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CAU Must Farm/Flag Fen Basin *Depth & Time* Series — Volume I

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By Mark Knight and Matt Brudenell

With contributions by
Grahame Appleby, Manuel Arroyo-Kalin, Rachel Ballantyne, Michael Bamforth, Lawrence Billington, Steve Boreham, Natasha Dodwell, Roger Doonan, Charles French, Kevin Hayward, Peter Hommel, Donald Horne, Mark Noel, Peter Northover, Tracey Pierre, Vida Rajkovača, Iona Robinson Zeki, Rob Scaife, Maisie Taylor, Sean Taylor, Simon Timberlake, Anne de Vareilles and Penelope Walton Rogers

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On the cover: *Bradley Fen 2001 (excavating the watering hole F.866).*

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Figures

Tables

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Charly French, Paul Middleton, Francis Pryor, Rob Scaife and Maisie Taylor were frequent visitors, bringing experience and encouragement in equal measure. Their generosity of ideas contributed greatly to the understandings presented here — all excavations should be afforded such wise counsel. In similar vein, conversations with Jo Brück, Christopher Evans, Kasia Gdaniec, David Gibson, David Hall, JD Hill, Gavin Lucas, Lesley McFadyen, Richard Mortimer, Stuart Needham, Roderick Regan and Ben Robinson kept us on our interpretive toes. That we had found a site worth explicating was made apparent by the number of requests to publish its plan (Richard Bradley, Mike Parker Pearson and David Yates) or to analyse its artefactual or environmental assemblages. Material gleaned from King's Dyke and Bradley Fen furnished parts of more than one PhD (Matthew Brudenell and Rob Law) along with several MPhil and undergraduate dissertations (Grahame Appleby, Manuel Arroyo-Kalin, Emma Beadsmoore, Tracey Pierre and Sean Taylor). We are grateful to those who expressed an interest and helped put our work into a much wider context.

An opportunity to think and read was extended to Mark Knight by the McDonald Institute for Archaeological Research. During time as Field Archaeologist in Residence in 2011 he was allowed to combine a bit of *field* with a bit of *theory*. This volume, or at least a large chunk of its theoretical input and product, represents an outcome of that time well appreciated and hopefully well spent. The main body of this text was completed in 2013, and was revised following comment in 2015 and 2018.

Finds were processed by Norma Challands, Jason Hawkes, Leonie Hicks, Gwladys Monteil and Sharon Webb. The graphics in this volume were produced by Andrew Hall with the assistance of Marcus Abbot, Michael Court, Vicki Herring, Donald Horne, Iain Forbes and Jane Matthews. Chloe Watson drew the log ladder and mallet. Studio photography was undertaken by Dave Webb, while onsite photography was undertaken by members of the excavation team. The text was edited by Iona Robinson Zeki, who tackled style in tandem with content, her interventions being astute as well as necessary.

Special thanks are extended to Mark Edmonds and Francis Healy for reading (so thoroughly) and commenting (so cogently) on this monograph. In line with a major theme of this book, we gained from their depth. We also accept that we still have a great deal to learn about radiocarbon dating, especially if we

want to employ it as a sensitive instrument. The monograph was proofread and indexed by Vicki Harley.

The monograph describes the core prehistoric archaeology of King's Dyke and Bradley Fen and is an expression of many peoples hard work in the field as well as in the library, lab and office. The excavation teams were as follows:

King's Dyke 1998: Marc Berger, Craig Cessford, Duncan Garrow, Cassian Hall & Mark Knight.

King's Dyke 1999: Marcus Abbott, Joe Abrams, Mary Alexander, Nicholas Armour, Rachel Ballantyne, Emma Beadsmoore, Andy Clarke, Anwen Cooper, Bob Davis, Duncan Garrow, Andrew Hall, Dave Hall, Jon Hall, Candy Hatherley, Mark Knight, Lesley McFadyen, Richard Mortimer, Ricky Patten, Martin Redding & Beccy Scott.

Bradley Fen 2001: Marcus Abbott, Rachel Ballantyne, Emma Beadsmoore, David Beresford-Jones, David Brown, Matthew Brudenell, Simon Burney, Craig Cessford, Norma Challands, Philip Church, Andy Clarke, Jason Clarke, Chantal Conneller, Bob Davis, Paul Donohue, Natasha Dodwell, Andy Fergerson, Duncan Garrow, Susanne Hakenbeck, Andrew Hall, Candy Hatherley, Teresa Hawtin, Charlie Kitchin, Mark Knight, Mary Leighton, Jane Matthews, Lesley McFadyen, Mary Nugent, Ricky Patten, Richard Purves, Martin Redding, Neil Redfern, Christina Robinson, Beccy Scott, Mark Spalding, Fraser Sturt, Richard Turnbull, Roland Wessling, Steven Williams & Felicity Woor.

Bradley Fen 2004: Ben Bishop, Emma Beadsmoore, Grahame Appleby, Matthew Collins, Donald Horne, Mark Knight, Iain Morley, Martin Oakes, Laura Preston, Tim Vickers, Ellen Simmons, Chris Swaysland & Steven Williams.

Being in the field at King's Dyke and Bradley Fen was a process of sustaining a close engagement with context and circumstance. Much of the time we did this surrounded by the roar, exhausts and dust of heavy plant as it uncovered the ground in front of us or removed the ground behind us. The process was fairly rapid and there was a sense of things being done at a pace. Throughout, however, we tried to stay contextual and we achieved this largely by talking through our individual features, putting into words *cuts*, *fills*, *layers* and *finds*. Friday afternoons (invariably after chips) frequently involved walking around the site discussing each other's postholes, pits, ditches and deposits. In this manner, we were able articulate and correlate different features and begin to recompose sites and landscapes. These grounded conversations occurred at the top of the contour, at King's Dyke, and continued all the way to the bottom of the contour, at Bradley Fen. As we moved down, the depth and complexity of sediment increased and our postholes, pits, ditches and deposits became progressively better preserved. In these sunken spaces, upcast banks and mounds endured. Buried soil, silt and peat horizons intervened between things. All of these details amplified our comprehension or, what we called at the time, our 'confidence in context' – in this we came to be immersed.

Summary

The King's Dyke (1995–1999) and Bradley Fen (2000–2004) excavations occurred within the brick pits of the Fenland town of Whittlesey, Cambridgeshire. The investigations straddled the south-eastern contours of the Flag Fen Basin, a small peat-filled embayment located between the East-Midland city of Peterborough and the western limits of the 'island' of Whittlesey. Renowned principally for its Bronze Age and Iron Age discoveries at sites such as Fengate and Flag Fen, the Flag Fen Basin also marked the point where the prehistoric River Nene debouched into the greater Fenland Basin.

In keeping with the earlier findings, the core archaeology of King's Dyke and Bradley Fen was also Bronze Age and Iron Age. A henge, two round barrows, an early fieldsystem, bronze metalwork deposition and patterns of sustained settlement along with metalworking evidence helped produce a plan similar in its configuration to that first revealed at Fengate. In addition, unambiguous evidence of earlier second millennium BC settlement was identified together with large watering holes and the first burnt stone mounds to be found along Fenland's western edge.

The early fieldsystem, defined by linear ditches and banks, was constructed within a landscape preconfigured with monuments and burnt mounds. Genuine settlement structures included three of Early Bronze Age date, one Late Bronze Age, ten Early Iron Age and three Middle Iron Age. Despite the existence of Middle Bronze Age wells, bone dumps and domestic pottery assemblages no contemporary structures were recognised. Later Bronze Age metalwork, including single spears and a weapon hoard, was deposited in indirect association with the earlier land divisions and consistently within ground that was becoming increasingly wet. By the early Middle Iron Age, much of the fieldsystem had been subsumed beneath peat whilst, above the peat, settlement features transgressed its still visible boundaries.

Combined, the King's Dyke and Bradley Fen excavations established a near continuous transect across the Flag Fen Basin's south-eastern gradient – the former exposing its very top, the latter its top, middle and base. The different elevations yielded different archaeologies and in doing so revealed a subtle correspondence between altitude and age. The summit of the gradient contained Roman as well as prehistoric features, whereas the mid-point contained nothing later than the early Middle Iron Age, and the base, nothing later than the very beginnings of the Middle Bronze Age. At the same time, there was a palpable relationship between altitude and preservation. A shallow plough soil was all that protected the most elevated parts. The very base of the gradient however, retained a buried soil as well as silt and peat horizons contemporary with prehistoric occupation and which preserved surfaces, banks and mounds that were not present higher up. The same deposits also facilitated the preservation of organic remains such as wooden barriers, log ladders and a fragment of a logboat.

The large-scale exposure of the base of the Flag Fen Basin at Bradley Fen uncovered a sub-peat or pre-basin landscape. A landscape composed of dryland settlement features related to an earlier terrestrial topography associated with the now buried floodplain of the adjacent River Nene. Above all, the revelation of sub-fen occupation helped position the Flag Fen Basin in time as well as space. It showed that the increasingly wet conditions which led to its formation as a small fen embayment transpired at the end of the Early Bronze Age. In the same way, the new found situation dissolved any sense of an all-enduring and all-defining fen-edge and instead fostered a more fluid understanding of the contemporary environmental circumstances. In this particular landscape setting wetland sediment *displaced* settlement as much as it *defined* it – the process was dynamic and ongoing.

…simultaneity is mere appearance, surface, spectacle. Go deeper. Do not be afraid to disturb this surface, to set its limpidity in motion. (Lefebvre & Régulier 2004, 80)

Chapter 6

The arrival of fen-edge settlement

In many respects the previous three chapters have served to document the undercurrent of a persistent operational grain in the landscape at Bradley Fen, first formalized in a system of field boundaries in the Middle Bronze Age, but traceable in the arrangement of features that both pre-existed and post-dated their construction. By the beginning of the Middle Iron Age, the authority of this earlier grain had ceased to be relevant and, instead, the fen-edge came to the fore as the principal organizational axis on the lowland terrace. This shift in orientation was marked by the arrival of settlement at the fen-edge, which heralded new forms of engagement with the fen-margin and the Basin as a landscape feature.

This penultimate chapter takes as its focus the settlement which developed on the damp-ground contours of Bradley Fen at the beginning of the Middle Iron Age. Unlike its predecessors, it showed no signs of being structured with respect to the alignments of the Bronze Age. Fixtures no longer abutted the line of relict banks or their hedgerows and structures were no longer erected in the corner of denuded paddocks. Rather, for the first time there was a lateral superimposition of settlement features across this axis, with the occupation scatter now skirting the fen-margins. This reorientation was accompanied by other changes in the material record, including a return in the visibility of the dead and, in this specific context, a rare insight into metalworking activities. However, in amongst these changes were threads of continuity with the Early Iron Age, particularly with regards to depositional practice and architectural tradition. These connections and contrasts are explored throughout the course of this chapter, which not only strives to create a detailed picture of this final phase of prehistoric occupation at Bradley Fen, but sets out to examine its relationship to other contemporary settlements in the Flag Fen Basin (such as the Cat's Water settlement site (Pryor 1984)).

Topographies and Environments *c.* 350–100 BC

The water-table continued to rise in the Flag Fen Basin during the Middle Iron Age, fuelling the further development of an already extensive wetland embayment (Fig. 6.1). The pollen record suggests the presence of an increasingly diverse range of semi-aquatic and marginal aquatic plant species, testimony to standing pools of water between areas of floodplain peat (see Scaife & French, Chapter 2). By the fourth century BC, the deepening and widening of this fen reed swamp had largely subsumed the now ancient timbers of the relict later Bronze Age post-alignments and other wooden architecture of the Basin interior. In some instances, it was probably only the rotten tops of the drowned posts that stood proud of the waterline, but in the case of the Flag Fen alignment, these continued to provide a context for the deposition of later Iron Age metalwork (Coombs 2001). To the south, the expansion of the mere was simultaneously inundating the last vestiges of the Must Farm roddon, whose freshwater channel also saw the deposition of items of later Iron Age metalwork prior to its complete inundation (Robinson et al. 2015). By the first century BC, the channel was fully choked and capped by peat growth, to the extent that it was indistinguishable from the rest of the embayment interior.

In terms of the greater landscape narrative, this was the wettest point in the Basin's prehistoric sequence and was set to become wetter still by the end of the first millennium BC. Whereas the landscape window described in Chapter 3 was largely a terrestrial space, by the Middle Iron Age, the frame falls on what is predominately an aquatic landscape, where well over half the ground surface lay underwater, or was permanently saturated. Here, the advancing peat continued to subsume the dryland terraces, particularly on the gentler contours at Fengate, Thorney and Whittlesey, whose shorelines were increasingly distanced from one another. Although Whittlesey had effectively been an island

Figure 6.1. *Flood map for the mid-late first millennium* BC *(*c. *400 to 100 cal* BC*). The white line marks the changes since the early Iron Age and gives an indication of the area of land lost.*

since the mid second millennium BC, direct links with both the mainland and the river Nene had been possible via timber causeways and the roddon. However, these physical connections were completely severed by the Middle Iron Age and, with the rising water-table, gone too was the possibility of reinstating them or erecting new pile dwellings similar to the Must Farm platform. Conditions were simply too wet in the interior to enable such projects, with boats now the only means by which the Basin could be crossed, in any direction.

Yet despite what we might perceive as worsening conditions – with direct occupation of the wetland no longer possible, or perhaps desirable – there was a very distinct draw of settlement to the fen-edge in the Middle Iron Age. Unlike in previous periods, where the lower terrace pastures and damp-ground contours were exclusively the domain of wells and waterholes, in the Middle Iron Age this zone was much more extensively settled. On the wetland side, the pollen record indicates that these terrace margins remained fringed by alder and willow carr, although this was diminishing as a consequence of inundation during the course of the Iron Age sequence. In its place, there developed a shallow, muddy water fen, with the saturated ground at Bradley Fen encroaching up to the 1.4m OD contour by the fourth century BC and, judging by the peat capping of Middle Iron Age features, rising to *at least* 2.0m OD by the first century BC (by which time settlement had ceased in this zone).

Within the lifespan of the settlement itself, the extent of waterlogged ground probably fluctuated between the 1.0 and 2.0m OD contours, with the land lying below 1.4m OD providing a seasonally available flood-water meadow – a rich grazing resource. It is clear nonetheless, that settlement *per se* did not extended below this line, as the stripped surface of the lowest-lying dateable feature with Middle Iron Age-type pottery rested on this contour. This then can be taken to mark the lower limits of ground able to sustain terrestrial settlement in the period. However, it is important to stress that this is a metre *below* the height conventionally regarded as marking the fen-edge of the later Iron Age at Fengate and beyond (*c.* 2.5m OD) (Evans 2003, 136). As such, Bradley Fen constitutes a surprisingly low-lying settlement swathe, literally a stone's throw away from ground that must have been wet under foot most of the year – ground previously thought to have been completely inundated by this period.

The environmental texture of this terrace margin is hard to detail with any precision. However, pollen from the upper profile of waterhole F.1064 (see Boreham, Chapter 5) suggests the lower contours of the site continued to be characterized by damp meadows and tall-herb plant communities (Fig. 6.2). How far these pastures extended upslope is difficult to predict, though the settlement was clearly sited within open grasslands, probably with further areas of winter pasture and arable plots on the dry free-draining soils above the 2.5m OD contour. This zone was ideal for cultivation and, as in earlier periods, the scarcity of features across the higher terraces at Bradley Fen implies that they remained under crop throughout much of the later prehistoric sequence. Such a reconstruction is broadly corroborated by de Vareilles's analysis of the charred plant remains (this chapter), which reveals that the cereals grown and harvested within the vicinity of the site were comparable to those recorded for the Early Iron Age. The general agricultural land-use model for Bradley Fen is therefore similar to that of the late second and earlier first millennia BC (see Chapter 5), with the only major differences being that the boundary between the zones of pasture and arable land would have shifted upslope in this period, whilst the gross area of land available for farming was reduced by the encroaching fen.

Settlement overview and chapter structure

In plan, the Middle Iron Age settlement at Bradley Fen is revealed as a fairly dense swathe of pits, postholes and structures, clustering along a narrow corridor-like strip of lowland ground between 1.4–2.5m OD (Fig. 6.3). With no contemporary remains at King's Dyke and only a handful of isolated features on the terraces above the 2.5m OD contour, this represents the *first* proper fen-edge settlement in the site's prehistoric sequence. Its foundation marks a major transformation in the geography of occupation when compared with the Early Iron Age, when the higher ground at King's Dyke and similar terrace-crown locations around the Basin were generally favoured (see Chapter 5). Indeed, this shift stands out all the more because the basic texture of the landscape changes relatively little across the Early to Middle Iron Age transition (see above), begging the question of why communities chose to settle the fen-edge at the start of this period.

This chapter attempts to grapple with this and other issues concerning the evolving character of settlement in the second half of the first millennium BC. It highlights the transformation in patterns of occupation, but also traces points of continuity from the preceding period. Yet these observations only take us so far, as they do not explain why settlement was drawn down to the fen-edge in the later first millennium BC: *why now*? Similarly, they do not help us to understand why the structural imprint of the Middle Iron Age occupation in this context resembles that of the Early Iron Age. Of course, unenclosed settlements are not uncommon in this period, but roundhouses *not* defined by eaves gullies are rare and so too are settlements dominated by small pits and postholes, which scarcely register in most of the region's Middle

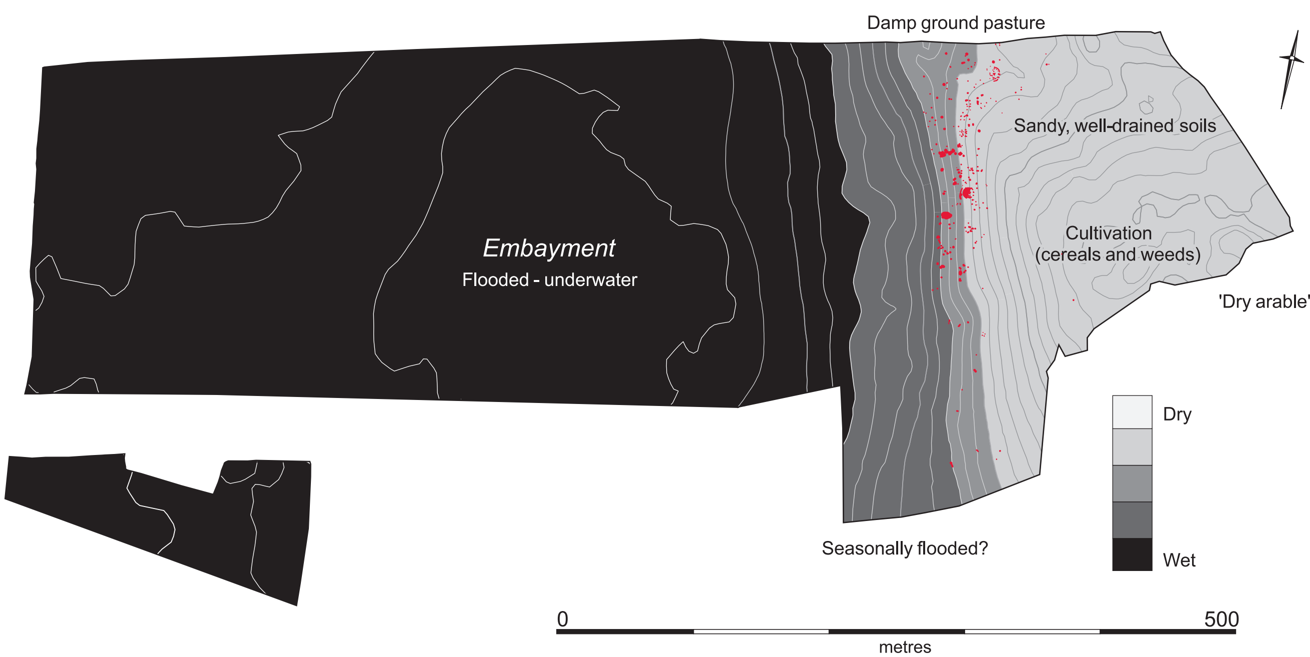


Figure 6.2. *Landscape reconstruction: the mid–late first millennium BC.*

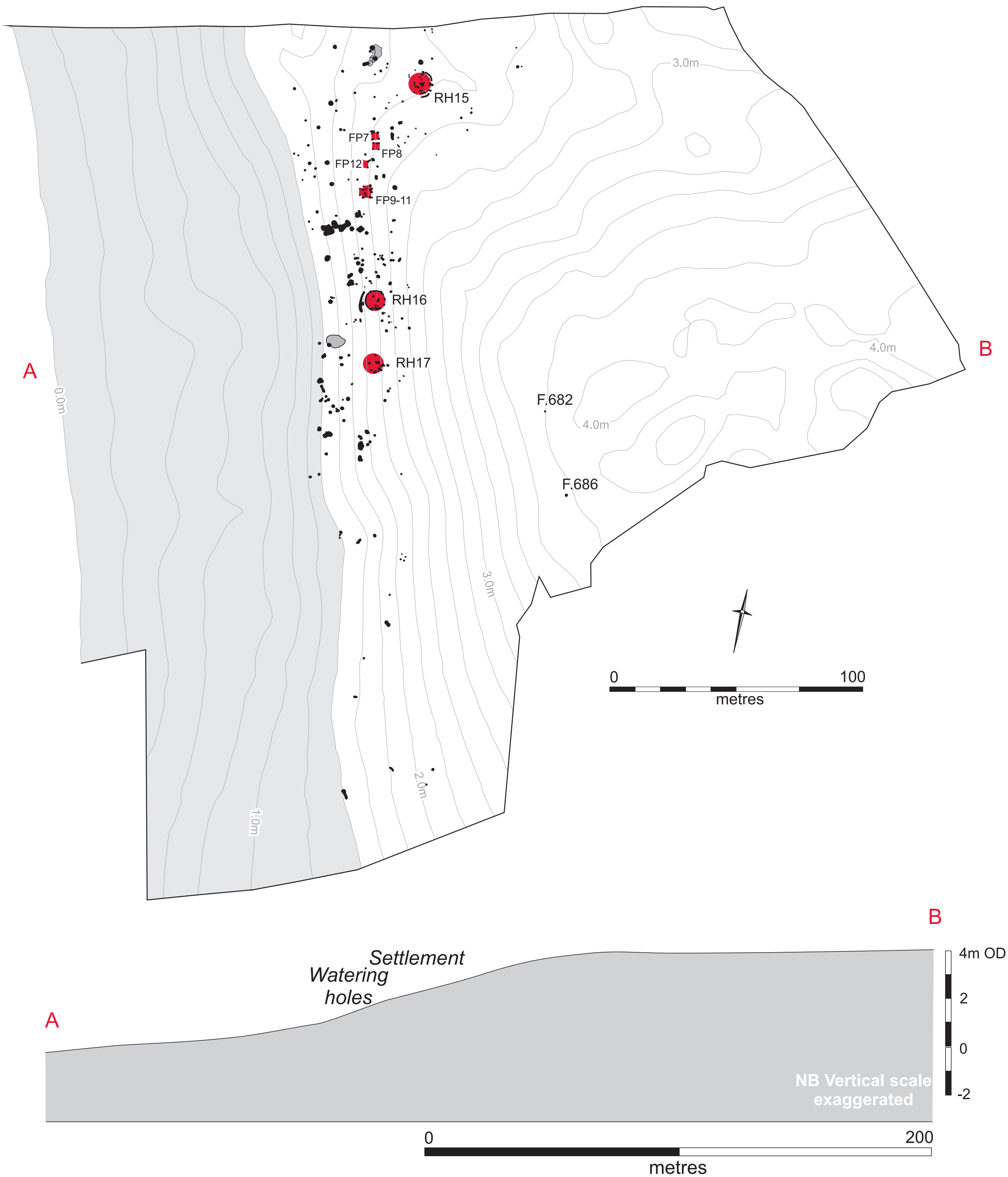


Figure 6.3. *Plan of the Middle Iron Age settlement at Bradley Fen.*

Iron Age settlements. In this regard, the Bradley Fen settlement signature is rather atypical for the period. When added to the fact that the site occupied a very low-lying position, conventionally assumed to be too wet for settlement by this time, it is not that surprising that the remains were initially thought to be earlier (Gibson & Knight 2006).

Taken together, these features raise some important questions concerning site chronology, sequence and function: does date have a bearing on why the site is so much lower than those on the opposite shoreline at Fengate and why are there no enclosures, ditch systems, or eaves-defined roundhouses? Are there indications of specialization in fenland resources, or does the material record suggest there may be other reasons why groups chose to reside at the wet/dry interface?

In order to address these questions, the detail of the settlement, its imprint and organization, must be examined more closely. This requires a careful analysis of the different components and material residues and, in light of the observations above, a consideration of how their character compares with the deposits and practices documented for the Early Iron Age.

