar 1A2. Fabric group: Mixed Erratic, olivine basalt, dolerite, and arenite. Medium density, irregular, sub-angular, mixed mottled dirty white and grey, angular mottled grey and black, and translucent white inclusions, ranging in size up to 6mm. Sandy matrix. Surface finish: both surfaces roughly wiped, some temper masked; irregular finger impressions on one side of the vessel. Oxidised: grey core, orange-brown surfaces with grey and sooty patches particularly on exterior. Potting quality: typical of erratic fabric group. Condition: complete and standing but for a large rim sherd which had been lost in antiquity. Vessel incomplete at time of burial.

R25 (FM/AO 8; Fig 104) Jar, form unknown. Fabric group: Erratic, dolerite. Sparsely tempered with angular mottled dark grey and black temper, ranging in size up to 6mm in length. Also occasional black organic matter, and rounded glassy sintered pellets. Fine-grained matrix. Abraded and laminated surfaces. Oxidised: grey core, and red-brown surfaces with extensive grey patches inside and out. Potting quality: unusually thin wall for erratic fabric group, otherwise typical. Condition: complete base and lower body circuit restored to about the maximum girth, where it fractured along a luting line. No joining sherds in the grave, therefore the pot was buried in this state.

R27 (FM/BH 3; Fig 104) Shapeless bowl, pinched rim 3D4. Fabric group: Erratic, quartzite. Sparse to medium density angular and sub-rounded white translucent temper, ranging in size up to 4mm, occasionally coarser. Fine-grained matrix with sparse fine mica. Surface finish: smoothed inner; masked outer. Underfired: incompletely fumed ware, black with weakly oxidised patches inside and out, sooty black deposit over base and lower body. Potting quality: typical of the erratic fabric group. Condition: complete circuit restored, but several rim sherds missing, probably owing to the friable state of the fabric.

R32 (FM/CO 8; Fig 104) Shouldered jar, pinched rim 4D2. Fabric group: Organic Erratic, basalt and arenite. Heavily tempered with irregular, sub-angular dark grey and dirty white translucent grits, ranging in size up to 5mm. In addition, there are black organic inclusions in the fabric and, at the surfaces, elongated voids, between 5 and 10mm long, probably due to organic inclusions being burnt out of the fabric. Fine-grained matrix with occasional fine mica. The finish is difficult to distinguish because the vesicular state of the surfaces makes them more than usually rough and uneven. Underfired: oxidised, black core; orange-brown surfaces with sooty patches at rim and base. Potting quality: poor even for the erratic fabric group; very thick base and an unusually high organic content in the fabric. Condition: the size and number of voids are such that the fabric can scarcely hold together; as a result it has not been possible to restore the vessel and estimate how much is missing. Already in a broken state when buried.

R33 (FM/BK 7; Fig 76) Shapeless jar, chamfered rim 3El. Fabric group: Calcite. Heavily tempered with angular white translucent calcite and sub-rounded chalk gravel, ranging in size up to 5mm. Sandy matrix. Surface finish: smoothed inner, abraded and vesicular; masked and smoothed outer. Incompletely oxidised: grey core, variegated brown and grey surfaces, sooty patches inside and out. Potting quality: typical of the erratic rather than the calcite fabric groups. Condition complete and standing, rim chipped with abraded fracture edges.

R37 (FM/DQ 16; Fig 105) Jar, form unknown. Fabric group: Calcite. Heavily tempered with sharply angular white translucent grits, ranging in size to 2mm in length. Fine-grained matrix. Surface finish: both surfaces well smoothed, masking the temper. Uncertain firing: grey core, grey-brown surfaces with extensive grey and sooty patches inside and out.

Potting quality: typical of the calcite group. Condition: complete base and lower body circuit to about maximum girth. No matching rim sherds in the grave filling so probably incomplete when buried.

R39 (FM/CX 12; Fig 105) Shouldered jar, out-turned rim 4G3. Fabric group: Mixed Erratic, arenite and dolerite. Sparse to medium density irregular, sub-angular, mottled dark grey and sub-rounded brown temper ranging in size to 5mm in length. Fine-grained matrix. Both surfaces rough and unfinished. Incompletely oxidised: grey core, brown lower surfaces shading to buff at the rim, extensive dark grey patches. Potting quality: more than usually ineptly shaped and finished, with very uneven wall-thickness even for the erratic fabric group. Condition: broken when found, with the sherds in two groups. They can be restored into an incomplete circuit from base to rim. The vessel was already incomplete when broken in the grave during burial.

R46 (FB/AX 19; Fig 105) Shapeless jar, pinched rim 3D2; so underfired that shape badly distorted during burial. Fabric group: Erratic, pyroxene syenite. Heavily tempered with angular grits, brown, with a marked metallic sheen, ranging in size to 4mm. Fine-grained matrix. Surface finish: abraded inner, particularly at the base; masked outer. Markedly underfired: incompletely fumed, black core, inner surface brown at the base shading to grey at the rim, outer surface mainly dark grey with weakly oxidised brown and also sooty patches. Potting quality: typical of the erratic fabric group. Condition: full base to rim circuit restored, except for some missing rim sherds, probably lost because of the friable state of the fabric. The vessel was probably complete at the time of burial.

R71 (FG/AL 6; Fig 106) Shapeless jar, chamfered rim 3E2. Fabric group: Erratic, myrmekitic granite. Sparse to medium density irregular, sub-angular white translucent grits, ranging in size up to 3mm. Fine-grained matrix with mica platelets up to 1mm. Surface finish: both surfaces rough and unfinished with visible temper. Oxidised, grey core, yellow-buff surfaces, with large sooty patches. Fired to a higher temperature than usual. Potting quality: typical of the erratic fabric group. Condition: complete restored, except for a small rim sherd with abraded fracture edges; probably in this state at the time of burial.

R82 (FG/DD 22 + sherd FG/DF; Fig 107) Large jar, form unknown. Fabric group: Erratic, arenite. Medium density, sharply angular pale red-brown and whitish translucent temper, generally ranging in size up to 5mm, with occasional grits up to 10mm. Fine-grained, smooth matrix. Surface finish: abraded, with elongated voids probably caused by chopped organic matter and protruding temper; traces of vertical combing or brushing on exterior. Oxidised, black core, orange-brown surfaces, with grey and black patches. Fired to a higher temperature and more successfully oxidised than usual for the erratic fabric group. Potting quality: much larger and thinner-walled than usual for the erratic fabric group; otherwise typical. Condition: broken when discovered in the grave; complete base and lower body circuit can be restored, but there are no sherds from the upper body or rim, so the vessel was incomplete when buried. It had fractured along a luting line.

R83 (FG/BS 12; Fig 107) Conical jar, chamfered rim 1E1. Fabric group: Calcite. In the hand specimen the fabric is heavily tempered with translucent white sub-angular grits, ranging in size up to 5mm. Fine-grained matrix. Surface finish: smoothed inner, temper not masked; masked outer. Incompletely fumed black ware, with occasional orange brown patches. Potting quality: typical of the erratic fabric group. Condition: complete and standing. There is one long opened crack, one large and one small rim sherd missing, all with abraded fracture edges; probably in this state at the time of burial.

R84 (FG/BP 15; Fig 108) Jar, form unknown. Fabric group: Calcite. Heavily tempered with angular, translucent white grits, ranging in size up to 2mm, with occasional larger grits. Fine-grained matrix. Surface finish: both surfaces abraded and vesicular, traces of vertical smoothing. Weakly oxidised, black core and inner surface, heavily sooted, orange-brown outer surface with extensive grey and sooty patches. Potting quality: typical of the calcite fabric group. Condition: complete base and lower body circuit restored. No joining rim sherds in the grave filling therefore incomplete when buried.

R91 (FG/CH 19; Fig 109) Shapeless jar, form unknown. Fabric group: Erratic, basalt. Medium density, sub-angular, mottled dark grey and black temper, ranging in size between 2 and 10mm. Sandy textured matrix. Surface finish: smoothed inner, temper visible; masked outer, with deliberate vertical smearing. Oxidised, black core, buff inner surface, variegated red-brown and buff outer surface, with extensive sooty patches. Potting quality: typical of erratic fabric group. Condition: complete base and lower body circuit surviving to about the maximum girth, fractured along the luting line. No joining rim sherds in the grave filling, therefore incomplete when buried.

R106 (FB/BG 116; Fig 109) Shouldered jar, chamfered rim 4D4. Fabric group: pot restored therefore fabric inaccessible. Sandy matrix. Surface finish: masked and smoothed inner except for base; masked and smoothed outer, matt finish except for sooty patches at base which are glossy. Brown rim and upper body, sooty black base and lower body. Potting quality: more typical of the erratic than the calcite fabric group. Condition: complete circuit but for small rim sherd.

R118a (FN/BG 9a; Fig 77) Jar, form unknown. Fabric group: Erratic. Sparsely tempered with irregular, sub-angular and angular, mottled dirty white and dark grey basalt temper, generally ranging in size between 4 and 10mm. Also very occasional chalk

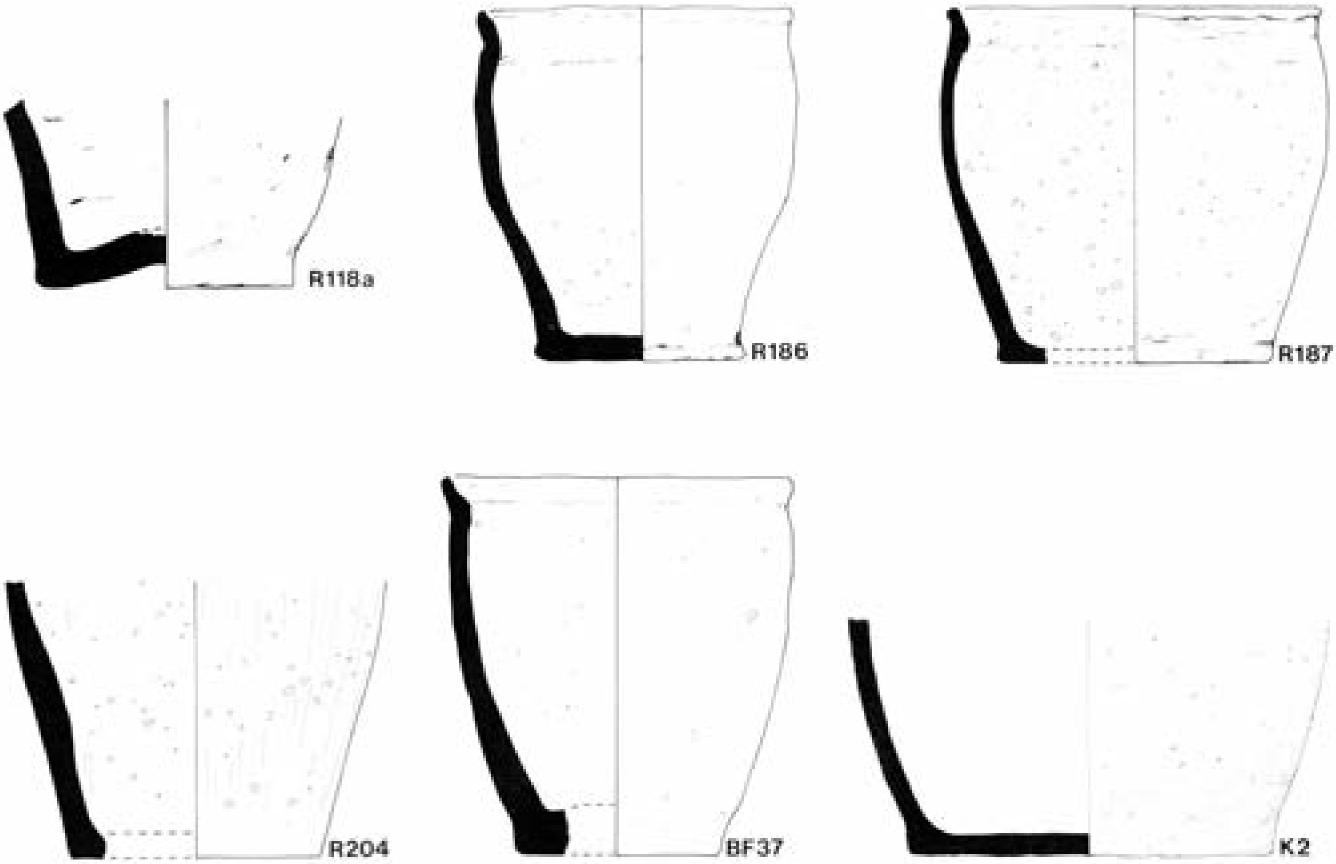

Fig 77 Rudston, Burton Fleming, and Kirkburn: pots in graves, not associated with other grave-goods (1:3)

inclusions. Fine-grained, smooth matrix with occasional fine mica. Surface finish: inner abraded and coated in PVA, retaining traces of the vertical pleating used to shape the base; masked outer surface. Underfired, weakly oxidised, black core, patchy brown surfaces with grey and sooty patches. Potting quality: wall thickness greater and more uneven than is typical of the erratic fabric group. Condition: complete base and lower body circuit restored. No joining sherds found in the grave filling. Vessel in this incomplete state at the time of burial.

R143 (FA/CR 34; Fig 110) Necked bowl with footring base 4F5. Fabric group: Erratic, basalt. Sparse–medium frequency with angular mottled white and grey inclusions, generally less than 2mm, which suggests deliberate crushing and sorting. Fine-grained matrix. Surface finish: both surfaces treated to mask the temper; inner smoothed; outer burnished, horizontal facets on rim and shoulder, vertical facets on lower body; a burnished fine ware. Uncertain firing: black core and inner surface, brown exterior, with extensive sooty patches, inside and out. Possibly an attempt to produce fumed black burnished ware. Potting quality: a burnished fineware. Considerably more time and effort expended on shaping and finishing than is typical of the erratic fabric group and with a more deliberately glossy finish than the calcite fabric group. Condition: in a fragmented state in the grave; complete base and lower body circuit restored, but two large rim sherds were not found in the grave. The pot had been broken elsewhere before being placed in the grave.

R178 (FA/BJ 17; Fig 113) Shapeless jar, pinched rim 3D1. Fabric group: Calcite. Sparsely tempered with white translucent angular slivers, generally ranging in size up to 2mm, occasionally larger. Fine-grained matrix. Surface finish: well smoothed inner, with patches of fine voids; masked outer. Partly oxidised: dark grey core and inner surface, naturally oxidised brown exterior with sooty patch extending from rim to maximum girth. Potting quality: shape rather asymmetrical, but wall thickness and finish typical of the calcite fabric group. Condition: complete base and body circuit restored.

R180 (FA/AR 10; Fig 115) Shapeless jar, chamfered rim 3E2. Fabric group: Mixed Erratic, olivine basalt and plagioclase-phyric lava. Medium density temper, irregular, sub-angular dark grey and brown inclusions, mainly greater than 2mm in length. An usually high proportion of coarse temper gives the fabric the appearance of being heavily tempered. Fine-grained matrix. Surface finish: unfinished inner, temper visible; masked outer. Partly oxidised: grey core, buff surfaces with extensive sooty patches on exterior. Potting quality: below the typical standard of shaping and finishing in the erratic fabric group. Condition: complete circuit, chips with abraded fracture edges missing from the rim; in this state at the time of burial.

R186 (FA/AB 1; Fig 77) Shapeless jar, pinched rim 3D2. Fabric group: Calcite. Medium density angular white temper, generally ranging up to 3mm in length. Fine-grained matrix. Surface finish: both treated to mask the temper; smoothed inner, rough matt outer surface. Underfired: incompletely fumed ware, black core, dark grey-black surfaces with partially oxidised brown and also sooty patches. Potting quality: thin walled and well finished but so poorly fired that the effects of ground water and soil compaction distorted the shape. Condition: complete base, but only about three-quarters of the body and rim circuit survive. Given the extremely friable state of the fabric, the missing sherds could simply have disintegrated.

R187 (FA/AD 2; Fig 77) Cylindrical jar, chamfered rim 3E2. Fabric group: Calcite. Heavily tempered with sub-angular transculent white grits, ranging in size up to 3mm. Fine-grained matrix. Surface finish: smoothed inner; unfinished outer, with vesicular areas on exterior. Uncertain firing: grey core, grey and brown variegated surfaces with extensive sooty patches. Potting quality: typical of the calcite fabric group. Rim formed by folding over lip edge and luting it onto the inner surface. Condition: fragmented. About half of body and rim circuit restored, no base sherds present. Clearly broken elsewhere before some sherds were placed in the grave.

R204 (FH/AZ+BA 6; Fig 77) Jar, form unknown. Fabric group: Calcite. Heavily tempered with crushed angular slivers of calcite, ranging in size up to 2mm in length and rather coarser, rounded chalk gravel. Fine-grained matrix. Inner surface badly eroded and vesicular; outer surface worn, with only traces of vertical wiping or brushing surviving. Underfired: oxidised, grey core, orange-brown surfaces, with grey patches. Potting quality: more typical of the erratic than the calcite fabric group. Condition: 20+ sherds found in two groups, at head and feet of skeleton. Both groups belong to the same area of the lower body of the pot, although they do not join. The vessel had been broken elsewhere and only token sherds placed in the grave.

BF4 (FR/CR 18; Fig 115) Jar, form unknown. Fabric group: Erratic. In the hand specimen, sparse to medium density tempering, irregular, angular dirty white and dark grey mottled grits, generally ranging between 3 and 6mm; also occasional chalk inclusions. Fine-grained matrix. Surface finish: inner surface badly eroded and pitted with large voids; outer surface masked. Underfired: incompletely fumed black ware, weakly oxidised inner surface with sooty patches. Potting quality: typical of the erratic fabric group. Condition: complete base and lower body circuit restored, surviving to less than half of the projected original height of the vessel. The fabric is extremely friable and laminated but this scarcely accounts for all the missing sherds.

BF6 (FR/CE 17; Fig 116) Barrel shaped jar 1AC. Fabric group: Calcite. Medium density tempering, angular grits, ranging in size up to 3mm. Fine-grained matrix. Surface finish: unfinished inner; masked outer, with traces of vertical faceting; vesicular patches. Oxidised, grey core, buff surfaces, with extensive grey and sooty patches outside. Potting quality: rather thick-walled and poorly finished for the calcite fabric group, yet still better finished than the erratic fabric group. Condition: complete circuit, with chipped rim. Probably in this state when placed in the grave.

BF18 (FR/AP 5; Fig 118) Jar, form unknown. Fabric group: Erratic, granite. Sparsely tempered with irregular, angular greyish-pink translucent grits, generally ranging in size up to 4mm; also organic matter. Fine-grained, smooth matrix. Surface finish: roughly smoothed inner, temper visible; masked outer. Underfired: partly oxidised, grey core, light brown inner surface, variegated grey and brown outer, with sooty patches. Potting quality: typical of the erratic fabric group. Condition: less than half base and lower body circuit restored. Initially it had fractured along a luting line. Only part of the base was placed with the burial.

BF19 (FR/AW 4) Form unknown. Fabric group: Erratic. Sparse irregular, angular dirty white and grey mottled basalt grits, ranging in size up to 5mm. Fine-grained, smooth matrix. Abraded surfaces. Underfired: fumed, brown core, dark grey-black surfaces. Potting quality: thinner walled and possibly also better shaped and finished than is typical of the erratic fabric group. Condition: two fragmented body sherds only; no rim or base sherds. The sherds had been carefully placed with the burial.

BF37 (FZ/CB 21; Fig 77) Shapeless jar, chamfered rim 3F1. Fabric group: Erratic, olivine basalt. Medium density tempering, sub-angular and cube-like fine-grained grey mottled fragments, ranging in size from 2 to 10mm, with a high proportion greater than 5mm. Also occasional rounded, dark grey glassy-like sintered grits, ?lava. Fine-grained matrix with fine mica. Surface finish: unfinished inner surface with finger impressions surviving around base and rim where shaping has occurred; masked outer. Poorly oxidised black core, dark brown inner surface, orange buff outer surface, with extensive sooty patches. Potting quality: very thick wall and poorly finished, below the average standard of the erratic fabric group. Condition: restored to about half body circuit, plus a spare sherd from the opposite side; no base sherds present. The vessel had been broken elsewhere and only some sherds recovered for burial.

Vessels found in ditches

Ditch of R4 (FE/CM 4; Fig 78) Jar, form unknown. Fabric group: Erratic. In the hand specimen, medium to heavily tempered with irregular, sub-angular mottled dirty white and dark grey basalt and dark grey dolerite lumps, ranging in size up to 5mm, occasionally 10mm. Fine-grained matrix, sparse fine mica. Abraded surfaces, temper protrudes. Partly oxidised, black core, brown surfaces with grey and sooty

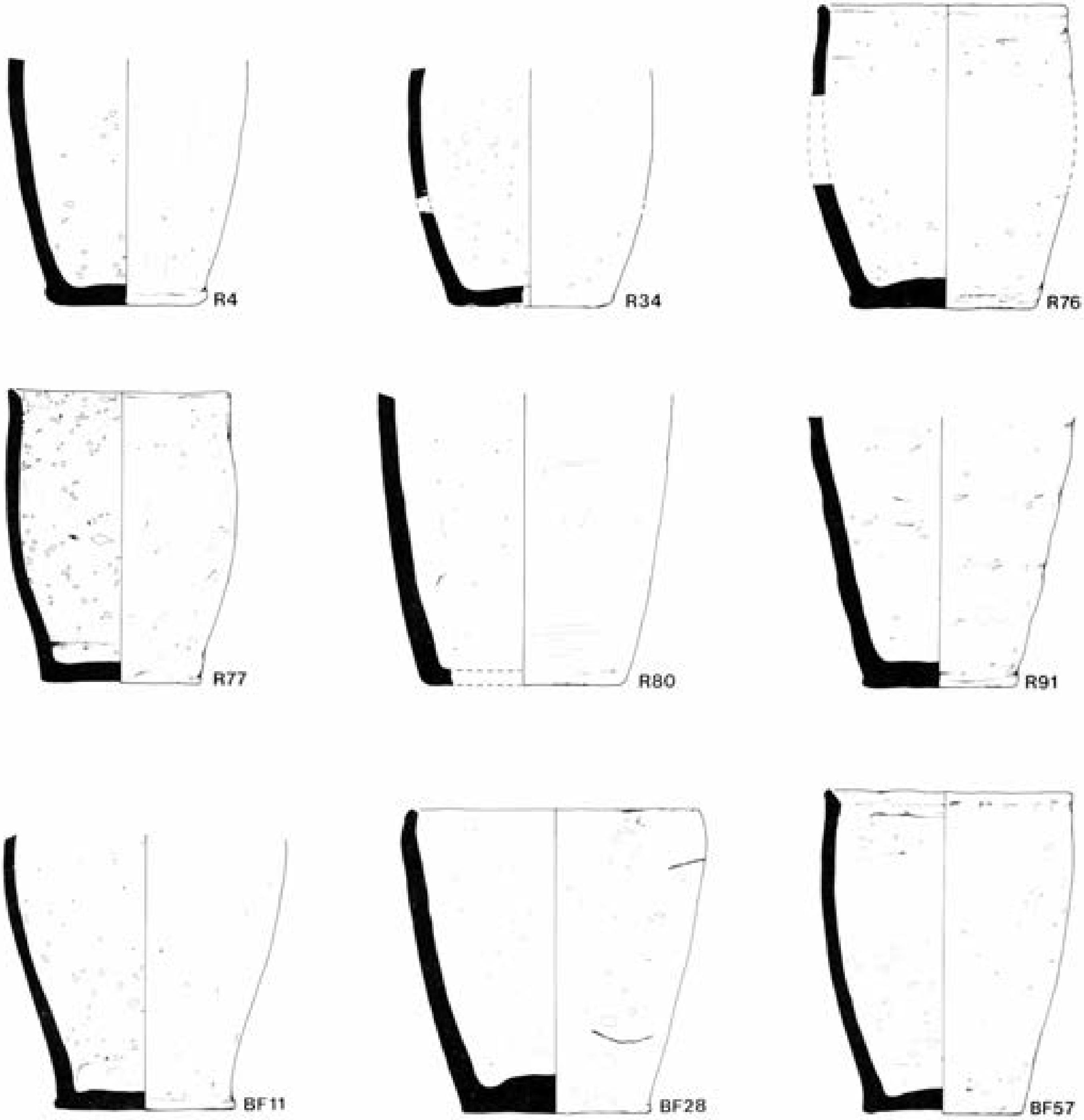

Fig 78 Rudston and Burton Fleming: pots in ditches (1:3)

patches. Potting quality: typical of the erratic fabric group. Condition: 20+ small sherds from base and body, no rim sherds identified.

Ditches of R34 (FM/FJ 10; Fig 78) Jar, form unknown. Fabric group: Calcite. Heavily tempered with sharply angular white transculent grits, ranging in size up to 2mm; standardisation of temper size suggests that it has been sorted. Fine-grained matrix. Abraded surfaces, no finish surviving. Oxidised: pink core, buff surfaces with extensive sooty patches inside and out. Potting quality: comparatively thin-walled for the calcite fabric group, otherwise typical. Condition: 20+ small sherds from base and lower body. Found in three groups in south, east, and west ditches. Probably comprises three larger sherds which were fragmented after deposition. All three groups are definitely from the same vessel, although they do not actually join.

North ditch of R76 (FG/CP+CQ; Fig 78) Barrel-shaped, rimless jar 3A2. Fabric group: Mixed Erratic, dolerite and quartzite. Heavily tempered with irregular, sub-angular dark grey mottled and translucent white grits, generally less than 4mm in length, with occasional grits up to 10mm. Sandy matrix. Surface finish: inner surface abraded and vesicular; masked outer. Weakly oxidised: black core, brown surfaces with extensive grey and sooty patches. Potting quality: typical of the erratic fabric group. Condition: found in two groups in the north ditch, sherds from a complete base circuit at east end, rim at west end.

Ditch of R77 (FG/CG+CN 5; Fig 78) Shapeless jar, chamfered rim 3E1. Fabric group: Calcite. Heavily tempered with angular calcite and rounded chalk gravel, ranging in size up to 3mm, and probably sorted. Fine-grained matrix. Surface finish: smoothed inner; masked outer. Incompletely fumed, black ware, with weakly oxidised brown and also sooty patches on outer surface. Potting quality: typical of the calcite fabric group. Condition: complete base and lower body circuit restored, about half of the rim circuit missing.

North ditch of R80 (FG/DA 13; Fig 78) Shapeless jar, form unknown. Fabric group: Mixed Erratic, arenite, basalt, and plutonic. Heavily tempered, with translucent white, dirty white, and dark grey mottled, and translucent brown grits, ranging in size up to 2mm, occasionally coarser. Coarse-grained, sandy matrix with sparse mica platelets up to 1mm in length. Surface finish: abraded, with abraded vesicular areas on the inside. Fired to a higher temperature than usual; partly oxidised, black core, orange-brown inner surface, brown outer surface, with sooty patches inside and out. Potting quality: typical of the erratic fabric group. Condition: about half of the lower body circuit restored; no base or rim sherds identified.

Ditch of R91 (FG/DP 19; Fig 78) Jar, form unknown. Fabric group: Erratic. Heavily tempered, with irregular, sub-angular dirty white and dark grey mottled basalt and occasional brown grits, ranging in size between 2 and 4mm. Fine-grained matrix. Surface finish: roughly wiped inner; masked outer. Partly oxidised: black core, orange-buff surfaces with large grey patches at the maximum girth. Potting quality: typical of the erratic fabric group. Horizontal luting lines visible as broad, shallow, and uneven grooves on the inside. Condition: about half base and lower body circuit restored; fractured along a luting line.

North ditch of BF11 (FR/CJ+CV 12; Fig 78) Jar, form unknown. Fabric group: Calcite. Heavily tempered with angular translucent white grits, ranging in size up to 2mm. Fine-grained matrix. Surface finish: masked and smoothed. Oxidised: grey core, yellow-buff surfaces, with grey and sooty patches, particularly outside. Potting quality: typical of the calcite fabric group. Condition: about half of the base and lower body circuit restored to above the maximum girth. Some sherds badly leached and vesicular, others scarcely affected.

Ditch of BF28/29 (FZ/DZ 19; Fig 78) Conical rimless jar 1A2. Fabric group: Mixed Erratic, dolerite, arenite, and lamprophyre. Heavily tempered with angular mottled dark grey and brown inclusions, ranging in size up to 10mm. Fine-grained matrix. Surface finish: wiped inner; masked outer. Oxidised: grey core, buff surfaces, with grey and sooty patched outside. Potting quality: typical of the erratic fabric group. Condition: complete base circuit, but only a quarter upper body and rim circuit survives.

Ditch of BF57 (FZ/AB 5; Fig 78) Shapeless jar, chamfered lip 3B1. Fabric group: Mixed Erratic. In the hand specimen, medium density tempering, irregular, sub-angular and angular, dirty white and dark grey mottled basalt, dark grey dolerite, and white quarzite translucent inclusions, ranging in size up to 7mm, a high proportion coarse. Sandy matrix. Surface finish: roughly wiped inner; masked outer, with traces of vertical facets. Partly oxidised: grey core, orange-brown inner and brown outer surfaces, with sooty patches. Potting quality: typical of the erratic fabric group. Condition: complete base and lower body circuit, about half of the rim missing.

Burial K2 (KB/AL 2; Fig 77) Jar, form unknown. Fabric group: Mixed Erratic. In the hand specimen, sparsely tempered with sub-angular and angular transparent white quarzite and grey and black mottled basaltic fragments, ranging in size up to 3mm. Sandy matrix. Unfinished surfaces. Uneven firing: grey core; surfaces shade from well-oxidised orange to grey. Potting quality: thinner walled than is usual for the erratic fabric group, otherwise typical. Condition: complete base and lower body circuit, no upper body or rim sherds; badly fractured and disturbed by the plough, therefore not possible to estimate condition at time of burial.

5 The textiles

by Elisabeth Crowfoot

For the catalogue, see Table 8.

Burton Fleming and Rudston

In the textiles from the Iron Age burials the fibres have been mineralised and have therefore in most cases been completely replaced by the oxides from the rusting iron, leaving only a cast of their original form. A few degraded fibres still adhering unreplaced to a brooch (BF10) were identified by H M Appleyard as animal, and it is clear from their general appearance that most of the fabrics would have been of wool (SEM report, p 122). The condition of preservation varies. In many, though the spinning direction of the coarse threads is clear, the weave surface is damaged and has not been identifiable, but in one important fabric every detail of the yarns, weave, and decoration can be seen in the mineralisation (BF20, Fig 79).

The *spinning* is predominantly Z in warp and weft (22 examples) but 13 textiles are woven of yarns with mixed spinning, Z one system, S the other. It is impossible to tell in any of these cases which is warp and which weft; weave edges, in a form associated with starting or ending borders, are only present on textiles with Z-spun yarns. The yarns are coarse, and in some cases very uneven; in only one fabric does the thread count rise above 10 per 10mm in either system.

The identifiable *weaves* present are *tabby* (plain weaves in 8 graves, and *four-shed (2/2) twills*, probably 26 examples, 3 of which show reverses in one or both systems, ie chevron or broken diamond weaves; in only one of these is the whole pattern construction clear (BF20, Fig 79, A). Apart from the obvious attraction of the diagonal patterns, one reason for the popularity of twill in northern weaving is its superior warmth, particularly noticeable when one system is heavily preponderant, as in much of the weaving on the warp-weighted loom. The surface produced by using yarns with mixed spinning, Z/S or S/Z, in which all the fibres lie in the same direction when woven, is also said to be thorn-proof and rain-repellent. The position of these weaves, fastened by a single brooch lying in the upper chest area in graves of both men and women, suggests that all come from the outer garment, probably a heavy cloak, worn for burial as in life, the edges pinned together on the chest or shoulder.

Fragments of small borders in five graves are in *extended tabby*, single threads over a paired system. The type is clearly seen in BF19 (Fig 79, E), where the broken loops of a starting edge are visible, and the end of the six coarse border wefts are tied in a simple finger knot and cut short. On four other borders this knot is the clearest surviving evidence. In three (R40, R102, R199), the border wefts are probably plyed; other loose plyed threads (R34, R102, R213) suggest the warp ends left hanging as fringes after end borders.

A wider *border with stripes*, and more elaborate decoration in which some details must have been needle-inserted, is clearly preserved on the fragments of a long-bow brooch in BF20 (Figs 79, A–C, and 80). The main weave of the cloak is a broken diamond twill woven of yarns with mixed spinning; these are noticeably uneven, particularly the S system, which suggests this must have been the weft. The best fragment (a) shows the broken edge of a stripe, 11 throws surviving, of fine hard-spun wool easily distinguished from that of the twill, in tabby repp, where the weft is closely packed to hide the paired threads of the warp. After an area of the main twill weave, *c* 11mm wide (10 throws), follows a second stripe, this one complete, 18 threads wide, with a pattern of narrow lines indicated by changes in the spinning direction, 4S, 4Z, 2S, 4Z, 4S. From what remains of the broken edge stripe (4S, 4Z, 2S, 1Z), this would have been completed in the same order – only the last seven threads and the closed loops of the weave border are missing. At intervals between the two stripes, S and Z threads of similar quality yarn are darned across the twill area, the spinning again following the same five pattern lines. It is clear that these threads were not inserted during the weaving, but added later by needle. The back of part of this area can be seen on (a) and another small piece (m), and the distinctive yarn of the cross-stripe only occasionally comes through to the back of the twill, while in two places little lumps of yarn show where the embroidery thread returns after being run a short way into the stripe above. Though the width of the inserted areas is narrower than the exposed areas of twill between them, the effect, if continued throughout, would have given something like a chequered border (Fig 79, C). Below the second stripe on piece (a), traces indicating the start of another group of inserted threads suggest the border was probably wider, with at least one other repeat of the chequered band and a third repp stripe. Allowing for the shrinkage that takes place during mineralisation, the border would then have been 50mm wide.

The brooch is broken into 13 fragments, all of which show textile, twisted and folded as caught by the pinning. One piece (i) shows only a scrap of twill; the other 12 all have remains of the border stripes, three (j, k, m) beside the main piece (a) showing also parts of the inserted patches. On seven of these fragments the S-spun threads of the twill are the paired system of the stripes, on the other five the Z-spun threads, indicating that the stripes ran in both warp and weft direction, and the borders pinned by the brooch came from two adjoining edges on a cloak decorated either on two adjoining or on all four sides (Wild and Bender-Jørgensen 1988, fig 5).

In the textiles from the extended burials, all prob-

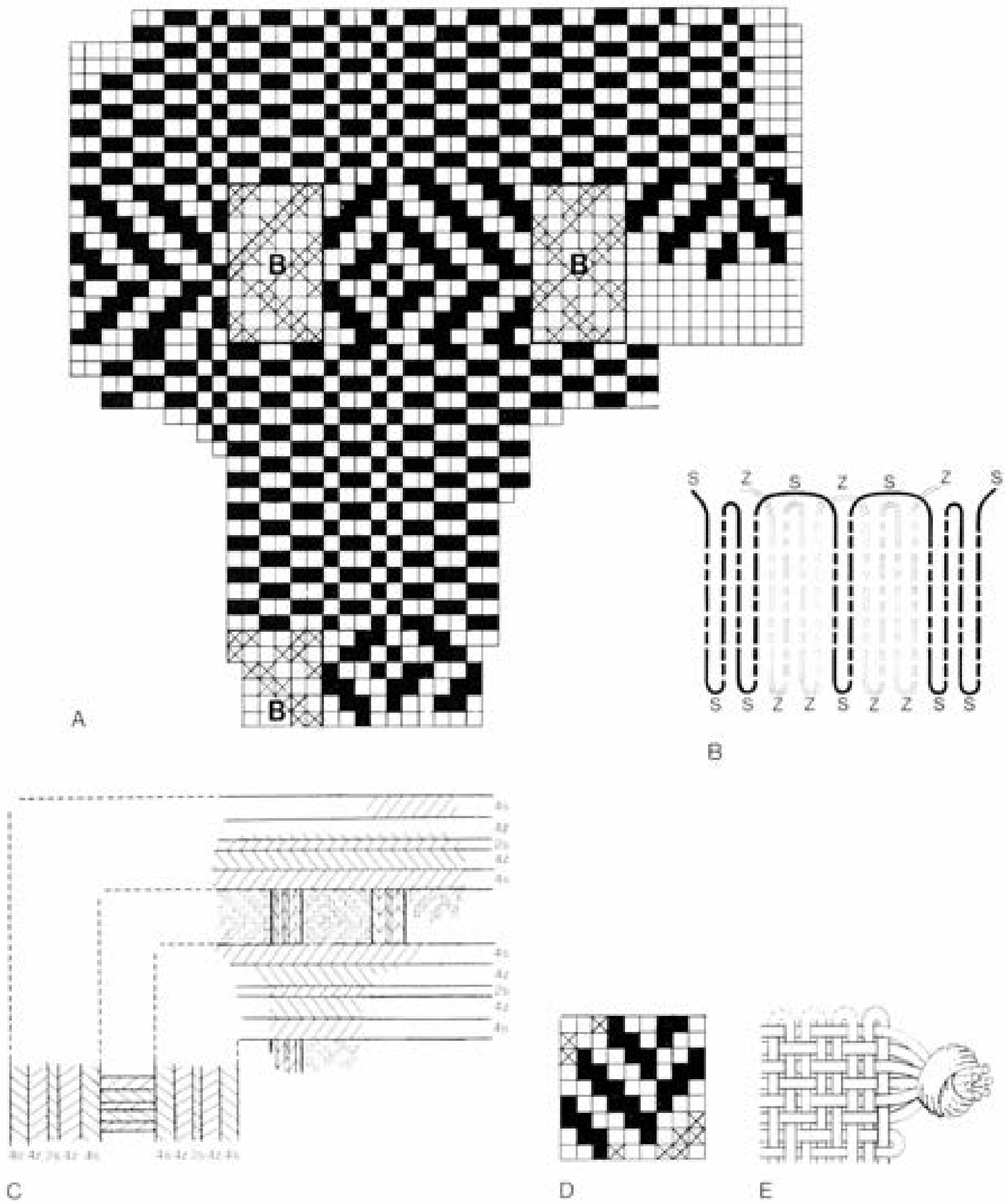

Fig 79 Diagrams illustrating replaced textiles from Burton Fleming: A, BF20, border on diamond twill, with embroidered inserts (B); B, BF20, passage of sewing threads in inserts; C, BF20, conjectural plan of borders; D, BF15, twill with reverse; E, BF19, starting border with knotted wefts

ably male (R24, R153, R154, R174, R175), only tabby weaves can be identified. Only one (R175) is on a brooch; other objects, a sword, dagger, and tongs, may have been separately wrapped.

Contemporary English textile material from the burial site of Wetwang Slack has the same general characteristics; the textiles are all mineralised, spinning is mainly Z with only two possible instances of S-spun threads, weave surfaces poor, but twills identifiable. In the more recently excavated cart-burials from the same site there are more mixed spinning, more tabby weaves, and finer textiles. Preservation here however is mainly on bronze, and, apart from the obvious status of those buried, the difference in quality may be partly due to fibre – flax seems to survive longer in contact with bronze, and finer flax fabrics at Burton Fleming and Rudston may have completely disappeared.

This higher proportion of tabby weaves is seen also in the early La Tène textile material from the

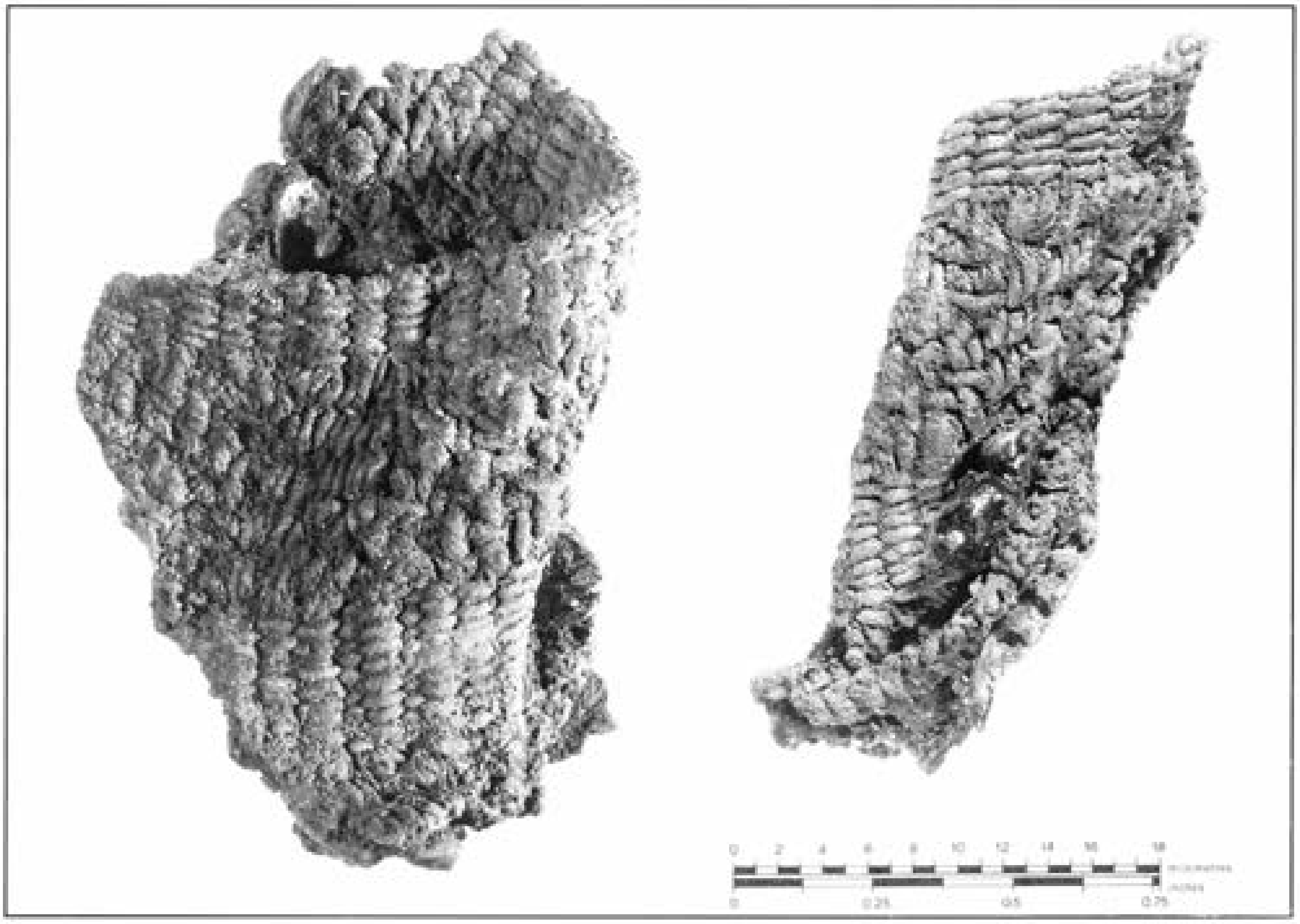

Fig 80 Replaced textile from Burton Fleming, BF20 (photos: Ancient Monuments Laboratory)

Dürrnberg – 25 tabbies, most of which were of flax, and only 4 twills; again all are Z-spun, except for one wool twill with yarns with mixed spinning (Hundt 1974, 135–40).

All the weaving techniques in the Burton Fleming and Rudston remains have a long and wide distribution in Europe. A woollen broken diamond twill, again from the Dürrnberg, is dated to the late Hallstatt period (ibid, 135), and the earliest examples from the north, the cloak from Gerumsberg in Sweden (Hoffmann 1964, 191–3) and a bog-find from Karlby in Denmark (Hald 1980, 45–7, 153), are regarded as possibly Late Bronze Age to Early Iron Age; both show the Bronze Age preference for S and S-ply thread. The origin of the change to mixed spinning in yarns for northern twills has recently been discussed, with particular reference to those of the Roman period distinguished by Bender-Jørgensen as the 'Virring type' (Wild and Bender-Jørgensen 1988, 66–71, 81–8), but although the broken diamond of BF20 is a variety of the pattern favoured in the northern Roman provinces (Wild 1977, nos 29, 30, 32, 35, 37, 38, 40), its very different quality, with uneven spinning and lower thread count, suggests local production rather than imports. The narrow starting border (Fig 79, E) appears in the north in the blankets of the Danish Bronze Age (Broholm and Hald 1940, 37–8), and again further south among the richly varied textiles of the Hallstatt culture (Hundt 1970, figs 5, 7), whose repp stripes are a decorative feature well before some on north European twill weaves of the first century AD (Hald 1980, 83, 85; Ullemeyer and Tidow 1973, 87–90) and those found on garments in all areas of Roman occupation (Wild 1970a, 54, 90–1, 105).

Most of these repp bands were probably simple colour contrasts. Particularly in the north, there are other weaves where patterns visible to the eye and in photography seem to be produced entirely by change of spin direction in groups of threads; as no change of colour is visible, or found in dye-testing, these are often described as 'spin-patterns' (Bender-Jørgensen 1986, 155–60), though the question of possible fugitive dyes has been raised (Hundt 1972, 104; 1973, 299). But the bands of the Burton Fleming border cannot come into this category. The quick changes of spinning direction do not catch the eye, and it seems obvious that here the S and Z yarns must have been of two very distinct colours to make the considerable care taken in their repetition worthwhile. The border is indeed a unique production. It is not an example of highly skilled weaving in the class of the elaborately patterned and fringed cloak borders on the 'Prachtmantels' of later periods from Scandinavia and north Germany (Wild and Bender-Jørgensen 1988, 72–3, 82–4), but the labour of supplementing the weave with the simple stitching of the cross-stripes, though rather unevenly carried out, makes it one of the earliest attempts at domestic embroidery from an English site.

Fleur Shearman reports: 'A small sample of thread from fragment (c), BF20, a patch of extended tabby weave from the border of the cloak, was examined using the Scanning Electron Microscope. Scale casts from woollen fibres were clearly present. However, vegetable fibres of a bast type (flax or hemp) were also noted. Further examination was necessary to give information on whether these fibres were part of the weave of the cloak, or intrusive fibres, perhaps from a linen undergarment, or incidental plant debris from the burial. A further thread from both warp and weft of fragment (c) showed wool to be present in both systems.'

Note (EC) In sample (c) the 'warp' is from the main weave, the 'weft' the border. The appearance of the border threads, those in the woven stripe and those in the inserted cross-strip, is identical, whether the spinning is Z or S, and it is clear that the vegetable fibres, as suggested, must be intrusive.

Kirkburn (Burial K5)

When the chain-mail shirt was removed, on the underside of the metal where it had been in contact with the man's body large areas indicating mineralisation of textile in varying stages of deterioration could be seen. In many places this was simply a red-brown deposit on the metal rings, in others a thicker layer in which remains of threads and spinning direction were visible, while in some clearer patches the weave structure could also be identified.

In these areas, where fibres were clearly mineralised, two weaves could be distinguished, both identified (SEM) as of wool – (A) a medium-grade twill with yarns with mixed spinning (Z/S or S/Z), from its appearance a good quality worsted, and (B) a coarser twill with softer threads Z-spun in both systems. In all the clear areas (A) lay under (B) next to the metal. Weave (B) was therefore the fabric nearest to the body.

The areas of preserved textile are indicated in Figure 81, showing the reverse side of the mail when lifted. The best preservation is in *CA 1*, on the left shoulder tab (lying over the man's bent legs), an area *c* 110×150mm, with weave (A) clearest in patches *c* 25×10 and 18×10mm; again on the right shoulder tab, less clear but still identifiable by the spinning, areas *c* 50×50 and 65×40mm; and on the studs from both tabs (LS, RS), and the breast fastener (KRDC), *c* 13×13mm. Weave (B) is clearly present in small fragments overlying the edges. Areas below the tabs in *CA 1* are again mainly of weave (A).

CA 2 shows a scatter over an area 90mm wide along the right edge of the mail; the recognisable weave is mainly (B), but there are patches of (A). On *CA 3* for a depth of *c* 150mm from the edge for 450mm to the end of the skirt, the weave is almost entirely (B). On *CA 4* mineralised textile for *c* 260×110mm round the ribs and arm bones, and along the edge beyond the vertebrae for *c* 100×180mm, appears to be mainly (B) with one tiny clear patch of (A), 13×12mm, showing through.

These textiles suggest that the man was fully clothed or covered in two layers of fabric – weave (B) against the body, probably a tunic or gown, reaching to or below his knees and round them as he lay, with weave (A) perhaps an outer tunic or cloak. In the burials from Burton Fleming and Wetwang Slack brooches indicate that the upper garment – certainly in BF20 a rectangular cloak – was fastened as in life on chest or shoulder, but at Kirkburn there is no trace of a brooch. It is possible that the cloak was not worn, but spread over the body; perhaps, from its absence on the upper part, slipping down to lie mainly across the lower body and legs.

It has been suggested that the heavy presence of textile on the shoulder tabs may indicate that these were lined, a sensible precaution where pressure on the shoulder would occur, though from the folded mail at the left side, where both broken edges are visible with no trace of textile between, it is clear the shirt was not lined throughout.

The weaves in this grave are very similar to those at Burton Fleming, though both are finer than any preserved there, with the exception of the broken diamond twill with yarns of mixed spinning of the cloak in BF20; the occasional unevenness of the S-spun thread of (A) is very slight, compared with that of the BF20 S system, and the general quality of thread is nearer to that used in the pattern stripes of the cloak border. As far as can be seen both (A) and (B) were simple four-shed diagonal twill constructions; in the largest area of (A) the lines are confused, but this seems to be due to broken threads and the distortion of the weave where it has subsided round the leg bones, and there are no clear reverses to indicate a broken diamond or herringbone pattern.

Kirkburn textiles

A Wool (SEM and H M Appleyard)

Spinning: Z one system, S the other, no selvedge preserved; both threads with sharp profile and tight spin, suggesting a combed wool, ie worsted.

Weave: 2/2 diagonal twill, count *c* 12–14(Z)/9–10(S) threads per 10mm, weave now damaged and loose.

The S-spun thread is in places slightly coarser and less even than the Z-spun.

B Wool (SEM)

Spinning: medium, Z in both systems, soft surface, no selvedge.

Weave: 2/2 diagonal twill, thread counts variable, 9/10 to 7/8 in different areas.

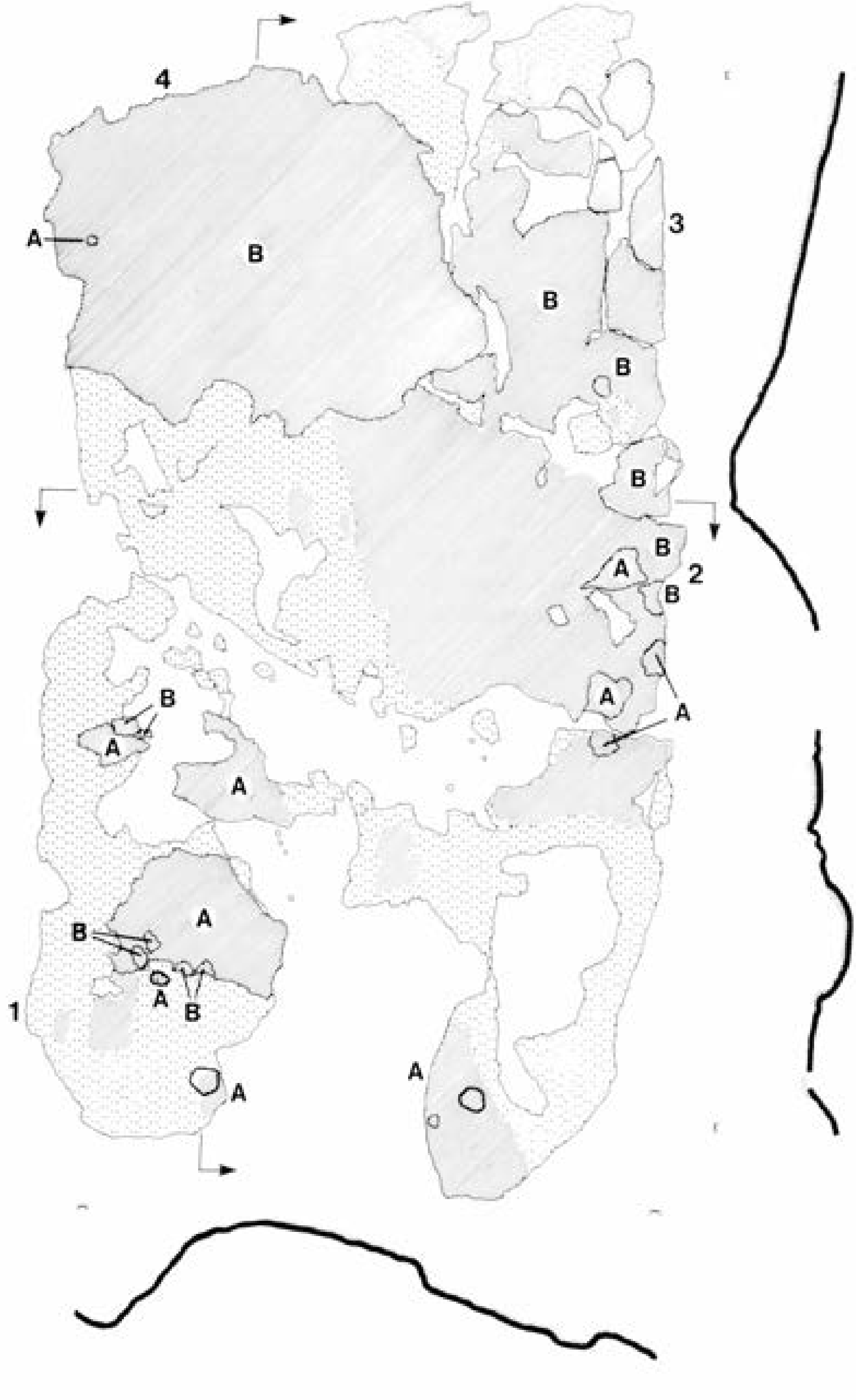

Fig 81 Textiles, Kirkburn K5: plan of the mail (stippled), showing the distribution of mineralised textiles (hatched); A and B show where specific textiles have been identified: A is the finer and nearer to the mail; B is the coarser and nearer to the skeleton; note that this is the front of the mail (the underside, as excavated); the back of the mail (the upper side, as excavated) is shown in Fig 127

Table 8 Textile catalogue

Burial	*Object*	*Measurement*	*Spin*	*Weave*	*Thread count*	*Thread diam*	*Borders*	*Comments*
R2	Brooch C2	L *c* 30	?Z/S	-	*c* 6 ?	-	-	traces all over, clear threads on pin
R7	Brooch H1	*c* 15×10	Z/Z	-	5/?	-	-	deteriorated
R13	Brooch F6	20×15	Z/S	2/2 twill	4–5/5	1–1.5	-	clear patch, open weave
R22	Brooch E1	-	Z/?	-	-	-	-	threads; grass impressions
R24	Sword Ba1	*c*40×25(a)	Z/S	tabby	6/4–5	1.5–2	-	below hilt, coarse fibres, loose soft weave
		L over *c* 180(b)	-	(leather)	-	-	-	under (a), patches with imprint of (a)
R27	Brooch E2	45×25	Z/S	tabby	5/3	1–1.5	-	Z spin tight; double fold, deteriorated
R34	Brooch C22	L *c* 6–7	Z/?	-	-	-	?fringe end	threads, lying side by side
R35	Brooch F1	-	Z/?	-	-	-	?border, end or starting	?knot, cut end cf BF19
R36	Brooch D1	*c* 80×40	Z/Z	2/2 chevron or broken diamond twill	5/5	1.3–1.5	-	both sides, round edges, in folds
R37	BroochG3	15×7	S,Zply	threads	-	-	-	and area ?leather
R38	Pin2	*c* 20×7	ZZ	tabby	est.3/4	-	-	on ring of pin
R39	Brooch A4	L*c* 10	Z/Z	?twill	-	-	-	and some Z-ply threads?
	Pin 4	-	Z	?	-	-	-	threads wound round, possibly from weave
R40	Brooch G4	25×15	Z/Z	2/2 twill	*c* 7/6	*c* 1	?border	even weave; knot, cf BF19
			?Zply				-	finer threads, ?wefts of border
R46	Brooch D2	*c* 10×10	Z/Z	?twill	*c* 5/4	-	-	traces much of surface
R60	Brooch E3	25×12, 30×12	Z/S	2/2 twill	-	-	-	deteriorated surface
R69	Brooch D3	75×20	Z/S	?	-	-	-	weave damaged
R76	Brooch E5	*c* 30×10	Z/?S	?	3 on 5mm/?	*c* 1	-	threads lying parallel, ?cord
R77	Brooch H2	10×10	Z/Z	?tabby	5/5	-	-	centre thread paired, ?1 broken
R82	Brooch F8	13×8	Z/S	2/2 twill	*c*6/6 (3 on 5mm)	*c* 1/1.5	-	detached fragment; Z threads finer
R83	Brooch C3	*c* 35×15	Z/?S	?	-	-	-	surface deteriorated
R84	Brooch A2	20×20, 30×20	Z/?	?	-	-	-	surface deteriorated
R91	Brooch C4	35×25, 25×40	Z/?	?	-	-	-	deteriorated mass, some threads clear
R97	Brooch D4	-	Z/Z	?	-	*c* 1.3	border, end?	threads side by side, fringe or pile
R102	Brooch B1	*c* 20×25	Z/Z,S-ply	?tabby	4/2 (plyed)	*c* 1.2/ 2(plyed)	border, end?	plyed threads tangled
R106	Brooch D5	*c* 20×15(a)	-	(leather)	-	-	-	at one end
		(b)	Z/Z	?	6/6	-	-	scattered, damaged
R140	Brooch E6	*c* 10×12	Z/S	?	-	1.3	?end border	threads side by side ?border or pile
R143	Brooch G5	35×	Z/Z, S	2/2 twill	5–6/6	*c* 1.5	-	round curves; occasional thread one system S
R153	Dagger Bd2	-	Z/?	?	-	-	-	leather from sheath; hilt,traces weave
R154	Tongs	*c* 35×12, 30×7	Z/Z	tabby	5/3	1.3–1.5	-	rather open weave; ?warp yarn finer, harder
R174	Spearhead A20	-	-	-	-	-	-	?leather, probably bone
R175	Brooch K1	7×7	Z/S	tabby	*c* 6/8 (3/4 on 5mm)	*c* 1.5		patches, pinhead; under catch, ?leather
R178	Brooch A3	17×20, 30×17	Z/Z	2/22 twill	*c* 5/6	*c* 1.5	-	areas round top surface, broken threads
R180	Brooch C5	75×17	Z/Z	2/2 twill	*c* 4–6/5–6	1.2–1.5	-	all over one side and round pin, damaged
R190	Brooch F2	15×13, 15×10	Z/S	2/2 twill	?/6	?1.75/ 1.5	-	loose, damaged; coarse Z threads round one loop
R194	Brooch F3	*c* 10×17	Z/Z	2/2 twill	7/4–5	*c* 0.8–1	-	all over curve, broken threads
R199	Brooch E7	20×11	Z/Z,Z-, S-ply	tabby	-	-	?starting border	edge thread ?plyed; damaged but like BI9 (Fig 79, E)
R201	Brooch J1	28×17	Z/Z	twill	-	-	-	deteriorated surface
R202	Brooch F4	*c* 10×10	Z/S	2/2twill	-	-	-	surface distorted, flattened

Table 8 contd

Burial	*Object*	*Measurement*	*Spin*	*Weave*	*Thread count*	*Thread diam*	*Borders*	*Comments*
R206	Brooch J2	-	Z/S	2/2 twill	4/4 on 5mm	-	-	all over fragments, one scrap on copper-alloy
BF1	Brooch C21	*c* 20×18	Z/S	2/2 twill	7/6	1.22/1.5	-	fold on head, double layer under pin
BF2	Brooch C6	13×20	Z/Z	2/2 twill	4/4 on 5mm	-	-	round pin deteriorated mass threads damaged
BF4	Brooch C17	20×15	Z/S	?	-		-	coarse, weave deteriorated
BF5	Brooch C7	L 20	Z/Z	2/2 twill	*c* 4/5	-	?fringe	round pin, mass parallel threads
BF6	Brooch C8	40×40 (a)	Z/S	?	-	-	-	on pin, deteriorated
		(b)	Z-ply	threads	-	-	-	lump under ?bone
BF7	Brooch C18	-	Z/Z	?	-	-	-	deteriorated, over all surface
BF9	Brooch C9	*c* 40×18	Z/Z	2/2 twill	4/4	-	-	patches all over
BF10	Brooch C1	15×15	Z/Z	?twill	6/5	1.0–1.2	-	a few degraded fibres round head
BF11	Brooch C19	-	Z/?	-	-	-	-	deteriorated mass
BF13	Brooch C10	*c* 15×15	Z/Z	2/2 twill	*c* 4/4 (2/2 on 5mm)	-	-	damaged. Z threads round pin
BF14	Brooch C11	35×30	Z/Z	2/2 twill	6/6	-	end or ?starting border	wefts ends tied knot, of BF19, Fig 79, D
BF15	Brooch C12	*c* 25×13	Z/Z	2/2 chevron or broken diamond	5/5	1.2,1.5	-	one reverse preserved Fig 79, E
BF18	Brooch C13	-	Z/Z	?	-	*c* 1.4	-	and traces leather?
BF19	Brooch C14	23×17	Z/Z	2/2 twill	5/5	*c* 1	end or starting border	(Fig 79,E) 6 weft border, only loops broken
BF20	BroochB2	*c* 45×26 60×35, 8×9, 24×18 17×15 15×9 22×15 18×8	S/Z Z,S	2/2 broken diamond twill tabby(repp) (over pairs)	9–10/9, 10–11/10 9–10/9 13–14 (on 5mm)	0.7–0.9 (Z) 1.0–1.3 (S) 0.5–0.6	- -	(Fig 79, A, B, C; Fig 80) twill ground weave, uneven, ?mistakes, two repp stripes, 7mm wide, spin 4S,4Z,2S,4Z, 4S; 1.1–1.4 twill clear between; embroidered cross-bars, spin as in stripes, intervals 13mm
BF41	Brooch E8	30×20	Z/Z	2/2 twill	*c* 6/?	*c* 1	-	one thread for 2.5 round end
BF53	Brooch C20	35×5	Z/?	?twill	-	*c* 1.75	-	threads weave, or wound round pin
BF56	Brooch A5	18×13	Z/S	2/2 twill	-	-		surface damaged, patches

Notes: Apart from BF10 (surviving animal fibres on a copper-alloy brooch), all the fibres are mineralised on iron artefacts; all measurements in mm

6 The human bones

by Sheelagh Stead

Introduction

There was an adult population of 246 skeletons upon which some assessment and record could be made, but only 11 below the age of 15: 170 from Rudston (152 from one cemetery and 18 from a separate group), 58 from Burton Fleming (in two groups), 10 from Garton Station, and 8 from Kirkburn. For statistical analysis they have been considered mainly as a single population. The condition of the skeletal material from the first two years' work failed to impress an overburdened British Museum (Natural History), so the writer undertook to supervise both the excavation of the skeletons and the production of the report. By providing continuity of care from the grave to the cradle of publication it was hoped to achieve a better result. Don Brothwell gave initial instruction and subsequent support throughout the project. He saw all the pathology, supervised X-raying, and provided comments that are included in this report. Janice Conheeny organised the storage of the bones, supervised the photography of the pathology, and assisted with X-raying; and Louise Jessup provided invaluable assistance in the field.

Condition

The gravels of the Gypsey Race valley had seriously eroded the bones throughout the Rudston and Burton Fleming cemeteries. The condition of the bone varied according to the ratio of gravel and earth present, with particularly poor preservation when earth was in direct contact with the bone. The Garton Station and Kirkburn bones were certainly better, but at Garton Station the burials in the bed of another intermittent stream had suffered in a different way, as water had deposited clay in the cavities of the bones. Skulls there were often filled with solid clay, and the rest of the skeleton was extracted only with great difficulty. The problem of lifting wet and frail bone was tackled by using Quentglaze (a plastic sealer produced by Quentsplass Ltd), which contains a solvent. Over-assiduous use could glue bones together, and after exposure to the air it was prone to solidify very quickly, but nevertheless Quentglaze proved extremely effective and allowed the lifting of skulls so thin that they were translucent. Apart from the teeth, the bones were usually brushed and scraped in the field rather than washed.

As a measure of condition the skeletons were given a working rating from A (all bones present and intact) to F (minimal bone surviving but sufficient to deduce a probable adult). None of these skeletons warranted an A category, and there were five graves in which no bones could be distinguished. Table 9 shows the overall condition of skeletons, excluding children.

The big difference between the percentages of skeletons in category B at Rudston and Burton Fleming on the one hand and Garton Station and Kirkburn on the other reflects the difference in soil conditions in the two valleys. When categories B and C are combined the contrast is even greater, with only 19% in the first area compared with 76% in the second. The greater the robustness of the original bone, the greater its survival rate, so male bones had survived better than female, and the bones of children were particularly vulnerable. Only at Kirkburn had infant bones survived, yet death in childbirth must have numbered among the female burials at Rudston and Burton Fleming.

Sex

Sexing was constrained by the poor condition of the bone. As so often it was the pubic bone that was adversely affected. There were only 38 pelvic girdles in reasonable condition and 26 others with some material from each of the three pelvic bones. Four categories are distinguished: male, female, contra sex and ?sex. Male and female were each divided into three degrees of certainty: definite (M, F), probable (Mp, Fp), and possible (?M, ?F). Contra sex was assigned to skeletons where male and female characteristics were present in equal balance. The question mark in the ?sex group is due almost entirely to condition, with 93% in the E and F categories. Another major obstacle to sexing was the gracile physique of many of the males. Many male skulls had smooth occipital bones and some had ambiguous frontal bone areas. There was a useful independent assessment of this evidence in an early season, when the writer was unable to work and Pat Smith took over and produced a report. Re-examination of that material, with the advantage of much more experience of the site, produced agreement about the sex of 11 out of 19 skeletons; 6 (all condition E) are studded with question-marks and disagreement, and there is one case of reverse discrimination over a skeleton in condition C. This result illustrates the

Table 9 Condition: Percentages of skeletons in categories B–F

	Rudston and Burton Fleming						*Garton Station and Kirkburn*			
Sex	M	F	C	?	*Total*	%	M	F	*Total*	%
B	7	3	1	0	11	5	3	3	6	35
C	23	7	3	0	33	14	4	3	7	41
D	41	46	7	4	98	42	1	0	1	6
E	13	38	6	27	74	31	0	2	2	12
F	3	4	0	12	19	8	0	1	1	6

Table 10 Distribution of sex and age (all sites)

	M	Mp	M?	*Total* M	F	Fp	F?	*Total* F	C	?*Sex*	*Total*
15–20	1	0	1	2	1	1	1	3	2	2	9
17–20	0	3	0	3	2	1	0	3	1	5	12
17–25	15	6	6	27	29	9	3	41	3	3	74
25–35	31	5	1	37	15	12	8	35	8	4	84
35–45	6	6	2	14	6	7	2	15	3	6	38
45+	9	1	0	10	3	3	1	7	0	2	19
25–45	0	1	1	2	0	0	3	3	0	5	10
Total	62	22	11	95	56	33	18	107	17	27	246

scepticism that should be applied to bone studies, and certainly emphasises the difficulties in dealing with this particular population. A number of adult skeletons with slight bones now classified as ?sex were originally regarded as ?F, but in the last resort it was decided that the erosion factor should be given more weight. A number of ?M skeletons were originally classified as contra sex because the skulls had several female features, but they were often young and in the end the pelvic and long-bone indicators were given priority. One tall female (GS8) had many masculine features to the skull – supra-orbital ridges, nuchal crest, and zygomatic arch extension, as well as the widest ramus breadth (mandible) of the entire population (41mm). But its pelvis is female, complete with a very wide sciatic notch and a pre-auricular sulcus on both ilia, and the skull is neat and rounded, with fine small teeth.

Two femur measurements that provided useful sex discrimination were a vertical femur head length and a mid-shaft circumference. The latter was especially valuable because the terminals of the long-bones were so often absent or imperfect. Additional confidence in the final sexing may be provided by grave-goods. As a general practice records of grave-goods were excluded from the notes on the skeletal data until after the sex had been assigned. The sex of four skeletons, all in poor condition and only one with any pelvic remains, does not correspond with the evidence of the grave-goods mainly because the skulls are incompatible with the limbs. Two skeletons, R57 and R148, have skulls with some male characteristics, but the limbs are very slight, even allowing for erosion; they were buried with a sword and spearhead and a shield-boss respectively. On the other hand the skull of R2 had some female characteristics but the limbs were large, and it had female grave-goods – a brooch, bead, and bracelet. These three were placed in the contra sex category. Another skeleton, R163, whose skull lacked male characteristics and whose limbs were very slight, had been accompanied by a sword and shield, but nonetheless it has been placed in the ?F category. Perhaps this is over-scrupulous, but they are treated on the same basis as the rest of the skeletal material.

Age

The age of adults was decided largely on the basis of the dental attrition chart in Brothwell (1981, 72), modified by a combined upper and lower attrition score based on the same chart. There are 95 males and 107 females (Table 10), and the only significant difference between their age at death is in the 17–25 age group where 41 females died (38% of the female population) compared with only 27 males (28% of the male population). This expected difference is probably due to the trauma of child-bearing. Among all adults the greatest number died within the 25–35 age-group, presumably towards the end of that range, and 72% of the entire population had died by their 35th year. There is a growing opinion that these long-accepted age correlations have been set too low. Certainly a mid point of 30 years for the group with the highest frequency of death seems too tight an age span for a younger generation to have matured before the death of their elders. An increase of five to ten years in these ages seems to be more realistic (see also Leese, p 174 below).