Despite the noted parallels in the vertical zoning of features, the compression of Middle Iron Age features into a narrow strip along the fen-edge makes it hard to maintain the contour-orientated approach used to structure the previous chapter. For this reason, the descriptions of settlement architecture which follow are arranged in a more conventional feature-type format. That being said, the narrative path remains sensitive to the terrace edge, with analysis moving from the structures, through to the surrounding pits and postholes, and, finally, to the finds from the peat itself. In effect, this takes discussion down the contour from the dry to the wet, allowing an appreciation of how material signatures change in relation to altitude.

Settlement architecture

Although features phased to the Middle Iron Age at Bradley Fen actually span the contours between 1.3 and 3.6m OD, the main focus of the settlement swathe was restricted to the narrow linear band of ground between 1.4 and 2.5m OD (Fig. 6.4). This fairly dense feature scatter comprised three roundhouses, six

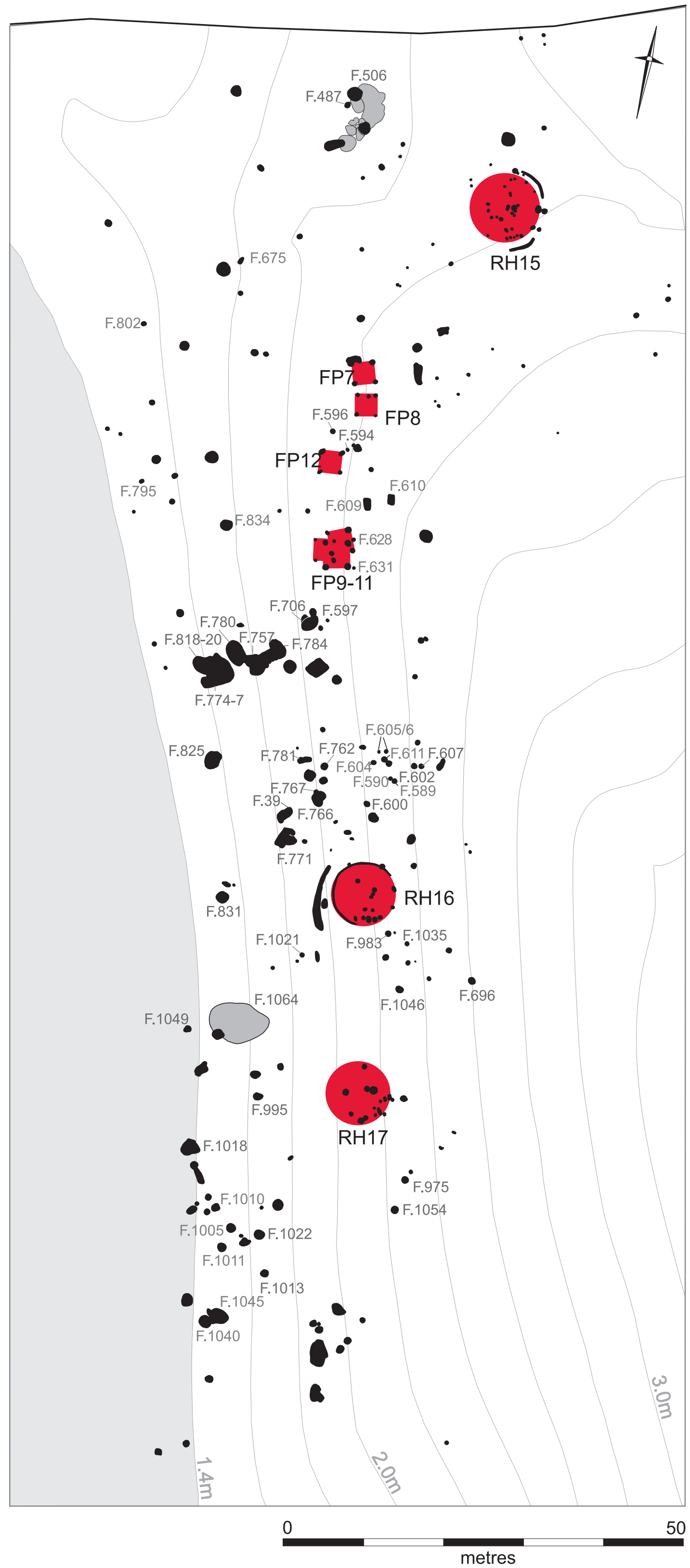


Figure 6.4. *Detail of the Middle Iron Age settlement at Bradley Fen.*

four-post structures and a further 212 external pits and postholes. In terms of area, its core covered at least 1.4ha, with the scatter thinning out quite abruptly beyond the centre of the site, although it probably did extend further north, past the limit of excavation.

Roundhouses

Three Middle Iron Age roundhouses were revealed between the 2.0 and 2.4m contours. The buildings were defined by a combination of wall-trenches, postholes and short lengths of gullies, with projected floor diameters of 7.5–8m (Table 6.1). Although the architectural details of each building varied, they all shared east-facing entrances marked by larger postholes and, in two instances, heavy-set four-post doorway structures. As with the Early Iron Age roundhouses at King's Dyke, there were no surviving floors, although interior fixtures including small pits and postholes were prolific in each structure. Unless otherwise specified, these are all thought to be structural components or features directly related to the use of the buildings.

Roundhouse 15

Roundhouse 15 was located at the northern end of the site and had a projected diameter of 8.0m (Fig. 6.5). The building was demarcated by a robust east-facing four-post doorway structure, the truncated remains of an external penannular drip gully and a scatter of small pits and postholes. Only the terminals of the drip gully (F.540 and F.541) survived around the entrance and consisted of two shallow trough-shaped arcs measuring less than 0.50m in width and 0.10m in depth. This gully was probably set back from the original wall-line by about a metre and, as with nearly all the features associated with the roundhouse, was filled with pale grey silty-sand flecked with occasional fragments of charcoal.

By contrast, the east-facing doorway was well preserved, four deep-set postholes framing a 1.65m wide entrance (F.9, F.10, F.521 and F.536; diameter range, 0.30–0.60m; depth range, 0.25–0.48m). In its character and form, this setting resembles the doorway structures of Roundhouses 7–9 at King's Dyke (Chapter 5). Further mirroring the imprint of these Early Iron Age entranceways, the inner two postholes were similarly the more robust: F.10 and F.536 being twice as deep as their external counterparts. Both inner postholes also retained traces of post-pipes (0.22m and 0.40m in diameter), while F.10 contained the decayed remains of the post at its base, leaving little doubt that the uprights were left to rot *in situ*.

On or within the projected wall-line of the building were a total of 21 postholes and/or small pits (F.12–14, F.28–31, F.515–519, F.524, F.530–535, F.537 and F.542), with four further features located between the wall-line and the drip gully (F.510–514). Some of these may be classed as structural supports, whilst others probably represent internal fixtures or repair posts on the exterior. In general, these were all small, shallow features (diameter range, 0.13–0.55m; depth range, 0.02–0.26m), of which only 10 survived to a depth greater than 0.10m. Amongst them was the base of a clay-lined pit (F.542), located at the foot of a row of posthole-sized cuts flanking the southern interior wall-line. A second cluster of features was sited near the centre of the structure, opposite the door. Of note in this group was posthole F.31, which contained a deposit of fragmented, disarticulated sheep bones from a single animal aged 0–13 months (12 fragments, 87g). A second, smaller collection of sheep bones was recovered from the adjacent posthole F.12 (14 fragments, 9g), with the likelihood being that this was derived from the same animal. The location of these deposits is remarkably similar to those at the centre of Roundhouse 14 at King's Dyke and invites the same interpretation, i.e. that they were formally interred as part of foundation or abandonment related practices.

Only five other features from the structure yielded finds, including the drip gullies, entrance post F.9, pit/posthole F.535 and pit F.514. These contained a total of 7 sherds of pottery (59g), a further 15 fragments of animal bone (410g) and a single lump of slag (693g). The latter derived from pit F.514, which displayed a shallow bowl-shaped cut measuring 0.55m in diameter and 0.16m in depth. This seems to have truncated the roundhouse drip-gully and may therefore post-date the abandonment of the structure.

Table 6.1. *Breakdown of artefacts categories for Roundhouses 15, 16 and 17*

Artefact type	Roundhouse 15	Roundhouse 16	Roundhouse 17
Pottery (no./wt)	7/59g	62/540g	108/763g
Animal bone (no./wt)	41/516g	60/495g	97/325g
Fired clay (no./wt)	-/-	9/1482g	13/34
Metalworking debris (no./wt)	1/693g	1/14g	2/320g
Burnt stone (wt)	0.1kg	8.7kg	1.3kg
Total finds	**49/1268g**	**132/2531g**	**220/1442g**

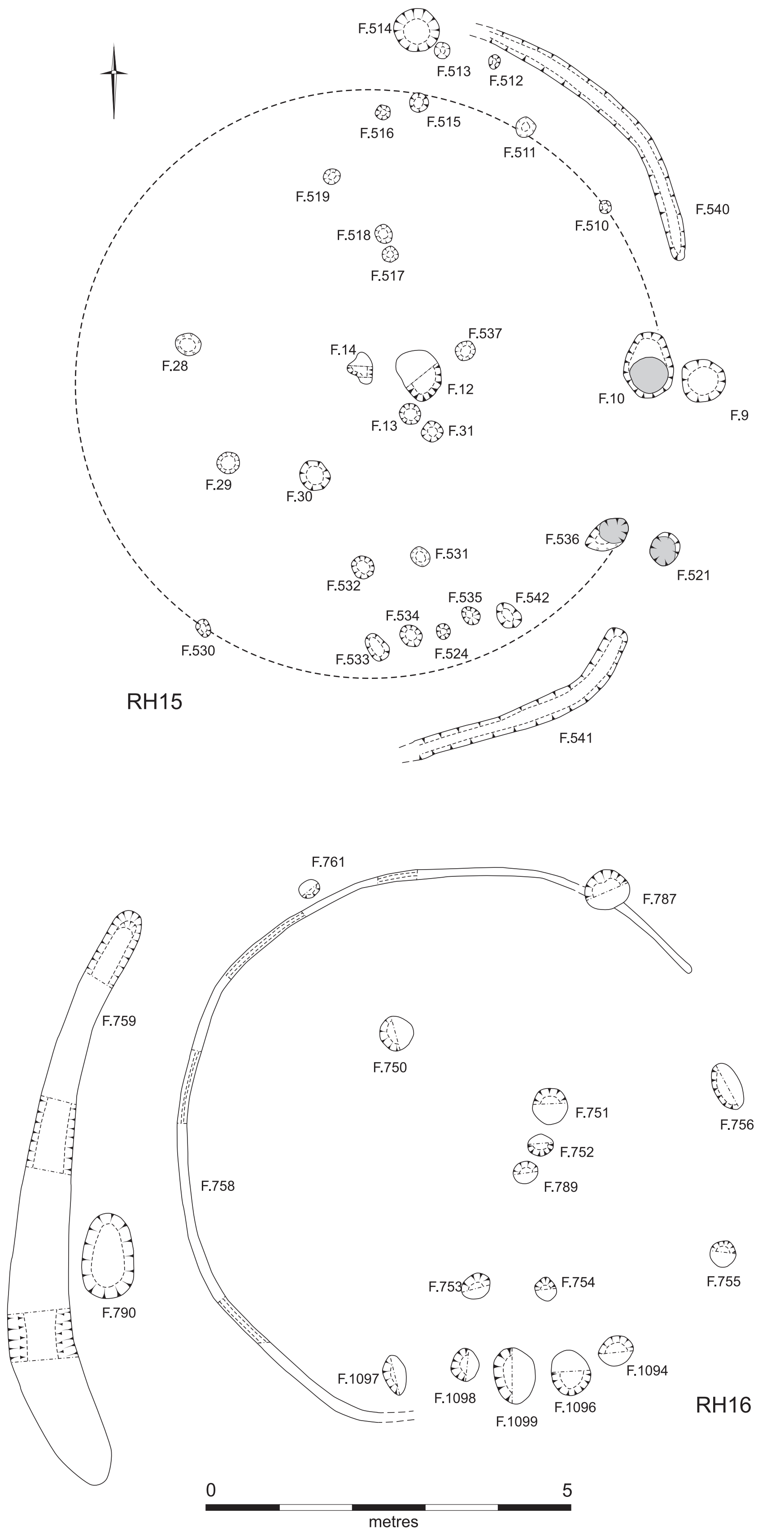


Figure 6.5. *Plan of Roundhouses 15 and 16.*

Roundhouse 16

Roundhouse 16 lay towards to centre of the main settlement swathe, around 75m south of Roundhouse 15 (Fig. 6.5). The ground plan of the building was marked by a partially surviving penannular wall-trench, 7.50m in diameter (F.758), an east-facing entrance defined by a pair of postholes (F.755–56, 1.55m wide) and an external, crescent-shaped gully which flanked the structure's western side (F.579). The building was perhaps the best preserved of the three roundhouses, though it had suffered some truncation on it eastern, upslope side, where the wall-trench petered out. The surviving section of this feature had a maximum width of 0.18m and a depth of 0.08m. A small posthole (F.761) adjacent to the northern side of the trench may have been set as a repair to the wall-line. The entrance postholes were partially truncated, but with depths of 0.32–0.34m, these were still the most robust postholes associated with the structure (overall posthole range 0.25–0.54m in diameter, 0.05–0.34m in depth).

Eleven features were located inside the roundhouse, including eight small pits (F.750–51, F.789, F.1094 and F.1096–99; diameter range, 0.28–0.85m; depth range, 0.07–0.28m) and three postholes (F.752–54). Five of the pits (F.1094 and F.1096–99) were arranged in an arc along the southern interior wall-line, matching the feature pattern in Roundhouse 15. These small shallow pits had bowl-shaped profiles filled with deposits of mid-grey sandy-silt with occasional flecks of charcoal. Pit F.1096 had a clay lining, as did pits F.750 and F.751. The latter was located on its own, towards the rear of the structure, whereas pit F.750 formed part of a second cluster of features near the centre of the building, again mirroring the arrangement of fixtures in Roundhouse 15. These three clay-lined 'cooking pits' were essentially shallow tanks constructed to hold and heat water and were backfilled with varying quantities of burnt stone. In F.751, this was accompanied by five adjoining pieces of a fire-cracked quern and a large associated rubbing stone, plus five refitting fragments of a single triangular loomweight (372g). These items were packed neatly into the small pit, indicating that care was taken in their selection and deposition.

Clay-lined pit F.1096 and the adjacent pit F.1094 were also associated with what might be termed formal deposits, as was the small pit F.789, located towards the centre of the roundhouse. All contained bundles of sheep bones seemingly derived from single animals of slightly differing ages. Pit F.789 yielded bones of a juvenile sheep (12 pieces, 52g), whilst those from F.1094 derived from a young adult (29 pieces, 198g) – these being found with refitting shoulder and body sherds from a single burnished jar (28 sherds, 153g). The oldest animal was from clay-lined pit F.1096, where the bones of a 6–8-year-old sheep were recovered (9 pieces, 286g) alongside a second partially intact triangular loomweight (1052g) and 11 sherds of pottery (188g). Of course, not all of the materials included in these deposits need to have been interred with same degree of care or intentionality. Some, particularly the small sherds from F.1096, may have simply been caught in the matrix of soil used to back-fill the feature. That being said, it is hard to argue that the relationship between groups of sheep bones from single animals and small pits in this context is a 'random' product of routine refuse maintenance practices, especially given the connection to deposits in Roundhouse 15 and the numerous comparable examples in the Early Iron Age structures at King's Dyke. In fact, in this earlier context, groups of sheep bone were occasionally deposited with burnished pots and loomweight fragments, just as they were here in the Middle Iron Age.

With the exception of F.1097, all the interior pits from the roundhouse yielded finds, as did entrance post F.576. Aside from those already detailed, this included a further 16 sherds of pottery (141g), one fragment of animal bone (3g), a single piece of fired clay (6g) and a small copper alloy ring found from the general interior area during machine stripping. Further artefacts were recovered from the external crescent-shaped gully F.759 and oval pit F.790 – both yielding pottery (7 sherds, 58g), bone (18 fragments, 153g), fired clay (2 fragments, 52g), burnt stone (2.8kg) and slag (3 fragments, 56g). The gully was positioned downslope from the roundhouse and, although it obviously respected the perimeter of the building, its southern tail appears to have been cut to avoid pit F.759, taking its line away from the curve of the structure. This implies the two external features were contemporary, which is further suggested by their analogous fills and the composition of their artefact assemblages (notably the inclusion of slag). The gully itself possessed a steep U-shaped profile, measuring up to 0.88m in width and 0.45m in depth. Its size, shape, orientation and the fact that it was set back at least 1.6m from the roundhouse wall-line suggest that it was not a conventional eaves-drip gully. Instead, it may have been dug as a sump for the structure, in an effort to lower groundwater levels at the back of the building.

Roundhouse 17

Roundhouse 17 lay toward the southern end of the main settlement swathe, 18m south of Roundhouse 16 (Fig. 6.6). Lacking traces of a surviving wall-trench or any encircling eaves-drip gully, the presence of the

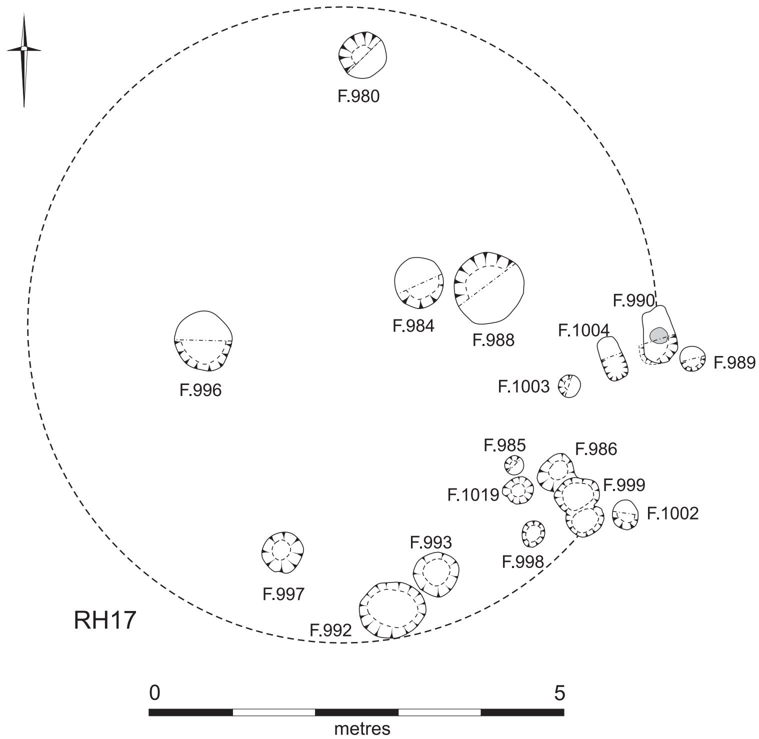


Figure 6.6. *Plan of Roundhouse 17.*

building was indicated by the distinctive arrangement of postholes forming an entrance structure, similar to that of Roundhouse 15 and reminiscent of the doorways of Roundhouses 7–9 at King's Dyke. Following suit, the interior pair of postholes in this setting, F.990 and F.999, were the most robust (0.51–0.55m in diameter, 0.30–0.49m in depth), with F.990 retaining traces of a post pipe. Framing the 1.6m wide entranceway, these were fronted by an exterior pair of slighter construction (F.989 and F.1002), both measuring <0.30m in diameter and <0.20m in depth.

The interior uprights of the doorway had clearly been replaced at least once during the life of the structure, as indicated by the addition of postholes F.986 and F.1004. Further repairs or structural supports are also suggested by the presence of postholes F.985, F.998 and F.1019 to the left of the entrance, although it is harder to account for the location of F.1003, which may possibly have been inserted after the abandonment of the building (total posthole dimension range, 0.24–0.55m in diameter, 0.06–0.49m in depth). Overall, the structure's postholes were confined to the entrance zone and yielded a surprising number of artefacts: 58 sherds of pottery (266g), 143 pieces of animal bone (205g), 2 fragments of fired clay (4g), 9 burnt stones (0.4kg) and 2 pieces of slag (232g). These mixed, finds-rich midden-type fills were particularly associated with the interior pairs of postholes in the doorways setting, with F.990 containing 43 sherds of pottery alone (203g). Collectively, the identified animal bone was dominated by sheep remains. Although the quantities from most deposits were too low to suggest anything but bone mixed within a generalized artefact-rich refuse, a sheep vertebra from F.986 had been split down the sagittal plane, mirroring the distinctive butchery techniques recorded in Early Iron Age contexts from Roundhouse 14 and waterhole F.945.

In a more familiar vein, the sheep bone deposit from posthole/pit F.1019 contained lamb bones probably derived from a single individual aged 10–12 months, suggesting the animal was killed in early spring (107 bone fragments, 135g). Its presence underlines the clear relationship between formal sheep bone deposits and Early and Middle Iron Age roundhouses on the site.

The seven remaining internal features in Roundhouse 17 were small shallow pits with bowl-shaped profiles, four of which were clay-lined (F.984, F.988, F.992 and F.996). The pits were filled with charcoal-flecked grey-brown sandy-clay silts, with cuts measuring 0.30–0.75m in diameter and 0.06–0.17m in depth. Their arrangement was broadly similar to that in Roundhouse 15 and 16, with an arc of pits lying around the southern interior close to the entrance (F.992–93 and F.997), two pits clustered near the centre (F.984 and F.988) and two located towards the back of the interior (F.996 and F.980). With the exception of pit F.980, all yielded mixed assemblages comprising slightly different quantities and combinations of pottery (51 sherds, 503g), animal bone (102 fragments, 120g), burnt clay (11 fragments, 30g) and burnt stone (8 pieces, 0.9kg) – groups of material whose composition and condition suggest they were drawn from a midden pile (see Brudenell & Cooper 2008). Though it seems doubtful that all these feature were open simultaneously, the arc of pits in the southern half of the structure may have been backfilled together (and/or with material derived from a common source), since fragments of the same burnished jar were recovered from F.992–93 and F.997 and two non-adjoining pieces of the same bone point were found in F.992 and F.997.

In the absence of a wall-line, the overall size of Roundhouse 17 can only be gauged by the arrangement of its internal features. Judging by comparisons with Roundhouse 16, the pit arc in the south probably lay very close to the perimeter and, assuming pit F.980 occupied a similar position on the opposite side of the structure, we can project a wall-line *c.* 7.5–8.0m in diameter, directly comparable to that of Roundhouses 15 and 16.

Four-post structures

Five definite four-post structures were identified within the northern half of the settlement swathe (Fig. 6.7), located between Roundhouse 15 and 16. The structures were arranged in a north–south line that followed the dominant axis of the settlement. They form two groups between the 2.1 and 2.3m OD contours: two abutting structures aligned on the same axis to the north (Four-post Structures 7 and 8) and a palimpsest of three overlapping building plans to the south (Four-post Structures 9–11). All the structures were sub-square in plan with postholes averaging 0.47m in diameter and 0.31m in depth (Table 6.2). These were typically U-shaped features filled with mid to dark grey-brown silty-clays with occasion flecks of charcoal. A total of three postholes in Four-post Structures 7 and 9 retained traces of a post-pipes (F.626, 0.16m in diameter; F.621, 0.25m in diameter; F.623, 0.29m in diameter), suggesting that the uprights were generally not left to rot *in situ*, but were removed upon abandonment. Fragments of desiccated wood were also recovered from posthole F.578 in Four-post Structure 8, but no post-pipe was observed.

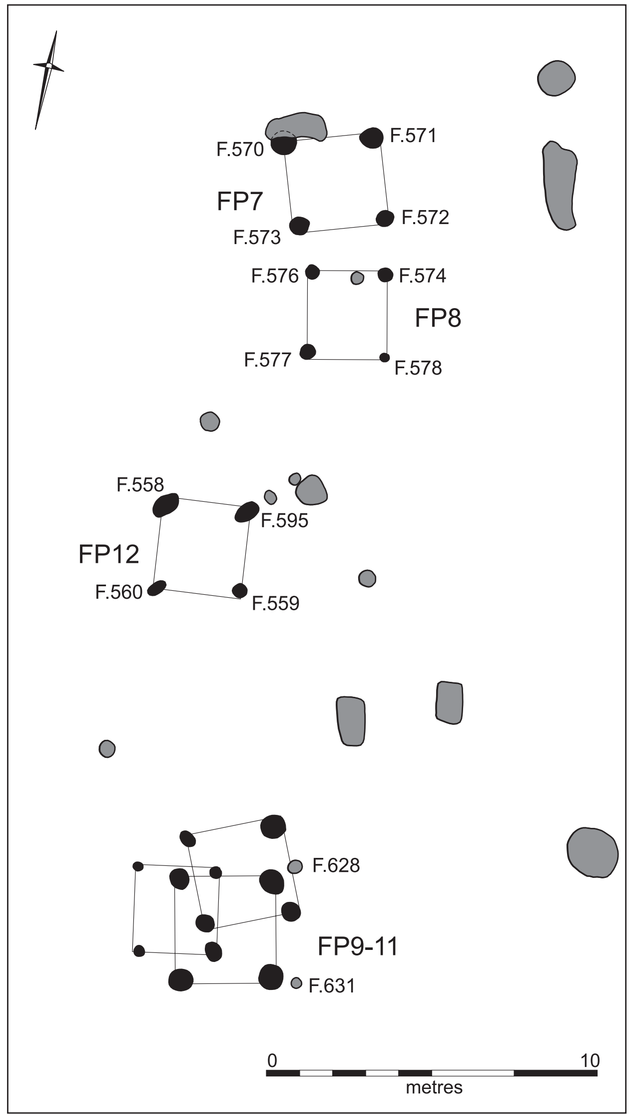


Figure 6.7. *Plan of Four-post Structures 7–11.*

Table 6.2. *Summary of four-post structure dimensions (m) and finds totals.*

Four-post Structure	Structure dimensions	Posthole dimensions (diam. × depth)	Finds (no./wt)
7	2.65 × 2.50	0.52–0.69 × 0.20–0.34	Pot (2/5g)
8	2.40 × 2.35	0.24–0.46 × 0.24–0.46	Fired clay (13/129g), including loomweight fragment
9	2.35 × 2.25	0.28–0.40 × 0.16–0.50	Slag (6/871g)
10	2.65 × 2.60	0.39–0.70 × 0.30–0.44	Slag (6/82g) and human burial
11	2.80 × 2.75	0.55–0.70 × 0.34–0.44	Animal bone (5/46g)
12	2.65 × 2.77	0.28–0.49 × 0.20–0.31	-

Another possible structure lay between the two main groups of four-post buildings, defined by a sub-square arrangement of features, F.558–60 and F.595 (Four-post Structure 12). Although the building is quite convincing in plan, being of a similar size and alignment to the other structures, three of the features were pit-like in form, displaying slightly asymmetrical bowl-shaped cuts. Their spatial patterning may therefore be coincidental; though it is possible these profiles resulted from the digging out of the postholes on abandonment. Regardless of the status of this group of features, there were no finds with which to date them and, in fact, there were few from the other definite four-post structures (Table 6.2). Some of the larger items were no doubt used as post-packing or post-pads, such as the slag in F.630 (Four-post Structure 9) or the possible loomweight fragment from F.578 (Four-post Structure 8). Other scraps of refuse may have become incorporated incidentally during construction or abandonment. Although the only directly datable finds, the potsherds, were restricted to posthole F.571 in Four-post Structure 7, the slag from Four-post Structures 9 and 10 (posthole F.613 and F.630) almost certainly derived from the metalworking activities conducted further south, which have been securely dated to the period (see below).

Whilst it is reasonable to conclude that all these building are of Middle Iron Age attribution, Four-post Structures 9, 10 and 11 could not have stood at the same time (Fig. 6.8). Their overlapping ground plans indicate a sequence of complete structural replacement, with each new building being partially constructed within the foot-print of the last, in a manner which avoided re-using/re-cutting any of the earlier postholes (though note should be made of F.628 and F.631 which were possibly replacement posts for Four-post Structure 11). Consequently, these subtle shifts in location have not left any stratigraphic relationships, making the order of the sequence impossible to untangle. However, this area of the site was clearly a focus for the erection and use of these structures and, if the label 'raised granary' is appropriate, would suggest that it constituted a persistent, functionally defined storage zone within the settlement swathe. Certainly, in the absence of pits large enough to be deemed 'grain silos' on the site's dryland contours (above 2.0m OD), these structures were probably the main repositories for cereals and other agricultural produce.

Although there is nothing to contradict this interpretation, the burial of a body within posthole F.613 (Four-post Structure 10 (Fig. 6.8)), suggests that other rites and practices were sometimes connected with these buildings. As reported below by Dodwell, the body had been carefully crammed into the cut following the removal of the post and, one assumes, the dismantling of the entire structure. The posthole may have been widened slightly for this purpose, but was still only 0.70m in diameter and 0.40m deep. The position of the body suggests that it was most likely bound and probably in a state of decay when interred. This raises the interesting possibility that it was carefully stored prior to burial in a protected scavenger-free environment for number of weeks, perhaps even on, or in, one of the four-post structures.

The notion that these buildings may have been excarnation platforms has been considered by several authors (e.g. Ellison & Drewett 1971; Carr & Knűsel 1997), though here there were no further human remains in any of the four-post structures or surrounding pits and postholes. Isolated fragments of human bone were found on the site, but these were confined to features on low-lying wetland fringes and in the peat itself (described below). This being said, there is certainly no reason why the four-post structures could not have performed several functions during their lifetime including, potentially, the storage of bodies.

The posthole burial, Four-post Structure 10 (Natasha Dodwell)

The body of a mature adult male had been interred in the upper fill of posthole F.613 (Fig. 6.8), which formed the northeast corner of Four-post Structure 10.

Posthole burial [573] – mature adult male, ht. 1.72m (5'8") The skeleton was on its back, tightly crouched, with the spine following the curve of the cut. The legs were tightly flexed, right over left, with the knees resting by the shoulders. The left arm was flexed over the stomach with the hand 'clutching' the femur and the right arm was flexed so that the hand lay beside the mouth. None of the long bones were complete, most of the articulating surfaces/joints were damaged or missing and the cortical bone was very abraded. The nasal area and maxilla were missing, the vertebrae survived as scraps with most of the bodies missing. Changes characteristic of osteoarthritis were recorded in the right shoulder, wrist and upper spine. An increase in porosity and eburnation were recorded on the right clavicle at the acromioclavicular joint and porosity and marginal osteophytes were recorded on the right trapezium where it articulates with the trapezoid and scaphoid. The surviving cervical vertebrae exhibited marginal osteophytes and porosity on the bodies and there were similar changes, including patches of eburnation, on the articulating facets of the upper thoracic vertebrae. Striated new bone, characteristic of a non-specific infection was recorded on the distal left fibula at the insertion for the interosseous ligament. Three wormian\sutural bones were observed along the left lamboid suture.

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
x	x	x	x	x	x	\	\	\	\	3	4	r	x	x	x

A loose maxillary second premolar was recovered. All of the surviving teeth were heavily worn.

The skeleton gives the impression of having been forcibly squashed into the posthole. The position of the body and the size of the cut imply that the man

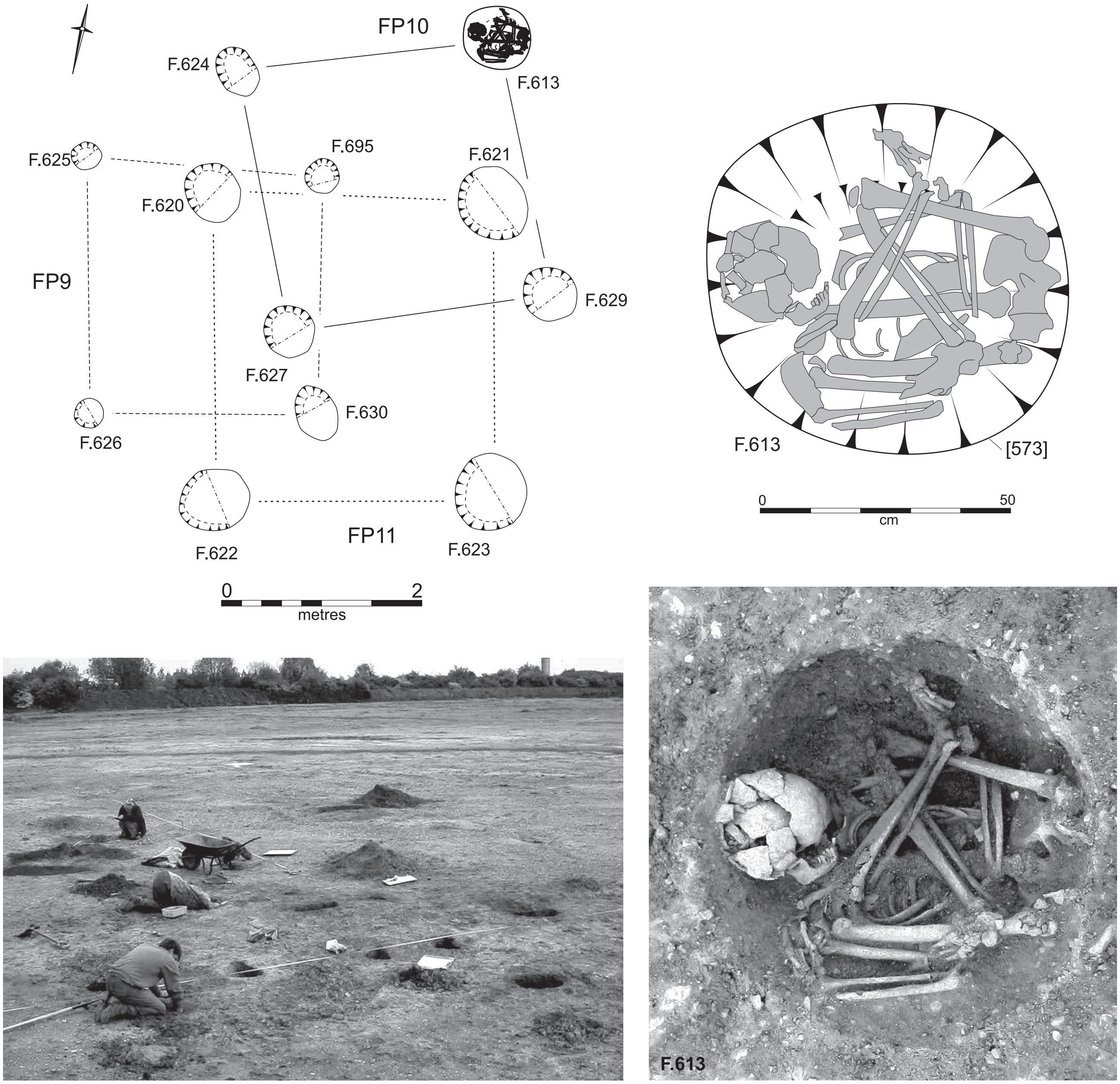


Figure 6.8. *Plan of Four-post Structures 9, 10 and 11 with detail of posthole F.613 and inserted burial.*

was probably bound first. Moreover, the extreme hyper-flexion at the hip joint and missing maxilla and distal phalanges suggests that a degree of decomposition *may* have occurred between death and final burial, allowing the body to be manipulated and forced in to this unnatural position. How long this period was would have been dependent on numerous interrelated factors (Janaway 1996), such as condition of the body at time of death, the season/temperature, whether the body was clothed, naked or 'stored' above or below ground. Bodies left in the open air decay far faster than those immersed in water or buried and different areas decompose at different rates.

In general, the articulations that give way first are the unstable ones involving small bones such as the distal feet and hands. Many of the metacarpals and middle and distal phalanges of the hands and feet of this skeleton were missing, although given the overall levels of preservation it could be argued that this was due to local soil conditions. More convincing as evidence for partial decomposition prior to burial is the position of the hip joints. Duday & Guillon (2006, 127–28) argue that the hip joint is an unstable articulation, since the ligaments at this point are very thin and powerful muscle groups in this area decompose relatively rapidly. Because of the snug fit of the ball and socket joint, these remain in articulation as connecting tissue begins to breakdown, enabling the joint to be manipulated, or hyperflexed, well beyond 'normal' reach. That the body appears to be articulated suggests that the interval between death and burial was probably not very long, perhaps a matter of weeks, or potentially even days if conditions were favourable for rapid decomposition.

The evidence for a brief interlude between death and burial raises interesting questions: why was it not buried straight away, where and how was the body kept? Equally curious is why the body had been squeezed into this abandoned four-post structure. Although there are no *direct* parallels for this context of interment, a recurring Iron Age mortuary rite in Southern Britain and the near continent involved the burial of complete or partial bodies in abandoned 'silo-type' grain storage pits. These contexts of burial and the practices of deposition associated with them, have been widely discussed in the last two decades, with interpretation often highlighting the conceptual/metaphorical connections with fecundity, regeneration and the various symbolic links between the human and agricultural cycles (e.g. Hill 1995; Williams 2003). Examples of this 'pit burial tradition' can be found across southern Cambridgeshire (e.g. Wandlebury (Dodwell 2004b), Harston Mill (O'Brien 2006), Trumpington (Evans et al. 2006; Evans et al. forthcoming) and Clay Farm (Philips & Mortimer 2012)), but tend not to extend into the Fenland region, where large silo-type pits are scarce, even on the inland terraces. Instead, cereal storage here is thought to have been provided by four-post granary structures or, alternatively, the rafters of roundhouses. However, the fact that one such abandoned building became a context for burial at Bradley Fen suggests that there may be parallels with mortuary traditions further south and that a similar suite of ideas associated with fertility and regeneration were being expressed.

Pits, postholes and peat

Excluding features associated with the structures discussed above, a further 128 pits were attributed to the Middle Iron Age, along with 83 postholes and a single grave (Fig. 6.9). The phasing of these features was primarily led by the ceramics (from 36 pits and 1 posthole), though it soon became apparent that a correlation existed between finds of Middle Iron Age pottery and peat-filled features between 1.4 and 2.1m OD. All pits and postholes containing peat deposits in this contour range were therefore assigned to the Middle Iron Age, phasing many features that yielded no finds whatsoever (a further 19 pits and 6 postholes), particularly in the northern half of the settlement swathe. A correlation was also noted between Middle Iron Age pottery and contexts yielding metalworking debris, meaning the presence of slag served as another proxy for dating features without ceramics, especially the four-post structures. Given these relationships, it was decided that other discrete, undated features between the 1.4 and 2.5m contours would also be detailed as part of this settlement, though there is no definite basis for period attribution. This includes a total of 72 pits (56%) and 76 postholes (92%), only 28 of which yielded artefacts (mainly pieces of animal bone). Some of these features may have had an earlier origin, but given their distribution and character, as a working model, it seems fair to assume that most are Iron Age in date.

The vast majority of pits dug within the settlement swathe were shallow features less than 0.50m deep, with none in excess of 1m (diameter range, 0.38–5.80m; depth range, 0.06–1.00m; Fig. 6.10). Four basic pit categories were distinguished:

1. Wells/waterholes (diameter range, 0.80–5.80m; depth range, 0.70–0.100m): The deepest pits in the settlement, including the weathering cone of F.1064 (see Chapter 5), which would have been an open hollow in the Middle Iron Age. Mainly confined to contours below 1.8m OD.
2. Regular profiled pits (diameter range, 0.40–3.05m; depth range, 0.07–0.62m): Pits oval or circular in plan and near-symmetrical in profile. Occurred across the settlement swathe.
3. Irregular profiled pits (diameter range, 0.60–3.40m; depth range, 0.06–0.50m): Pits which were irregular in plan and/or displayed asymmetrical profiles. Generally wide and shallow, sometimes hollow-like in form. Occurred across the settlement swathe and included most intercutting pits.
4. Clay-lined pits (diameter range, 0.38–0.99m; depth range, 0.06–0.35m): Effectively a sub-category of regular profiled pits, but distinguished by their clay lining and described in detail below. Occurred across the settlement swathe with isolated examples above 2.5m OD.

Most of the pits contained one or two deposits of grey silt, with the waterholes displaying more complex fill sequences. These had peat in their upper profiles, with peat also filling many of the smaller features on lower-lying contours. With a few exceptions, there were no clues as to the original function of pits or the scatter of individual postholes (diameter range, 0.12–0.70m;

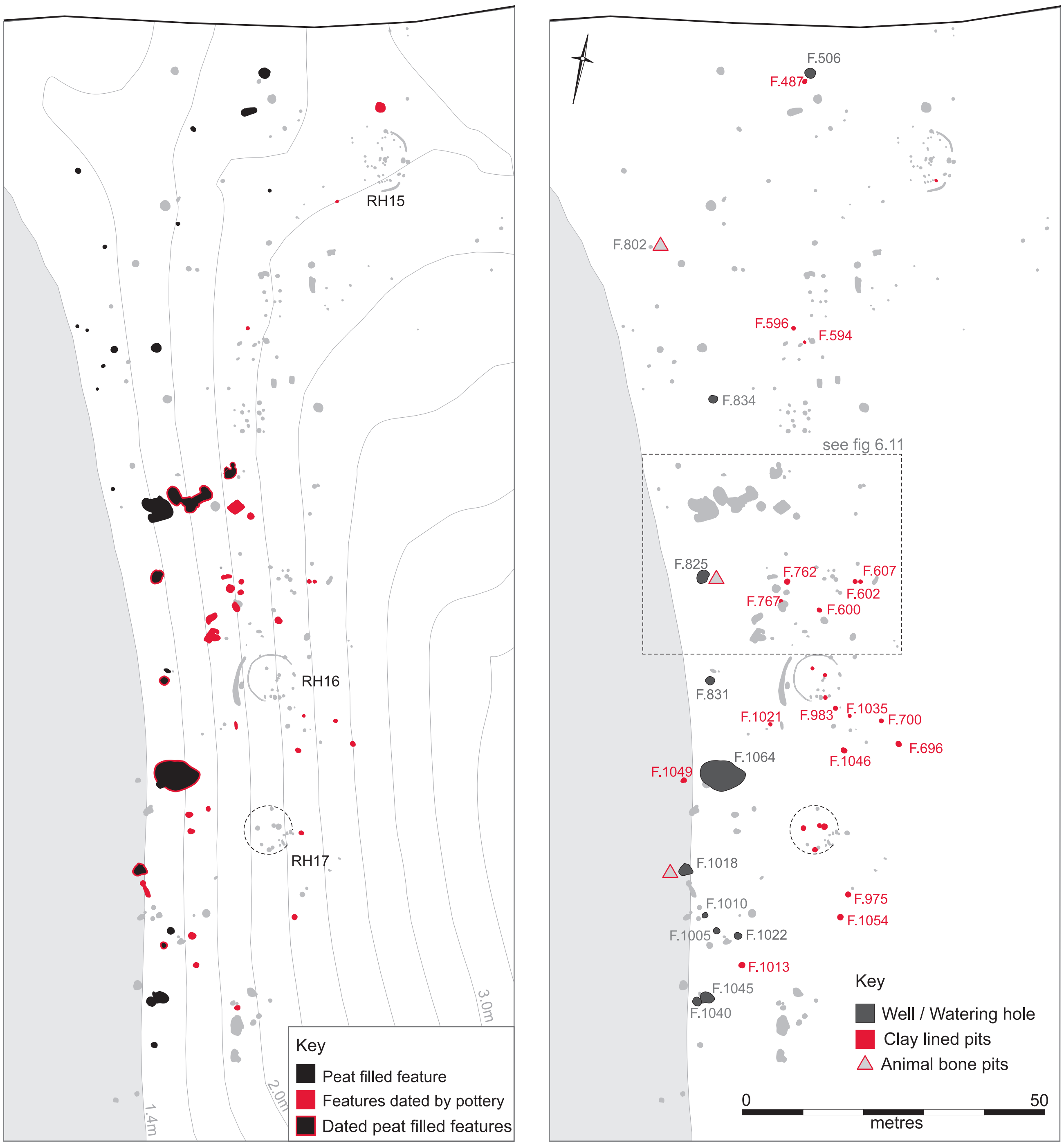


Figure 6.9 *Plan of Middle Iron Age pits and postholes (excluding features associated with structures).*

depth range, 0.03–0.37m). Even where finds were encountered, in most instances these failed to shed any light on the purpose of the cuttings themselves. In general, the majority of artefact assemblages were small and scrappy, comprising occasional fragments of animal bone, pottery and/or burnt stone. The character and composition of these materials probably reflect conditions on the settlement, with low levels of refuse strewn across the site, some of which became caught in features during construction and/or backfilling.

Against this background, and judging by pits which have yielded more substantial dumps of mixed,

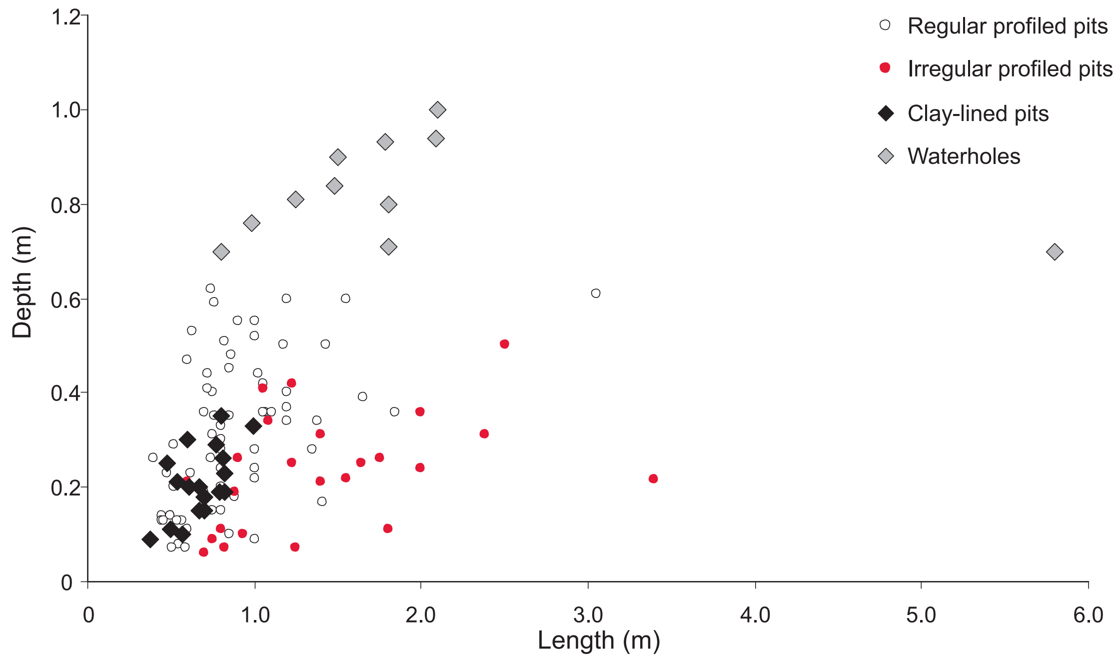


Figure 6.10. *Middle Iron Age pits and postholes – depth/dimension diagram.*

artefact-rich refuse, there was also likely to have been a number of established midden piles between the roundhouses – refuse heaps drawn on to back-fill redundant features. Although it was rare for these deposits to include just one category of find, as will be shown below, pattern is discernible in the density and distribution of certain materials around the settlement, which hint at the organization of activities and practices. Pattern can also be observed in the arrangement of different types of feature across the gradient of the site, as one moves downslope towards the wet-edge. Described below then are the key features in these various zones from dry ground to wet.

Key features on the dry ground contours

Furnace and features yielding metalworking debris

One of the smallest but most significant features found within the settlement swathe was the base of a metalworking furnace, F.611 (Figs 6.11 & 6.12). This circular posthole-sized feature, which measured just 0.48m in diameter and 0.23m in depth, was located 12m north of Roundhouse 16 on the 2.3m contour. The sides of the clay-lined furnace were scorched red, whilst the fill comprised black charcoal-rich silts packed with pieces of slag and clay refractory material (2566g in total). Surrounding the furnace was a scatter of small pits and postholes (F.589–90, F.604–06 and F.642), presumably belonging to a light structure of some kind. F.642, located immediately adjacent to the furnace, was a rake-out pit filled with bands of charcoal and ash (0.53m in diameter and 0.20m deep). Further to the east were two clay-lined pits, F.602 and F.607, which both yielded pieces of slag and may have been used for quenching. Archaeomagnetic dating of the furnace lining suggests that the last firing took place between 310 and 80 BC (see Noel below).

Debris from F.611 and its associated metalworking activities were widely scattered across the site, with the core of the distribution centred upon features located between Roundhouse 17 and Four-post Structures 9–11 (Fig. 6.4). These included material from iron smelting, smithing and copper alloy casting activities, with the finds often mixed amongst pieces of animal bone, pottery and/or burnt stones. They comprised nodules of slag, crucible fragments, smithing hearth bottoms, unprocessed ore and hammerscale, which are detailed in full by Timberlake, Doonan & Hommel later in this chapter. By far the largest assemblage derived from pit F.597, which contained a dump of just under 46kg of slag and other metalworking debris. The pit was located 19m to the northwest of furnace F.611 (Fig. 6.11). It was shallow and oval in plan (2.28m long, 1.70m wide, 0.37m deep), with an undulating base cut into an earlier tree-throw (F.706). The dark mottled fill was almost entirely made of ash, charcoal and metalworking debris, capped by a thin layer of peat.