Adults have been taken to include those from 15 years old upwards. In terms of status bestowed by burial in a central grave in a barrow even two of the three adolescents (R64 and BF32) qualify, so perhaps the achievement of puberty was the deciding factor.

The bones of six children were excavated (Table 11), but the only one buried singly in a central grave was R95, where unusually the barrow ditch was circular. R185b and c were in a central grave together with R185a, a probable adult of ?sex. R111, BF38, and BF39 (together witih BF40, a female aged 17–20) were in barrow ditches. R10 was in a small north–south grave with no trace of an associated barrow ditch (p 7). The infants are discussed more fully in the section on traumatic death, p 136 below.

The number of juveniles is obviously unrepresentative of the original population, and there must be an explanation. Perhaps they occupied the empty graves, or were buried in the now levelled barrow mounds.

Measurements and indices (Tables 12–14)

Measurements were taken according to Brothwell (1981) and recorded on his standard form; it has since been revised, but for the sake of standardisation the original version was used throughout. In

Table 11 Distribution of juvenile deaths (all sites)

	Age	*N*	*Burial*
Infants	8 lunar months (*in utero*)	1	K2B
	9½–10 lunar months (new born)	1	K6B
Children	2–3 years	3	R10, 95, 185B
	4–6 years	1	R185C
	7 years ± 9 months	1	R111
	8–13 years	1	BF39
Adolescents	12–16 years	3	R64, BF32, 38

Table 12 Stature

Burials	*Male*				*Female*			
	n	m	sd	r	n	m	sd	r
R1–189	36	171.57	4.51	17.87	26	157.40	3.87	12.84
R190–208	8	167.12	4.25	10.21	2	159.69	6.12	8.65
BF1–22	7	167.79	2.56	8.32	8	159.73	4.23	12.11
BF23–64	14	170.03	6.02	19.48	6	154.84	3.69	8.89
GS1–10	5	175.31	2.35	5.11	3	163.77	7.95	15.81
K2–8	3	172.56	2.44	4.87	4	160.37	4.21	9.88

n = number, m = mean, sd = standard deviation, r = range; stature in centimetres

addition several other measurements were taken: a vertical femur head length; a midshaft cicumference, which was devised by Black (1978) to derive some evidence from poorly surviving bone; two measurements of the sacrum, width and a midline length; and a calcaneum length. Unfortunately bicondylar breadths of femur and tibia would have been feasible only in exceptional cases. Many skulls and some long-bones had to be washed and restored after leaving the field to permit measurement. Restored material does not admit of perfect measurement but even with unrestored material there are problems. Most of the skulls were on their sides with the thin temporal bone uppermost, bearing the full weight of the grave filling. This often caused lateral compression and a degree of skewness, which affects the mandible as well. Stature was calculated on Trotter and Gleser's femur length formula for white males and females (Brothwell 1981, 101) as being the measurement possible for the greatest number of individuals.

There was no statistical evidence for treating the individual sites as other than a single population. There was no justification either for separating the north–south from the east–west orientated burials at Rudston and Burton Fleming. This is supported by the weight of the non-metrical evidence which suggests a single population with a changing burial rite. The samples from Garton Station and Kirkburn are very small and no reason was found to exclude them from the rest of the data. Stature calculations are shown separately (Table 12) to demonstrate the similarity between the sites, though the Garton sample is consistently at the taller end of the range. Morven Leese gives a detailed analysis of the statistical data, including comparisons between the stature and cephalic indices of the East Yorkshire sites and Maiden Castle (p 172).

Teeth

Teeth were mainly healthy apart from endemic periodontal disease, and well formed apart from a few cases of hypoplasia. There were only 30 individuals with full dentition surviving, and 55 more with one to four teeth missing (mainly incisors). Tables 15 and 16 record the distribution of caries, abscesses, and *ante mortem* loss.

What the tables do not show is that the caries is restricted to 29 females (one of whom has eight carious teeth), 17 males, and 7 contra and ?sex. A number of loose root stumps that may well have been carious are not recorded because tooth positions could not be assigned, and in any case some may result from age and heavy attrition.

Tables 15 and 16 show that caries was twice as high in females as males. A lower standard of oral hygiene among females was suggested to account for their greater *ante mortem* loss of teeth in a Romano-British cemetery at Cirencester (Wells 1982, 147), and caries could be caused in the same way, but a more likely explanation is the greater calcium deficiency among females caused by child-bearing. This would result in poorer enamel and less ability to form secondary dentine to compensate for caries and attrition.

Abscesses were 30% higher in males than in females and *ante mortem* loss 8% higher.

There are two cases of extensive bone destruction extending well beyond the apex of tooth roots: one was probably caused by an abscess and the other by a cyst. In R55, a male aged 17–25, the area of destruction extends over the three upper left molars where only the third has caries (a mesial cavity extending from the occlusal surface to the neck). The destroyed area is 23mm wide and 28mm in height. The lower left teeth have some calculus on the occlusal surface of the premolars and considerable amounts on those of the molars, indicating that all occlusion has been avoided on the left side. The only other carious teeth in this individual are the upper right second and third molars, but an X-ray revealed no apical infection here. R3, a female aged 25–35, also has a large cavity in the maxilla, over the upper right molars, but here the teeth are perfectly healthy and there is normal occlusion (see below, injuries, p 136).

Ante mortem loss is on the whole a function of age and the progress of periodontal disease. Those aged 45+ have the highest number of teeth lost *ante mortem*: 41 males and 23 females. Periodontal disease was scored from 1 to 3, slight to severe (Table 17). Severe cases in the young (17–25) were mainly restricted to lower first molars. Exceptions are R55 and BF28, who have caries, abscesses, *ante mortem* loss, some periodontal disease, and occlusal calculus. With the older individuals caries and pulp erosion due to heavy attrition are difficult to differentiate. R107 (45+) has heavy attrition, five teeth lost *ante mortem*, calculus in molar roots, and three periodontal abscess cavities, but no proven caries.

Not many cases of hypoplasia were recorded (eg R55, R63, R131, and BF40). R119 (female, 17–25) stood out as an exception with 10 out of 16 teeth affected.

Unevenness or incompatibility in degree of attrition is often a function of age where increasing disease and loss of teeth occur. In the case of younger people there may be an occupational explanation. Thus of six females with heavy attrition of the anterior teeth (some with secondary dentine, especially incisors) incompatible with much lighter molar wear, four are in the 17–25 age bracket and two are 25–35 (R80, R106, R173, GS2, GS8, and K7). There is one male (R152a, age 25–35) with the same wear discrepancy – a marked step down from the second lower incisors to the first which are worn down to neck level. Three more females (R36, R77, and R106), also younger, show a different wear pattern on the

Table 13 Standard measurements for male and female skeletons

Description of variable	*Biometric symbol*	*Male*					*Female*				
		n	m	sd	min	max	n	m	sd	min	max
Cranium											
Max cranial length	L	58	189.3	5.84	172.0	201.0	57	181.0	6.60	168.0	194.0
Max cranial breadth	B	42	136.3	5.04	125.0	152.0	49	130.3	5.07	120.0	141.0
Min frontal breadth	B'	48	97.2	4.42	89.0	112.0	47	93.6	4.09	85.0	101.0
Max frontal breadth	B"	40	118.8	5.58	107.0	134.0	36	114.5	6.06	101.1	129.0
Basion-bregmatic height	H'	26	138.7	4.95	128.0	147.0	28	131.4	5.01	118.0	143.0
Basion-nasion length	LB	24	105.0	8.51	93.0	138.0	20	99.1	4.78	91.0	106.0
Biasterionic breadth	Biast B	35	119.3	6.20	97.0	133.0	35	106.0	5.45	95.0	121.0
Temporal max squamous length	A-Tl	69	87.2	4.49	71.0	98.0	61	82.4	4.30	72.0	92.0
Basion-alveolar length	GL	9	93.3	4.91	84.0	102.0	12	92.6	5.54	84.0	102.0
Nasion-alveolar length	G'H	10	72.3	5.74	65.0	84.0	14	66.5	4.32	60.0	75.0
Bimaxillary breadth	GB	11	90.9	5.90	82.0	101.0	9	89.6	3.40	85.0	95.0
Malar height	MH	48	47.6	3.08	42.0	56.0	37	44.2	3.16	38.0	51.0
Palate breadth	G2	36	38.6	3.57	31.0	44.0	34	36.7	3.19	27.7	43.0
Palate length	G'1	27	45.5	3.27	40.0	52.0	25	42.5	3.10	37.0	51.0
Orbital breadth	O'1	28	39.9	2.46	36.0	47.0	35	38.7	2.32	33.0	43.5
Orbital height	O2	27	34.3	2.73	29.0	40.0	33	34.2	3.57	26.0	40.0
Foraminal length	FL	25	38.8	2.71	35.0	45.0	34	35.6	2.69	29.0	40.0
Foraminal breadth	FB	27	31.3	1.89	28.0	35.1	30	29.6	1.88	25.5	34.4
Frontal arc	S1	43	132.3	7.17	117.0	150.0	45	125.6	6.88	108.0	146.0
Parietal arc	S2	37	133.1	7.60	118.0	152.0	37	127.8	9.71	102.0	146.0
Occiptal arc	S3	36	119.7	9.43	92.0	142.0	41	113.6	6.86	98.0	130.0
Frontal chord	S'1	44	113.7	5.43	102.0	122.0	46	108.3	5.80	93.0	122.0
Parietal chord	S'2	36	118.6	5.91	110.0	137.0	37	113.2	7.77	95.0	129.0
Occipital chord	S'3	36	98.7	6.14	78.0	114.0	41	95.8	4.58	86.0	107.0
Nasal breadth	NB	25	23.4	2.29	19.0	29.5	21	23.8	2.24	20.0	28.0
Nasal height	NH'	22	53.6	4.50	48.0	68.0	21	48.8	3.79	43.0	57.0
Simotic chord	SC	31	9.3	1.73	6.0	13.0	32	9.3	1.84	6.0	16.0
Breadth at superior nasal points	NB4	34	12.9	2.62	8.0	19.0	32	12.6	2.26	8.5	19.0
Bi-dacryonic arc	DC	18	22.8	3.21	12.0	17.0	12	21.5	2.66	18.0	25.0
Mandible											
Bicondylar width	W1	39	116.0	7.49	97.5	129.0	33	109.4	7.48	94.0	124.0
Foramen mentalia breadth	ZZ	55	44.4	2.46	39.0	51.1	40	42.0	2.26	34.5	47.8
Ramus min breadth	RB'	83	32.0	2.70	25.5	39.0	77	29.9	3.11	22.0	41.1
Symphyseal height	H1	50	32.9	3.67	23.0	41.0	46	30.3	2.79	25.0	37.0
Max projected mandibular length	ML	45	107.8	5.43	99.0	119.0	48	102.7	6.05	78.0	114.0
Projected height of left ascending ramus	RL	41	65.4	5.70	53.0	77.0	38	59.2	6.19	49.0	74.0
Height of horizontal ramus at 2nd molar	M2H	65	30.1	3.12	19.0	37.0	63	27.3	2.80	18.0	32.0
Condyle length	CYL	60	21.3	2.04	16.2	27.7	68	19.0	2.00	13.1	23.3
Coronoid height	CrH	67	66.8	5.91	52.0	87.0	63	58.7	4.78	46.3	70.0
Mandibular angle (in degrees)	M<	45	118.5°	6.39	106.0°	132.0°	43	124.7°	7.53	108.0°	145.0°
Incisura height	IH	73	49.4	5.54	35.0	64.0	69	41.6	4.48	33.0	55.0
Mandibular breadth at 2nd molar	G'2	47	41.3	3.37	34.0	49.3	41	39.5	3.13	31.8	48.0
Post cranium											
Femur:											
max length	FeL1	75	453.1	20.51	403.0	493.0	51	420.8	18.61	388.0	474.0
min anterior-posterior diameter	FeD1	91	24.8	1.87	20.4	29.0	98	22.5	2.27	17.5	28.0
transverse diameter	FeD2	91	35.4	2.09	30.5	42.0	98	31.3	2.53	21.2	37.0
vertical head diameter		72	47.3	2.30	43.0	54.0	55	41.8	2.00	36.0	45.3
midshaft circumference		88	87.6	4.96	76.0	101.0	102	76.7	5.62	63.0	95.0
Tibia:											
max length	TiL1	52	360.2	17.35	314.0	390.0	29	336.3	15.17	305.0	377.0
max anterior-posterior diameter	TiD1	85	34.7	2.94	28.0	42.0	90	29.1	2.92	20.8	34.8
transverse diameter	TiD2	86	23.2	2.21	19.7	34.7	89	20.3	2.29	14.4	26.5
Fibula:											
max length	FiL1	14	352.9	13.56	329.0	373.0	7	339.4	8.85	331.0	355.0
Humerus:											
max length	HuL1	43	327.3	14.57	291.0	357.0	31	302.7	17.71	271.0	352.0
max diameter	HuD1	40	21.7	1.33	19.0	24.5	30	21.0	1.91	15.2	25.0
min diameter	HuD2	40	18.9	2.07	12.0	23.2	31	17.4	1.85	13.0	20.6
Radius:											
max length	RaL1	28	249.3	14.03	228.0	272.0	15	228.8	13.99	205.0	260.0
Ulna:											
max length	UlL1	16	270.8	12.66	252.0	290.0	11	245.0	12.15	227.0	259.0
Sacrum:											
midline length		12	110.2	6.52	100.0	121.0	7	107.3	10.37	92.0	119.0
max width		32	116.3	5.73	108.0	130.0	22	116.9	5.68	105.0	128.0
Calcaneum:											
max length		7	77.9	3.53	74.0	83.0	3	74.7	4.04	71.0	79.0

Key: n = number of cases, m = mean, sd = standard deviation, min = minimum, max = maximum; measurements are in millimetres

Table 14 Indices

Indices	*Male*				*Female*			
	n	m	sd	r	n	m	sd	r
Cranial								
Cephind	41	72.26	3.16	11.14	44	72.19	3.97	18.41
Htind 1	21	100.86	4.17	15.46	24	97.11	9.85	36.18
Htind 3	22	74.34	5.72	21.93	22	73.67	5.70	19.65
Upfacind	13	78.60	5.92	16.77	9	73.54	5.98	19.55
Nasind	19	43.51	4.81	18.85	17	49.53	6.68	22.89
Orbind	26	85.20	6.74	27.50	25	88.69	8.28	31.30
Palind	27	85.11	8.97	32.90	23	86.05	9.51	37.40
Foramind	27	81.03	6.50	25.93	23	84.50	6.14	27.40
Post cranial								
Platymeric	87	70.24	6.09	27.10	101	72.24	7.58	42.95
Platycnemic	82	66.96	5.76	28.46	90	69.69	6.52	46.99
Humw	40	84.69	7.68	33.83	30	83.20	8.26	30.96

For key see Table 13

anterior teeth, where the occlusal edge is at a normal level but there is unusual wear on the lingual surface.

The percentage of non-production of third molars expressed in terms of possible third molar positions is greater for the mandible than the maxilla for both sexes. Between the sexes it is almost identical for the maxilla (male 7.7%, female 7.5%) and somewhat higher in females for the mandible (male 10.5%, female 14.1%).

Residual deciduous dentition is slight, three cases in young adults (5–20) and one in the 25–35 age group. The teeth involved are second deciduous molars instead of (and in one case as well as) second adult premolars. The fourth example (R118b) has two deciduous upper canines with no root atrophy and two adult canines almost fully erupted behind the two adult second incisors, overcrowding an already narrow palate.

There were very small numbers of impacted teeth, three individuals with third molars and two with canines. There were six underdeveloped third molars, five in females.

Atypical teeth include a few examples of bifurcation in canines, and one in upper second incisors; one third molar has four roots, and two individuals had a molar with an extra cusp.

Table 15 The distribution of caries, abscesses, and *ante-mortem* loss – maxilla

Tooth	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	*Total*
Caries																	
male																	
n	55	72	78	73	71	71	60	57	60	62	75	70	71	71	67	57	1070
carious	2	2	2	0	0	1	0	1	0	0	1	1	2	2	1	1	16
%	3.6	2.8	2.6	0	0	1.4	0	1.8	0	0	1.3	1.4	2.8	2.8	1.5	1.8	1.5
female																	
n	52	72	74	73	67	68	65	55	52	55	68	66	65	67	60	48	1007
carious	6	5	7	2	1	1	0	0	0	0	0	2	3	7	2	3	39
%	11.5	6.9	9.5	2.7	1.5	1.5	0	0	0	0	0	3.0	4.6	10.4	3.3	6.3	3.9
Total population																	
n	118	167	165	172	153	166	149	133	144	139	163	156	156	158	145	115	2399
carious	8	8	10	2	1	2	0	2	0	0	1	3	6	10	5	5	63
%	6.7	4.8	6.1	1.2	0.7	1.2	0	0.8	0	0	0.6	1.9	3.8	6.3	3.4	4.3	2.6
Abcesses																	
male	0	1	2	1	1	0	0	0	0	1	1	2	0	3	1	2	15
female	0	2	1	1	1	0	0	0	0	0	0	0	0	4	0	0	9
contra	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
total	0	3	3	2	2	0	0	0	0	1	1	2	0	8	1	2	25
Ante-mortem loss re erupted tooth positions (EP)																	
male																	
EP	59	74	80	77	75	78	74	75	70	75	82	75	74	73	68	60	1169
A-m loss	1	2	5	2	3	1	1	0	1	0	0	1	4	4	1	2	28
%	1.7	2.7	6.2	2.6	4.0	1.3	1.4	0	1.4	0	0	1.4	5.4	5.4	1.5	3.3	2.4
female																	
EP	56	73	75	77	73	74	68	71	68	71	72	72	71	70	67	55	1113
A-m loss	1	5	0	1	1	1	0	0	0	0	1	1	0	2	1	1	15
%	1.8	6.8	0	1.3	1.4	1.4	0	0	0	0	1.4	1.4	0	2.6	1.5	1.8	1.3
Total population																	
EP	126	170	178	170	173	180	178	172	160	170	179	169	167	163	156	126	2637
A-m loss	2	7	6	3	4	2	1	0	1	0	1	5	5	7	3	3	50
%	1.6	4.1	3.4	1.8	2.3	1.1	0.6	0	0.6	0	0.5	2.9	3.0	4.3	1.9	2.4	1.9

For key see Table 16

Table 16 The distribution of caries, abscesses, and *ante-mortem* loss – mandible

Tooth	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	*Total*	*Combined total, maxilla & mandible*
Caries																		
male																		
n	65	85	82	79	77	77	68	64	67	69	76	81	79	85	80	69	1203	2273
carious	0	2	3	0	0	1	0	0	1	0	0	0	0	3	3	0	13	29
%	0	2.4	3.6	0	0	1.3	0	0	1.5	0	0	0	0	3.5	3.8	0	1.1	1.28
female																		
n	66	82	85	83	82	83	88	70	68	72	78	80	77	84	84	70	1252	2359
carious	2	1	4	1	0	0	0	0	0	0	0	0	2	4	2	3	19	58
%	3.0	1.2	4.7	1.2	0	0	0	0	0	0	0	0	2.6	4.8	2.4	4.3	1.5	2.4
Total population																		
n	152	195	185	187	180	182	176	152	162	176	189	183	183	196	192	154	2813	5212
carious	2	4	7	1	0	1	0	0	1	0	0	0	2	7	6	4	35	98
%	1.3	2.1	3.9	0.5	0	0.5	0	0	0.7	0	0	0	1.1	3.6	3.1	2.6	1.2	1.88
Abcesses																		
male	0	1	2	1	1	0	0	0	2	0	0	1	0	2	2	0	12	27
female	0	2	1	1	0	0	0	0	0	0	0	1	1	2	2	0	10	19
contra	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	3
total	0	3	4	3	1	0	0	0	2	0	0	2	1	4	4	0	24	49
Ante-mortem loss re erupted tooth positions (EP)																		
male																		
EP	69	89	85	83	83	83	82	74	86	78	80	83	80	86	81	76	1298	2467
A-m loss	4	4	3	2	1	0	2	1	1	1	1	2	2	4	4	3	35	63
%	5.8	4.5	3.5	2.4	1.2	0	2.4	1.3	1.2	1.3	1.2	2.4	2.5	4.6	4.9	3.9	2.7	2.55
female																		
EP	70	90	88	85	85	89	93	85	84	80	83	89	81	87	84	76	1349	2462
A-m loss	1	4	4	2	2	2	2	1	0	0	0	2	4	4	5	2	35	50
%	1.4	4.4	4.5	2.4	2.4	2.2	2.2	1.2	0	0	0	2.2	4.9	4.6	6.0	2.6	2.6	2.03
Total population																		
EP	151	208	201	194	190	195	199	179	191	171	186	201	189	200	193	168	3016	5653
A-m loss	6	9	7	4	3	2	4	2	1	1	1	4	6	8	10	7	75	125
%	4.0	4.3	3.5	2.1	1.6	1.0	2.0	1.1	0.5	0.6	0.5	2.0	3.2	4	5.2	4.2	2.5	2.2

Key: n = number of surviving teeth; total population = male + female + contra + ? sex; EP = n + post-mortem loss positions

On the whole teeth were evenly spaced throughout the dental arcs. As usual irregularities of spacing occur in the anterior teeth. In this population there are very few cases (14 in all), and interestingly 11 of them belong to restricted geographic groups. Two groups are from Rudston: R143, R146, R147, and R174, R175, R181. There is also a pair from Burton Fleming (BF4 and BF6) and another from Garton Station (GS4 and GS7). The irregularities involve overcrowding leading to rotation and overlapping. The one exception is BF33, where there is a wide spacing between the upper first incisors which are 8mm apart.

There are five examples of a marked overjet of the upper teeth, and four of them form pairs with geographic links, R69 and R76, and BF24 and BF40 (see also 'family' groupings, below). The fifth is R55.

Non-metrical variants and 'family' groups (Tables 18, 19)

Three cases of non-metrical variants warrant further comment: R62 (female), with metopism, has a parallel suture dividing the right frontal bone, and the same may be true of the left but because of a *post mortem* break this is uncertain. There are two males with remarkable lamboid wormian bones, R133 and BF20, which are good parallels for those illustrated in Brothwell (1981, 47, fig 2, 26, C and A respectively).

Table 17 Distribution of periodontal disease between sexes and ages

	15–20		17–25		25–35		35–45		45+		
*Grades**	M	F	M	F	M	F	M	F	M	F	*Total*
0	2	2	5	3	1						13
1			12	13	14	3	1				43
1/2				1	1		2	2			6
2			4	6	6	8			2	1	27
2/3				3		1		5		1	10
3			1	2	13	12	7		8	4	47
First molar only			2	2		1					5
										Total	151

For definition of grades, see key to Table 21

Table 18 Non-metrical variants of the skull

	Male			*Female*			*Contra/?Sex*			*Total*		
	+	n	%	+	n	%	+	n	%	+	n	%
Metopism	13	82	16.5	12	88	13.6	1	16	6.2	26	186	13.9
Wormian bones												
Lamboid	38	63	60	36	60	60	8	13	61.5	82A	136	60.2
Parietal	7	53	13.2	3	54	5.5	1	12	8.3	11	119	9.2
Coronal	4	58	6.8	3	55	5.4	1	12	8.3	8B	125	6.4
Tori												
Mandible	4			1			1			6	180	3.3
Maxilla	3			1			0			4	143	2.8
Palate	1			3			1			5	146	3.4
Parietal notch bones												
Right & left	8			2			0			10	101	9.9
Single notch	1			4			1			6		
Total	9			6			1			16	105	15.2
Supra orbital foramen												
Right & left	9			7			1			17	97	17.5
Single foramen	13			8			3			24C		
Total	22			15			4			41	153	26.8
Supra orbital notch												
Right & left	10			15			1			26	97	26.8
Single notch	9			7			1			18D		
Total	19			22			2			44	153	28.7
Supra orbital notch and foramen												
Combinations	10			8			2			20	97	20.6
Parietal foramen												
Right & left	11			7			3			21	133	15.7
Single foramen	7			7			1			15		
Total	18			14			4			36	137	26.3

A 3 with ossicles at right and left asterion
B 2 with ossicles at bregma and one with right and left epipteric
C 1 with a double foramen
D 2 with double notches

'Single' refers both to cases where a right *or* left variant is present and the other is absent *ante-mortem* (the majority) or is absent *post-mortem*

Table 19 Non-metrical variants and congenital defects of the post-cranial skeleton

Anomaly	*n*	*Burial no and sex*
Scapula		
Separate right & left acromion	1	R55 (M)
Humerus		
Septal apertures	6	R82 (L), R152B (L), GS6 (R&L) (M) R23 (R&L), R131 (R) (F), BF27 (C)
Sternum		
Sternal foramen	1	R181 (M)
Fused manubrium sternum	2	R76 (F), BF4 (C)
Spine		
Atlas		
Bipartite foramen	6	R140, BF7, BF35 (M) R23, BF21 K8 (F)
Sacrum and L5 vertebra		
L5 separate neural arch	2	R76, R97 (F)
Spina bifida occulta	2	GS10 (M), R97 (F)
Partial sacralization of L5	4	R104, BF6, K8 (F), BF4 (C)
Separate first sacral vertebra	2	R73A, R73B (F) (in same grave)
Patella vastus notch (Fig 82)	1	R110 (M)

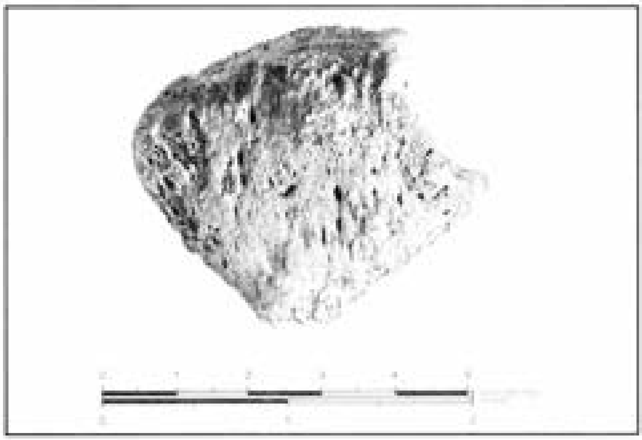

Fig 82 Patella with vastus notch (R110) (photo: British Museum)

R104 (female) has a partial inca division corresponding to an asymmetric central segment only of a tripartite inca. Other cases with large lamboid wormian bones are R40, R144, R190, and BF2 (male), and R15, R106, R201, and BF18 (female).

There is little difference in the distribution of these variants between the sexes apart from sacral anomalies where eight are female, one male, and one contra. There is a tendency for a number of variants to be present in the same individual. For the cranium (excluding supra orbital foramen and notches) R84, R104, R106, and R143 have three different variants each, BF21 has four, and BF25 has five. The same is true of the post-cranial skeleton where R23, R76, BF4, and K8 have two anomalies/congenital defects each. BF27 has three cranial anomalies and one of the post-cranial skeleton.

There has been considerable work supporting the genetic basis for the occurrence of non-metrical variants. Their analyses on this site have been particularly worthwhile because geographical groupings can be recognised among the clearly spaced barrows, and some of the non-metrical variants/anomalies are definitely concentrated. Of metopic cases, 61% are grouped, as are 50% with parietal notch bones, 50% with tori of the mandible, and 27% with parietal foramen. Of dental anomalies, 80% with overjet of maxilla and 78% with overcrowding are grouped, as are 60% of sacral LVS anomalies. Furthermore, some pairs of burials with one anomaly in common are members of larger groups linked by another anomaly.

The following list and Figure 83 identify possible family groups, on the basis of bone anomaly links, where there is close proximity between the graves or barrows.

1 Dental

a Overcrowding and rotation of anterior teeth

(11 of the 14 examples are grouped)

1 R143, R146, R147. All males. Of the group of burials R135–147, 3 have this anomaly, 3 do not, and 5 have loose or missing anterior teeth
2 R173–5, R181. A female and three males
3 BF4, BF6. Contra and female; see also sacral anomalies
4 GS4, GS7. Two males

b Overjet of maxilla

(4 of the 5 examples are grouped)

1 R69, R76. Two females (near but not adjacent)
2 BF24, BF40. Male and female (see metopic group)

2 Cranial

a Metopic

(16 of the 26 examples are grouped: Table 20)

1 The group BF24–40 includes 6 with metopism, 3 male (BF24, BF25, BF37), 2 female (BF36, BF40), and 1 contra (BF27). The 'family group' is emphasised by a second link: BF24 and 40 have overjet of maxilla
2 R34, R38. Both male
3 R80, R83, R84. Two female, one male
4 The group R190–208, archaeologically isolated and perhaps fully excavated, includes 5 with metopism (R191, R208, male; R193, R200, R203, female), 6 without, and 5 with the relevant area missing

b Large number of lamboid wormian bones

R104, female, has 9, including partial inca; and R106, female, has 12 large ossicles. The relevant area is missing on R105, R108, and R114, but R97 has an ossicle at lambda

c Ossicle at lambda

(6 out of 16 are grouped)

1 R139 (?sex), R140 (male), see Fig 83
2 R190 (male), R201 (female); not adjacent graves, but see metopism, above
3 BF18 (female), BF20 (male)

d Tori of the mandible/maxilla

(3 out of 6 are grouped)

BF6 (female), BF16 (male), BF20(female), in the same row of burials

Table 20 Metopic groups

Burial Groups	*R34–38*		*R80–84*		*R190–208*		*BF24–40*		
Sex	M	F	M	F	M	F	M	F	C
15–20						1		1	1
17–25	1				1	1	2	1	
25–35			1	1		1			
35–45	1			1			1		
45+					1				

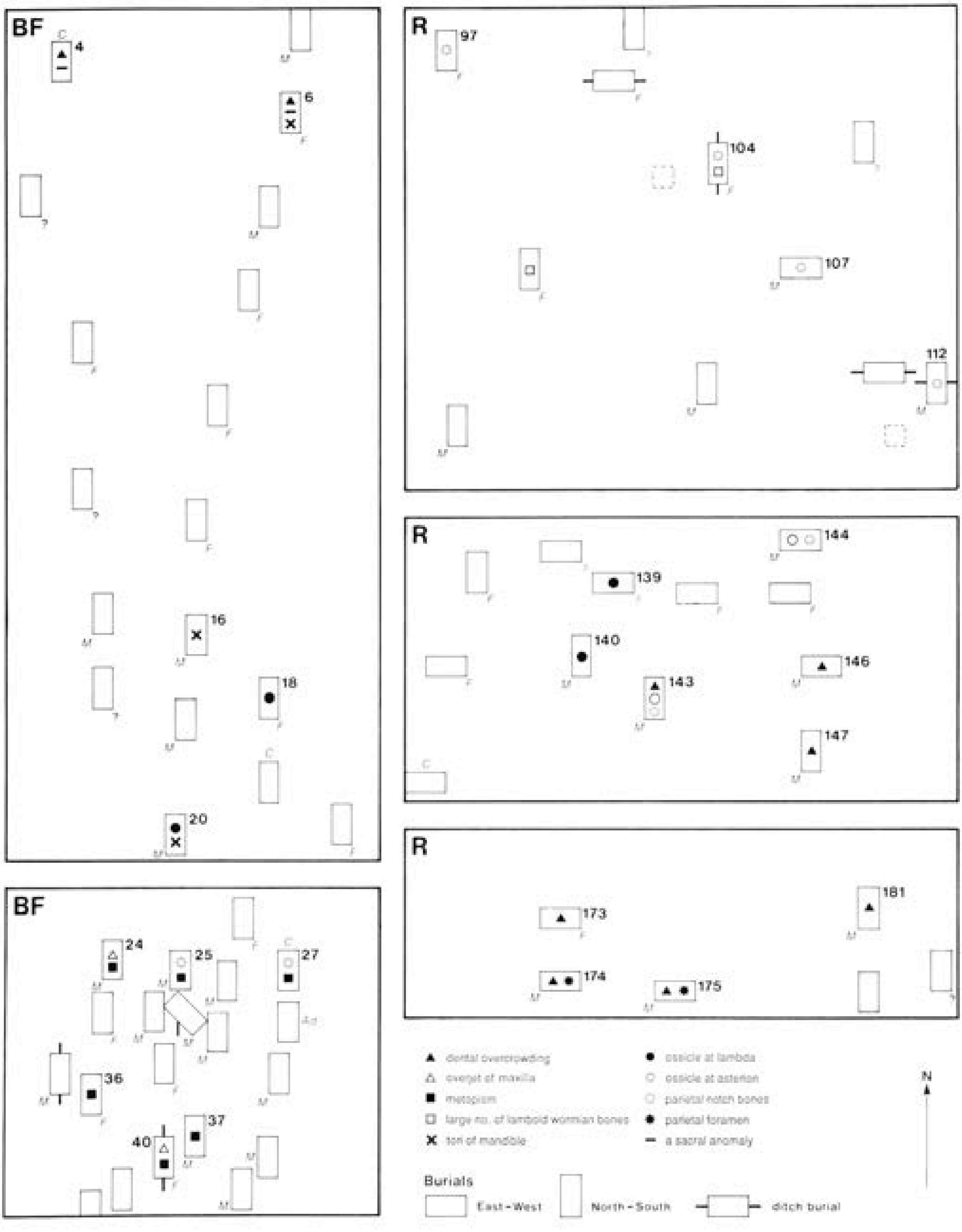

Fig 83 Rudston and Burton Fleming: possible 'family' groups suggested by non-metrical variants

e Parietal notch bones

(8 out of 16 are grouped)

1 BF25, BF27 (males); see also metopism, above
2 R97, R104 (females), R107, R112 (males)
3 R143, R144 (males); see also dental anomalies

f Parietal foramen

(10 out of 36 are grouped)

1 R26 (contra), R27, R30 (females), R31 (male), (R28 and 29, the relevant area missing *post mortem*). In the five barrows with shared ditches (R26–30) all skeletons except R26 (contra) are females, three of them aged 17–25
2 R174, R175 (males); see also dental anomalies
3 K3–5 (males), K6 (female)

3 Sacral

1 R73a and b. Two females in the same grave, both aged 25–35, 73a being at the younger end of the range and taller and slighter than 73b. 73a is metopic and 73b is not. They both have the congenital anomaly of a separate first sacral vertebra.
2 BF4 (contra) and BF6 (female); see also dental anomalies

Other 'family' links are suggested on archaeological grounds, by joined or shared barrow ditches and closely-placed graves, but only two of them have bone anomaly links.

Four of these groupings combine east–west and north–south graves despite the fact that these burial rites have been clearly differentiated on archaeological grounds (p 35). The groups are R26–31, R97–112, R139–47, and R173–5, which are all east–west, but R181, probably part of the same grouping, is north–south and slightly further away. The group R139–47 is the most significant, and apart from R139 (?sex) all those with anomalies are male. R146 (E/W) shares a dental link with R143 and R147 (N/S), R146 and R147 being the most similar, both with rotated lower canines; R147 has 45° rotation (with bifurcated long roots and occlusal surface extending well beyond normal level). R142 has overlapping and slight overcrowding of the lower anterior teeth. There is another link between the two types of burial where R143 (N/S) and R144 (E/W) have right and left parietal notch bones. Furthermore, R142 has ossicles (right and left) at asterion and R144 had one at the left though not at the right. R143 is particularly significant because it was accompanied by a distinctive pot and must be one of the latest north–south burials on the site. Here one of the last north–south burials is linked with the subsequent east–west burial rite.

Pathology

1 Trauma

Fractures

There are five healed fractures of the clavicle, two left (R112, BF2), three right (R43, R84, R192), and all, interestingly, are males. A further right male clavicle (BF25) has a lesion at the sternal end of the shaft, but the X-ray shows no evidence of a fracture (Fig 84).

A male aged 25–35 (R162) has an abnormal left humerus and scapula (Fig 85). The ulna and radius appear to be of the same length as the right (terminals missing). The distal phalanges of the left hand were found curled into the palm and they are thinner and slightly shorter than those on the right. This position is compatible with normality and the less robust left hand may just indicate right-handedness emphasised by the superior right arm. The left scapula has a flattened glenoid fossa, but it is the left humerus that presents us with a much greater level of damage and abnormality. The head is flattened, has multiple fissuring, and at the distal end the epicondyle is unusually extended. Its length is reduced to 221mm, while the right is 324mm. Probably the humerus head suffered a fracture early in life severe enough to interrupt blood supply from the nutrient arteries and to stunt further growth. The flattening of both bones of the shoulder joint could have caused frequent dislocation. There is also a very prominent and anomalous growth on the external occipital protuberance (cranium). The X-ray does not show evidence of trauma, but perhaps its prominence indicates mild trauma to the back of the head. Could there be an association with the atrophied arm?

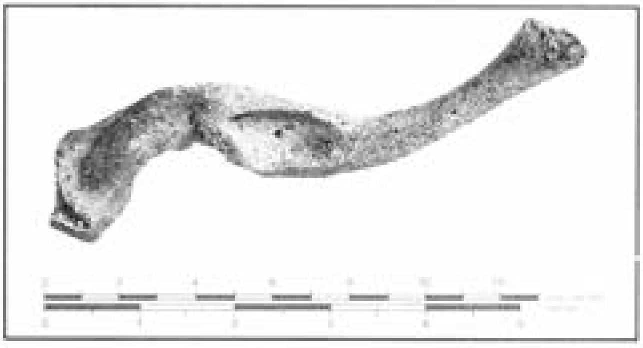

Fig 84 Clavicle with a lesion at the sternal end of the shaft (BF25) (photo: British Museum)

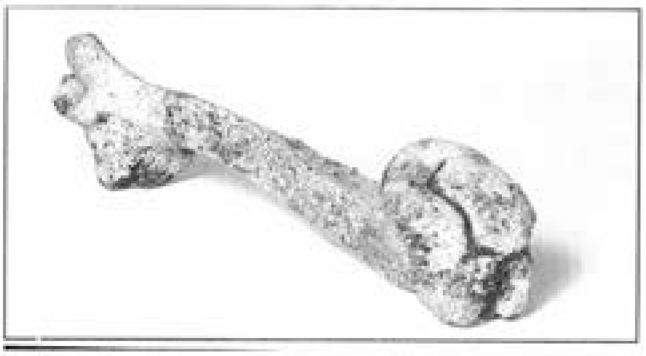

Fig 85 Abnormal left humerus (R162) (photo: British Museum)

For a compression fracture in the thoracic spine, see p 138, R76.

Injuries

R3 Female, 25–35. There are two pieces of evidence relating to the skull, one certainly and the other possibly associated with trauma. First, there is a healed cut on the outer surface of the frontal bone, 25mm long, extending medially (along the line of the metopic suture), starting 20mm above the nasion. Second, there is a large cavity (22mm in diameter and 10mm deep) in the right maxilla above the molars, but the teeth are perfectly healthy. A dentist (John Vidler) identified this as a cyst, which unlike an abscess would have caused no pain and could have been caused by a blow to the face.

R132 ?Female, 25–35. The left femur has a rough spongey exostosis posteriorly on the proximal third of the shaft (Fig 86). The new bone extends for about 60mm in length and is raised to a height of 12mm. It is about 25mm wide at its upper limit, narrowing towards the lower limit. Both the left femur and tibia are thinner than the right, the difference being much more marked in the femurs. The X-ray does not reveal the density expected from an ossified haematoma. Also there is no evidence of a fracture and the original cortical surface is intact. This could be a tumour or the early stages in an ossifying of soft tissue resulting from a traumatic injury caused, for instance, by a kick from a horse.

Fig 86 Femur exostosis, posterior view (R132) (photo: British Museum)

Four skeletons show inflammatory reactions to trauma causing damage to soft tissue:

R100 Female. A right clavicle has a wide splayed acromial extremity, which might be explained by ossification and remodelling after damage to soft tissue, especially as the shoulder is subject to this type of damage.

R148 (contra) and GS6 (male – cart-burial). Two cases of a considerable length of long-bone shaft swelling. Both present smooth cortical bone. The first is a right radius where the whole distal half of the shaft is affected but the ulna is perfectly normal. The second is a tibia where the swelling is anterior in midshaft. In neither case does the inflammation seem to have been active at death, and in both the bone successfully remodelled.

R164 Male. The damage to a right ulna is much more contained. There is a small roughened exostosis on the interosseus border at the distal end of the shaft.

Traumatic death

There are two deaths associated with childbirth, one (K6) with a newborn infant (9PY1/2PY–10 lunar months) and the other (K2) with a near full-term infant (8 lunar months) *in utero*. Both are buried in the same grave, with K6 as the primary burial and K2 much higher up in the same filling. Surely K2 was buried with the knowledge of the nature of the death of K6. In the primary burial, K6, the mother is lying with knees drawn up to the right and the upper half of her body much flatter but tilted towards the right. The infant lies between the mother's legs. As found, its head was in the angle between her upper and lower right leg bones with its pelvis almost touching the mother's right calcaneum. The infant's legs are extended and parallel to one another at sharp angle to its upper half. Its feet and tibia have fallen within the mother's pelvic girdle after *post mortem* collapse. Perhaps this was a stillbirth and the umbilical cord was left uncut. In the secondary burial (K2) the woman was on her right side with her knees drawn up and with a *post mortem* collapse of the left leg to form a tight parallel with the right. The wrists are crossed left above right, below the left femur, across the lower part of the trunk. The infant's skeleton has scattered with the collapse of the mother's pelvis, but the head is the lowest part of the skeleton as found, with the right temporal and right forearm flat on the mother's sacrum. Its head is on the left of the mother's pelvis and facing to the front of her body.

The remarkable burial ritual of casting spears into the corpse and grave (see p 33) does not necessarily explain three of the speared burials. Before the phenomenon was clarified at Garton Station, it had been thought that spearheads discovered in the Rudston burials R94, R140, and R152 (all males) had been the cause of death, perhaps in hunting accidents. In R140 the spear had been thrust into the front of the body, through the superior ramus of the right pubic bone. The pelvis had twisted, but with a definite down-ward angle (much greater now than before disintegration of the corpse), so it would have been difficult for a spear cast from the top of the grave to have penetrated the body as found. In the other two cases, R94 and R152, the spear had definitely been thrust from the back of the body. In R94 the skeleton was on its left side and the spear entered the body from the back immediately to the right of the spine (next to thoracic vertebra 12 and lumbar vertebra 1) and probably deflected outwards to the front of the body. In R152 the skeleton was flat on its back and the spearhead (160mm long, above average length) entered on the left of the body next to thoracic vertebra 7, pointing upwards slightly to the left. It is likely to have penetrated the heart. These individuals may have died and then been ritually speared before laying out in the grave, but the possibility of traumatic death at least for R94 and R152 cannot be eliminated.

2 Infections

Non-specific infections

BF11 Female. A possible infection of the palate, which has a markedly pitted surface.

BF20 Male. The left auditory meatus shows near complete blockage. X-rays do not further diagnosis. Initially it was thought that this could be the result of an infection or a congenital abnormality. But it seems more likely to be a case of pseudo pathology due to the infilling of the meatus with a calcareous deposit.

R84 and R107 Males. Two cases of pathological change to phalanges. The first has a fusion of the middle and distal phalanges, which could be arthritic (there is osteophytosis of the spine), but the junction is fairly smooth. Possibly the result of a septic finger. The second involves the proximal phalange of the right index finger, where there is a dorsal swelling.

Specific infections

BF17 Male, 17–20. Probably a case of polio. It is evidenced by the atrophy of the right lower limb, which affects the width of the femur and tibia (Fig 87). The midshaft circumference of the right femur is 19mm less than the left. The extremities of both bones are missing but they appear to be the same length as the left. The right talus and calcaneum are normal, as is the rest of the body. The right humerus and ulna are thinner than the left, but this is probably due to *post mortem* erosion.

There are other cases where one limb or side of the body is thinner than its opposite number but they cannot confidently be attributed to disease. In life one arm or leg is often more robust than its pair, and in these graves *post mortem* erosion was often greater on the uppermost limb. Nevertheless R34 and R88 should be mentioned in this context.

3 Tumours

There is an argument for a malignant tumour of a left humerus (R132, see above). There is also a possibility of a benign tumour on the cranium of BF48, a female (Fig 88). This is on the endocranial surface of the left parietal where there is a mound of smooth bone, 17mm in diameter. It looks like a benign osteoma but

Fig 87 Atrophy of right femur and tibia, with left for comparison, anterior view (BF17) (photo: British Museum)

Fig 88 Interior surface of the skull showing a benign meningioma or haematoma on the left parietal (BF48) (photo: British Museum)

as it is endocranial and situated in the region of the meningeal vessels, it could be an organised haematoma. From the X-ray the mound appears to be quite dense bone.

4 Osteoarthritis of the spine

Because of the very poor condition of the bone it seemed advisable to present the figures according to the amount of spine surviving, calculated to include fragments as well as complete or near complete vertebrae. Out of the total adult population of 246 skeletons only 22 had a virtually complete vertebral column and more than half had less than 25% of the column surviving. Of the 111 individuals with more than 25% surviving, 47 (42%) have varying degress of arthritis (for grades see caption to Table 21). The overall percentages for males and females are identical, but there is a significant difference in the 25–35 age group where 42% of males compared with 69% of females are affected. Only one male and one female over 35 are unaffected, but they are in the categories 25% and 50% present and would probably have had arthritis in the vertebrae now missing. 13% (but only six individuals) of both males and females under 25 are affected including one (R76) severely affected (see below).

Special cases involving osteoarthritis and other pathology of the spine

R76 Female, 17–25, towards the younger end of the range. T4 and 5 are fused on the left side of the body. T5 is wedge-shaped, and very narrow ventrally. T3, 4, and 6 show compensatory development. T5 also has a vertical smooth-sided split medially from back to front of the body. There is no inflammatory change so this is probably either a trauma from a compression fracture or is of a congenital origin (Fig 89). T7 and 8 have osteophytosis, and the lumbar vertebrae have slight arthritis on the superior facets,

Table 21 Vertebral osteoarthritis, subdivided according to the percentage of vertebrae surviving, and graded in terms of severity

% Spine present	T	100% *Grade* 0	1	2	3	T	75% *Grade* 0	1	2	3	T	50% *Grade* 0	1	2	3	T	25% *Grade* 0	1	2	3	A %	B	C
Male																							
15–25	5	3	1	1		3	3				8	7	1			7	7				13	–	3
25–35	6	2	3	1		3	1		2		9	8	1			8	3	4	1		42	2 (G1,G3)	14
35–45	0					4		4			1		1			3		3			100	1 (G1)	9
45+	2			2		0					0					1	1				66	1 (G1)	3
Total	13					10					18					19					42		
Female																							
15–25	5	3	2			9	8			1	4	4				5	5				13	–	3
25–35	2		2			4	2	2			3	1	2			4	1	3			69	2 (G1)	11
35–45	1		1			3		3			1	1				0					80	–	4
45+	0					0					1		1			2			2		100	1 (G1)	4
Total	8					16					9					11					43		
Contra	1	1				1	1				2		2			2	2						3
? Sex	0					0					0					1		1					1
Total	22					27					29					33							55
% of total population	8.9					10.9					11.8					13.4							

Grades: See Brothwell 1981, 148, pl 6.9.0 = absence of osteoarthritis, 1 = slight, 2 = medium, 3 = severe
A: % of individuals having more than 25% of the vertebrae surviving with osteoarthritis of the spine
B: Osteoarthritis in skeletons with less than 25% of the vertebrae surviving (G = grade)
C: Total number of individuals with osteoarthritis of the spine
T: Total

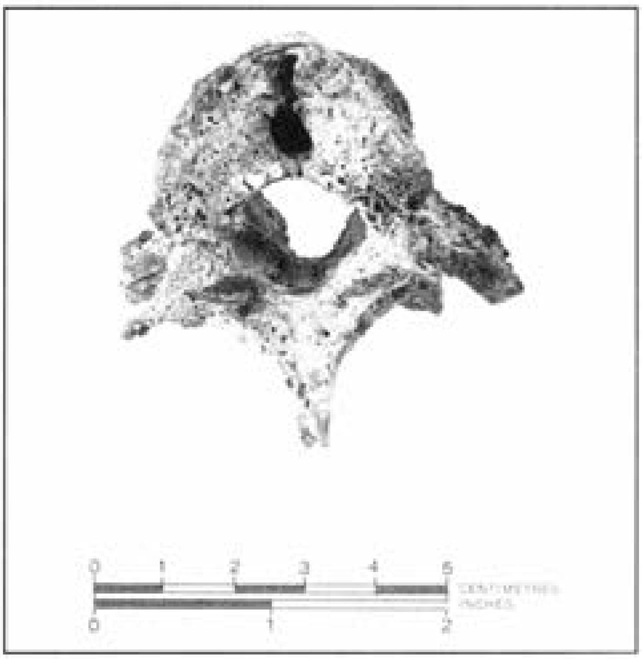

Fig 89 Fifth thoracic vertebra with a compression fracture, inferior surface (R76) (photo: British Museum)

but the remainder of the column is unaffected (almost 100% survives).

R144 Male, 25–35. C2 and 3 are fused at both right and left articulating facets. The vertebral bodies are missing *post mortem*. C4 has its superior and inferior facets so collapsed that they almost join. There is no thoracic evidence and lumbar fragments show slight osteophytosis.

K8 Female, 45+. T12 has a collapsed vertebral body and its inferior surface as well as the superior surface of L1 have large depressions. Of the few remaining vertebrae all the lumbar vertebrae and sacrum have osteophytosis and facet degeneration (grades 1 and 2).

R51b (?sex, 25+), R204 (male, 25–35), and K8 (female, 45+, see above) have large intervertebral depressions all of lower thoracic vertebrae (T10, 11, 12). In the case of K8 they may be related to the vertebral collapse due to trauma, but R204 was X-rayed and there seems to be no alternative explanation to Schmorl's Nodes, though the depression here is unusually large and driven to one side.

BF6 Female, 25–35. L4 has begun to collapse but there is no compensatory change on L5. Almost all vertebrae survive and all are affected by arthritis (grade 1 for cervical and thoracic and grade 2 for lumbar), osteophytosis, and facet degeneration. See also comments on osteoarthritis other than the spine, below.

BF2 Male, 45+. Similar to BF6, grade 1/2.

R160 Male, 35–45. Slight ossification of soft tissue onto the odontoid process of the axis, but there is also an extension of the articulating facet for the process on the atlas. This could be the result of trauma.

Osteoarthritis other than the spine

7 males, 4 females, and 1 contra have osteoarthritis elsewhere in the skeleton (see Table 22).

BF6 appears four times in Table 22 as well as suffering from osteoarthritis of the spine (above). The hip joint shows severe arthritic change. Two individuals have partial blocking of the foramen magnum (cranium). It is rough-textured and bone-coloured (R152a is half blocked, BF1 a quarter blocked), but is most probably a *post mortem* deposit.

Table 22 Osteoarthritis other than spinal

Joint	*n*	*Burial no and sex*
Temporo-mandibular	3	R107 (M), BF6, GS8 (F)
Metacarpal (/carpal)	1	K8 (F)
Ulna & radius, elbow	1	BF6 (F)
Hip	7	R43, 144, 152A, 164, 181 (M), BF6, BF21 (F)
Knee	2	GS10 (M), BF6 (F)
Ankle	1	R182 (C)
Feet	1	R182 (C)

7 The animal bones

by A J Legge

Animal bones consisting of food offerings placed in graves at Rudston, Burton Fleming, Garton Station, and Kirkburn have been studied. In addition, two horse burials from Kirkburn are described.

Much of the bone, especially from the food offerings, is very poorly preserved, with severely eroded surfaces and the loss of the less dense and later fusing epiphyses (usually the proximal ends). Erosion of the bone is especially severe in the case of the skull and mandible. In some cases, sets of loose upper and lower teeth appear to represent juvenile pig heads where all of the bone has been lost.

The state of fusion among the bones described below is indicated by the letters (F) fused, (FSG) fusing, and (UF) unfused, in this case juvenile or sub-adult. The proximal end of the bone is indicated by (p), and the distal end by (d); for example, the designation (UFd) means that the bone had an unfused distal end. Ages from tooth eruption and wear are taken from Simonds (1854) and Bull and Payne (1982). Wear on the pig molars is described by the system of Grant (1982, fig 3, 94); these wear stages are designated as (stage –). This system is used below for the upper pig teeth, as well as the lower teeth for which it was originally intended (see Table 23).

Table 23 Estimated ages from pig dentition

	Jaw	*Side*	P4	M1	M2	M3	*Age (months)*
Rudston							
Burial 8	max	R	U	e	c	-	15–18
Burial 24	man	L	-	-	c	E	15–18
Burial 41	max	R	-	b	U	-	12–15
Burial 44	max	L	U	g	c	-	15–18
	man	L	U	g	c	-	
Burial 58	max	R	b	-	-	-	18–21
	man	R	-	-	e	U	
Burial 141	max	R	-	-	h	e	24–33
Burial 146	max	L	-	-	g	b	21–24
	man	L	-	-	g	b	
Burial 159	max	L	-	-	b	U	18–21
	man	L	-	-	-	U	
Burial 169	max	L	-	k	d	U	18–21
	man	L	-	g	e	U	
Burial 172	max	R	-	j	e	U	18–21
	max	L	-	j	e	U	
Burial 188	man	R	U	-	-	-	15–21
Burton Fleming							
Burial 28	max	L	U	-	b	-	18–21
	man	L	-	-	-	U	
Garton Station							
Burial 6	max	R	U	-	-	-	21–24
	max	L	-	-	f	d	
	man	L	-	-	f	d	
Kirkburn							
Burial 3	max	R	-	e	b	U	18–21
	man	R	-	e	b	U	
Burial 5	max	L	-	k	h	f	24–33
	max	R	-	-	h	f	
Burial 8	max	L	-	b	-	-	6
	man	L	-	b	-	-	

Notes: The alphabetic codes for tooth wear stages come from Grant 1982. The designation 'U' represents a tooth that is unworn or, because of the poor state of the material, possibly unerupted.

Rudston

R2 (FE/AV) Left humerus of sheep, shaft only, badly eroded

R3 (FE/AZ) Left humerus of sheep, badly eroded

R6 (FE/BX) Left humerus of sheep, shaft only

R7 (FE/BJ) Left humerus of sheep, badly eroded

R8 (FE/CJ)

1 Right maxilla, pig, P^4 unworn, M^1 in wear (stage e) and M^2 in early wear on the second cusp (stage c); an age of 12–15 months indicated

2 Complete right forelimb of pig: scapula, humerus (Fd), radius/ulna, metacarpals III and IV, one lateral metacarpal, two medial phalanx 1 (UFp), two lateral phalanx 1, 1 medial phalanx 2 (Fp); apart from the specimens where the fusion is designated, the epiphyses are missing so that fusion cannot be determined; very eroded

Probably the burial of the right side of the skull without mandible, plus a complete right forelimb.

R11 (FL/CF) Left humerus of sheep (Fp+d), eroded

R12 (FL/AH) Fragments of left humerus shaft, sheep; poor preservation

R13 (FL/AB) Right humerus of sheep, badly eroded

R14 (FL/CH) Fragment of left humerus shaft, sheep, very eroded

R16 (FL/CG) ?sheep humerus (mislaid by the excavator)

R18 (FL/DB) Distal articulation of left sheep humerus (Fd)

R20 (FL/CM) Fragment of left humerus shaft of sheep, very eroded

R24 (FN/CF)

1 Left mandible fragment, pig, with M_2 in wear (stage c) and M_3 in early eruption; an age of 12–18 months indicated

2 Bones of left forelimb, pig: scapula, humerus (Fd), ulna, and probable fragments of the radius

This bone group probably represents a complete left forelimb, at least to the distal radius, deposited with the left mandible but with no evidence for the maxilla; very poorly preserved.

R25 (FN/AP) Left humerus of sheep, shaft only, very eroded

R27 (FM/BN) Left humerus of sheep, badly eroded

R33 (FM/BP) Left humerus of sheep, badly eroded

R37 (FM/DR) Left humerus of sheep, badly eroded

R41 (FM/ER) Right loose maxillary teeth of young pig: dp^4 and M^1 (just in wear; stage b), and unworn, probably unerupted M^2; an age of about 6 months indicated; this probably represents the burial of the right side of the skull without mandible, with the young bone unable to resist destruction

R44 (FM/EP) Left part mandible and maxilla, pig, both having P4 (stage U), M1 (stage g), and M2 (stage c); very eroded skull fragments, and one incisor tooth; both upper and lower M2 show very early wear, indicating an age of about 10–12 months; apparently the burial of the left half of a pig head

R46 (FB/BR) Left humerus of sheep, shaft only, eroded

R57 (FN/CL) Poorly preserved fragments of teeth, pig

R58 (FA/BK)

1 Upper and lower loose teeth of pig including both right and left teeth: P^1, P^2, P^3 (right); P_3 (left), M_2 and M_3 (right), canines (left and right), incisors (left and right). The M_2 shows wear on both cusps, while the M_3 is unworn; the archaeological indications are that the teeth all come from the same specimen, and an age of about 18–24 months is indicated

2 Very poorly preserved fragments of left radius and ulna of pig

Probably the burial of a pig head and left forelimb.

R69 (FG/AC) Left humerus of sheep (Fp+d); probably an older animal, since there is an inflammatory bony exostosis on the lateral margin of the distal articulation

R71 (FG/AP) Left humerus of sheep (Fp+d), eroded

R81 (FG/AW) Left humerus of sheep, proximal end broken (Fd), eroded

R82 (FG/DE) Left humerus of sheep, proximal missing, eroded

R83 (FG/BT) Right humerus of sheep (Fp), eroded

R84 (FG/BO) Left humerus of sheep. Proximal end missing; posterior surface of distal shaft shows five distinct cut marks a little above the articular surface, probably for cutting through the attachment point of the triceps muscle

R97 (FB/BP) Left humerus of sheep, shaft only, eroded

R106 (FB/BQ) Left humerus of sheep (Fp+d), good preservation

R118 (FN/BH) Left humerus of sheep, proximal end missing (Fd); cuts on lateral surface of distal shaft

R131 (FG/CW) Left humerus of sheep, proximal end missing (Fd), eroded

R141 (FN/BW)

1 Right maxilla fragment of pig, containing M^2 (stage h) and M^3 (stage e), which has moderate wear extending to the third cusp, indicating an age of about 24–33 months

2 Bones from right forelimb of pig; scapula part, humerus shaft, part radius, and fragment of ulna; vertebrae fragments, probably of pig

Probably the burial of the right half of a pig head without mandible and right forelimb.

R143 (FA/CP) Left humerus of sheep, poorly preserved, proximal end probably fused but badly damaged

R146 (FA/CG)

1 Loose upper and lower left teeth of pig, P^3–M^2 and P_3, M_1 (stage g), M_2 (stage b); in both upper and lower the second cusp of M2 is unworn, indicating an age of 12–18 months

2 Part of left scapula, shafts of left humerus, radius, and ulna of pig; very poorly preserved

By comparison with other graves in these groups, this probably represents the burial of a left half pig head, of which the teeth only have survived, and left forelimb.

R159 (FD/CH) Loose left maxillary and mandibular teeth, pig (M^2 stage b, M^3 and M_3 unworn, plus a fragment of M^1); M_3 length 30.5mm; an age of 12–18 months indicated

Burial of the left side of a pig head.

R169 (FD/AZ)

1 Left half of skull and mandible, pig; maxilla has M^1 (stage k), M^2 (stage d), M^3 unworn; mandible has P_4, M_1 (stage g), M_2 (stage e), and M_3 unworn; other tooth fragments also found; both upper and lower M2 show early wear on the second cusp, while the M3 are erupting but unworn; an age of 15–18 months indicated

2 Left forelimb of pig, complete, poorly preserved; the following bones were determined: scapula, humerus (UFd), radius (UFd), ulna (UFp), metacarpals II–V (UFd), medial and lateral phalanx 1 (UFd), medial and lateral phalanx 2, medial and lateral phalanx 3

Burial of a left half pig skull and left forelimb.

R172 (FD/BR)

1 Left half of skull, pig, now lacking anterior part; permanent molars in place; M^1 heavy wear (stage j), M^2 moderate wear (stage e), M^3 unworn

2 Loose right maxillary and mandibular teeth of pig (I^1 and upper canine, P_2, P_3, P_4 (stage e) and M^1 (stage j), M^2 (stage e), and M^3 unworn; the maxillary M^2 has wear on both cusps (stage e) while the M^3 is unworn 3 Right humerus and radius, shafts only; right metacarpals III and IV (UFd)

The similarity in the wear of the right and left parts of the pig dentition described above suggests that they represent the two halves of the same skull, placed separately in the grave as is known from other better-preserved examples described below. The bones are all of the right forelimb. By tooth eruption and wear, an age of about 15–17 months is indicated.

R178 (FA/BY) Lateral metacarpal of pig, poorly preserved (UFd), one medial phalanx of pig (UFp), two phalanx 3 of pig

R186 (FA/BX) Left humerus of sheep, shaft only, poor preservation

R187 (FA/BV) Left humerus of sheep, poorly preserved (Fp+d)

R188 (FA/BQ)

1 Anterior part of mandible, right and left sides of pig, with both P_2 unerupted, and both P_3 and P_4 erupted; mandible broken across the M_1 sockets; the permanent premolars erupt at 12–15 months of age

2 Bones from right pig forelimb: radius, fragment of ulna shaft, metacarpals II and IV; one lateral phalanx (UFp) and two medial phalanx 2 (Fp)

Apparently the burial of a pig mandible with right forelimb.

Burton Fleming

BF4 (FR/CQ) Left humerus of sheep, poorly preserved

BF6 (FR/CF) Left humerus of sheep (proximal end broken), poorly preservedl; cuts on medial surface of distal shaft

BF10 (FR/BR) Left humerus of sheep (UFp), poorly preserved

BF18 (FR/AN) Left humerus of sheep (Fp+d); eroded, but visible cut marks on medial surface, a little above the distal articulation

BF19 (FR/AV) Left humerus of sheep, proximal end missing and most of distal end (Fd), eroded

BF21 (FR/AS) Left humerus of sheep, proximal end missing (Fd), very eroded

BF28 (FZ/CA)

1. Left side maxilla of pig, with P^4 (unworn), M^1 socket, and M^2 in very early wear (stage b), plus cranial fragments
2. Left side mandible fragment, with unerupted M_3 only
3. Bones of left forelimb: scapula, humerus, radius/ulna, metacarpals III and IV, and one broken phalanx 1 (UFp); apart from the latter, the bones are too broken for fusion to be determined; very poorly preserved

The burial of the left halves of the skull and mandible, and the left forelimb.

BF48 (FZ/BO) Fragment of shaft from right humerus, sheep, very eroded

BF50 (FZ/BG) Skeleton of young sheep or goat, poorly preserved: forelimb shaft fragments of both right and left humerus, radius, metacarpal; hindlimb shaft fragments of both right and left femur, tibia, metatarsal (left only), pelvis (left only). The metacarpal shafts are unfused distally; although there are no skull parts, the development of the bone suggests an animal of 3–6 months of age. The metacarpal shaft is relatively short, and very broad, suggesting that the burial may be that of a goat.

BF58 (FZ/BN) Left humerus shaft only, sheep, eroded

BF60 (FZ/DR) Left humerus, radius and ulna shaft fragments, pig

Garton Station

GS6 (Garton Station cart-burial GW/KB, JX, JY, JZ, KB)

1. Fragmentary skull of pig, with loose upper and lower teeth; unworn right P^2 and P^3, and unworn right P_3 and P_4, plus molar fragments; from the left maxilla the deciduous premolars are present, and M^1 (stage f), and M^2 (stage d); the left mandible is more intact, with permanent premolars erupting, M_1 (stage f), M_2 (stage d), and M_3 unerupted
2. Bones of the forelimbs, both right and left. Scapula: the right scapula has six butchery cuts immediately below the glenoid on the medial face of the bone; humerus: right (UFp+FSGd), left broken p+d; radius and ulna: right ulna (UFp), left ulna broken, radius (FSGp+UFd); right metacarpals II–V (all UFd), two phalanx 1 (UFp), and one left lateral metacarpal (UFd); seven ribs with proximal articulations, right side also

The teeth, jaws, and skull fragments described under 1 above probably represent the right and left halves of the same skull; the fragmentary state of the material makes it is difficult to determine whether the permanent premolars had erupted to the point of replacing the maxillary milk teeth. This assemblage therefore appears to be composed of the two halves of a skull split on the mid line, the two forelimbs, and some right ribs. The right forelimb at least appears to have been deposited as a forequarter.

Kirkburn

K3 (KR/AZ, BA, BC)

1. Right and left maxillae, right and left mandibles, and skull fragments, pig; the maxillae have unworn premolars, with M^1 in wear (stage e), M^2 in wear (stage b), and M^3 unerupted; the mandibles show very similar development: unworn premolars, M_1 in wear (stage e), M_2 in wear (stage b), and unerupted M_3
2. Right and left forelimbs from scapula to feet, pig: scapula (Fp), humerus (Fp+FSGd), radius (FSGp+UFd), ulna (UFp), distal end broken, carpals, metacarpals III and IV (UFd), medial and lateral first phalanges (UFp)
3. Comminuted rib fragments, right and left sides

This example appears to represent the offering of the two skull halves, plus the two forequarters.

K5 (KR/CF, CG, CH, CJ, CQ, CR)

1. (CG) Left pig maxilla with skull fragments making up most of the left side, and mandible, left; maxilla has P^1 to M^3 (M^1 stage k, M^2 stage h, M^3 stage f); mandible has M_3 only (stage d); length 31mm
2. (CJ) Pig right maxilla, with M^2 (stage h) and M^3 (stage f); pig right mandible, with M_3 (stage d)
3. (CF) Pig, right scapula (Fp), humerus (UFp+Fd), radius (Fp+d), ulna (UFp+d), carpals, metacarpals II and IV (Fd), two phalanx 1 (Fp), and two phalanx 2 (Fp)
4. (CR) Pig left scapula (Fp), humerus (UFp+Fd); the distal articulation of this specimen has two cut marks on the surface, and three on the medial face of the bone; radius (Fp+UFd), ulna (UFd), proximal end broken, metacarpals II, III, and IV (Fd), two medial and one lateral phalanx 1 (Fp)

This group again represents the left and right halves of a pig skull, and left and right forelimbs, with the right and left groups deposited separately in the grave. The left side group was placed near to the head, while the right side group was placed on the lower abdomen. Judging from both the tooth wear and degree of bone fusion, the same animal is probably represented. An age of about 30–36 months is indicated by the degree of wear on the third permanent molars.

K8 (KR/CG north) Left maxilla and mandible of a juvenile pig; maxilla has milk premolars, with an M^1 showing early wear (stage b); mandible shows very similar wear on the milk tooth dp_4 (stage h) and the M_1 (stage b)

The burial is of a half skull with mandible; an age of six months or a little less is indicated.

Grave offerings: discussion

The distribution of offerings in the graves is summarised in Table 24. These commonly comprise:

1 The humerus of a sheep, mostly of the left side
2 The front and hind limbs of a young sheep or goat
3 One half of a pig skull, with or without mandible
4 A pig mandible with one front limb
5 One half or a whole pig skull and one limb
6 An entire pig skull (deposited as two halves) with both front limbs

Unfortunately the condition of the animal bone is rather poor; most specimens have an eroded and pitted surface, and commonly the epiphyses are eroded away. However, a number of specimens show distinct cut marks on the surfaces of the bones, which may indicate something of the nature of the offerings that were deposited.

Firstly, four of the sheep humeri (burials R84, R118, BF6, BF18) show butchery cuts above the distal articulations. Unfortunately, most of the humeri have surfaces so eroded that such cut marks would be most often obscured. The cut marks are designated after the codes and illustrations of Binford (1981) for the appropriate bones. These are:

R84 Five diagonal cuts on posterior shaft surface of humerus, distal end. These are nearest to Hd-3 (Binford fig 4.30), but placed somewhat higher on the shaft.

Table 24 Distribution of bone groups by site

Sheep humerus		R	BF		
	r	2	1		
	l	24	7		
Pig bones		R	BF	GS	K
half skull only	*r*	1	-	-	-
	l	1	-	-	-
half skull and mandible	*r*	-	-	-	-
	l	2	-	-	1
mandible + forelimb	*r*	1	-	-	-
	l	1	-	-	-
half skull (no mandible) + forelimb	*r*	2	-	-	-
	l	-	-	-	-
half skull + mandible and forelimb	*r*	-	-	-	-
	l	2	1	-	-
whole skull + forelimb	*r*	-	-	-	-
	l	-	1	-	-
whole skull + both forelimbs		-	-	1	2

Key: R Rudston; BF Burton Fleming; GS Garton Station; K Kirkburn; r right; l left

R118 Four cuts on lateral surface of humerus, a little above the distal articulation. Cuts between positions illustrated by Binford (fig 4.30) as Hd-3 and Hd-4.

BF6 Cuts on the medial surface of the humerus shaft, a little above the distal articulation. These correspond to Hd-2(f) (Binford fig 4.30).

BF18 As BF6 above.

The presence of cut marks on these specimens shows the disarticulation of the distal humerus from the proximal radius/ulna. As the humerus alone was deposited in the graves, the proximal articulation of this bone would have been disarticulated from the scapula. This end of the bone is of low density, and seldom survives on these specimens. If these joints were placed in the grave with meat upon them, the quantity represented by the humerus alone would be modest.

Twelve of the sheep humeri were sufficiently well preserved for some measurements to be taken (Table 25). A comparison of the measurement BT (von den Dreisch 1976) of the archaeological specimens (including those where, owing to damage or erosion, the proximal fusion could not be determined) shows that the mean for this measurement is 24.4mm. This is identical with the same measurement from a sample of 28 fully fused humeri of modern Soay sheep (Holmes *et al* forthcoming). While this single measurement cannot say a great deal about the body form of the Iron Age sheep, the comparison does indicate their small body size, which would appear to be similar to that of the modern Soay.

The two burials containing split pig crania and both front limbs (K5 and GS6) both show clear cut marks upon the pig limb bones, suggesting that they too had been disarticulated before deposition. In the case of burial GS6, the proximal right pig scapula shows cut marks on the medial face of the bone a little above the articular surface (Binford 1981, fig 4.29). This face is exposed only after the forelimb has been cut from the thorax of the animal. This is a typical dismemberment cut. Similarly, the left humerus of the pig placed with burial K5 has oblique cut marks of the type 'oblique Hd-2' (Binford 1981, fig 4.30(f)). This again indicates the dismemberment of the joints in question. The anterior surface of the humerus also has two vertical cut marks upon it.

Table 25 Burton Fleming and Rudston: dimensions of sheep bones from burials

Burial	GLC	S	Bt	Ht	Htc
R14 (FR/BR)	-	10.4	21.4	-	11.5
R33 (FM/BP)	-	11.9	22.8	14.8	11.0
R69 (FG/AC)	130.0	14.1	25.7	-	12.8
R71 (FG/AP)	115.3	11.7	-	-	11.9
R84 (FG/BO)	-	-	25.0	-	12.3
R146 (FA/GC)	-	11.6	23.0	-	10.7
R141 (FN/BD)	-	13.4	25.8	-	14.0
R118 (FN/BH)	-	-	26.1	-	13.2
BF4 (FR/CQ)	-	-	24.0	-	13.0
BF6 (FR/CF)	-	13.5	25.0	-	12.6
BF18 (FR/AN)	-	13.8	25.6	-	12.4
BF21 (FR/AS)	-	12.7	23.6	-	11.3

Note: All measurements correspond to those of von den Dreisch (1976).

These cuts can only have been placed upon the articular surface when the limb was fully extended, when this part of the articulation is exposed and not in contact with the proximal radius.

The excavation record and photographs of these grave groups show that the bones were placed in their correct anatomical orientation but not necessarily in their correct anatomical position. The presence of typical cut marks of dismemberment on the few better preserved bones makes it probable that the bones were placed in the grave after they had been defleshed; these food offerings were very likely to have been symbolic rather than actual.

Further evidence that the bones were placed in the graves in a defleshed condition comes from the placement, in some cases, of pig skulls without mandibles and mandibles without skulls. Owing to the powerful musculature of the pig cheek, the rather narrow zygomatic arch, and the long vertical ramus of the mandible, it seems more probable that the skull and mandible were separated by cooking rather than by a knife. Unfortunately, again the poor preservation of the cranial and mandibular bones would obscure cut marks.

The pig skulls and limb bones come from animals of ages varying from one animal of 6 months or so up to two of about 2–3 years. Most of the pig skulls and jaws (13 of 16) come from animals in the 12–24 month age range.

Kirkburn horse-burials

Full measurements of the two horse-burials from Kirkburn are given in Table 27 below. Both horses are fully adult, judged both from the complete bone fusion and the degree of tooth wear. Ageing from the dentition has been done by means of crown height measurements, following the method of Levine (1982). As the crania of the Kirkburn horses were very fragmentary, ageing was based upon the height of the maxillary teeth, all of which were loose. The Kirkburn horses have a tooth size (mesio-distal diameter) very similar to that of Levine's modern New Forest ponies (ibid, table 1, 232), so that ages could be estimated directly from the relevant tooth wear curves in that publication. On this basis horse 1 (KR/DB) appears to be about 13 years of age, while horse 2 (KN/PY) is somewhat younger; the different teeth suggest an age of between seven and nine years.

In the older horse (KR/DB) there is interesting evidence for bit wear on the anterior surfaces of the upper and lower permanent second premolars (Fig 90, a–f). The wear is most strongly expressed on the lower premolar, where the surface of the tooth is distinctly worn to a curved form. At this point the enamel folds within the tooth structure are worn flush with the enclosing dentine, and do not stand slightly proud as in the normal pattern of wear. Under magnification, the enamel also shows a more opaque appearance due to fine angular shattering of its surface by percussion from, or champing at, the bit. My attention to the possible presence of this wear was stimulated by the work of David Anthony (Anthony and Brown 1989), who has kindly examined illustrations of the wear on these teeth and agrees that this is an unquestionable example of bit wear; the manner by which this wear occurs is described in Anthony and Brown (1989):

> A properly adjusted bit placed on a well-trained horse will ideally remain on the soft tissues of the mouth. If the horse can lift the bit back onto its premolar teeth, the rider is prevented from causing pain to the tongue and gums, and must attempt to control the horse by strength alone.... The fleshy corners of the mouth are sufficiently far forward so that the bit is prevented from moving back farther than the anterior half of the first lower premolar (P2). The bit therefore repeatedly moves onto a limited part of the occlusal surface of the lower P2, and must be held with considerable force to prevent it from slipping back onto the gums.

Pathology

Horse KN/PY

The feet of this specimen show signs of inflammatory lesions. On the right hind leg, the central and third tarsals are fully fused together ('spavin'). Those of the left hind leg show lipping at the joint margins. The first phalanges of the front limbs show exostoses at the attachments of the middle sesamoid ligaments ('ringbone'); the second phalanges have evidence for proximal sesamoiditis.

The evidence for bit wear in horse KR/DB is a very good indication that the animal in question was regularly bitted with an iron bit. Bearing in mind the remarks of Anthony and Brown above, and the evidence for spavin, ringbone, and proximal sesamoiditis from horse KN/PY, conditions likely to be induced by hard riding on hard ground, by overwork, or by working when too young (Hayes 1968) these were almost certainly riding horses, although the manner or style of the riding remains an open question.

The stature of the two horses (withers height) can be calculated in metres using Kiesewalter's factors (Boessneck 1970), as shown in Table 26. The Keisewalter factors give a slightly variable result when applied to the larger (KN/PY) horse; the mean of four bones suggests a withers height of 1.42m. The smaller horse (KD/RB) gives very consistent results at 1.34m. By the traditional British measure these represent small horses of 13.9 and 13.2 hands high respectively. Both specimens are at the larger end of the size range reported for horses at several Iron Age and Romano-British sites reported by Wilson (1978, 117). Single specimens of a metacarpal and metatarsal preserved from the Iron Age 'King's Barrow' at Arras in Yorkshire (Legge 1984) indicate a smaller horse (or horses), at 1.32m (metacarpal) and 1.30m (metatarsal).

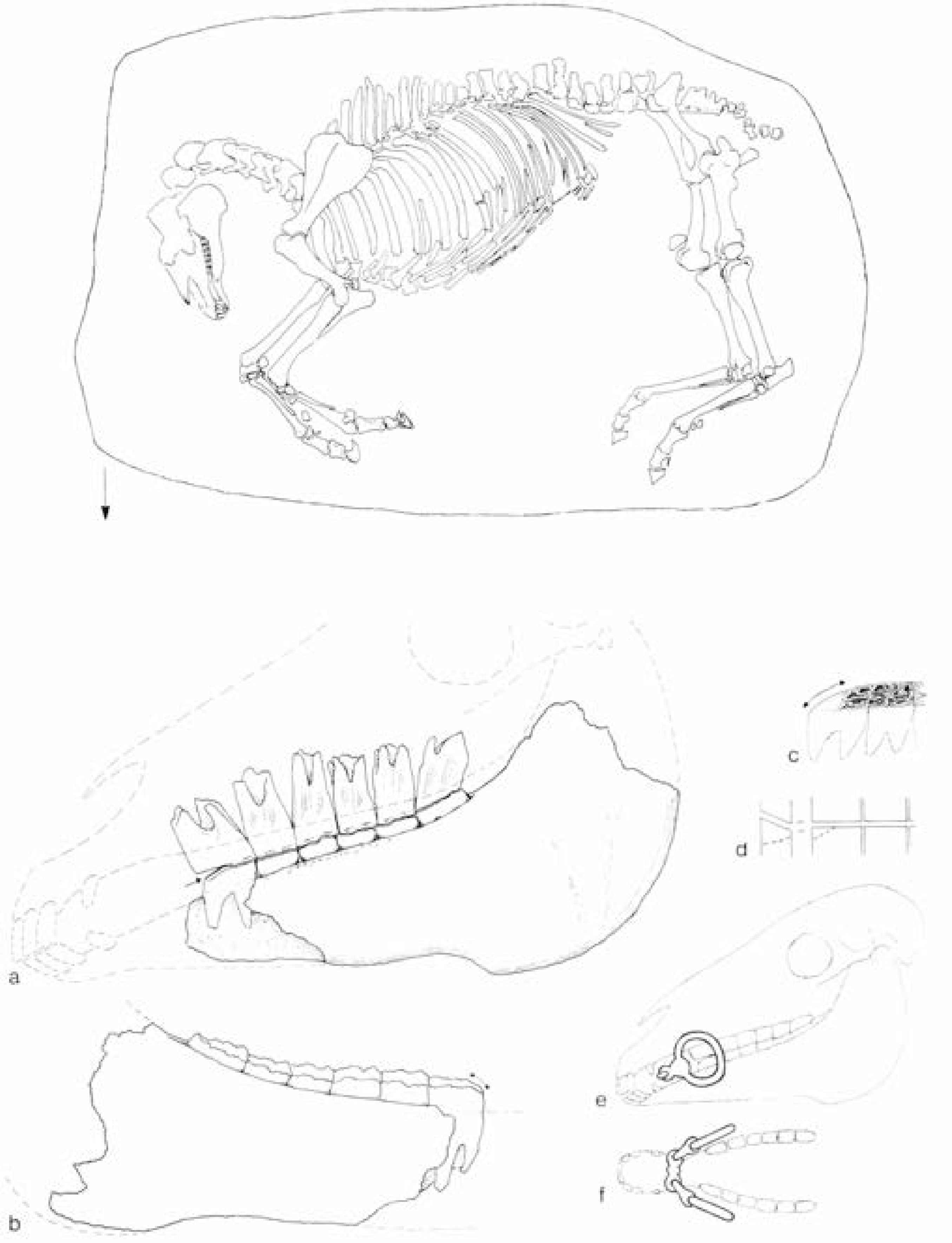

Fig 90 Plan of horse-burial 1 at Kirkburn (1:15), with details of the teeth showing wear caused by a horse-bit (a–c, 1:3); for location of grave see Fig 24

Table 26 Stature of horses (m); lateral length measurements (LI)

Bone	KN/PY	*Suggested stature*	KD/RB	*Suggested stature*
Metacarpal	225.0	1.44	208.6	1.34
Metatarsal	267.0	1.42	251.4	1.34
Radius	321.3	1.39	309.7	1.34
Tibia	338.0	1.47	307.0	1.34

Table 27 Kirkburn horse-burials: measurements

All measurements correspond to those of von den Dreisch (1976). The measurements taken are those not affected by *post mortem* erosion or damage; bony exostoses preventing measurement are indicated by 'exos'. Where bones are too damaged for a particular measurement to be taken this is indicated by np (not possible).

Specimen KN/PY F7 (all bones fully fused)

Scapula (R):
SLC 71.0; GLP 94.6; LG 59.0; BG 42.6

Scapula (L):
SLC 73.5; GLP 93.5; LG 58.0; BG 45.0

Humerus (R):
GLI 295.0; GLC 283.0; Bp 96.0; SD 35.5; Bd 80.4; Bt 77.0

Humerus (L):
GLI 297.0; GLC 285.0; Bp 94.3; SD 35.6; Bd 80.4; Bt 76.8

Radius/ulna (R):
GL 410.0; GLI 408.0

Radius (R):
GL 339.0; GLI 325.0; LI 322.0; SD 39.0; PL 327.0; CD 26.8; Bp 85.0; BFp 78.4; Bd 78.0; BFd 67.4

Ulna (R):
SDO 50.4; DPA 66.0; LO 79.5

Radius/ulna (L):
GL 414.0; GLI 412.0

Radius (L):
GL 337.0; GLI 325.0; LI 321.0; SD 38.7; PL 333.0; CD 27.0; Bp 85.3; BFp 78.2; Bd 78.0; BFd 69.0

Ulna (L):
SDO 49.0; DPA 65.0; LO 79.3

Metacarpal (R):
GL 233.0; GLI 230.0; LI 225.0; Bp 53.5; Dp 35.4; Sd 32.2; CD 25.5; DD 21.7; Bd 52.4

Metacarpal (L):
GL 233.0; GLI 230.0; LI 225.0; Bp 53.0; Dp 35.5; Sd 32.6; CD 25.8; DD 21.4; Bd 52.6

Phalanx 1 (front R):
GL 88.0; Bp 58.0; BFp 54.0; Dp 36.0; SD exos; Bd 52.6; BFd 46.5

Phalanx 1 (front L):
GL 87.0; Bp 58.0; BFp 53.4; Dp 37.0; SD exos; Bd 53.0; BFd 46.7

Phalanx 2 (front R):
GL 49.0; Bp 56.7; SD 46.4; Bd 52.7

Phalanx 2 (front L):
GL 49.0; Bp 56.7; SD 47.0; Bd 53.0

Phalanx 3 (front R):
GL 60.0; GB 70.0; Bf 52.5

Phalanx 3 (front L):
GL np; Gb 72.0; Bf 54.0

Femur (R):
GL 397.0; Bp 119.0; DC 57.3; CD 39.0; SD 50.2; Bd 95.0

Femur (L):
GL np; Bp 117.0; DC 57.4; CD np; SD np; Bd 95.0

Tibia (R):
GL 352.0; LI 338.0; Bp 101.0; SD 34.6; CD 30.7; Bd 78.0; Dd 46.0

Tibia (L):
GL 355.0; LI 338.0; Bp 102.0; SD 39.0?; CD 32.0?; Bd 79.0; Dd 46.0

Metatarsal (R):
GL 275.0; GLI 267.0; Bp 53.0; CD 30.3; Bd 52.0; Dd 27.0

Metatarsal (L):
GL 274.0; GLI 268.0; Bp 51.6; CD 30.4; Bd 52.6; Dd 25.3

Astragalus (R):
GH 60.0; GB 63.0; Bfd 53.4; Lmt 62.3

Astragalus (L):
GH 61.0; GB 65.0; Bfd 54.3; Lmt 64.0

Calcaneum (R):
GL 113.0; GB 54.0

Calcaneum (L):
GL 113.0; GB 54.0

Phalanx 1 (hind R):
GL 85.0; Bp 58.0; Bfp 52.7; Dp 40.0; SD 33.0; Bd 49.0; Bfd 45.0

Phalanx 1 (hind L):
GL 85.0; Bp 58.4; Bfp 52.0; Dp 39.4; SD 34.0; Bd 49.0; Bfd 45.0

Phalanx 2 (hind R):
GL 49.0; Bp 55.0; Bfp 48.6; Dp 34.0; SD 43.3; Bd 49.0

Phalanx 2 (hind L):
GL 49.0; Bp 55.8; Bfp 49.3; Dp 34.4; SD 44.4; Bd np

Phalanx 3 (hind R):
GL 53.0; GB 65.0; BF 50.0; Ld 50.0; Hd 40.0

Phalanx 3 (hind L) eroded

Mandible (R; symphysis and ramus broken):
measurement 6 173.0; 6a 167.0; 7 84.4; 7a 83.2; 8 87.4; 8a 85.6; 22a 98.6; 22b 73.9

Mandible (L; P_2 missing *post mortem*, ramus broken):
measurement 7 85.4; 22a 97.0; 22b 75.0

Cranium very fragmented; tooth dimensions:

right	P^2	P^3	P^4	M^1	M^2	M^3
height	43.4	46.4	50.0	55.0	48.0	44.0
mesio-distal	37.0	25.6	27.8	27.0	25.7	27.7

left	P^2	P^3	P^4	M^1	M^2	M^3
height	41.7	-	51.7	-	51.4	47.0
mesio-distal	36.5	25.3	26.2	24.2	26.0	29.8

Specimen KR/DB (all bones fully fused)

Scapula (R):
SLC 60.7; GLP 87.4; LG 53.4; BG 46.7

Scapula (L):
SLC 60.0; GLP 86.6; LG 57.2; BG 46.0

Humerus (R):
GLI 277.0; GLC 260.0; Bp 89.0; SD 34.3; Bd 72.6; Bt 70.6

Humerus (L):
GLI 275.0; GLC 260.0; Bp 88.7; SD 34.7; Bd 71.9; Bt 70.3

Radius/ulna (R):
GL 398.0; GLI 393.0

Radius (R):
GL 327.0; Ll 310.0; SD 39.0; PL 316.2; CD 106.0; Bp 78.4; BFp 72.8; Bd 72.3; BFd 60.0

Ulna (R):
SDO 46.2; DPA 64.6; LO 78.6

Radius/ulna (L):
GL 393.0; GLl 390.0

Radius (L):
GL 325.0; Ll 315.7; SD 37.5; PL 319.0; CD 108.0; Bp 79.3; BFp 71.2; Bd 72.9; BFd 61.8

Ulna (L):
SDO 46.4; DPA 63.1; LO 79.7

Metacarpal (R):
GL 216.0; GLl 213.0; Ll 208.6; Bp 50.0; Dp 32.9; Sd 32.0; CD 24.0; DD 20.8; ; Bd 45.4

Metacarpal (L):
GL 215.0; GLl 210.0; Ll 207.6; Bp 50.9; Dp np; Sd 32.2; CD 92.5; DD 21.2; Bd 45.7

Phalanx 1 (front R):
GL 79.5; Bp 52.7; BFp 45.8; Dp 34.2; SD 36.4; Bd exos; BFd 42.8

Phalanx 1 (front L):
GL 80.7; Bp 52.3; BFp 45.6; Dp 34.5; SD 36.5.; Bd 49.7; BFd 42.9

Phalanx 2 (front R):
GL 43.5; Bp 50.4; SD 43.2; Bd 48.8

Phalanx 2 (front L):
GL 44.4; Bp 50.6; SD 44.1; Bd 50.2

Phalanx 3 (front R):
GL np; GB 66.0; Bf 49.5

Phalanx 3 (front L):
GL np; Gb 70.9; Bf np

Femur (R):
GL 368.0; Bp 119.0; DC 53.4; CD 140.0; SD 39.4; Bd 88.5

Femur (L):
GL 357.5; Bp 117.8; DC 53.5; CD 141.0; SD 38.4; Bd 84.0

Tibia (R):
GL 337.0; Ll 307.0; Bp 90.4; SD 38.4; CD 107.0; Bd 67.5; Dd 41.2

Tibia (L):
GL 336.0; Ll np; Bp 90.0; SD 38.2; CD 110.0; Bd np; Dd 46.0

Metatarsal (R):
GL 259.0; GLl 252.0; Bp 48.0; CD 95.5; Bd 45.4; Dd 36.0

Metatarsal (L):
GL 255.0; GLl 253.0; Bp 48.7; CD 95.0; Bd 45.3; Dd 36.1

Astragalus (R):
GH 56.0; GB 56.8; Bfd 47.3; Lmt 55.0

Astragalus (L):
GH 57.2; GB 61.9; Bfd 49.4; Lmt 57.4

Calcaneum (R):
GL 103.6; GB 50.0

Calcaneum (L):
GL 104.7; GB 50.7

Phalanx 1 (hind R):
GL 77.5; Bp 48.5; Bfp 46.0; Dp 36.0; SD 30.8; Bd 42.2; Bfd 40.4

Phalanx 1 (hind L):
GL 79.2; Bp 50.4; Bfp 46.4; Dp 36.5; SD 30.6; Bd 41.6; Bfd 40.2

Phalanx 2 (hind R):
GL 45.0; Bp 48.8; Bfp 42.7; Dp 31.5; SD 40.5; Bd 45.4

Phalanx 2 (hind L):
GL 44.3; Bp 48.8; Bfp 44.2; Dp 31.4; SD 41.1; Bd 45.6

Phalanx 3 (hind R) broken

Phalanx 3 (hind L):
Bf 44.2

Cranium very fragmented; tooth dimensions:

right	P^2	P^3	P^4	M^1	M^2	M^3
height	17.2	31.4	36.4	-	-	-
mesio-distal	36.8	26.8	-	-	-	-

left	P^2	P^3	P^4	M^1	M^2	M^3
height	17.0	32.7	32.4	28.9	34.2	29.5
mesio-distal	36.1	28.2	26.0	23.2	24.8	30.7

8 The environmental evidence

a The molluscan evidence from Garton Station and Kirkburn

by Nigel Thew and Pat Wagner

Introduction

The areas excavated at Garton Station and Kirkburn were on chalk gravels, and the rendzina soils which develop on them produce alkaline conditions, in which snail shells are the only environmental evidence which commonly survives, apart from the soils and sediments themselves.

Methods and procedure

Sampling

The sampling strategy was by no means comprehensive, but was intended to test the amount and quality of information that snails could provide in the interpretation of the archaeological features. At Kirkburn site 1 samples were taken from two of the Iron Age barrow ditches (K5 and K6), the cart-burial (K5), and a ditch of unknown date (Z). From Kirkburn site 2, the Neolithic enclosure ditch as well as the ring ditch and its enclosed pit (Kl0) were sampled, as was the Bronze Age burial (K9). Iron Age samples were taken from one of the horse-burials and the ditch of the square enclosure. Samples were also taken from each of three possible Roman ditches to be north of site 2, adjoining Green Lane (TTl, TT2, TT3).

At Garton the majority of the Iron Age burials were sampled but only a single Anglian grave (GS21). In addition, a soil profile was sampled near the centre of Barrow G: it includes a buried soil profile which conforms to the model of rendzina soil with dark brown soils grading down into light brown, stonier, more sandy soils with less matrix and a lower flint:chalk ratio.

Sample processing

All the samples were dry sieved through an 8mm mesh. 2kg, or as much as was available of the sieved sample, was wet sieved through a nest of sieves, the finest mesh being 0.5mm.

Molluscan material which had either a distinctive shape or microsculpture was separated out and identified with the aid of Kerney and Cameron (1979) and the writer's own reference collection.

Results

Tables 28 and 29 list the snail counts by species for all the samples analysed. The table lists the total number for each sample and the total including *Ceciloides acicula*, which is a post-Roman introduction to the British fauna. This burrowing snail by its habit is normally intrusive. Fragments from one individual are indicated by an 'X', followed by a number where it is evident that the fragments are derived from more than one individual.

Samples where less than 2kg of sieved soil was available for wet processing have a calculated value per 2kg for direct comparison.

Discussion and interpretation

The excavated sites lie in a gently sloping area between the 23m and 30m contours, through which a 'gypsey race' or intermittent watercourse runs. Hence there is potential variation in dampness, but no real difference in slope or height within and between the sites.

Nature of the substrate

The chalk gravels underlying the excavated areas give rise to rendzina soils. These soils tend to be characterised by well- developed horizons under permanent or well-established grassland. Below the turf the upper horizon is dark brown, humic, clay-rich and relatively stone-free; beneath this at a depth of *c* 300mm there is usually a stony layer of lumpy chalk and flint over a zone of 'pea gravel' brought down by earthworm action. Below this there is a light to medium brown weathered subsoil horizon of chalk gravel mixed with humus, which is still subject to some worm activity. Finally, there is a very light brown unweathered chalk gravel, which consists of a high ratio of chalk to relatively unpatinated flints in a scant matrix of silt and sand. Worm action leads to fragments of shell being taken down and incorporated into soil; some are destroyed by leaching, but a number survive to reach the a/c horizon where they remain for some time, though not indefinitely, for a shell is susceptible to the same processes as any other fragment of calcium carbonate. If the soil is buried, leading to the inactivation of the worm populations, no further movement of the shells occurs and a stratified sequence reflecting changes which have taken place at the surface is preserved. The process of leaching is largely arrested if burial takes place beneath deposits which are calcareous.

Interpretation

The molluscan assemblages from the Neolithic features indicate that the prevailing landscape was of fairly moist, tall, well- established, stable herbaceous vegetation, as shown by the presence of *Cochlicopa* spp and *Euconulus fulvus*. There is no evidence for trees or scrub in the vicinity, and the presence of the species *Punctum pygmaeum*, *Euconulus fulvus*, and *Vertigo pygmaea* indicates that the ground was undisturbed for some time before the construction of the features. The consistent representation of *Cepea nem-*

Table 28 Mollusca from soil samples at Garton Station

	Soil profile at centre of Barrow G						*Iron Age graves*							*Iron Age graves*				*Iron Age graves*					*Anglian grave*
	Overburden		*Buried soil*				6						2	4		5		7	8	9	10		21
	IZ	JA	JB	JC	JD	JE	IQ	IP	IG	IF	IS	IR	GU	GW	GV	GY	GX	HA	FJ	HC	FL	FK	HX
Pomatias elegans																						x	
Cochlicopa lubrica																							
Cochlicopa lubricella																				x(2)			
Cochlicopa sp										1								x		4	x	1(2)	
Vertigo pygmaea					1															1	1		
Pupilla muscorum			6(8)	2(6)	x		1(2)	x(3)	7(14)	6(8)	x		x(2)		x	x		x(2)	9(18)	23(28)	9(10)	18	x
Vallonia costata	1		1																			1	
Vallonia excentrica	6	5	10	2	x	x	1		6	6			3(4)	3	1	2		8	5	35	12	8	4
Ena obscura																							
Punctum pygmaeum																				1			
Vitrina pellucida																							
Vitrea contracta																		7			1		
Nesovitrea hammonis																		1					
Oxychilus alliarius																							
Limax/Deroceras spp																							
Euconulus fulvus																							
Ceciliodes acicula	29	46	49	26	12					1													8
Helicella itala	7(8)	10	11	2	x(2)	x(2)	2	3(4)		9	x	x	6	4	1(3)	1(3)	1(2)	x(2)	8	8(10)	10	6(8)	4
Trichia cf *hispida*																							
Cepaea nemoralis																							
Cepaea sp																							
Arianta/Cepaea apices			1																				
Marshy species																							
Succinea sp																							
Vertigo angustior																							
Sample weight processed (when <2000g)									890														
Total molluscs (corrected to 2kg of sample)	15	15	31	10	5	3	5	7	29/ 65	19	2	1	12	7	5	6	2	21	31	82	35	38	6
Total including *Ceciliodes acicula*	44	61	80	36	17					20													14

Table 29 Mollusca from soil samples at Kirkburn

		Kirkburn site 1					*Kirkburn site 2*												
		Iron Age features					*Iron Age features*						*Bronze Age*	*Neolithic features*					
	Grave	*Barrow ditches*				*Linear Ditch*	*Enclosure Ditch*		*Horse Burial*	*Linear Ditches*			*Grave K9*	*Enclosure Ditch*		*Ring Ditch*	*Pit K10*		
	5	5		6		Z	SS5	SS2		TT1	TT2	TT3					PM	PU	PX
	SS15	SS10	SS11	SS12	SS13	SS14	lower	upper		SS6	SS7	SS8	SS9	SS4	PH	SS1	B	B	
		upper	lower	upper	lower	B													
Pomatias elegans																			
Cochlicopa lubrica								1											
Cochlicopa lubricella																			
Cochlicopa sp		x				1(12)		1(3)								1	x(2)	x	
Vertigo pygmaea										1	3	7				1			
Pupilla muscorum	x	x(5)	1	1	1	1	2(3)	5(6)	2(3)	1	3(8)*	5(6)*				x		1	
Vallonia costata						1					1	26						1	
Vallonia excentrica		28		4		3	5	34	3	15	48	53				x	5	1(2)	
Ena obscura												1							
Punctum pygmaeum												25					2	1	
Vitrina pellucida						1		4(5)				x					x	1	
Vitrea contracta																			
Nesovitrea hammonis																			
Oxychilus alliarius						3(5)													
Limax/Deroceras spp								2			6	2							
Euconulus fulvus																		1	
Celiciodes acicula		5		25		14			2	41	130	87					15	x	
Helicella itala	x	5(6)	x	10		1	x	16	x(2)	11	31	27	x				x		
Trichia cf *hispida*												2							
Cepaea nemoralis															3		1		3
Cepaea sp								x				x		x		x	x(2)	x	
Arianta/Cepaea apices												5 (juv)					1		
Marshy species																			
Succinea sp							x												
Vertigo angustior																			
Sample weight processed (when <2000g)		1600g															450g	430g	
Total molluscs (corrected to 2kg of sample)	2	40/ 50	2	15	1	14	10	67	8	28	97	156	1	1	3	5	16/ 71	10/ 47	3
Total including *Ceciliodes acicula*		45/ 56		40		28			10	69	227	243					31/ 138	11/ 51	

* Samples include one example of *Pupilla muscorum var bigranata*

oralis in these samples suggests that the vegetation was subject to little, if any, grazing before or after the Neolithic activity.

The central pit within the ring-ditch (K10) contained a diverse fauna which, together with the humic soil matrix, was charred. This fauna included two specimens of *Vertigo angustior*, a species which requires permanently wet grassland; they may have originated in the vicinity of the gypsey race which seems to have been considerably wetter and probably permanently damp in the Neolithic period. *Vertigo angustior* is exceedingly rare today and this is the first record of this species, fresh or fossil, in east Yorkshire.

The later molluscan faunas associated with the series of Iron Age features are markedly different; the shade requiring species such as *Cepea* are virtually absent and the faunas are dominated by *Pupilla muscorum*, *Vallonia excentrica*, and *Helicella itala* species, which indicates a dry, grazed, short-turf grassland.

The upper ditch fills of the two barrows and the Iron Age enclosure at Kirkburn contrast with the lower ditch fills, formed by subsoil collapse, which are almost devoid of molluscan remains. These upper secondary fills reflect the conditions bordering the ditch at the time of silting as well as those within the ditch itself and contain the species *Pupilla muscorum*, *Vallonia excentrica*, and *Helicella itala*, which seem to indicate that the landscape around the funerary structures continued to be grazed after construction.

The faunas from the Garton Iron Age graves are very similar and reflect their infill source more by numerical than species differences. Soil samples from GS7–10 were dark brown, humic, and clay-rich, with high proportions of matrix (50%), and contained predominantly patinated flint clasts. These samples evidently represent a high percentage of old topsoil incorporated in the grave infill, and contained at least 35 molluscan remains. Samples GX, IS, and IR from GS5 and GS6, which were light brown, sandy, and with little matrix (20–25%), containing predominantly rounded chalk clasts, represent a high proportion of old subsoil incorporated within the grave fill; these samples contained only one or two molluscan fossils. The remaining samples fall between the soil and subsoil of the original rendzina profile and this is reflected in the low number of molluscan remains. Again the fauna is dominated by the dry grassland species *Pupilla muscorum*, *Vallonia excentrica*, and *Helicella itala*, but the round barrow Iron Age graves at Garton associated with the course of the Gypsey Race (GS7 and GS10) also included specimens of *Pomatias elegans*, *Vitrea contracta*, and *Nesovitrea hammonis*, species which show that the turf was considerably damper in the vicinity of these graves than those which lay beyond the influence of the water course. A sample (IG) from a dark patch in the cart-burial (GS6) was, despite the low gross weight, very rich in molluscan remains and probably represents an included turf which might indicate that the turves were not stripped and removed prior to grave construction.

The linear ditches at Kirkburn (site 1, ditch Z; site 2, ditches bordering the Green Lane) probably represent field boundaries, as drainage would not have been a problem on such permeable soils. The basal fills of these ditches do not consist of collapsed subsoil but of gradual infill, which suggests that after initial construction and collapse they were cleared out rather than recut. The diverse fauna suggests that the ditches had been damper than the surrounding ground. The presence of *Ena obscura*, a woodland or scrub species, together with a diverse fauna in ditch TT3 suggests that a hedge had been planted adjoining the ditch, reinforcing the boundary line.

The Anglian grave fauna is not markedly different from those from the earlier graves, other than the increased percentage of *Ceciliodes acicula*, and includes the species *Helicella itala* and *Vallonia excentrica*, which prefer dry calcareous grassland. The inference is for a continued grassland vegetation which was probably grazed.

The overburden of the soil profile at the centre of Barrow G differs from the underlying buried soil by the absence of *Pupilla muscorum* from the molluscan fauna. This species avoids arable cultivation and may indicate disturbance of the overburden by medieval ploughing.

Discussion

Virtually no work has been done on the mollusca associated with archaeological finds in east Yorkshire, except for an early study by the Rev E P Blackburn of hand-picked snails taken from numerous Bronze Age and a single Neolithic barrow, excavated by J R Mortimer (Blackburn 1908). Most of the snails recovered were *Cepea nemoralis*, *Cepea hortensis*, or *Arianta arbustorum*. These species indicate that the Bronze Age barrows were constructed on a landscape covered by ungrazed or lightly grazed tall, moist, herbaceous vegetation. Other snails found beneath these barrows included *Discus rotundatus*, *Oxychilus cellarius*, *Oxychilus alliarius*, and *Trichia hispida*, all species requiring some damp and shade to survive, and unlikely to be found in anything but tall, moist, rich herbaceous vegetation or rich grassy vegetation mixed with some scrub. Two specimens of *Acicula fusca*, a species requiring permanently damp grassland, were recorded from Bronze Age barrows at Garton Slack, together with the marsh snail *Succinia putris*.

b The environmental evidence from pollen preserved by copper salts from Iron Age and Anglian graves at Kirkburn and Garton Station

by J R A Greig

Introduction

The preservation of plant remains is usually a chancey affair, except in the case of completely waterlogged sites. Where sites are on a light rendzina soil, conditions for preservation are at their most difficult. However, few archaeological sites have no plant remains preserved at all. In the case of the excavations at Garton Station in 1984 and at Kirkburn in 1985 the writer was able to collect suitable material from copper corrosion products, or to ensure that it was collected later during conservation of the metalware, which has provided these results.

Description of samples

Garton Station (Anglian)

GS32 Cauldron fill; chalk gravel, lumps of earth and smaller dark lumps of amorphous organic material, possible wood fragments and flakes of verdigris; a few amphibian bones and possibly some from small mammals such as voles or mice

GS32 Cauldron outside; as above, but less organic material and no bones

GS33 Hanging bowl fill

GS33 Hanging bowl outside

Kirkburn (Iron Age)

K5 Organic material from toggle (KR/AR); very small amount of organic material; soil and copper corrosion products; little pollen

K5 organic material from terret (KR/AU); very small sample, little organic material, copper corrosion; little pollen

K5 organic material from strap union (KR/BD); moderate amount of organic material; plenty of pollen

K5 Organic material from strap union (KR/BE); organic material and copper corrosion products; moderate pollen

K5 Organic material from 'lid' (KR/BV); a bit like wood although structureless

K5 Organic samples from nave hoop (KR/CD); also like wood

K5 Organic material from toggle (KR/DD); iron corrosion products, not much organic material

K5 Organic material from nave hoop (KR/DH); amorphous organic material

K6 Organic material from ring (KR/CM); a mass of small round objects, although unidentifiable; plenty of pollen

Preparation

The samples were taken from their sealed plastic bags and prepared for pollen analysis by normal means: they were disaggregated in hot 5–10% NaOH. The fine material was sieved through a 0.3mm mesh, and what was left was examined under a binocular microscope for any macroscopic information about the material, quoted above under 'description of samples'. The fine material was subjected to the usual series of chemical processes such as hydrofluoric acid treatment and acetolysis, stained with safranin, and mounted in glycerin jelly on slides. Some of the pollen was rather shrunken and shrivelled, making it hard to identify, and counting was often done under oil immersion (magnification ×1000). In other cases where there was a very little pollen, it was necessary to scan the slide(s) at lower power to find enough pollen to count; indeed, this was all that could be done with poor samples such as KR/AR. There was some pollen that could not be identified (recorded as 'varia'), and because of the state of the pollen these analyses are not always as exact as those from more conventional waterlogged deposits.

The preservation of pollen by copper

Pollen normally decays in a biologically active soil such as that around Kirkburn, so that even the tough exine is destroyed by soil fungi and only a few thick-walled grains are left, if any at all; pollen analysis is then difficult (Dimbleby 1985). I have the negative results of many unsuccessful soil pollen analysis preparations that show this disappearance of pollen from the soil.

Copper salts can preserve pollen by their fungicidal action. This is why organic copper compounds such as 'Cuprinol' are widely used for the treatment of structural timber today. In the case of buried copper or bronze, the decayed products in the grave may have themselves promoted the formation and spread of copper corrosion products, and so encouraged the preservation of organic material nearby. Liquid in containers such as drinks may have become sour and acid, while corpses would have gone through a phase of liquefaction and released fluid that would have corroded the metalwork. This unpleasant state of affairs is shown by the preserved nematode worms that were found covering a copper-alloy brooch in a grave in sandy soil (Platt 1980).

The organic material preserved in contact with metal objects is noticeable if one is looking for it, otherwise it may just be considered a part of the green mass of corrosion products (verdigris). The presence of these few grammes of organic matter are, hardly surprisingly, often unnoticed by the people who excavate them and therefore not collected for investigation. However, some of them contain useful amounts of preserved pollen.

Understanding these spectra

When interpreting pollen spectra from naturally-formed sediments such as those from lakes and buried soils, it is normally assumed that the pollen was mostly carried there from the surrounding vegetation ('catchment') by natural transport such as in wind and streams. The results therefore represent the local and regional vegetation according to various factors of production and dispersal, which are well discussed in the literature.

In the case of manmade deposits such as pits and latrines in settlements, pollen was also brought there on or in pollen-containing materials, for instance in cereals and their products, grasses, hay, dung, fibres, peat, etc. Some of the resulting pollen spectra are recognisable, especially with the aid of macrofossil, beetle, and other results (Greig 1982). Deposits such as wells and ditches can represent either natural or manmade pollen deposition conditions.

Often there are indications whether a deposit has formed from pollen rain of plant materials, from macrofossils, beetle remains, etc. The amounts of copper-preserved organic material is usually much too small to contain anything much in the way of macrofossils, so the pollen spectra have to be interpreted unassisted. However, sometimes the circumstances of the finds give some clues as well as the spectra themselves.

Results

Garton Station: Anglian grave goods (G/i, G/o, G/b in Table 30)

Cereals and other cultivated plants

The cauldron had a good pollen flora inside and outside and the hanging bowl somewhat less so; there the vast number of fungal spores show that the action of the copper had been slow. They had an overall similarity in pollen flora, with (in descending order of abundance) roughly equal large amounts of grass and cereal pollen, some *Plantago lanceolata* (ribwort plantain), and traces of a large range of herbs and trees. Inside the cauldron the Cerealia pollen (43%) seemed to consist of *Triticum* type

Table 30 Pollen recovered from Garton Station and Kirkburn

	Garton (Anglian)			*Kirkburn (Iron Age)*				
	G/i	G/o	G/b	AR	AU	BD	BE	CM
Pinus (pine)	-	-	-	-	+	2	1	-
Ranunculus tp (buttercup)	1	2	6	-	-	1	2	2
Papaver tp (poppy)	+	-	-	-	-	-	-	+
Caryophyllaceae (stitchwort)	-	+	-	-	-	-	1	1
Spergula (spurrey)	-	+	-	-	-	-	-	-
Chenopodiaceae (goosefoot)	-	+	-	-	-	-	-	-
Tilia (lime)	-	-	-	-	-	-	-	+
Linum usitatissimum tp (flax)	+	-	-	-	-	-	-	-
Acer (maple)	-	-	-	-	-	-	-	+
Trifolium repens (white clover)	22	-	2	-	-	-	1	8
Trifolium pratense (red clover)	-	+	-	-	-	-	-	-
?*Anthyllis* (kidney vetch)	-	-	-	-	-	-	1	-
Lotus tp (trefoil)	1	+	-	-	-	-	-	3
Vicia faba (field bean)	-	+	-	-	-	-	-	-
Leguminosae (pea family)	-	+	-	-	-	-	-	3
Filipendula ulmaria (meadowsweet)	+	1	-	-	-	2	2	21
Potentilla tp (cinquefoil)	-	-	-	-	-	-	1	15
Sanguisorba minor (salad burnet)	2	-	12	-	-	4	2	+
Polygonum persicaria (red shank)	1	-	-	-	-	-	-	-
Polygonum bistorta tp (bistort)	-	-	4	-	-	-	1	-
Rumex (dock)	2	3	-	-	-	-	2	+
Urtica (nettle)	-	-	-	-	-	-	1	+
Ulmus (elm)	-	-	-	-	-	-	-	+
Betula (birch)	+	+	-	-	-	+	2	-
Alnus (alder)	1	1	4	-	-	2	4	1
Corylus (hazel)	2	4	8	-	-	2	5	-
Quercus (oak)	+	1	-	-	-	2	-	1
Salix (willow)	-	-	-	-	-	-	-	5
Ericales (heather)	+	+	-	-	-	+	-	1
Fraxinus excelsior (ash)	-	-	-	-	-	1	1	-
Lamium tp (dead nettles)	-	+	-	-	-	-	-	+
Rhinanthus tp (yellow rattle)	-	-	2	-	-	-	-	-
Plantago major (greater plantain)	-	-	2	-	-	2	-	+
Plantago media (hoary plantain)	-	-	-	-	-	-	1	1
Plantago lanceolata(waybread)	2	11	6	-	-	23	14	11
Campanulaceae (bellflower)	-	-	-	-	-	-	-	+
Galium tp (cleaver)	+	+	4	-	-	1	2	1
Sambucus nigra (elder)	-	-	-	+	+	+	-	-
Compositae (T) (daisy)	2	3	8	-	-	1	+	1
Artemisia (mugwort)	+	2	2	-	-	+	-	+
Cirsium tp (thistle)	+	1	-	-	-	-	-	2
Centaurea scabiosa (greater knapweed)	-	-	-	-	-	-	-	+
C nigra (knapweed)	+	+	?	-	-	-	-	-
Compositae (L) (dandelion)	1	4	6	-	-	2	3	1
Cyperaceae (sedges)	1	+	-	-	-	-	-	+
Gramineae (grasses)	40	35	16	-	-	47	51	13
Cerealia (cereals)	41	35	12	-	-	4	2	2
Secale tp (rye)	-	+	-	-	+	-	-	-
varia (unknowns)	2	2	4	-	-	+	4	16
Pollen sum	176	314	50	-	-	245	167	285
Polypodium (polypody)	-	-	(4)	+	+	(2)	(1)	-
Pteridium (bracken)	-	-	-	?	?	(4)	(28)	(+)
fungal spores	-	-	++++	-	-	-	-	-

Key: G/i, G/o, Garton, inside, outside bronze hanging bowl; G/b, cauldron fill; % total pollen; + = <1%; taxonomic order

(wheat) and *Hordeum* type (barley) in roughly equal proportions. A grain of *Linum usitatissimum* (flax) was counted during scanning of the slide. The deposits outside the bowl (G/o) included some probable *Secale* (rye) which was also seen when the slide was scanned, and a grain of *Vicia faba* (field bean). The hanging bowl contained less cereal pollen (12%) in the small count that was possible.

Cereals liberate little pollen (apart from rye), although large amounts can be found in whole cereal products such as grain, straw, and chaff (Greig 1982). Only traces of cereal pollen would be expected from naturally dispersed spectra from an arable landscape. The large amounts of cereal pollen in these Garton spectra probably therefore represent whole plant material rather than natural transport from the atmosphere. The cereal-rich spectra may therefore relate to some long-vanished cereal contents of the bowl, perhaps food or drink, although they could equally but less interestingly be from straw. The record of flax is interesting since a test showed that flax flowers contain only about 370 pollen grains each (compared with many thousands in cereals) and this scarcity makes flax pollen very under-represented. Flax is, of course, well known as an important Saxon crop so it is interesting to get a record of it here, and likewise the field bean.

Weeds

The pollen of cornfield weeds is sometimes found with cereal remains, although these do not give a very distinctively identifiable pollen record; *Papaver* (poppy), *Spergula* (corn spurrey), *Polygonum persicaria* (redshank), and *Artemisia* (mugwort) are the best examples.

Grassland plants

Among the other pollen records are a number of taxa such as *Trifolium* spp (clovers), *Lotus* (birdsfoot trefoil), *Sanguisorba minor* (lesser burnet), *Plantago lanceolata* (ribwort plantain), *Centaurea nigra* type, and Compositae (L) (hawkweeds, dandelions, etc), as well as large amounts of Gramineae (grass) pollen. This group is indicative of grassland, probably fairly short and calcareous as shown by the presence of lesser burnet. I have seen the latter growing abundantly on the barrow at Belas Knap, showing its suitability for such a habitat. Many of these plants now grow in the green lanes that run between the fields. These pollen types are quite often found in waterlogged deposits and seem more likely to have arrived with pollen rain from the atmosphere rather than from plant materials.

Signs of woodland

Tree and shrub pollen is not abundant, being mainly represented by a trace of *Betula* (birch), *Alnus* (alder), *Corylus* (hazel), and *Quercus* (oak). This pollen is widely scattered on the wind, and could have arrived from the vicinity. It would be most surprising if the landscape had been completely treeless during the time the deposits formed! The Ericales pollen does not seem to belong in this area, but maybe it travelled a distance on the wind.

Wetland

Vegetation from wet places is represented, somewhat surprisingly on this dry site, in the form of *Filipendula ulmaria* (meadowsweet) and *Polygonum bistorta* type (bistort). The amounts are small, however, and the pollen could have arrived in a number of ways.

One can conclude that the abundance of cereal pollen and the traces of flax and bean pollen in the bowls may well represent something that was in them, such as offerings of food and drink. Some of the large range of herbaceous pollen could conceivably have come from honey, although it could equally have come from the local vegetation.

Kirkburn: Iron Age grave-goods

The Iron Age bronzework of the adjacent burial site at Kirkburn (in the next field to the Garton site) was sampled carefully for organic material preserved by the metalwork that might contain pollen, and the samples for analysis were recovered during conservation. Pollen analyses of some of these organic samples were successful, others just contained a trace of pollen. The successful analyses had a basically similar pollen spectrum.

Cultivated plants

The cereal pollen values, between 2 and 4% of the total, were what one would expect from an arable landscape and natural dispersal via the weather, rather than from whole cereals on the spot (as was the case with the Garton spectra).

Grassland pollen

Lotus (birdsfoot trefoil), *Trifolium repens* (white clover), *Plantago lanceolata* (ribwort plantain), and *Potentilla* type (cinquefoil) are suggestive of fairly short-turf grassland, pasture perhaps. *Centaurea scabiosa* (greater knapweed) and *Sanguisorba minor* (lesser burnet) suggest that it was dry and calcareous too (like today's Festuco-Brometea). However, the 21% *Filipendula* (meadowsweet) pollen suggests a damper kind of grassland as well (like the Molinio-Arrhenatheretea). The pollen could, of course, have accumulated from the local grassland flora via the atmosphere, but plant material seems a more likely pollen source in a grave that was open only a short time. The pollen content of various kinds of grassy material, although not calcicolous grassland, has been tested (Greig 1984).

In the case of the less successful samples, the sievings from the pollen preparation process had been examined under a stereo microscope, and some of the remains could have been those of wood. If so, this would explain the low pollen content. Leather is another material low in pollen which might also be the source of some of the organic remains.

Discussion of pollen preserved by copper

Over the years, other cases of pollen preserved by copper salts, mostly in graves, have occasionally been reported. These are discussed in Greig (1989). One such case was the enormous bronze vessel from Iron Age Hochdorf in south Germany with a crust almost entirely of pollen (Körber-Grohne 1985). The interpretation of honey in these remains depended on the presence of large amounts of pollen from insect-pollinated plants used by honeybees such as *Tilia* (sometimes far from its usual habitat) or members of the Labiatae. There are modern comparable spectra in honey from bees foraging in such traditional habitats, for example the linden-rich 'Waldhonig' sold in Germany today. Honey seems to be fairly readily identifiable as long as the spectrum is not too mixed.

Comparison with other pollen and seed studies

There are few conventional pollen analyses from wetland sites to provide the cultural landscape background for this region. Bush (1988) has studied waterlogged deposits at Willow Garth (between Rudston and Bridlington), on the course of the Gypsey Race. His results show signs of calcicolous grassland similar to those recovered from the copper-preserved material. According to these results, this grassy landscape seems to have existed since the Mesolithic period, although not everyone agrees with the interpretations, and it does seem strange not to have had signs of forest; still, the chronology is supported by ten radiocarbon dates. At another site, Roos Bog between Hull and Withernsea on Holderness, the uppermost part of the pollen diagram (Beckett 1981) shows undated signs of a lime/elm/oak mixed forest on the dry land (zone RB 7). This was supplanted by a much more open landscape, presumably in stages during the prehistoric period, and at the very top of the sequence (RB 10) one can also discern the grass/plantain/herb type of open landscape pollen spectrum (if one ignores the pollen input from probably local bog vegetation). In this article Steve Beckett also quotes his results from another site with signs of wildwood, Gransmoor Quarry (between Great Driffield and Bridlington Bay), where mixed lime forest seems to have developed during the Atlantic period, followed by clearance which started gradually after a radiocarbon-dated elm decline. Such small boggy sites are often surrounded by alder carr, which tends to mask the effects of general forest clearance somewhat, and adds an extensive wetland element to the pollen spectra. If these extraneous factors are ignored, the indications of open landscape are very similar to those obtained from the Kirkburn samples and those from Garton Station (apart from the pollen from cultivated plants). It is a pity that these episodes of landscape change and their chronologies were of peripheral interest to the projects in Humberside. We do know, however, from elsewhere that something approaching chalk grassland in an almost treeless landscape had developed by the Bronze Age, as shown by the results from the Wilsford Shaft in Wiltshire (Robinson, Dimbleby, Osborne in Ashbee *et al* 1989). The main opening-up of the wildwood may have taken place in many parts of lowland Britain during the later part of the prehistoric period – extensive evidence of woodland clearance was found round Scunthorpe (South Humberside) by Holland (1975), which was closely dated to the Iron Age. More evidence for this chalk grassland landscape comes from the fill of the Roman well at Rudston, which also contained seeds and pollen of many of these taxa (Greig in Stead 1980).

The evidence from the molluscs at this site presented by Nigel Thew and Pat Wagner agrees very well with the botanical data, with evidence during the Iron Age for dry, grazed, short-turf grassland, and also some signs of damp conditions.

c Deposition of clay in the Garton Station cart-burial

by Susan Limbrey

Samples of the material replacing the wood of the cart wheel rim and spokes, together with the surrounding fill of chalk gravel, were examined under stereo microscope, in thin section, and by particle size analysis.

Particle size analysis was carried out by sieving and by 'SediGraph' X-ray particle size analyser, after dispersion in an ultrasonic bath. Two samples gave differing results, in accord with the micromorphological evidence that size sorting occurred during deposition of the material. In both there was only a trace of fine sand and coarse silt, medium silt was present to 5 and 10%, fine silt to 10 and 20%, the remaining 85 and 70% being clay. The deposit is and massive when dry but when wetted breaks down into a very fine flaky structure. The colour of the material is 7.5YR when moist, 7.5YR 6/4 in dry condition. The clay is predominantly non-calcareous, showing that it was derived from decalcified soils, probably the argillic soils which developed on the cryoturbated and soliflucted combination of loess and chalk in the surrounding Wolds, eroded during a period of arable farming. Stream flow in the valley floor has carried the silt and clay into the grave pit, where it was deposited not only in the spaces left by decay of the wooden wheel, but also as a coating to and partial infill of the spaces between the chalk pebbles packed around it.

It is clear from micromorphology that the silt and clay did not infiltrate in such a way as to infill or replace the wood as it decayed. In the samples examined, the only traces of wood structure were those preserved in the corrosion product of the iron tyre. The silt and clay were deposited as laminae which initially followed the contours of chalk fragments which had pressed against the wheel. Laminae vary from less that 0.1mm to about 0.3mm and are size-sorted, having alternating silt and clay bands. After initial formation of continuous laminae, further deposition involved a more lenticular form (Fig 91, a), possibly as a result of water dripping rather than flowing into the vacant space, and the silt component becomes less evident. The centre of the space is eventually filled by clay with very little silt, suggesting increasing filtration of the transported material and slowing of flow as the spaces through which the water was percolating became constricted. There is a scatter of silt-grade black particles, probably fine char or soot from smoke, of a kind which is common in agricultural soils and here has been sorted during erosion and transport so as to travel with material of finer grade because of its lower density than the mineral material.

Seen under stereo microscope, a fracture surface displays the lenticular structure which is also apparent in the way in which the material breaks down when wetted. Some surfaces display a pronounced complex ripple effect (Fig 91, b). This occurs particu-

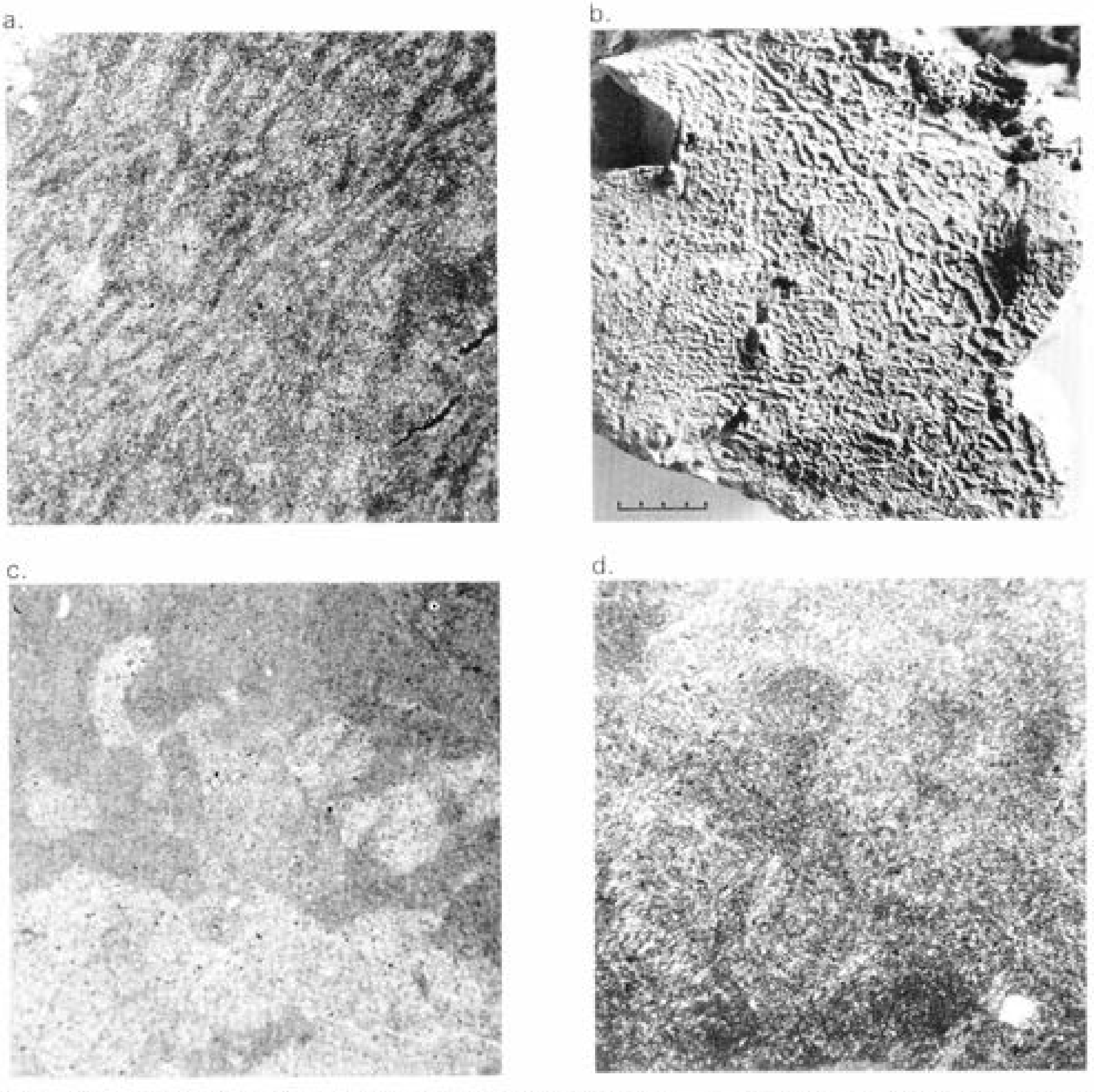

Fig 91 Thin-sections of clay from the Garton Station cart-burial (GS6): a, showing lenticular structure (crossed polarizers, frame length 2.5mm); b, surface of a crack across the infill, under incident light, showing 'ripple' modelling, worn trails, and, on the flatter area to the left, faecal pellets (incident light, scale divisions 1mm); c, showing a mixture of finer (dark) and coarser (light) material via animal burrowing (plane polarized light, frame length 2.5mm); d, showing complete reworking by animal burrowing, with crescentic and circular orientation patterns in the clay (crossed polarizers, frame length 0.6mm) (photo: Birmingham University)

larly where the deposit had developed cracks when the clay shrank on partial drying, and may be the effect of the pulling apart of the still moist clay, but these surface have also been traversed by worms whose trails lead into holes which penetrate the clay mass. It is possible that the entire modelling of the surfaces is in fact the result of worm traverses. Faecal deposits of these worms are scattered about, mostly short cylinders with rounded ends but including longer casts. These deposits are of identical material to that of the surfaces on which they lie, except that close to the corroding iron tyre, where the whole deposit is rust-stained, there are rusty pellets on unstained surfaces and vice versa. In places, the faecal pellets are seen to be 'melting' into the surface on which they lie.

In thin section, the effect of animal working is seen in the disruption of the laminar structure, and the mixing of material of different particle size distribution via burrow formation and infill (Fig 91, c). The worms appear to have avoided the more silty areas and have in part followed the more clay-rich laminae, and in the central part of the infill where there is little silt, the whole fabric is thoroughly churned up, the depositional orientation of the clay being replaced by orientations in burrow fills which appear crescentic or circular depending on the direction in which the section cuts them (Fig 91, d).

While attribution of the structures observed to the activity of animals seems clear, identification of creatures involved is less so. The trails and burrows are of the order of 0.2 to 0.5mm across, the faecal deposits rather less, sizes consistent with that of Enchtraeidae. These worms, however, are characteristic of soils rich in decaying plant material and are very common in the litter and root mat zones, and much less so at depths of more than a few centimetres. Though they ingest fine soil as well as organic tissue they would need a higher organic content than would appear to have been present here, since it is clear that their activities follow decay of the wood rather than being involved in it. Enchytraeidae do retreat to some depth in the soil to avoid dry conditions at the surface, and it may be that the grave pit provided a refuge rather than a food supply, though the possibility remains that other contents of the grave were providing their nutrition.

9 Geophysical prospecting

a Geophysical prospecting at Rudston

by A J Clark

The south field (R1–22)

The first prospecting work in the area was carried out by the Ancient Monuments Laboratory on the site of the group of barrows in the southern field in 1968. Preliminary tests were made with resistivity, using the then conventional Wenner configuration of electrodes at 3ft (0.91m) spacing, and with the Elsec proton magnetometer. Both of these were ineffective for detecting the barrow ditches, but a successful survey was made with the square array resistivity configuration with electrode spacing and reading interval both at 2.5ft (0.76m).

The result of the survey is shown in Figure 92, where it is compared with a plan of the subsequent excavation. The survey is presented as a manually produced 'dot density' plot, each reading being represented by a group of randomised dots proportional in number to the difference between the reading and a base level typical of undisturbed ground, giving an overall half-tone effect. Because of their slightly better water retention, the ditches gave lower readings than the surrounding natural. Few ditch readings diverged by more than 3 ohms below the base level of 18 ohms, and dot density saturation was therefore set at 15 ohms.

The plot shows some stripiness and overall step changes of density level, due to small changes in mean resistivity caused by intermittent rain during the survey. Barrows in the northern part of the area tend to disappear in an overall darkening of the plot where deeper topsoil against the field boundary has lowered the background resistivity level. Modern filtering methods could have compensated for this. Grave pits, although discernible in at least two barrows, are not well represented because, as they were rapidly backfilled mainly with the material into which they were dug, the porosity of their contents does not contrast with the surrounding natural as do the slowly accumulated fillings of the ditches. Natural soils and bedrocks forming a solid mass will often change greatly in resistivity when broken up, but the texture of the chalk gravel natural of this site would not be much altered.

The same area was surveyed with the proton magnetometer. This showed no response to the barrow ditches, confirming the initial tests, but a substantial magnetic anomaly (70 nanotesla (nT) peak; 5.5×3m in extent) within barrow R11. This was interpreted as a cart-burial. A pulsed induction metal detector showed no response, but this was thought to be because of the depth of the anomaly source. The excavation later showed that no cart existed, and subsequent examination showed that the source of the anomaly was a fortuitous admixture of magnetite, probably of glacial origin, with the natural chalk gravel at this point.

Because of the varied instrumental response on this site, it was decided to use it as a test-bed for comparing the capabilities of a number of new instruments and techniques that were emerging at the time, using the resistivity and magnetometer surveys as controls. Colleagues responded enthusiastically, and tests were made with pulsed induction meters of different types, magnetometers, the so-called SCM (Soil Conductivity Meter) and infrared detection. The exercise is described in Clark (1990). It provided valuable information especially on the limitations of techniques and, in the case of the SCM, led to a reappraisal of its principle of detection.

The north field (Makeshift, including R26–44)

In contrast with the detailed work in the southern field, this survey was designed primarily as a wide-ranging search for barrows containing cart-burials. Using the Elsec proton magnetometer, 260 50ft (15m) squares were surveyed at a reading interval of 5ft (1.5m) over a period of three weeks.

Only one magnetic anomaly suggestive of a vehicle was encountered, peaking at 30nT; but a detailed resistivity survey of the square containing it showed no coherent pattern indicating a barrow, and it was concluded that the anomaly was caused by modern iron rubbish, or more probably natural interference of the kind already encountered. The only clearly defined archaeological feature was the continuation of the southern boundary ditch of the area containing the barrows in the south field (just missed by the survey there), which gave anomalies reaching 20nT in places.

b Geophysical prospecting at Garton Station and Kirkburn

by A L Pacitto

In view of nineteenth-century and later discoveries at Arras and elsewhere in East Yorkshire the probability of a vehicle burial turning up during the excavation of an Iron Age cemetery in this area must be high. With this in mind a series of magnetic surveys was carried out in advance of excavation on several sites, starting in 1959. These surveys proved negative, with the exception of one doubtful result at Rudston in 1968, which on excavation was a natural anomaly (A J Clark's report, above).

Brewster's Garton Slack cart-burial was found in 1970 during excavation of an area threatened by quarrying and no magnetic measurements were taken. In 1984 a further three cart-burials were dis-

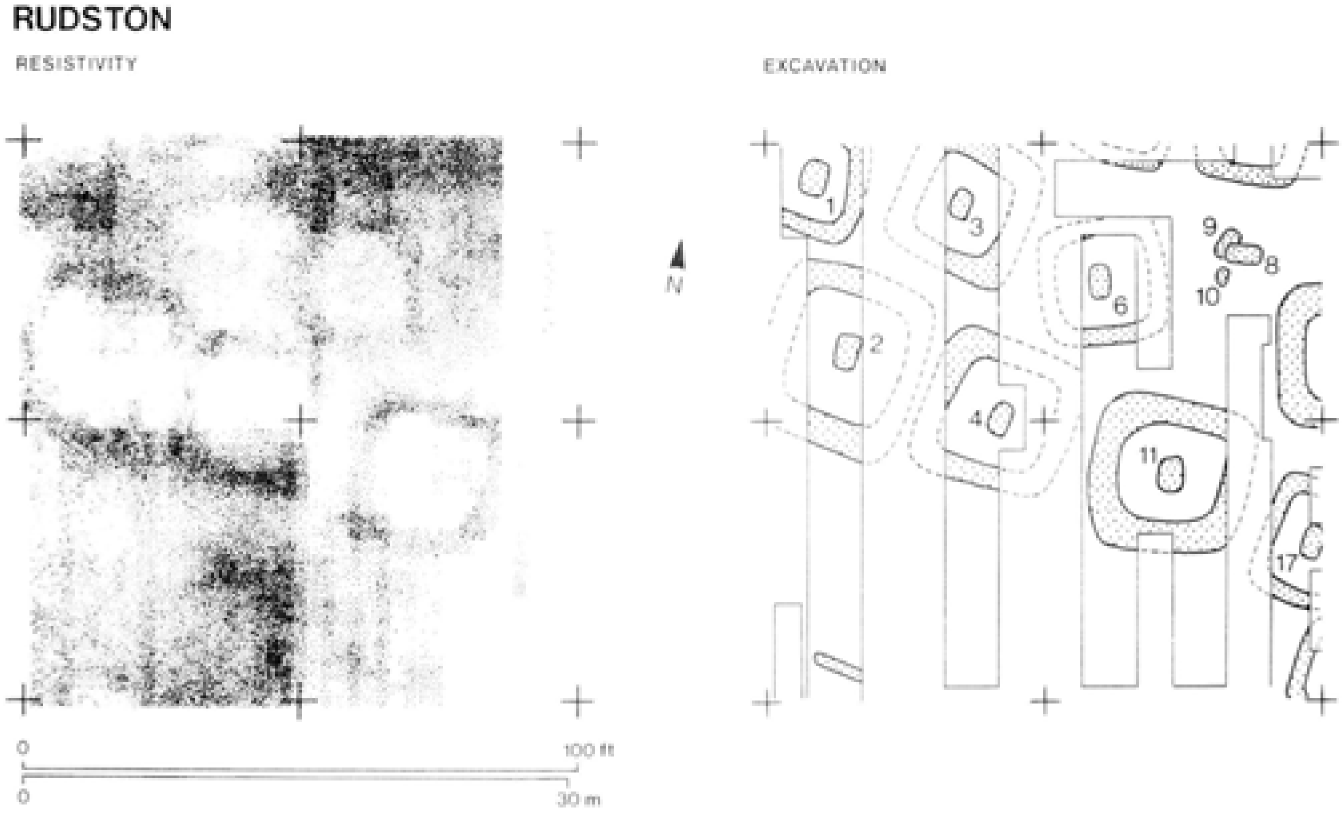

Fig 92 Resistivity survey at Rudston, compared with the results of the subsequent excavation (see also Fig 7)

covered in the same area during quarrying operations, and on this occasion a fluxgate gradiometer was on hand. Unfortunately it developed a series of faults, and a detailed survey was impossible, but it appeared that the anomaly caused by the iron tyres was high, probably in the range of 100 to 200mA/m.

With this in mind several sites were selected from air photographs, and surveys were carried out in the autumn of 1984. Three large anomalies were found, all within the central areas of square-ditched enclosures. Two were close together near Garton Station, while the third was in North Yorkshire, on the Howardian Hills.

These anomalies were plotted in detail on a half-metre grid aligned on magnetic north. The instrument used was a Plessey fluxgate gradiometer with 1 metre separation and scaled in mA/m. At the North Yorkshire site the negative readings peaked at –120, similar to the larger enclosure at Garton Station (Enclosure L, Fig 20), which was –130. The anomaly in the smaller Garton Station square (Enclosure R, Fig 20) was somewhat different however, reaching only –40mA/m against a positive of 180. All three anomalies had a maximum horizontal spread of about 6 to 7m at ground level.

On excavation the anomaly in Enclosure L at Garton Station proved to be a bar of iron some 1.1m long at a depth of 0.6m below the surface of the gravel (in the Anglian Burial GS32). This was consistent with the magnetic plot obtained from the surface prior to excavation. The anomaly in the smaller enclosure caused some disquiet, however, for it was very difficult to reconcile it with either of the classic forms of cart-burial, ie with wheels removed and laid flat on the floor of the grave, or with wheels still attached to the axle and standing upright. On excavation it was found that the wheels had been removed, and they were leaning together against the side of the grave. Again this was consistent witht the magnetic plot – the high positive represented the tops of the tyres, while the weaker negative was from the lower parts on the floor of the grave.

It had now been proved that a pair of iron tyres would give a strong and easily detectable anomaly, but it was still not clear what the overall pattern would be from a more conventional grave with the tyres lying flat and not overlapping. This was settled in 1987 when yet another large anomaly was found within a square barrow about 400m to the south of the Garton Station site in Kirkburn parish. Again it was a simple bipolar pattern covering an area about 6m across, but this time the readings were rather lower, peaking at 70 and –60mA/m, which suggested iron at a greater depth.

On excavation a very large grave was found with two iron tyres lying flat and almost touching one another. An unexpected complication was the coat of iron mail lying over the adjoining tyres in the centre of the grave, but this probably had little effect on the overall pattern as seen from ground level. The assumption of a deep grave proved correct, with the tyres being found 1.25m below the gravel surface.