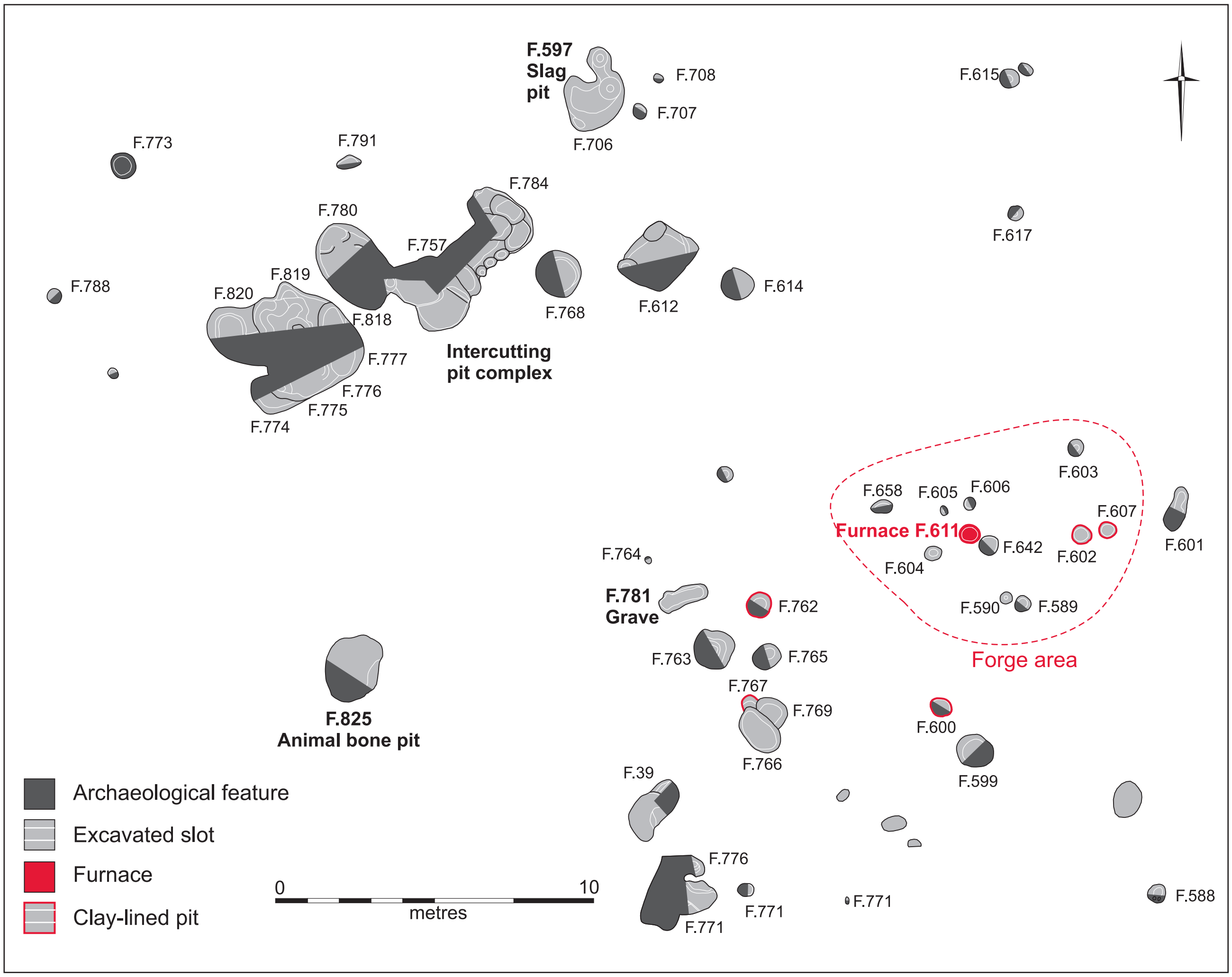


Figure 6.11. *Plan of furnace and features yielding metalworking debris.*

The architecture and functioning of furnace F.611 (Simon Timberlake)

Structures associated with iron smelting are rarely found intact within the archaeological record and this single example (F.611) of a furnace from Bradley Fen is no exception. The absence of any fired and slagged (vitrified) clay lining and also the presence of a reduced and blackened interior, suggests the feature could have been the slag pit underlying a clay-walled shaft furnace constructed above ground level (see Tylecote 1986). This pit would have lain below the level of the tuyere entry, therefore well below the hottest part of the furnace and the area of formation of the iron bloom (a level to which the walls of the furnace would have been reduced at the end of each smelt in order to facilitate the removal of the iron).

Despite this, the depth of the firing (semi-vitrification) and heat penetration (i.e. colour zones black > brown > orange > pink, some 50mm into the natural) on the sides of the pit suggest some sort of long-term heating effect resulting from the accumulation of slag. This is an indication, perhaps, of the repeated filling and emptying of the pit, as well as the rebuilding of the furnace superstructure above it. Nothing of the latter survives, in part due to subsequent soil truncation. However, the presence of a rake-out pit (F.642) on the south-western side implies that this must have been the furnace front and perhaps therefore the point of entry of the tuyeres. It has been suggested that slag pits were packed with wood or straw which gradually burnt out as the iron slag slowly descended and then filled them (Starley 1999; Paynter 2007). This ensured that all the furnace charge remained within the hot zone of the furnace during smelting, whilst at the same time facilitating the much easier removal of the congealed yet non-accreted slag cake afterwards. Fragments of

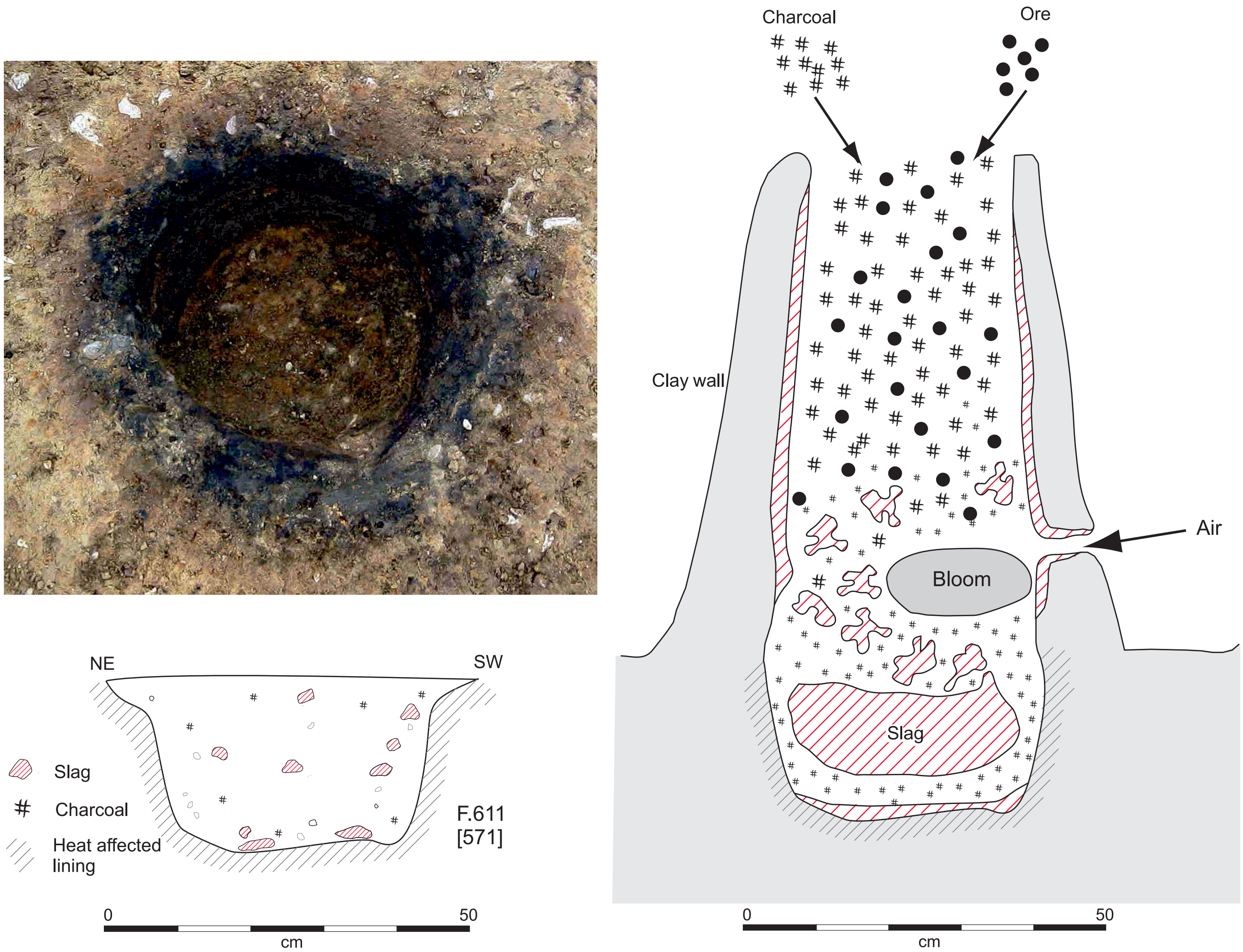


Figure 6.12. *Photograph, section and reconstruction of furnace F.611.*

this burnt wood alongside charcoal, ash and possibly some of the original broken up slag (consisting of furnace conglomerate, slag nodules and slag runs) were recovered from the silt that had been washed back into this emptied slag pit (F.611) following its last use.

The suggested reconstruction of the furnace (based on Dungworth 2011, fig. 9.2) is shown in Fig. 6.12. The internal diameter, based upon the dimensions of the everted lip of the slag pit, was probably *c.* 0.5 m, whilst the clay walls (based upon the debris recovered from F.597 and other similar examples) were probably between 50 and 100mm thick at the base and 30 and 50mm at the top, suggesting a structure around 1m high. The potential furnace capacity would thus have been around 200 litres, which, when accommodating a charge of *c.* 27 litres (perhaps 35kg) of ore and 173 litres of charcoal, would, following smelting, have yielded somewhere in the region of 3–10kg of iron metal and 15–30kg of slag. This furnace may well have been re-used 6–10 times, thereby satisfying the entire iron production phase recorded at the Bradley Fen settlement.

Archaeomagnetic dating of the last firing event of F.611 (Mark Noel)

Samples taken from the clay lining of furnace F.611 were found to contain an intense archaeomagnetism which had clearly been orientated by the Earth's magnetic field. Demagnetization tests indicated a moderate stability of the remnant magnetism. Hence, the data indicate that F.611 was heated above the magnetic 'blocking temperature' of magnetite during use (namely 580°C) and has survived largely undisturbed. Archaeomagnetic vectors in the feature were averaged and compared to the UK Master Curve for the period 1000 BC to AD 600. The results suggest that the last firing took place between 310 and 80 BC, with a date centred upon 190 BC, corresponding to the Middle Iron Age.

The deposit of archaeomagnetic interest comprised an 80mm wide zone of burnt clay lining the *in situ* furnace bowl. Following excavation to expose the optimum unweathered material (using non-magnetic tools), 17 oriented samples were recovered using the *button method* (Clark et al. 1988). This technique employs a 25mm, flanged plastic disc to act as a field orientation reference, sample label and specimen holder inside the laboratory magnetometer. Buttons were glued in position using a fast-setting epoxy resin with their surfaces set horizontal. Finally, orientation arrows were marked using a sun compass.

After drying, consolidation and cutting in the laboratory, the natural remanent magnetization (NRM) of 13 samples of sufficient volume were measured with a Molspin fluxgate spinner magnetometer (Molyneux 1971) with a minimum sensitivity of around $5\times10^{-9}Am^2$. Remanence direction were corrected for the solar orientation using a computer program which takes account of the site's coordinates and time GMT: these results are listed in Table 6.3 and plotted on a stereogram in Fig. 6.13.

Generally, the NRM will comprise a primary magnetization (in this case presumed to be of thermal origin), together with secondary component acquired in later geomagnetic fields due to

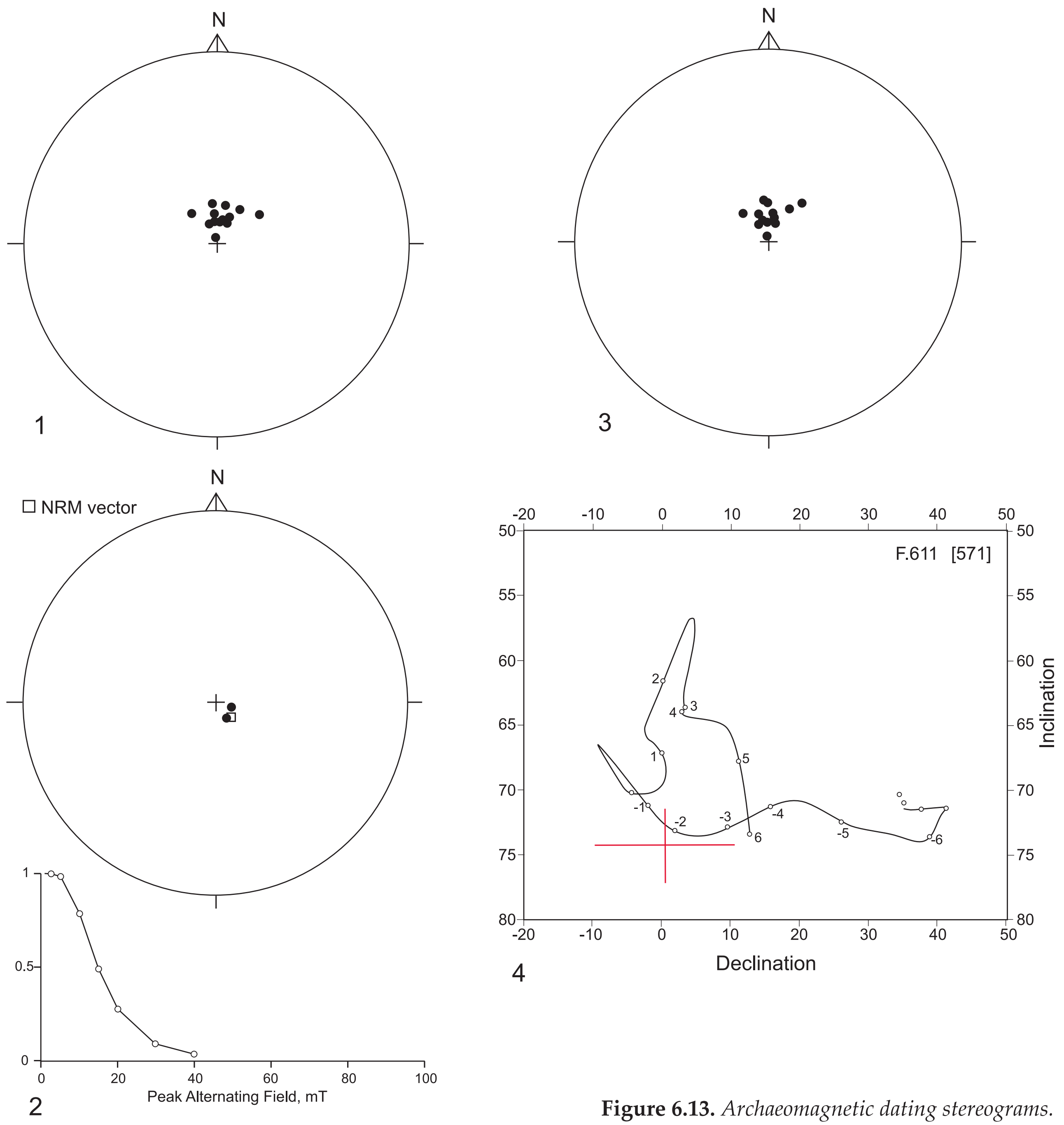


Figure 6.13. *Archaeomagnetic dating stereograms.*

Table 6.3. *Archaeomagnetic results from fired clay lining [571] of F.611. LITH = lithology, FCL = fired clay, D = declination, I = inclination, J = intensity in units of mAm^{-1}×10^{-2}, A.F. = peak alternating demagnetizing field in milliTesla, K = precision parameter, cse = circular standard error, alpha95 = semi-angle of the 95% cone of confidence. Samples whose data are missing in the table above were rejected as being too small for analysis.*

Sample	LITH	J	D	I	A.F.	D	I
WHI1	FCL	111.6	33.3	66.2	2.5	31.0	67.4
WHI2	FCL	22.3	354.2	66.2	2.5	353.9	66.0
WHI3	FCL	311.2	55.3	60.3	2.5	39.7	60.5
WHI4	FCL	101.6	25.1	73.1	2.5	9.1	73.8
WHI5	FCL	74.4	24.9	76.3	2.5	12.3	76.2
WHI6	FCL	Too small					
WHI7	FCL	167.9	355.8	76.8	2.5	341.3	77.0
WHI8	FCL	Too small					
WHI9	FCL	75.0	354.8	72.2	2.5	340.1	72.2
WHI10	FCL	81.5	6.1	77.1	2.5	354.5	77.7
WHI11	FCL	169.8	340.2	77.5	2.5	331.0	77.7
WHI12	FCL	141.0	12.3	66.9	2.5	356.9	67.0
WHI13	FCL	Too small					
WHI14	FCL	187.1	12.2	76.2	2.5	12.7	77.3
WHI15	FCL	69.0	348.3	86.2	2.5	341.9	86.4
WHI16	FCL	Too small					
WHI17	FCL	94.4	320.4	66.7	2.5	318.6	67.1
Mean of samples						**0.2**	**74.3**
At Meriden						**0.6**	**74.2**
					K = 64.8	**cse = 2.8**	**Alpha = 5.2**

diagenesis or reheating. Usually, a weak viscous magnetization is also present, reflecting a tendency for the remanence to adjust to the recent field. If the secondary components are of relatively low stability, then removal by partial demagnetization will leave the primary remanence of archaeological interest. A pilot specimen with typical NRM and lithological characteristic (WHI 10) was demagnetized incrementally, up to a peak alternating field of 40mT and the changes in remanence recorded in order to identify the components of archaeomagnetism and their stability (Fig. 6.13). From a study of the pilot sample behaviours, an alternating field of 2.5mT was chosen which would provide for the optimum removal of secondary component of magnetization in the remaining samples. After partial demagnetization in this field, sample remanences were re-measured and the results are shown in stereogram of Figure 6.13.

Overall, the samples were found to contain an intense natural remanent magnetization, consistent with the burnt clay containing a substantial proportion of ferrimagnetic iron oxides, such as titanomagnetite (Table 6.3). In Figure 6.13 it can be seen that the samples have yielded NRM vectors which have clearly been orientated by the Earth's magnetic field and with inclination typical for the sampling latitude. Figure 6.13 shows the result of the stepwise demagnetization test performed on sample WHI 10. It is evident that the intensity of remanence decays very rapidly with rising field strength, although the orientation is moderately stable to a peak of 20mT. These results suggest that the NRM resides in large multidomain grains of titanomagnetite whose intrinsic magnetic stability is low. Hence, the scatter in vectors seen in Figure 6.13 is thought to be due to partial instability of magnetization, combined with post-firing movement of the furnace lining and micro-movement of the particles within the fired clay. A nominal 'cleaning' field of 2.5mT was applied to the remaining samples, sufficient to remove any viscous magnetization acquired in the recent historic Earth's field during transport to the laboratory.

Partial demagnetization ('magnetic cleaning') of the sample set induced only minor changes in the grouping of the archaeomagnetic vectors (Fig. 6.13). The mean archaeomagnetic vector has been computed in Table 6.3 and corrected to Meriden, the reference location for the UK Master Curve. In Figure 6.13, the adjusted vector is compared to the UK Master Curve for the period 1000 BC to AD 600. The closest approach to the Curve occurs during the second century BC, consistent with a last-firing date centred on 190 BC. The intersection of the vector error envelope with the prehistoric section of the Curve yields an actual date range for the last firing event of 310–80 BC.

The metallurgical debris from slag pit F.597 (Simon Timberlake)

The study of the slag assemblage within pit F.597 provides us with a microcosm of the metallurgical activity taking place in this Middle Iron Age fen-edge settlement. The 46kg of iron slag recovered from this dump contained a minimum of 30kg of iron smelting/primary bloom smithing slag in the form of fragments of up to nine *slag cakes* defining the average diameters of these furnace bottoms (which ranged from 230 to 320mm), numerous fragments of broken-up but dense *furnace conglomerate* containing voids formed from the impressions of the wood or charcoal filling the slag pit(s), *dense slag nodules* and slag runs (*slag runnel*)

Table 6.4. *Categories of metallurgical debris within F.597 (weight in grams). FC + SC = furnace conglomerate + slag cake; DN + LDN + SRN = dense slag nodule + low density nodule + slag runnel; SR + FR = slagged refractory + fired refractory (hearth lining); SHB = smithing hearth base; HS = hammerscale (visually identified from amongst 0.038kg of magnetics recovered from 4 bulk samples); Crucible = crucible associated with Cu-alloy casting.*

Context (quadrant)	FC + SC	DN + LDN + SRN	SR + FR	SHB	HS	Crucible
568	3772	1889	3515	680	-	-
568 (NE)	1596	2013	2534	-	-	10
568a–b (NE)	210	1290	1455	1216	-	-
568c (NE)	2677	2811	6237	924	6.5	-
568 (NW)	-	1297	1219	542	3.5	-
568d (SW)	200	1271	538	-	0.1	-
568 (SE)	240	2345	1024	-	6.6	-
568a	918	1044	1281	86	-	-
Total (kg)	**10430**	**13960**	**17803**	**3760**	**17**	**10**

broken off the exteriors of iron blooms/ slag masses during the primary smithing, and finally, large quantities of the porous charcoal and iron oxide-rich *low density slag nodules* (slag lumps), most of which would have come from the upper fills of these furnaces. Within this same assemblage we find evidence for *secondary iron smithing* (i.e. both forging (platy hammerscale) and welding (spheroidal and platy hammerscale)) in the form of six or seven *smithing hearth bases* (SHB), each of around 100–120mm diameter (total 3.76kg), plus 17g of *hammerscale* identified amongst the magnetic residues recovered from four bulk samples).

However, by far the largest category of ironworking debris was the *slagged* and *fired refractories* (FR and SR); these consisted of the linings of hearth and furnace walls which have reacted or become fused with iron slag and which are commonly referred to as fired clay (FC) or vitrified clay surfaces (VCS). No fragments of tuyeres were identified amongst this material, although several heavily vitrified aperture rims suggest that pipes of around 50–60mm external diameter had been inserted into the furnace walls. This broken-up refractory material (17.8kg) was probably dumped here following the periodic dismantling of the *c*. 30mm (20–50mm) thick walls of the smelting furnace(s) during the removal of the iron blooms, yet it is not always possible to distinguish this sort of walling from the generally thinner, but similarly vitrified, clay lining of the smithing hearths. For this reason refractories have been omitted from the overall calculations on the amount of bloomery slag produced (Table 6.4) and, as a result, the evidence of iron smelting at this site might be under-represented. Little can be said about the very small amount of undiagnostic broken crucible (just 10g) recognized within this particular feature assemblage, except to point out that this serves to emphasize the cross-over, both in activity area and specialism, between iron production, smithing and copper alloy metalworking in Iron Age settlement contexts.

From a functional perspective, the opportunistic reworking of tree-throw F.706 into a dumping pit (F.597) for a small number of broken-up iron furnace structures (and their associated slag accumulations), attests to the small-scale, simple nature of the iron production carried out at Bradley Fen. At some of the much larger iron production sites we see the construction of slag heaps within the vicinity of the furnaces (as at the Middle Iron Age site at Moore's Farm, Welham Bridge, East Yorkshire (Halkon 1997)), or else the dumping of slag within pits or in large infill spreads (as at the Late Iron Age iron smelting settlement of Crawcellt, in northwest Wales (Crew 1998)). Yet here, at Bradley Fen, some 91% of the iron slag has been dumped into a single feature, consisting of just 2 cubic metres of material. The lack of scorching on the underlying soil surface suggests none of this was dumped directly following its raking out from the still hot furnace. Rather pit F.597 acted as a final dump for the slag waste produced during a succession of different iron smelting operations. The analysis of this slag pit by quadrants and context (in the form of excavated spits or lenses) suggests a predominant tipping direction from the north, in particular from the northeast, with many of the denser slag pieces ending up in the middle of the pit and in the lower ashy silt and charcoal-rich layer, with the lighter refractories deposited around the edges and in the top, close to the interface with the peat (Figs 6.14 & 6.15). Likewise we find most of the smithing hearth waste and also the crucible, ending up within this same north-eastern sector; the suggestion being that most of the slag was dumped here episodically, the result of a number of distinct phases of smelting and ironworking carried out during the tenure of the Middle Iron Age settlement.