Until 1984 there was little idea of the scale of anomaly to be expected from a pair of buried iron tyres, nor was it obvious what kind of pattern would appear, so the discoveries at Garton Station and Kirkburn provided invaluable information. The iron bar in the Anglian grave gave a pattern very similar

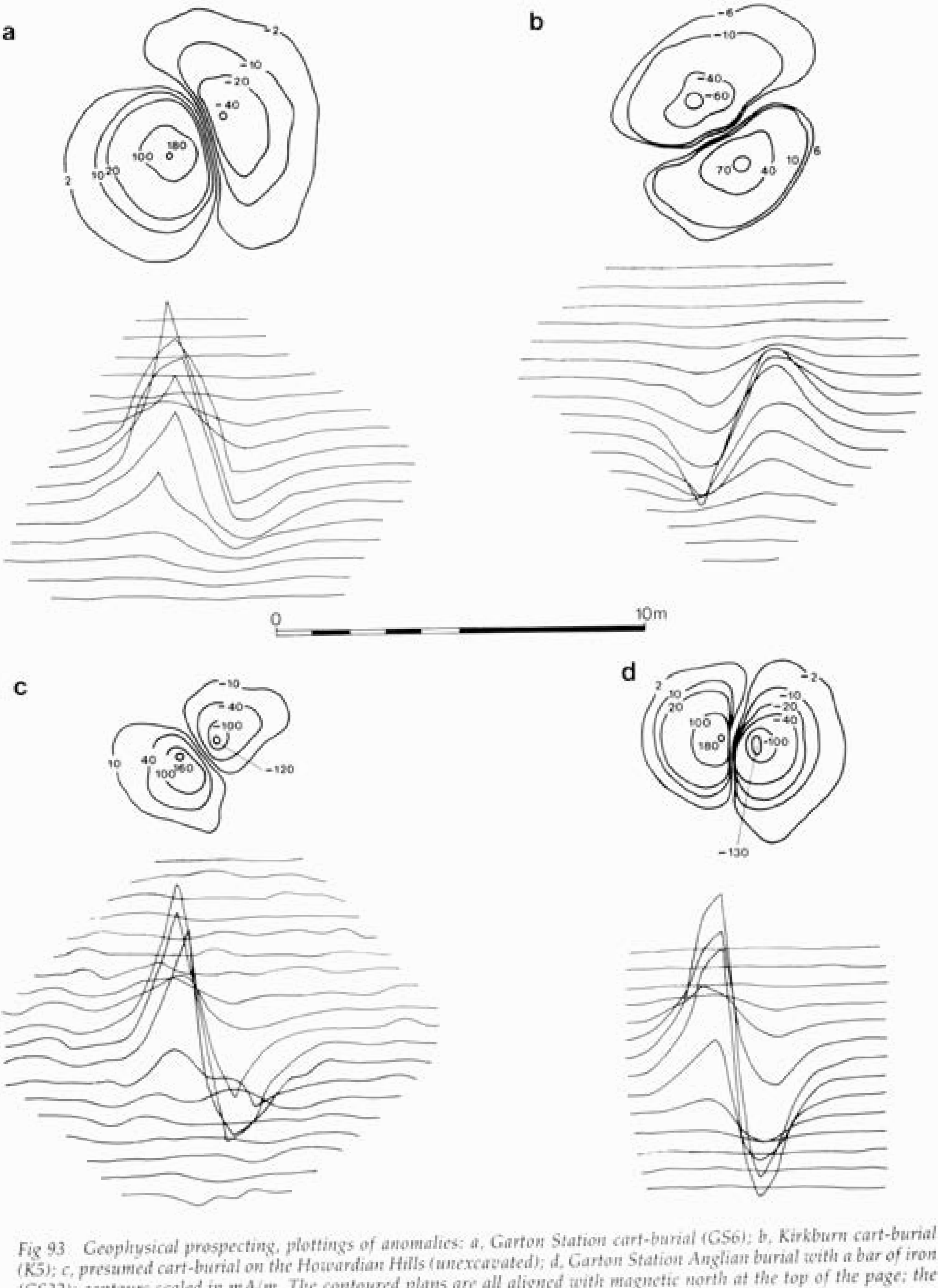

Fig 93 Geophysical prospecting, plottings of anomalies: a, Garton Station cart-burial (GS6); b, Kirkburn cart-burial (K5); c, presumed cart-burial on the Howardian Hills (unexcavated); d, Garton Station Anglian burial with a bar of iron (GS32); contours scaled in mA/m. The contoured plans are all aligned with magnetic north at the top of the page; the graphs are drawn on a line cutting the high and low points of the survey

to both the Kirkburn cart-burial and the anomaly on the Howardian Hills, although when plotted in graph form (Fig 93) the gradient between the north and south poles was rather steeper, as might be expected from what was virtually a bar magnet. The Garton Station cart-burial plot was atypical and reflected a unique arrangement of the tyres.

Attempts were made to record the magnetic plan at various levels during excavation, but this proved impractical, partly because of to the restricted space in the grave, but mainly because of the extreme magnetic gradients. They were so great that an almost imperceptible movement of the gradiometer could alter the reading by a factor of 10 or more, and levels eventually rose beyond the range of the instrument (3000mA/m). The symmetrical bipolar pattern did break down, but only after the useful limit of the gradiometer had been reached.

In view of the importance of these burials, every effort was made to obtain advance information of the presence and distribution of metalwork before it was uncovered. This was difficult, particularly in the Kirkburn grave, where the electromagnetic smog from the tyres and mail effectively blinded any of the more sophisticated instruments. A very cheap and insensitive detector of the type used to find electrical wiring or water pipes in walls was helpful in these circumstances, and a simple magnetometer based on a Hall Effect transistor might have been useful. One specific problem arose with regard to the mail. It was in a very fragile condition, and removing it in a block could have endangered other objects which it might have concealed. Obviously there was no hope of seeing through it with any form of metal or magnetic detector because of the underlying tyres, and the only alternative seemed to be a sonic technique. Mr E C Button, MRCVS, of The Mount Veterinary Group, Malton, very kindly agreed to help, and came out to the site with his ultrasound machine. A polythene bag filled with water was used as an interface between the probe and the mail, but unfortunately no consistent results were achieved. In part this may have been due to the voids beneath the mail, but the gravelly filling was not helpful either.

A pulsed induction meter was used with some success, particularly in the Garton Station cart-burial, where the tyres were further from the other artefacts. In no case was it possible to locate the grave from the surface using a metal detector.

The gradiometer surveys are plotted in plan and 'section', or graph, form, as this seems to be the most informative method of presentation. All graphs are drawn on a line cutting the high and low points of the survey.

10 Scientific analyses

a Report on the petrology of pottery from Iron Age cemeteries at Rudston and Burton Fleming

by I C Freestone and A P Middleton

Introduction

Twenty-eight vessels from burials and barrow ditches were sampled and examined in thin section in the petrological microscope. On the basis of their inclusions, they have been divided into two main groups, according to whether they contain rock or sparry calcite temper. Some indication of size and proportion of inclusions is given in this report. However, these estimates do not always reflect the appearance of the fabric in the hand specimen, in which relatively sparse, coarse inclusions, which were not sampled by the thin section, may appear prominent. Similarly, the recorded presence of a rock type in a fabric may be based on the observation of only one or two fragments in a thin section, owing to the low density of the coarse inclusions. Thus the sample examined was not always a statistically reliable one.

Table 31 lists the vessels examined and the main inclusions recorded.

Fabric Group 1: rock temper (22 vessels)

This fabric is characterised by the presence of sparse to common angular to sub-angular rock fragments, typically up to a few millimetres in diameter, but occasionally reaching 10mm. They are typically polymineralic, appear to be unweathered and have not disaggregated into their component minerals to any marked extent. These coarse rock fragments are set in a brown birefringent fired clay matrix which typically contains common to abundant, poorly sorted quartz silt and sand up to 0.5mm diameter. Identifications of the rock fragments are given in Table 31. Most common are varieties of basalt and dolerite (essentially the same mineral assemblage: dolerite is

Table 31 Petrology of pottery: vessels examined, fabric groups, and principal inclusions

Fabric Group 1: rock temper, erratic fabric group

R91	FG/CH	basalt			
R143	FA/CR	basalt			
R12	FL/AF	olivine basalt			
BF37	FZ/CB	olivine basalt			
R6	FE/BY	orthopyroxene basalt			
R14	FL/BS	dolerite			
R25	FN/AO	dolerite			
BF10(D)	FR/CW	?dolerite			
R11	FL/BO		granite		
BF18	FR/AP		granite		
R71	FG/AL		myrmekitic granite		
R27	FM/BH			quartzite	
R28	FG/DD			arenite	
R46	FB/AX		pyroxene syenite		
R20	FL/CL				limestone
R32	FM/CP	basalt (1)		arenite (2)	
R180	FA/AR	olivine basalt (1) plagioclase phyric lava (2)			
BF28(D)	FZ/DZ	dolerite (1) lamprophyre (3)		arenite (2)	
R80(D)	FG/DA	basalt (2)	hornblende granite/diorite (3)	arenite (1)	
R39	FM/LX	?dolerite (2)		arenite (1)	
R22	FL/CY	olivine basalt (1) dolerite (2)		arenite (3)	(chalk)
R76	FG/CP	dolerite (1)		quartzite (2)	(chalk)

Fabric Group 2: sparry calcite temper, calcite fabric group

R13	FL/AA	abundant sand, sparse calcite
R18	FL/DB	
R37	FM/DQ	
R186	FA/AB	
R204	FH/BA	
R84	FG/BP	glauconitic clay

Notes: The numbers in parentheses following the inclusion type in Fabric Group 1 indicate ranking according to relative abundance; (D) indicates that the vessel was found in the barrow ditch rather than the grave.

coarser grained). Also present may be granite, quartzite, a range of sandstones (grouped together as 'arenite' in Table 31), and more exotic rock types such as pyroxene syenite and lamprophyre. One section (R20, FL/CL) contains two limestone fragments only: one of these is microcrystalline and the other a pelletal limestone. This vessel is tentatively grouped with the other rock-tempered vessels despite the low frequency of inclusions and the fact that it is the only example of a calcareous temper (the others are silicate rocks). Two vessels (FL/CY(13), R22; FG/CP(10), R76) show sparse rounded grains of chalk in addition to rock temper. However, in view of the morphology of the grains, it is probable that they were incidentally included in the clay, which may therefore have been superficial cover on the chalk outcrop. On the basis of the foregoing, of the 22 sherds examined in this group, 15 contain only a single rock type, 4 contain 2 rock types, and 3 contain 3 rock types. These estimates of the number of rock types are minimal, because of the sampling difficulties referred to above and in some cases because of problems in classifying one or two isolated fragments of a complex rock type.

There can be little doubt that the rock fragments (except the chalk) observed in the fabrics represent deliberately added crushed temper. They are coarse, angular, and polymineralic, in marked contrast to the finer, naturally included, quartzose silt and sand grains in the same fabrics. Furthermore, the predominance of polymineralic rock fragments indicates that they are not present as the result of prolonged weathering and sedimentary transport.

Finally, in order to explain the rock fragments as natural inclusions, it would be necessary to invoke a wide range of compositionally unusual sands or gravels, each composed of essentially a single rock type. Given the regional geology (Mesozoic sediments) this seems most improbable.

As has been implied, the rock temper fragments are not compatible with the local bedrock geology. Furthermore, although there are limited outcrops of basaltic and doleritic rocks (Whin Sill, Cleveland Dyke) in north-east England, these do not appear capable of providing the *range* of basalt/dolerite types in the fabrics, and certainly not the additional even more exotic material such as pyroxene syenite, which in Britain is restricted to a few small outcrops in Assynt, Scotland. Indeed, the potential sources of the fabrics are further restricted by the combinations of temper types which occur in certain pots. For example, vessel FG/DA, R80(D) contains a combination of arenitic, basaltic, and granitic/dioritic rocks which would imply an uncommon juxtaposition of rock types if all had been derived from bedrock in the close vicinity of the site of manufacture.

It is therefore unlikely that the rock tempers in the pots were derived directly from outcrops of bedrock; such a situation would require a large number of remote pottery sources supplying Rudston and Burton Fleming, and furthermore that the potters themselves in some cases mixed tempers obtained from diverse localities. Rather, it is probable that the temper was obtained from the erratic pebbles and boulders in the superficial glacial boulder clays of the area. These pebbles themselves may have been moved by later fluvial activity.

The petrographies of the glacial erratic assemblages of Yorkshire were discussed extensively by Harker (in Lamplugh 1889; 1890), Phemister (1926), and others. Of particular interest is the widespread occurrence of Scandinavian boulders in the drift, which is likely to explain the occurrence of some of the more exotic rock types such as pyroxene syenite (probably originating in the Oslo igneous province).

According to Lamplugh (1890), in exposures on the Yorkshire coast, basaltic and other fine-grained igneous rocks make up between 7% and 50% of the boulders, while granitic, schistose, and gneissose rocks compose just a few percent. The bulk of the erratic rocks are Palaeozoic and Mesozoic limestones, sandstones, etc. Thus, while the drift contains the appropriate types of rock for the tempers of the pots, hard rocks such as granite, and particularly hard *black* rocks, such as basalt and dolerite, are over-represented, while soft rocks such as sandstones and particularly limestones are under-represented. This implies a strong element of selection of the materials used for temper from those available. Technological advantages of 'hard rock' temper for low-fired ceramics such as those of Rudston and Burton Fleming are not apparent. Indeed, in that these rocks are relatively tough, and therefore hard to crush, any real advantages offered over the other rock types are unclear. Furthermore, the predominance of hard rock temper is unlikely to reflect a local variation in the geology of the drift, for a similar bias has been detected by the authors in a number of other sites in the area. It may be that some spurious special property was attributed to pebbles or boulders of such material. Alternatively they may have been selected initially for other purposes – hearthstones, pounding, or grinding stones – and we are seeing in the pottery fabrics a recycling of such material.

In view of the diverse nature of the erratic inclusions, it is not possible at this stage to draw any firm conclusions regarding either the number of sources producing the Rudston and Burton Fleming pottery, or the locations of those sources. Examination of the matrices of the pots, however, reveals considerable textural variation between vessels (from abundant medium grained sand through to scattered silt). It is therefore unlikely that these vessels were produced from a single clay deposit, and probable that more than one source was involved.

Fabric Group 2: calcite temper (6 vessels)

These vessels are heavily tempered with poorly sorted angular grains of sparry calcite up to 5mm in diameter. Often the grains are monocrystalline rhomboidal cleavage fragments, and less frequently they are polycrystalline. In addition, subordinate to minor grains of cryptocrystalline calcite, identified as chalk, are present in all six examples. Composite chalk/sparry calcite grains are typically rare, but are readily recognised in some sections (eg FG/BP, R84). Quartz silt and in some cases sand are present in these sherds but are typically sparse, considerably less abundant than in rock-tempered Fabric 1. One vessel (FL/AA, R13) shows a converse situation with abundant sand and sparse calcite. Another vessel (FG/BP, R84) is characterised by the presence of common glauconitic pellets, 0.1–0.2mm in diameter; these were not observed in the other sherds.

The source of the sparry calcite is not clear, but its close association with chalk suggests that it may be derived from secondary deposits of calcite (eg tufa, caliche) associated with the chalk outcrop. Dr Paul Nicholson of the University of Sheffield has drawn our attention to a very convincing example of intimately associated chalk and calcite (apparently derived from chalk and vein calcite) in a calcite-gritted sherd of Roman date from Wharram Percy, North Yorkshire. Catt and Penny (1966) record the presence of a calcreted conglomerate containing pebbles predominantly of chalk, which rests on the surface of the Basement Till adjacent to the buried cliff which passes within a few miles of Burton Fleming; deposits of this type could be a source for the calcite temper, and merit further investigation.

The presence of glauconite in one of the sherds suggests a clay source in the Lower Cretaceous Speeton Clay, which outcrops a few kilometres to the north of Burton Fleming. However, rafts of glauconitic clay also occur in the glacial tills of the area (for an outline of the Quaternary geology, see Ellis 1987), so that no firm conclusion can be drawn at present. As in the case of the erratic-tempered material, the variations in the calcite-tempered fabric suggest more than one source for the pots but, given the variability of the superficial clay deposits in the area, the chances of identifying such sources are slight.

b The examination of red inlay on the brooches from Rudston and Burton Fleming

by Julian Henderson and Ian Freestone

Introduction

Of the 64 brooches from the cemeteries, decorative knobs, originally red or red-brown in colour, are clearly present upon eight. A further three show evidence of inlay partially coated by the products of corrosion of the iron of the brooches.

Samples were removed from seven knobs on six brooches, but it was not possible to sample the remaining objects without severe risk to their integrity.

Categories of inlay

Examination with a binocular microscope revealed two groups of inlay, one of opaque red glass and the other of mineral or stone-like material. The glass knobs have typically retained their original dome-like form, and have smooth, hard surfaces which, although they have dulled as a result of weathering, show no tendency to flake or exfoliate. In some cases, cracks have opened vertically through the knobs but heavily weathered glass was not found. In the present study, these red glasses, which have been applied to metal surfaces prepared to take them, are termed 'enamel'.

Table 32 Identification and analysis of knobs from Burton Fleming and Rudston

BMRL no	*Grave and brooch nos*	*Material*	*Analytical technique*	*Comment*
33084P	R22(E1)	glass (and coral)	LPM	well-preserved glass
33080X	R32(G1)	glass	EPMA, SEM	
33078W	R76(E5)	glass	EPMA, SEM	
33079U	R199(E7)	glass	EPMA, SEM	
33081V	BF41(E8)	glass	EMPS, SEM	
33085Y	R71(E4)	?glass	LPM	obscured by corrosion
33086W	R60(E3)	?dolomitic clay/ceramic	LPM	obscured by corrosion
33087U	BF10(C1)	glass	LPM	intact, not samplable
33082T	R39(A4)	(a) dolomitic clay/ceramic	XRD, SEM	
		(b) iron oxide	SEM	
33083R	R102(B1)	dolomitic clay/ceramic	XRD	
33088S	R178(A3)	?dolomitic clay/ceramic	LPM	obscured by corrosion

Key: LPM, low-powered microscope; EPMA, electron probe microanalysis; SEM, scanning electron microscope; XRD, X-ray diffraction

There are two types of mineral knob, distinguished by their relative hardness. The softer knobs have rough, matt surfaces. In some cases they have eroded from domes to more conical forms, the erosion having been partially controlled by planes of weakness which run parallel to their bases, producing a step-like effect in profile. The second type of mineral knob is represented by only one example. It is much harder and retains a dome-like appearance, although it is extensively cracked.

Neither of the mineral knob types is such a deep red as the glass and, with experience, both may be distinguished from it. Thus the presence of either stone or glass inlay has been determined in most cases, even where it was not possible to sample, and details are given in Table 32. On ten brooches it has been possible to identify 11 examples of inlay (one brooch, R39, has examples of both stone types), while the nature of the inlay on one object is obscured by corrosion.

Mineral inlay

X-ray diffraction of two examples of the softer mineral inlay, using Debye-Scherrer cameras, gave major lines corresponding to dolomite, with minor quartz and faint lines suggesting kaolinite (a clay mineral) and hematite (red iron oxide). The hematite is likely to be responsible for the red colour of the material.

In order to obtain a more precise identification, a sample was mounted in epoxy resin, polished with diamond pastes down to 1μm, and examined in the scanning electron microscope (SEM). Elemental analysis, using the energy dispersive X-ray analyser, indicated that the material was composed predominantly of iron oxide (*c* 40%), silica (27%), and alumina (12%); the constituents of dolomite, lime (8%), and magnesia (4%) were subordinate. This suggests a mixture of hematite, clay, and dolomite, but with hematite and clay dominant. The microstructure of the material is very fine; there is little material coarser than 20μm except for a few quartz grains. It is very porous and consists of an interconnected aluminosilicate matrix which contains abundant fine particulate iron oxide (<10μm) and abundant rhombic voids, typically about 10μm in diameter. The voids represent original grains of dolomite which have dissolved out of the material, for in some cases rather ragged and corroded grains of dolomite are still present.

These decorative knobs appear to have been made from a fine-grained ferruginous dolomitic clay. The clay is represented by the interconnected matrix phase which has a glassy appearance; few clay-like particles may be resolved. Our tentative interpretation is that this matrix is vitrified clay which was fired to improve the red colour and the hardness. Thus these knobs appear to be ceramic. We are still hesitant about this model because firing temperatures in excess of 800°C are estimated to have been required to produce vitrification of the type observed. Dolomite decomposes at substantially lower temperatures, yet some dolomite is still present. Therefore it is necessary to assume that the firing was short, so that not all of the dolomite broke down. The clay used has an iron oxide content considerably in excess of that usually found in domestic pottery (up to about 15% as opposed to 40%), so that it is likely to have been sought out specifically to produce inlay.

The harder mineral material, represented by a single example (Table 32), was also examined in the SEM. It consists essentially of iron oxide with sparse quartz grains, and in view of its colour is therefore identified as haematite. This knob is extensively cracked, and the red colouration appears to be confined to a thin layer close to the surface, so that this too is likely to represent a fired material.

'Enamel'

Four millimetre-sized fragments of red 'enamel' were mounted in epoxy resin, polished with diamond pastes down to 0.5μm and coated with a thin layer of carbon. They were examined in the SEM to determine their phase composition and microstructure, and in the electron microprobe to determine their elemental compositions. Details of the operating conditions, precision, and accuracy of the microprobe are given elsewhere (Henderson 1988).

The compositions of the 'enamels' are expressed as weight percent oxides in Table 33 and show that the principle components are soda, lime, silica, lead, and copper oxides. As for many other Iron Age opaque red glasses, the base composition seems to represent a soda-lime-silica glass to which lead and copper oxides have been added; the relative concentrations of the remaining components are lower by the proportion one would expect if diluted by 40–50% PbO and CuO.

Table 33 Electron probe microanalysis of red glass knobs from Burton Fleming and Rudston (expressed as weight % oxide)

Analysis no	*1 Rudston*	*2 Rudston*	*3 Rudston*	*4 Burton Fleming*
Sample no	R199–33079U	R32–33080X	R71–33078W	BF41–33081V
NA_2O	8.2	6.0	8.0	8.1
MgO	0.3	0.8	0.5	0.4
Al_2O_3	1.4	2.7	1.7	1.5
SiO_2	40.35	35.4	40.3	40.1
P_2O_5	0.1	nd	0.1	nd
SO_3	0.2	0.1	0.1	0.1
Cl	0.4	0.5	0.5	0.5
K_2O	0.2	0.4	0.2	0.3
CaO	3.9	4.9	3.2	4.4
TiO_2	0.1	0.1	0.1	0.1
Cr_2O_3	nd	nd	nd	nd
MnO	0.1	0.1	nd	nd
Fe_2O_3	2.0	1.3	1.8	1.8
CoO	nd	nd	nd	nd
NiO	nd	0.1	nd	nd
CuO	8.9	3.7	6.0	6.1
ZnO	nd	nd	nd	nd
As_2O_3	nd	nd	nd	nd
SnO_2	0.1	0.1	0.1	0.1
Sb_2O_3	nd	0.2	nd	0.1
BaO	0.1	0.1	nd	0.1
PbO	35.5	45.4	38.9	38.0

Notes: for details of analytical conditions, precision, and accuracy, see Henderson (1988); nd, not detected

Three of the 'enamels' (analyses 1, 3, and 4, Table 33) have closely similar compositions; the oxides of sodium, silicon, calcium, aluminium, iron, lead, and copper vary within relatively narrow ranges. Indeed, they are so close that it is quite possible that they represent glass removed from a single block or ingot of raw glass and, if so, the associated brooches (E4, 7, and 8) are likely to have been decorated at about the same time, perhaps by the same craftsman or in the same workshop. The glass represented by analysis 2, on the other hand, is distinct in most of its oxides; soda is low at 6.0% relative to 8.0–8.2% in the group of three, silica is low at 35.4% relative to 40.1–40.3%, while lead is correspondingly high. These differences are not just due to a difference in dilution by lead oxide, however, for lime and alumina are higher in analysis 2 (Table 33). While analysis 2 (brooch G1) falls into the same general compositional category as the others, it is sufficiently different to represent a different batch, manufactured using different proportions of slightly different raw materials.

SEM examination reveals that the colour of all four glasses is due to a dispersion of crystals of cuprite (cuprous oxide, Cu_2O), as shown in Figure 94. Some metallic copper is present, but only in minor quantities and furthermore it is partially coated with cuprite (Fig 94, b). Thus the copper metal does not contribute significantly to the colouration. The glass with the higher lead concentration (Table 33, no 2) shows a streaky, inhomogeneous appearance; it contains crystals of cuprite and also of wollastonite ($CaSiO_3$), a devitrification product, which show a parallel lineation (Fig 94, c). This alignment was taken on by the crystalline phases when the knob was pressed into shape in the hot, softened state. The cuprite crystals in this glass are finer and less devel-

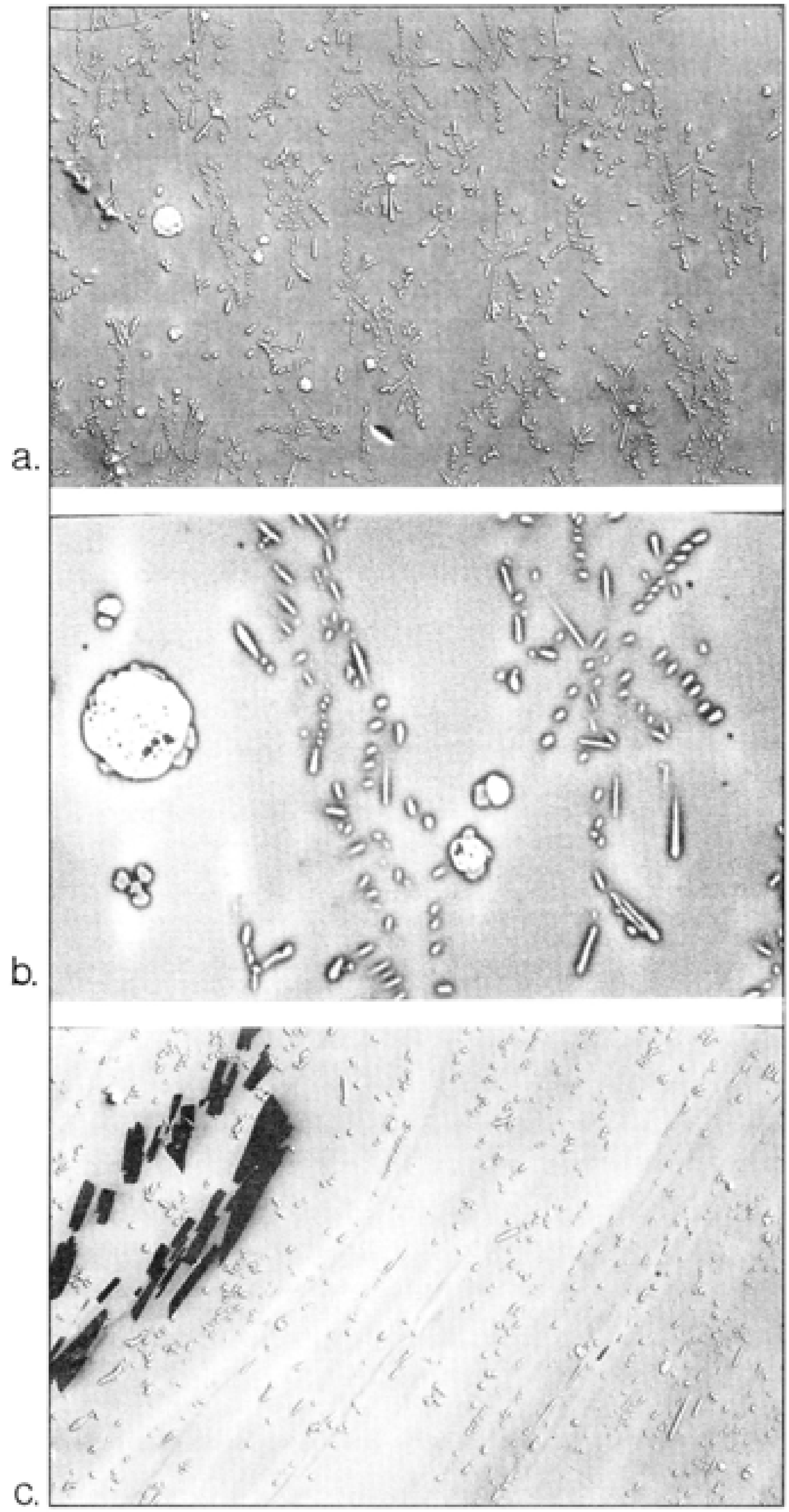

Fig 94 SEM photomicrographs: a, glass from sample 1 – abundant dendritic crystals of cuprite with sparse rounded grains of metallic copper in a silicate glass matrix (×400); b, increased magnification of area to left of centre in a, showing discontinuous cuprite rims on rounded copper grains (×1500); c, sample 2. Note needle-like form of cuprite crystals and their size relative to a. Also shows wollastonite crystals (black, upper left) and compositional streaking of glass, with parallel lineation (×400) (photo: British Museum)

oped than in the others, as might be expected from its lower copper oxide content.

The manufacture of opaque red glass has been the subject of considerable attention (eg Guido *et al* 1984; Freestone 1987). Reducing conditions are required to maximise the growth of cuprite which may be facilitated by internal reducing agents such as antimony, tin, and iron oxides. In the present case the antimony content is negligible while the tin oxide (SnO_2) content at 0.1% is too low to have had a significant effect and is likely to have been incorporated as a component of scrap copper added as the colourant. The iron oxide, at around 2%, is relatively high for ancient glass and is likely to have been added as a reductant. The high lead oxide content is a characteristic feature of bright 'sealing wax' red glass; it appears to favour the production of coarser cuprite crystals which in turn impart a more intense red colour (Freestone 1987).

Discussion

Iron Age red glass made in the tradition of the Rudston and Burton Fleming 'enamels' has been analysed elsewhere (Hughes 1972; Henderson 1981; 1987; Henderson and Warren 1983). Similar 'enamels' were used and probably produced in the Roman period (Bateson and Hedges 1975; Biek *et al* 1980; Henderson 1989a), although there is also another distinct compositional category of opaque reds with lower lead oxide contents from the first century AD onwards (Hughes 1972; Freestone 1987). In compositional terms the Rudston and Burton Fleming opaque reds conform to the Iron Age tradition of manufacture.

Meare Lake Village in Somerset stands out in the British context as an industrial centre for glass production in the 5th–2nd centuries BC. At Meare Lake Village West, red glass was used in the moulding process of bead production (Henderson 1981; 1987). A relatively wide compositional range in red glass composition at the industrial site of Meare may reflect the use of this type of glass over a long period, perhaps several centuries. On the other hand, decorative red glass on metalwork from the Seven Sisters hoard, Glamorgan, displays a relatively low level of compositional variation (Henderson *et al* 1990), reflecting the difference in context and mode of deposition, and the period over which the material was deposited. The group of three Rudston and Burton Fleming reds with close compositions exhibit a comparably low level of variation and, as with the Seven Sisters material, are likely to have been manufactured at the same site.

Unpublished work by the authors indicates that the Burton Fleming analyses 1, 3, and 4 are close to other Iron Age red 'enamel' from Yorkshire such as that on the Bugthorpe disc and on the bronze cylinder from the Wetwang cart-burial. Comparison of the lead and copper oxides in the Rudston and Burton Fleming 'enamels' with opaque red 'enamel' and glass from Meare, Polden Hill, Yorkshire, Seven Sisters, and Lesser Garth (Henderson *et al* 1990, fig 4) suggests that they are members of an 'earlier Iron Age' compositional grouping (corresponding to most Meare opaque reds), implying that they should date to the 5th–2nd centuries BC. Analysis of other Iron Age opaque glasses has shown that before the second century BC, manganese oxide levels are normally less than 0.05%, whereas after this date they may be as high as 0.15–0.8% (Henderson and Warren 1983). Although two of the Rudston and Burton Fleming analyses are borderline in terms of their attribution to either the high or low manganese groups (nos 3 and 4 contain 0.08% and 0.1% MnO respectively, expressed as 0.1% in Table 33), in analyses 1 and 2 MnO is below detection (*c* 0.05%) so that we can add this as further compositional evidence for the dating of the 'enamels' to the second century BC or earlier. There is evidence that, by the first century AD, it is possible to distinguish compositionally between glasses used and perhaps made in eastern and western zones in Britain (Henderson 1989b), but for the earlier period the picture is not yet so clear, and we are unable to place the production of the Rudston and Burton Fleming 'enamels' in a regional context.

Red 'enamel' has been recognised on only seven of the objects from the two cemeteries; a further 57 brooches have none. This is unlikely to represent a failure to identify glass; although the brooches themselves are heavily corroded, the glass does not tend to be, and while it may be completely obscured in some cases, these are not likely to be common. Nor is the absence of red 'enamel' likely to have been a question of the preference of the wearers; at least four brooches have red knobs made from inferior (less brilliant and/or softer) materials. Indeed, in view of the relative softness and ease of weathering of some of the ceramic knobs, it is possible that other examples have been lost or have not been recognised. Thus, to the people buried at Rudston and Burton Fleming, red 'enamel' was a scarce and desired material, to be imitated when not available.

c The chemical analysis of the glass beads from Burton Fleming and Rudston

by Julian Henderson

Introduction

One of the main concentrations of Iron Age glass beads in Britain is in Yorkshire. A high proportion of the beads are made out of blue glass, which, on analysis, normally proves to be coloured by cobalt oxide. It is still a somewhat open question as to where some types of Iron Age glass beads were manufactured, though one of the largest collections of beads, at Wetwang Slack, includes some colourless and opaque yellow beads which are considered to have been imported from the Somerset area of southern England. Others almost certainly originated from further afield, including areas of central Europe (Henderson in press). Because a proportion of the glass beads of earlier Iron Age date from Wetwang have been chemically analysed, including comparable wave-decorated globular types, it is possible to place the Burton Fleming and Rudston beads into a technological context and attempt to suggest where they might have been made.

Analytical technique

Electron probe microanalysis was used to analyse a sample of each of the four beads. A microsample was mounted in epoxy resin, highly polished and coated with carbon prior to analysis. The electron microprobe used was an automated Cambridge microscan 9 with two wavelength-dispersive spectrometers attached. The electron beam was defocused to 80 microns for analysis to minimise loss of sodium from the silicate network of the glass. The results were corrected and quantifed using a ZAF programme.

Results

The chemical analyses of the four glass beads analysed are presented in Table 34. The first compositional feature which should be noted is the distinction between the soda-lime-silica translucent blue glasses and the lead oxide-soda-lime-silica opaque yellow glass. The blue glasses are typical of Iron Age soda-lime-silica compositions with low magnesia and potassium oxide levels. In all three cases the blue colouration can be attributed to cobalt oxide in the presence of iron and copper oxides. Part of iron and probably all the copper would have been introduced with the cobalt in association with the original cobalt-rich mineral ore. The cobalt itself is likely to have been added to the glass melt as a frit, or already incorporated in a small piece of blue scrap glass.

The opaque yellow glass is probably coloured and opacified by crystals of lead antimonate, and the orange hue of the glass heightened by the presence of iron oxide.

Table 34 Chemical compositions of the glass beads from Rudston and Burton Fleming (expressed as weight % oxide)

	C1	C2	C3	C4
Colour	tr bl	tr bl	tr bl	op ye
Burial no	R2	R16	R193	BF19
Na_2O	17.2	18.1	19.3	13.0
MgO	0.5	0.6	0.7	0.5
Al_2O_3	1.8	1.2	2.2	1.9
SiO_2	69.6	62.7	63.0	56.0
P_2O_5	0.1	0.1	0.1	nd
SO_3	0.2	0.1	0.1	0.2
Cl	0.4	0.4	0.4	0.4
K_2O	0.4	0.3	0.6	0.4
CaO	5.8	9.5	9.0	5.6
TiO_2	0.1	0.1	0.1	0.1
Cr_2O_3	nd	nd	nd	nd
MnO	0.1	0.1	nd	0.1
Fe_2O_3	1.7	1.4	0.9	2.3
CoO	0.1	0.1	0.1	nd
NiO	nd	nd	nd	nd
CuO	0.3	0.2	0.2	nd
ZnO	nd	nd	nd	nd
As_2O_3	0.2	nd	nd	nd
SnO_2	nd	0.1	nd	nd
Sb_2O_3	nd	0.2	0.3	0.7
BaO	nd	nd	nd	nd
PbO	1.3	1.4	0.3	20.2

Key: tr, translucent; bl, blue; op, opaque; ye, yellow; nd, not detected

Interpretation

Globular or annular cobalt blue glass beads with wave decoration are common and relatively undiagnostic artefacts in the European Iron Age and have been derived from archaeological contexts ranging from early to late Iron Age in date (Frey *et al* 1983). However, by analysing the Burton Fleming and Rudston examples chemically it is possible to relate them to extant databases for Iron Age blue glass used in the manufacture of both wave-decorated beads and other types. Cobalt blue glass was used to make a range of bead types found at the nearby site of Wetwang Slack, and because the chemical compositions of the blue glasses in the different bead types formed distinct and relatively tight compositional groups it was possible to infer that each bead type was made using a separate stock of blue glass, and therefore possibly also in separate production centres concentrating on the manufacture of particular types and/or at different times. Bearing in mind that glass beads can change hands and be traded easily, to prove that the beads were made at a specific location one would need to find the remnants of a glass bead manufacturing centre which specialised in producing that type. This has not definitely been identified in Iron Age Britain or Europe for the types of beads found at Burton Fleming and Rudston, though a range of Iron Age sites involved in different aspects of the glass industry have been found (Henderson 1989b), including Meare which specialised in manufacturing beads in opaque yellow and colourless glass.

When comparing the chemical composition of ancient glasses, one comparison which can be made is between components which performed different functions in the glass. Some elements were used in the initial manufacture of the glass (usually major and some minor element oxides), and others to impart colour, opacity, or clarity; the latter normally occur at minor or trace levels in the glass. In the case of Iron Age cobalt blue glasses one can be fairly certain that at some point in the manufacture of the raw glass a quite specific cobalt blue colourant was selected in the form of a cobalt-rich mineral or an extant piece of cobalt blue glass (Henderson 1985). So, given a reasonable sample size, one might expect that this deliberate selection of glass colourant might provide a way of chemically fingerprinting Iron Age blue glass.

As mentioned above, a distinction between elements associated with cobalt in decorated beads from Wetwang generated a range of possible inferences about the origins of the beads. When compared with plots for iron oxide against cobalt oxide in the types of beads found at Wetwang, the two Rudston blue wave-decorated beads (C1 and C2) fall at one end of the wave-decorated bead group from Wetwang (Henderson in press, fig 1), with the other (C3) containing a lower iron oxide level. This implies that the third bead was manufactured using a slightly different colourant compound and therefore possibly at a slightly different time. The fact that the two Rudston wave-decorated beads fall into the Wetwang group suggest that they were made in the same workshop, or at least that the supply of colourant raw materials to that workshop was the same. C3 also differs from C1 and 2 in being undecorated, and it is suggested elsewhere (Henderson in press) that the different bead types may have been manufactured in different workshops during the Iron Age. In the absence of direct workshop evidence, at present we are unable to state whether these beads were made on the continent or locally.

The opaque yellow bead from Burton Fleming contains 0.1% manganese oxide. The level of this compound in Iron Age opaque yellow glass strongly suggests that the bead was made in or after the second century BC (Henderson and Warren 1983). It is possible to state this because the site of Meare Lake Village provides the exceptional evidence (in a European context) for the manufacture of a range of quite specific bead types between the fifth and third centuries BC from opaque yellow and colourless glass and types which are not found outside Britain (Guido 1978; Henderson 1987b). None of the opaque yellow Meare glass analysed contains manganese oxides at the relatively high level found in the Burton Fleming bead, but many opaque yellow glasses from reliable contexts of the second century BC and later do. Since, at the moment, we have no evidence for the manufacture of opaque yellow glass of this composition in late Iron Age Britain, and the closest composition for the use of opaque yellow glass is that found in second–first century BC and later contexts such as at Hayling Island, Hampshire (Henderson 1987c, ill 128), it is probable that this yellow glass bead was imported. The yellow glass used at 'Loughey', Co Down, for the manufacture of opaque yellow globular beads is of another, quite distinct, composition characteristic of a continental European source (Henderson 1987b; 1987c, 183–5).

In sum, chemical analysis has shown that two of the wave-decorated beads probably derived from the same source as those analysed from Wetwang, and may have been manufactured in continental Europe or, just as plausibly, locally. The third wave-decorated bead may derive from a similar source, but was probably manufactured at a different time. In the absence of industrial evidence for the manufacture of blue glass of these compositions and wave-decorated beads, it is difficult to be precise about the production centre for such beads. On the other hand one can be more definite about opaque yellow glass. The opaque yellow bead is made of glass which was probably imported from the continent (north-western Europe); the composition of the Burton Fleming opaque yellow glass bead conforms with opaque yellow glass manufactured in or after the second century BC.

Table 35 Harwell radiocarbon dates for Rudston (from human bone)

Grave	*Harwell reference*	*uncalibrated results*	*1σ error term 68% confidence*	*2σ error term 95% confidence*
R143	HAR-1129	2050±80	**180 cal BC–cal AD 20	360 cal BC–cal AD 110
R178	HAR-1130	2150±150	**390 cal BC–cal AD 1	750 cal BC–cal AD 130
R180	HAR-1058	2520±70	*800–530 cal BC	820–400 cal BC
R182	HAR-1057	2600±70	*825–780 cal BC	900–540 cal BC

Key: * *Pearson and Stuiver 1986;* ** *Stuiver and Pearson 1986*

d Radiocarbon dates

by Janet Ambers

Rudston

Human bone from four of the Rudston burials (all with grave-goods) was radiocarbon dated at Harwell (Table 35), but the results were erratic: R143 and 178 each gave a calibrated range at the one sigma level (using the intercept method) that included the expected date, but R180 produced a date between 300 and 500 years too early and R182 was at least 700 years too early. The results have been published by Walker *et al* 1987, 79–80 (listed under the project name, Burton Fleming Series).

Kirkburn

Three samples from the 1987 Kirkburn excavation were analysed for radiocarbon content at the British Museum Laboratory, with the results given in Table 36.

All three samples were of reasonably well-preserved bone and were treated with dilute acid to extract 'collagen' (here defined as the acid insoluble fraction of bone rather than the true biochemical definition). Only the collagen fraction was dated. In the early days of radiocarbon dating bone acquired a reputation for producing misleading results. It is now known that this was due to the use of whole bone for analysis; the inorganic fraction of bone is liable to exchange with carbonates carried in groundwaters and is therefore not a realistic indicator of age under normal circumstances. The extraction and measurement of only the protein ('collagen') fraction avoids this difficulty, and gives reliable

Table 36 BM radiocarbon dates for Kirkburn

			Possible calibrated age range(s) 1σ *error term 68% confidence*	*2σ error term 95% confidence*
BM-2619	Horse metatarsal KN/RB	1880±50	*70–145 or 160–195 cal AD	*10–240 cal AD
BM-2620	Human long-bone	3370±50	**1740–1620 cal BC	**1870–1845 or 1770–1520 cal BC
BM-2674	Horse metatarsal KN/PY	1940±50	*5–115 cal AD	*60 cal BC–140 cal AD
BM-2619& BM-2674†		1910±35	*60–120 cal AD	*10–145 cal AD

Key: * *Pearson and Stuiver 1986;* ** *Stuiver and Pearson 1986;* † *combined results*

results in most situations. After pretreatment the cleaned samples were converted to benzene and analysed by conventional liquid scintillation counting (Ambers *et al* 1987).

All results are quoted in the form recommended by Stuiver and Polach (1977) in uncalibrated years BP (before 1950) and corrected for measured C13 variation. Errors quoted are the counting error for the sample combined with an estimate of the errors contributed by the modern and background samples. This estimate includes both counting and non-counting errors, the latter being computed from differences in the overall count-rates observed among the individual backgrounds and moderns. It should be noted that these error terms only include contributions from measurement error; they cannot make any allowance for age offsets implicit in the sample material itself, nor for any time difference between the formation of context and sample.

Calibrations are given based on 1 sigma (68% confidence) and 2 sigma (95% confidence) error terms, using the curves of Pearson and Stuiver (1986) and Stuiver and Pearson (1986), and Method A of revision 2.0 of the University of Washington Quaternary Laboratory Radiocarbon Calibration Program (Stuiver and Reimer 1986: this uses the intercept method of calibration recommended in the original curve publication). Calibrated dates are quoted in the form recommended in Mook (1986), with the end points of the calibrated date ranges rounded to the nearest five years.

The two results for horse-burials, BM-2619 and BM-2674, are in good agreement and there is archaeological evidence to suggest that the animals involved died at approximately the same time, and therefore under the same atmospheric conditions. In that case it would be justifiable to combine the two uncalibrated results. This gives a mean value of 1910±35 BP, and a smaller possible calibrated age range, as shown in Table 36.

11 A preliminary statistical survey

by Morven Leese

Introduction

The aim of this statistical survey of the burials is to summarise their main features and to draw some preliminary conclusions on the basis of statistical analyses. The information can be divided into two categories, that relating to individual human bones and that relating to the burials themselves. The latter includes sex-ratio and age-at-death statistics, sizes of barrows and directions of burials, and the frequencies of important types of grave-goods. This survey, the main purpose of which is to summarise rather than to interpret the data, also outlines those aspects which might benefit from further study.

Human bones

1 Scope

Data were available for about 250 adults from the four sites: Rudston (comprising over half the sample), Burton Fleming, Garton Station, and Kirkburn; the latter two groups comprise 10 and 7 individuals respectively. Comparative data were kindly supplied by John Dent for Wetwang, and for Maiden Castle and Yorkshire (mainly Driffield) by Don Brothwell; the latter are called 'Driffield' in the following text. The comparative data were in the form of means and standard deviations, or in some cases means only, and were for varying subsets of measurements. A table of summary statistics for the four sites (mean, standard deviation, minimum, maximum, and number of measurements) is given in the main report on human bones by Sheelagh Stead (Table 13, p 129); that report also describes the biometric symbols used.

Preliminary analyses indicated little inter-group variation at Rudston, Burton Fleming, Garton Station, and Kirkburn, except for stature (see below). The data from different groups were therefore combined and are called 'Yorkshire sites' in the following text. Before finalising the storage of the data, the opportunity was taken to review some of the sex attributions, and to check the data. The values were entered into eight files, each relating to a separate bone complex, and were stored as system files in the package SPSS/PC; this package was used for the statistical analysis (Norusis 1988). In addition to the summary statistics quoted in Table 13, plots showing the distributions of all the variables were obtained. Since these were reasonably symmetric, the use of means and standard deviations as summaries of the population values was considered justified. The plots also identified a few outlying measurements. In most cases these occurred sporadically, rather than as complexes of several measurements on the same individual. One exception was GS8, which had three outlying measurements (see also p 127, main report).

Correlations between variables were also computed within each of the eight bone complexes. These were generally positive where expected (for example the various cranial arcs with their corresponding chords, eg S1 with S1'). While the correlations are of little intrinsic interest, it is worth noting that correlated data can lead to overestimation of the significance of differences, owing to double-counting variables which are effectively proxies of one another. Multivariate methods are preferable, since they take account of correlations, but the large number of missing values limits their value in this case. A compromise approach has therefore been taken, in which stature and a number of skeletal indices are discussed individually, but cranial measurements are considered together as a multivariate group.

2 Stature

Stature was estimated using the formulae (for white males and females) given by Brothwell (1981 101), based on femur length. For those individuals with measurements on other long bones, but not the femur, multiple regression techniques enabled rough estimates of stature to be made. These had a typical residual error of +40mm, and were thus not sufficiently good to present as numerical data; however, they are available for use in cases where a crude estimate of stature would be considered adequate.

The mean stature, estimated by the standard femur length formulae, was compared for each of the four groups. The mean for Garton Station was found to be significantly higher than the rest by approximately 50mm. Figure 95 shows the pattern, which is

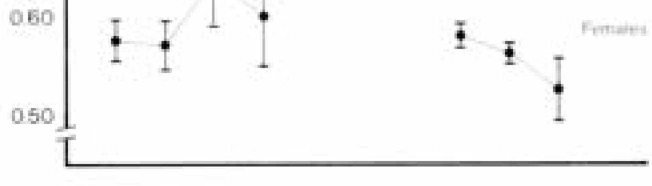

Fig 95 Mean estimated stature in m for four study sites (R, BF, GS, and K), also showing means for Wetwang and Maiden Castle; key to sites: R, Rudston; B, Burton Fleming; G, Garton Station; K, Kirkburn; R_m, mean for four study sites; M, Maiden Castle mean; W, Wetwang mean; error bars are ±2-sigma standard errors on the means

similar for men and women. A two-way analysis of variance confirms the difference as significant at the 5% level. No other consistent differences in stature were observed, even among the suggested family groups (see p 131), although in those cases the sample sizes were probably too small for any to emerge. Although the Garton Station individuals were distinctive in stature on average, their cranial measurements were not unusual, except for the already mentioned GS8. It was therefore decided to include them in the summary statistics for the sites taken together; it can be argued that there are other groupings, as yet it can be argued that there are other groupings, as yet unrecognised, which are taller or shorter than the average; the aim was to characterise the population as a whole, including its various sub-populations.

It is worth stressing at this stage that stature estimates based on regression lines, including those based on the standard formulae, have errors of estimate due to lack of fit in the regression line. This source of error is additional to random variation about the line and can cause bias in the estimates. Regrettably it is not readily assessed, since the relevant values are not generally quoted along with the formulae. The effects of possible bias are especially important when comparing stature based on different formulae, or when comparing estimates with actual measurements of stature.

Because of these statistical problems, comparison with external data on stature should be treated with caution. However, if it can be assumed that the estimation error is relatively small, then comparative data show some consistent trends, given in Table 37 and Figure 95. Although in the case of Maiden Castle no standard deviation estimate was available, a standard deviation can be estimated at 0.05m, based on a pooled variance, for males and females and the Yorkshire sites and Wetwang taken together (each variance being computed about the appropriate mean). On the basis of this estimate, differences between sites are significant at the 10% level at least, and the pattern is consistent for males and females. This suggests that individuals at the Yorkshire sites tend to be taller than those at Wetwang, who themselves are taller than those at Maiden Castle.

3 Skeletal indices

The cephalic index (Cephind = B/L×100) is now regarded with circumspection as a reflection of cultural change, perhaps because of over-enthusiastic use in the past. Nevertheless it is useful in that it is based on well-defined measurements, and is not affected by living conditions to the same extent as, say, stature. Another advantage of this measure is that sets of comparable data are available in the literature. For example several sets are given by

Table 37 Estimated stature (m)

	Males			*Females*		
	mean	*sd*	*n*	*mean*	*sd*	*n*
Yorkshire sites	1.71	0.048	68	1.58	0.046	48
Wetwang	1.67	0.051	122	1.56	0.055	168
Maiden Castle	1.65	-	19	1.52	-	9

Table 38 Cephalic index

	Males			*Females*		
	mean	*sd*	*n*	*mean*	*sd*	*n*
Yorkshire sites	72.3	3.1	41	72.3	4.0	45
Wetwang	73.6	4.0	60	74.0	3.8	45
Driffield	72.7	-		74.2	-	

Table 39 Platymeric and platycnemic indices (Yorkshire sites)

	Males			*Females*		
	mean	*sd*	*n*	*mean*	*sd*	*n*
Platymeria	70	6	91	72	7	98
Platycnemia	67	7	85	70	7	89

Brothwell (1981) and these show significant trends, with Yorkshire Bronze Age and English Iron Age mesocephalic (mean cephind 75.0–79.9) and the British Neolithic dolicephalic (mean cephind <75.0). The data for three specific Iron Age data sets are shown in Table 38, where it can be seen that they are all rather low, and in particular that the Yorkshire sites mean approaches the typical value for the British Neolithic.

Other indices which are of potential interest are the femur-shaft (FeD1/FeD2×100) and tibia-shaft indices (TiD2/TiD1×100). Low values of these (platymeria and platycnemia) tend to occur in modern primitive and early peoples, and may possibly indicate environmental or behavioural effects, such as squatting, or pathological conditions. There is controversy as to the interpretation of these indices, but it was nevertheless considered useful to present the relevant values for the Yorkshire sites area (Table 39).

Both males and females have mean values <85, the cut-off point for platymeria, and 95% of individuals come into this category. However, there is no tendency for platycnemia (cut-off value 63). There is no correlation between the two indices for individuals in this data-set.

4 Cranial measurements

It was decided to investigate multivariate methods as described for example by Brothwell and Krzanowski (1974). These methods (especially canonical variates or discriminant analysis) are in principle appropriate for comparing the Yorkshire sites data with data for other sites on a multivariate basis. However, they require individual measurements for all sites, whereas only summary statistics are available for the comparative material. It was therefore decided to plot principal components as an alternative, indicating the positions of the means for Wetwang and Driffield on the same diagram as the Yorkshire individuals. Cranial measurements only were plotted, since they were shown in the Brothwell and Krzanowski study to discriminate well between various groups. The measurements used were S1, S2, S3, S1', S2', S3', GL, G'H, GB, O'1, O2, L, B, B', H', LB, Biast B, NB, NH', SC. Principal components and canonical variates are described by Cooley and Lohnes (1971).

A problem in deriving the principal components was the high percentage of missing data for many variables. Some ad hoc procedures developed by Brothwell and Krzanowski (and successful in their study) were not practicable in this case. Recently, however, new techniques have been developed by Andy Scott at Lancaster University, using an iterative technique for both canonical variates and principal components analysis based on incomplete data (Scott 1988). Scott has kindly agreed to try his techniques on this problem, and he is being supplied with the data.

In the meantime, principal components plots have been derived, for males and females separately, using the group means in place of missing values. Standardisation to unit variance has not been applied, since the variances are similar for all variables. The first two components for males and females are shown in Figure 96. Since the proportion of missing values is similar for all groups (though slightly lower at Garton Station and Kirkburn), the plot is acceptable as a guide to group comparisons. However, the positions of apparently outlying individuals may be distorted. Some apparent outliers are individuals who happen to have a large number of variables present, especially variables which tend to be missing for most other cases. Such data-rich individuals appear different from the majority, because the majority are represented by constant mean values not their own (variable) values.

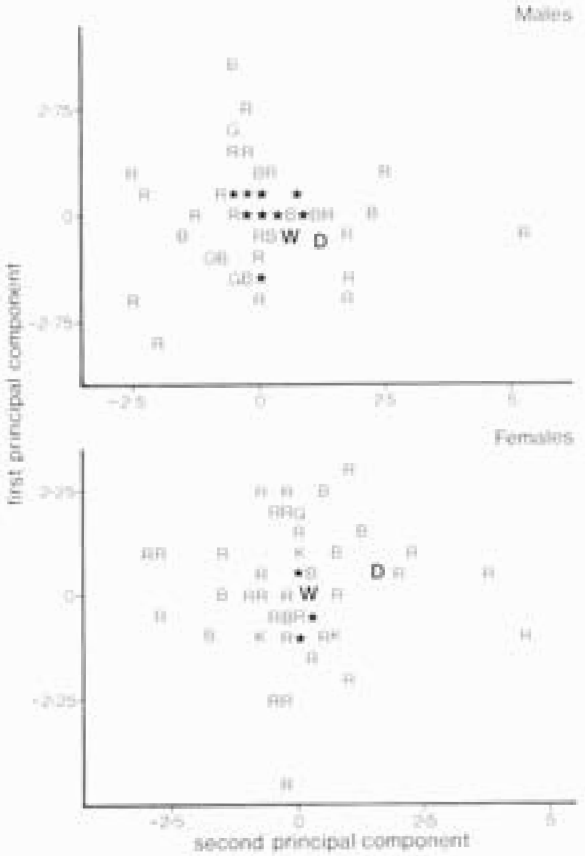

*Fig 96 Principal components plots for cranial measurements; key to sites: R, Rudston; B, Burton Fleming; G, Garton Station; K, Kirkburn; D, Driffield mean; W, Wetwang mean; * denotes more than one individual; male and female plots are on different scales*

Analysis of the first two components in terms of the original variables shows that the first component is correlated with parietal arc S2 (and its corresponding chord S2') for both males and females. For males the second is correlated with GB (bimaxilliary breadth) and NB (nasal breadth), whereas for females the second component is correlated with O2 (orbital height). This might imply that these variables would be the first choice for scatter plots, in the absence of multivariate techniques. However there is a gradual fall-off in the relative importance of components, rather than a sharp break, and the first two components only account for 30% of the total variance; this suggests that a simple two-dimensional plot may be unrepresentative. However, in this case the general impression given by the first two components is reflected by the third and fourth, and the eighth and ninth components; the latter are the last two components contributing substantially to the overall variance.

The main features of the data can be seen in Figure 96. The four Yorkshire groups are very similar to one another and the means for Wetwang and Driffield lie well within their range. Examination of all the cranial variables individually confirms the conclusions reached from the principal components plots.

5 Summary

The Yorkshire individuals have a mean estimated stature of 1.71+0.006m (males) or 1.58+0.007m (females), slightly taller than at Wetwang and Maiden Castle. Garton Station individuals are significantly taller on average than those in the other three groups. A few outlying individuals have been identified but there are problems in accurately identifying all potential outliers because of missing values. The general cranial characteristics observed at the Yorkshire sites , when taken as a whole, are similar to the means for comparable Iron Age material. The mean cephalic index for Rudston is 72+4 (dolicephalic), and the majority of individuals exhibit platymeria.

Burials

1 Scope

Data from almost 300 graves at the four Yorkshire sites have been entered into four computer databases. The databases include data on the graves themselves (size, location, etc), grave-goods (relatively common goods such as pottery, brooches, etc), other grave-goods (mainly metal) such as spears and swords which occur in a specific subset of the graves, and data on the skeletons (sex, age, burial direction of the skeletons, etc). Each skeleton has a record in each database, and in most cases each grave contains one and only one skeleton. The few exceptions, for example multiple and unexcavated graves, are commented on where appropriate.

The findings are based mainly on examination of various two-way cross-tabulations of the data, as well as chi-squared tests, log-linear models, and iterative proportional scaling (IPS), as described by Bishop *et al* (1975). Chi-squared tests are appropriate for testing association in two-way tables. Log-linear analysis is a technique whereby best-fitting statistical models are fitted to the frequencies of items categorised according to a number of factors; IPS adjusts frequencies so that particularly high (or low) associations are highlighted. The computer package used was SPSS-PC+, version 3.0. A few alterations to the data as originally entered into the databases were made, subsequent to the statistical analysis; these do not affect the overall conclusions.

Sex is classified as M, Mp, M? (definite male, probable male, and possible male), and similarly for females; C (contraindications, ie both male and female characteristics); and ? (unknown). Age is classified as 1 (0–16 years), 2 (17–25 years), 3 (26–35 years), 4 (36–45 years), 5 (over 45 years), and −1 (unknown). In considering these demographic characteristics, data from all four sites have been combined, on the assumption that only one basic population is involved, as suggested by the study of human bones.

Type of burial is classified as CO (contracted), CR (crouched), F (flexed), and E or W (extended with head at the east or west respectively). A further description of direction, applying only to the contracted, crouched, and flexed burials, is denoted by two letters, the first referring to the direction the head is at, the second to the direction in which the face is pointing. Thus N(E) means head at the north, facing east. A small number of burials have been classified as 'disturbed'. The latter have been ignored in summary statistics.

Grave-goods considered are: pottery, brooches, animal bones, and general metalwork such as swords, spears, and tools. More detailed information is available on the condition of the pottery, the typology of the swords, etc, but these points are not considered at this stage although the data are in the databases. Some types of grave-goods are present only very occasionally, for example bracelets and toe-rings; these are not dealt with here. Spatial data have not yet been entered into the databases, but general points can be made from the site plans without specific numerical analysis at this stage.

2 Sex and age statistics

The data have been tabulated separately according to the different degrees of confidence in the sex attributions (ie 'definite', 'probable', and 'possible'). Data from all four cemeteries and for all age groups were combined (doubt about sex attribution not being associated with any particular age group). Table 40 gives the totals in each category, and this shows that there are approximately equal numbers of females and males in the 'definite' group. However, there are more female than male attributions in the more doubtful categories; this apparent difference is confirmed by a highly significant chi-squared value ($X^2=12$, with 2 df) for the association between proportion of males and confidence in attribution.

After a reconsideration of the skeletons, a few were reclassified and tabulated according to the condition of the bone, as shown in Table 41 (B represents the best condition, F the worst). A log-linear model fitted to the data suggests significant associations between doubt and condition, and between sex and condition. There are more female assignments given to skeletons in bad condition and there are more skeletons in bad condition given a doubtful assignment. This is also apparent from Table 42. In this table, some of the condition categories have been combined and the frequencies have been adjusted, using iterative proportional scaling, so as to highlight associations between categories. Leaving aside doubtful cases, it can be concluded (on the basis of the 117 definite attributions only) that the number of males per 100 females is approximately 109+18, ie not inconsistent with equal numbers of men and women.

The age distribution for skeletons whose sex has been definitely determined is shown, for all cemeteries combined, in Table 43. There is a significant association between sex and age at death ($X^2=13$, with 4 df) resulting from a relative excess of females dying in the 17–25 years age-group, and a corresponding excess of males dying in the 26–35 years age-group.

Age at death is a dynamic measure, since the

Table 40 Burials: frequency of males and females (all Yorkshire sites)

Confidence in attribution	*Possible*	*Probable*	*Definite*	*Total*
Male	9	15	61	85
Female	28	34	56	118
Total	37	49	117	203
SR[*]	32	44	109	

[*]Standardised sex ratio (number of males per 100 females)

Table 41 Condition of bones (Rudston and Burton Fleming)

Condition	B	B/C	C	C/D	D	D/E	E	E/F	F	Total
M	(5)	-	20	6	19	4	-	-	-	54
Mp	-	2	1	1	5	1	3	1	1	15
M?	-	-	-	1	3	1	3	-	1	9
Total	5	2	21	8	27	6	6	1	2	78
F	-	3	5	4	30	5	2	-	-	49
Fp	-	-	2	1	12	3	16	1	-	35
F?	-	-	1	-	1	4	13	4	2	25
Total	-	3	8	5	43	12	31	5	2	109

Table 42 IPS analysis of bone condition data

Condition	B/C–C	C/D–D	D/E–E	E/F–F	
M	**205**	137	45	13	400
Mp	77	77	99	**147**	400
M?	18	85	**157**	**140**	400
	300	300	300	300	1200
F	**174**	**178**	35	12	400
Fp	82	111	**147**	59	400
F?	44	11	117	**228**	400
	300	300	300	300	1200

Note: high frequencies denote positive association number of individuals dying in any age group is a function of the number still alive as well as the intrinsic probability of an individual dying at a given age. A preferable analysis for these data is therefore a 'life-table', as described by Boddington (Boddington *et al* 1987). In such a table the percentage dying is computed from the number dying for each age-group; from this is found the complementary number surviving from the preceding population. The percentage dying can then be expressed as a proportion of the survivorship. This value, standardised by dividing by the number of years in the age-band concerned, is the crude probability of dying per year (q).

There are a number of assumptions involved in life-table calculations, the most important being that the population was stable, ie it had a replacing birth-rate and that it was subject to no catastrophic external influences (eg war, famine, etc). Because these assumptions cannot be checked, and because the sample size is low, the results should be treated with caution; their main use is to provide a rough comparison of the relative death-rates for men and women at different ages. The results are shown in Table 44. The initial population is taken from the totals in the 17–25 age-band, since infant deaths are very much under-represented in the data and therefore do not provide a valid starting population.

Leaving aside the results for the final age-band (whose value is limited by the small sample size and the need to assume an upper age limit), Table 44 confirms the relatively high probability of dying for young adult women compared to men, assuming that equal numbers of male and female children survived until adulthood. However this table suggests, contrary to a possible implication of Table 43, that the probability of dying for men aged 26–35 is not relatively high compared to that for women, but is in fact about the same. For the next age band (36–45), the probability of dying for women is slightly higher than that for men, though the numbers are too small to allow definite conclusions; an analysis of the errors involved and comparative data would be required for further interpretation in a wider cultural context.

Table 43 Age distribution for males and females (all sites)

	<17 yrs	17–25 yrs	26–35 yrs	36–45 yrs	>45 yrs	Total
Male	1	15	29	10	6	61
Female	1	31	14	8	2	56
Total	2	46	43	18	8	117

Table 44 Life-table based on data in Table 43 (ages >17 years)

Age	*Males*		*Females*	
	D	q	D	q
17–25	15	0.03	31	0.06
26–35	29	0.06	14	0.06
36–45	10	0.06	8	0.08
>45–60*	6	0.07	2	0.07

*Key: D, number dying; q, probability of individual dying per year; * assumed upper age limit*

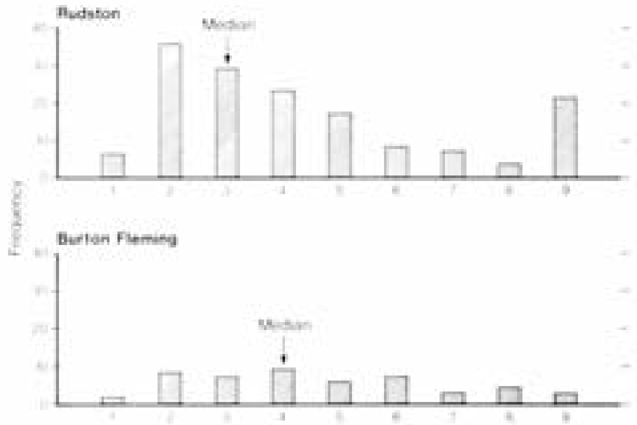

Fig 97 Areas of barrows in nine size classes (in m^2): 1 (<15), 2 (16–20), 3 (21–25), 4 (26–30), 5 (31–35), 6 (36–40), 7 (41–45), 8 (46–50), 9 (>50)

3 Characteristics of burials

The sizes of the barrows are shown in Figure 97. The sizes at Rudston seem to be more variable than at Burton Fleming, there being a relatively high percentage of barrows over 50m^2 yet a median value of 21–25m^2, compared to the median for Burton Fleming of 26–30m^2. In other words, there are both more large and more small barrows at Rudston compared to Burton Fleming. However, comparing the two distributions with a Kolmogorov-Smirnov test (which is sensitive to most types of deviation) shows that such apparent differences may have arisen by chance (with probability 25%) and they therefore cannot be proven to be significant. Also many of the larger barrows are unexcavated which may have distorted the sample to some extent.

The most striking feature of Table 45, which shows the main types of burial represented at each of the sites, is the presence of the extended burials at Rudston but not elsewhere. There is some evidence (X^2=4 with 2 df) for a difference in the relative proportions of crouched, contracted, and flexed burials at Rudston and Burton Fleming, there being a higher proportion of flexed burials at Rudston.

In order to investigate a possible sex-link in burial direction, the burial types found at both main cemeteries, namely the crouched, contracted, and flexed burials, were subdivided as shown in Table 46 (only definite attributions to male, female, and contraindicated individuals considered). Log-linear analysis of the table shows that the patterns for males, females,

Table 45 Frequency of different types of burial

	Disturbed	*Crouched*	*Contracted*	*Flexed*	*Extended*	*Total*
Rudston	9	65	45	35	31	185
	5%	35%	24%	19%	17%	100%
Burton Fleming	5	33	20	7	-	65
	8%	50%	31%	11%	-	100%
Kirkburn	-	2	1	4	-	7
	-	29%	14%	57%	-	100%
Garton Station	-	5	-	5	-	10
	-	50%	-	50%	-	100%

Table 46 Burial directions at Rudston and Burton Fleming

	Body on left				*Body on right*				*Total*
	N(E)	S(W)	E(S)	W(N)	N(W)	S(E)	E(N)	W(S)	
Rudston									
Males	16	5	2	1	3	1	2	1	31
Females	20	6	1	2	3	-	2	3	37
Subtotal	36	11	3	3	6	1	4	4	68
Contra	6	4	1	-	2	-	-	-	13
Total	42	15	4	3	8	1	4	4	81
	52%	19%	5%	4%	10%	1%	5%	5%	100%
Burton Fleming									
Males	11	3	-	-	-	-	1	-	15
Females	8	-	-	-	1	1	-	-	10
Subtotal	19	3	-	-	1	1	1	-	25
Contra	4	-	-	-	-	-	-	-	4
Total	23	3			1	1	1		29
	79%	10%			3%	3%	3%		100%

and contraindicated individuals are not differentiated.

In Table 46 north-pointing, east-facing burials (and to a lesser extent south-pointing, west-facing burials) predominate. This reflects the situation in the whole dataset. At Kirkburn and Garton Station (not included in the table) this type of burial is universal, except for the single north–south disturbed skeleton at Kirkburn. At Burton Fleming the predominance of such burials is very strong. At Rudston it is less so and, as noted above, there are also extended burials at Rudston not occurring elsewhere (see Table 45). None of these are north-pointing; they are mainly east-pointing. The presence at Rudston (but rarely at Burton Fleming) of east-, and occasionally west-, as opposed to north- or south-pointing graves suggests that such graves form a different statistical population and as such should be summarised separately.

4 Grave-goods

North- and south-pointing burials are equivalent to one another in terms of the orientation of the grave itself (the distinction being in the placement of the body within the grave). The same applies, of course, to east- and west-pointing burials. For these reasons it is considered justifiable to present the grave-goods summaries in terms of north–south and east–west burials without further distinction.

Types of burial which appear at Rudston but not at the other sites are east- or west-pointing; they are generally flexed or extended (only 5, or 9%, of the 54 graves being the more usual crouched or contracted). Previous studies of this material (Stead 1976) have revealed that the east–west graves contain a distinctive set of grave-goods compared to the more common north–south graves, either at Rudston or at Burton Fleming; these features are summarised in Table 47 and Figure 98. Note that the grave-goods categories are not mutually exclusive, and that many graves contain no goods of any kind. Table 47 shows the presence of the most important goods: pottery; pig bones or sheep bones; brooches; and metal artefacts such as swords, daggers, etc, including metal fragments. Other deposits such as toe-rings, bracelets, and pins are occasionally present, but only in <10% of the graves in total. Despite their potential archaeological significance, they are too few in number to be considered here.