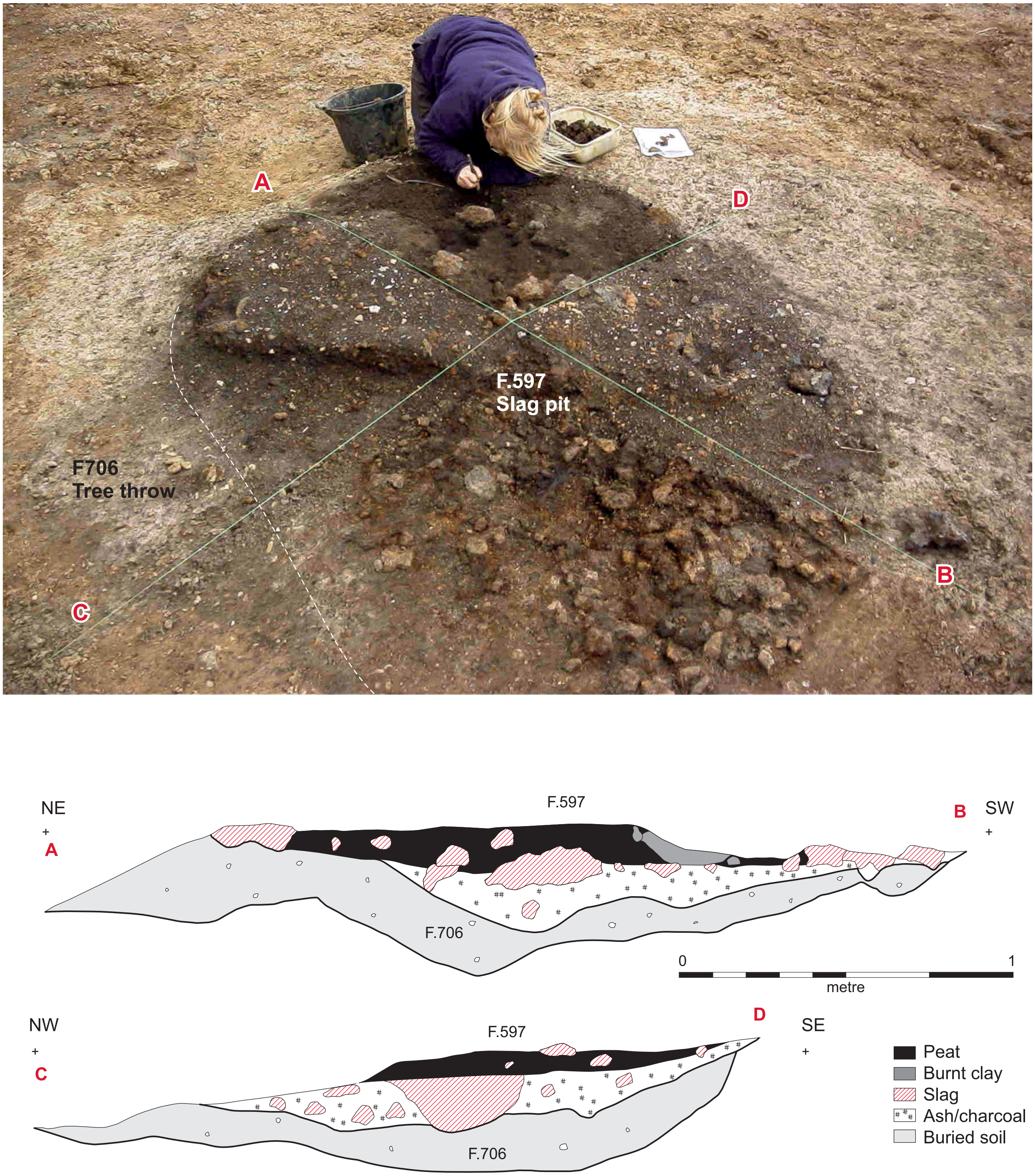


Figure 6.14. *Photograph and sections of slag pit F.597.*

In its entirety, this slag dump represents the production of about 25kg of iron from *c.* 50–60kg of what was *possibly* locally sourced bog iron ore (goethite/limonite); the latter extracted from the base of the peat deposits occurring along the fen-edge, but probably first roasted and enriched prior to smelting (see full metalworking report below). The 3.93kg of smithing waste (SHB and hammerscale) might reflect part, or

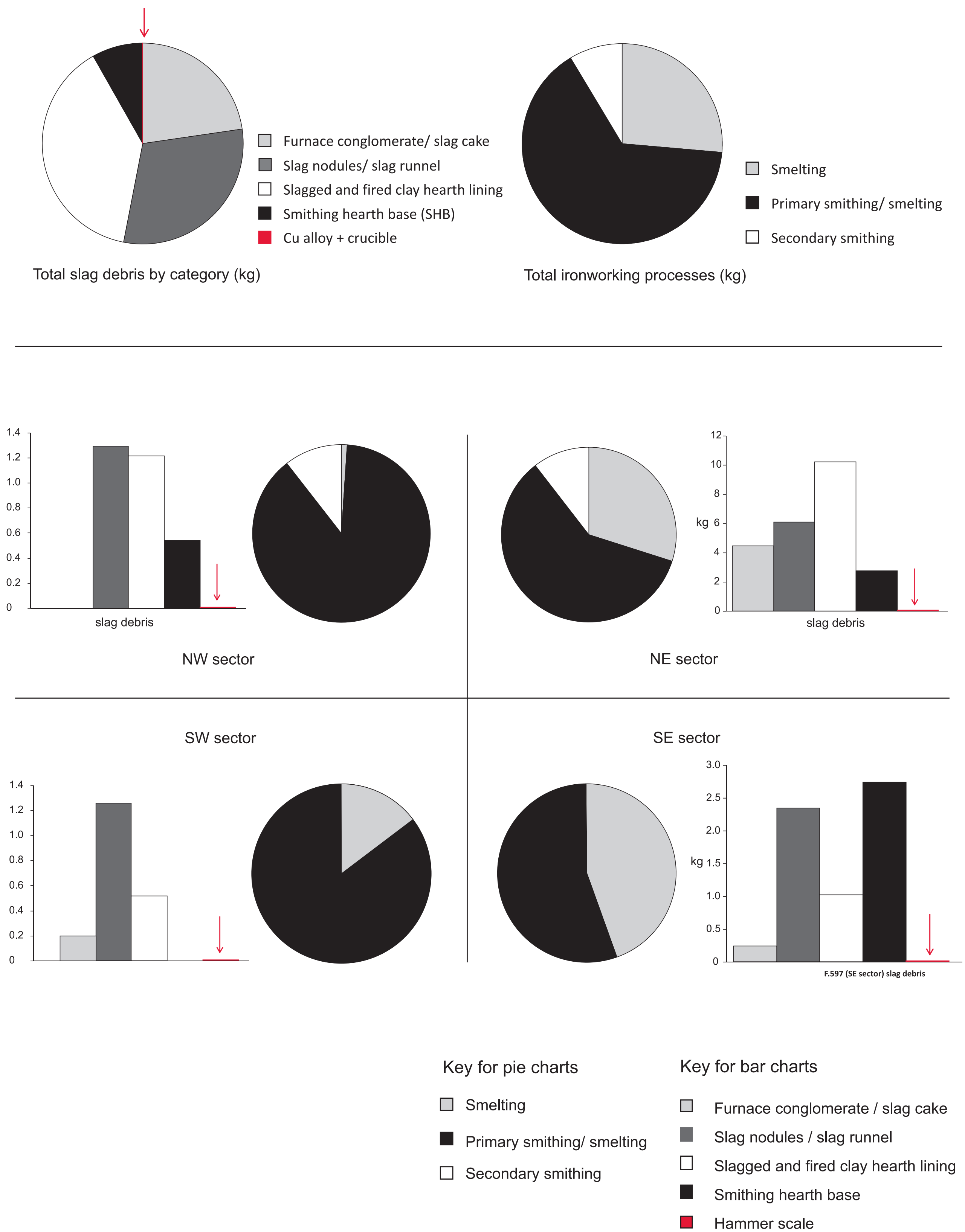


Figure 6.15. *Slag pit F.597 – distribution of slag debris by sector.*

Table 6.5. *Summary of finds from clay-lined pits (* denotes pits within roundhouses). Overall, 89% of period's burnt stone (by wt) derived from the 21 pits, along with 35% of pottery sherds, 8% of animal bones and 12% of fired clay fragments.*

Pit	Pottery (no./wt)	Burnt stone (wt)	Bone (no./wt)	Slag (no./wt)	Burnt clay (no./wt)	Notable finds
F.594	-	1.8kg	-	-	-	
F.596	8/58g	3.9kg	-	-	-	
F.600	-	15.0kg	-	-	-	
F.602	83/986g	<0.1kg	15/64g	1/195g	1/10g	
F.607	23/113g	9.0kg	3/4g	1/26g	-	
F.696	5/62g	5.2kg	-	-	4/6g	
F.700	13/81g	8kg	-	-	-	
F.750*	-	0.2kg	-	-	-	
F.751*	-	4.2kg	-	-	5/372g	Loomweight; burnt quern; rubber stone
F.762	3/13g	0.8kg	-	-	-	Burnt quern
F.983	15/110g	-	2/8g	-	-	
F.984*	2/8g	0.1kg	5/20g	-	-	
F.988*	3/6g	-	7/25g	-	-	
F.992*	20/181g	-	7/22g	-	8/20g	Worked bone point
F.996*	-	0.4kg	3/4g	-	3/10g	
F.1013	3/24g	-	4/50g	-	5/20g	
F.1021	-	-	1/158g	-	-	
F.1035	11/28g	-	-	-	-	
F.1046	4/39g	-	1/117g	-	-	
F.1054	1/6g	-	-	-	-	
F.1096*	11/188g	1.2kg	13/235g	-	2/1058g	Loomweight
Total	**205/1903g**	**49.8kg**	**61/707g**	**2/221g**	**28/1496g**	

all of the smithing required to turn this billet iron into useable objects, implying a level of production purely designed for local needs.

Clay-lined pits

A total of 26 clay-lined 'cooking pits' were found within the core of the settlement swathe, with two further isolated examples on the higher ground above the 3.5m contour (F.682 and F.686). These distinctive sub-circular shallow pits displayed either bowl-shaped profiles or had short, steeply sloped sides and flat bases (diameter range, 0.38–0.99m; depth range, 0.06–0.35m in depth). The pits were lined with a single layer of impervious un-fired blue-grey clay between 0.02 and 0.07m thick and were backfilled with mid-grey silty-sand, commonly containing quantities of burnt stone, charcoal and other scraps of refuse including pottery, animal bone, burnt clay and slag (Table 6.5), with only seven empty examples (F.487, F.542, F.682, F.686, F.767, F.975 and F.1049). The most abundant find was burnt stone, present in 12 of the clay-lined pits. In all, 50kg of fire-cracked stone were recovered from the pits, representing 89% of all burnt stone retrieved from features attributed to the Middle Iron Age (Fig. 6.16). Though the hearths upon which these stones were heated have not survived, their presence within the major concentrations of clay-lined pit is indicated by ash- and charcoal-rich 'rake-out' features F.609, F.610 and F.995 (Fig. 6.4).

In general, it is assumed that the clay-lined pits were constructed to hold and heat water for cooking, with hot stones being dropped in for this purpose. Alternatively, some may also have been used in tanning or dyeing and, potentially, others could have functioned as pits for quenching during metalworking. On this note, it may be no coincidence that five of the clay-lined pits (F.600, F602, F.607, F.762 and F.767) were located within 9m of furnace F.611 and that two of the closest, F.602 and F.607, yielded fragments of slag (see above). Elsewhere, however, Webley (Webley 2007b, 141) has drawn attention to the close spatial relationship between clay-lined pits and roundhouses,

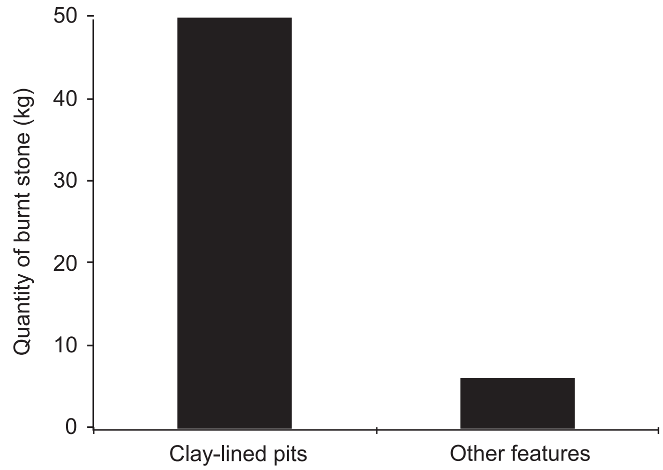


Figure 6.16. *Burnt stone. Graph shows total quantity of burnt stone from clay-lined pits (14 features) as compared to other middle Iron Age features (17 features).*

particularly in regards to their position within household interiors. The distribution at Bradley Fen broadly conforms to this pattern, with 8 of the pits located within the perimeter of Roundhouses 15–17 and a further 12 lying within 20m from the centre of these buildings.

Characterizing the burnt stone contents of clay-lined pits, a case study of pit F.696 (Simon Timberlake)

Some 5.17kg of burnt stone (35 pieces) from F.696 were examined for the purposes of characterizing the types of glacial erratic-sourced cobbles used. These cobbles comprised 12 different sandstone lithologies ranging from Tertiary to Cretaceous sarsens, Lower Greensand, Lower Cretaceous and Middle Jurassic Estuarine and Deltaic Series sandstones from Eastern England, alongside a smaller component of far-travelled rocks consisting of a single piece of quartz schist and a larger cobble of dolerite (altogether some 12% weight of the assemblage). This selection of well-rounded cobbles of between 50mm and 120mm diameter (100–600g in weight) would seem to be the typical measure of the sorts of stone selected and collected from the local gravels for the purposes of burning: the cobbles were then used to boil water and cook food within individual clay-lined pits.

Burial F.781

The burial of an adult male was found in a shallow, elongated grave in the centre of the settlement swathe, *c.* 15m northwest of Roundhouse 16 between the 1.8 and 2.0m OD contours (Fig. 6.17). The grave cut was akin to a hollow, with slightly irregular and diffuse edges measuring 1.61m in length, 0.64m in width and 0.17m in depth. The body lay in a prone, flexed position roughly perpendicular to the fen-edge, with the head downslope to the west. The fill was a pale grey-brown sandy-silt and yielded 10 sherds of Middle Iron Age pottery (69g), 2 fragments of crucible (6g) and hammerscale (<1g). The presence of metalworking waste within the grave fill is of note, suggesting the burial was broadly contemporary with furnace F.611 and the burial in Four-post Structure 10, which was also accompanied by pieces of slag (see above).

Intercutting pit complex

Around 25m north of Roundhouse 16, 10 irregularly-shaped pits were arranged in a broadly northeast–southwest line between the 1.5 and 2.0m contours (Fig. 6.11). This pit complex comprised two adjacent intercutting clusters, the lowest-lying of which consisted of seven scoop-like hollows (F.774–77 and F.818–20), with cuts measuring up to 2m in length and 0.42m in depth. The pits were evidently worked in close succession and, although clear stratigraphic relationships could not be discerned, all were filled with thin deposits of dirty sandy-clay gravels, capped by a homogenous layer of peat. A similarly haphazard arrangement of shallow cuts characterized the second, larger pit cluster to the east. This cluster was numbered

Figure 6.17. *Burial F.781.*

F.757, F.780 and F.784, although it proved difficult to distinguish where one cut ended and the next started. The pits had irregular profiles and undulating bases, measuring up 3.40m in length and 0.42m in depth. The fill sequence was more or less similar to that in the western group, though each pit contained lenses of grey silty-sands with localized charcoal-rich spreads and tips. These corresponded with find concentrations, with the cluster yielding fragments of pottery (17 sherds, 151g), animal bone (17 fragments, 47g), burnt stone (0.1kg) and metalworking debris (34 pieces, 183g) including slag and crucible fragments.

The purpose served by this pitting is hard to determine. Although the cuttings were too shallow to suggest they were dug as waterholes, the peaty deposits filling the western pit group indicate that waterlogged conditions soon encroached upon the lowest-lying features. However, in light of their irregular profiles, it seems more likely the pits functioned as extraction hollows, dug to remove gravels for floors or yard surfaces and to stabilize localized areas of saturated ground.

The human remains (Natasha Dodwell)

The skeleton (a mature adult male, height 1.66m (5′5 ″)) lay in a shallow cut with his upper body prone and legs flexed to the right. The head was at the western end of the grave, with the right arm extended and the left arm flexed below the body with the hand touching the right upper arm. The bone was in good condition although all of the long bones had post-mortem breaks and many of the joint surfaces had either broken off, were damaged or were missing. There was also some rodent damage to the cortical bone. Changes characteristic of osteoarthritis were recorded on the articulating facets of several cervical vertebrae and on the bodies of the lower thoracic and lumbar vertebrae. A smooth, raised callous around the distal shaft of the left ulna, *c*. 40mm from the head is evidence of a well-healed fracture.

8	x	x	5	\	\	2	1	1	2	3	4	5	6	x	x
8	7	x	5	4	3	\	1	\	2	3	4	5	x	7	8

Slight deposits of calculus were recorded on the surviving dentition and the anterior dentition was heavily worn.

Key features on the wetland fringe

Waterholes and hollows

The lower damp-ground contours of the settlement, below *c.* 1.8m OD, were home to a series of fairly small waterholes and irregular hollows. As in the Early Iron Age, these were not cut to any great depth as the water-table was perched high in this zone. Those 10 features classed as possible wells/waterholes measured just 0.70–1.00m in depth and were dotted along the wet fringes with the majority lying between the 1.4 and 1.6m contours. Six were located toward the southern end of the settlement swathe (F.1005, F.1010, F.1018, F.1033 F.1040 and F.1045), with a further three spread evenly across the centre of the site (F.825, F.831 and F.834) and a single isolated waterhole to the north (F.506) – the only example above the 1.8m contour. These features were typically circular or oval in plan (diameter range, 0.80–2.10m), with steep, occasionally undercutting sides and multiple fills of silts and slumped gravels. The absence of wattle-linings, stake revetments or re-cuts suggests that efforts were not made to prolong the use-life of individual features, no doubt because groundwater levels were high and relatively easy to tap. Indeed, the frequency of waterholes suggests that most were probably short-lived, with complete replacement and relocation being favoured over maintenance.

Finds from the waterholes mainly consisted of animal bone, particularly from cattle, with a large dump of butchery waste in 'bone pit' F.1018, detailed below. Scraps of pottery, fired clay, burnt stone and slag were also present within some of the waterholes, though the only significant 'midden-type' refuse assemblage derived from F.1022. This yielded a combination of 32 sherds of pottery (364g), 60 fragments of animal bone (490g), 0.3kg of burnt stone and a large assemblage of fired clay (129 pieces, 1475g), made up of what appear to be fragments of oven lining. However, waterholes F.506 and F.1045 contained no finds whatsoever. The former cut through some of the upper fills of the Early Iron Age Group A pit complex discussed in the previous chapter. This area of once intense pitting was likely to have been a damp, partially silted hollow by the Middle Iron Age and F.506 may have been dug to take advantage of the depression. The other feature still extant from the earlier first millennium BC was the upper profile of 'boat-pit' F.1064 (see Chapter 5). The erosion of this feature had resulted in the formation of a wide, waterlogged hollow, which judging by stratified finds of Scored Ware pottery in the upper fills (nine sherds, 285g in total from the tertiary silts), was still potentially around *c.* 0.70m deep at its centre. This was equivalent to the depth of several Middle Iron Age wells discussed above and probably served as a waterhole accessible to livestock.

Bone pits and body parts

Two pits located at either end of the settlement swathe were found to contain large dumps of freshly butchered, disarticulated animal bone. Both features were located on the damp-ground contours between 1.4 and 1.6m OD, but displayed different form and fill characteristics. Pit F.802 was a small circular peat-filled feature, which lay at the northern end of the site. Although it measured just 0.63m in diameter and 0.23m in depth, the pit was packed with 71 pieces of bone (2844g, Fig. 6.9), deriving from a minimum of three cows, two pigs and a sheep. Butchery marks were observed on a number of bone fragments, with cut marks on joint surfaces and several cattle limb bones chopped through the mid-shaft for marrow-fat removal.

The species representation and techniques of butchery evident from remains in F.1018 were broadly consistent with those from F.802, although the context itself was rather different, as was the quantity of remains interred. Located at the opposite end of the settlement scatter on 1.4m contour, F.1018 was one of the largest discrete pits/waterholes on the site, measuring 2.10m in length and 1.00m in depth. The pit had steep sides, a flat base and an unweathered lower profile filled with grey silts and mottled orangey grey-brown clay-sands. These were sealed by slumping and stabilization deposits, capped by peat-mixed clays that yielded a single sherd of Scored Ware pottery. The base of the pit, however, was covered by heap of disarticulated animal bone which had entered as a single dump. As detailed by Rajkovača in Figure 6.18, this was the largest discrete faunal assemblage recovered from the settlement, accounting for 61.6% of all bone (by weight) attributed to the period. Although it included the remains of pigs, sheep and red deer, it was dominated by cattle bone, with no fewer than nine individuals represented.

Butchery patterns indicate the systematic processing of carcasses for meat and marrow extraction. Moreover, the distinctive manner in which cattle pelves were split suggests the same individual may have been responsible for the slaughter and simultaneous processing of the nine animals (Fig. 6.19). Certainly, the condition of the bone and the general character of the deposit imply that this was debris generated in a single mass cull and butchery event – one which would have yielded vast quantities of beef. Though this shares similarities with the deposits in F.802, its size and composition has closer parallels with the bone dumps in the waterholes detailed in Chapters 4

Waterhole F.1018

Bone dump composition (Vida Rajkovača)
Out of the 224 (19,021g: 18,654g from the primary fill) fragments of animal bone from F.1018, 178 (79%) were assignable to species (Table 6.6). Cattle remains dominated, accounting for 167 of the identifiable fragments (94%). More significantly, the count of *minimum number of individuals* (MNI) suggests that the remains of no fewer than nine cows were incorporated in the dump. Age estimations based on the epiphyseal fusion data indicate that the majority were culled as adult animals with a small proportion slaughtered as sub-adults (in detail, 0% of the cattle were <16 months of age at death; 16% were +16 months–<28 months; 74% were +28 months–<3.5 years and 10% were +3.5 years). Correspondingly, analysis of mandibular tooth wear produced a somewhat similar, albeit slightly less reliable (based on six ageable mandibles) set of results – the peak corresponding to adult animals. Overall, this age mortality profile is broadly compatible with prime beef production. However, the presence of some older animals would also imply cattle were kept for milk, traction and other secondary products.

Analysis of body part distribution showed that all parts of the beef carcass were present in the dump, with distal humerii and ribs being particularly prevalent. Butchery marks were observed on 39 bone specimens, representing 22% of the bone material. Skinning was observed on astragali and calcanei and initial dismemberment on major joints and vertebrae – carcasses being split into left and right portions. Ribs were cut to 'pot sized' pieces and scapulae were crudely chopped diagonally. Further, all humeri, radii and tibiae were chopped midshaft, possibly for marrow removal and were not further processed. Metapodial elements were the only elements which have been axially split and the splinters may have also been used for bone working.

Overall, these marks could be grouped into four categories according to the ordered stages of processing they correspond to. The first category consisted of sets of marks consistent with gross carcass dismemberment. The second was related to the dressing and preparation of the meat joints, whilst the third pertained to traces of food consumption, such as meat removal. The fourth and final category included marks indicative of the splitting/ breaking of bones for marrow fat extraction.

The manner in which some of the bone was processed suggests that the same individual may have been responsible for the butchery of several, or potentially all of the animals. This is implied by the way that the pelves of several different cows were split, with a blow being delivered at the same point on the acetabulum separating them into three identical portions (Fig. 6.19). According to Lyman's (1979) straightforward (but perhaps not entirely reliable) calculations, the butchery of these nine cows would have yielded 2250–3429kg of meat. These estimates are broadly similar to those generated using figures supplied by Cunliffe (3690kg (2005, 416)), who estimates the average weight of a cow at 410kg. Either way, it is clear the butchery events associated with F.1018 would have generated at least a couple of tonnes of beef.

The modified skull fragment (Natasha Dodwell)
The adult, male cranium (represented by the majority of the occipital and parietal portions of the skull) stands out for its association with a large quantity of butchered cattle bones, for the trauma suffered ante-mortem and for the way in which it has been modified post-mortem. The fragment of cranium has a history.