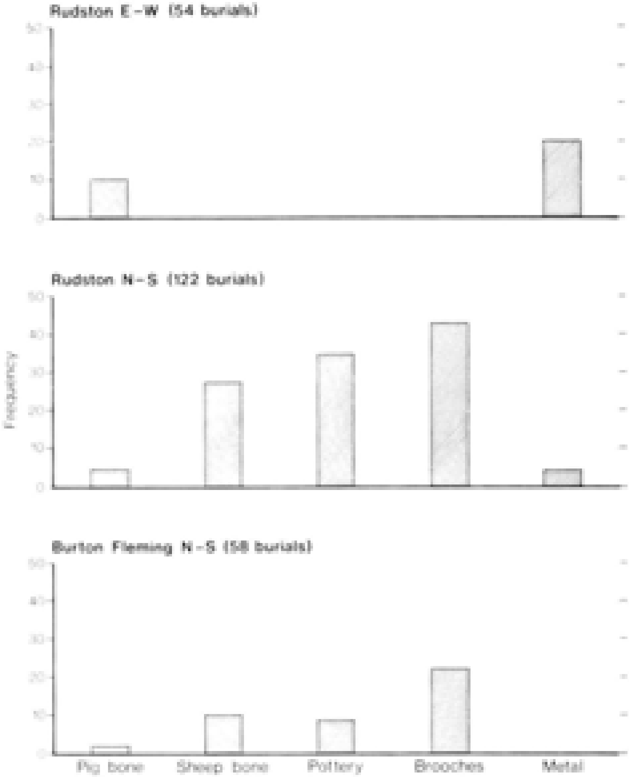

Fig 98 Numbers of graves containing various grave-goods (categories are not mutually exclusive)

Table 47 shows that there is a clear distinction between the east–west graves (at Rudston) and the north–south graves (at Rudston and Burton Fleming). The east–west graves (Rudston only) typically contain, where there are grave-goods at all, pig

Table 47 Presence of various grave-goods (burials grouped by direction)

	Number of skeletons with one or more example of:					
	Pig bone	*Sheep bone*	*Pottery*	*Brooch*	*Metal*	*Total*
Rudston E–W	10 19%	- 0%	- 0%	- 0%	19 35%	54
Rudston N–S	4 3%	29 24%	34 28%	43 35%	4 3%	122
Burton Fleming N–S	2 3%	9 16%	8 15%	21 36%	- 0%	58

Notes:

1 *The two east–west pointing graves at Burton Fleming (62 and 63) contain no grave-goods and are not included in the table.*

2 *The figures relate to the number of skeletons; in the majority of cases there is one skeleton per burial, except for graves 61 at Burton Fleming and 52, 73, 118, and 152 at Rudston, where there are three.*

bones and/or metalwork but not brooches or pottery. By contrast, the north–south graves (at both Rudston and Burton Fleming) tend to contain sheep bones, pottery, or brooches but no metalwork, except for a few graves at Rudston. The proportions containing these different types of grave-good are very similar at Rudston and Burton Fleming except that the proportion containing pottery is significantly higher at Rudston, at 28% compared to 15% (X^2=4, with 1 df; significance 5%). The apparently higher proportion of graves at Rudston containing sheep bones is not statistically significant, if the bones are treated as independent of the presence of pottery (though, as noted below, the pottery and sheep bones tend to co-occur and so are perhaps more realistically treated as a unit). The range of brooch types (designated type A–L) is also rather different at Rudston and Burton Fleming, as shown in Table 48.

At Garton Station and Kirkburn the number of graves is too small for statistical analysis. They are in any case unlike the bulk of the graves at the other sites, including cart-burials and multiple spear deposits in about half the male graves but otherwise without goods except for a pot in an unusually directed grave (east-pointing, facing north, ie unlike the usual north-pointing, facing east).

The condition (degree of fragmentation) of pottery when placed in the grave was thought to be possibly related either to the presence of an animal bone or to the sex of the body (or both); see p 108, main report. In order to investigate this, the relevant data for male and female burials (definite and probable attributions only) were analysed by fitting log-linear models. These showed no evidence for association between sheep bones and female burials, nor between condition of pottery and female burials. The best-fitting model did, however, include association between the presence of a sheep bone and the condition of pottery, with standing vessels being more often associated with bones than fractured vessels. This observation would benefit from a larger sample size, since the connection seems to have no obvious explanation, fractured as well as standing vessels being capable of containing bones.

5 Discussion

Rudston east–west graves

These 54 graves are characterised by pig bones and metalwork, the latter being present in about one-third of the graves. The pig bones are equally divided among the metalwork-containing graves and the rest and there is no evidence for association between these two types of goods *in individual graves*. The only obvious structure in the data is the apparent sex-link in some of the grave-goods: for example the spindlewhorls occur in F or Fp graves; apart from these, the other metalwork tends to occur in M, Mp, or C graves. (The three F? graves containing metalwork may need to be disregarded because of the difficulties in determining sex noted earlier.) It is worth noting at this point that the Garton Station and Kirkburn metalwork is exclusively in indubitable M graves.

Other features of these graves are the presence of extended burials (31, or 58% of the total), and the higher percentage of flexed burials (17 or 31% of the total). These different types of burial do not appear to be associated with any differences in type of goods.

Table 48 Frequency of brooch types at Rudston and Burton Fleming

Type	A	B	C	D	E	F	G	H	I	K	L	*Total*
Rudston	3	1	7	5	7	9	5	2	2	1	1	43
Burton Fleming	2	1	15	-	1	2	-	-	-	-	-	21

Rudston north–south graves

A few contain pig bones and metalwork (but not together). However, the majority of graves containing goods contain pottery, sheep bones, or brooches. An interesting feature of these graves is the relatively high percentage containing two or three different types of these goods together. There is evidence for association between sheep bones and pottery: of the 29 graves containing sheep bones, 23 also contain pottery; indeed 16 had the sheep bone actually in the pot, and 4 others had the bone amongst potsherds. There is also some evidence for brooches being associated with pottery, though to a lesser extent. The more subtle associations require to be investigated using multivariate methods (rather than two-way associations) so will be deferred. It may be of interest, however, to note which graves contain all three (bone, pot, and brooch): 2, 13, 25, 27, 37, 71, 82, 83, 84, 106, 178.

Burton Fleming north–south graves

While broadly similar to the Rudston north–south graves, a smaller proportion of these contains pottery. The other feature is that multiple deposits are rare and are mainly found within a specific part of the cemetery; they occur in graves 4, 6, 18, and 19, which have three, and 10, 11, and 28, which have two goods. This area of the Burton Fleming cemetery is near to part of the Rudston cemetery, which, as noted above, tends to be richer in variety of goods than Burton Fleming as a whole. Grave 28 is an oddity in that it contains a pig bone and there is a pot in the barrow ditch; 61a is unusual in containing several pieces of jewellery.

6 Summary

The most reliable data suggest that equal numbers of men and women were buried and that women had a slightly higher probability of dying in the 17–25 age group. Previously noticed differences between the Rudston and Burton Fleming cemeteries have been confirmed. These differences lie in the directions of burial and in the grave-goods, with two distinct types occurring at Rudston, one pointing north or south like the Burton Fleming graves and the other pointing east or west. Direction of burial does not appear to be sex-linked, and grave-goods are definitely sex-linked only to the extent that some of the artefacts, such as swords and spindlewhorls, occur in 'male' and 'female' types as expected. There is some evidence for spatial differentiation within the cemeteries but this requires to be investigated further.

Future work

Two-way chi-squared tests for the interactions between pairs of variables should be replaced in some instances by log-linear analysis; this will provide more subtle tests for three- and higher-way associations which have hitherto been expressed as simple cross-tabulations. The larger two-way tables will be amenable to correspondence analysis, and it is also hoped to apply this technique to the individual graves and their contents. Plots of the spatial distribution of various types of goods, which will be possible when the spatial data have been entered into the databases, may reveal new features but it seems unlikely that seriation (which might have indicated chronological trends) will be helpful, since the goods are sparse.

Spatial analysis may also be relevant to the further study of the biometric data, particularly for investigating clusters of bodies having similar stature, cephalic indices, or other significant features. The other outstanding statistical problems in the study of the biometric data are the assessment of errors using standard stature formulae, and the treatment of missing values. The latter may be solved by using the techniques developed by Scott.

12 Discussion

Arras Culture burials were covered by small barrows whose distinctive square-plan ditches feature prominently on air photographs taken of East Yorkshire. Certainly by the second century BC these barrows were grouped in large cemeteries, especially in the eastern parts of the Wolds where they frequently occupied gravel-filled valleys. The way in which droveways lead in to cemetery areas between Burton Fleming and Rudston strongly suggests that the cemeteries were grazed, and indeed that would have been an obvious use, maintaining the cemeteries and making them productive without unduly disturbing their sanctity. Examination of molluscs from Garton Station and Kirkburn confirms that the barrows were set in short-turf grassland.

The normal burial-rite at Burton Fleming and Rudston had the corpse crouched or contracted, sometimes in a coffin, and buried with its head at the north end of the grave facing east. Occasionally the rite was varied so that the head was at the south end, and more rarely the body faced the opposite way, on its right side instead of its left. A single brooch was the artefact most commonly found in the grave, normally in the vicinity of the shoulders, where it may well have fastened a cloak. Rarely the corpse wore a bracelet (once, a couple of bracelets) or a bead. It may be that the body was dressed as in life, but there were only slight hints of clothing where the textile had been mineralised by contact with corroding metal. Among these remains was a relatively substantial piece from an elaborately striped border with small areas clearly added by needle – perhaps the earliest attempt at embroidery so far known from England. The strict ritual involved in the burial rite is betrayed by the standard orientation of the skeleton, and also by the inclusion of a simple joint of meat, usually the upper left foreleg of a sheep. Sometimes the meat was buried in a pot, and sometimes the pot was incomplete.

This normal rite was practised at other sites, for many of the Iron Age burials in Yorkshire excavated by nineteenth-century antiquarians seem to conform, where the records allow such detail to be determined. Certainly it was typical in the great cemetery of 446 burials at Wetwang Slack (Dent 1982), although with subtle differences because pots were extremely rare, glass beads relatively common, and one of the graves also produced a sword.

In the Makeshift cemetery at Rudston a quite different burial practice is represented alongside the normal rite. Here (designated Type B to distinguish it from the normal rite, Type A), the corpse was not so tightly confined: it was flexed or fully extended. The orientation was different, too, with the head at the east or west end, instead of the north or south. Whereas brooches were relatively common within Type A, there was only one in a Type B grave; instead a quite different range of artefacts was found – swords, spearheads, tools, knives, and spindle-whorls. The difference between the two types of burial was further apparent in their choice of meat – pork with Type B instead of the lamb with Type A. As with the sheep bones, specific cuts of pork were favoured: here it was the head, cut in half, and a forelimb, but the bones had probably been defleshed before being put in the grave. Six Type B graves had combinations of half-head and forelimb, one had a single leg bone, and three others had remains of heads. Two Type A graves had half-heads and forelimbs of pig, two had leg or foot bones, and two others had remains of heads. But sheep bones were found in 38 Type A graves, and never once in Type B.

The Type B rite does not seem to have been recorded by the nineteenth-century antiquarians, and it is not represented at Wetwang Slack. Outside the Makeshift cemetery there are two burials of this type in Bell Slack, Burton Fleming (BF62 and BF63), and perhaps one other at Grindale. The Grindale grave (Barrow 2, Manby 1980, 33–8) had been disturbed by nineteenth-century excavators and the position of the skeleton is unknown (indeed, no human remains were found in 1857, cf Wright 1861, 36), but the grave was orientated east–west and the complete skeleton of a young pig survived.

The Garton Station and Kirkburn burials vary slightly from the Type A rite at Rudston and Burton Fleming. They are north–south orientated, but in a more relaxed position: only one is contracted, and most are flexed. Furthermore, the typical Type A grave-goods are absent: there are neither brooches nor sheep humeri, and the only pot is with an east–west orientated oddity (a crouched burial in a secondary position in its barrow). The sample is small, so the absence of certain types of grave-goods must be treated with caution, but the presence of others, never found with Type A at Burton Fleming and Rudston, is surely significant – swords in two graves, carts in two, and a shield certainly in one and perhaps in more. At Garton Station all the men had been given special treatment (one cart-burial and four speared corpses), none of the women had grave-goods, and there were several unusual barrows (some lacked central graves, and some had causeways in the ditches). When meat was included in Garton Station and Kirkburn graves it was always pork, as in the Type B burials at Rudston, and without exception the same bones were found (half-head and forelimb). Not only had it been important to select certain cuts of meat, but their precise positions in the grave had been carefully defined. In K3, K5, and GS6 four cuts were deposited, and in each grave the left half-head had been placed near the head of the human corpse, and the right half-head was near its stomach; the pig's left leg was on the human's left side, and the right leg on its right (Figs 125, 127, and 122). These burials from Garton Station and Kirkburn do not stand alone, and there is a case for regarding them as a third variant of the square barrow tradition, Type C. It does not seem to be represented in the large Wetwang Slack cemetery, where all the burials appear to conform with Type A, but the smaller clusters of graves to the east and west of that cemetery belong to Type C. The most impressive of Brewster's burials from Garton Slack, one with a cart and the other with a mirror, were in flexed positions and accompanied by pig bones (Brewster 1971; 1975, 110); the skeletons in the Wetwang Slack cart-burials were also flexed, and two of them had pig bones (Dent 1985a). It seems likely that Type C was represented at Arras, too, where pig bones were found with cart-burials in the King's Barrow and Lady's Barrow – but the records of the Arras excavations do not allow detailed analysis.

The dating of Arras Culture burials depends on the chronology of the associated artefacts. Attempts to date human bone by radiocarbon have produced erratic results (p 169), and in any case calibrated radiocarbon dates have a very wide spread in the Iron Age. Artefacts can be dated in broad terms by reference to the continent if they are imported or directly related to continental typologies. But only one piece published in this volume can be classified as a continental import – the hollow ring in K6, a typical La Tène I artefact, associated with a Type C burial. As for typologies, the most useful are those for brooches and sword scabbards, types that are relatively well-represented in the Yorkshire graves.

Brooches are the most common artefacts found in Arras Culture burials, which might seem a fortunate chance, but of the three varieties of square barrow ritual defined here, Type C has no brooches and Type B has but one. Only in the normal Type A burials are brooches relatively common: they produced 63 brooches at Rudston and Burton Fleming, and 43 at Wetwang Slack. Of these, only 8 are typical La Tène I forms and the vast majority, 91 out of 106, are distinctively British versions derived from La Tène II forms. The very few La Tène I brooches, too, are probably of British manufacture: most of them have some form of hinge mechanism instead of the spring that was used on the continent. Of the brooches published here, only one seems to have had a true spring (B2). Even the Cowlam brooch, which superficially resembles the so-called Marzabotto continental form, has a hinged pin and must have been made in Britain (Stead 1979, 64–5). But in terms of chronology this need not be a serious problem; the Cowlam brooch could have been manufactured in the same year as its continental cousin.

The brooches from the Wetwang Slack cemetery are similar to those in Type A burials at Rudston and Burton Fleming, with the addition of a single example extending the range into La Tène III. That cemetery is important because of a chronological relationship between some of the graves: some barrows cut earlier barrows, and there is an element of horizontal stratification in the overall arrangement of the cemetery. From these graves a sequence of brooches can be constructed, giving useful support for the predicted typological development as well as suggesting that several of the oddities – plate brooches, penannulars, and S-brooches – belong to the early stages of the cemetery (Dent 1982, 441).

The imbalance between La Tène I and II brooches is open to several interpretations. It may suggest that Type A Arras Culture burials started in the third century BC and included a couple of brooches that had somehow survived from early in the previous century; alternatively, perhaps the rite was limited to a few, starting early in the fourth century, and eventually spread to many in the second century; or it could be that the rite was practised by all, starting early in the fourth century, but brooches were worn by only a few and later they became much more common. Brooches provide equally vague evidence for the end of Type A burials. Only one La Tène III brooch was found, at Wetwang Slack; it seems to be a local version and cannot be dated closely, but it should be no earlier than the first century BC. Otherwise the latest brooch is the most developed version of the involuted series; the best dating for the type is the association in R143 of a well-developed involuted brooch with a pedestalled pot that probably belongs late in the second century BC. It seems likely that brooches ceased to be deposited with Type A burials early in the first century BC.

Brooches were far less popular with Type B burials, where only one example was found. In percentage terms that is one brooch with 2% of Type B burials, compared with 33% of Type A burials at Rudston and Burton Fleming, and 10% at Wetwang Slack. The one Type B brooch is later than any other from Rudston or Burton Fleming, which may suggest that all Type B burials were later than all Type A burials. That would be consistent with the sole piece of stratification in the Makeshift cemetery: R9, a Type A burial, was cut by R8, Type B. To pursue the argument, it would suggest that the wearing of brooches became unfashionable in Yorkshire in the first century BC – and that, of course, might have implications for the dating of the latest Type A burials. In the half century or so before the Roman conquest of Yorkshire, well-dated brooches were current in the area (Stead 1971, 39–40; more have been found since, at Garton Slack and Wetwang Slack: Dent 1983a, 8, fig 6, nos 5 and 6; and there are several from recent excavations at Redcliff, near North Ferriby: Crowther and Didsbury 1988, 15, 16), but not one of them has been found in an Arras Culture grave. The evidence is negative, but it does suggest that most Arras Culture burials came to an end in the first century BC.

No brooches have been found with definite Type C burials; the only dress fastener is the pin with a Wetwang Slack cart-burial. Of the sites that included Type C burials only Arras has produced brooches: one is derived from a La Tène I form and the other two (a penannular and a decorated plate brooch) are types that appear early in the Wetwang Slack sequence. Whilst it might have been merely a matter of fashion for brooches to be absent from Type C burials, the few available facts are consistent with C having been earlier than A.

Sword scabbards suffer from the same limitation as brooches, in that all the Yorkshire examples are local products, at least one remove from the continental sequence; and numerically they are far less significant than brooches. In recent excavations only three metal scabbards were recovered, two from Wetwang Slack cart-burials and one from Kirkburn; they are closely related, with La Tène I chape-ends, decorated front-plates, and 'enamel' decoration. All were found in Type C burials. The swords from Rudston were in wood and leather scabbards, without metal fittings, and were found in Type B burials. All the Yorkshire swords seem to be derived from a La Tène I tradition, uninfluenced by the lengthening of continental swords in La Tène II and III. Most have campanulate hilt-ends (reflecting campanulate scabbard mouths), for which no secure typology can be suggested: on the continent they were common in La Tène I and II, and survived into La Tène III. But the Rudston Type B burials also had swords in straight scabbard mouths, which can be no earlier than La Tène III and might belong to the first century AD. None of the Type A burials published here was accompanied by a sword. As far as it goes, the evidence of the swords and scabbards is consistent with the brooches, suggesting that Type C is earlier than Type B.

The remaining artefacts give little chronological information. The pots are basic local products, achieved with a minimum of effort. They seem to belong to a conservative tradition that shows no development from examples associated with La Tène I brooches to those found with the most developed involuted brooches. Only one – the well-finished necked bowl with pedestalled base, found with a tightly involuted brooch in R143 – shows that there was any influence from potters south of the Humber, and that one example gives useful guidance to the dating of involuted brooches. Two glass beads associated with long flat bow brooches are dated by Henderson 'Early La Tène II' (R2) and 'in or after the second century BC' (BF19). Of other types, only bracelets seem to have any chronological significance. They appear to have been more popular in earlier graves (La Tène I and the early stages of La Tène II), but they are too few and varied to allow detailed typological comparisons.

The dating of the artefacts suggests that some Type C burials belong to La Tène I; most Type A burials belong to the second century BC; and some Type B burials belong to the first century BC or even the first century AD. But this does not necessarily mean a simple progression from one type to the other. Some A burials, with La Tène I brooches, could be earlier than C burials, while the burial of pork – specific cuts of pork – is a factor that links C and B. The relationship between A and B burials at Rudston has been illuminated by the study of the human bones. A number of possible 'family groups' has been suggested on the basis of non-metrical variants of the skeletons, features that might well indicate genetic links. No fewer than four of these groups combine A and B burials (p 134), suggesting that some families practised the two different rites. The most impressive example is R139–47, where three A and three B burials are variously linked by four non-metrical variants. R143 is one of the latest A burials on the site (on the grounds of both pot and brooch), so it is particularly interesting to find it linked with some of the B burials, which in general are later than A. There is a suggestion here of the change from A to B perhaps within a generation of the same family.

The Rudston and Burton Fleming excavations produced nothing that might be classified as 'art', the nearest approach being a couple of decorated brooches. Far more important pieces came from Garton Station and Kirkburn. Artefacts found there, and in the Wetwang Slack cart-burials, vastly increase the small corpus of Celtic art from Yorkshire and throw new light on the development of Celtic art in Britain. The art-works from the Wetwang Slack cart-burials – two scabbards, a 'bean-can', and a pair of horse-bits – are linked and draw that small group of burials together, suggesting that the three followed one another closely, perhaps even in the same generation. The four burials from Kirkburn's site 1 might well represent a similar close-knit and relatively rich community; certainly four of the skeletons (K3, K4, K5, and K6) provide a hint of a family relationship (p 135). The Kirburn artworks, a scabbard and a pair of linch-pins, are not closely related stylistically, but both are linked to motifs from Wetwang Slack. At Garton Station the only elaborately decorated object is the large terret from the cart-burial, whose low-relief lobes and 'berried rosettes' invite comparison with the linch-pins from Kirkburn. These stylistic links suggest that the group of cart-burials at Wetwang Slack, the small group of burials at Kirkburn, and the Garton Station cart-burial might well have been contemporary.

The scabbard from Kirkburn is closely related to the two from Wetwang Slack: all have decorated copper-alloy front-plates, closely similar chapes, and suspension-loops placed centrally on the iron back-plates. The bean-can from Wetwang 2 has quite comparable 'engraved' ornament, and the four pieces should obviously be considered together. This is not the place for a detailed stylistic analysis, because the Wetwang pieces are not fully published (but two of them have been illustrated: the scabbard from Wetwang 1, Megaw and Megaw 1989, fig 329, and the bean-can, ibid, fig 326, and Dent 1985a, pl xxi). However, a brief comment is necessary to set the Kirkburn find in context.

The design on the Wetwang 3 scabbard is perhaps the most primitive, with well-spaced elaborate reversed-S motifs whose terminals spiral within a field defined by a triangular 'cusp' on the stem. The Wetwang 2 bean-can also has separate S-motifs, but they interlock in a chain and their comma-leaf terminals turn back and almost touch the points of similar triangular cusps (Fig 99, b). The motif is more developed at Kirkburn, where the S-motifs are linked to form a scroll, with tendrils alternating to right and left: the filling of the terminals is derived from the same motif (Fig 99, c), but here the comma-leaf touches the triangular cusp (creating the fan-shaped void so popular in British Celtic art, Fig 99, e).

The only other British scabbard whose front-plate has overall engraving was also found in a Yorkshire burial, at Bugthorpe (Piggott 1950, fig 2, no 5; Stead 1979, 60–1). But its cast copper-alloy chape-end is typologically more developed than the ring-chapes of Kirkburn and Wetwang, and its engraved scroll ornament is more advanced and linked to the later Mirror Style. From just south of the Arras Culture area, the Sutton scabbard-plate (Fox 1958, pl 21), with alternating engraved panels and laddering, is more

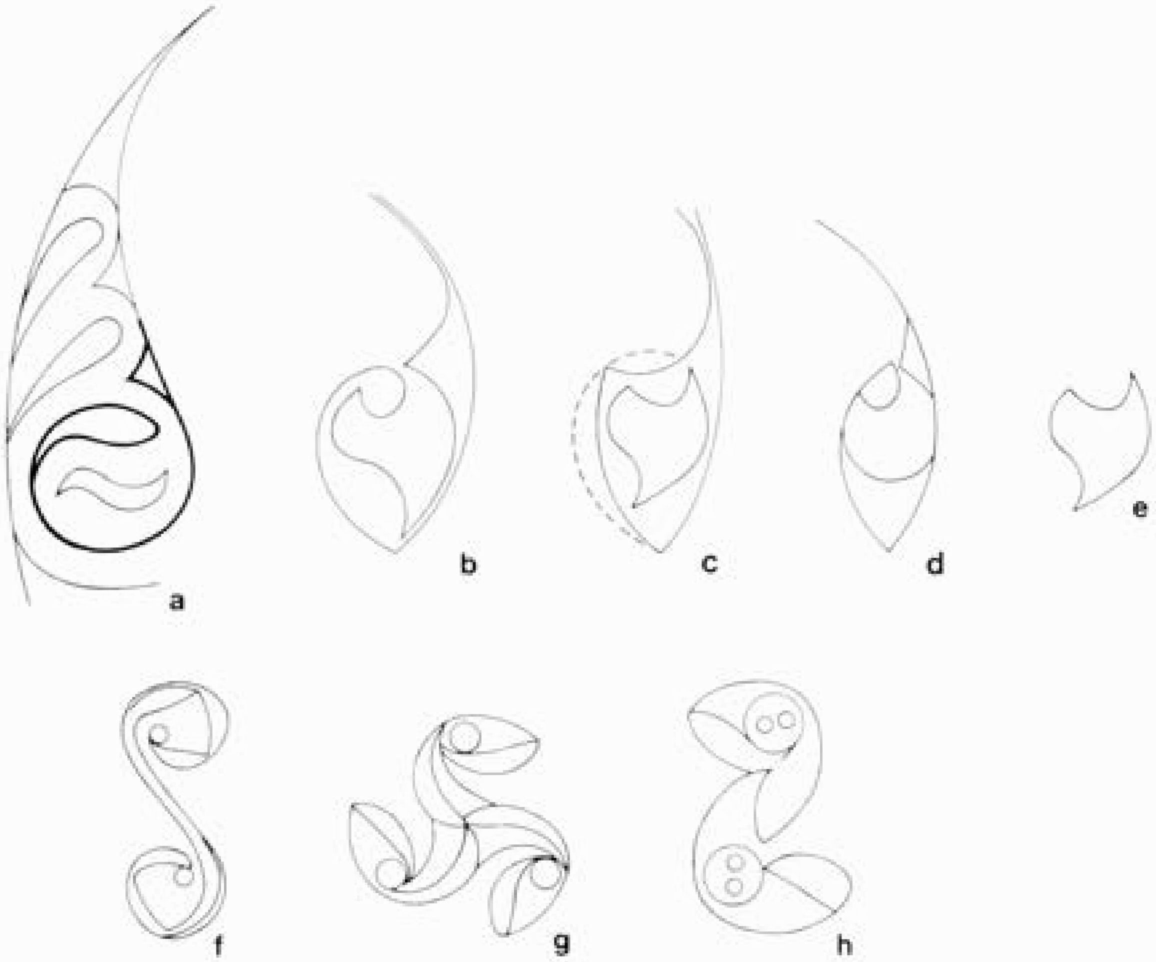

Fig 99 Sketches to illustrate the development of art motifs: a, Saulces-Champenoises; b, Wetwang Slack 'bean-can'; c, Kirkburn scabbard; d, Sutton scabbard plate; e, a fan-shaped void; f, Wetwang Slack horse-bit; g, Kirkburn linch-pin; h, Garton Station terret

closely related: some of its curved motifs terminate in lobes touching triangular cusps on the stem (Fig 99, d), but its fillings are dominated by circles. Further removed, and perhaps ancestral, is the fragment from the top of a scabbard in a Wisbech collection (Piggott 1950, 5; Jope 1961 may be right to regard it as a dagger-sheath, his no 29, but it is comparable in width to the Yorkshire scabbards). Like the Yorkshire scabbards, it has a copper-alloy front-plate and iron back-plate, and although only the upper part survives it is likely that the front-plate was decorated for its full length. The design is a scroll of confronted S-motifs bordering devolved palmettes, derived from the palmette and lotus leaf device that played such an important part in the development of Celtic art.

Otherwise the nearest approach to the Yorkshire scabbards is in Northern Ireland, where six decorated front-plates are known (Raftery 1983, 97–104; 1984, 75ff). There are several points of resemblance, perhaps especially in the spiral tendrils and varied fillings on the Bann scabbard (ibid, fig 51, 2). Much has been written on the relationship between the Irish scabbards and British Celtic art, most recently by Raftery (1984, 88–99, published before the discovery of the recent Yorkshire scabbards), who covers the field thoroughly and concludes that the Irish Scabbard Style had direct continental links and an origin in the third century BC. His thesis is probably correct, but the new finds do strengthen the ties between Northern Ireland and Yorkshire, quite apart from considerations of the art style. One fascinating link is the very distinctive hollow copper-alloy ring, which Raftery has mapped throughout Celtic Europe. Outliers at Lisnacrogher suggest direct contact between Ireland and the continent, but now one of the Lisnacrogher examples can be matched almost exactly at Kirkburn (K6, Fig 69). Another detail that may well be significant is the position of the suspension-loop on the scabbard. The evidence is slight, for no Irish suspension-loop in fact survives; but the only back-plate (Raftery 1983, no 265, with an undecorated front-plate) has rivet-holes that must have been intended for the plates of a central loop. Central suspension-loops might have been normal fittings on scabbards in northern England, Scotland, and Ireland (Stead 1988, 23); some, but not all, of these scabbards seem to have been worn on the warrior's back. The earliest central suspension-loop is perhaps that from Orton Meadows, Peterborough, on a scabbard whose chape is bridged front and back and whose front-plate has cross-hatched borders that recall Late Hallstatt dagger sheaths (Stead 1984b, 47–9). So far, central suspension-loops do not seem to have been recognised on the continent. Another factor common to the Irish and Yorkshire scabbards is the use of copper-alloy front-plates, as opposed to the iron scabbard plates that are so much more common on the continent (though copper-alloy was occasionally used, eg Osterhaus 1969); but the only surviving back-plate from Ireland was also made of copper-alloy, and that cannot be matched in Yorkshire. The chape-ends, however, argue against a direct connection betwen the known Irish and Yorkshire scabbards, although elsewhere in England the shape of the Irish chape-ends can be matched as closely as on the continent (eg an iron example from the River Witham, Petch 1957, 9).

Whatever the significance of the links between the two areas, they do not seem to allow the Yorkshire tradition to have been derived from Ireland. In particular, the Yorkshire chape-ends are related to a British type represented at Orton Meadows and Standlake (Stead 1985b, fig 10a and b) – the one almost certainly and the other probably earlier than the Yorkshire examples. Furthermore, the origins of the Yorkshire Scabbard Style (following Raftery's 'Irish Scabbard Style', which is more correct than a Sword Style) seem to be in southern Britain, and ultimately on the continent. The spiral or comma-leaf turning back to a triangular cusp on the stem is developed from the half-palmette (Fig 99, a), a motif already detached and involved with varied fillings on the unprovenanced flagon from Besançon Museum, which is unlikely to date later than the middle of the fourth century BC (Frey 1984). In southern Britain this palmette-dominated art-style is represented at Cerrig-y-Drudion (Stead 1982) as well as on the Wisbech scabbard (Jope 1961, pl xxiv), and on both pieces it has been adapted to a scroll. The design on the Wetwang 1 scabbard (Megaw and Megaw 1989, fig 329) has nothing to do with the palmette, but it too is derived ultimately from a Greek motif, the wave tendril (Jacobsthal 1944, 70, 92, and P107). The Wetwang example is very much a Celtic version of this motif, with swelling ribbon, varied infillings, and tightly coiled spirals, and its overall layout is reflected in the design on the Kirkburn scabbard. The Yorkshire Scabbard Style has its origins in the early stages of Celtic art, and could have followed soon after pieces such as the Besançon flagon. The La Tène I chape-ends and hollow ring, and the absence from the Wetwang Slack cart-burials, Garton Station, and Kirkburn of the La Tène II brooches so common in the other burials, suggest that the Yorkshire scabbards should be dated no later than the third century BC.

The position of the Yorkshire Scabbard Style in the development of La Tène art in Britain occasions no real surprise, but the associated relief ornament – lost-wax castings decorated with arrangements of lobes – is more unexpected. Relief ornament was executed in repoussé on major pieces such as the contemporary Torrs pony-cap (for typical cusps cf Atkinson and Piggott 1955, pl lxxxi,b) and on the Battersea Shield (which might have been early, cf Stead 1985b, 32–3; for cusps see especially ibid, fig 12g and pl vi, top), but decorated lost-wax castings with small lobes in relief are usually regarded as later. However, in the Yorkshire graves there are five items of harness or vehicle fittings decorated in this way: a pair of horse-bits from Wetwang 2, a pair of linch-pins from Kirkburn, and a terret from Garton Station. Direct association with the Yorkshire Scabbard Style occurs in only one grave, Wetwang 2, where the horse-bits and the bean-can were found; but it has been argued above that K5, with the two linch-pins, is more or less contemporary with K3, with the decorated scabbard; and stylistically the Garton Station terret is linked to the Kirkburn linch-pins. The design on the horse-bits is the simplest: an 'S' like that on the bean-can, but lacking the triangular cusps, and with the terminals divided into lobes set sharply at angles to one another (Fig 99, f). On the linch-pins this S-motif has been converted to a triscele (Fig 99, g), and the terminals are more compact – the domed tip becomes the 'eye' of the bird-head so familiar on British Celtic art. The Garton Station terret employs the same device, this time in the form of a reversed-S, and with the relief reduced to three lobes (Fig 99, h). Typologically the Wetwang piece seems more primitive, but who knows how long the evolution of such a motif would have taken? All three designs are more or less contemporary with the Yorkshire Scabbard Style, and apparently before the introduction of the La Tène II brooch. Hitherto such works would have been dated to the first century BC on the evidence of the great Snettisham torque and the Gussage All Saints moulds. The Snettisham torque is relatively securely dated to the first century BC (a coin was actually trapped in it, giving a *terminus post quem* for its burial but not, as originally reported, for its manufacture), but the dating of the Gussage moulds is more open. Spratling (in Wainwright and Spratling 1973, 122–3, and in Wainwright 1979, 125) was convinced on archaeological grounds that the metal-working debris from pit 209 dated from the first century BC, but a radiocarbon date from the bottom of the pit was calibrated to 355–20BC (Wainwright and Switsur 1976, 37, 39; a sample 'from a lens high in its silting' was calibrated to 165BC–AD80; neither sample is plotted on the published section). Spratling's conviction was based on a very thorough analysis of British Iron Age metalwork, and he favoured late dates because the only securely dated metalwork was indeed late. The problem with British Iron Age chronology is that there are no secure early dates; a relatively satisfactory chronology is achieved only in the approach to the Roman conquest, where long-lived types and survivals give an inevitable bias towards a low chronology. The new finds from Yorkshire help to redress this imbalance by providing a horizon in La Tène I, perhaps in the third century BC. They release the anchor that tied so many objects to the first century BC, and allow the possibility of an earlier date for pieces such as the Ipswich torques.

There was more to the Arras Culture than burials, ritual, and artefacts. Work on other aspects is only just beginning, but the information acquired, although unpublished and incompletely digested, cannot be ignored. Twenty years of air photographs have revealed a vast complex of settlements, roads, fields, and dykes as well as barrows. But with a few obvious exceptions these features are undated. Before the Iron Age aspects of this landscape could be identified and disentangled, a reference sequence of pottery covering the first millennium BC had to be established, and existing museum collections were obviously inadequate. Excavation was needed, but the area excavation of a single settlement would not achieve this aim: the most effective approach was to trial-trench over a relatively wide area. Sites with pits were selected; on the analogy of southern England pits were likely to be Iron Age, should be near the centre of domestic activity, and be more likely than ditches to produce useful groups of pottery. Cathy Stoertz (National Monuments Record) selected the initial list from air photographs, and in three seasons (1988–90) 57 pits on 9 sites were excavated. They produced a range of pottery that established the outline of a relative chronology from the end of the second millennium BC to the Roman period. Arras Culture pottery, as represented in the graves, gradually develops within that sequence; if there is any outside influence then it comes from further north in Britain. The preliminary results from the settlements suggest that the Arras Culture evolved locally.

British prehistory used to be seen in terms of a series of invasions bringing new developments across from the continent, and the British Iron Age was classified according to those invasions. In the 1960s there was a reaction in favour of cultural continuity, but one of the very few invasions to survive was the Arras Culture (Hodson 1964, 101; Clark 1966, 186). Certainly there are continental influences: the idea of the cart-burial is undoubtedly related to a continental tradition, and so are the square barrows. These two aspects must be viewed in terms of European La Tène cultures; although they cannot be matched exactly in any one area, they differ from the tradition in Champagne, for instance, no more than Champagne or the Belgian Ardennes differs from the Middle Rhine. But other aspects of the burial rite cannot be paralleled in these areas, especially the position of the body in the grave. Continental La Tène burials are usually extended; crouched, even flexed, burials are quite exceptional in western Europe (Stead 1979, 38). According to Uzsoki (in Horvath *et al* 1987, 29), contracted burials are not uncommon in Celtic cemeteries in Hungary, but they are still exceptional. In Britain beyond East Yorkshire, the relatively few Iron Age inhumations are contracted, crouched, or flexed and many are north–south orientated, as in Types A and C in Yorkshire (Whimster 1981; C E Wilson 1981, 138–40), suggesting that the crouched burial was deeply rooted in native tradition. But the previous phase of crouched inhumation in graves under barrows ceased in Yorkshire about a millennium before the Arras Culture started, and in those graves the predominant orientation was east–west (Tuckwell 1975, 99). Ironically, the flexed or extended Type B burials in Yorkshire more closely resemble the continental La Tène traditions, but they seem to be later than A and C and cannot be linked with the introduction of cart-burials and square barrows.

The rite of crouched burial is not the only native aspect of Arras Culture burials; with only one exception the grave-goods – pottery and metal – seem to be of local manufacture. The one artefact that can be classified as an import is the hollow ring from Kirkburn, an outlier of a well-known continental type. Many of the Yorkshire artefacts are related to European pieces, but they belong to distinctive British varieties and there is nothing to suggest that they were introduced to this country via Yorkshire. The local pottery tradition and the continuity of occupation on settlement sites further emphasise the native element in the Arras Culture.

Direct continental influence on the Arras Culture amounts to two aspects of the burial rite, cart-burials and square barrows. Their arrival points to at least one immigrant who had a powerful effect on the religious life of a tightly defined community – perhaps a tribe (Ramm 1978). The new influence may have affected only a small element in Yorkshire, and there is some suggestion that the early converts were relatively rich. Perhaps the immigrant was a well-connected evangelist. The impetus seems to have come in the fourth century BC, and by late in the third century BC it had spread to the masses. Thousands of small square barrows must have been constructed in the second century BC. In the first century BC there was a sharp change in burial rite at Rudston, but again it does not seem to represent an incoming population. Indeed, there is a suggestion that the change can be seen within a single family; as with the start of the Arras Culture, the most likely explanation is a change in beliefs. At Rudston the new rite might have survived into the first century AD, but elsewhere Arras Culture burials came to an end more than a century before the Roman conquest of Yorkshire.

Appendix List of graves and grave-goods

The skeletons vary considerably in position, and no attempt to classify them can be completely satisfactory. But some form of classification is necessary, if only to avoid repetition in the descriptions, so six categories are defined. The position of the skeleton is described according to the way in which the legs have been placed in the grave (see Fig 100).

1 *Contracted* More or less on its side with the knees touching the chest, all leg-bones virtually parallel with the vertebrae. The arms are usually sharply bent, with the elbows just above waist level and the hands in front of the face. Such skeletons are so tightly contracted that they would fit into a box only 0.35/0.4m wide and 0.7/0.85m long.

2 *Contracted on back* With the legs drawn up together at the side of the chest, one femur crossing the body, but all lower leg-bones aligned. Usually the hands are in front of the face, one forearm crossing the chest. They occupy a wider space than the previous category. Contracted on chest is a comparable position.

3 *Tightly crouched* More or less on its side and the knees drawn up in front of the chest; there is a definite but small angle between the femora and the vertebrae (say 15–40°). Hands in front of the face.

4 *Crouched* Usually on its side, with the knees drawn up to about the level of the waist. The angle of the femora to the vertebrae is between 40 and 90°. Hands in front of the face.

5 *Flexed* Usually on its side, with the legs together and the femora at an angle of more than 90° to the vertebrae. The hands are usually in front of the face.

6 *Extended* On its back, with one or both legs more or less fully extended and the arms by the sides.

Where the skeleton has legs in different positions the skeletal position is classified according to the more extended leg. Any marked variation from these categories is noted in the descriptions.

The measurements are those of the features when first defined, at the gravel level, after the topsoil had been removed, and depths are from that level; in the illustrations of the grave-groups (Figs 101–127) the outlines of the bottoms of the graves are plotted. Barrow measurements give the size of the platform, within the ditches, east–west first, then north–south; ditch measurements give the average depth and width, where sectioned.

Skeletons are sexed according to degrees of confidence: certain, probable, and possible; some are of unknown sex, and others have clear contra-indications (one factor indicates male and another female). The condition of the bones is indicated by letter codes: A = excellent, all bones sound (none of the skeletons here recorded warrant an 'A'); B = good, most bones complete and in reasonable condition; C = fair, most long-bones complete, but smaller bones in poor condition; D = poor, at least one complete long-bone, but little of the fingers, toes, ribs, and vertebrae; E = very poor, fragments of skull and fragmentary shafts of long-bones; F = no bones surviving, or only a little tooth enamel.

Rudston (Makeshift cemetery)

R1 (FE 1) Grave 2.1×1.4m, D 0.6m; barrow ?×4.6m; ditch D 0.3m, W 0.8m. N/S, facing E, tightly crouched; r forearm outstretched, hand near knees. Female, age 17–25; condition D.
Sherds (FE/AI, AJ, AL) in grave

R2 (FE 2; Fig 101) Grave 2.05×1.25m, D 0.6m; barrow ?×7m; ditch D 0.4m, W 1.6m. N/S, facing E, flexed; l arm flexed in front of body, r arm fully outstretched across it. Sex: contra-indications, age 17–25; condition D

1 Pot (FE/AM) over ankles
2 Iron brooch (C2, FE/AP) in front of face
3 Glass bead (C1, FE/AO) between r shoulder and skull
4 Shale bracelet (C1, FE/AQ) on l forearm
Sheep bone (FE/AV) beneath skull

R3 (FE 3) Grave 1.8×1.25m, D 0.75m; barrow ?×5m; ditch D 0.6m, W 1.35m. N/S, facing E, tightly crouched. Female, age 25–35; condition C. In coffin 1.05×0.5m, recognised 0.25m from floor of grave

Sheep bone (FE/AZ) immediately NE of skull

R4 (FE 4) Grave 1.9×1.3m, D 0.6m; barrow ?×5.6m; ditch D 0.6m, W 1.35m. N/S, facing E, contracted. Female, age 17–25; condition D

1 Iron brooch (C15, FE/AX) immediately E of forearms
Pot (FE/CM) in ditch

R5 (FE 6) Grave 1.9×1.1m, D 0.95m; barrow 3.8m×?; ditch D 0.3m, W 0.7m. N/S, facing E, contracted. Female, age 17–25; condition D/E

Sherd (FE/CE) in grave

R6 (FE 7) Grave 1.7×1.1m, D 0.8m; barrow ?×5m; ditch D 0.4m, W 1m. N/S, facing E, flexed; l knee more flexed than r, r forearm across waist with hand near l elbow. Female, age 35–45; condition D

Pot (FE/BY) in sherds in front of face
Sheep bone (FE/BX) amongst sherds; sherd (FE/BZ) in grave

R7 (FE 5) Grave 1.55×1.15m, D 0.9m; barrow 3.8×?;

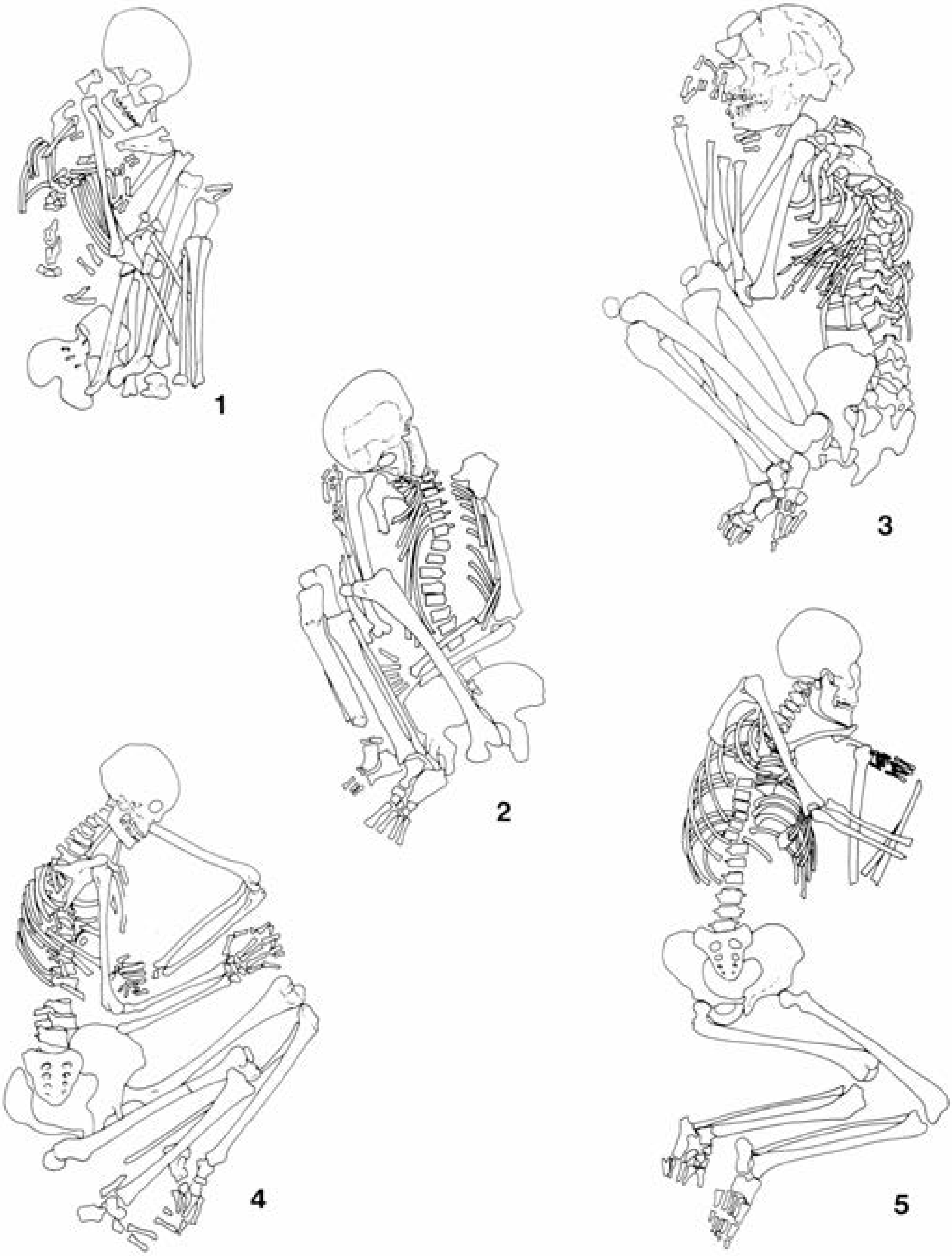

Fig 100 Positions of skeletons: 1, contracted (R60); 2, contracted on back (BF19); 3, tightly crouched (R43); 4, crouched (R106); 5, flexed (R30)

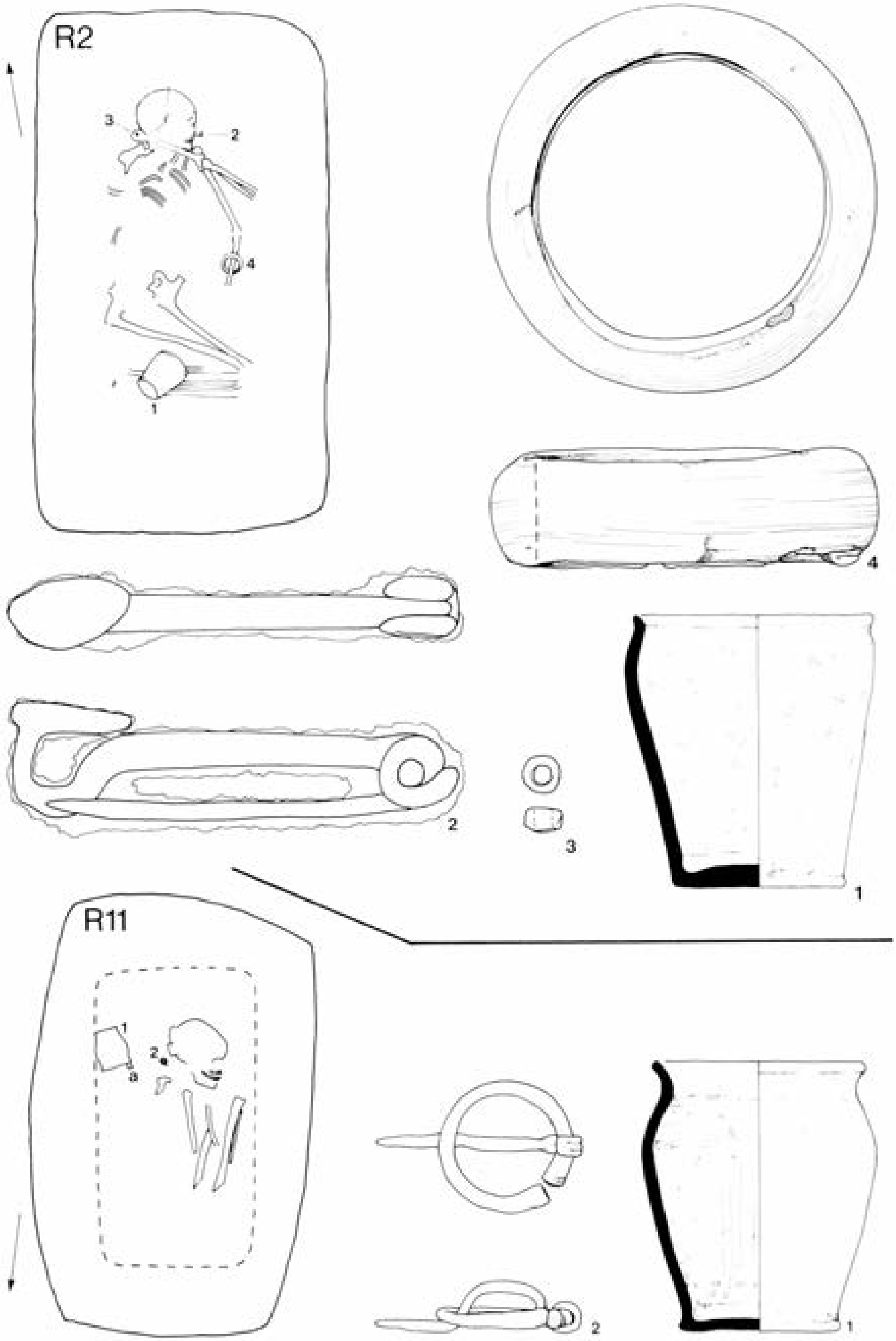

Fig 101 Rudston grave-groups, R2 and R11: plans (1:20), pots (1:3), bracelet, brooches, and bead (1:1)

ditch D 0.55m, W 1.25m. N/S, facing E, contracted on back. Sex ?, age 15–20; condition D/E

Iron brooch (H1, FE/BH) on skull
Sheep bone (FE/BJ) by hands

R8 (FE 8) Grave 2×1.15m, D 0.95m. W/E, extended; r arm by side and l arm flexed with hand over hip. Probable female, age 45+; condition E. Cuts Burial 9

Pig bones (FE/CJ) over hip and waist

R9 (FE 9) Grave 1.8×1.1m, D 0.6m. N/S, facing E, crouched or contracted on back; r forearm across chest, position of legs and l forearm unknown. Probable male, age 17–25; condition D/E. Lower part cut by Burial 8

R10 (FE 10) Grave 1.3×0.85m, D 0.6m. N/S, facing E; position unknown, only skull and slight trace of r arm surviving. Child, age 2–3; condition E/F

R11 (FL 3; Fig 101) Grave 1.9×1.35m, D 0.65m; barrow 5.4×5.4m; ditch D 0.75m, W 1.25m. S/N, facing W, contracted. Possible female, age 35–45; condition E. In coffin 1.05×0.55m recognised 0.4m above the floor of the grave

1 Pot (FL/BO) behind skull
2 Copper-alloy brooch (L1, FL/BR) near back of skull
Sheep bone (FL/CF) in pot

R12 (FL 1) Grave 1.25×1.1m, D 0.7m; barrow 4.2×4.2m. N/S, facing E, contracted. Sex ?, age 35–45; condition E

Pot (FL/AF) in sherds scattered near feet
Sheep bone (FL/AF) amongst sherds

R13 (FL 2; Fig 102) Grave 2.05×1.05m, D 0.55m; barrow 6×5.4m; ditch D 0.85m, W 1.25m. N/S, facing E, flexed on back; l arm extended, r forearm across chest. Skeleton lost

1 Pot (FL/AA) between hips and heels
2 Iron brooch (F6, FL/AM) on neck
Sheep bone (FL/AB) inside pot

R14 (FL 5) Grave 1.9×1.2m, D 0.8m; barrow ?×?4m; ditch D 0.5m, W 1m. N/S, facing E, contracted. Probable female, age 25–35; condition E

Pot (FL/BS) W of body
Sheep bone (FL/CH) over r wrist

R15 (FL 8) Grave 1.75×0.9m, D 0.95m. W/E, facing S, flexed; arms folded in front of chest. Female, age 17–25; condition D/E

R16 (FL 4; Fig 102) Grave 2.1×1.35m, D 0.8m; barrow ?×6.2m; ditch D 0.75m, W 1.3m. N/S, facing E, tightly crouched. Probable female, age 25–35; condition D. In coffin 1.1/1.2m×0.65m

1 Pot (FL/BZ) in front of face
2 Glass bead (C2, FL/CJ) under skull (near l ear)
Sheep bone (FL/CG) inside pot

R17 (FL 11) Grave 1.85×1.2m, D 0.85m; barrow ?×5m; ditch D 0.45m, W 0.8m. N/S, facing W, crouched; slightly on chest facing floor of grave, feet about 0.25m above floor – apparently the side of the grave had collapsed in the course of the burial. Male, age 25–35; condition D

R18 (FL 12) Grave 1.35×1.05m, D 0.7m; barrow ?3.5m×?; ditch D 0.3m, W 0.8m. N/S, facing E, contracted on back; l elbow outstretched, and hand by knees. Sex: contra-indications, age 25–35; condition E

Pot (FL/DB) over chest
Sheep bone (FL/DB) inside pot

R19 (FL 7) Grave 2.1×1.3m, D 0.75m; barrow ?×5.6m; ditch D 0.65m, W 1.25m. N/S, facing W, contracted on back; knees drawn up on E but skull facing W, r forearm across chest (hand on l shoulder), l forearm across waist. Probable female, age 17–25; condition D

Sherd (FL/BX) in grave

R20 (FL 9; Fig 102) Grave 1.75×1.15m, D 0.7m; barrow ?×5.2m; ditch D 0.4m, W 1m. N/S, facing E, contracted on back. Male, age 45+; condition D/E

1 Pot (FL/CL) behind skull
2 Iron brooch (G2, FL/CK) over neck
Sheep bones (FL/CM, DE) in pot; some animal vertebrae over body

R21 (FL 10) Grave 1.75×1.05m, D 0.8m; barrow ?×4.2m; ditch D 0.8m, W 0.6m. N/S, facing E, contracted. Probable female, age 35–45; condition E

R22 (FL 13; Fig 103) Grave 1.5×1.1m, D 0.9m; barrow ?4.5m×?; ditch D 0.5m, W 0.9m. N/S, facing E, contracted on back. Probable female, age 17–25; condition D/E

1 Pot (FL/CY) in front of face
2 Iron brooch (E1, FL/CX) on top of skull (by r cheek)

R23 (FN 13) Grave 1.95×0.95m, D 0.35m. W/E, facing N, flexed on back; r arm extended. Female, age 17–25; condition C

R24 (FN 14; Fig 103) Grave 1.9×0.95m, D 0.3m. E/W, extended; head facing N, l forearm folded across waist, legs crossed below knees. Probable male, age 17–25; condition C/D

1 Iron sword (Ba1, FN/BP) over body – tang on chest
2 Iron spearhead (A15, FN/CE) in SW corner of grave

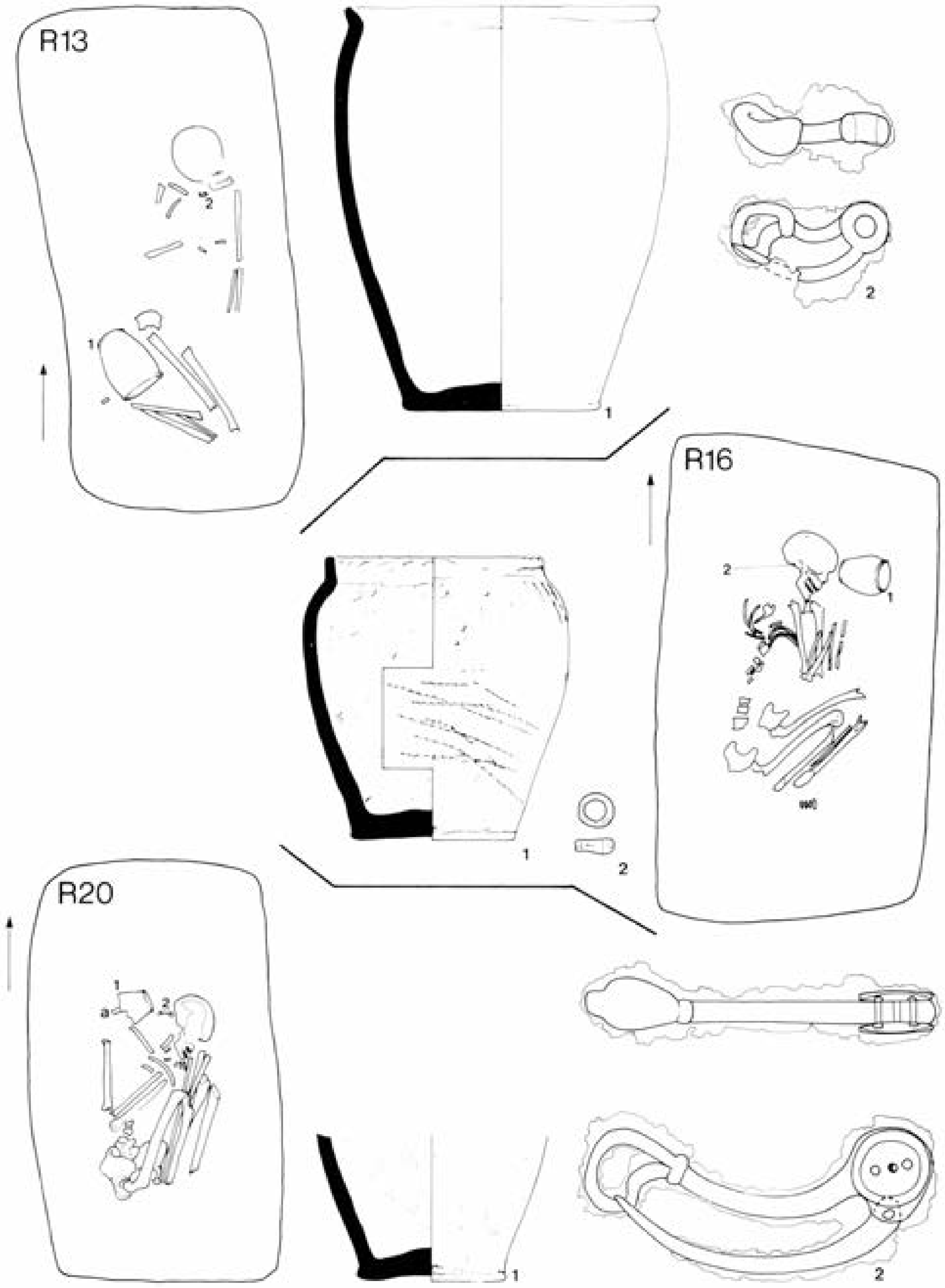

Fig 102 Rudston grave-groups, R13, R16, and R20: plans (1:20), pots (1:3), brooches and bead (1:1)

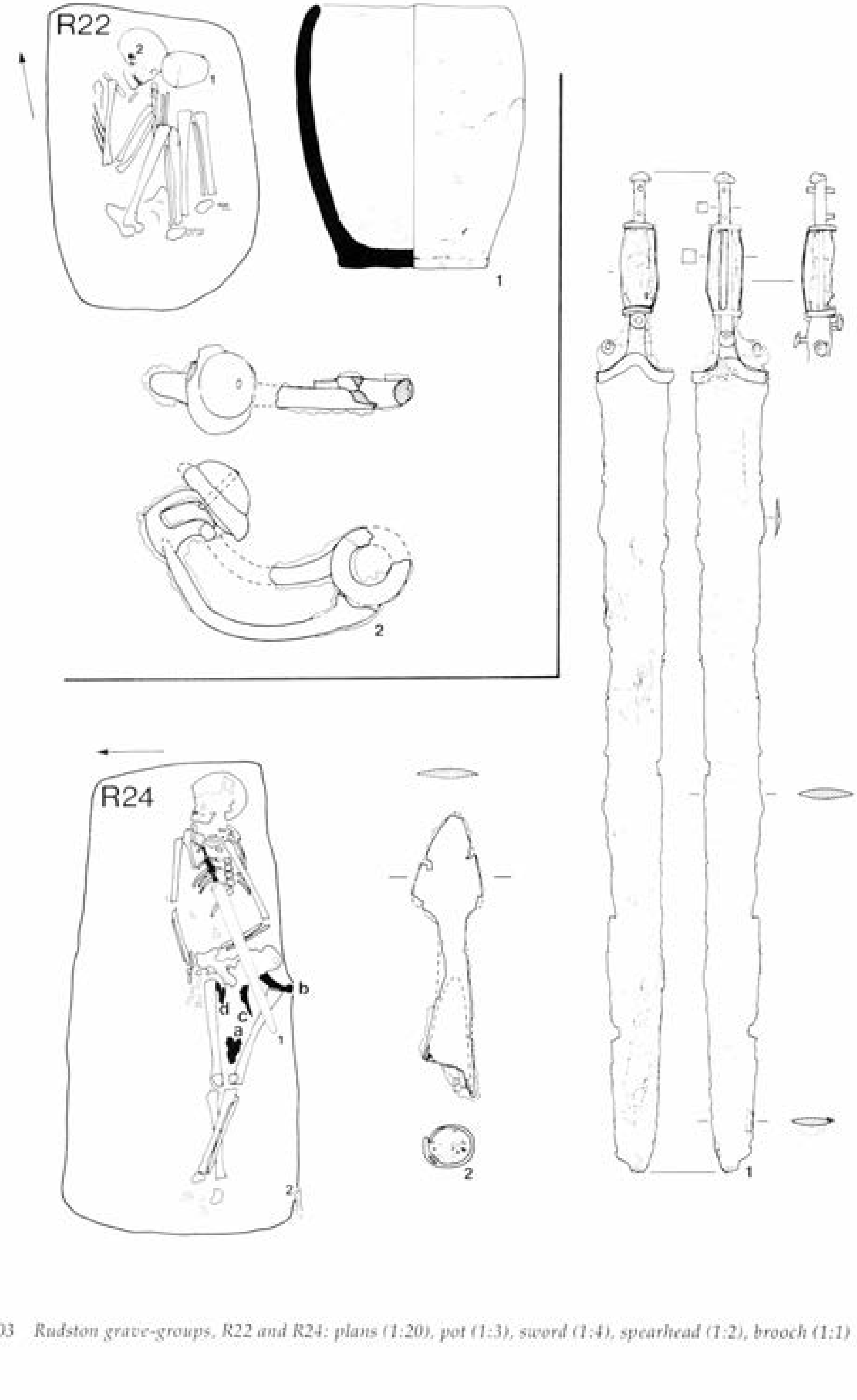

Fig 103 Rudston grave-groups, R22 and R24: plans (1:20), pot (1:3), sword (1:4), spearhead (1:2), brooch (1:1)

Pig bones (FN/CF) between legs: from the left side of a pig – a, mandible; b, humerus; c, scapula; d, radius and ulna

R25 (FN 8; Fig 104) Grave 1.95×1.4m, D 0.7m; barrow ?×5.8m; ditch D 0.4m, W 1m. N/S, facing E, contracted; r forearm folded across waist. Male, age 45+; condition D. Coffin: W edge visible only

1 Pot (FN/AO) adjoining ankles
2 Iron brooch (F7, FN/AQ) at back of neck
Sheep bone (FN/AP) in pot

R26 (FM 4) Grave 2.1×1.15m, D 1m; barrow ?×3.4m; ditch D 0.15m, W 0.3m. W/E, facing S, extended; r arm extended, l forearm across waist. Sex: contra-indications, age 25–35; condition D. Additional human femur (FM/CN) under r arm

R27 (FM 3; Fig 104) Grave 1.8×1m, D 0.6m; barrow 4.6×6m; ditch D 0.45m, W 1.2m. N/S, facing E, tightly crouched. Female, age 17–25; condition D/E. In coffin 1.3×0.5/0.55m, visible 0.4m above floor of grave

1 Pot (FM/BH) adjoining legs
2 Iron brooch (E2, FM/BM) in front of face
Sheep bone (FM/BN) just outside pot; sherd (FM/BB) in grave; sherd (FM/EZ) in ditch

R28 (FM 2) Grave 1.75×0.95m, D 0.45m; barrow ?3.6m×?; ditch D 0.2m, W 0.5m. E/W, facing N, crouched (almost flexed). Probable female, age 25–35; condition E

R29 (FM 5) Grave 1.55×1.3m, D 0.6m; barrow ?×3.9m; ditch D 0.3m, W 0.6m. W/E, facing S, extended; both arms fully extended, legs also extended but crossing grave diagonally with feet together in SE corner and well above floor. Possible female, age 17–25; condition E

Minute iron fragments (1, FM/BU, etc) over middle of body and r leg

R30 (FM 1) Grave 1.65×0.85m, D 0.7m. N/S, facing E, flexed on back; r arm extended across body (Fig 100, 5). Female, age 17–25; condition C

Sherd (FM/BE) in grave

R31 (FM 9) Grave 1.8×0.9m, D 0.7m. N/S, flexed on back; legs together on E but skull upright, l forearm on chest, r on waist. Male, age 45+; condition D/E

Sherd (FM/CT) in grave

R32 (FM 8; Fig 104) Grave 1.85×1.4m, D 0.65m; barrow 7.6×7.6m; ditch D 0.75m, W 1.4m. S/N, facing W, contracted. Sex: contra-indications, age 35–45; condition E. In coffin 1.15×0.55m (Fig 30)

1 Pot (FM/CO) broken in SE corner of coffin
2 Copper-alloy brooch (G1, FM/BR) beyond skull in SW corner of coffin

R33 (FM 7) Grave 1.75×1.35m, D 0.6m; barrow 6×6m; ditch D 0.5m, W 1.2m. N/S, facing E, contracted on back. Female, age 25–35; condition D. In coffin 1.15×0.7/0.8m

Pot (FM/BL) over feet
Sheep bone (FM/BP) inside pot

R34 (FM 10) Grave 2.25×1.45m, D 0.7m; barrow 7.8×7.4m; ditch D 0.4m, W 1.25m. N/S, facing W, crouched. Probable male, age 35–45; condition E. In coffin 1.5×0.7m first seen 0.5m above floor of grave

Iron brooch (C22, FM/CU) in front of face
Pot (FM/FJ) in ditch; sherds (FM/CJ, CK) in grave; sherds (FM/FH, FK) in ditch

R35 (FM 6) Grave 1.85×1.15m, D 0.4m; barrow 4.8×6.2m; ditch D 0.4m, W 1.05m. N/S, facing E, contracted; l arm fully extended with hand at feet. Probable male, age 17–25; condition C/D

Brooch (F1, FM/CG) between l wrist and knees

R36 (FM 14) Grave 1.6×1.1m, D 0.6m; barrow 4×4.2m; ditch D 0.45m, W 1m. N/S, facing E, contracted on chest; l arm under chest, hand between legs. Female, age 17–25; condition D

Brooch (D1, FM/DB) between chest and knees
Sherds (FM/DD) in grave

R37 (FM 16; Fig 105) Grave 1.6×0.95m, D 0.8m; barrow 4.6×4.2m; ditch D 0.3m, W 0.8m. N/S, facing E, tightly crouched. Possible female, age 17–25; condition E

1 Pot (FM/DQ) over r shoulder
2 Iron brooch (G3, FM/DG) near r elbow
3 Iron fragments (2, FM/DV, etc) over knees and legs
Sheep bone (FM/DR) inside pot; sherd (FM/EY) in ditch

R38 (FM 15) Grave 2.1×1.2m, D 0.55m; barrow 8.6m×?; ditch D 0.75m, W 2m. N/S, facing E, contracted on back. Possible male, age 17–25; condition E. In coffin 1.45×0.5m, extremely long relative to length of skeleton, 0.85m

Iron pin (2, FM/EH) near feet, and remains of another (3, FM/EJ, EK) between r shoulder and skull
Two sherds (FM/EM) in grave; sherd (FM/EX) in ditch

R39 (FM 12; Fig 105) Grave 1.75×1m, D 0.4m; barrow 4.2×4.4m; ditch D 0.35m, W 0.9m. S/N, facing E, contracted. Possible male, age 35–45; condition D/E

1 Pot (FM/CX) near feet
2 Iron brooch (A4, FM/CV) over l forearm
3 Iron fragment, possibly from a ring-headed pin (4, FM/CW), in front of skull