There is a smooth, shallow depression on the posterior of the left parietal, adjacent to the sagittal suture which has the appearance of a healing/healed projectile injury. The lesion is sub-rectangular (4.75 long, 3.4mm wide, *c.* 3mm deep) and does not penetrate the skull vault. There is no evidence of trauma on the internal surface of the vault. The margins, sides and base of the lesion are smooth and remodelled, indicating that the man survived the trauma

Table 6.6. *Number of Identified Specimens (NISP) and the Minimum Number of Individuals (MNI) for all species from F.1018. Bone surface preservation was excellent, with a near absence of gnawing marks (*c. *1%).*

Taxon	NISP	NISP %	MNI
Cow	167	93.8	9
Sheep/goat	3	1.7	1
Pig	7	3.9	2
Red deer	1	0.6	1
Sub-total to species	**178**	**100**	**-**
Cattle-sized	45	-	-
Sheep-sized	1	-	-
Total	**224**	**-**	**-**

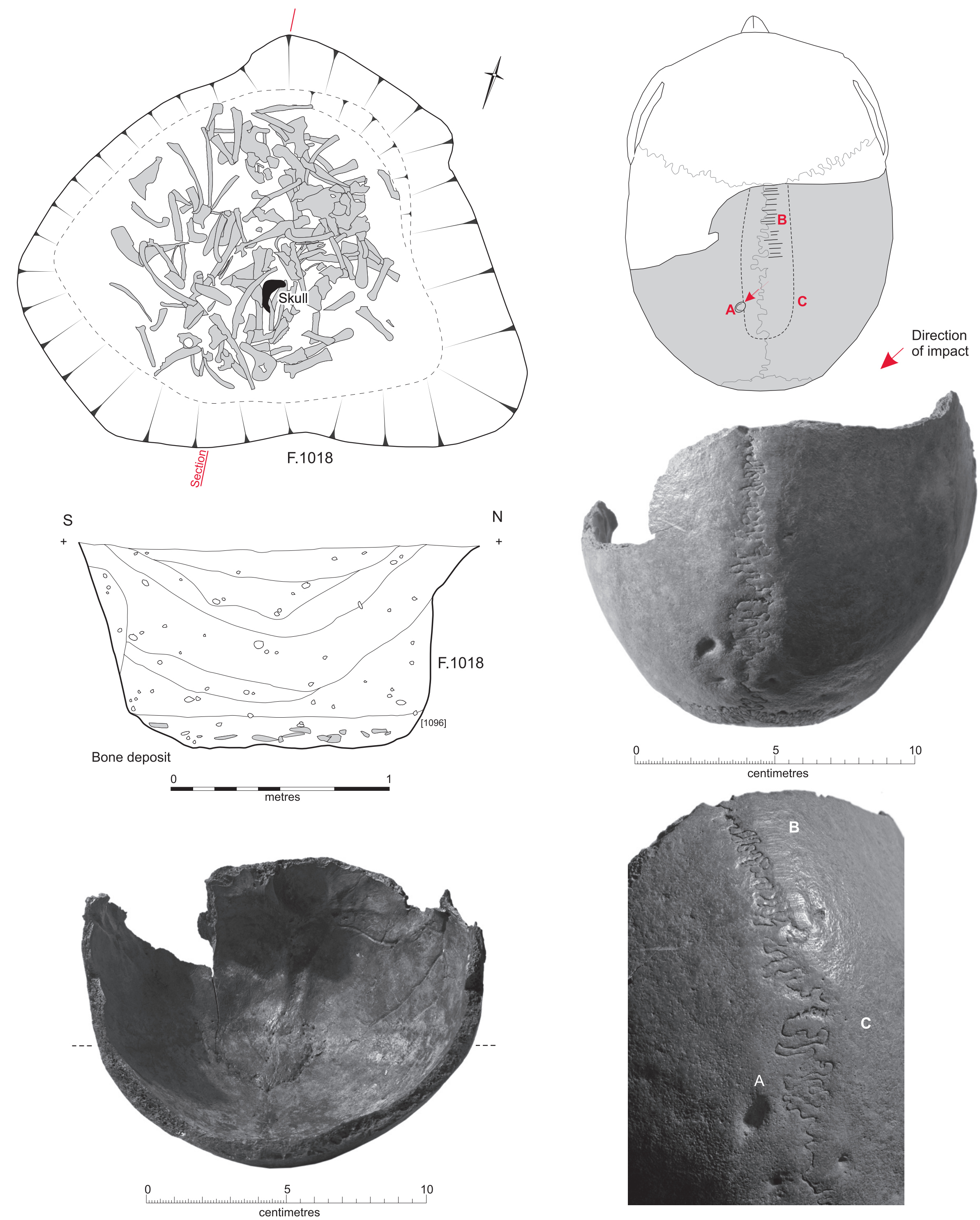


Figure 6.18. *Waterhole F.1018.*

and the wound had time to remodel and heal. Calculating the direction of entry of the projectile is made difficult by the degree of remodelling but the lesion is more gently angled at its anterior side suggesting that this was the direction from which the projectile entered. Projectile weapons could be spears, arrows, sling-stones or pebbles. Studies have shown that 7–25% of projectile wounds in prehistory are located on the cranial vault (Smith et al. 2007, 542, table 2) and the identification of such a lesion is evidence for interpersonal violence in this period.

Inside the cranium, there is an off-white residue (limescale) marking where liquid, presumably groundwater, has settled. The position in which the cranial fragment was discovered during the excavation of pit F.1018 (i.e. on its side (see Fig. 6.18)) is unlikely to have allowed for the build-up of a residue where it was recorded. This raises the possibility that the skull fragment was buried elsewhere prior to its deposition in this pit.

At the most anterior surviving part of the sagittal suture, at the vertex of the skull, on the right side of the cranium are a series of small, parallel scratches, similar in appearance to rodent gnawing. If they are rodent gnawing they suggest that the bone was above ground or only shallowly buried. The scratches are regular and localized and it is possible that they are shallow cut marks resulting from the removal of soft tissue (i.e. scalp and hair). Subsequent to these shallow markings, overlying them, the cortical bone has been flattened visibly as though it has been rubbed frequently against something, again possibly to remove soft tissue.

One of the most striking characteristics of the cranial fragment is the polished appearance and feel of the outer surface, suggesting that it may have been rubbed or repeatedly handled. Indeed the bone's burnished appearance almost demands that the skull is picked up and touched. Cranial fragments with a similar 'polished' appearance have been found around the Fen Basin at Hurst Lane and Trinity lands, both on the Isle of Ely, (Evans et al. 2007, 66) and in a palaeochannel at Goodwin Ridge, Over (Evans 2013; Dodwell with Riddler 2016). What was its purpose and who looked after it? This bone evokes images of being handled, possibly revered like a relic, connecting the living with the dead. Without absolute dating it is impossible to determine how long the skull was curated before it was finally buried.

Figure 6.19. *Example of distinctive butchery of bone from F.1018. 1. Cow pelvis split into three portions by blow to acetabulum. 2. Unbutchered cow pelvis.*

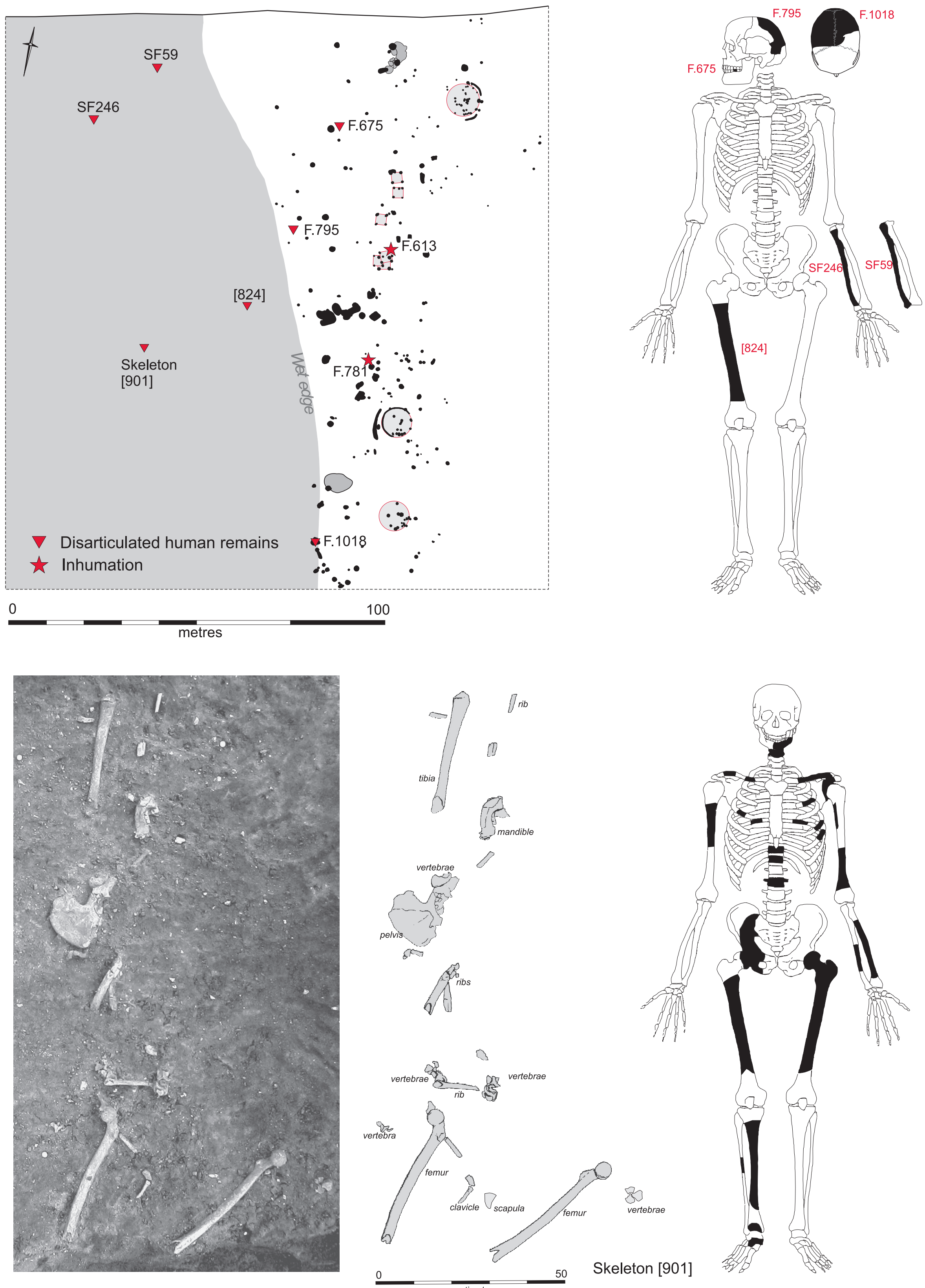


Figure 6.20. *Distribution of articulated and disarticulated human remains.*

and 5 (F.34, F.391, F.528, F.544 and F.991), all of which occupied comparable wet-edge locations. Indeed, the earlier suggestion that some of these deposits derived from events organized at an inter-household level, probably holds true for this context, given the number of animals involved. Whether this relates to an annual sort and cull of cattle from a communally managed herd, or a one-off large-scale feasting event, is harder to distinguish, though the inclusion in the dump of a human skull fragment suggests that the act of interment may also have been associated with other rites.

The skull formed part of the general jumble of bones at the bottom of the pit, with no indication that it had been carefully placed or distinguished in any way in its burial. Dodwell's analysis (Fig. 6.18) demonstrates that the skull (which had traces of a healed trauma from a projectile) had been deliberately modified and was possibly polished in sections. Furthermore, a deposit of limescale on the interior suggests it had lain in standing water for a fairly long period, though its position/angle in F.1018 seems to preclude the possibility that this deposit formed while it lay within the pit itself. This points to the skull having been previously deposited in a waterlogged context, either on the surface of the adjacent fen, or within a water-filled feature occupying a similar location along the damp-ground terrace contours. The period of delay between the death of the individual (an adult male) and the final interment of the skull in F.1018 is impossible to judge. However, bearing in mind the polish, which suggests the cranium was repeatedly handled and/or rubbed, it is not unreasonable to envisage this period of delay/curation as being fairly long-lived (perhaps several years or possibly decades).

Two other features on the wetland fringe yielded human remains, both located at the northern end of the site (Fig. 6.20). The first was a peat-filled posthole F.795 (0.45m in diameter), which lay on the 1.5m OD contour and contained two adjoining adult skull fragments. The second was pit F.675 (0.75m in diameter and 0.09m deep), located around 30m to the north of F.795, which yielded a single adult molar.

Finds from the wet

Sherds of Scored Ware pottery and further human remains were recovered from the peat deposits west of the settlement swathe, in an area which would have been completely saturated and probably under shallow, but permanent standing water by the Middle Iron Age. The finds were made during machine stripping and hand excavation of deposits capping/covering several major Bronze Age features, including areas of the fieldsystem (F.812–15 (Fig. 4.20)) and waterhole F.859 (Figures 3.27). These effectively constitute chance finds and probably represent a tiny fraction of those which originally ended up in this wetland context. Although the sherds of Scored Ware pottery can be confidently assigned to the Middle Iron Age (four sherds, 135g), the period attribution of the four separate human bone finds is far less secure, since none have been radiocarbon dated. The decision to discuss them here was largely informed by the presence of similar remains in features on the adjacent wetland fringe and, more specifically, the fact that these were also peat-filled or peat-capped contexts (see above). However, the possibility that some could be of Later Bronze Age or Early Iron Age origin cannot be ruled out.

Issues of dating aside, the human remains recovered from the peat comprised a single right femur, two left ulna bones and a disarticulated skeleton from the capping of waterhole F.859 (see Table 6.7). All were located toward the northern end of the site, between 11 and 47m from edge of the adjacent settlement. The most significant discovery was the 'washed-out' body of an adult female, found above F.589 at a height of *c.* 1.3m OD in the peat. Whilst the body was fragmentary and,

Table 6.7. *Single disarticulated skeletal elements assigned to the Iron Age at Bradley Fen.*

Feature	Context	Small finds no.	Feature type	Skeletal element	Age & sex	Comments
F.675	636	-	Small pit	1st mandibular molar	Adult	Blackened
F.795	802	-	Posthole	l. parietal	Adult	Porotic hyperostosis
F.812–5	824	-	Peat layer over pits & ditches	r. femur	Adult	Shaft only
F.1018	1096h	-	Large pit	Fused r & l parietal & occipital	Middle/ mature adult ?male	Lesion on l. parietal; lots of butchered cattle in pit
-	-	59	Peat	l. ulna	Adult	Complete
-	-	246	Peat	l. ulna	Adult	Shaft only

strictly speaking, disarticulated, many of the bones lay in their correct anatomical alignment suggesting the skeleton had gradually broken up post-deposition, probably as a consequence of water movement. The slightness of drift implies that this occurred in a fairly sheltered or stable environment; the body possibly having become lodged in reeds or other semi-aquatic vegetation. As Dodwell reports below, skeletons and disarticulated human remains in similar contexts and condition have been found elsewhere in the Flag Fen Basin and in the southern fens. Although not all of these examples can be stated to be Iron Age with certainty, it seems likely that burial in watery contexts was a common rite in the period, perhaps much more so than dryland excarnation or inhumation – a topic returned to in the chapter's final discussion.

Body in the peat (Natasha Dodwell)
The body of a middle adult female was represented by disarticulated elements, which lay in the peat capping of waterhole F.859, in an area *c.* 1.50 × 0.50m (Fig. 6.20).

None of the long bones were complete; many were split and most of the articulating facets were missing. The cortical bone was also abraded. The body was represented by the following elements: left femur (proximal shaft flattened anterior-posterior), right femur, left radius, left mandible (and three molars), rib shafts, ?right clavicle, left glenoid cavity, right talus, ?right humerus, right tibia, scraps of vertebral bodies.

A similar spread of disarticulated human skeletal elements, from a single individual has recently been recorded at the western end of the Goodwin Ridge, at Over, at the very edge of a palaeochannel. Although none of the bones showed any evidence of animal gnawing, it was argued, as here, that it might represent the remains of a body that had been left on the water's edge (Dodwell with Riddler 2016). Nearer to Bradley Fen, at the Power Station sub-site at Flag Fen, a single, poorly preserved skeleton, believed to be Iron Age in date was recovered *c.* 40m north of the post-alignment. Pryor (2001, 59) writes that '*Its position in the silts suggested that it had found its way into (or been placed in) the water in Iron Age times*'.

Fragmentation and the breaking-down of the human body is a pattern seen throughout prehistory. The incorporation of these fragmented elements into features within settlements, marking physical boundaries and even significant events/episodes in the lives of the living, has been recognized as a distinct funerary tradition in the Early and Middle Iron Age (e.g. Woodward 1992; Parker Pearson 1993), a tradition which extended back into the Bronze Age (e.g. Brück 1999a). Carr & Knüsel (1997) suggest that excarnation and exposure played a significant role in mortuary ritual in the Iron Age. Wait's (1985, 99) analysis of Iron Age burial has shown that in the Early Iron Age individuals were represented by single, disarticulated skeletal elements often buried within settlements and that by the Middle Iron Age both disarticulated elements and articulated burials were being deposited. The evidence of Iron Age remains from Bradley Fen and other Flag Fen Basin sites appears to follow this trend. At Bradley Fen, single disarticulated elements were recovered from a total of six contexts, summarized in Table 6.7. Disarticulated mandibles and long bones were recovered from the Flag Fen platform site and along the Power Station and Northey Landfall ends of the post-alignment (Halstead et al. 2001, 330–50, Ferrante di Ruffano 2010, 128). At Cat's Water, six crouched or tightly crouched inhumations in shallow graves, believed to be Iron Age, were recorded in addition to disarticulated skeletal elements from within ditches, pits and structures within the settlement (Pryor 1984). Cumulatively, these sites suggest a pattern in the way human remains were deposited in this landscape.

Discussion – the character and organization of the settlement

In contrast to the Early Iron Age evidence at King's Dyke, the extended aperture of the excavations at Bradley Fen allows us to discern the configuration of the Middle Iron Age settlement much more clearly. Revealed, is a settlement defined *vertically*, but ordered *horizontally*: a compressed, corridor-like swathe of features, structured in relation to the wetland margin. Though the relationship between feature-type and contour range was less pronounced than in the Earlier Iron Age, as noted at the beginning of this chapter, there are nonetheless similarities in the basic vertical patterning of fixtures up and down the terrace edge. Indeed, the overall character of the settlement imprint has it closest local parallels with the Early Iron Age site at King's Dyke, with the robust four-post doorway settings of Roundhouses 15 and 17 mirroring those of Roundhouses 7–9. As well as this shared sense of architectural tradition, continuities can be traced in certain depositional practices, namely those involving the interment of butchered and disarticulated sheep remains in roundhouse interiors and large pit-derived cattle bone dumps along the wetland fringe. These continuities are significant, but there are also some important differences in the character of the settlement signatures.

Beyond the obvious distinctions in date and topographic setting, contrast exists in the manner by which these feature scatters emerged and the likely duration of the settlements' occupation. In the previous chapter, it was argued that the imprint of the Early Iron Age settlement at King's Dyke resulted from a reiterative mode of occupation where a series of structures and other features were gradually renewed within the same locale, but never on the exact same spot. In plan, this gave the illusion that fixtures were contemporary, whereas in reality, the settlement configuration was a displaced or offset palimpsest created over several centuries. Although a scarcity of feature superimposition also characterizes the Middle Iron Age settlement swathe at Bradley Fen, in this context it seems more likely that the site plan does indeed reflect a fairly pristine and comparatively short-lived occupation. A certain degree of time-depth is undoubtedly still implied by the setting of Four-post Structures 9–11, the presence of the intercutting pit complex and the general density of features within the settlement spread (including those in the roundhouses' interiors). However, there is a coherency to the arrangement and distribution of certain fixtures and finds on the site which suggest contemporaneity, or at the very least, a persistence in consensus on spatial order.

In contrast to the vertical or contour-orientated arrangement of features already emphasized throughout this chapter, this patterning is played-out *horizontally* along the north–south axis of the settlement and works on a number of spatial scales; not all of which are immediately apparent. The most obvious relates to the zoning of the four-post structures, presumably used for storage, and secondly, the spread of pits and postholes filled with metalworking debris around furnace F.611 – an area which may be labelled a workshop. These constitute two distinct activity zones, separated by an almost linear arrangement of irregularly profiled pits, the majority of which form part of the intercutting pit cluster. Though the function of these pits is less obvious, their consistency in form and fill mark them out as another coherent, spatially distinct group. Importantly, these three feature-sets/activity zones are connected by finds of slag, presumably derived from furnace F.611, which suggests they are broadly contemporary.

The distribution of slag across the settlement also unites the three roundhouses, whose contemporaneity is further implied by the similarities in their footprint and, in particular, the arrangement of their internal features. This is most readily appreciated when the ground plans of the buildings are overlain and orientated on their entranceways. As Fig. 6.21 demonstrates, there is clear patterning in the distribution of pits and postholes on the left-hand side of the structures (looking in), adjacent to the doorways. In total, over half of all the internal features were located in this zone, with each roundhouse displaying an arc of non-intercutting pits

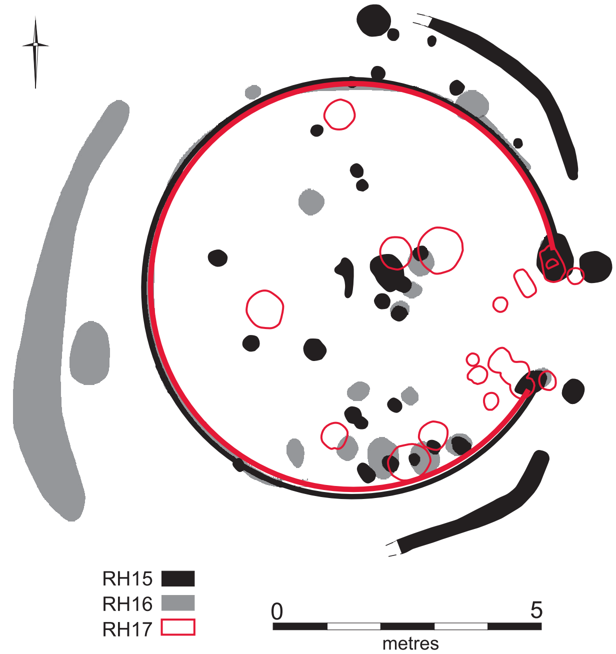


Figure 6.21. *Patterning in the distribution of pits and postholes on the left-hand side of Roundhouses 15, 16 and 17.*

around the interior wall-line. A second cluster of features is also distinguishable close to the middle of the roundhouses and may flank central hearths in this area. Combined, this patterning underlines the importance of these zones in the structures and inevitably invites reference to 'sunwise' models of first millennium BC domestic practice and its cosmological underpinnings (Fitzpatrick 1994; 1997). Their structured arrangement certainly suggests these spaces were functionally and conceptually differentiated from the rest of the interior and were indeed a focus for the interment of sheep remains. Although there is a case to argue that some of these features were deliberately dug to receive foundation or abandonment-type deposits, the fact that six of the eight clay-lined pits were located in these zones, indicates they were primarily areas for mundane day-to-day activities associated with cooking and potentially storage.

Leaving aside these issues, it is clear that roundhouse interiors were organized along very similar lines, with similar types of features being constructed, used and repeatedly renewed around the same two points. Whilst this in no way proves that the buildings stood at the same time, on balance, the consistency of these arrangements and the broader analogies in the form and size of the structures strongly favours this interpretation. Moreover, given that they have a fairly unusual imprint for Middle Iron Age roundhouses in the region, owing to their lack of well-defined eaves gullies, it is hard to envisage buildings with such similar and distinctive ground plans *not* being constructed around the same time. Of course, we could still be looking at a sequence of single structures erected by the same group over a number of decades. Lateral settlement 'drift' is hard to rule out, but the coherency of the site plan and the positioning of the structures in relation to the other major feature groups, argues against this: in this time-transgressive environment, extended occupation would inevitably result in *vertical* settlement drift, as the lower contours were progressively inundated (as demonstrated at Cat's Water (Pryor 1984)).

But if we accept then that the three structures were contemporary, what was the relationship between them? In terms of their artefact repertoires, there are no obvious signs of functional or status-related differences between the buildings. In fact, the overall condition and composition of their material assemblages is broadly comparable and, although Roundhouse 15 yielded fewer finds in total (see Table 6.1), this distinction can be accounted for by the truncation of the structure's interior features. As such, a discussion of the buildings relationship to one another, and the settlement swathe as a whole, must hinge upon the reading of their spatial configuration. Of course, these judgements on association are made more difficult because of the strict easterly alignment of the roundhouse doorways, which serves to obscure any obvious expressions of integration – a pattern that conforms to a wider Iron Age building tradition, thought to be governed by cosmological principles (e.g. Oswald 1997). Still, given the proximity of Roundhouses 16 and 17, it is tentatively proposed that these buildings constituted a paired or modular household unit. This interpretation certainly has its attractions, as the distance between the known and projected wall-lines of the two buildings is broadly similar to the paired structures in several 'domestic' Middle Iron Age enclosures in Cambridgeshire, including Haddenham V (Evans & Hodder 2006b) and Colne Fen, Earith (Evans et al. 2013). It is also notable that the zone immediately around and between Roundhouses 16 and 17 was home to just a light scatter of small pits and postholes, hinting that this was maintained as a predominantly feature-free yard space. Interestingly, this is broadly equivalent in area to the compound spaces of several of the region's Iron Age enclosures, implying that there was some measure of consensus on what the appropriate scaling, setting and spacing of domestic architectures were in this period.

What then of Roundhouse 15? Its distancing implies a degree of autonomy from the buildings to the south, but it was clearly still part of the same settlement complex. Though we should be cautious in assuming a one-to-one relationship between social and spatial distance, this somewhat neighbourly arrangement of structures suggests the settlement's resident community was made up of *at least* two different household groups – further structures almost certainly lying to the north of the excavation area. Any sense of their independence from one another, however, was probably more apparent than real. Certainly, the number and distribution of four-post structures implies that cereals were being stored communally in this context, whilst the general patterning of other features between the buildings (vertically and horizontally) gives the impressions of a common agreement on the spatial order of things. Of course, we can only guess as what served to unite these households, but kinship was probably a foundation and would have no doubt structured the organization of many tasks within the settlement perimeter.

Reflections and implications

Stepping back from this detailed dissection of the site's anatomy, we are left with the impression a comparatively pristine and coherent settlement plan, in which the spatial ordering of contemporary features is patterned both vertically and horizontally across the terrace edge. Viewed topographically, the settlement is primarily organized on pragmatic grounds, with structures and other fixtures occupying the slightly higher, dry sections of the terrace above 2.0m OD and wells and waterholes sited along the lower damp-ground contours (Fig. 6.22). Set against this, and ordered on the horizontal axis, we find that some features fall within semi-discrete, functionally related groupings, with a zone of four-post structures, a metalworking workshop area and a quasi-linear arrangement of pits, all bracketed by a series of roundhouses – the southern two potentially forming a paired household unit.

Admittedly, there are no sharply defined edges to this zoning and indeed some of these patterns are not as immediately apparent from the site plan as others. Ultimately, this blurring reflects the fact that these were lived-in spaces. Though the site may have been organized according to a spatial template, or an idealized model that encouraged routinized practice, these frameworks were neither dictatorial nor necessarily long-lasting. Over time, as the settlement developed, some were no doubt adapted, abandoned or overridden as circumstances shifted – including those caused by the inundation of features on the damp-ground contours. This has served to erode any hard definition of zones on the cumulative site plan. The overall configuration of the settlement can

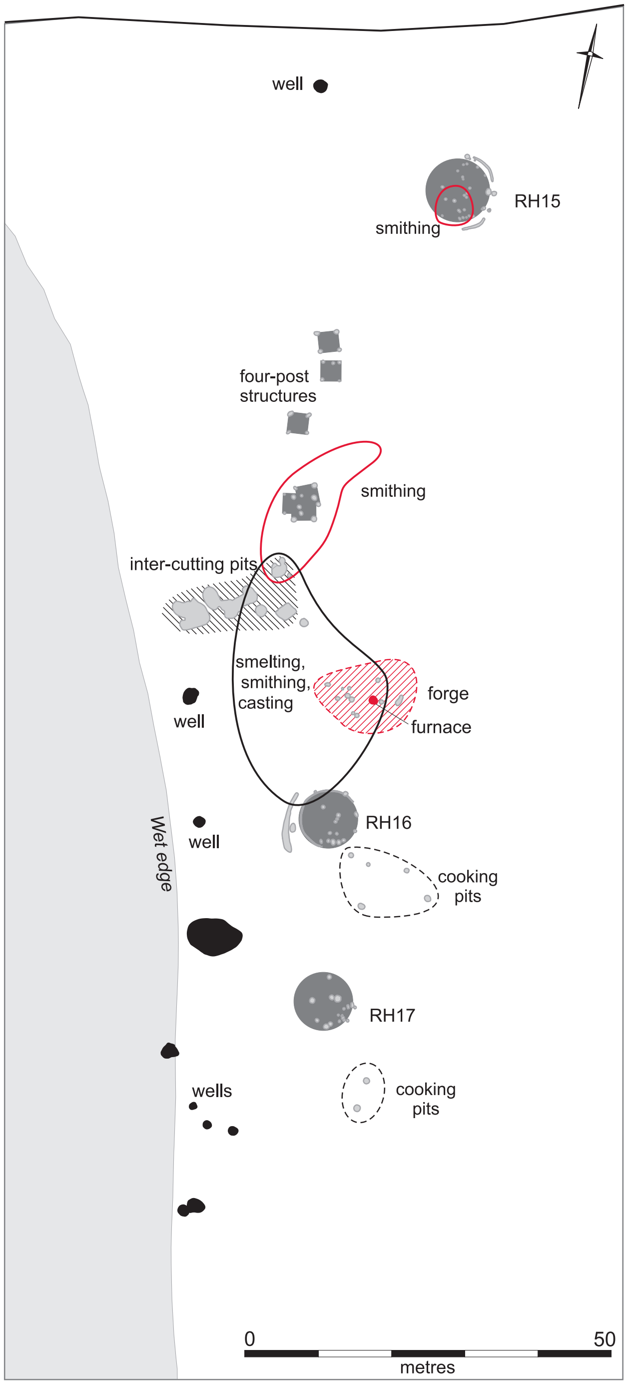


Figure 6.22. *Functionally related groupings, with a zone of four-post structures, a metalworking workshop area and a quasi-linear arrangement of pits, all bracketed by a series of roundhouses.*

therefore be understood as a consequence of various patterns and organizational principles, realized to different degrees. On this issue, is important to stress that we are not looking at a snapshot of settlement. Although the remains *are* broadly contemporary, it is still feasible that we are dealing with half a century or so of occupation.

On reflection then, the character and duration of the Middle Iron Age settlement at Bradley Fen would appear to be different to that of the Early Iron Age occupation at King's Dyke, despite sharing open, sprawling site plans. This much can be discerned from the close analysis of their architectural imprints. Yet it does leave the hanging question of how meaningful these differences are: a question which is hard to fully resolve. For instance, whilst feature-zoning is less apparent at King's Dyke, is this because the settlement was longer-lived and any impression of spatial order has become obscured by the duration of occupation or is it the case that our excavation aperture was too small to observe such patterns in the first place? To some extent, the answer to both these question is probably yes. Still, there is a sense that the settlement configurations at King's Dyke were more fluid and transitory than those at Bradley Fen, regardless of duration. Though there may not be much time-depth to the Middle Iron Age occupation, the fact that we do see some evidence for the formation of inter-cutting pit clusters and the rebuilding of four-post structures on the same spot, suggests, given time, there would have been greater levels of superimposition within the pre-existing order of feature groupings.

In both periods then, there existed an iterative quality to the imprinting of settlement, but in the Middle Iron Age, this became more closely focused, with a greater emphasis on maintaining the coherency of founding spatial orders – in essence, the original arrangement of things and fixtures. True, settlement was also focused in the Early Iron Age, but here it was only loosely centred upon the same locale, with practice favouring a shifting of architectures upon renewal, as opposed to perpetuating the same plots. As such, space appears more regulated in the Middle Iron Age, which in other contemporary contexts in the region, manifests itself in the construction of formal settlement compounds and multi-phase roundhouses. These can be viewed as different responses to a wider set of concerns surrounding the close definition and distinction of households and household groups and the demarcation of different spaces within the domestic sphere. The zoning of features at Bradley Fen may well be an expression of this. So too might the neighbourly arrangement of the roundhouses, whose distancing suggests a subtle tension between the autonomy of the household and the wider collective of the settlement's resident community.

What this potentially amounts to is both an understated transformation in the conceptualization of the domestic and a shift in how tenure and place were understood and worked upon. This goes hand-in-hand with changes in the organization of other social and material traditions too, which we can also begin trace in the archaeological recorded when we set patterns against those from the Early Iron Age. This line of enquiry is best explored by following the format of the previous chapter and focusing on the themes of foodways and technological traditions.

Foodways

For all the parallels and contrasts that can be drawn between the Early and Middle Iron Age occupations at King's Dyke and Bradley Fen, there is no escaping the fact that the shift of settlement down-slope to the fen-edge in this period marked a significant transformation in the wider organization of the prehistoric landscape. In essence, it reflects the emergence of a new order to the lowland terraces of the Flag Fen Basin, with the fen-edge now harnessed as the principal organizational axis. What interests us here, however, is how this switch in orientation impacted on the structure and character of agricultural regimes and the foodways of communities who resided in such fen-edge settlements. Is there evidence that these changes were met by shifts in the agrarian economy and/or the nature of commensal practice? Furthermore, was the draw of settlement toward the fen-edge in any way linked to the increasing exploitation of this environment, specifically, its wetland wildlife?

In attempting to give some explanation as to why settlement moved towards the fen-edge in the Middle Iron Age, it would be unwise not to cite the possible 'economic' benefits of such locations. Set in the zone of the wet/dry interface, the settlement not only offered ready access to the rich grazing pastures and other marshland resources of the adjacent fens, but remained in close proximity to the well-drained up-slope terraces. The merits of such locations are widely discussed in the literature on Iron Age Fenland settlements, with emphasis placed on the potential for maximizing the exploitation of different environments from these settings. Yet, although this chimes with our own sense of economic rationality, with the exception of Haddenham V (Evans & Hodder 2006b), the faunal record from fen-edge Iron Age settlements is commonly characterized by a paucity of wetland species, despite the obvious potential for fishing, trapping and wildfowling.

Bradley Fen is no different in this respect. In fact, comparatively speaking – and given the site's very low-lying position – the evidence for wetland fauna is remarkably limited, with just one fish and duck bone recovered in total (see Rajkovača below). Of course, the nature of sampling strategies and, in particular, the extent of sieving programmes (C. Evans pers. comm.), has a significant impact on the recovery of fish and small bird bones. But even allowing for some of these biases, both the number and range of remains is surprisingly small, especially when set against the inventory of wetland species recovered from Cat's Water on the opposite side of the Flag Fen Basin (Biddick 1984, 263–64). Yet it was not just fish and fowl remains which seem comparatively underrepresented in this context, but evidence for wild species of plants and animals in general. As noted by de Vareilles below, we now lose sight of wild plant foods altogether in the charred botanical remains, whilst four fragments of deer bone in pit F.1018 provide the only other evidence of wild fauna.

Clearly, these resources contributed relatively little to the later prehistoric diet, with the marshland fauna apparently being all but ignored. Instead, the site's subsistence signature is more ostensively 'terrestrial', domesticated and indicative of a mixed farming economy based on cereal cultivation and the rearing of livestock. With regards to the former, the presence of four-post structures, quernstones and the evidence from de Vareilles's analysis of the plant remains, suggests that cereals were stored, processed and prepared for consumption on site, with the waste materials (e.g. chaff and straw) used as fuel in the metalworking furnace and probably also animal fodder. The cereals themselves – barley, spelt and emmer – were likely grown in fields on the higher terraces east of the settlement, in the large expanse of open ground devoid of Iron Age features (an area covering at least 3.3ha). Although no tangible traces of these fields or paddocks now exist, the morphology of the Bradley Fen settlement swathe and, in particular, the abrupt fall-off of features above the 2.5m OD contour, hint that that a boundary separated the settlement from a zone of arable land. Certainly, the impression is that the eastern sprawl of the settlement was confined in some way, possibly by a hedge line running parallel to the fen margin. This, however, cannot be proved with the evidence at hand and we are limited as to how far we can reconstruct the organization of the surrounding agricultural landscape.

Turning back to the faunal remains, Rajkovača's analysis indicates that cattle were the mainstay of the livestock economy at Bradley Fen, predominating over sheep, with a more limited representation of pig and horse. This is in keeping with patterns identified at Cat's Water and most other Middle/later Iron Age sites in the Fenland region of Cambridgeshire (see Table 6.8). Given the availability of pasture and water

Table 6.8. *Relative importance of the three main domesticates on Iron Age sites in fen-edge settings. Figures are based on the number of identified specimens (NISP) reported for each species, expressed as a relative percentage of the total NISP.*

Site	Cattle %	Ovicapra %	Pigs %	Reference
Bradley Fen	61	31	8	This publication
Cat's Water	50	42	8	Biddick 1984
Market Deeping	49	43	8	Albarella 1997
Tanholt Farm, Southern Extension	46	12	42	Rajkovača 2009
Hurst Lane	45	41	9	Higbee & Clarke 2007
Earith Sites I & II	45	46	9	Higbee 2013
Haddenham Sites V&VI	22	70	8	Serjeantson 2006a–b

meadows on the fen-edge, plus the move towards settlement in this zone, such trends are not entirely surprising. We should, however, be cautious in reading the data too directly. For, as in the Early Iron Age, the overall content and composition of the faunal assemblage was determined by a limited number of formal deposits involving large dumps of butchered cattle bone ('bone pits' F.802 and F.1018) and the burial of sheep remains in roundhouses.

These deposits were generated and interred in a very particular set of social circumstances, which potentially had very little to do with the normal rhythms of culling and consumption. They constitute set-piece events which bear a striking resemblance to those documented in the Early Iron Age and invite similar interpretations (see Chapter 5). The sheep bone deposits in the roundhouses are near identical to those in the structures at King's Dyke, both in terms of the number and age-profile of the animals interred and the spatial patterning of deposits around the interior of the buildings (Fig. 6.23). These are believed to be the residues of formal dining events; some deposited during particular moments in the history of the structures, including foundation and abandonment. The parallels with King's Dyke serve to show that these practices evolved into a long-held, conventionalized depositional tradition. Interestingly, this was echoed more widely in the Middle Iron Age, with further examples from the Scored Ware-using fen-edge communities to the south at Haddenham V (Serjeantson 2006a, 240–42) and Colne Fen Site I, Earith (Higbee 2013, 210).

By contrast, the deposition of large dumps of butchered cattle bone in pits along the fen margins was a practice more specific to the Bradley Fen/Flag Fen Basin context, though it did have a longer local ancestry originating in the Middle Bronze Age. The dump in pit F.1018 was the largest of its kind, with the remains of a minimum of nine cows interred. As with the Early Iron Age examples, the scale of slaughter and consumption associated with this event speaks of participation by a community group larger than that residing at the site itself. Again, this probably relates to large-scale feasting of one kind or another.

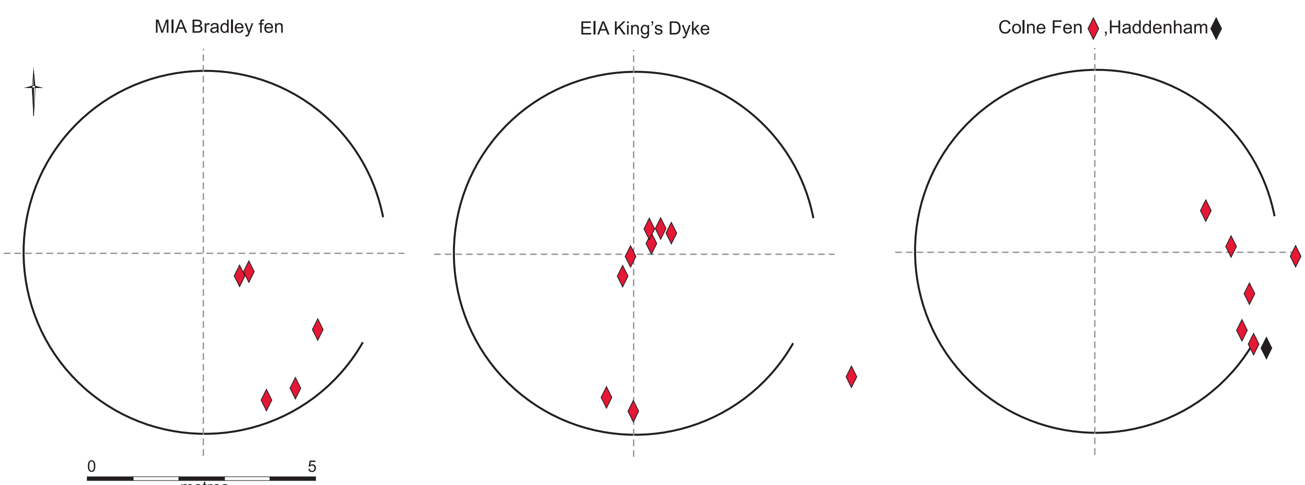


Figure 6.23. *Sheep bone deposits in roundhouses.*

Unfortunately, fleshing out the details of this, or any other formal dining event of the period, is difficult, not least because of the scarcity of the ceramics associated with such deposits. In fact, one of the main changes we can observe in relation to these contexts is a decrease in the evidence that a different service of vessels were used and deposited as part of the proceedings. Whereas in the Early Iron Age there were signs that particular categories of pot were deployed, and possibly reserved for use (and deposition), in formal dining, there were no such hints that these practices continued into the Middle Iron Age at Bradley Fen. More generally, the visual, tactile and functional distinctions between pots of the previous period dissolved around the fourth century BC, to be replaced by a more restricted range of containers that fulfilled a variety of culinary roles. As discussed by Brudenell (below), this signals wider changes in the aesthetics of dining and the way food and drink were presented and consumed, both in everyday meals and moments of formal dining.

Returning to the questions posed at this beginning of this section, on balance, it would seem that there are more points of continuity in our understanding of Early and Middle Iron Age foodways than there are differences. Although there are changes in the settlement geography and no doubt the wider organization of the agricultural landscape, archaeologically at least, these do not translate into a markedly different picture of the agrarian economy. As far as can be discerned, the move to the fen-edge in the Middle Iron Age was not met by any great surge in the exploitation of marshland fauna, nor any obvious signs of wetland specialization. On the contrary, the plant and faunal record is overtly terrestrial in nature and, in terms of scale and composition, very similar to that documented earlier in the first millennium BC. Likewise, in the instances where we can see the conduct of individual consumption practices more directly (i.e. in episodes of formal dining), we find a clear thread of continuity in the location, context and scale of events and their resulting deposits. Nevertheless, it is perhaps prudent not to overstate the similarities with the Early Iron Age, for underlying the more overt trends, are subtle differences which may be no less significant in terms of understanding transformations in everyday routines. This is aptly illustrated by changes in the ceramic record which earmark wider shifts in culinary practice and, potentially, the basic structure of mealtime activities. However, these differences only begin to surface when we take a comparative, diachronic approach to the foodways theme, which is something all the authors below have attempted to do from different material standpoints.

The faunal remains (Vida Rajkovača)

The Middle Iron Age settlement at Bradley Fen yielded the largest faunal sub-assemblage from the excavations (734 specimens, weighing 30,900g (Fig. 6.24)) and provides important insights into the nature of cultural and economic practices along the fen-edge at this time. Although the assemblage is fairly typical of the period and area and shares a few traits with those considered in the previous two chapters, it does also have some unique characteristics, particularly with regard to the spatial patterning of remains. These have a direct bearing on the foodways theme, shedding light on both routinized and set-piece practices of deposition.

Cattle

Amounting to around two-thirds of the entire assemblage, cattle were undoubtedly the main economic asset and the biggest food provider in the Middle Iron Age. They dominated the NISP and the MNI counts (Table 6.9), with the remains of no fewer than 12 cows deposited in 4 'bone dumps' identified at the site (F.802, F.825, F.1018 and F.1064, 84% of the bone in these assemblages being cattle). As shown by the skeletal element count, all parts of the beef carcass were recorded, albeit with a slight over-representation of mandibles, loose teeth and tooth fragments. This is indicative of on-site processing and the consumption of entire animals.

The exploitation of cattle as main food provider was noted from a high percentage of elements with butchery marks. Of 79 specimens affected by butchery (10.7% of the assemblage), 54 were of cattle, which were generally processed in a crude way. This figure corresponds to 18.4% of the entire cattle cohort. Butchery actions recorded on cattle elements spanned the entire *chaîne opératoire* of the butchery process, except for slaughter. Similarly to the Middle Bronze Age material, butchery evidence was quite uniform: the same actions were repeatedly performed on the same elements. Blows were sent in the same direction and equivalent joints were treated in the same way.

Two-thirds of the cattle were culled as adult animals, with the remainder slaughtered as sub-adults or older adults. Although the mandibular tooth-wear data were insufficient for the kill-off profiles to be built, the epiphyseal fusion data indicated that 20% of cattle cohort were +16 months–<28 months; 65% were +28 months–<3.5 years and 15% were +3.5 years. The culling of cattle at or near their maximum body size corresponds to the most efficient point of killing for meat. This is best illustrated by the deposit from F.1018, which has been fully detailed earlier in this chapter (see Rajkovača above).

Ovicaprids

The sheep/goat cohort made up just under a third of all identified bone (Table 6.9). The presence of all body parts suggests that sheep were bred, slaughtered and consumed on site. As was the case with cattle, sheep appear to have been slaughtered around their third year, at the stage when the animals reached maturity and full body weight. Epiphyseal fusion data available from a small number of elements showed that 12% of sheep died between +16 months–<28 months; 69% at +28 months–<3.5 years and 19% at an age older than 3.5 years.

Although recovered from other context types, ovicaprid elements were particularly common from features making up, or associated with, the roundhouses (Table 6.10). Indeed, the range of species represented in these contexts was even more restricted than that from the four 'bone dumps': the only other species being positively identified was cattle, albeit in small numbers. Here the pattern of sheep bone deposition is of note, with younger individuals

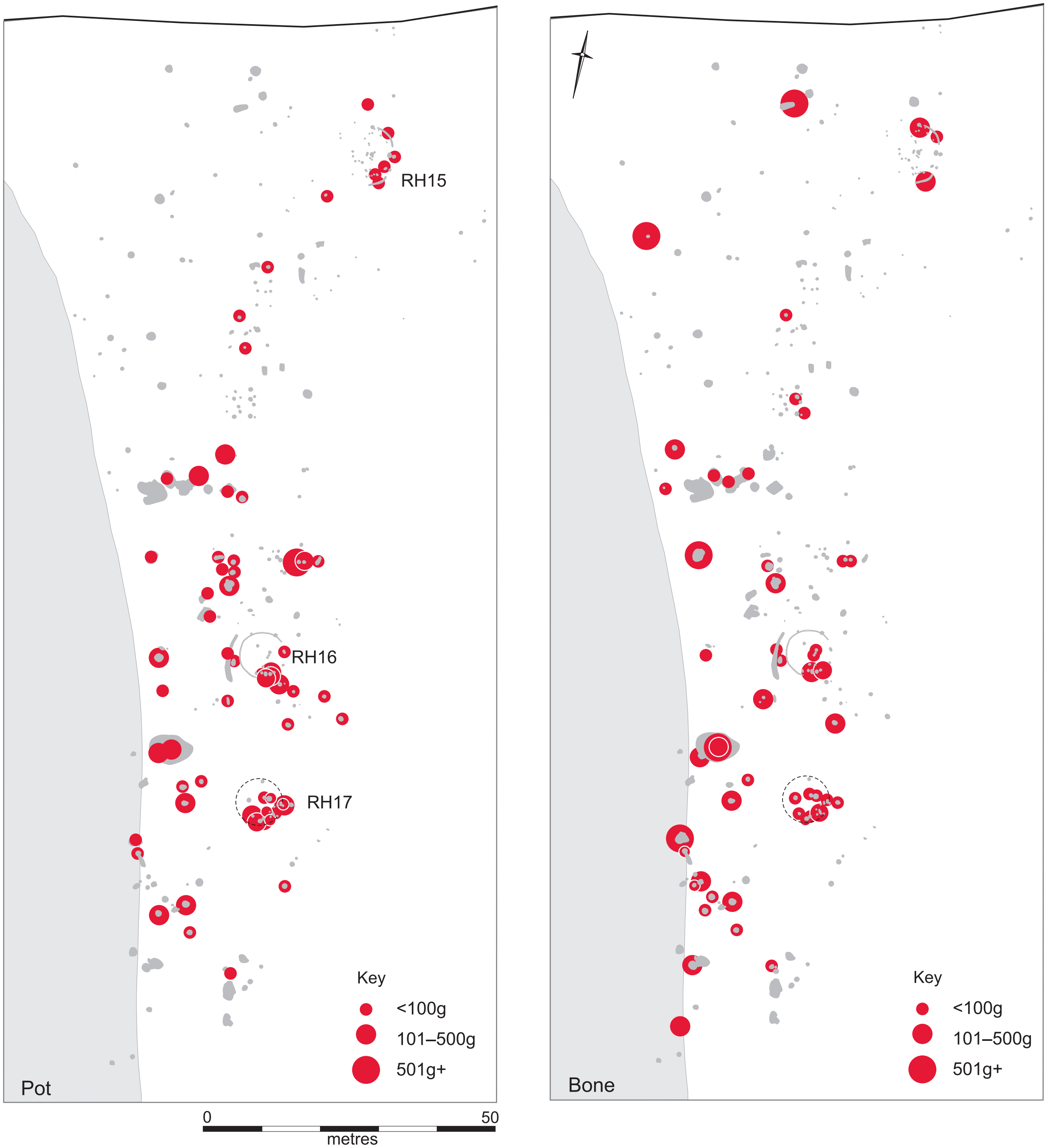


Figure 6.24. *Distribution of pottery and animal bone in the Bradley Fen Middle Iron Age settlement.*

being especially common in these settings. These show regularity in their spatial distribution, with all the roundhouses assemblages summarized below.