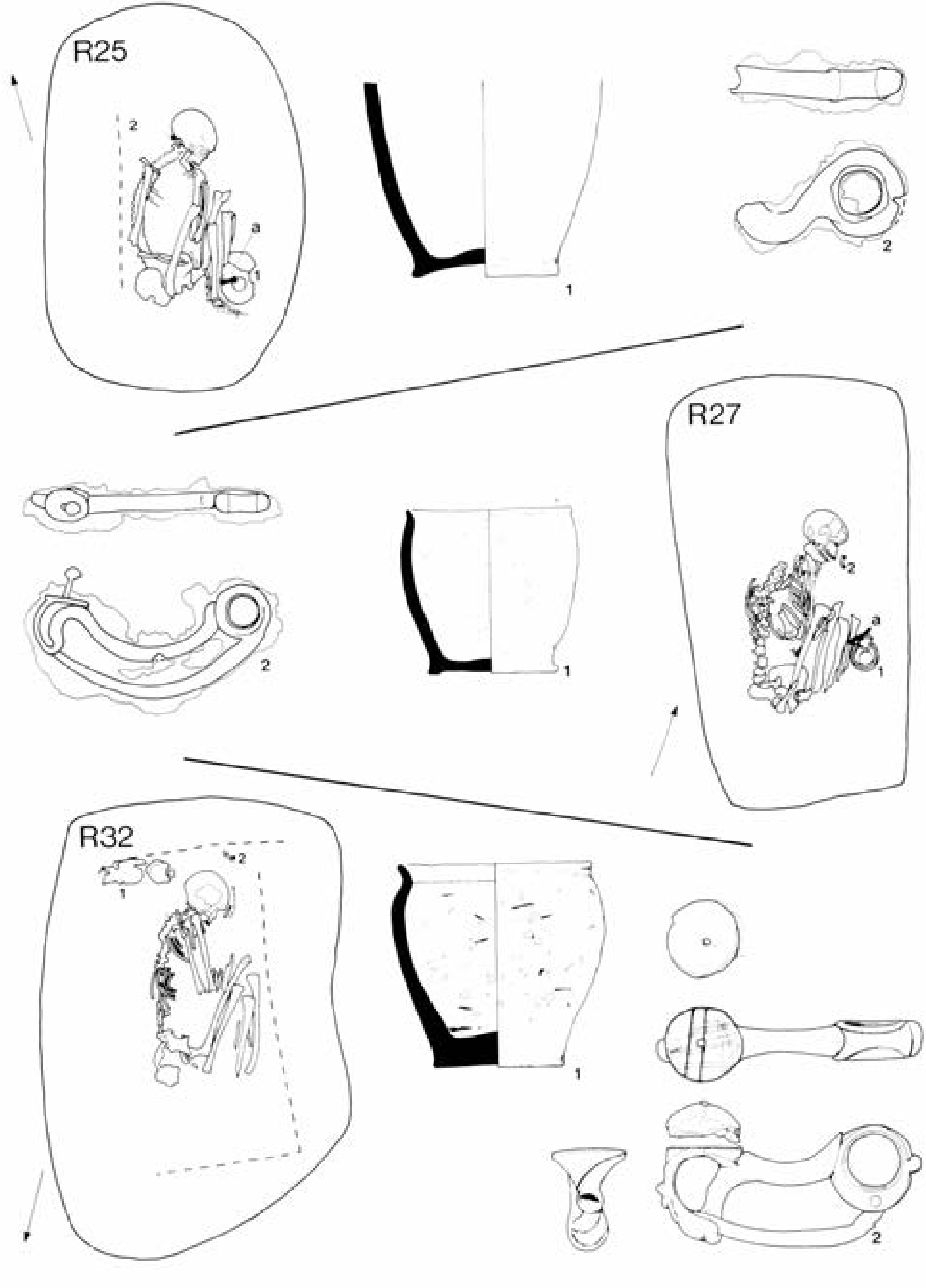

Fig 104 Rudston grave-groups, R25, R27, and R32: plans (1:20), pots (1:3), brooches (1:1)

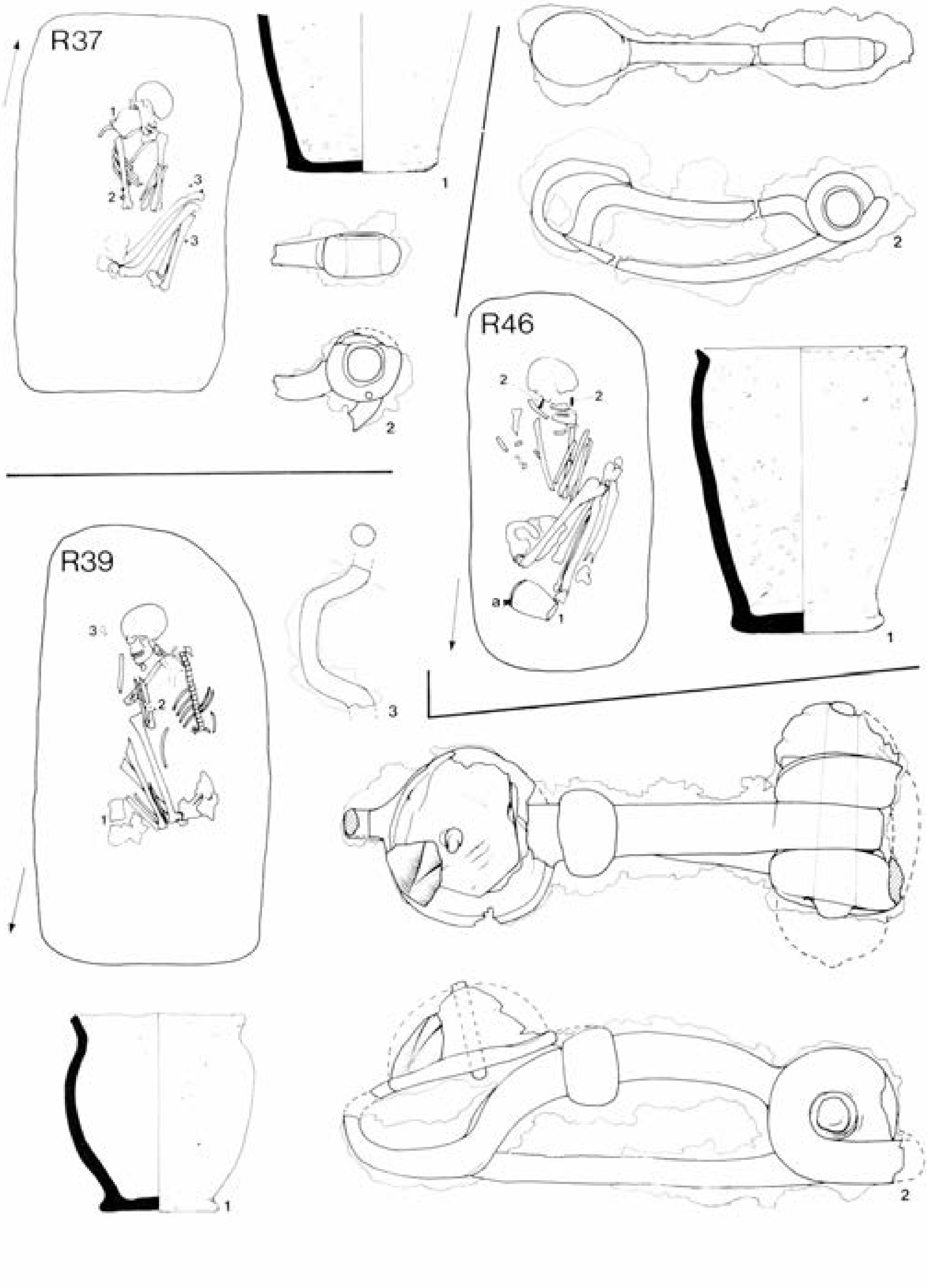

Fig 105 Rudston grave-groups, R37, R39, and R46: plans (1:20), pots (1:3), brooches and pin (1:1)

R40 (FM 11) Grave 2.1×1.15m, D 0.5m; barrow 4.4×5m; ditch D 0.5m, W 1.15m. N/S, facing E, crouched. Male, age 25–35; condition D

Iron brooch (G4, FM/DF) between chest and wrists
Sherds (FM/FE) in ditch

R41 (FM 13) Grave 1.75×1.05m, D 0.2m; barrow 5.6×5.2m; ditch D 0.25m, W 0.9m. W/E, facing S, contracted – an unusually tightly contracted position, with r knee between shoulder and skull, l knee on chest, and l forearm under legs and over r arm. Male, age 17–25; condition D

Pig bones (FM/EB, ER, ET) near chin

R42 (FM 19) Grave 1.75×1.05m, D 0.95m; barrow ?×4m; ditch D 0.1m, W 0.5m. N/S, facing E, tightly crouched; l forearm across chest. Male, age 25–35; condition D/E

R43 (FM 18) Grave 1.95×1.15m, D 0.75m; barrow ?×4.6m; ditch D 0.15m, W 0.5m. N/S, facing W, tightly crouched (Fig 100, 3). Male, age 35–45; condition C

Sherd (FM/EU) in grave

R44 (FM 17) Grave 2.1×1.1m, D 0.75m; barrow ?×6.6m; ditch D 0.2m, W 0.45m. N/S, facing E, crouched; slightly on chest, r forearm outstretched with hand beyond knees, l forearm had not survived. Sex ?, age 25–35; condition E

Pig bones (FM/EP) to E of skull and chest

R45 (FN 15) Grave 1.8×0.85m, D 0.35m. E/W, extended; head facing S, r forearm folded across waist, r leg flexed with knee across l leg. Male, age 45+; condition D

Iron knife (FN/BQ) over r elbow

R46 (FB 19; Fig 105) Grave 1.6×1m, D 0.6m; barrow ?×4.4m. S/N, facing W, tightly crouched. Probable male, age 45+; condition D

1 Pot (FB/AX) by feet
2 Iron brooch (D2, FB/BD) over skull
Sheep bone (FB/BR) in pot

R47 (FG 26) Grave 1.7×1m, D 0.25m; barrow ?×6.4m; ditch D 0.35m, W 0.9m. No trace of a skeleton in a shallow N/S grave

R48 (FB 20) Grave not located; barrow ?×7.2m

R49 (FG 27) Grave 1.55×0.9m, D 0.45m; barrow ?×4.4m; ditch D 0.25m, W 0.6m. N/S, facing E, crouched; only the legs survived – r leg crouched, l leg perhaps flexed. Possibly sub-adult; condition E/F

R50 (FG 28; Fig 106) Grave 1.55×0.85m, D 0.8m. E/W, facing N, crouched (almost flexed); l forearm across waist. Male, age 17–25; condition C

1 Iron knife (1, FG/DZ) under r hand
2 Iron spearhead (C1, FG/DT) at edge of grave, beyond l shoulder and above level of bones

R51 (FB 1) Grave 1.9×0.8m, D 0.2m; barrow ?5.8m diam; ditch D 0.55m, W 0.8m. Two skeletons in the same grave:

a N/S, facing E; skull and one arm *in situ* (the rest had been disturbed by 51b); the legs had been swept to one side when the bone was still articulated. Possible female, age 35–45; condition E

b S/N, facing W, flexed; forearms outstretched. Sex ?, age 25+; condition D

R52 (FG 29) Grave 2.05×1.3m, D 0.75m; barrow ?×6.6m; ditch D 0.15m, W 0.5m. W/E, extended; head facing S, hardly any of the other bones survived. Possible female, age 15–20; condition E/F

R53 (FA 20) Grave not located; barrow 10.4×10.6m

R54 (FG 30) Grave 1.65×1.1m, D 0.35m; barrow ?×6.2m; ditch D 0.45m, W 0.8m. N/S, facing E, tightly crouched; l arm extended, hand near feet. Female, age 17–25; condition D

Copper-alloy ring (A1, FG/DN) behind the back just below shoulder-level

R55 (FA 35) Grave 1.8×0.7m, D 0.5m. E/W, extended; head facing S, r arm folded across waist, l hand on l shoulder. Male, age 17–25; condition C

R56 (FA 36) E/W grave located but not excavated

R57 (FN 17; Fig 106) Grave 2.2×0.95m, D 0.8m; barrow ?×5.8m; ditch D 0.15m, W 0.5m. E/W, extended; head facing N, nothing of l arm survived. Sex: contra-indications, age 25–35; condition E

1 Iron sword (Bc1, FN/BR) over, under, or at the side of the body, tang on chest
2 Iron spearhead (A16, FN/BS) in SW corner of grave
Pig bones (FN/CL) near r elbow

R58 (FA 21) Grave 2.3×1.15m, D 0.45m. E/W, extended. Sex: contra-indications, age 25–35; condition D

Pig bones (FA/BK) between knees

R59 (FN 6) Grave 1.65×1.1m, D 0.3m; barrow ?×5.4m; ditch D 0.2m, W 0.6m. N/S, facing E, flexed; r leg crouched, very little survives of forearms. Sex ?, age 17–20; condition E

Shale bracelet (C2, FN/AF) on fragment of forearm, E of chest

R60 (FN 5) Grave 1.7×1.05m, D 0.4m; barrow ?×4.2m; ditch D 0.2m, W 0.5m. N/S, facing E, contracted; both arms extended, hands near feet (Fig 100, 1). Possible female, age 25–35; condition C

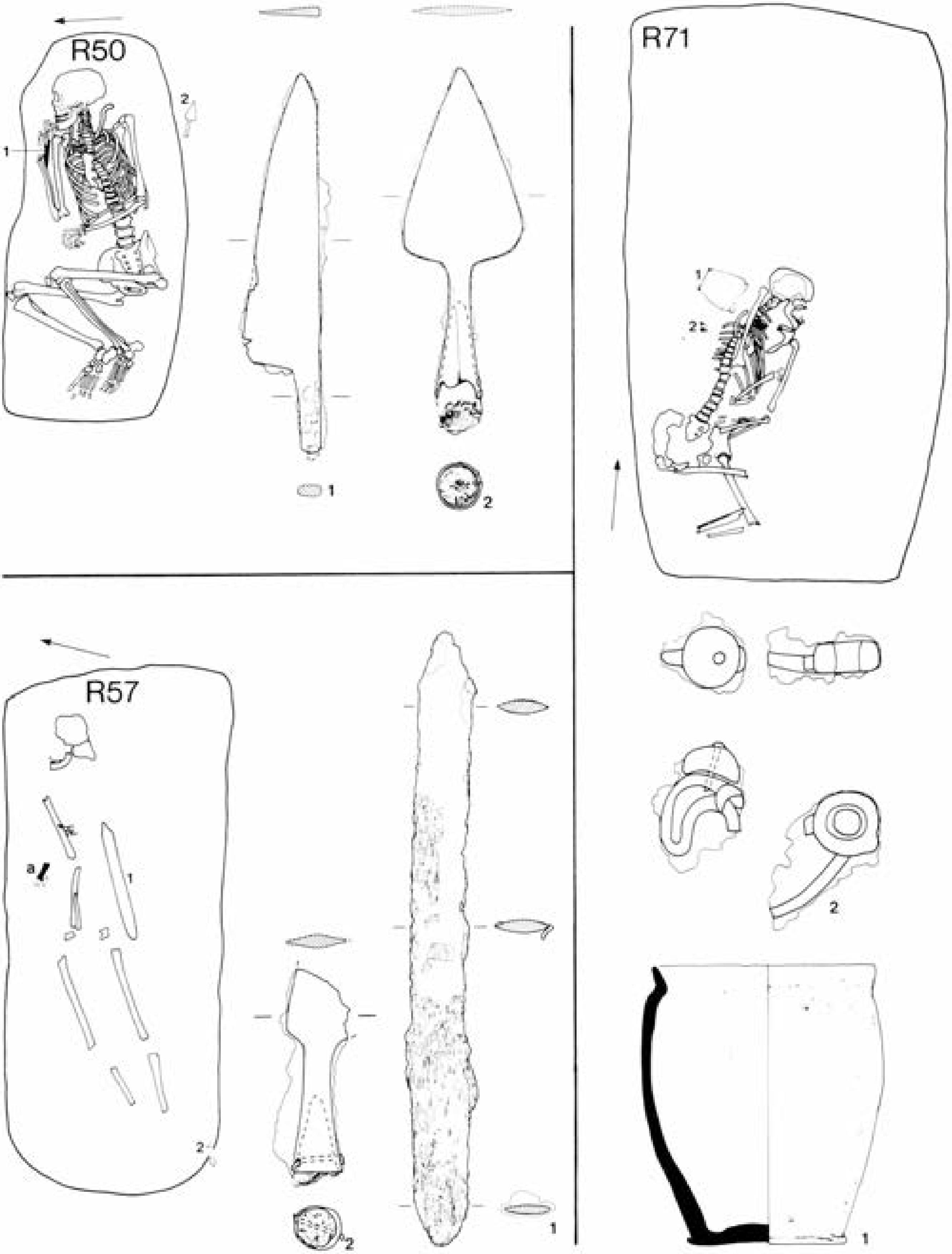

Fig 106 Rudston grave-groups, R50, R57, and R71: plans (1:20), sword (1:4), spearheads and knife (1:2), pot (1:3), brooch (1:1)

Iron brooch (E3, FN/AC) in two pieces (0.3m apart) one on skull, other on chest
Sherds (FN/AD) in grave

R61 (FA 22) Grave 1.6×1.15m, D 0.8m; barrow ?×4.4m; ditch D 0.1m, W 0.5m. S/N, facing W, tightly crouched. Female, age 35–45; condition D

Sherds (FA/BT) in grave

R62 (FA 23) Grave 1.85×1.1m, D 0.3m; barrow ?×5.6m; ditch D 0.15m, W 0.7m. S/N, facing W, contracted on back; r forearm folded across waist. Probable female, age 25–35; condition D

Sherd (FA/BS) in grave

R63 (FN 4) Grave 1.5×1.1m, D 0.35m; barrow ?×4.8m; ditch D 0.3m, W 0.9m. S/N, facing W, tightly crouched; arms folded, hands by opposite shoulders. Sex: contra-indications, age 17–20; condition C

Sherds (FN/AS) in grave

R64 (FN 12) Grave 1.7×1m, D 0.25m; barrow ?×5.6m; ditch D 0.2m, W 0.7m. N/S, facing W, crouched; on back, l forearm folded across waist. Adolescent, age 12–15; condition E

Iron ring-headed pin (4, FN/BC) in front of face

R65 (FN 18, FA 24) No central grave; barrow ?×7.6m; ditch D 0.4m, W 1.2m

R66 (FN 7) Grave not located; barrow ?×8.6m; ditch D 0.25m, W 0.8m

R67 (FA 33) Grave not located; barrow ?×8m; ditch D 0.55m, W 1.4m

R68 (FG 4) Grave 2.05×1.45m, D 0.75m; barrow 4.6×3.8m; ditch D 0.15m, W 0.45m. W/E, extended; head facing N, r forearm folded across waist, position of l arm unknown. Probable female, age 25–35; condition E/F

Sherd (FG/AO) in grave

R69 (FG 1) Grave 1.6×1.05m, D 0.6m; barrow 4.8×4.6m; ditch D 0.3m, W 0.9m. N/S, facing E, contracted on back; r forearm across waist, l arm extended with hand by feet. Female, age 17–25; condition C/D

Iron brooch (D3, FG/AD) in front of face
Sheep bone (FG/AC) over l shoulder

R70 (FG 24) Grave 2.1×1.2m, D 0.55m; barrow ?×4.2m; ditch D 0.1m, W 0.35m. E/W; little survives, but judging from the shape of the grave and position of the skull, the skeleton had been extended or flexed. Possible female, age 25–35; condition F

R71 (FG 6; Fig 106) Grave 2.7×1.6m, D 0.65m; barrow 5.8×6.2m; ditch D 0.65m, W 1.5m. N/S, facing E, flexed; r leg crouched, l arm flexed with hand on hip. Female, age 35–45; condition D. Skeleton very much at one end of a very large grave

1 Pot (FG/AL) behind shoulder
2 Iron brooch (E4, FG/AH) behind the back
Sheep bone (FG/AP) in pot; sherd (FG/CA) in ditch

R72 (FG 2) Grave 1.85×1.05m, D 0.8m; barrow 3.4×3.4m; ditch D 0.15m, W 0.35m. N/S, facing E, crouched. Sex ?, age 35–45; condition E

Sherd (FG/CD) in ditch

R73 (FG 3; Fig 31) Grave 2×1.5m, D 0.8m; barrow 5.2×4.4m; ditch D 0.25m, W 0.4m. Two skeletons in the same grave:

a E/W, facing S, crouched. Female, age 25–35; condition D

b E/W, extended; head facing N, hands on respective shoulders. Female, age 25–35; condition D

R74 Grave not excavated; barrow ?×5.6m

R75 (FG 7) Grave 2.2×1.5m, D 1.05m; barrow ?×3.6m; ditch D 0.1m, W 0.3m. E/W, facing N, flexed; l arm extended, possibly also r arm (but only humerus survives). Sex ?, age 35–45; condition E

R76 (FG 10) Grave 2×1.25m, D 0.65m; barrow 5.4×6.4m; ditch D 0.5m, W 1m. N/S, facing E, flexed; l elbow outstretched, hand on lower part of chest. Female, age 17–25; condition D. Possibly in coffin

Iron brooch (E5, FG/AX) by l hand
Pot (FG/CP) in ditch; sherds (FG/CM, CO, CQ) in ditch

R77 (FG 5) Grave 2.05×1.15m, D 0.65m; barrow 5×5.2m; ditch D 0.45m, W 1m. N/S, facing E, crouched; forearms extended, hands by knees. Probable female, age 25–35; condition E. In coffin at least 1.05×0.55m, shown by lines of gravel filling and seen 0.1–0.15m above floor of grave

Iron brooch (H2, FG/BL) at back of neck
Sherds (FG/AK, BB) in grave; pot (FG/CU) in ditch

R78 (FG 8) Grave 2.05×1.25m, D 0.7m. E/W, facing N, flexed on its back; r arm extended, l arm folded across chest, hand near neck. Male, age 25–35; condition B

R79 (FG 9) Grave 2.2×1m, D 0.8m. E/W, extended; head facing N, position of arms unknown. Sex: contra-indications, age 25–35; condition E

Animal bone (FG/BA) about 0.2m above shoulder

R80 (FG 13) Grave 1.45×1.1m, D 0.35m; barrow 4.4×4m; ditch D 0.2m, W 0.5m. S/N, facing W, crouched on back; r forearm across waist. Burial tucked into the very corner of the grave. Female, age 25–35; condition D

Pot (FG/DA) in ditch; sherds (FG/CZ, DB) in ditch

R81 (FG 11) Grave 1.75×1.15m, D 0.6m; barrow 5.4×5.2m; ditch D 0.4m, W 0.9m. N/S, facing E, crouched; l arm extended, hand near ankles. Male, age 17–25; condition C

Sheep bone (FG/AW) lifted with the human bone

R82 (FG 22; Fig 107) Grave 2×1.35m, D 0.6m; barrow ?×5.2m; ditch D 0.3m, W 0.9m. S/N, facing W, tightly crouched. Male, age 25–35; condition B. Linear filling lines on each side suggest coffin 0.65m wide

1 Pot (FG/DD) over waist between legs and chest; one sherd behind pelvis
2 Iron brooch (F8, FG/CX) over r hand in front of face
Sheep bone (FG/DE) behind waist

R83 (FG 12; Fig 107) Grave 1.75×1.1m, D 0.5m; barrow 5×5m; ditch D 0.35m, W 0.9m. S/N, facing E, crouched; r arm extended, hand on legs. Probable female, age 35–45; condition E

1 Pot (FG/BS) in front of face
2 Iron brooch (C3, FG/BR) over l wrist between pot and face
Sheep bone (FG/BT) in pot

R84 (FG 15; Fig 108) Grave 2.05×1.3m, D 0.7m; barrow 8.2×8.4m; ditch D 0.7m, W 1.4m. N/S, facing W, crouched. Male, age 25–35; condition D. In a coffin at least 1.3m×0.65/0.75m, showing as a dark line on three sides

1 Pot (FG/BP) between rump and heels
2 Iron brooch (A2, FG/BV) in front of face
Sheep bone (FG/BO) in pot; sherds (FG/BM, DG, DO) in ditch

R85 (FG 31) Grave 1.55×0.55m, D 0.85m, in barrow ditch. N/S, facing W, flexed; r arm extended, l forearm folded across waist. Probable female, age 17–25; condition E

R86 (FG 16) Grave 2.15×1m, D 0.7m; barrow ?×?4m; ditch D 0.05m, W 0.2m. W/E, facing S, flexed; l elbow drawn back and forearm across body, r forearm outstretched, hands in front of waist. Possible female, age 25–35; condition E

R87 (FG 14; Fig 108) Grave 2.1×1.1m, D 0.5m. E/W, extended; head facing S, r forearm across waist, position of l forearm unknown, r leg slightly flexed. Probable male, age 17–25; condition E

1 Iron dagger (Bd1, FG/BX) alongside r humerus
2 Iron hammerhead (p 79, FG/BY) l of hips
3 Iron fragment (3, FG/BK) in the filling in SW corner of grave

R88 (FG 18) Grave 2×0.85m, D 0.7m; barrow 4.4×3.8m; ditch D 0.15m, W 0.4m. W/E, facing S, flexed; r arm partly outstretched, l elbow back but forearm outstretched, both hands in front of waist. Female, age 17–25; condition E

R89 (FG 17) Grave 2.05×1 15m, D 0.7m; barrow 6.6×6m; ditch D 0.4m, W 1.2m. N/S, facing W, contracted on back. Female, age 25–35; condition D

R90 (FG 21) Grave 1.6×1.2m, 0.2m; barrow 4×5m; ditch D 0.1m, W 0.45m. No trace of a skeleton in a very shallow N/S grave

Sherd (FG/CC) in ditch

R91 (FG 19; Fig 109) Grave 2×1.3m, D 0.45m; barrow 6.2m×?; ditch D 0.6m, W 1.3m. S/N, facing W, crouched. Probable female, age 25–35; condition D. In a coffin 0.95 by at least 0.45m, line visible on three sides

1 Pot (FG/CH) in sherds, in a line within bottom end of coffin
2 Iron brooch (C4, FG/CF) under neck
Pot (FG/DP) in ditch; sherd (FG/DP) in ditch

R92 (FG 20) Grave 2.25×1.4m, D 1.1m; barrow 4.8m×?; ditch D 0.2m, W 0.35m. E/W, extended. Probable female, age 35–45; condition E

Chalk spindle-whorl (1, FG/CL) E of r shoulder

R93 (FB 4) Grave not excavated; barrow 9.6×7.6m; ditch D 0.75m, W 2m

R94 (FB 12) Grave 1.6×0.95m, D 0.6m; barrow 4.2×4.6m; ditch D 0.3m, W 0.8m. S/N, facing W, crouched; l forearm outstretched, hand near knees. Probable male, age 17–25; condition C

Iron spearhead (A1, FB/AZ) clearly in the body, resting on 12th thoracic and 1st lumbar vertebrae and under ribs – the point (FB/BA) dislodged and found behind 9th thoracic vertebra

R95 (FB 6) Grave 0.95×0.8m, D 0.1m; barrow *c* 5m diam; ditch D 0.2m, W 0.7m. N/S, facing E, crouched. Child, age 2–3; condition E/F

R96 (FB 5) Grave 1.3×0.75m, D 0.45m, in barrow ditch. E/W, facing S, flexed; r hand on r shoulder. Male, age 25–35; condition D

R97 (FB 18) Grave 2.25×1.25m, D 0.55m; barrow ?×6.4m; ditch D 0.5m, W 1.5m. S/N, facing W, crouched; l leg contracted. Female, age 17–25; condition C

Iron brooch (D4, FB/AY) in front of face
Sheep bone (FB/BP) W of face

R98 (FB 17) Superficial grave; barrow 10×8m; ditch D 0.7m, W 2.2m. S/N, facing W, crouched; on back, l leg contracted. Sex ?, age 17–20; condition E

Sherds (FB/AS) in grave

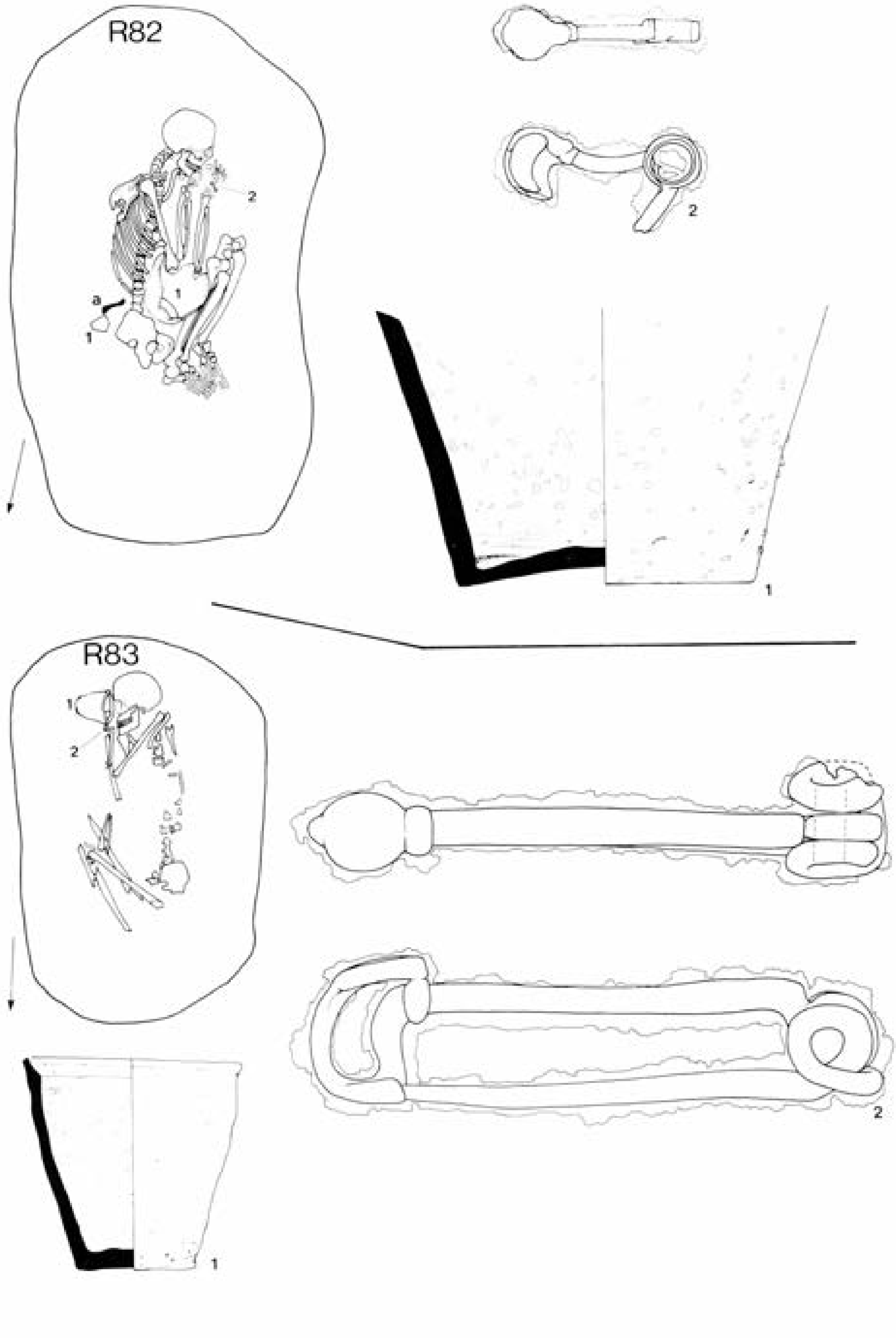

Fig 107 Rudston grave-groups, R82 and R83: plans (1:20), pots (1:3), brooches (1:1)

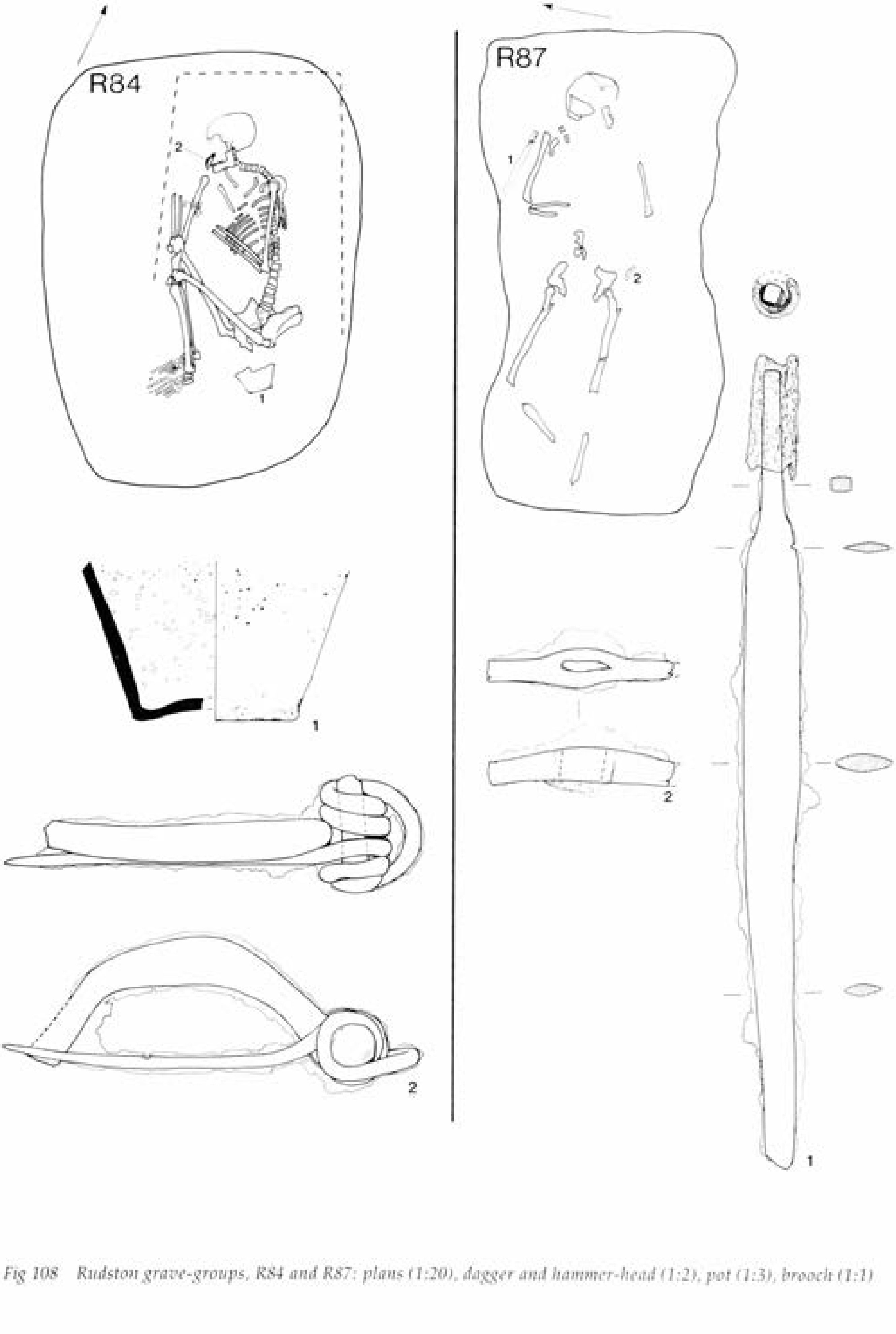

Fig 108 Rudston grave-groups, R84 and R87: plans (1:20), dagger and hammer-head (1:2), pot (1:3), brooch (1:1)

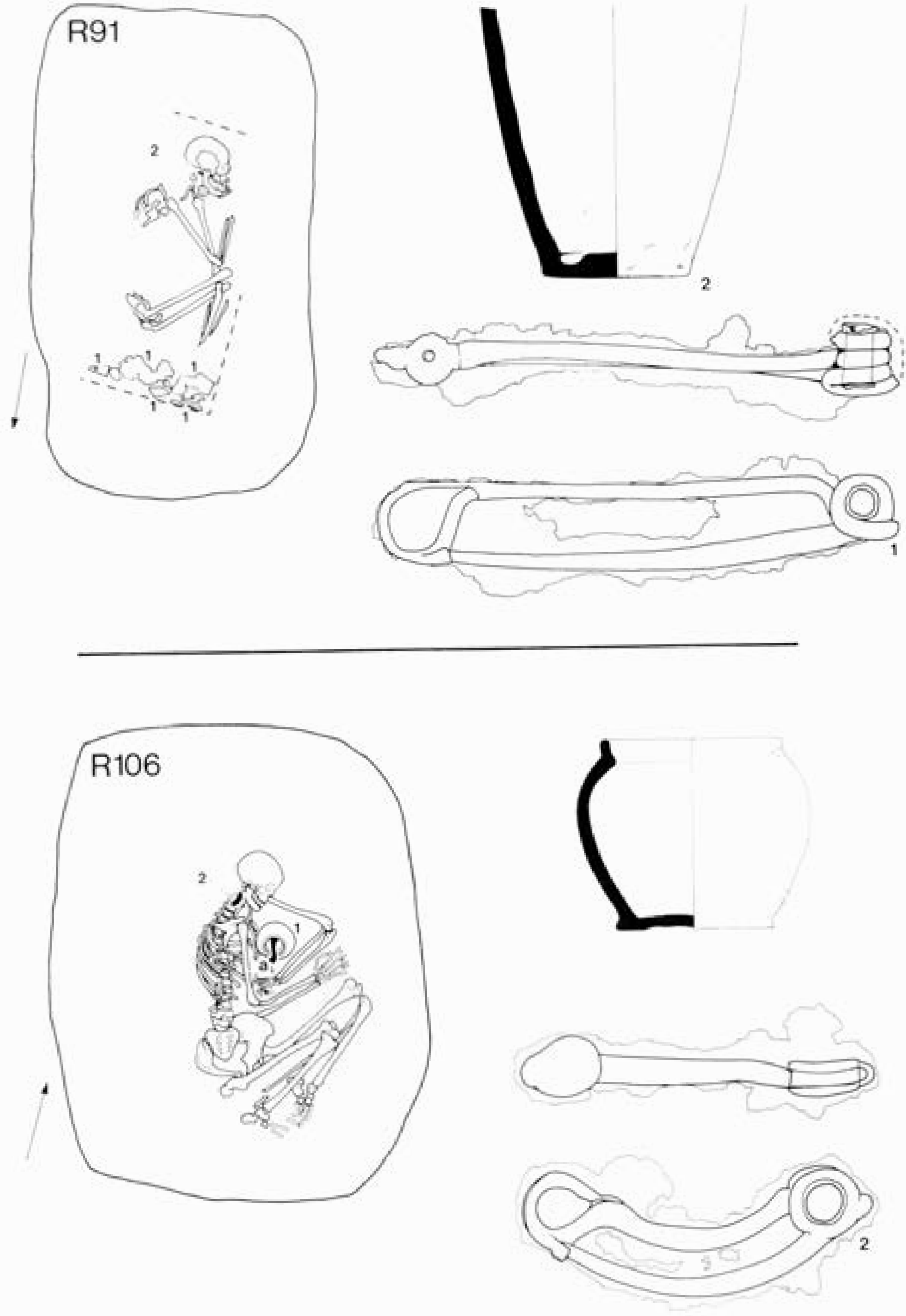

Fig 109 Rudston grave-groups, R91 and R106: plans (1:20), pots (1:3), brooches (1:1)

R99 (FB 25) Grave 1.4×1m, D 0.45m, in barrow ditch. N/S, facing E, crouched. Sex: contra-indications, age 15–17; condition B

R100 (FB 24) Grave 1.6×0.8m, D 1.1m, in barrow ditch. E/W, facing N, tightly crouched; slightly on chest, facing floor of grave. Female, age 17–25; condition D

R101 (FB 8) Superficial grave; barrow *c* 6m diam; ditch D 0.3m, W 0.8m. Fragments of two long-bones. ? Adult; condition F

R102 (FB 9) Grave 1.85×1.1m, D 0.7m; barrow 8×6.4m; ditch D 0.8m, W 1.6m. S/N, facing W, crouched; on chest and facing floor of grave, l arm extended but hand turned under waist, r leg contracted. Male, age 25–35; condition C. Possibly in coffin, some 1m×0.55/0.6m

Iron brooch (B1, FB/AR) over neck

R103 (FB 13) No grave survived; barrow 9.6×8.2m; ditch D 0.45m, W 1.7m

R104 (FB 21) Grave 1.5×0.85m, D 0.7m, in barrow ditch. N/S, facing W, flexed. Female, age 17–25; condition B/C

R105 (FB 11) Grave 1.7×1.2m, D 0.35m; barrow 4.8×5.2m; ditch D 0.25m, W 0.8m. N/S, facing E, contracted. Sex ?, age about 15; condition E

Sherds (FB/AP) in grave

R106 (FB 16; Fig 109) Grave 1.95×1.55m, D 0.65m; barrow ?×5.6m; ditch W 1.4m. N/S, facing E, crouched; r forearm outstretched, hand near knee, l elbow outstretched, hand near r elbow (Fig 100, 4). Female, age 17–25; condition B/C

1 Pot (FB/BG) in front of chest (cradled by l arm)
2 Iron brooch (D5, FB/BF) on neck
Sheep bone (FB/BQ) in pot; sherd (FG/BE) in grave

R107 (FB 10, Fig 55) Grave 2.05×1m, D 0.7m; barrow 4.2×3.2m; ditch D 0.2m, W 0.4m. E/W, extended. Male, age 45+; condition B

Iron sword (Bb1, FB/AQ) under body; handle under r shoulder and tip of blade under l hip

R108 (FB 7) Grave 1.25×0.65m, D 0.15m; barrow 6.6×7m; ditch D 0.5m, W 1.1m. S/N, facing W, crouched. Male, age 25–35; condition C

R109 (FB 15) No grave survived; barrow 8.2×9.4m; ditch D 0.5m, W 1.7m

Sherds (FB/BC) in ditch

R110 (FB 22) Grave 1.5×0.55m, D 0.55m, in barrow ditch; cut Burial 111. W/E, facing N, flexed; r leg crouched. Male, age 35–45; condition C

R111 (FB 26) Grave 0.9×0.4m, D 0.4m, in barrow ditch; cut by R110. N/S, facing E; only skull and one humerus *in situ* – other bones in fill of R110. Child, age about 7; condition E

R112 (FB 23) Grave 1.5×0.65m, D 0.55m, in barrow ditch. N/S, facing E, crouched; forearms outstretched. Male, age 35–45; condition C

R113 (FB 14) No grave survived; barrow 6.6×7.8m; ditch D 0.2m, W 0.8m

R114 (FB 2) Grave 1.45×0.95m, D 0.25m; barrow 8.6×7.6m; ditch D 0.45m, W 1.5m. N/S, facing W, crouched; head tilted back, l arm flexed with hand on legs. Probable male, age 17–20; condition D

Sherd (FB/AD) in grave

R115 (FN 16) N/S grave, superficial, disturbed by Drott; barrow ?×5.8m; ditch D 0.25m, W 1m. Probable male, age 25–35; condition F

R116 (FA 27) Grave not located; barrow ditch only

R117 (FA 28) No central grave; barrow ?×5.2m

R118 (FN 9) Grave 2.05×2.1m, D 0.25m; barrow ?×6.8m; ditch D 0.6m, W 1.2m. Two skeletons side by side (but opposite orientations) in the same grave:

a N/S, facing E, contracted; r forearm folded across chest. Female, age 25–35; condition D

Pot (FN/BG) N of r shoulder
Sheep bone (FN/BH) in pot

b S/N, facing W, crouched; l arm extended, hand under knee, r forearm outstretched. Female, age 16–20; condition C/D

Iron brooch (C16, FN/BK) behind neck

R119 (FN 2) Grave 1.7×1.1m, D 0.15m; barrow ?×7.6m; ditch D 0.3m, W 1.2m. S/N, facing W, flexed. Probable female, age 17–25; condition E

Copper-alloy bracelet (B1, FN/AA) on l forearm

R120 (FA 14) Grave not located; barrow ?×5.4m

R121 (FA 13) Grave not located; barrow ?×7.6m

R122 (FN 1) Grave not excavated; barrow ?×6.6m; ditch D 0.55m, W 1.8m

R123 (FA 19) Grave not located; barrow ditch only

R124 (FN 3) Grave not located; barrow ditch only; ditch D 0.3m, W 1m

R125 (FA 18) Grave 1.85×1m, D 0.25m; barrow ?×5.4m; ditch D 0.2m, W 0.8m. N/S, facing E, contracted on back. Probable female, age about 15; condition E

R126 (FA 16) No central grave; barrow ?×7.6m

Sherds (FA/BF) on the barrow platform

R127–9 Graves not located; barrow ditches only

R130 (FA 32) Grave not located; barrow ?×?10m

R131 (FG 23) Grave 1.6×1.1m, D 0.65m; barrow ?×4.8m; ditch D 0.35m, W 0.9m. N/S, facing E, contracted. Female, age 25–35; condition C/D

Sheep bone (FG/CW) over elbows

R132 (FG 25) Grave 2.2×1.35m, D 0.45m; barrow ?×4.6m; ditch D 0.35m, W 0.7m. N/S, facing E, crouched; apparently on back, legs facing E, but head turned back to face W; r arm flexed, hand over legs, position of l arm unknown. Possible female, age 25–35; condition E

R133 (FG 32) Grave 1.6×1.15m, D 0.6m; barrow ?×4.6m; ditch D 0.35m, W 0.5m. S/N, facing W, crouched. Male, age 25–35; condition C

R134 (FB 3) Grave 1.65×1m, D 0.7m; barrow ?×5.2m; ditch D 0.25m, W 0.8m. N/S, facing E, contracted. Probable female, age 35–45; condition E

Iron brooch (F9, FB/AF) near r elbow

R135 (FD 35) Grave 1.75×1.15m, D 0.65m; barrow 5.2×6m; ditch D 0.25m, W 1m. N/S, facing W, contracted. Sex ?, age 45+; condition E/F

R136 (FD 34) Grave 1.75×1m, D 0.55m; barrow 5.2×6m; ditch D 0.5m, W 1.2m. N/S, facing W, contracted; r arm extended, hand by feet. Female, age 17–25; condition D

R137 (FD 31) Grave 1.95×1m, D 0.8m. E/W, facing N, flexed; both arms in front of body and flexed, forearms crossed, hands at waist level. Female, age 25–35; condition D

R138 (FD 33) Grave 1.9×1.1m, D 0.6m. W/E, facing S; on chest and facing floor of grave, r forearm crosses under waist, l arm flexed. Sex ?, age 35–45; condition E

R139 (FD 32; Fig 55) Grave 1.9×0.85m, D 0.75m. E/W, extended or flexed; only part of skull survives. Sex ?, age 17–25; condition F

Iron sword (Bb2, FD/CT) on S side of grave; if the skeleton had been extended on its back, the sword would have been alongside the l arm, with its tang by the shoulder

R140 (FD 30; Fig 110) Grave 2.05×1.4m, D 0.7m; barrow 5×5.6m; ditch D 0.25m, W 0.95m. N/S, facing E, tightly crouched. Male, age 25–35; condition C

1 Iron brooch (E6, FD/CM) over hips
2 Iron spearhead (A10, FD/CK) in pelvis

R141 (FN 10; Fig 110) Grave 1.8×0.95m, D 1m; barrow 3.6m diam; ditch D 0.3m, W 0.7m. W/E, facing N, flexed; on chest, l arm folded under chest, r arm flexed, hand by hip. Sex: contra-indications, age 17–25; condition D/E. The following objects were found together, behind the skeleton's back (see inset detail):

1 Iron ?awl (FN/BF) – for all tools see pp 79ff
2 Iron file (FN/BF)
3 Iron knife (FN/BF)
4 Antler tine (FN/BE)
Pig bones (FN/BD) S of back and over hips; others (FN/BW) near tools: (a) skull remains; (b) r forelimb

R142 (FN 11) Grave 1.95×0.95m, D 1.05m; barrow ?×3m; ditch D 0.3m, W 0.55m. W/E, facing S, flexed; arms in front of body, extended together with hands towards knees. Female, age 45+; condition E

R143 (FA 34; Fig 110) Grave 1.95×1.2m, D 0.75m; barrow ?×5.8m; ditch D 0.35m, W 1m. N/S, facing E, flexed; slightly on back. Male, age 17–25; condition C. Layout of skeleton and sherds of pot strongly suggest outline of coffin, 0.95×0.5m, but no soil traces

1 Pot (FA/CR) in sherds mainly over knees (one large sherd near feet, another near l elbow, and others in front of face)
2 Iron brooch (G5, FA/CO) over l arm
Sheep bone (FA/CP) amongst sherds at knees

R144 (FA 31; Fig 111) Grave 2.3×1.05m, D 0.7m; barrow ?×4.4m; ditch D 0.15m, W 0.4m. W/E, facing N, extended; entire body facing floor of grave, l hand under chest, r hand by r shoulder. Male, age 25–35; condition D

1 Iron sword (Bb3, FA/CC) over body, tang resting on r shoulder
2 Iron spearhead (A11, FA/CD) near l foot

R145 (FA 30) Grave 1.95×1.15m, D 1.25m; barrow ?×?4m; ditch D 0.1m, W 0.2m. E/W, extended; hands on respective shoulders. Probable female, age 45+; condition E

Chalk spindle-whorl (2, FA/CB) on or under body by r hip
Sherd (FA/CE) in grave

R146 (FA 29; Fig 111) Grave 2.15×1.1m, D 0.65m. E/W, facing S, flexed; partly on back, arms extended. Male, age 25–35; condition D/E

1 Iron sword (Ba2, FA/BZ) over r arm
2 Iron spearhead (A17, FA/CA) in front of face
3 Bone point (1, FA/CK) in chest
Pig bones (FA/CG–CJ) in front of and behind skull: (a) skull remains; (b) l forelimb; sherd (FA/BU) in grave

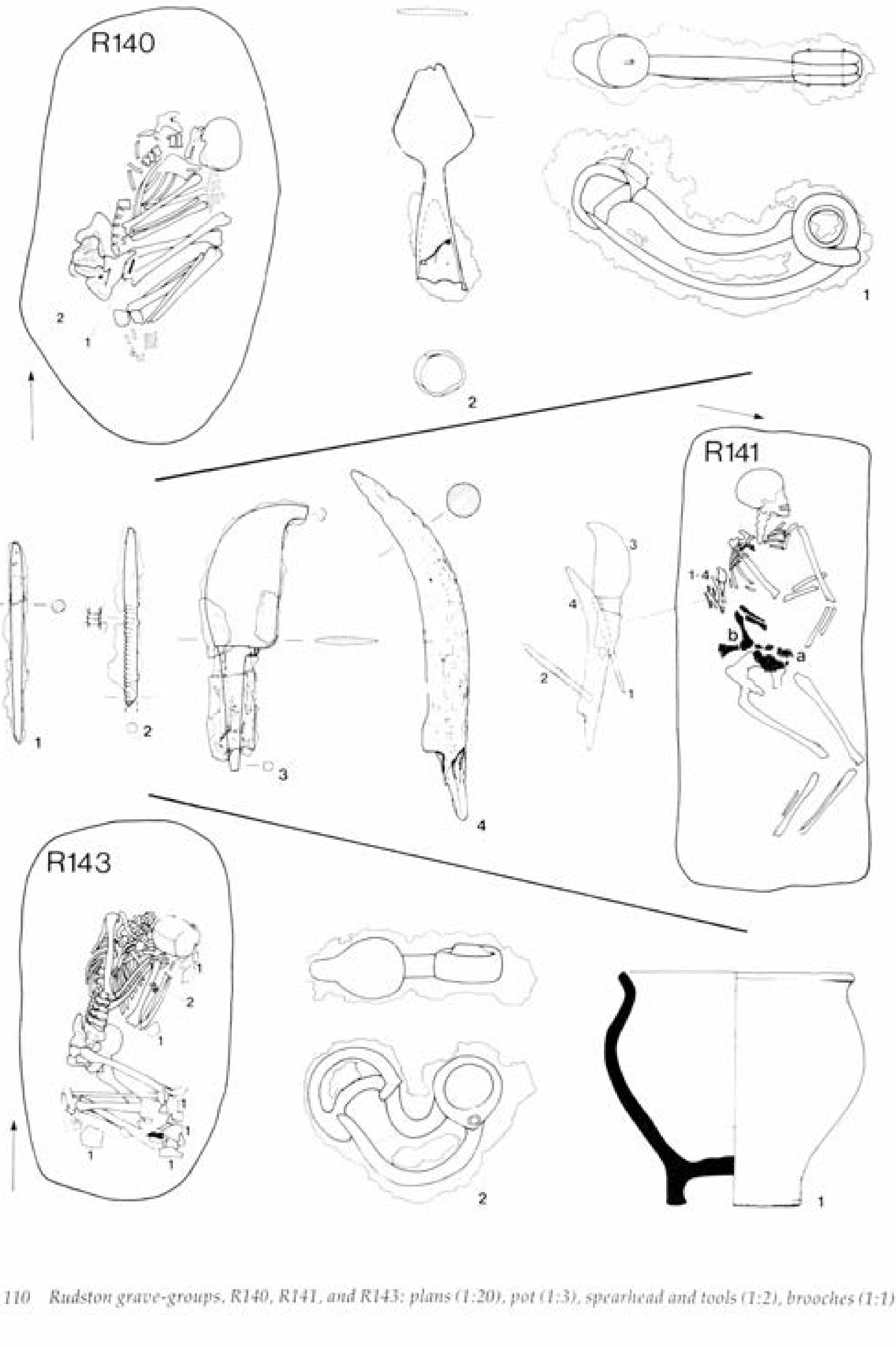

Fig 110 Rudston grave-groups, R140, R141, and R143: plans (1:20), pot (1:3), spearhead and tools (1:2), brooches (1:1)

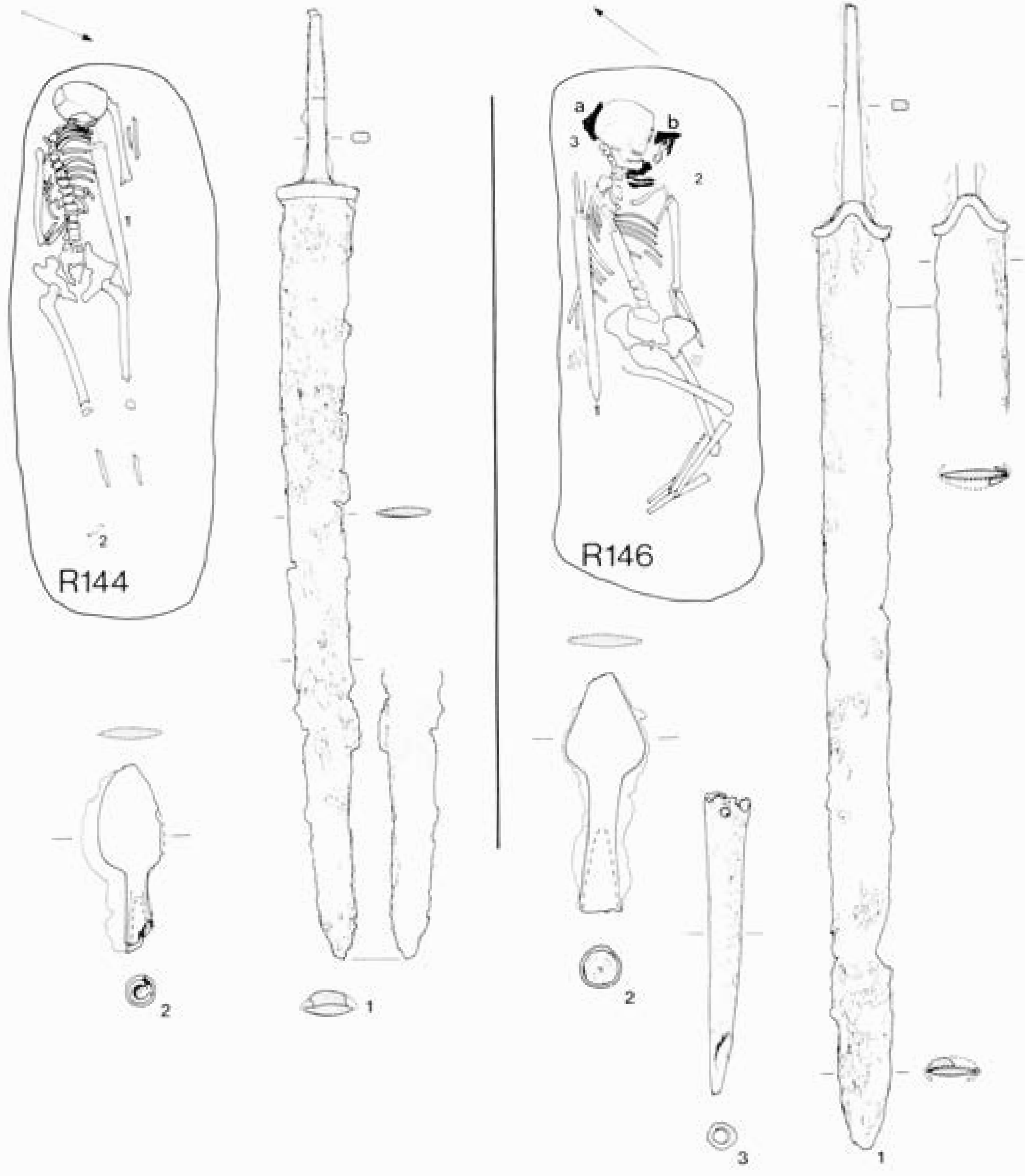

Fig 111 Rudston grave-groups, R144 and R146: plans (1:20), swords (1:4), spearheads and bone missile point (1:2)

R147 (FA 12) Grave 1.9×1.15m, D 0.5m; barrow ?×5.2m; ditch D 0.2m, W 0.7m. N/S, facing E, contracted. Male, age 15–20; condition C

R148 (FD 29) Grave 2.2×0.9m, D 0.7m; barrow 3.8×5m; ditch D 0.15m, W 0.5m. W/E, extended; face down, head facing S, r leg flexed (crossing under l leg); r arm crosses under neck, forearm turned up in front of face, l hand near l shoulder. Sex: contra-indications, age 17–25; condition D

Iron shield-boss to S of waist, binding strip near l knee (A1, FD/DB–F, DK, DL)
Sherds (FD/DM) in grave

R149 (FD 28) No central grave; barrow 7.2×7.2m; ditch D 0.35m, W 1.25m

R150 (FD 27) Grave 2×0.9m, D 0.4m; barrow 4.4×3.6m; ditch D 0.1m, W 0.5m. E/W grave, empty

R151 (FD 26) No central grave; barrow 5.2×4m; ditch D 0.15m, W 0.45m

R152 (FD 25; Fig 32) Grave 2.35×1.25m, D 0.65m. Two skeletons side by side in the same grave:

a W/E, extended; elbows outstretched, hands over hips. Male, age 25–35; condition C

Iron spearhead (A2, FD/CP) in ribs

b W/E, extended; facing N, r leg slightly flexed so lower part is over l leg. Probable male, age 17–25; condition C

R153 (FD 24, Fig 55) Grave 1.85×0.75m, D 0.75m. W/E, facing S, flexed; on back, r arm extended, hand near knees, l hand near throat. Sex: contra-indications, age 25–35; condition D

Iron dagger (Bd1, FD/CR) alongside r humerus

R154 (FD 23; Fig 112) Grave 2.05×1.05m, D 0.6m; 5.4m diam; ditch D 0.15m, W 0.6m. E/W, extended; head facing S, l hand on throat, r forearm has not survived. Probable male, age 17–20; condition E

1 Iron sword (Ba3, FD/BW, BX) by r hip; copper-alloy shank (FD/BX) presumably from the handle of the sword
2 Iron spearhead (A4, FD/CA) N of tongs; point of blade between arms of tongs
3 Iron spearhead (A3, FD/BZ) S of body; point of blade between arms of tongs
4 Iron ?hammer-head (p 80, FD/CB) by r humerus
5 Iron tongs (p 79, FD/BY) over sword
6 Iron coupler (p 79, FD/CD) between the arms of the tongs
7 Possible wooden shield (B1)

R155 (FD 21) Grave 2.15×1.6m, D 0.9m; barrow 4.4×5m; ditch D 0.25m, W 0.6m. N/S, facing E, crouched. Possible female, age 17–25; condition E

R156 (FD 20) Grave 1.95×1.2m, D 0.9m; barrow 3.8×4.6m; ditch D 0.15m, W 0.6m. S/N, facing W, crouched. Probable female, age 17–20; condition E. In coffin 1.2×0.75m, recognised 0.2m above floor

R157 (FD 19) No central grave; barrow 4.6×4.6m; ditch D 0.15m, W 0.6m

R158 (FD 17) Grave 2.15×1.05m, D 0.75m; barrow 3.6×4m; ditch D 0.1m, W 0.6m. N/S, facing E, flexed; on back, l forearm folded across waist, hand on r elbow. Probable male, age 35–45; condition E

R159 (FD 16) Grave 1.95×1.3m, D 1.1m; barrow 5.4×5.6m; ditch D 0.35m, W 1m. N/S, facing E, flexed; on back, r arm flexed, hand on hips. Probable female, age 25–35; condition D

Pig bones (FD/CH)

R160 (FD 18) Grave 1.75×1.35m, D 0.85m; barrow ?×3.8m; ditch D 0.2m, W 0.55m. N/S, facing E, crouched. Possible male, age 35–45; condition D

R161 (FD 15) Grave 1.8×1.2m, D 0.8m; barrow 4.2×4.6m; ditch D 0.15m, W 0.5m. N/S, facing E, flexed; on back, r arm extended. Possible male, age 15–20; condition C/D

R162 (FD 14) Grave 1.65×1.05m, D 0.75m. N/S, facing W, crouched; forearms folded, l hand on knees, r elbow outstretched, hand in front of waist. Probable male, age 25–35; condition B/C

R163 (FD 6; Fig 113) Grave 2×1.1m, D 0.95m; barrow 5.6×4.6m; ditch D 0.15m, W 0.55m. E/W, facing N, flexed; on back, forearms have not survived. Possible female (but not according to the grave-goods), age 25–35; condition E

1 Iron sword (Ba4, FD/DH) S of hips
2 Iron shield fitting (A2, FD/DG) N of skeleton on level of femora

R164 (FD 13) Grave 1.8×1.1m, D 0.8m; barrow 4.6×5.4m; ditch D 0.1m, W 0.4m. N/S, facing E, flexed. Male, age 25–35; condition D

R165 (FD 12) Grave 1.85×1.1m, D 0.6m; barrow 4.4×5m; ditch D 0.15m, W 0.65m. N/S, facing E, crouched (or flexed). Sex ?, probably sub-adult; condition F

R166 (FD 10) Grave 2.05×1.1m, D 0.7m; barrow 4×5.2m; ditch D 0.1m, W 0.5m. N/S, facing E, flexed on back; l forearm extended. Sex ?, age 45+; condition E

R167 (FD 8) Grave 1.9×1.25m, D 0.95m. N/S, facing E, crouched. Possible female, age 25+; condition E/F

R168 (FD 22) No central grave; barrow *c* 5m diam; ditch D 0.15m, W 0.5m

R169 (FD 5) Grave 2.65×1.4m, D 0.9m; barrow 7.4×7.4m; ditch D 0.1m, W 0.5m. E/W, extended; head facing S, r elbow outstretched, hand near r hip, l forearm has not survived, knees well apart (rather bow-legged). Female, age 35+; condition D

Pig bones (FD/AZ) alongside r arm

R170 (FD 11) Grave 1.85×0.9m, D 0.45m. E/W, extended or flexed (only skull fragments survive). Possible male, age 25–35; condition F

Iron spearhead (A18, FD/BM) N of shoulders

R171 (FD 7) Grave 2×1.1m, D 0.8m; barrow 4.4×4.4m; ditch D 0.1m, W 0.5m. N/S, facing E, crouched. Sex ?, sub-adult; condition F

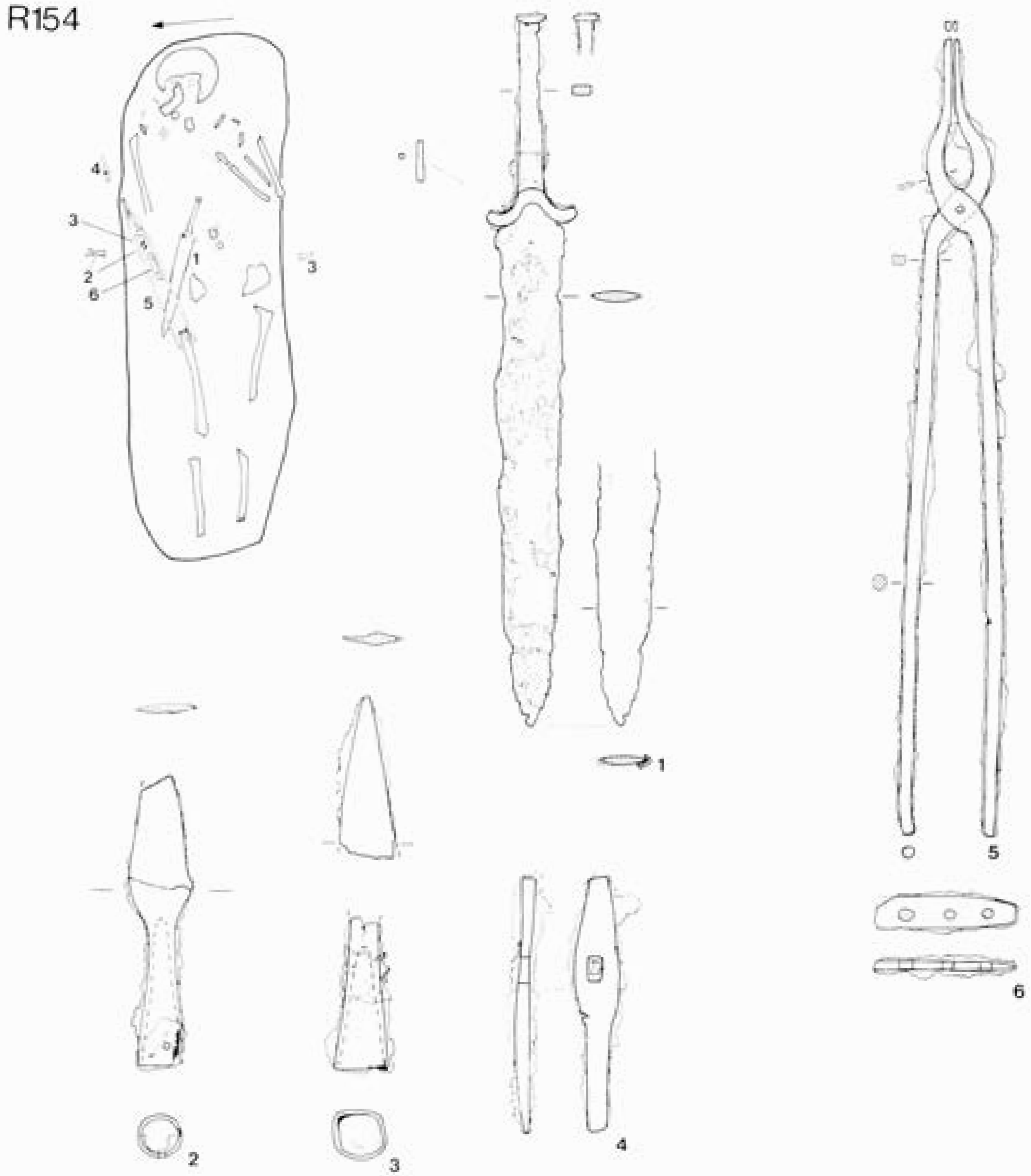

Fig 112 Rudston grave-group, R154: plan (1:20), sword and tongs (1:4), spearheads and hammer-head (1:2)

R172 (FD 4) Grave 2.1×1.35m, D 0.9m; barrow 4.8×5.4m; ditch D 0.2m, W 0.8m. N/S, facing E, crouched. Traces of coffin, 1.3×0.75m, 0.1m from floor. Possible female, age 25–35; condition E

Pig bones (FD/BR) over shoulders and forearms in front of chest

R173 (FD 3) Grave 2.7×1.25m, D 1m; barrow 6.8×6m; ditch D 0.25m, W 0.6m. E/W, extended; slightly twisted – body diagonal to grave and legs along S side, head facing N, l forearm across waist, r elbow outstretched, hands together near r hip. Probable female, age 17–25; condition D

R174 (FD 2; Fig 114) Grave 2.35×1.2m, D 1.1m. W/E, extended; head facing S, l arm flexed, hand over stomach. Male, age 17–25; condition C

1 Iron sword (Ba5, FD/AE) within r arm
2–9 Seven iron spearheads scattered over and on both sides of the lower part of the body: 2 (A5, FD/AG); 3 (A6, FD/AN); 4 (A12, FD/AJ); 5 (A13, FD/AQ); 6 (A14, FD/AM); 7 (A19, FD/AL); 8 (A20,

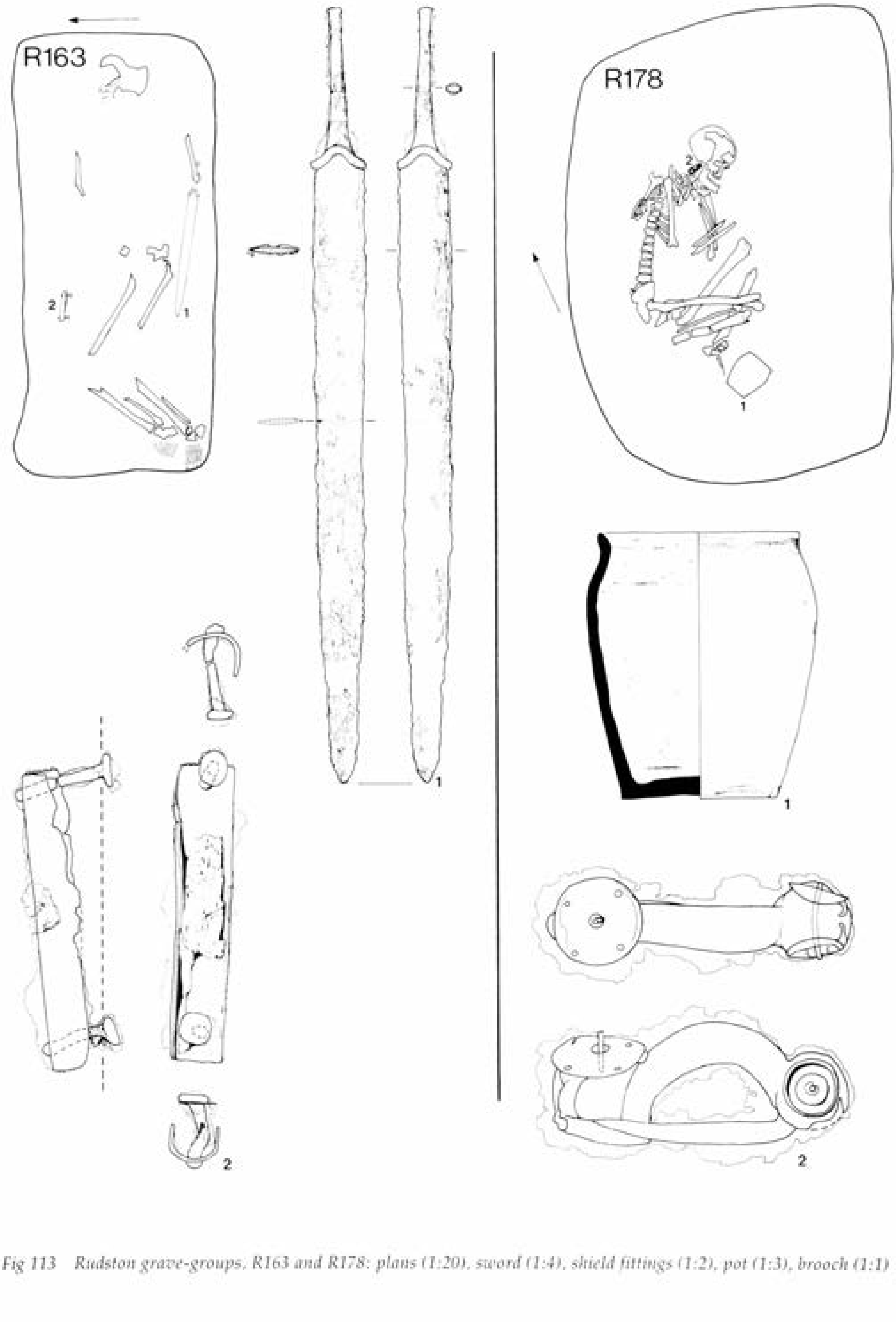

Fig 113 Rudston grave-groups, R163 and R178: plans (1:20), sword (1:4), shield fittings (1:2), pot (1:3), brooch (1:1)

FD/AO); 9 (B20, FD/AP)
10, 11 Two bone points, to l of pelvis: 10 (2, FD/AH); 11 (3, FD/AK)
12, 13 Bone toggle (p 94, FD/AF) over r hip; and the end of another
14 Copper-alloy fragment (4, FD/AD) within l humerus
15 Possible wooden shield (B2)

R175 (FD 1) Grave 1.8×0.9m, D 0.65m; barrow ?4m diam; ditch D 0.1m, W 0.25m. W/E, extended; head facing S, l arm flexed, hand over r hip. Possible male, age 17–25; condition C/D

Iron brooch (K1, FD/AB) on l shoulder

R176 (FA 11) Grave W 1m, D 0.8m; barrow 3.6m diam; ditch D 0.2m, W 0.6m. E/W, extended or flexed; only upper half of skeleton excavated (lower half under road) – on its back, head facing N, both hands near throat. Male, age 17–25; condition C

Sherds (FA/BR) in grave

R177 (FA 17; Fig 29) Grave 1.95×1.15m, D 0.5m; barrow ?×6.2m; ditch D 0.4m, W 1.2m. E/W, facing N, tightly crouched; partly on back, forearms folded, r hand over l elbow, l hand on chest. Female, age 17–25; condition D. Orientated across the width of a normal N/S grave

R178 (FA 7; Fig 113) Grave 2.05×1.15m, D 0.4m; barrow 6×6m; ditch D 0.25m, W 0.7m. N/S, facing E, crouched; l leg tightly crouched. Probable male, age 35–45; condition D

1 Pot (FA/BJ) at feet
2 Iron brooch (A3, FA/BH) over neck
Pig bones (FA/BY and BW) inside pot

R179 (FA 5) Grave 1.95×1.05m, D 0.55m; barrow 4.8m diam; ditch D 0.1m, W 0.6m. W/E, facing N, flexed. Possible male, age 17–25; condition E

R180 (FA 10; Fig 115) Grave 1.85×1.3m, D 0.45m; barrow ?×5.4m; ditch D 0.3m, W 1m. S/N, facing W, tightly crouched. Female, age 35–45; condition D

1 Pot (FA/AR) in sherds at feet
2 Iron brooch (C5, FA/AL) in front of face, near l wrist

R181 (FA 9) Grave 1.8×1.15m, D 0.5m; barrow ?×5.2m; ditch D 0.25m, W 0.9m. N/S, facing E, contracted on back; l arm extended, hand near feet. Male, age 25–35; condition C

R182 (FA 4; Fig 55) Grave 1.95×1.1m, D 1.3m; barrow ?×4.2m; ditch D 0.1m, W 0.3m. E/W, facing S, extended; entire body facing floor of grave, l arm outstretched under chest, hand near S side of grave, r hand by r shoulder, r leg slightly flexed. Sex: contra-indications, age 25–35; condition D

1 Iron sword (Bb4, FA/AN) to N of back – tang at shoulder level

Sherds (FA/AV, AW) in grave

R183 (FA 3; Fig 115) Grave 2×1.2m, D 0.9m; barrow 4.4×3.8m; ditch D 0.1m, W 0.2m. E/W, facing N, extended; head facing N, l hand on l hip. Female, age 17–25; condition D

1 Chalk spindle-whorl (p 94, FA/AG) E of r shoulder
2 Copper-alloy ring (A2, FA/AH) on toe of r foot

R184 (FA 6) Grave 1.75×0.9m, D 0.1m; barrow ?4×5m; ditch D 0.1m, W 0.3m. N/S, facing E, crouched; only part of one femur survived. Sex ?, adult; condition F

R185 (FA 8) Graves a, 1.3×0.9m; b and c, 1×0.9m; barrow ?×5.6m; ditch D 0.15m, W 0.6m. Three superimposed layers of bone:

a Superficial. S/N, two leg bones: ?disturbed by recut grave for b and c. Sex ?, adolescent; condition E/F

b D 0.15m. S/N, facing W, crouched. Child, age 2–3; condition E/F

c D 0.2m. S/N, facing E, crouched. Child, age 4–6; condition D

Sherd (FA/BA) in grave

R186 (FA 1) Grave 1.75×1.25m, D 0.6m; barrow 5.2×5m; ditch D 0.25m, W 0.75m. S/N, facing W, contracted. Sex: contra-indications, age 35–45; condition E

Pot (FA/AB) S of skull
Sheep bone (FA/BX) in pot

R187 (FA 2) Grave 1.9×1.15m, D 0.55m; barrow 5×4.4m; ditch D 0.25m, W 0.8m. S/N, facing W, contracted on chest; l hand under l shoulder, r elbow near knees. Male, age 25–35; condition D

Pot (FA/AD) broken, over knees
Sheep bone (FA/BV) amongst sherds; sherd (FA/AE) in grave

R188 (FA 25) Grave 2.05×1.05m, D 0.75m. W/E, facing N, flexed; arms outstretched together to edge of grave, hands together level with waist. Female, age 35–45; condition D/E

Pig bones (FA/BQ) between waist and hands

R189 (FA 26) Barrow ditch only

Rudston (Argam Lane)

R190 (FH 18) Grave 1.95×1.35m, D 0.65m; barrow 4.8×4.8m; ditch D 0.2m, W 0.6m. N/S, facing E, tightly crouched; body slightly on chest, l forearm

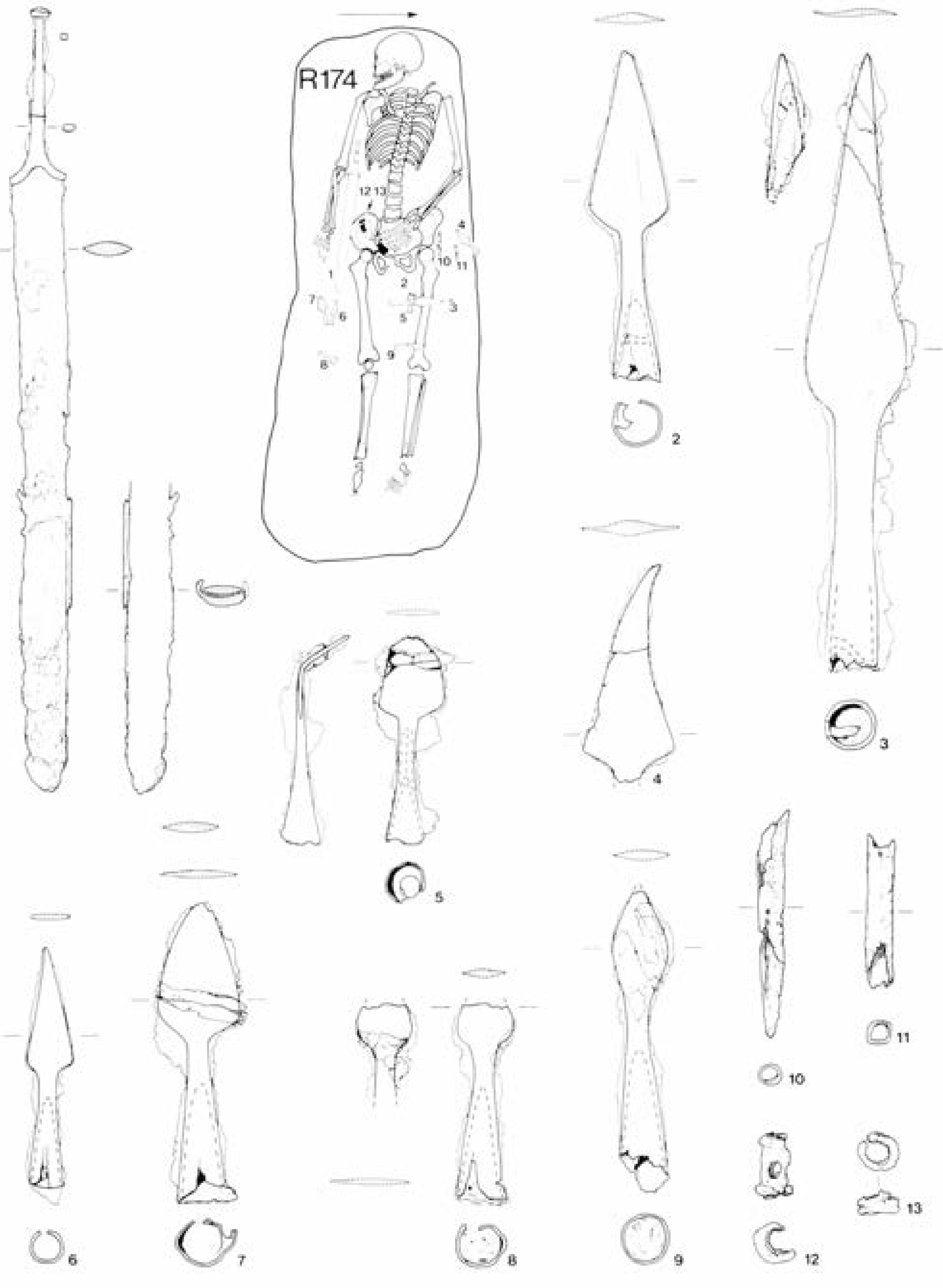

Fig 114 Rudston grave-group, R174: plan (1:20), sword (1:4), spearheads, bone missile points, and bone toggles (1:2)

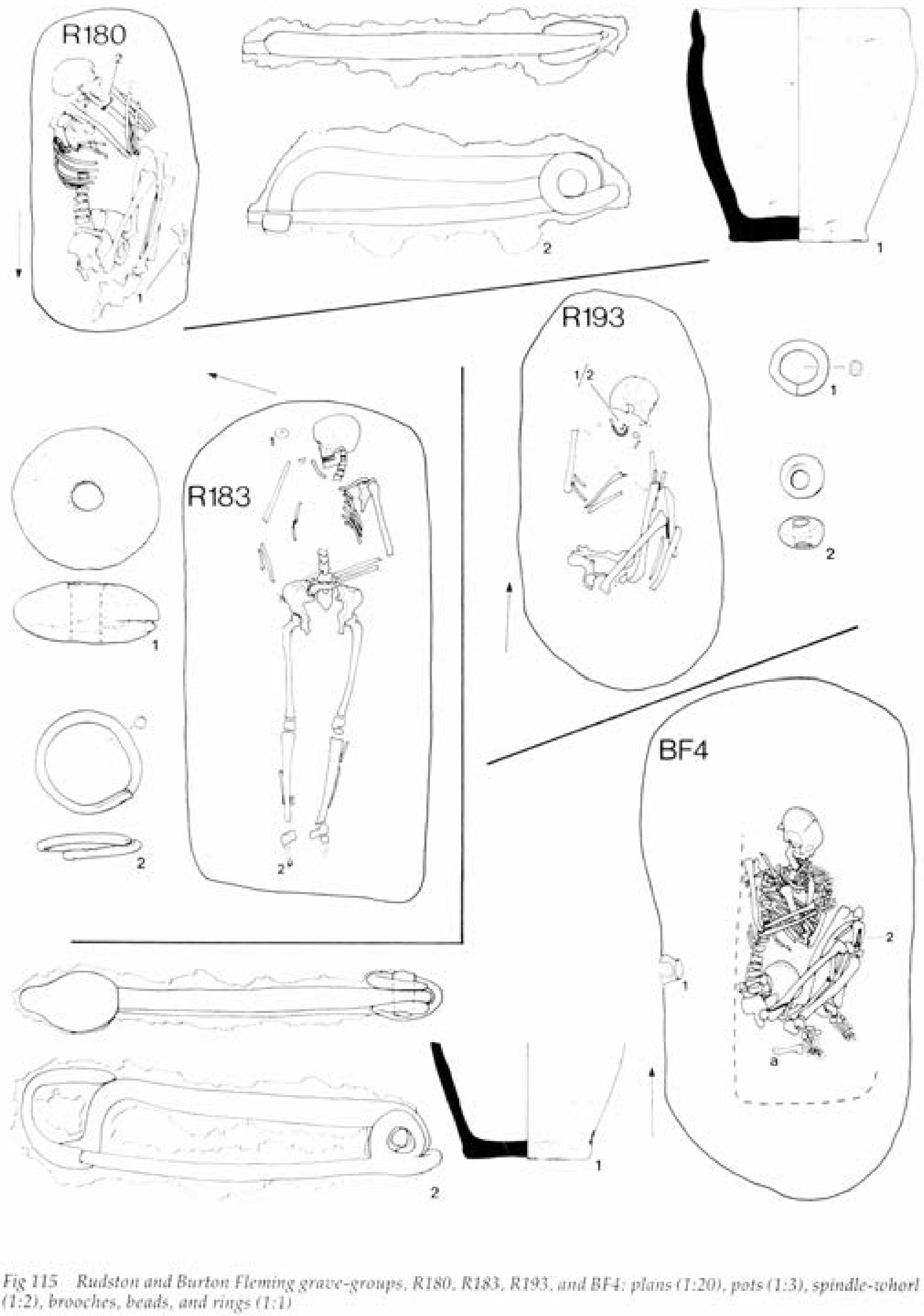

Fig 115 Rudston and Burton Fleming grave-groups, R180, R183, R193, and BF4: plans (1:20), pots (1:3), spindle-whorl (1:2), brooches, beads, and rings (1:1)

outstretched, hand between knees. Possible male, age 17–25; condition D

Iron brooch (F2, FH/BF) near r elbow

R191 (FH 17) Grave 2×1.3m, D 0.7m; barrow 4.8×5m; ditch D 0.2m, W 0.8m. S/N, facing E, crouched; l forearm outstretched, hand near knees. Male, age 17–25; condition D

R192 (FH 16) Grave 1.75×1.1m, D 0.7m; barrow 3.6×4.2m; ditch D 0.2m, W 0.5m. N/S, facing E, contracted; l elbow outstretched, hand on chest. Male, age 17–25; condition D

R193 (FH 15; Fig 115) Grave 1.9×1.15m, D 0.65m; barrow 4×4.4m; ditch D 0.15m, W 0.5m. N/S, facing E, contracted on back. Possible female, age 25–45; condition D/E

1 Copper-alloy ring (A3, FH/BH) on neck
2 Glass bead (C3, FH/BJ) on neck
3 Iron fragment (5, FH/BL) near r elbow

R194 (FH 11) Grave 1.6×1m, D 0.65m; barrow 3×4.6m; ditch D 0.1m, W 0.5m. N/S, facing E, contracted. Probable female, age 17–25; condition D/E

Iron brooch (F3, FH/AV) on neck

R195 (FH 12) Grave 1.65×1.2m, D 0.7m; barrow 4.4×4m; ditch 0.2×0.7m. N/S, facing E, contracted. Possible male, age 17–25; condition D

Iron brooch (F10, FH/BE) near elbows on chest

R196 (FH 13) Grave 1.95×1.1m, D 0.45m; barrow 4.6×5m; ditch D 0.1m, W 0.6m. S/N, facing W, contracted. Sex ?, age 17–20; condition E

R197 (FH 14) Grave 1.6×0.95m, D 0.65m; barrow ?3.5×?4.5m; ditch D 0.15m, W 0.45m. N/S, facing E, contracted on back; r hand on l shoulder, l arm extended, hand near feet. Sex ?, age 35–45; condition E

R198 Barrow 4.8m diam; no central grave

R199 (FH 10) Grave 1.85×1m, D 0.4m. S/N, facing W, contracted. Probable female, age 25–35; condition D.

Iron brooch (E7, FH/AT) on neck

R200 (FH 9) Grave 1.65×1.15m, D 0.55m. S/N, facing W, tightly crouched; arms flexed, hands together on hips. Female, age 17–25; condition D

R201 (FH 8) Grave 1.55×1.3m, D 0.9m. N/S, facing E, crouched. Female, age 25–35; condition D

Iron brooch (J1, FH/AS) by right shoulder

R202 (FH 7) Grave 2.1×1.05m, D 0.5m; barrow 4×?5m; ditch. N/S, facing E, contracted; l arm extended, hand near feet. Male, age 25–35; condition C/D

Iron brooch (F4, FH/AU) on chest

R203 (FH 5) Grave 1.7×1.2m, D 0.75m; barrow 3.6×?4.5m; ditch D 0.1m, W 0.3m. N/S, facing E, tightly crouched. Female, age 17–20; condition D

R204 (FH 6) Grave 1.45×1.05m, D 0.8m; barrow 4m×?. N/S, facing E, contracted. Male, age 25–35; condition C/D

Pot in sherds mainly N of shoulders (FH/AZ) but also by feet (BA)

R205 (FH 4) 1.35×0.9m, D 0.75m. N/S, facing E, contracted; r forearm across waist, hand under both legs. Probable male, age 25–35; condition C

R206 (FH 3) 1.75×1.2m, D 0.7m. N/S, facing E, contracted on back. Female, age 25–35; condition D

Iron brooch (J2, FH/AA)

R207 (FH 2) 1.8×1m, D 0.55m. S/N, facing W, tightly crouched; r arm extended, hand between legs. Probable male, age 25–35; condition D. Possible coffin-line on one side only

R208 (FH 1) 1.65×0.9m, D 0.45m. N/S, facing E, crouched. Male, age 45+; condition D

Burton Fleming (opposite Argam Lane)

BF1 (FR 22) Grave 1.7×1.1m, D 0.75m; barrow 5.2×5.6m; ditch D 0.45m, W 1.3m. S/N, facing W, tightly crouched. Probable female, age 25–35; condition C/D

Iron brooch (C21, FR/CO) on neck

BF2 (FR 21) Grave 2.3×1.6m, D 0.65m; barrow 6.4×7.2m; ditch D 0.55m, W 1.7m. S/N, facing W, tightly crouched; r arm outstretched, hand beyond knees, l forearm folded under waist. Male, age 25–35; condition C

Iron brooch (C6, FR/CS) under front of skull

BF3 (FR 19) Grave 1.4×1m, D 0.7m; barrow 3.6×4.4m; ditch D 0.25m, W 0.5m. N/S, facing E, contracted; only the legs survive. Sex ?, age 17–25; condition E/F

Sherd (FR/CN) in grave

BF4 (FR 18; Fig 115) Grave 2.25×1.2m, D 0.4m; barrow 6×6.4m; ditch D 0.5m, W 1.3m. N/S, facing E, crouched on back; l leg contracted, r forearm folded across chest, hand between l shoulder and l knee. Sex: contra-indications, age 25–35; condition C

1 Pot (FR/CR) near edge of grave
2 Iron brooch (C17, FR/BX) over l knee
Sheep bone (FR/CQ) near feet

BF5 (FR 20) Grave 1.95×1.4m, D 0.9m; barrow 5×5.4m; ditch D 0.5m, W 1.2m. N/S, facing E, tightly crouched. Male, age 35–45; condition D

Iron brooch (C7, FR/CC) N of r shoulder, W of skull

BF6 (FR 17; Fig 116) Grave 1.9×1.2m, D 0.75m; barrow 6×5.4m; ditch D 0.6m, W 1.5m. N/S, facing E, crouched; l leg tightly crouched, r forearm across waist, hand near l knee, l arm extended, hand near hips. Female, age 25–35; condition C

1 Pot (FR/CE) N of r shoulder
2 Iron brooch (C8, FR/CG) adjoining N side of skull
Sheep bone (FR/CF) under pot; sherd (FR/CY) in ditch

BF7 (FR 15) Grave 1.95×1.15m, D 0.5m; barrow 5.8×6m; ditch D 0.65m, W 1.6m. S/N, facing W, tightly crouched; on back, hands together at throat. Male, age 17–25; condition D

Iron brooch (C18, FR/BH) S of r shoulder, behind skull

BF8 (FR 16) Grave 1.65×1.2m, D 0.3m; barrow 4.8×5.4m; ditch D 0.2m, W 0.9m. N/S, facing E, crouched; r leg tightly crouched, r forearm across chest, hand near r knee. Probable female, age 17–20; condition D

Sherds (FR/DH) in grave

BF9 (FR 13; Fig 116) Grave 2.45×1.85m, D 0.55m; barrow 7.2×8.8m; ditch D 0.7m, W 1.9m. S/N, facing W, crouched. Probable female, age 25–35; condition E

1 Iron brooch (C9, FR/BN) on r shoulder
2 Shale bracelet (C3, FR/BY) on l forearm

BF10 (FR 14; Fig 117) Grave 2.25×1.4m, D 0.95m; barrow 7.2×6.8m; ditch D 0.6m, W 1.6m. S/N, facing E, crouched; r arm extended, hand near r foot. Female, age 17–25; condition D

1 Copper-alloy brooch (C1, FR/BU) between chin and r shoulder
2, 3 Copper-alloy bracelets (B2 and 3, FR/BS, BT), one on each forearm
Sheep bone (FR/BR) near l knee; sherds (FR/CT, CU) in ditch

BF11 (FR 12; Fig 118) Grave 1.95×1.5m, D 0.75m; barrow 7×7m; ditch D 0.75m, W 1.9m. N/S, facing E, crouched on chest; l forearm folded under waist, r forearm folded back. Probable female, age 25–35; condition C

1 Iron brooch (C19, FR/BM) near r shoulder
2 Copper-alloy bracelet (A1, FR/BZ) on r forearm
Pot (FR/CV) in ditch; sherds (FR/BJ, CK, CM) in ditch

BF12 (FR 11) Grave 1.8×0.9m, D 0.2m; barrow 6.2×5.8m; ditch D 0.5m, W 1.3m. N/S, facing E, tightly crouched; l elbow drawn well back, but hand near face. Sex ?, age 35–45; condition E

BF13 (FR 10) Grave 1.8×1.3m, D 0.6m; barrow 6.4×5.2m; ditch D 0.55m, W 1.3m. N/S, facing E, crouched. Female, age 45+; condition B/C

Iron brooch (C10, FR/BD) E of r hand
Sherd (FR/AZ) in ditch

BF14 (FR 9) Grave 1.95×1.15m, D 0.3m; barrow 5.2×5.4m; ditch D 0.35m, W 1m. S/N, facing E, tightly crouched; r elbow outstretched, near knees, and r forearm almost vertical. Probable male, age 35–45; condition D

Iron brooch (C11, FR/AY) corroded onto skull

BF15 (FR 8) Grave 2×1.15m, D 0.2m; barrow 6.4×5.8m; ditch D 0.45m, W 1.1m. S/N, facing E, crouched; r leg contracted, l forearm folded across waist, r forearm did not survive. Sex ?, age 25–45; condition D

Iron brooch (C12, FR/AJ) over neck

BF16 (FR 7) Grave 1.6×0.9m, D 0.5m; barrow 6.4×6.4m; ditch D 0.6m, W 1.6m. N/S, facing E, tightly crouched. Probable male, age 35–45; condition D

Sherd (FR/BG) in ditch

BF17 (FR 3) Grave 1.7×0.95m, D 0.55m; barrow 4.2×4.4m; ditch D 0.4m, W 1.5m. N/S, facing E, contracted on back. Probable male, age 17–20; condition D

BF18 (FR 5; Fig 119) Grave 2.15×1.35m, D 0.65m; barrow 6×6.4m; ditch D 0.4m, W 1.2m. N/S, facing E, tightly crouched; partly on chest, l forearm folded under chest, hand near r shoulder. Probable female, age 35–45; condition D

1 Pot (FR/AP) N of r shoulder
2 Iron brooch (C13, FR/AO) at r shoulder
Sheep bone (FR/AN) E of r shoulder

BF19 (FR 4; Fig 119) Grave 1.8×1.05m, D 0.5m; barrow 4.8×5.6m; ditch D 0.35m, W 0.9m. N/S, facing W, contracted on back; l forearm folded across waist, hand under legs (Fig 100, 2). Sex: contra-indications, age 35–45; condition C

1 Large sherds of a pot (FR/AW) N of l shoulder
2 Iron brooch (C14, FR/AD) W of r hand
3 Iron ring (A4, FR/AH) on neck
4 Glass bead fragment (C4, FR/BC) under pot
5 Iron fragment (6, FR/BB) under pot
Sheep bone (FR/AV) with pot

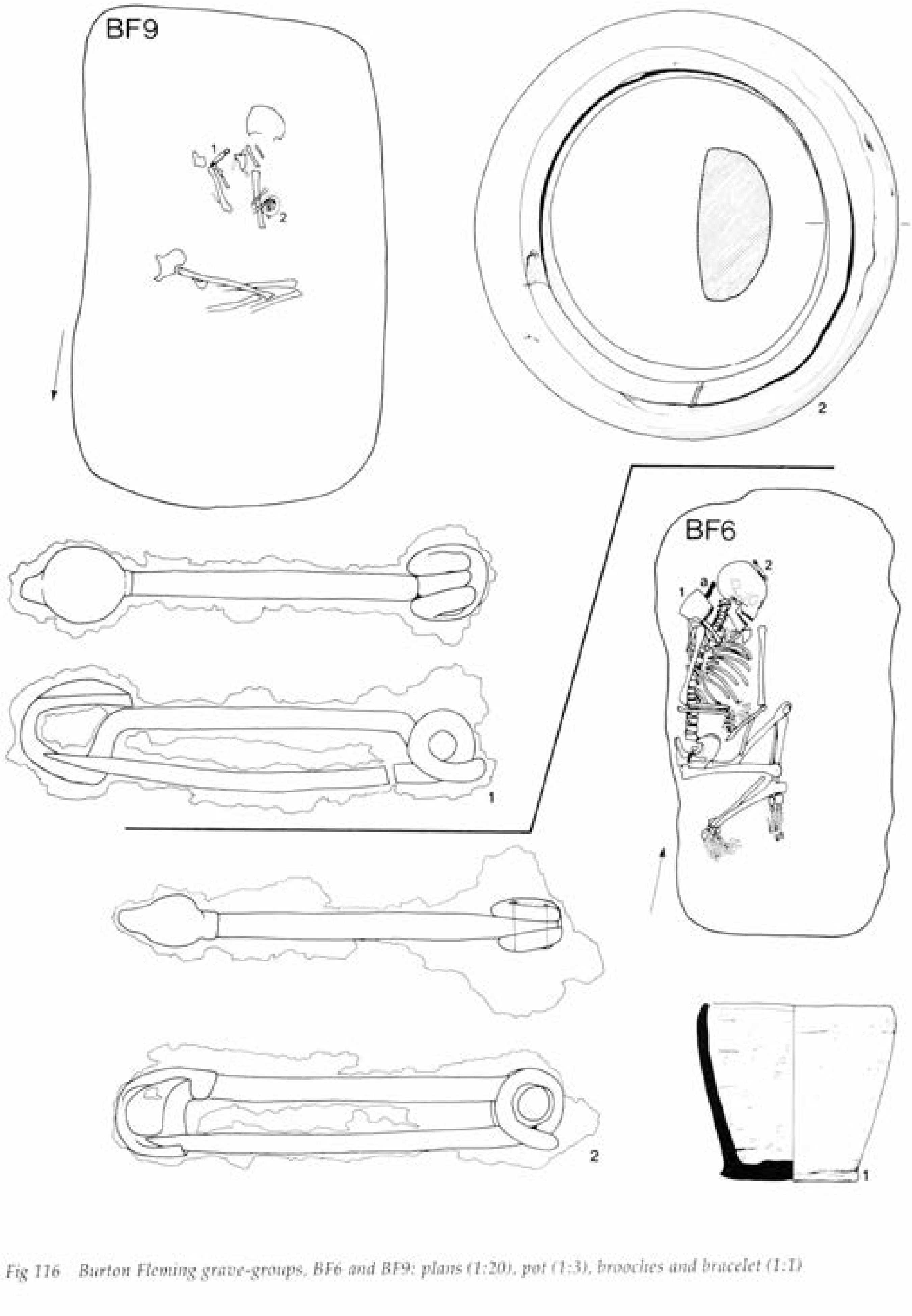

Fig 116 Burton Fleming grave-groups, BF6 and BF9: plans (1:20), pot (1:3), brooches and bracelet (1:1)

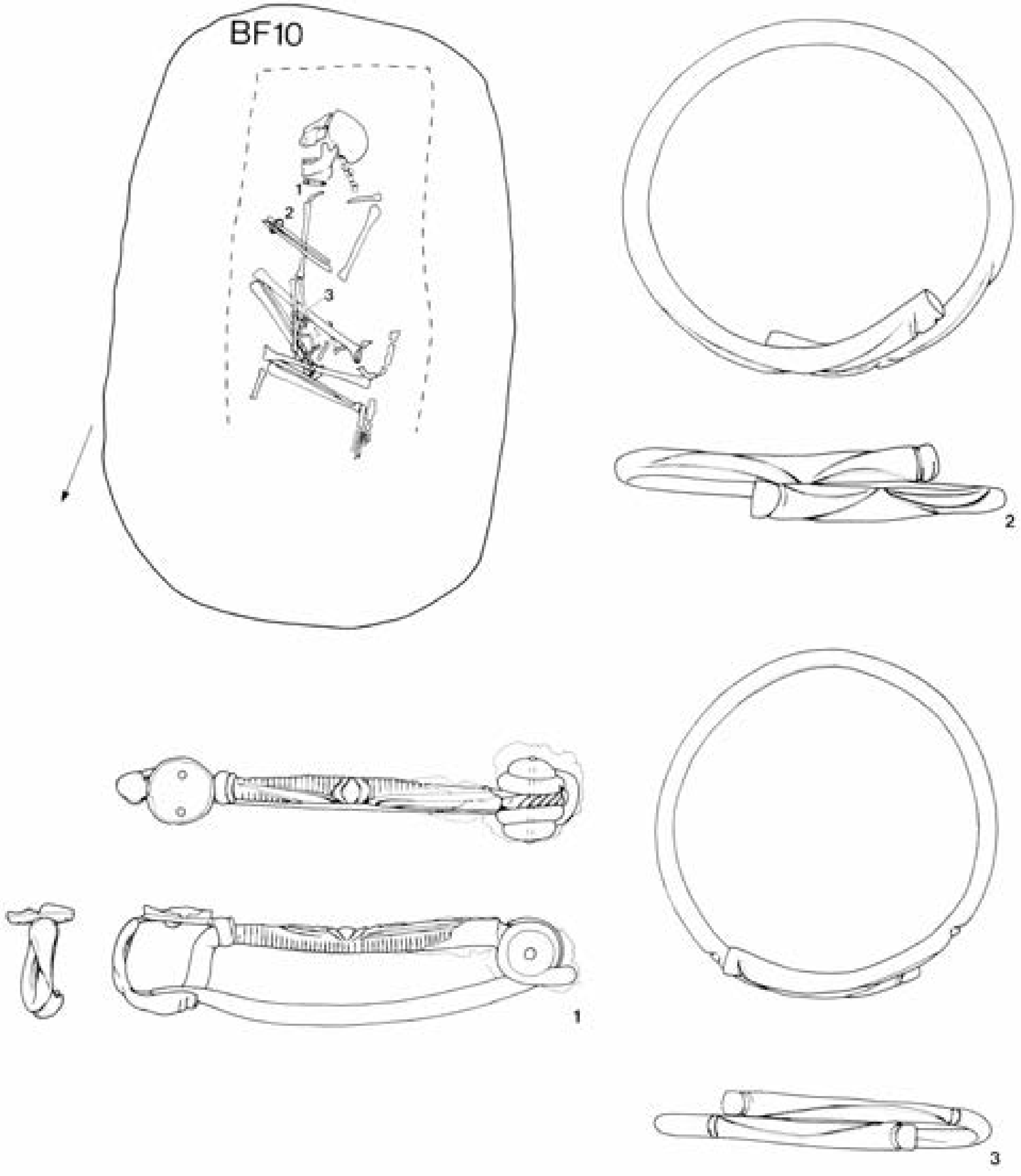

Fig 117 Burton Fleming grave-group, BF10: plan (1:20), brooch and bracelets (1:1)

BF20 (FR 2) Grave 1.9×1.15m, D 0.6m; barrow 8.8×8.4m; ditch D 0.8m, W 2.5m. S/N, facing W, crouched; r leg contracted. Probable male, age 25–35; condition B/C

Iron brooch (B2, FR/AA) behind neck
Two sherds (FR/AB) in grave

BF21 (FR 6) Grave 1.7×1.15m, D 0.7m; barrow 5×5m; ditch D 0.5m, W 1.8m. N/S, facing W, contracted; skeleton squashed into SW quadrant of grave. Probable female, age 45+; condition D

Sheep bone (FR/AS) in centre of grave, E of human skull

BF22 (FR 1) Grave 1.8×1.05m, D 0.7m; barrow 4.4×?5m; ditch D 0.45m, W 1m. N/S, facing E, contracted. Sex ?, age 25–35; condition E/F

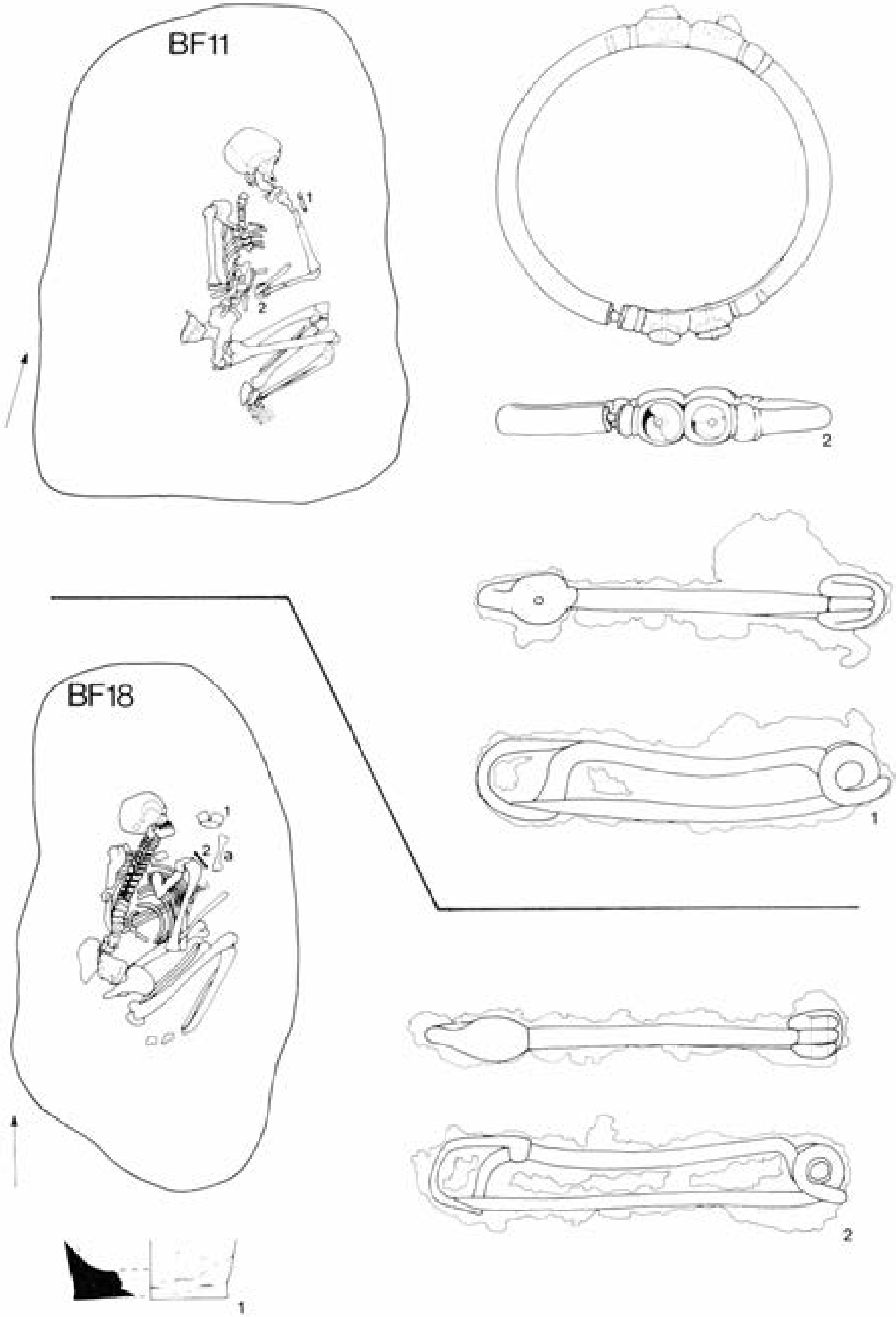

Fig 118 Burton Fleming grave-groups, BF11 and BF18: plans (1:20), pot (1:3), brooches and bracelet (1:1)

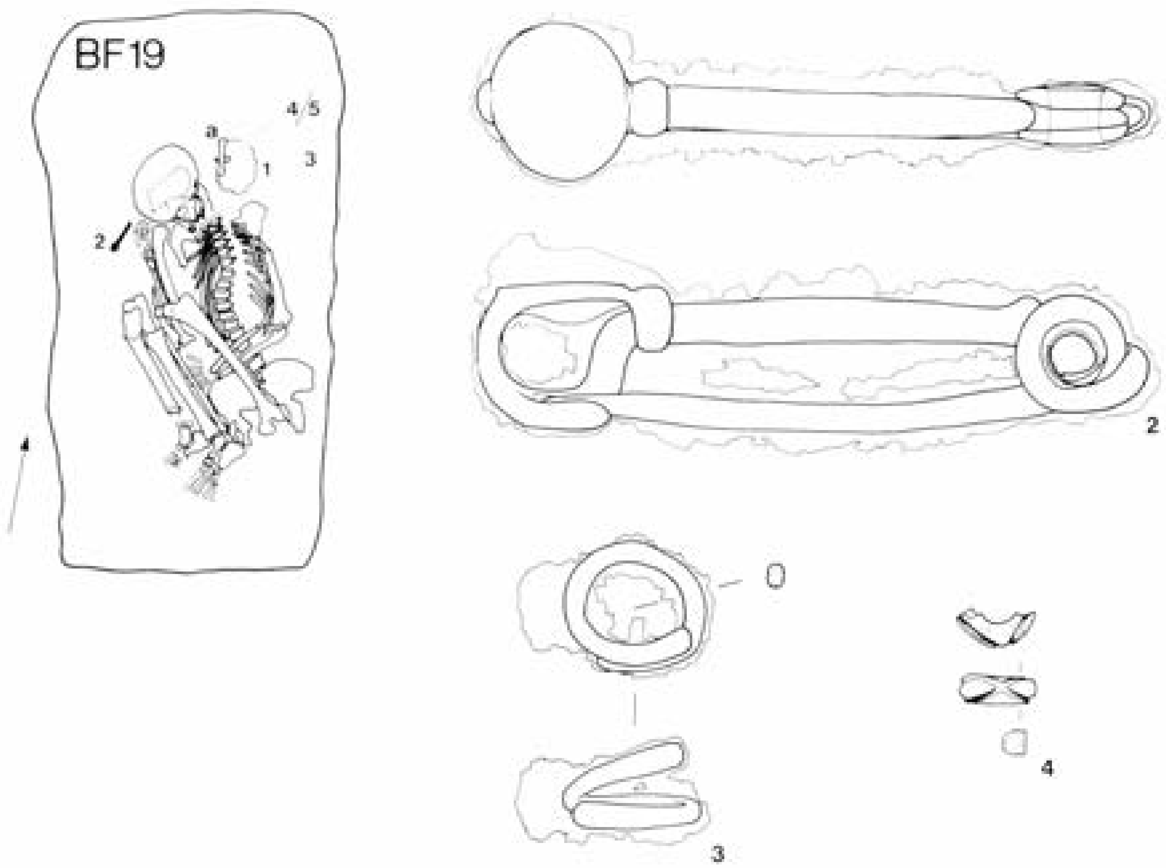

Fig 119 Burton Fleming grave-group, BF19: plan (1:20), brooch, ring, and bead (1:1)

Burton Fleming (Bell Slack)

BF23 (FZ 33) Grave 1.6×1.05m, D 0.65m; barrow 4.4m×?. N/S, facing E, contracted. Possible female, age 25+; condition D/E

BF24 (FZ 18) Grave 1.9×1.1m, D 0.7m; barrow 4.8m×?5m; ditch D 0.2m, W 0.5m. N/S, facing E, crouched; r leg tightly crouched. Male, age 35–45; condition C/D

Sherd (FZ/CG) in grave

BF25 (FZ 17) Grave 1.65×1.15m, D 0.75m; barrow 4×4m; ditch D 0.15m, W 0.7m. N/S, facing E, tightly crouched. Male, age 17–25; condition C

BF26 (FZ 15) Grave 2×1.2m, D 0.45m; barrow ?4×?4m; ditch D 0.1m, W 0.55m. N/S, facing E, flexed; l arm extended, r forearm outstretched over waist. Male, age 25–35; condition C/D

BF27 (FZ 32) Grave 1.4×0.85m, D 0.55m; barrow 3.6×3.4m; ditch D 0.1m, W 0.4m. N/S, facing E, contracted. Sex: contra-indications, age 15–20; condition D

BF28 (FZ 19) Grave 1.9×1.2m, D 0.85m; barrow 5×4.8m; ditch D 0.1m, W 0.3m. N/S, facing W, crouched; l arm extended, hand in front of feet. Probable female, age 17–25; condition E

Pig bones (FZ/CA) over upper part of body; pot (FZ/DZ) in ditch between 28 and 29

BF29 (FZ 23) Grave 1.6×1.2m, D 0.65m; barrow 5.2×4.6m; ditch D 0.25m, W 0.7m. N/S, facing E, contracted. Possible male, age 25–45; condition D

Iron brooch (F5, FR/BY) over the waist
Pot (FR/DZ) in ditch between 29 and 28

BF30 (FZ 34) Grave 1.2×0.75m, D 0.25m. NW/SE, facing E, flexed; on back, r leg crouched, hands on respective shoulders. Male, age 45+; condition C/D

Sherd (FZ/DE) in ditch

BF31 (FZ 11) Grave 1.85×1.05m, D 0.5m; barrow 4×4.2m; ditch D 0.1m, W 0.75m. N/S, facing E, contracted on back; r forearm folded across both legs. Male, age 45+; condition C/D

Iron brooch (F11, FZ/AK) adjoining body W of hips

BF32 (FZ 29) Grave 1.55×1.35m, D 0.85m; barrow 4.4×4.2m; ditch D 0.25m, W 0.65m. N/S, facing E, tightly crouched; on back, l arm ?extended, nothing of r forearm survived. Adolescent, age 12–15; condition E

BF33 (FZ 10) Grave 1.85×1.25m, D 0.85m; barrow 4.4×5m; ditch D 0.15m, W 0.8m. N/S, facing E, crouched; l elbow slightly outstretched, hand by hips. Male, age 25–35; condition C

BF34 (FZ 42) Grave 1.45×0.9m, D 0.65m. N/S, facing E, contracted. Female, age 17–25; condition D

BF35 (FZ 39) Grave 1.5×1.1m, D 0.95m. N/S, facing E, contracted. Male, age 45+; condition C

BF36 (FZ 16) Grave 1.75×1.25m, D 0.7m; barrow 4.8×4.6m; ditch D 0.1m, W 0.55m. N/S, facing E, tightly crouched; on back, forearms crossed, r hand at knees, l hand between r elbow and hips. Probable female, age 17–25; condition D

BF37 (FZ 21) Grave 1.4×1.05m, D 0.15m; barrow 5.2×5.4m; ditch D 0.15m, W 0.5m. S/N, facing W, contracted; r elbow outstretched, between knees. Possible male, age 17–25; condition E

Pot (FZ/CB) in sherds in front of face

BF38 (FZ 20a) Grave L 1.55m, D 0.55m; and **BF39** (FZ 20b) Grave L 1.45m, D 0.5m (widths unknown). Apparently two graves side by side and on the same N/S orientation – one must have cut the edge of the other; both cut by a third grave (BF40) on a slightly different alignment. Only disturbed bones from both BF38 and 39: 38, adolescent, age 13–16, condition F; 39, child, age 8–13, condition F

BF40 (FZ 20c) Grave 1.55×0.95m, D 0.7m. N/S, facing E, crouched on back; l elbow outstretched, hand in front of waist, r forearm outstretched, hand near l elbow. Female, age 17–20; condition D

BF41 (FZ 9) Grave 1.75×1.2m, D 0.45m; barrow 5.4×?6m; ditch D 0.1m, W 0.5m. N/S, facing E, contracted; l arm extended. Male, age 25–35; condition D

Iron brooch (E8, FZ/BF) in front of the face

BF42 (FZ 14) Grave 1.55×1m, D 0.65m. N/S, facing E, crouched; slightly on chest, r forearm outstretched, hand between knees. Male, age 17–25; condition B

BF43 (FZ 27) Grave 1.6×1.1m, D 0.3m; barrow 4.6×5.6m; ditch D 0.25m, W 0.75m. Empty grave

BF44 (FZ 25) Grave 1.9×1.25m, D 0.45m. Possibly a grave, but no bone survived

BF45 (FZ 36) Grave 2.2×1.5m, D 0.2m; barrow ?6×7.2m; ditch D 0.25m, W 0.8m. S/N, facing E, tightly crouched. Sex ?, age 25–35; condition E

Sherds (FZ/DW) in grave

BF46 (FZ 26) Grave 1.75×1m, D 0.5m; barrow 3.6×4.2m; ditch D 0.1m, W 0.4m. N/S, facing E, crouched; l arm extended, hand by legs. Male, age 25–35; condition D

Sherds (FZ/EB) in grave

BF47 (FZ 31) Grave 1.4×1m, D 0.3m; barrow 5.8×6.4m; ditch D 0.3m, W 0.9m. N/S, facing E, contracted on back. Sex ?, age 17–20; condition E

Two shale rings (B1 and 2, FZ/CT and CS) side by side in front of face

BF48 (FZ 12) Grave 1.8×1m, D 0.75m. N/S, facing E, tightly crouched. Female, age 25–35; condition D

Sheep bone (FZ/BO) immediately W of chest

BF49 (FZ 35) Grave 1.3×0.9m, D 0.25m. N/S, facing E, crouched on chest; r elbow slightly outstretched, hand near legs, l forearm outstretched. Female, age 17–25; condition D

BF50 (FZ 7) Grave 2×1.05m, D 0.4m; barrow 5.8×6.4m; ditch D 0.35m, W 1.2m. S/N, facing W, contracted on back; l arm ?extended, r forearm folded across chest, hand by knees. Male, age 25–35; condition D

Sheep or goat bones (FZ/BG) over body

BF51 (FZ 28) Grave 1.75×1.2m, D 0.15m; barrow 6×6.8m; ditch D 0.2m, W 0.6m. S/N, facing W, contracted on back. Sex ?, age 25–45; condition E

BF52 (FZ 22) Grave 1.65×0.95m, D 0.5m; barrow 5×6m; ditch D 0.2m, W 0.6m. N/S, facing E, contracted on back. Female, age 17–25; condition C/D

BF53 (FZ 37) Grave 1.8×1m, D 0.3m; barrow ?4×4.8m; ditch D 0.1m, W 0.55m. S/N, facing W, contracted on back. Sex ?, age 17–25; condition E

Iron brooch (C20, FZ/DK) behind skull

BF54 (FZ 1) Grave 1.3×0.75m, D 0.1m; barrow 7.2×7m; ditch D 0.4m, W 1.1m. S/N, facing W, contracted. Probable male, age 25+; condition E/F

BF55 (FZ 41) Grave 1.4×0.8m, D 0.5m. N/S, facing E, flexed on back. Probable female, age 17–25; condition D

BF56 (FZ 30) Grave 1.5×0.8m, D 0.25m; barrow ?5×6m; ditch D 0.3m, W 1m. N/S, facing E, contracted. Male, age 25–35; condition D

Iron brooch (A5, FZ/CE) well to N of skull
Sherd (FZ/DD) in ditch

BF57 (FZ 5) Grave 1.7×0.8m, D 0.3m; barrow 5.4×5.8m; ditch D 0.15m, W 0.6m. N/S, facing W, tightly crouched. Female, age 17–25; condition D/E

Pot (FZ/AB) in ditch

BF58 (FZ 6) Grave 1.95×1.1m, D 0.45m. N/S, facing E, flexed on back; r arm outstretched across chest, hand beyond l elbow. Probable male, age 35–45; condition D

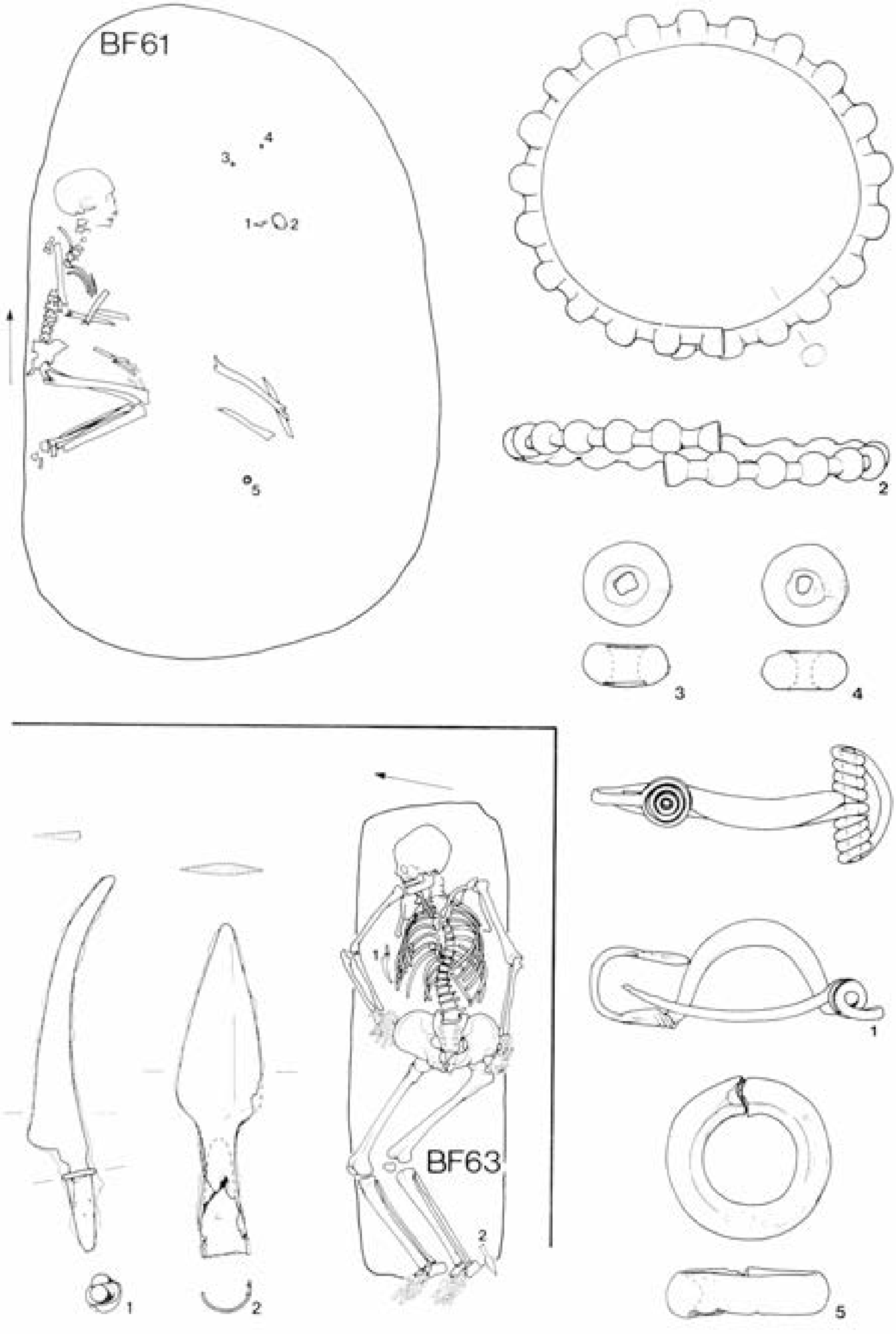

Fig 120 Burton Fleming grave-groups, BF61 and BF63: plans (1:20), knife and spearhead (1:2), bracelet, brooch, beads, and ring (1:1)

Sheep bone (FZ/BN) in front of face

BF59 (FZ 38) Grave 1.3×0.95m, D 0.25m. N/S, facing W, flexed; slightly on chest. Sex ?, age 25–35; condition D

BF60 (FZ 40) Grave 1.35×1m, D 0.6m. N/S, facing E, tightly crouched. Possible female, age 45+; condition E

Pig bones (FZ/DR) over legs

BF61 (FZ 3; Fig 120) Grave 2.45×1.6m, D 0.2m; barrow ?10×9.4m; ditch D 0.6m, W 2m. Two skeletons in the same shallow grave:

a N/S, facing E, flexed; central to the grave – the bones had virtually disappeared. Sex ?, sub-adult ?; condition F

1 Copper-alloy brooch (A1, FZ/BH) in vicinity of chest
2 Copper-alloy bracelet (B4, FZ/BJ) near brooch
3, 4 Copper-alloy beads (A5 and 6, FZ/AY, AZ) in vicinity of skull
5 Shale ring (B3, FZ/BP) near feet

b N/S, facing E, crouched; almost flexed, forearms outstretched. To W of a and near edge of grave. Probable female, age 35–45; condition D/E

BF62 (FZ 4) Grave 1.85×0.7m, D 0.5m. E/W, facing N, crouched; l arm folded across waist, hand near knees. Possible female, age 25–35; condition D/E

BF63 (FZ 2; Fig 120) Grave 2.1×1.05m, D 0.7m. E/W, facing N, flexed; on back, arms by sides. Male, age 25–35; condition B

1 Iron knife (3, FZ/AP) between chest and r elbow
2 Iron spearhead (A7, FZ/BA) immediately S of heels

BF64 (FZ 24) Grave 2.1m×0.95m, D 0.25m; barrow 5.4×6.6m; ditch D 0.35m, W 1m. N/S, facing E; only part of the skull survived – the grave had been cut by a later ditch. Sex ?, adult; condition F

Garton Station

(grave measurements at gravel level, when first exposed)

GS1 (GW 36) Grave 1.9×1.2m, D 0.9m; barrow 3.8m×?. N/S, facing E, crouched; l hand near knees. Female, age 17–25; condition C

GS2 (GW 15) Grave 2.2×1.25/1.4m, D 1.0m; barrow 5.4×5.8m; ditch D 0.45m, W 1.2m. N/S, facing E, crouched; r arm outstretched, hand near knees. Female, age 25–35; condition E

GS3 (GW 37) Grave 2.3×1.3/1.5m, D 1.0m; barrow 5.6×6.4m. N/S, facing E, crouched; l arm folded back, hand on waist. Possible female, age 25–35; condition E

GS4 (GW 16; Fig 121) Grave 1.85×1.4m, D 1.0m; barrow 5.8m diam; ditch D 0.5m, W 1.4m. N/S, facing E, flexed; l arm extended, hand below knees. Male, age 17–25; condition C

1, 2 Iron shield fittings: a length of spine-cover over the skull and shoulders (A3, GW/HP); another over the legs (GW/HQ), and a loose rivet (GW/HO)
3–5 Iron spearheads: 3 (B1, GW/CQB) and 4 (B10, GW/CQA) in the filling, pointing downwards, the points 0.8m above the skeleton; 5 (B21, GW/HN) near the feet

GS5 (GW 17; Fig 121) Grave 2.25×1.25/1.3m, D 0.85m; barrow 4.8m diam; ditch D 0.25m, W 0.75m. N/S, facing E, crouched. Male, age 17–25; condition C

1–4 Iron spearheads: 1 (B12, GW/FO), 2 (B22, GW/HK), 3 (A8, GW/HG), and 4 (B11, GW/HJ)
5–7 Bone missile points: 5 (GW/HI), 6 (GW/HM), and 7 (GW/HL)
8 Possible wooden shield (B3)

GS6 (GW 22; Figs 122, 126) The cart-burial, grave 4.0×2.4/2.7m, D 1.3/1.4m; barrow 11.2×12m; ditch D 0.7m, W 2.4m. N/S, facing E, flexed; the r leg almost crouched, arms extended together, hands towards knees. Male, age 35–45; condition C

1, 2 Iron tyres (GW/KC, KD)
3–6 Iron nave-hoops (GW/KG, KH, KE, KF)
7, 8 Iron linch-pins (GW/JN, JK)
9, 10 Iron horse-bits (GW/JL, JP)
11 Copper-alloy and iron terret (GW/JI)
12–15 Copper-alloy terrets (GW/JG, JH, JJ, JM)
Pig bones: a, left, and b, right sides of skull; c, left forelimb; d, right forelimb

GS7 (GW 18; Fig 123) Grave 2.05×1.65m, D 0.75m; barrow 5.8m diam; ditch D 0.35m, W 1.3m. N/S, facing E, flexed on its back; arms extended by the sides. Male, age 25–35; condition B/C

1 Copper-alloy toe-ring (A7, GW/HD) on one of the toes of the l foot
2–12 Iron spearheads: 2 (A9, GW/FV), 3 (B2, GW/FR), 4 (B3, GW/HR), 5 (B4, GW/FM), 6 (B13, GW/FU), 7 (B14, GW/FQ), 8 (B15, GW/FX), 9 (B23, GW/FN), 10 (B24, GW/FS), 11 (B25, GW/FP), 12 (C2, GW/FW)

Nos 5, 7, and 9 were in the grave filling, points downwards and about 0.2/0.25m above the skeleton at the level of the waist; nos 2, 6, 8, and 12 were in the same area, but immediately above the body; no 4 was in the chest; and nos 3, 10, and 11 were on the floor of the grave behind the body

GS8 (GW 19) Grave 2.25×1.35/1.1m, D 0.5m; barrow ?6.4×6.2m; ditch D 0.25m, W 0.7m. N/S, facing E, flexed on its back; hands together near the chin.

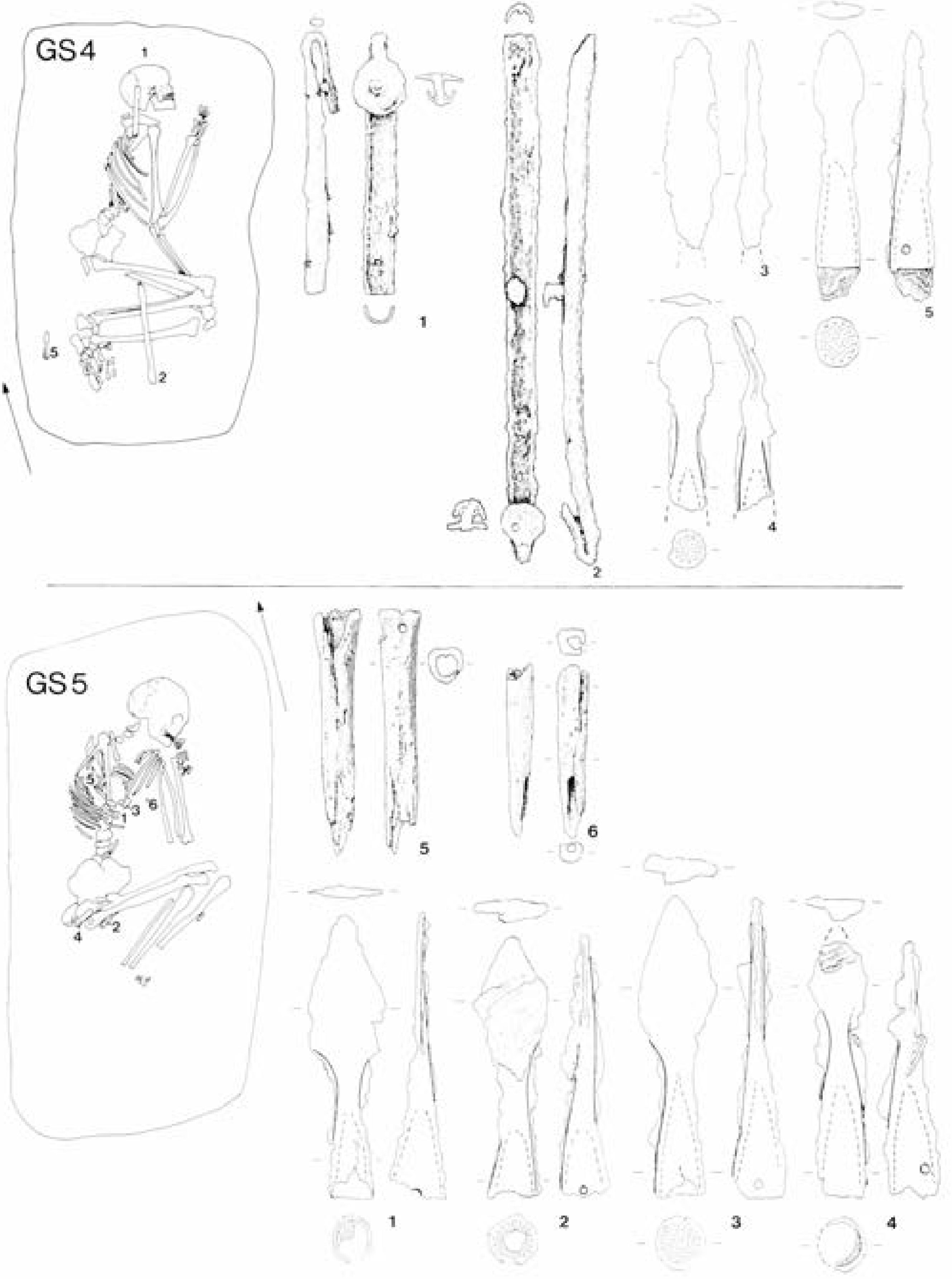

Fig 121 Garton Station grave-groups, GS4 and GS5: plans (1:20), shield fittings (1:4), spearheads and bone missile points (1:2)

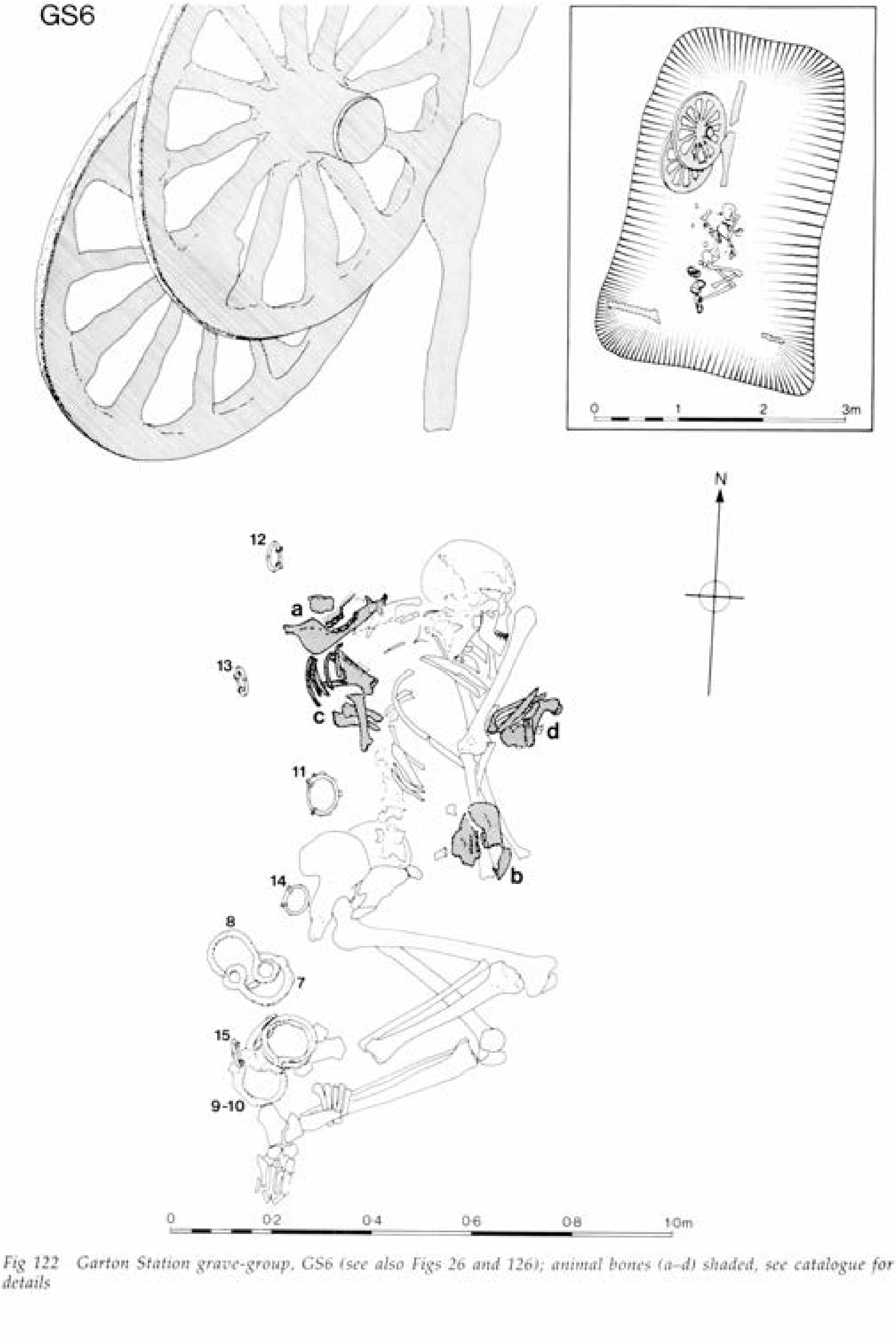

Fig 122 Garton Station grave-group, GS6 (see also Figs 26 and 126); animal bones (a–d) shaded, see catalogue for details

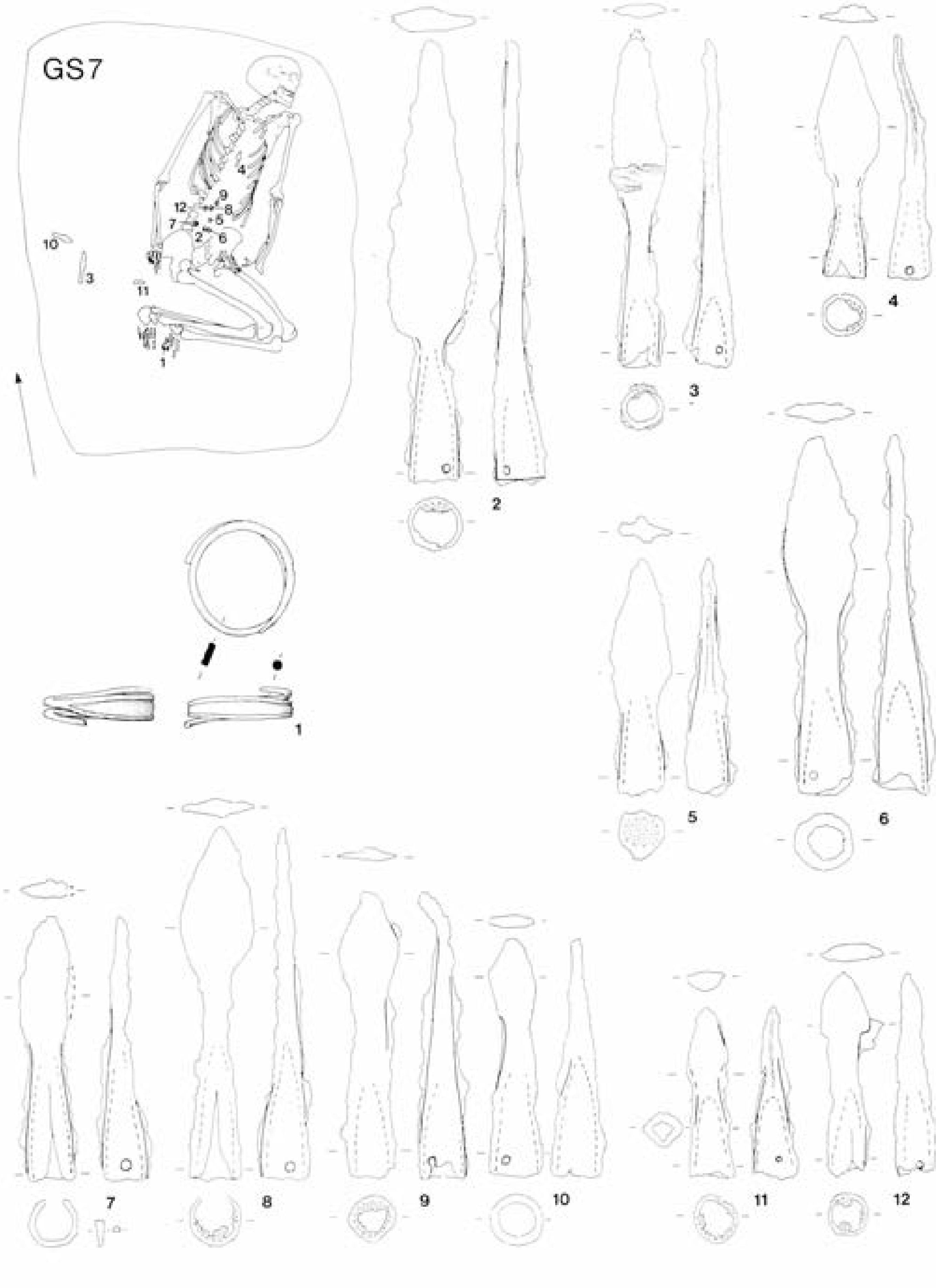

Fig 123 Garton Station grave-group, GS7: plan (1:20), spearheads (1:2), toe-ring (1:1)

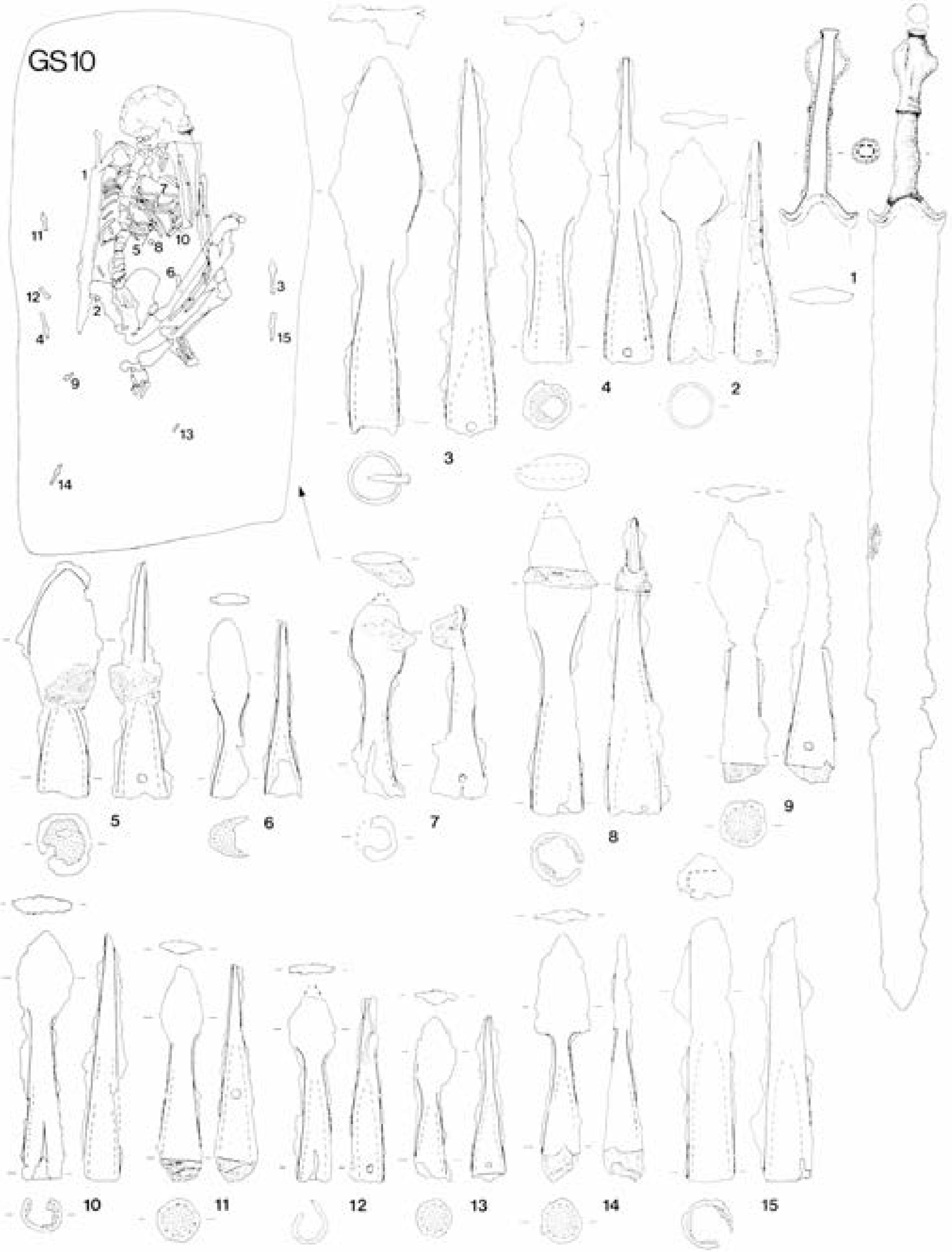

Fig 124 Garton Station grave-group, GS10: plan (1:20), sword (1:4), spearheads (1:2)

Female, age 17–25; condition B/C

GS9 (GW 20) Grave 2.3×1.5/1.7m, D 0.95m; 7×6.6m; ditch D 0.3m, W 1m. N/S, facing E, flexed on its back. Probable female, age 35–45+; condition E/F

GS10 (GW 21; Fig 124) Grave 2.15×1.2m, D 0.6m; barrow 6.2m diam; ditch D 0.4m, W 1.2m. N/S, facing E, tightly crouched; l arm outstretched, hand over legs. Male, age 25–35; condition C/D

1 Iron sword (Ba6, GW/GS) behind the back
2–15 Iron spearheads: 2 (A21, GW/GP), 3 (B5, GW/GK), 4 (B6, GW/GH), 5 (B7, GW/GQ), 6 (B8, GW/GN), 7 (B16, GW/GR), 8 (B17, GW/GO), 9 (B26, GW/GG), 10 (B27, GW/GM), 11 (B28, GW/GJ), 12 (B29, GW/GI), 13 (B30, GW/GE), 14 (C3, GW/GF), 15 (C4, GW/GL)
16 Possible wooden shield (B4)

Kirkburn

(**K1** An Anglian burial in the upper filling of Burial 5 – to be published with the Garton Station Anglian burials)

K2 A superficial burial, grave not recognised, cut into the upper filling of K6. D 0.25m. E/W, facing N, crouched; l forearm across waist, hand near knees, r arm extended below legs. Female, probably 25–35; condition C. Remains of a foetus *in situ*

Base of a pot (KR/BP) near knees – badly disturbed by subsoiling plough

K3 (Fig 125) Grave 2.2×1.6m, D 1.1m; barrow 5.4×5.6m; ditch D 0.2m, W 0.7m. N/S, facing E, flexed on its back; hands together near the chin. Male, age 17–25; condition B

1 Iron sword in copper-alloy and iron scabbard, face down, and with the handle at the foot of the grave, at the side of the skeleton (A1, KR/AP)
2–4 Three iron spearheads, points downwards, above the skeleton's chest (KR/AI, AJ, AM)
Pig bones: a, left, and b, right sides of skull; c, left forelimb; d, right forelimb

K4 Grave 2.4×1.45m, D 1.0m; barrow 6.2m diam; ditch D 0.1m, W 0.5m. NW/SE, facing E, flexed; the arms folded at the waist. Male, age 25–35; condition B/C

K5 (Figs 126, 127) The cart-burial, grave 5.2×3.7/3.1m, D 1.25m; barrow 11.8×13m; ditch D 0.9m, W 3m. N/S, facing E, flexed on its back, r leg crouched; r arm extended by the side, l forearm folded across chest. Male, age 25–35; condition C

1, 2 Iron tyres (KR/CC, CB)
3–6 Copper-alloy nave-hoops (KR/AX, DH, CD, DG)
7, 8 Copper-alloy and iron linch-pins (KR/AY, BM)
9, 10 Copper-alloy 'miniature terrets' (KR/AY, BL)
11, 12 Copper-alloy and iron horse-bits (KR/BF, BH)
13–17 Five copper-alloy terrets (KR/AS, AT, AU, AV, AW)
18, 19 Copper-alloy strap-unions (KR/BD, BE)
20 Coat of iron mail (KR/BO, CA, DC, DF)
21–3 Three copper-alloy toggles (KR/AQ, AR, DD)
24 D-shaped 'lid' (copper-alloy on organic material) (KR/BU)
Pig bones: a, left, and b, right sides of skull (right side mainly under mail); c, left forelimb; d, right forelimb

K6 (Fig 69) Grave 2.55×2.45/1.95m, D 1.3m; barrow 8.4×8.2m; ditch D 0.6m, W 2m. N/S, facing E, flexed, l leg almost crouched; both arms outstretched towards knees. Female, age 17–25; condition B. The remains of a new-born child, under six months, between the pelvis and the heels

1 Copper-alloy stud (KR/CN, p 94), near the bead, to W of mandible
2 Amber bead (D1, KR/CO) wedged between the fourth and fifth cervical vertebrae
3 Hollow copper-alloy ring (A8, KR/CM) over the jet bead
4 Jet bead (B4, KR/CP) by l ear (E of mandible)

K7 Grave 1.7×0.9/1.0m, D 0.75m; barrow (D) 11×9m. N/S, facing W, contracted, on its chest. Female, age 17–25; condition B

K8 Grave 2.3×1.5/1.35m, D 0.9m; barrow (A) ?10×9m. N/S, facing E, crouched/flexed. Female, age 45+; condition C

Two groups of pig bones over the body (KR/CW, CX)

K9 (Bronze Age) Grave 2.3×1.5m, D 0.8m to level of skeleton – but seemed to extend a further 0.3m below. E/W, facing S, crouched, with l leg contracted; r forearm folded across waist. Male, age 17–25; condition B/C. An additional radius and ulna (adult, and apparently buried articulated) over the legs

K10 Pit 0.9m diam, D 0.75m; barrow 10.5–11m diam; ditch D 0.6m, W 1.3m. No finds other than two animal bones

No central graves were located in barrows C (8×8m) and E (12×13m).

Fig 125 Kirkburn grave-group, K3: plan (1:10), sword (1:3), spearheads (1:2); animal bones (a–d) shaded, see catalogue for details

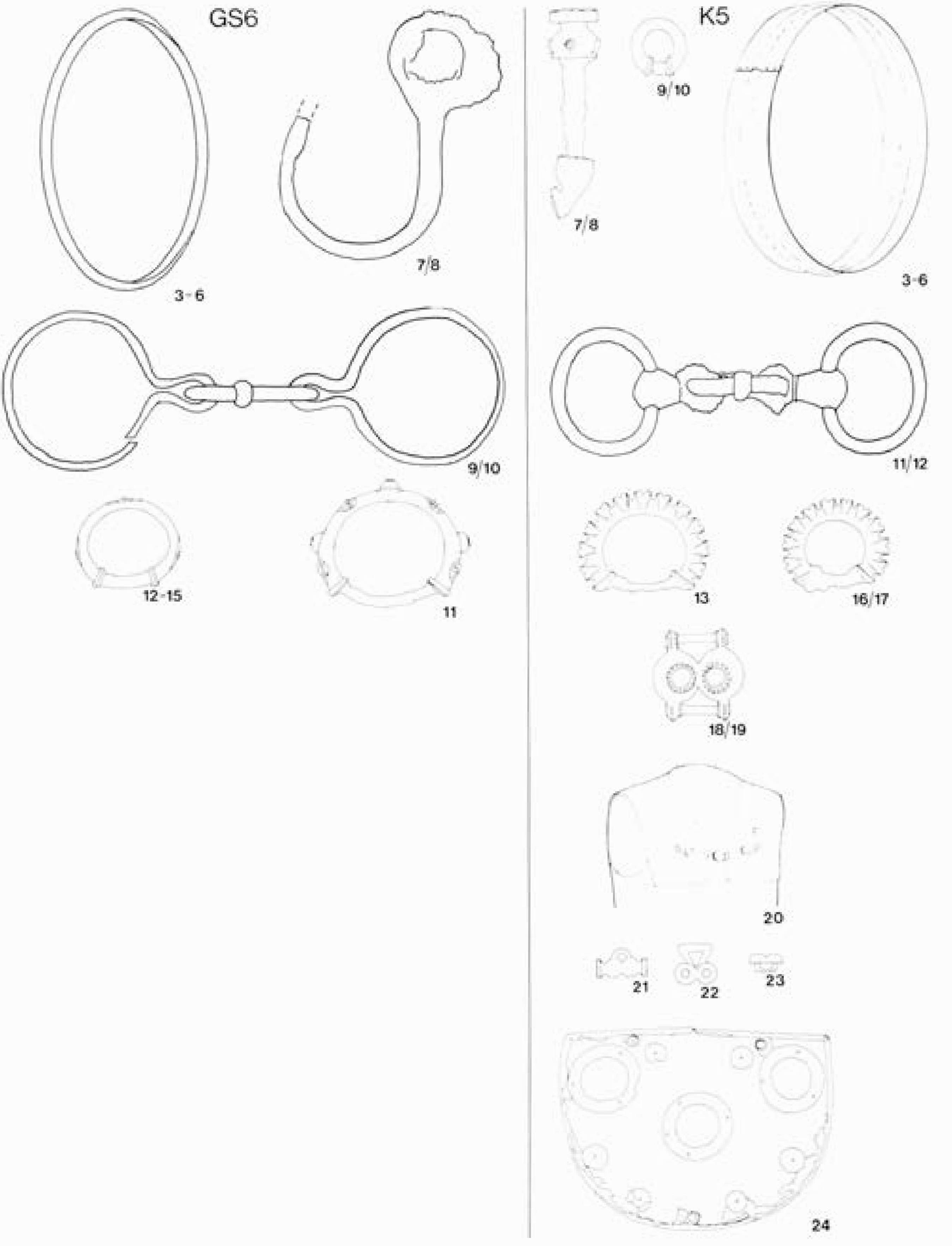

Fig 126 Sketches to compare the grave-goods from the two cart-burials, GS6 and K5, numbered according to the plans (Figs 122 and 127) and the catalogue

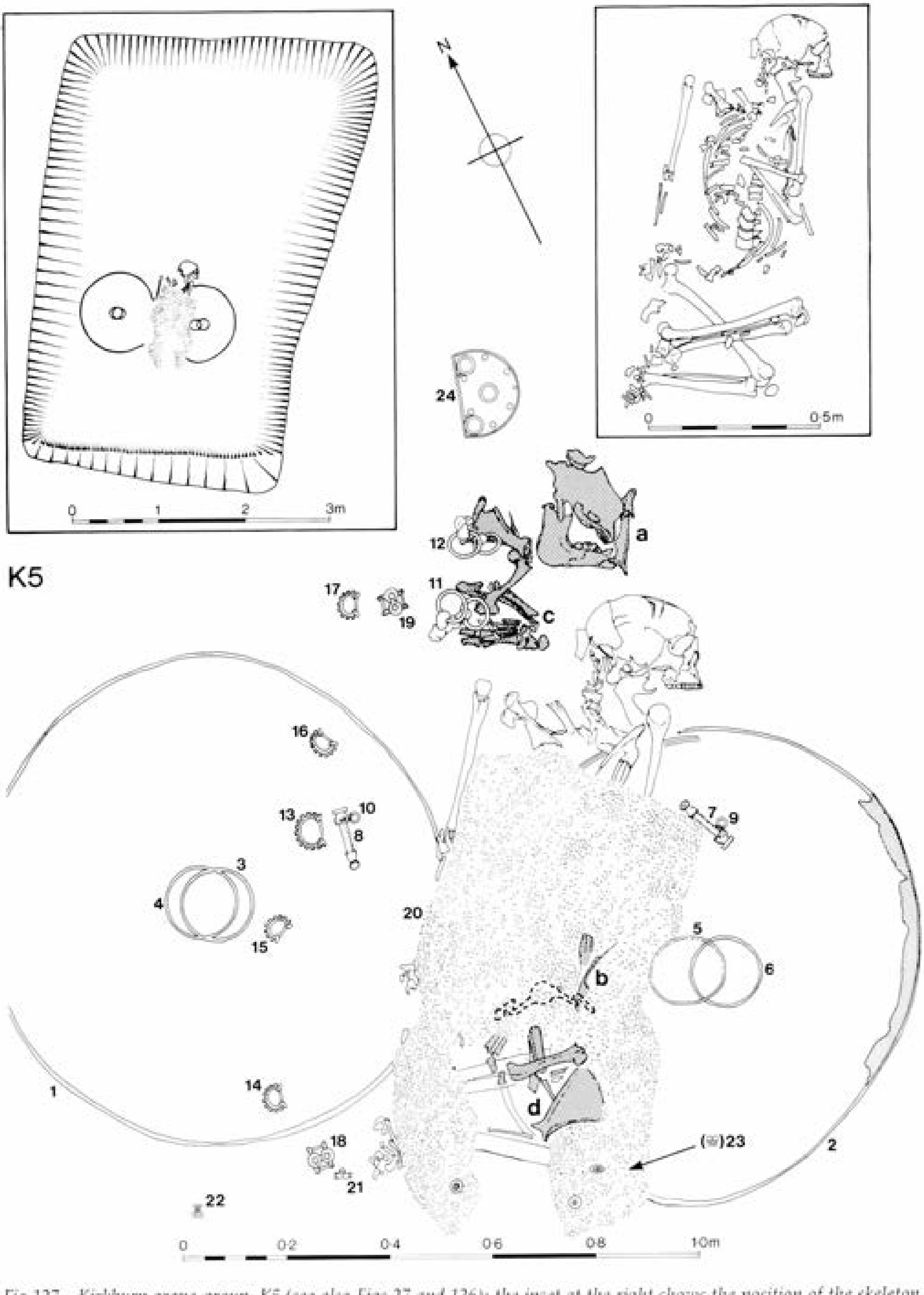

Fig 127 Kirkburn grave-group, K5 (see also Figs 27 and 126); the inset at the right shows the position of the skeleton after the removal of the mail; precise position of item 23 unknown – it was under the mail and disturbed when the mail was lifted; animal bones (a–d) shaded, see catalogue for details

Summary

Arras Culture burials were covered by small barrows whose distinctive square-plan ditches feature prominently on air photographs taken of East Yorkshire. Between 1967 and 1978 250 of these burials were excavated in the parishes of Burton Fleming and Rudston, where several cemeteries are grouped in the gravel valley of the Gypsey Race. In a typical burial the corpse was crouched or contracted, sometimes in a coffin, and buried with its head usually at the north end of the grave facing east. The most common artefact in these graves was a single brooch; rarely, a bracelet was found, and occasionally a pot. Sometimes an animal bone had been included in the grave, typically the upper left foreleg of a sheep.

But in the Makeshift cemetery at Rudston another rite was practised alongside these normal burials. Here the corpse had not been so tightly confined: it was flexed or fully extended. The orientation was different, too, with the head at the east or west end, and a quite different range of artefacts was found – swords, spearheads, tools, knives, and spindle-whorls. The difference between the two types of burial is further emphasised by the animal bones: sheep were never found with this second rite, but sometimes there were pig bones, usually half a skull and a fore-limb. There is a suggestion that the difference between the two types of burial is in part chronological, with the extended east–west skeletons later than the more common crouched and north–south orientated burials. There is also a strong hint that the difference was not related to a movement of people. The new rite seems to have been adopted by the native population.

One disappointment in the work at Burton Fleming and Rudston was the failure to locate a cart-burial, one of the most interesting burial practices in the Arras Culture. Geophysical detecting there, and elsewhere, was hampered by the lack of a control but that was rectified by the chance discovery of cart-burials in Wetwang Slack in 1984. Once the response of a cart-burial had been recorded it was relatively easy to detect others; one was excavated at Garton Station in 1985, and another at Kirkburn in 1987. The cart-burials included a more varied range of artefacts, including decorated metalwork, and they also provided information about the Iron Age cart. Observation of the new graves, and comparison with other excavations, shows that the entire cart was buried but only after it had been dismantled. In a typical Yorkshire cart-burial the wheels were removed and placed flat on the floor of the grave; the corpse was then placed on top of them; next the T-shaped framework of the axle and pole was arranged over the corpse; and finally the body of the cart was inverted and supported by the axle and pole to form a canopy. At Garton Station, exceptionally, the wheels were leant against the wall of the grave, but otherwise the same sequence was observed. In all the cart-burials the yoke had been buried alongside the corpse, always at the west side of the grave; its line was indicated by terrets and strap-unions whose spacings were consistent in all graves. Remarkably the corpse in the Kirkburn cart-burial had been covered with a mail tunic – the most complete example, and one of the earliest, from the entire Celtic world.

Another fascinating rite, well-represented at Garton Station but also found at Kirkburn and Rudston, involved the spearing of the corpse at the time of burial. Graves included up to 14 missiles (iron spearheads and bone points) that had been hurled into and around the corpse.

The Arras Culture burial rite is confined to a tight concentration in eastern Yorkshire, which might well represent the distribution of a tribe. In the past it has been argued that it relates to an immigrant tribe from the continent. But only two elements of the burial rite, square barrows and cart-burials, have clear continental parallels. Other features, such as the crouched burials, are virtually unknown abroad. Of the artefacts found in the graves only one, a hollow ring from Kirkburn, is an undoubted continental type; the rest are distinctively British. Recently Arras Culture settlements have been identified and compared with earlier sites in the first half of the first millennium BC and later settlements extending into the Roman period. There is no hint of an intrusive culture here: the settlements and especially the pottery strongly suggest continuity without outside contacts. There was certainly some influence from La Tène cultures on the continent, but it was limited to two aspects of the burial rite, and could have been caused by a change in beliefs rather than a change in population. At Rudston there is a suggestion that the further change in burial rite, and perhaps in beliefs, at an advanced stage in the Arras Culture can be seen within the burials of a single family. Arras Culture burials seem to start in the fourth century BC, are most numerous in the second century BC, and end in the first century BC as mysteriously as they started.

Résumé

Les inhumations associées à la culture d'Arras étaient recouvertes par de petits tumulus, les fossés en carré qui les entourent sont tout à fait caractéristiques et ils figurent à une place proéminente sur les photographies aériennes prises dans l'est du Yorkshire. Entre 1967 et 1978 on a fouillé 250 de ces inhumations sur le territoire des paroisses de Burton Fleming et Rudston, plusieurs cimetières se trouvaient en effet groupés là, dans la vallée de graviers de la Gypsey Race. Dans l'inhumation type, le corps avait été accroupi ou ramasseé sur lui-même, quelquefois dans un cercueil, et il avait été enterré avec la tête généralement placée à l'extrémité nord de la tombe, le visage tourné vers l'est. Le plus souvent on ne retrouvait dans ces tombes qu'un unique objet façonné: une broche; dans de rares cas seulement on a aussi découvert un bracelet et parfois un pot. Quelquefois un os provenant d'un animal avait

également été déposé dans la tombe; l'os type était la partie supérieure de la patte antérieure gauche d'un mouton.

Mais dans le cimetière de fortune de Rudston, on avait pratiqué un autre rite, en parallèle avec le rituel funéraire normal. Dans ce cas, le corps n'avait pas été aussi étroitement confiné: il etait en position fléchie ou même complètement allongé. Son orientation était également différente, la tête se trouvait à l'extremité est ou ouest, et on a retrouvé une gamme d'objets façonnés tout à fait différente – des épées, des pointes de lances, des couteaux et des volants de fuseaux. La dissimilitude entre ces deux types d'inhumation se manifeste encore dans les os d'animaux: on n'a jamais trouvé d'os de moutons associés au second rituel, mais il y avait parfois des os de porc, en général la moitié d'un crâne et un membre antérieur. On a émis l'hypothèse que la différence entre les deux sortes d'inhumations pouvait être en partie d'ordre chronologique, les squelettes allongés est-ouest étaient plus tardifs que les inhumations ramassées et orientées nord-sud, qui étaient aussi plus fréquentes. Il est aussi fort probable que les différences n'etaient pas dûes à un déplacement de la population. Le nouveau rituel semble avoir été adopté par la population d'origine.

Le fait qu'on n'ait pas réussi à localiser de tombe à char, une des plus intéressantes pratiques funéraires de la culture d'Arras, au cours des fouilles à Burton Fleming et à Rudston a constitué une déception. La détection géophisique à cet endroit, et ailleurs, a été entravée par le manque de points de référence, mais ce problème disparut quand on découvrit, tout à fait par hasard, des tombes à char à Wetwang Slack en 1984. Une fois que l'on eut enregistré la réaction à une tombe à char, il fut relativement facile d'en détecter d'autres; on en mit une à jour à Garton Station en 1985, et une à Kirkburn en 1987. Les tombes à char contenaient une plus grande variété d'objets, y compris des objets en métal décoré, et elles ne fournissaient aussi des renseignements sur les chars de l'Age du Fer. Après avoir étudié les nouvelles tombes, et les avoir comparées avec d'autres sites, il est apparu que le char entier était enterré, mais seulement après avoir été démonté. Dans une tombe à char typique du Yorkshire les roues étaient enlevées et placeées à plat sur le sol de la tombe, le corps était alors déposé dessus, ensuite le chassis en T formé par l'essieu et le timon était posé sur le corps, et finalement la caisse du char était renversée et s'appuyait sur l'essieu et le timon pour former une sorte de dais. Garton Station constitue une exception, les roues y étaient appuyées contre le mur de la tombe, ce fait mis à part le même ordre avait été respecté pour le reste. Dans toutes les tombes à char le joug avait été enterré le long du corps, toujours du côté ouest de la tombe: sa position était indiquée par des anneaux d'attelle et des raccords de courroie retrouvés aux mêmes emplacements dans toutes les tombes. On doit noter que le corps de la tombe à char de Kirkburn avait été couvert d'une tunique de mailles – l'exemple le plus complet et le plus ancien de tout le monde celte.

Un autre aspect fascinant du rituel, bien représenté à Garton Station mais également présent à Kirkburn, consistait à transpercer le corps au moment de l'inhumation. Les tombes comprenaient jusqu'à 14 traits (pointes de lance en fer et pointes en os) qui avaient été lancés dans et autour du corps.

Le rituel funéraire de la culture d'Arras se concentre dans une petite région de l'est du Yorkshire qui pourrait bien représenter le territoire d'une tribu. Dans le passé, on a suggéré qu'il s'agissait peut-être d'une tribu d'immigrants venus du continent. Mais deux éléments seulement du rituel funéraire, les tumulus carrés et les tombes à char, ont des équivalents indéniables sur le continent. D'autres caractéristiques, comme par exemple les inhumations ramassées, sont pratiquement inconnues à l'étranger. Parmi le mobilier découvert dans les tombes, un seul objet, un anneau creux provenant de Kirkburn, vient sans aucun doute du continent; le reste est de toute évidence d'origine britannique. On a récemment identifié des sites de la culture d'Arras et on les a comparés avec des sites plus anciens datant de la première moitié du premier millénaire avant J-C et des sites plus récents allant jusqu'à la période romaine. On n'a pas trouvé d'indices témoignant de l'intrusion d'une autre culture: les sites et en particulier la poterie donnent fort à penser que nous sommes en présence d'une occupation continue, sans contacts avec le monde extérieur. Il y a certainement eu une influence des cultures de la Tène sur le continent, mais elle s'est limitée à ces deux aspects du rituel funéraire et il se peut qu'elle ait été la conséquence d'un changement dans les croyances plutôt que d'un changement dans la population. On a émis l'idée qu'à Rudston une autre modification du rituel funéraire, et peut-être des croyances, à un stade avancé de la culture d'Arras, se reconnaissait aux inhumations consacrées à une seule famille. Les inhumations de la culture d'Arras semblent commencer vers le quatrième siècle avant J-C, elles atteignirent leur apogée vers le deuxième siècle avant J-C et prirent fin au premier siècle avant J-C aussi mystérieusement qu'elles avaient commencé.

Zusammenfassung

Die Gräber der Arraskultur waren von kleine Hügeln überdeckt, deren charakteristiche, quadratische Gräben sich auf den Luftaufnahmen Ostyorkshires mit großer Deutlichkeit abzeichnen. Zwischen 1967 und 1978 wurden in den Gemeinden Burton Fleming und Rudston, wo mehrere dieser Gräberfelder im Kiestal der Gypsey Race lagen, 250 dieser Gräber ausgegraben. In einem typischen Grab lag die Leiche entweder in Hockerstellung oder zusammengekrümmt, manchmal in einem Sarg, mit dem Kopf gewöhnlich am Nordende des Grabes und nach Osten gewendet. Die häufigste Beigabe in diesen Gräben bestand aus einer einzelnen Fibel; in seltenen Fällen wurden auch ein Armreif oder gelegentlich ein Topf gefunden. Manchmal war auch ein Tierknochen mit ins Grab gelegt worden. Kennzeichnenderweise war dies der obere Teil des linken Vorderbeines eines Schafes.

Auf dem Gräberfeld Makeshift bei Rudston wurder jedoch neben diesen normalen Grablegungen ein weiterer Ritus praktiziert. Hierbei wurden de Leichen nicht so fest eingeengt: sie lagen vielmehr gelöst oder vollausgestreckt. Auch die Ausrichtung war abweichend; der Kopf lag am Ost- oder Westende des Grabes. Außerdem wurde eine völlig andere Zusammenstellung von Artifakten in den Gräbern gefunden: Schwerter, Speerspitzen, Werkzeuge, Messer und Spindelwirtel. Der Unterschied zwischen diesen beiden Begräbnistypen wird weiterhin durch die Tierknochen unterstrichen: niemals wurde bei dem zweiten Ritus Schaf gefunden, doch waren manchmal Schweineknochen vorhanden. Gewöhnlich handelte es sich dabei um einen halben Schädel und eine Vordergliedmaße. Man hat vorgeschlagen, daß der Unterschied zwischen den beiden Begräbnistypen zum Teil chronologisch bedingt ist, wobei die ausgestreckten, ostwestlichen Skelette später datieren als die üblicheren nord-südlich ausgerichteten Hockergräber. Es gibt weiterhin überzeugende Hinweise dafür, daß dieser Unterschied nicht auf Einwanderer zurückgeht. Der neue Ritus scheint von der einheimischen Bevölkerung angenommen worden zu sein.

Enttäuschend bei der Arbeit in Burton Fleming und Rudston war jedoch, daß keine Wagengräber, eine der interessantesten Begräbnisweisen der Arraskultur, festgestellt werden konnten. Geophysikalische Untersuchungen an dieser und an anderen Stellen wurden durch das Fehlen von Kontroldaten beeinträchtigt. Diesen Magel behob dann 1984 der Zufallsfund eines Wagengrabes bei Wetwang Slack. Als die Daten für ein Wagengrab erst einmal bekannt waren, war es relativ leicht weitere Beispiele zu entdecken. Eines wurde dann 1985 in Garton Station und ein weiteres 1987 in Kirkburn ausgegraben. Die Wagengräber enthalten eine große Variationsbreite an Artifakten, einschließlich verzierte Metallarbeiten. Außerdem geben sie Auskunft über die Wagen der Eisenzeit. Beobachtungen aus den neuen Gräbern und Vergleiche mit anderen Ausgrabungen haben gezeigt, daß der ganze Wagen mit ins Grab gegeben wurde, aber erst nachdem man ihn in seine Einzelteile zerlegt hatte. Bei einem typischen Wagengrab in Yorkshire wurden zuerst die Räder abgenommen und flach auf den Boden des Grabes gelegt. Der Leichnam wurde dann auf ihnen aufgebahrt und der T-förmige Rahmen von Achse und Deichsel über die Leiche gelegt. Zuletzt stülpte man den umgekehrten Wagenkasten, von Achse unde Deichsel gestützt, als eine Art Baldachin darüber. In Garton Station jedoch waren, abweichend, die Räder gegen die Seite des Grabes gelehnt; ansonsten wurde derselbe Ablauf beachtet. In allen Wagengräbern war das Joch neben der Leiche, immer zur Westseite des Grabes hin ausgelegt. Sein Umriß wurde durch Zügelringe und Riemenschlüsse, deren Abstände zu einander in allen Gräbern gleich waren, gekennzeichnet. Besonders bemerkenswert ist, daß der Leichnam in dem Wagengrab von Kirkburn mit einem Kettenpanzer bedeckt war. Dies ist das früheste und vollständigste Beispiel seiner Art innerhalb des keltischen Kulturkreises.

Bei einem weiteren fazinierenden Rituel, das in Garton Station gut vertreten war und auch in Kirkburn und Rudston auftrat, wurde die Leiche während des Begräbnises gespeert. Die Gräber enthielten bis zu vierzehn Geschosse (eiserne Speerspitzen und Knochenspitzen), die man in und um den Leichnam geschleudert hatte.

Die Begräbnisriten der Arraskultur sind auf einen festumschreibenen Schwerpunkt im Osten von Yorkshire beschränkt, welcher sich sehr gut mit der Verbreitung eines Stammes decken kann. Früher argumentierte man, daß es sich dabei um Einwanderer vom Festland gehandelt habe. Aber nur zwei der Elemente dieses Begräbnisritus, die quadratischen Hügel und die Wagengräber, haben klare Parallelen auf dem Kontinent. Alle anderen Erscheinungsformen, wie etwa die Hockergräber, sind dort so gut wie unbekannt. Von allen in den Gräbern gefundenen Artifakten ist nur eines, ein Hohlring aus Kirkburn, zweifellos festländischen Ursprungs; der Rest ist eindeutig britisch. Kürzlich sind Siedlungen der Arraskultur festgestellt worden, und wenn man diese mit älteren Fundstellen, die in die erste Hälfte des ersten vorchristichen Jahrtausends datieren, und spätere Siedlungen, die bis in die römische Zeit reichen, vergleicht, zeigen sich hier keine Spuren für eine von außen eindringende Kultur. Die Siedlungen und besonders die Keramik deuten stark auf eine Kontinuität ohne äußere Kontakte hin. Es gibt gewiß einige Einflüsse aus den La Tène-Kulturen des Festlandes, aber diese beschränkten sich auf zwei Aspekte der Begräbnisriten und diese könnten sehr wohl mehr durch einen Glaubenswandel also durch einen Wandel in der Bevölkerungszusammensetzung entstanden sein. In Rudston gibt es Andeutungen für einen weiteren Wandel im Begräbnisritus und vielleicht auch in den Glaubensvorstellungen während des fortgeschrittenen Stadiums der Arraskultur. Dies zeigt sich in den Begräbnissen einer einzelnen Familie. Es scheint, daß die Gräber der Arraskultur im vierten Jahrhundert v Chr beginnen, ihre größte Zahl während des zweiten vorchristlichen Jahrhunderts erreichen und im ersten Jahrhundert v Chr so geheimnisvoll wie sie begonnen haben, wieder enden.

Bibliography

Ambers, J, Matthews, K, and Bowman, S, 1987 British Museum natural radiocarbon measurements XX, *Radiocarbon*, **29(2)**, 177–96

——, ——, and ——, 1990 British Museum natural radiocarbon measurements XXII, *Radiocarbon*, **33**

Anthony, D W, and Brown, D R, 1989 Looking a gift horse in the mouth: identification of the earliest bitted equids and the microscopic analysis of bit wear, in *Animal domestication and its cultural context: essays in honour of Dexter Perkins and Pat Daly* (ed P Crabtree), University of Pennsylvania, Museum of Applied Science Centre (MASCA) Publications

Ashbee, P, Bell, M, and Proudfoot, E, 1989 *Wilsford Shaft excavations 1960–2*, HBMC Archaeol Rep, **11**, London

Atkinson, R J C, and Piggott, S, 1955 The Torrs chamfrein, *Archaeologia*, **96**, 197–235

Bailiff, I K, 1987 The thermoluminescent dating of the Iron Age pottery, in Heslop 1987, 71–2

Bantelmann, N, 1972 Fibeln vom Mittellatèneschema im Rhein-Main-Moselgebeit, *Germania*, **50**, 98–110

Bateson, J D, and Hedges, R E M, 1975 The scientific analysis of a group of Roman-age enamelled brooches, *Archaeometry*, **17**, 177–190

Beckett, S C, 1981 Pollen diagrams from Holderness, North Humberside, *J Biogeogr*, **8**, 177–98

Bedwin, O, 1981 Excavations at the Neolithic enclosure on Bury Hill, Houghton, West Sussex, 1979, *Proc Prehist Soc*, **47**, 69–85

Benadik, B, Vlček, E, and Ambros, C, 1957 *Keltské pohrebiská na juhozápadnom Slovensku*, Bratislava

Bender-Jørgensen, L, 1986 *Forhistoriska Textiler i Skandinavien*, Copenhagen

Benoit, F, 1955 *L'art primitif méditerranéen de la Vallée du Rhône*, Aix-en-Provence

Beresford, M W, and St Joseph, J K S, 1958 *Medieval England, an aerial survey*, Cambridge

Biek, L, Butcher, S A, Carruthers, T G, Rooksby, H P, Warren, S E, Crummet, J G, Hedges, R E M, and Kaczmarczyk, A, 1980 Enamels and 'glass-pastes' on Roman period 'bronzes' found at Nornour, Isles of Scilly, *Proc 16th Int Symp Archaeometry Archaeol Prospect, Edinburgh 1976* (eds E A Slater and J O Tate), 50–79, Edinburgh

Binford, L R, 1981 *Bones; ancient men and modern myths*, New York

Bishop, Y M M, Fienberg, S E, and Holland, P, 1975 *Discrete multivariate analysis: theory and practice*, London

Black, T K, 1978 A new method for assessing the sex of fragmentary skeletal remains: femoral shaft circumference, *American J Phys Anthrop*, **48**, 227–32

Blackburn, E A, 1908 Notes on the molluscs taken from British barrows in East Yorkshire, *The Naturalist*, 417–19

Boddington, A, Garland, A N, and Janaway, R C (eds), 1987 *Death, decay and reconstruction: approaches to archaeology and forensic science*, Manchester

Boessneck, J, 1970 Ein Altägyptisches Pferdskelett, *Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*, **26**, 43–7

Bradley, R, and Chambers, R, 1988 A new study of the cursus complex at Dorchester-on-Thames, *Oxford J Archaeol*, **7**, 271–89

Brewster, T C M, 1963 *The excavation of Staple Howe*, Malton

——, 1971 The Garton Slack chariot burial, East Yorkshire, *Antiquity*, **45**, 289–92

——, 1975 Garton Slack, *Curr Archaeol*, **51**, 104–16

——, 1980 *The excavation of Garton and Wetwang Slacks*, East Riding Archaeol Res Comm, Prehist Excav Rep, **2**, National Monuments Record, London (microfiche only)

Broholm, H C, and Hald, M, 1940 *Costumes of the Bronze Age in Denmark*, Copenhagen

Brothwell, D R, 1981 *Digging up bones*, 3 edn, London and Oxford

Brunaux, J L, and Rapin, A, 1988 *Gournay II: boucliers et lances, dépôts et trophées*, Paris

Bull, G, and Payne, S, 1982 Tooth eruption and epiphyseal fusion in pigs and wild boar, in Wilson *et al* 1982, 55–71

Bulleid, A, and Gray, H St G, 1911 *The Glastonbury Lake Village*, **1**, Taunton

——, and ——, 1917 *The Glastonbury Lake Village*, **2**, Taunton

Burgess, E M, 1953a The mail-maker's technique, *Antiq J*, **33**, 48–55

——, 1953b Further research into the constructio of mail garments, *Antiq J*, **33**, 193–202

Bush, M B, 1988 Early Mesolithic disturbance: a force on the landscape, *J Archaeol Sci*, **15**, 453–62

Bush, M B, and Flenley, J R, 1987 The age of the British Chalk grassland, *Nature (Lon)*, **329**, 434–6

Cardwell, P, 1989 Excavations at Cat Babbleton Farm, Ganton, North Yorkshire, 1986, *Yorkshire Archaeol J*, **61**, 15–27

Catt, J A, and Penny, L F, 1966 The Pleistocene deposits of Holderness, East Yorkshire, *Proc Yorkshire Geol Soc*, **35**, 375–420

Challis, A J, and Harding, D W, 1975 *Later prehistory from the Trent to the Tyne*, BAR, **20**, Oxford

Clark, A J, 1990 *Seeing beneath the soil*, London

Clark, J G D, 1966 The invasion hypothesis in British archaeology, *Antiquity*, **40**, 172–89

Clark, J G D, Higgs, E S, and Longworth, I H, 1960 Excavations at the Neolithic site of Hurst Fen, Mildenhall, Suffolk, 1954, 1957 and 1958, *Proc Prehist Soc*, **26**, 202–45

Clarke, R R, 1951 A hoard of metalwork of the early Iron Age from Ringstead, Norfolk, *Proc Prehist Soc*, **17**, 214–25

Coles, J M, 1973 *Archaeology by experiment*, London

——, 1987 *Meare Village East*, Somerset Levels Pap, **13**

Collis, J R, 1968 Excavations at Owslebury, Hants: an interim report, *Antiq J*, **48**, 18–31

Crowther, D, and Didsbury, P, 1988 Redcliff and the Humber, in Price *et al* 1988, 3–20

Cunliffe, B W, 1988 *Mount Batten, Plymouth*, Oxford Univ Comm for Archaeol Monog, **26**, Oxford

Curle, J, 1911 *A Roman frontier post and its people*, Glasgow

Decker, K V, and Scollar, I, 1962 Iron Age square enclosures in the Rhineland, *Antiquity*, **36**, 175–8

de Navarro, J M, 1972 *The finds from the site of La Tène*, **1**, *Scabbards and the swords found in them*, London

Dent, J S, 1982 Cemeteries and settlement patterns of the Iron Age on the Yorkshire Wolds, *Proc Prehist Soc*, **48**, 437–57

——, 1983a A summary of the excavations carried out in Garton Slack and Wetwang Slack, 1964–1980, *East Riding Archaeol*, **7**, 1–14

——, 1983b Weapons, wounds and war in the Iron Age, *Archaeol J*, **140**, 120–8

——, 1985a Three cart burials from Wetwang, Yorkshire, *Antiquity*, **59**, 85–92

——, 1985b La nécropole de Wetwang Slack, *Histoire et archéologie: les dossiers*, **98**, 42–51

——, 1989 Settlements at North Cave and Brantingham, in *New light on the Parisi* (ed P Halkon), 26–32, Hull

Dimbleby, G W, 1985 *The palynology of archaeological sites*, London

Drury, P J, 1978 *Excavations at Little Waltham, 1970–71*, CBA Res Rep, **26**, London

Dunning, G C, 1934 The swan's-neck and ring-headed pins of the early Iron Age in Britain, *Archaeol J*, **91**, 269–95

Duval, A, 1989 *L'art celtique de la Gaule*, Paris

Dymond, D P, 1966 Ritual monuments at Rudston, E Yorkshire, England, *Proc Prehist Soc*, **32**, 86–95

Ellis, S, 1987 *East Yorkshire fieldguide*, Quat Res Ass, Cambridge

Elsdon, S, and May, J, 1987 *The Iron Age pottery from Dragonby*, Nottingham

Fell, V, 1988 Iron Age metalworking tools from Gussage All Saints, Dorset, *Proc Dorset Natur Hist Archaeol Soc*, **110**, 73–6

Feugère, M, 1985 *Les fibules en Gaule Méridionale de la conquête à la fin du Ve siècle après J-C*, *Revue Archéol de Narbonnaise*, Supp **12**, Paris

Flouest, J-L, and Stead, I M, 1981 Fouille de sauvetage à Tinqueux (Marne), 1974, *Mems Soc Archéol Champenoise*, **2**, 151–76

Foster, J, 1980 *The Iron Age moulds from Gussage All Saints*, Brit Mus Occas Pap, **12**, London

——, 1986 *The Lexden tumulus*, BAR, **156**, Oxford

Fowler, E, 1960 The origins and development of the penannular brooch in Europe, *Proc Prehist Soc*, **26**, 149–77

Fox, C, 1946 *A find of the early Iron Age from Llyn Cerrig Bach, Anglesey*, Cardiff

——, 1947 Aniversary address (to the Society of Antiquaries of London), *Antiq J*, **27**, 113–19

——, 1958 *Pattern and purpose*, Cardiff

Freestone, I C, 1987 Composition and microstructure of early opaque red glass, in *Early vitreous materials* (eds M Bimson and I C Freestone), Brit Mus Occas Pap, **56**, 173–91, London

Frey, O-H, 1968 Eine neue Grabstele aus Padua, *Germania*, **46**, 317–20

——, 1984 Zur Bronzeschnabelkanne in Besançon, in *Hommages à Lucien Lerat* (ed H Walter), *Annales Littéraires de l'Université de Besançon*

Frey O-H, Matthäus, H, and Braun, Ch, 1983 *Glasperlen der vorrömischer Eisenzeit*, Marburger Studien zur Vor- und Frühgeschichte, **5**, Mainz

Grant, A, 1982 The use of tooth wear as a guide to the age of domestic ungulates, in Wilson *et al* 1982, 91–108

Gray, H St G, and Bulleid, A, 1953 *The Meare Lake Village*, **2**, Taunton

Greene, E D, 1972 The chariot as described in Irish literature, in *The Iron Age in the Irish Sea Province* (ed C Thomas), 59–73, London

Greenwell, W, 1865 Notices of the examination of ancient grave-hills in the North Riding of Yorkshire, *Archaeol J*, **22**, 97–117, 241–64

Greig, J R A, 1982 The interpretation of pollen spectra from urban archaeological deposits, in *Environmental archaeology in the urban context* (eds A R Hall and H K Kenward), CBA Res Rep, **43**, 47–65

——, 1984 The palaeoecology of some hay meadow types, in *Plants and ancient man* (eds W van Zeist and H A Casparie), 213–36, Rotterdam

——, 1989 Pollen preserved by copper salts, in *Archäobotanik, Dissertationes Botanicae* (eds U Körber-Grohne and H-J Küster), **133**, 11–24

Guido, C M, 1978 *The glass beads of the prehistoric and Roman periods in Britain and Ireland*, Soc Antiq Res Rep, **35**, London

Guido, C M, Henderson, J, Cable, M, Bayley, J, and Biek, L, 1984 A Bronze Age glass bead from Wilsford, Wiltshire: Barrow G42 in the Lake Group, *Proc Prehist Soc*, **50**, 245–54

Guštin, M, and Pauli, L, 1984 *Keltski Voz*, Posavski Muzej Brežice, **6**

Haberey, W, 1949 Ein spätrömisches Frauengrab aus Dorweiler, Kr Euskirchen, *Bonner Jahrb*, **149**, 82–93

Haffner, A, 1977 Die frühkeltische Fürstengräber von Hochscheid – 'Fuckerichscheide', *Führer zu vor- und frühgeschichtlichen Denkmälern*, **34**, 163–71

Haffner, A, and Joachim, H-E, 1984 Die keltischen Wagengräber der Mittelrheingruppe, in Guštin and Pauli 1984, 71–87

Hald, M, 1980 *Ancient Danish textiles from bogs and burials*, Copenhagen (English edn of *Olddanske Tekstiler*, 1950)

Hayes, M H, 1968 *Veterinary notes for horse owners* (rev J F D Tutt), London

Hayfield, C, 1987 *An archaeological survey of the parish of Wharram Percy, East Yorkshire I: the evolution of the Roman landscape* (*Wharram: a study of settlement on the Yorkshire Wolds*, **5**), BAR, **172**, Oxford

Henderson J, 1981 A report on the glass excavated from Meare Village West 1979, *Somerset Levels Pap*, **7**, 55–60

——, 1985 The raw materials of early glass production, *Oxford J Archaeol*, **4(3)**, 262–92

——, 1987a The archaeology and technology of glass from Meare Village East, in Coles 1987, 170–82

——, 1987b The Iron Age of 'Loughey' and Meare: some inferences from glass analysis, *Antiq J*, **67**, 29–42

——, 1987c Glass, and glass-working, in *Hengistbury Head, Dorset, I: the prehistoric and Roman settlement 3500 BC– AD 500* (B Cunliffe), Oxford Univ Comm for Archaeol Monog, **13**

——, 1988 Electron probe microanalysis of mixed-alkali glasses, *Archaeometry*, **30**, 77–91

——, 1989a Analysis of enamels and glasses used in the decoration of brooches from Prestatyn and its archaeological interpretation, in *Prestatyn 1984–5: an Iron Age farmstead and Romano-British industrial settlement in North Wales* (K Blockley), BAR, **210**, 181–3, Oxford

——, 1989b The scientific analysis of ancient glass and its archaeological interpretation, in *Scientific analysis in archaeology and its interpretation* (ed J Henderson), Oxford Univ Comm for Archaeol Monog, **19**, 30–62

Henderson, J, and Warren, S E, 1983 Analysis of prehistoric lead glass, *Proc 22nd Int Symposium on Archaeometry*, Bradford 1982 (eds A Aspinall and S E Warren)

Henderson, J, Wood, N, and Tregear, M, 1990 The relationship between glass, enamel and glaze technologies: two case studies, in *Cross-craft and cross-cultural interactions in ceramics* (eds P McGovern and M Notis), *Ceramics and civilisation*, **4**, American Ceramic Society, Columbus, Ohio

Heslop, D H, 1987 *The excavation of an Iron Age settlement at Thorpe Thewles, Cleveland, 1980–82*, CBA Res Rep, **65**, London

Hodson, F R, 1964 Cultural grouping within the British pre-Roman Iron Age, *Proc Prehist Soc*, **30**, 99–110

——, 1968 *The La Tène cemetery at Münsingen-Rain, Acta Bernensia*, **5**, Bern

Hoffmann, M, 1964 *The warp-weighted loom, Studia Norvegica*, **14**, Oslo

Holland, S M, 1975 Pollen analytical investigations at Crosby Warren, Lincolnshire, in the vicinity of the Iron Age and Romano-British settlement at Dragonby, *J Archaeol Sci*, **2**, 353–63

Horváth, L, Kelemen, M, Uzsoki, A, and Vadász, E, 1987 *Corpus of Celtic finds in Hungary*, **1**, *Transdanubia*, *1*, Budapest

Houlder, C H, 1963 A Neolithic settlement on Hazard Hill, Totnes, *Proc Devon Archaeol Soc*, **21**, 2–30

Hughes M J, 1972 A technical study of opaque red glass of the Iron Age in Britain, *Proc Prehist Soc*, **38**, 98–107

Hull, M R, 1961 The brooches at Bagendon, in *Bagendon: a Belgic oppidum* (E M Clifford), 167–85, Cambridge

Hull, M R, and Hawkes, C F C, 1987 *Corpus of ancient brooches in Britain: pre-Roman bow brooches*, BAR, **168**, Oxford

Hundt, H-J, 1959 Vorgeschichtliche Gewebe aus dem Hallstatter Salzberg, *Jahrb Römisch-Germanischen Zentral Mus Mainz*, **6**

——, 1970 Gewebefunde aus Hallstatt; Webkunst und Tracht in der Hallstattzeit, *Krieger und Salzherren*, 53–71, Mainz

——, 1972 Die Textilreste aus dem Reihengräberfriedhof von Donzdorf, in *Der Reihengräberfriedhof von Donzdorf* (E Neuffer), Forschungen und Berichte zur vor- und frühgeschichte in Baden-Württemberg, Bd 2, Stuttgart

——, 1973 Die ersten Textilreste aus dem Grabern von Altenerding, *Ber Römisch-Germanischen Komm*, **54**, 290–303

——, 1974 Die Textilreste aus dem Grabern von Dürrnberg, in *Der Dürrnberg bei Hallein* (F Moorleitner, L Pauli, and E Penninger), **2**, Munich

Jacobi, G, 1974 *Werkzeug und Gerät aus dem Oppidum von Manching, Die Ausgrabungen in Manching*, **5**, Wiesbaden

Jacobstal, P, 1944 *Early Celtic art*, Oxford

Jenkins, J G, 1961 *The English farm wagon*, Reading

Jensen, J, 1989 The Hjortspring boat reconstructed, *Antiquity*, **63**, 531–5

Jones, J D, and Stead, I M, 1969 An early Iron Age warrior burial found at St Lawrence, Isle of Wight, *Proc Prehist Soc*, **35**, 351–4

Jope, E M, 1957 A fragment of chain-mail from the Romano-British temple site at Woodeaton, *Oxoniensia*, **22**, 106–7

——, 1961 Daggers of the early Iron Age in Britain, *Proc Prehist Soc*, **27**, 307–43

Kerney, M P, and Cameron, R A D, 1979 *A field guide to the land snails of Britain and north-west Europe*, London

Kinnes, I A, and Longworth, I H, 1985 *Catalogue of the excavated prehistoric and Romano-British material in the Greenwell collection*, London

Kinnes, I A, Schadla-Hall, T, Chadwick, P, and Dean, P, 1983 Duggleby Howe reconsidered, *Archaeol J*, **140**, 83–108

Körber-Grohne, U, 1985 Die biologische Reste aus dem hallstattzeitlichen Fürstengrab von Hochdorf, Gemeinde Eberdingen (Kreis Ludwigsburg), *Forschungen und Berichte zur vor- und frühgeschichte in Baden-Württemberg*, **19**, 85–265

Kossack, G, 1971 The construction of the felloe in Iron Age spoked wheels, in *The European community in later prehistory* (J Boardman, M A Brown, and T G E Powell), 143–63, London

Kruta, V, 1978 Le casque d'Amfreville-sous-les-Monts (Eure) et quelques problèmes de l'art celtique du IV siècle avant notre ère, *Etudes Celtiques*, **15(2)**, 405–24

Lamplugh, G V, 1889 Glacial sections near Bridlington, part IV, *Proc Yorkshire Geol Soc*, **11**, 275–307

——, 1890 On the larger boulders of Flamborough Head and other parts of the Yorkshire Coast, *Proc Yorkshire Geol Soc*, **11**, 397–423

Legge, A J, 1984 The horses from the King's Barrow, Arras, in Guštin and Pauli 1984, 41

Levine, M, 1982 The use of crown height measurements and eruption-wear sequences to age horse teeth, in Wilson *et al* 1982, 91–108

Loughlin, N, and Miller, K, 1979 *A survey of archaeological sites in*

Humberside, Hull
Loveday, R, and Petchey, M, 1982 Oblong ditches: a discussion and some new evidence, *Aerial Archaeol*, **8**, 17–24
Lynch, F, 1970 *Prehistoric Anglesey*, Llangefni
Macdonald, G, and Park, A, 1906 *The Roman forts on the Bar Hill, Dumbartonshire*, Glasgow
Macgregor, M, 1962 The early Iron Age metalwork hoard from Stanwick, N R Yorks, *Proc Prehist Soc*, **28**, 17–57
——, 1976 *Early Celtic art in North Britain*, Leicester
McInnes, I J, 1968 The excavation of a Bronze Age cemetery at Catfoss, East Yorkshire, *East Riding Archaeol*, **1(1)**, 2–11
Mahany, C M, 1969 Fengate, *Curr Archaeol*, **1**, 156–7
Mallory, J P, and Hartwell, B, 1984 Donegore, *Curr Archaeol*, **8**, 271–5
Manby, T G, 1958 A Neolithic site at Craike Hill, Garton Slack, East Riding of Yorkshire, *Antiq J*, **38**, 223–36
——, 1980 Excavation of barrows at Grindale and Boynton, East Yorkshire, 1972, *Yorkshire Archaeol J*, **52**, 19–47
Manning, W H, 1985 *Catalogue of the Romano-British iron tools, fittings and weapons in the British Museum*, London
Megaw, J V S, and Megaw, M R, 1989 *Celtic art*, London
——, and ——, 1990 *The Basse-Yutz find: masterpieces of Celtic art*, Rep Res Comm Soc Antiq London, **46**, London
Metzler, J, 1986 Ein frühlatènezeitliches Gräberfeld mit Wagenbestattung bei Grosbous-Vichten, *Archäol Korresp*, **16**, 161–77
Mook, W G, 1986 Business meeting: recommendations/resolutions adopted by the Twelfth International Radiocarbon Conference, *Radiocarbon*, **28**, 799
Mortimer, J R, 1897 The Danes Graves, *Yorkshire Phil Soc Rep*, 1-10
——, 1905 *Forty years researches in British and Saxon burial mounds of East Yorkshire*, London
Müller, F, 1985 Keltisch Scheibenhalsringe – ein oberrheinisches Erzeugnis mit weiter Verbreitung, *Archäol Korresp*, **15**, 85–9
——, 1986 Das Fragment eines keltischen Kettenpanzers von der Tiefenau bei Bern, *Archäologie der Schweiz*, **9**, 116–23
Musty, J, and MacCormick, A G, 1973 An early Iron Age wheel from Holme Pierrepont, Notts, *Antiq J*, **53**, 275–7
Newman, T G, 1976 A crop-mark site at Hasting Hill, Tyne and Wear, *Archaeol Aeliana*, **53(4)**, 183–4
Osterhaus, U, 1969 Zu verzierten Frühlatènewaffen, in *Marburger Beiträge zur Archäologie der Kelten* (ed O-H Frey), Fundberichte aus Hessen, **1**, Bonn
Oswald, A, 1967 Excavations for the Avon-Severn Research Committee at Barford, Warwickshire, *Trans Birmingham Archaeol Soc*, **83**, 1–64
Pagès Allary, J, Déchelette, J, and Lauby, A, 1903 Le tumulus arverne de Celles près Neussargues (Cantal), *L'Anthropologie*, **14**, 385–416
Palk, N A, 1984 *Iron Age bridle-bits from Britain*, Univ Edinburgh Dept Archaeol Occas Pap, **10**
Palmer, R, 1976 Interrupted ditch enclosures in Britain: the use of aerial photography for comparative studies, *Proc Prehist Soc*, **42**, 161–86
Pearson, G W, and Stuiver, M, 1986 High-precision calibration of the radiocarbon time scale, 500–2500 BC, in Stuiver and Kra 1986, 839–62
Petch, D F, 1957 Archaeological notes for 1956, *Lincolnshire Archit Archaeol Soc Rep Pap*, **7**, 1–26
Phemister, J, 1926 The distribution of Scandinavian boulders in Britain, *Geol Mag*, **63**, 433–54
Piggott, S, 1949 A wheel of Iron Age type from Co Durham, *Proc Prehist Soc*, **15**, 191
——, 1950 Swords and scabbards of the British early Iron Age, *Proc Prehist Soc*, **16**, 1–28
——, 1952 Celtic chariots on Roman coins, *Antiquity*, **26**, 87–8
——, 1965 *Ancient Europe*, Edinburgh
——, 1969 Early Iron Age horn-caps and yokes, *Antiq J*, **49**, 378–81
——, 1983 *The earliest wheeled transport*, London
Platt, H M, 1980 Preserved worms on an Anglo-Saxon brooch, *J Archaeol Sci*, **7**, 287–8
Powlesland, D, Houghton, C, and Hanson, J, 1986 Excavations at Heslerton, North Yorkshire, 1978–82, *Archaeol J*, **143**, 53–173
Price, J, Wilson, P R, Briggs, C S, and Hardman, S J (eds), 1988 *Recent research in Roman Yorkshire*, BAR, **193**, Oxford
Pryor, F, 1978 *Excavation at Fengate, Peterborough, England: the first report*, Toronto
Pryor, F, French, C, and Taylor, M, 1985 An interim report on excavations at Etton, Maxey, Cambridgeshire, 1982–1984, *Antiq J*, **65**, 275–311
Raftery, B, 1983 *A catalogue of Irish Iron Age antiquities*, Veröffentlichung des vorgeschichtlichen Seminars Marburg, Sonderband **1**
——, 1984 *La Tène in Ireland: problems of origin and chronology*, Veröffentlichung des vorgeschichtlichen Seminars Marburg, Sonderband **2**
——, 1988 *Hollow two-piece metal rings in La Tène Europe*, Marburger Studien zur Vor- und Frühgeschichte, **11**
Ramm, H G, 1978 *The Parisi*, London
Reinach, S, 1908 *Album des moulages et modèles...I, Ages de la pierre – époques celtiques*, Paris
Ridgway, J, 1973 *Some aspects of the technology of Iron Age brooches in East Yorkshire*, unpubl dissertation, Conservation Laboratory, Inst Archaeol, London
Rigby, V, 1980 The coarse pottery, in Stead 1980, 45–94
——, 1986 The later prehistoric and Roman pottery, in Powlesland *et al* 1986, 141–56
Riley, D N, 1982 *Aerial archaeology in Britain*, Aylesbury
—— (ed), 1988 *Yorkshire's past from the air*, Sheffield
Ritchie, W F, and Ritchie, J N G, 1985 *Celtic warriors*, Aylesbury
Robinson, H R, 1975 *The armour of imperial Rome*, London
Rosenberg, G, 1937 *Hjortspringfundet*, Nordiske Fortidsminder, **3(1)**
Rusu, M, 1969 Das keltische Fürstengrab vin Ciumeşti in Rumänien, *Ber Römisch-Germanischen Komm*, **50**, 267–300
St Joseph, J K S, 1962 Air reconnaissance in northern France, *Antiquity*, **36**, 279–86
——, 1964 Air reconnaissance: recent results, *Antiquity*, **38**, 217–18
Selkirk, A, 1983 Baldock, *Curr Archaeol*, **86**, 70–4
Simonds, J B, 1854 *The age of the ox, sheep and pig*, London
Simpson, G, 1979 Some British and Iberian penannular brooches and other early types in the Rhineland and the '*Decumates agri*', *Antiq J*, **59**, 319–42
Slade, F, 1964 A Late Neolithic site at Sonning, Berkshire, *Berkshire Archaeol J*, **61**, 4–19
Smith, I F, 1965 *Windmill Hill and Avebury: excavations by Alexander Keiller 1925–1939*, Oxford
Spratling, M G, 1972 *Southern British decorated bronzes of the late pre-Roman Iron Age*, unpubl PhD thesis, Univ London
——, 1979 The debris of metalworking, in Wainwright 1979, 125–49
——, 1981 Metalworking at the Stanwick *oppidum*: some new evidence, *Yorkshire Archaeol J*, **53**, 13–16
Spruytte, J, 1983 *Early harness systems*, London
Stead, I M, 1961 A distinctive form of La Tène barrow in Eastern Yorkshire and on the Continent, *Antiq J*, **41**, 44–62
——, 1965a *The La Tène cultures of Eastern Yorkshire*, York
——, 1965b The Celtic chariot, *Antiquity*, **39**, 259–65
——, 1968 An Iron Age hillfort at Grimthorpe, Yorkshire, England, *Proc Prehist Soc*, **34**, 148–90
——, 1971 Yorkshire before the Romans, some recent discoveries, in *Soldier and civilian in Roman Yorkshire* (ed R M Butler), 21–43, Leicester
——, 1975 The La Tène cemetery at Scorborough, East Riding, *East Riding Archaeologist*, **11**, 1–11
——, 1976 La Tène burials between Burton Fleming and Rudston, North Humberside, *Antiq J*, **66**, 217–26
——, 1979 *The Arras Culture*, York
——, 1980 *Rudston Roman Villa*, Leeds
——, 1982 The Cerrig-y-Drudion 'hanging bowl', *Antiq J*, **62**, 221–34
——, 1984a Cart burials in Britain, in Guštin and Pauli 1984, 31–41
——, 1984b Some notes on imported metalwork in Iron Age Britain, in *Cross channel trade between Gaul and Britain in the pre-Roman Iron Age* (eds S Macready and F H Thompson), Soc Antiq Lond Occas Pap, n ser, **4**, 43–66
——, 1984c Celtic dragons from the River Thames, *Antiq J*, **64**, 268–79
——, 1985a *Celtic art in Britain before the Roman conquest*, London
——, 1985b *The Battersea Shield*, London
——, 1986 A group of Iron Age barrows at Cowlam, North Humberside, *Yorkshire Archaeol J*, **58**, 5–15
——, 1988 Chalk figurines of the Parisi, *Antiq J*, **68**, 9–29
Stead, I M, and Rigby, V, 1989 *Verulamium, the King Harry Lane*

site, HBMC Archaeol Rep, **12**, London

Stephens, M R, 1986 *Interim report on the excavations at Devil's Hill, Heslerton*, Malton

Stillingfleet, E W, 1846 Account of the opening of some barrows on the Wolds of Yorkshire, *Proc Archaeol Inst*, York vol, 26–32

Stuiver, M, and Kra, R S, 1986 The 12th International ^{14}C Conference Proc, *Radiocarbon*, **28(2)B**

Stuiver, M, and Pearson, G W, 1986 High-precision calibration of the radiocarbon time scale, AD 1950–500 BC, in Stuiver and Kra 1986, 805–38

Stuiver, M, and Polach, H J, 1977 Discussion: reporting of ^{14}C data, *Radiocarbon*, **19(3)**, 355–63

Stuiver, M, and Reimer, P J, 1986 A computer program for radiocarbon age calibration, in Stuiver and Kra 1986, 1022–30

Sturt, G, 1949 *The wheelwright's shop*, Cambridge

Swain, H C, 1987 The Iron Age pottery, in Heslop 1978, 57–71

Swanton, M J, 1973 *The spearheads of the Anglo-Saxon settlements*, Royal Archaeol Inst, London

——, 1974 *A corpus of pagan Anglo-Saxon spear-types*, BAR, **7**, Oxford

Taylor, R J, and Brailsford, J W, 1985 British Iron Age strap-unions, *Proc Prehist Soc*, **51**, 247–72

Tuckwell, A, 1975 Patterns of burial orientation in the round barrows of East Yorkshire, *Bull Inst Archaeol Lond*, **12**, 95–123

Ullemeyer, R, and Tidow, K, 1973 Textil und Lederfunde der Grabung Feddersen Wierde, in *Einzeluntersuchungen zur Feddersen Wierde* (H Hayen, R Ullemeyer, K Tidow, and F Ruttner), Wiesbaden, 77–152

von den Dreisch, A, 1976 *A guide to the measurement of animal bones from archaeological sites*, Harvard Peabody Mus Bull, **1**

Vouga, P, 1923 *La Tène*, Leipzig

Wainwright, G J, 1972 The excavation of a Neolithic settlement on Broome Heath, Ditchingham, Norfolk, *Proc Prehist Soc*, **38**, 1–97

——, 1979 *Gussage All Saints, an Iron Age settlement in Dorset*, DoE Archaeol Rep, **10**, London

Wainwright, G J, and Spratling, M G, 1973 The Iron Age settlement of Gussage All Saints, *Antiquity*, **47**, 109–30

Wainwright, G J, and Switsur, V R, 1976 Gussage All Saints – a chronology, *Antiquity*, **50**, 32–9

Walker, A J, Keyzor, R S, and Otlet, R L, 1987 Harwell radiocarbon measurements V, *Radiocarbon*, **29**, 78–99

Ward Perkins, J B, 1941 An Iron Age linch-pin of Yorkshire type from Cornwall, *Antiq J*, **21**, 64–7

Wells, C, 1982 The human burials, in *Romano-British cemeteries at Cirencester* (A McWhirr, L Viner, and C Wells), *Cirencester excavations*, **2**, Cirencester

Wheeler, R E M, 1943 *Maiden Castle, Dorset*, Rep Res Comm Soc Antiq Lond, **12**

Whimster, R, 1981 *Burial practices in Iron Age Britain*, BAR, **90**, Oxford

Wild, J P, 1970a *Textile manufacture in the northern Roman provinces*, Cambridge

——, 1970b Button-and-loop fasteners in the Roman provinces, *Britannia*, **1**, 137–55

Wild, J P, and Bender-Jørgensen, L, 1988 Clothes from the Roman Empire: barbarians and Romans, in, *Archaeological textiles* (eds L Bender-Jørgensen, B Magnus, and E Munksgaard), *Arkaeologiske Skrifter*, **2**, 65–98

Wild, J P, and Ryder, M L, 1977 *Vindolanda III: the textiles*, Vindolanda Trust, Hexham

Williams, C, 1978 *Modelmakers' plans for an early Iron Age British chariot*, Cardiff

Wilson, B, 1978 Methods and results of bone analysis, in *The excavation of an Iron Age settlement, Bronze Age ring ditches, and Roman features at Ashville Trading Estate, Abingdon (Oxfordshire) 1974–76* (ed M Parrington), CBA Res Rep, **28**, 110–26, London

Wilson, B, Grigson, C, and Payne, S (eds), 1982 *Ageing and sexing animal bones from archaeological sites*, BAR, **109**, Oxford

Wilson, C E, 1981 Burials within settlements in southern Britain during the pre-Roman Iron Age, *Bull Inst Archaeol London*, **18**, 127–69

Wright, T, 1861 *Essays on archaeological subjects*, **1**, London

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Excavations at Rudston 1970 (burials R68–R92).
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