Roundhouse 15

This roundhouse produced the smallest quantity of bone of the three structures. Of the 41 specimens recorded, 33 were assigned to species and 24 were positively identified as sheep/goat (Table 6.11). Based on their size, element representation and age, the sheep bones from postholes F.12 and F.13 in the centre of the structure are likely to be the remains of the same animal aged 6–12 months at death. Cattle derived from those contexts away from the house core, i.e. gullies F.540, F.541 and pit F.514 'touching' the northeast edge of the structure. Three specimens were affected by butchery, a sheep scapula showing signs of meat removal and two cattle elements with crude chop marks indicative of marrow removal.

Table 6.9. *Number of Identified Specimens and the Minimum Number of Individuals for all species from Middle Iron Age contexts (59 relating to 56 features). The abbreviation n.f.i. denotes that the specimen could not be further identified.*

	Roundhouses 15, 16 and 17			Bone 'dumps' (F.802, F.825, F.1018, F.1064)			Other contexts			Assemblage total		
Taxon	**NISP**	**NISP %**	**MNI**	**NISP**	**NISP %**	**MNI**	**NISP**	**NISP %**	**MNI**	**NISP**	**NISP %**	**MNI**
Cow	18	*14.3*	2	235	*83.7*	12	40	*51.4*	1	293	*60.4*	15
Sheep/goat	107	*84.9*	9	14	*5*	1	31	*39.7*	1	152	*31.4*	11
Sheep	1	*0.8*	1	4	*1.4*	1	1	*1.3*	1	6	*1.2*	3
Pig	-	-	-	24	*8.5*	3	3	*3.8*	1	27	*5.6*	4
Horse	-	-	-	3	*1*	1	3	*3.8*	1	6	*1.2*	2
Red deer	-	-	-	1	*0.4*	1	-	-	-	1	*0.2*	1
Sub-total to species	**126**	***100***	**-**	**281**	***100***	**-**	**78**	***100***	**-**	**485**	***100***	**-**
Cattle-sized	18	-	-	71	-	-	34	-	-	123	-	-
Sheep-sized	38	-	-	13	-	-	57	-	-	108	-	-
Rodent-sized	-	-	-	.	-	-	1	-	-	1	-	-
Mammal n.f.i.	8	-	-	6	-	-	1	-	-	15	-	-
Bird n.f.i.	1	-	-	.	-	-	.	-	-	1	-	-
Fish n.f.i.	-	-	-	.	-	-	1	-	-	1	-	-
Total	**191**	**-**	**-**	**371**	**-**	**-**	**172**	**-**	**-**	**734**	**-**	**-**
Total weight	**1373g**			**26282g**			**3245g**			**30900g**		

Table 6.10. *Number of Identified Specimens and the Minimum Number of Individuals for all species from the three round houses. The abbreviation n.f.i. denotes that the specimen could not be further identified.*

	Roundhouse 15			Roundhouse 16			Roundhouse 17			Total NISP
Taxon	**NISP**	**NISP%**	**MNI**	**NISP**	**NISP%**	**MNI**	**NISP**	**NISP%**	**MNI**	
Ovicaprid	24	72.7	2	49	*98*	3	34	*79*	4	107
Sheep	-	-	-	-	-	.	1	*2.4*	1	1
Cow	9	27.3	1	1	*2*	1	8	*18.6*	1	18
Sub-total to species	**33**	***100***	**-**	**50**	***100***	**-**	**43**	***100***	**-**	**126**
Cattle-sized	4	-	-	3	-	-	11	-	-	18
Sheep-sized	4	-	-	7	-	-	27	-	-	38
Mammal n.f.i.	-	-	-	-	-	-	8	-	-	8
Bird n.f.i.	-	-	-	-	-	-	1	-	-	1
Total	**41**	**-**	**-**	**60**	**-**	**-**	**90**	**-**	**-**	**191**

Table 6.11. *Number of Identified Specimens for all species and weight (in grams in parentheses) from features associated with Roundhouse 15. The abbreviation n.f.i. denotes that the specimen could not be further identified.*

Taxon	F.12	F.13	F.514	F.540	F.541	Total
Sheep/goat	10	12	-	2	-	24
Cow	-	-	1	1	7	9
Sub-total to species	**10**	**12**	**1**	**3**	**7**	**33**
Cattle-sized	-	-	2	-	2	4
Sheep-sized	4	-	-	-	-	-
Mammal n.f.i.	-	-	-	-	-	4
Bird n.f.i.	-	-	-	-	-	-
Total	**14(9)**	**12(87)**	**3(120)**	**3(14)**	**9(286)**	**41(516)**

Roundhouse 16

Repeating the pattern observed in Roundhouse 15, three features in the central and southwest part of the house interior (F.789, F.1094 and F.1096) were packed full of sheep bones: 54 specimens representing the minimum of three animals (Table 6.12).

Roundhouse 17

Sheep or sheep-sized elements constituted more than 90% of the house's assemblage (Table 6.13). Echoing the same pattern of spatial distribution noted from the two other structures, juvenile sheep elements were recovered from almost all features, but the largest quantity again came from the central or southwest part of the house interior. It is estimated, based on the element representation and age, that no fewer than four animals were deposited, aged as immature, juvenile and sub-adult. Only one sheep mandible was recovered, but the teeth were not preserved. Several loose deciduous fourth premolars were found, supporting the presence of juvenile individuals and confirming that they did not survive past their first or second year.

Only four bones were noted with butchery marks. The practice of splitting the carcass into left and right portions was evidenced by the presence of sheep vertebra centrum in posthole F.986 that had been split down the sagittal plane (Fig. 6.25). This butchery signature had already been recorded on the same body elements from Early Iron Age contexts in Roundhouse 14 at King's Dyke and pit F.945 at Bradley Fen (see Chapter 5). Skinning was also recorded, with a series of 12 fine and shallow cut marks noted on a sheep calcaneum.

Other species

Other species from the settlement accounted for just 7% of the assemblage, with pig and horse being rather under-represented. The pig cohort comprised as little as 5.6% of the identified species count, being recovered from pit contexts scattered along the linear swathe of the settlement. On-site slaughter and consumption is suggested, based on the body part distribution showing an equal representation of both non-meat and meat bearing joints. Remains of horse were equally scarce at 1.2%, since the average for Iron Age site is generally though to rest around the 10% mark (Cunliffe 2005, 417). This species was represented by six specimens, all of which concentrated around the northern half of the settlement. The presence of red deer was also identified based on a fragment of tibia found in the large 'bone dump' in F.1018.

Discussion

The character of the faunal record suggests that the community at Bradley Fen were heavily reliant on the management of cattle (primarily), sheep and domestic pigs, with very little involvement in the procurement of wild animal resources, whether of terrestrial (deer) or marshland origin (birds, fish). Although the fen-edge shift of settlement in the Middle Iron Age heralded wider changes in the organization of the agrarian landscape, this transformation appears to have had relatively little impact on the nature of the faunal record at Bradley Fen, both in terms of species representation and context of deposition. As in the Early Iron Age, remains of sheep/goat were focused on the

Table 6.12. *Number of Identified Specimens for all species and weight (in grams in parentheses) from features associated with Roundhouse 16. The abbreviation n.f.i. denotes that the specimen could not be further identified.*

Taxon	F.751	F.759	F.789	F.1094	F.1096	Total
Sheep/goat	-	-	9	28	12	49
Cow	-	-	-	-	1	1
Sub-total to species	**-**	**-**	**9**	**28**	**13**	**50**
Cattle-sized	1	3	-	-	-	4
Sheep-sized	-	2	3	1	-	6
Mammal n.f.i.	-	-	-	-	-	-
Bird n.f.i.	-	-	-	-	-	-
Total	**1(3)**	**5(7)**	**12(52)**	**29(198)**	**13(235)**	**60(495)**

Table 6.13. *Number of Identified Specimens for all species and weight (in grams in parentheses) from features associated with Roundhouse 17. The abbreviation n.f.i. denotes that the specimen could not be further identified.*

Taxon	F.984	F.986	F.988	F.990	F.992	F.993	F.996	F.997	F.1004	F.1019	Total
Sheep/goat	3	6	7	5	2	4	1	4	-	28	60
Sheep	-	1	-	-	-	-	-	-	-	1	2
Cow	-	-	-	-	1	-	1	-	-	-	2
Sub-total to species	**3**	**7**	**7**	**5**	**3**	**4**	**2**	**4**	**-**	**29**	**64**
Cattle-sized	-	1	-	-	-	-	-	-	-	-	1
Sheep-sized	2	-	-	3	3	2	-	1	1	11	23
Mammal n.f.i.	-	-	-	-	-	-	1	7	-	-	8
Bird n.f.i.	-	-	-	-	1	-	-	-	-	-	1
Total	**5(20)**	**8(33)**	**7(25)**	**8(32)**	**7(22)**	**6(36)**	**3(4)**	**12(13)**	**1(5)**	**40(135)**	**97(325)**

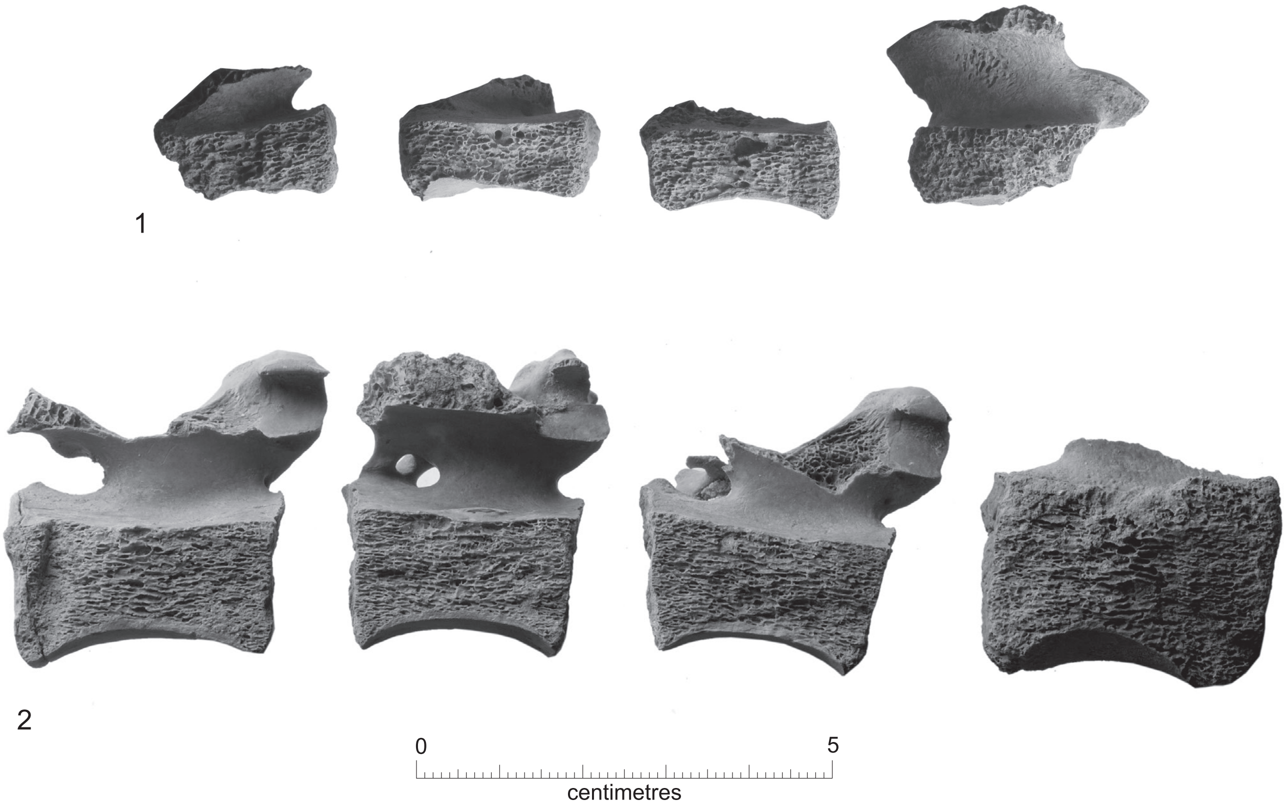


Figure 6.25. *Sheep vertebra split down the sagittal plane, examples from 1. F.61, Roundhouse 14, King's Dyke and 2. F.986, Roundhouse 17, Bradley Fen.*

roundhouses and their adjacent pits on the dry terrace, whilst deposits of cattle bone were predominately associated with wells and waterholes on the lower damp-ground contours (Fig. 6.26). There remained an intimate connection between species, contour and context, with the only difference being that the feature-sets with these varying faunal signatures now belonged to the same settlement site in the Middle Iron Age, as opposed to being spatially removed from one another (as in the Early Iron Age).

Similar intra-site patterns have been noted across other Iron Age sites, both regionally and nationally, with bones of larger species (i.e. cattle) tending to be more common in 'peripheral' settlement locations (e.g. Wilson 1996; Davis 2003, 131; Higbee & Clarke 2007, 65).

The large cattle-dominated 'bone dumps' from the Middle Iron Age settlement also have parallels in earlier phases of occupation at the site. In terms of their content, condition and context – including feature-type (waterholes) and proximity to the wet-edge – these bone dumps are remarkably similar to those documented in the Middle Bronze Age and Late Bronze/Early Iron Age (see Chapters 4 and 5). However, the scale of these deposits reached its zenith in the Middle Iron Age, highlighting the importance of cattle and the proficiency of livestock management by communities who tended the low-lying terraces of the basin. The scale of consumption is best illustrated by the bone in F.1018, which yielded the butchered remains of no fewer than nine cows. These were culled around their maximum body weight, with the pattern of carcass reduction suggesting thorough use of animal body parts, with a high numbers of bone shafts being chopped mid shaft for marrow extraction. The beef yields from this processing would have been enormous and the event almost certainly involved the wider community and/or cattle drawn from a number of different herds.

More generally, the overall composition of the faunal assemblage at Bradley Fen shows that cattle were the mainstay of the livestock economy. Given the availability of rich pastures in this lowland zone, this is perhaps not that surprising. However, a comparison of the relative frequency of the three main 'food species' across other sites in fen-edge settings, demonstrates that these trends are not always constant (Table 6.8). Despite the similarities in environmental conditions,

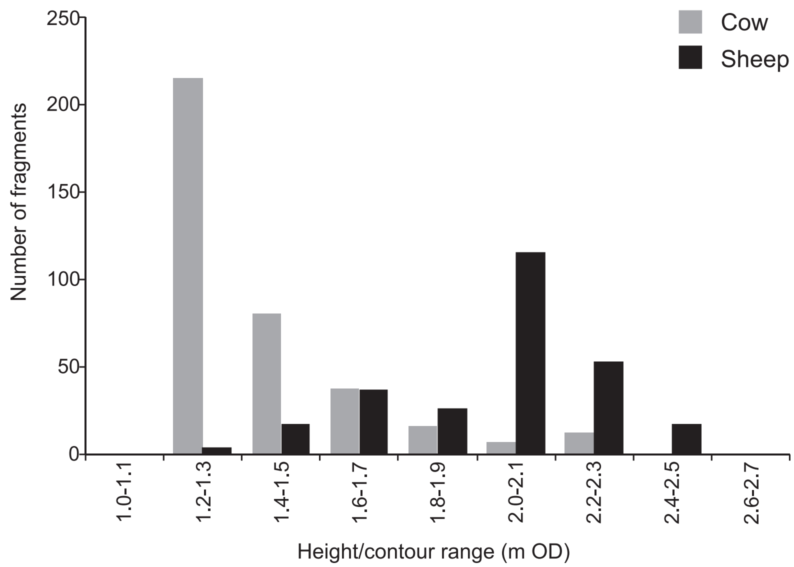


Figure 6.26. *Relationship between gross bone fragment count and contour at Bradley Fen for Middle Iron Age cattle and sheep remains.*

certain sites are dominated by cattle, while others have a prevalent sheep cohort.

More consistent is the paucity of marshland fauna or other wild animals in many of these assemblages. Though a number of the sites listed in Table 6.8 have remains of red and/or roe deer, fox, otter, mallard and greylag goose, as well as fish remains, these tend to constitute a small fraction of the faunal record. Sites like Haddenham V are very unusual, characterized by a strikingly high percentage of bird and beaver remains (Serjeantson 2006a). Bradley Fen, on the other hand, lies at the opposite extreme, displaying a negligible wild component, suggesting the community made very little use of the available wetland resources. This is perhaps closer to the 'norm' for the period and, as evidenced by numerous national and regional reviews (Maltby 1996; Hambleton 1999; Albarella & Pirnie 2008; Hambleton 2009), Iron Age sites in general do not tend to have a significant wild component, whether by the fen-edge or not.

The carbonized plant remains (Anne de Vareilles)

Seven samples were selected for investigation from the Middle Iron Age settlement from Bradley Fen: the entrance posthole of Roundhouse 15, F.9; the entrance postholes of Roundhouse 16 F.755 and F.756 and its associated gully, F.759; the slag pit F.597; the furnace F.611 and posthole F.613 from Four-post Structure 10 (Table 6.14). Due to the low number of samples and their small spatial coverage, interpretations must remain speculative.

Cereals, processing waste and arable weed flora

The presence of hulled barley (*Hordeum vulgare sensu lato*, of both the two-row and six-row varieties), spelt and emmer in the assemblage demonstrate continuity in the choice of cereals with the Early Iron Age. The chaff-rich sample from F.597 contained very little grain and few weed seeds, most of which were grain-sized. This botanical composition suggests that the grain had been stored as clean spikelets (Hillman 1981, 1984). Threshing, winnowing and coarse sieving to separate the sheaves from the straw and other impurities would have consumed less time and energy when done as a group activity during the harvesting season. The grain would then have been stored hulled (which increased its durability) and its lighter chaff only removed as grain was prepared for consumption. Given the important economic and social role of domestic herds at this time (see Rajkovača above), it is likely that the straw was an essential by-product and presumably stored in similar fashion to the grain, i.e. in raised structures.

The arable weed flora changes slightly from the Early Iron Age, with species such as cleavers and vetches and/or wild peas no longer visible in the record. The cultivated soils were damp (but not wet) and, unlike in the late second and earlier first millennium BC, do not appear to have been lacking in nutrients. Evidence for the use of wild plant foods and scrubland or woodland species, such as hawthorn and holly, disappear altogether. This absence of wild plant foods may reflect a growing dependency upon farmed goods.

Remains in context

As only a few features from Roundhouses 15 and 16 were sampled, it was not possible to conduct a spatial analysis of charred plants remains from around these buildings. It is nevertheless interesting to note that all three entrance postholes sampled contained

Table 6.14. *Middle Iron Age charred soil samples. '-' 1 or 2; '+' <10; '++' 10–50; '+++' >50 items. P = present. 100% of each flot fraction was examined.*

Context			16	755	756	758	568	573	571
Feature			9	755	756	759	597	613	611
Feature type			Ph	Ph	Ph	Gully	Pit	Ph	Furnace
Structure			RH 15	RH16				FP10	
Sample volume (litres)			3	6	2	7	12	14	2
Cereal grains & chaff	*Hordeum vulgare sensu lato*	Hulled barley grain					2		
	Triticum spelta/dicoccum	Spelt or emmer wheat				1			
	Triticum / Hordeum	Wheat or barley					2	1	
	H. vulgare sl. Internode	2-row barley inernode					3		
	H. vulgare sl. Internode	6-row barley internode					1		
	Triticum spelta glume base	Spelt chaff					71	1	
	T. spelta spikelet fork	Spelt chaff					3		
	T. dicoccum glume base	emmer chaff	4						
	T.spelta/dicoccum glume base	Spelt or emmer chaff	3						
	T. spelta/dicoccum	Spikelet fork	2						
	Triticum sp. glume base	Glume wheat chaff					33	1	
	Triticum sp. rachis internode	Glume wheat chaff					1		
Non cereal seeds	*Thalictrum flavum* L.	Common Meadow-rue				1 cf.			
	Chenopodium sp.	Goosefoots			1	4			
	Chenopodium / Atriplex	Goosefoot / Orache				1			
	Montia fontana ssp. minor Hayw.	Blinks				2			
	Stellaria media (L.) Vill	Common Chickweed		3		1			
	Caryophyllaceae indet.	Pink family seeds				2			
	Polygonum aviculare L.	Knotgrass			1	9			
	Brassica / Sinapis sp.	Cabbages / mustards				2			
	Trifolium sp.	Clovers				6			
	Medicago / Trifolium sp.	Medics or clover				5			
	Epilobium hirsutum L.	Great willowherb				1			
	small *Veronica* sp.	Field-speedwell	1						
	Plantago lanceolata L.	Ribwort plantain				5			
	Crepis sp.	Hawk's beard				2			
	Eleocharis sp.	Spike rushes				1	1		
	large lenticular *Carex* sp.	Large flat sedge seed				1			
	medium trigonous *Carex* sp.	Trilete sedge seed				4			
	large Poaceae indet.	Large wild grass seed		1		1	8		
	medium Poaceae indet.	Medium wild grass seed				1	1		
	cf. *Arrhenatherumelatius* Var. *bulbosum* (Willd.) St Amans	False oat-grass root bulb				2			
	Poaceae culm node	Grass straw node		1		8	1		
	Indet. Poaceae culm internode	Thin grass stem frags.				+++			
	Indet. Poaceae root node	Grass stem base				++			
	Indet. Poaceae awn	Grass awn					1		
	Indeterminate wild plant seeds		1		1	8	1		

Table 6.14 *(cont.).*

	Context	16	755	756	758	568	573	571
	Feature	9	755	756	759	597	613	611
	Feature type	Ph	Ph	Ph	Gully	Pit	Ph	Furnace
	Structure	RH 15	RH16				FP10	
Other residues	Very large charcoal (>10mm)	-						
	Large charcoal (>4mm)	+	+	+++	++	+++	+	+++
	Med. charcoal (2–4mm)	++	++	+++	++	+++	++	+++
	Small charcoal (<2mm)	+++	+++	+++	+++	+++	+++	+++
	twig charcoal - all <3mm diameter				+			
	Vitrified charcoal					+	-	
	Bone fragments			-	+	++	-	
	Burnt clay					+		
	Slag					++		+++
	Burnt stone			-				
	Modern contamination (roots,seeds etc.)	P	P	P	P	P	P	P

some cereal processing waste but few other ecofacts. These findings are consistent with the pattern observed in Roundhouse 14 at King's Dyke and one might therefore expect to find fewer remains in the other structural features of the Middle Iron Age houses. The southern entrance posthole of Roundhouse 16, F.755, was slightly richer than its northern counterpart, F.756. The gully F.759 was relatively rich in plant remains too, but the wild seeds it contained do not appear to be associated with cereal crops. Instead, the wild seeds, grass stems and roots originate from lightly grazed, fairly wet grassland, growing on a sandy/gravelly soil. The delicate preservation of their fine botanical structures suggests the remains might be *in situ* and may represent the dwelling's surroundings. There are three ways by which the monocot roots could have been charred: 1) the plants were uprooted and burnt; 2) the ground was broken up to reveal topsoil roots before a fire was lit; or 3) turf was purposefully dug up and burnt, perhaps to quench a fire or create a controlled smoky combustion rather than intense flames.

Evident crop storage pits were not found in any of the phases of this site. There are, however, four-post structures which are likely to have been granaries. The prehistoric use of above-ground granaries has been extensively explored by Gent (1983). Sufficient here is to mention that these structures are not uncommon on prehistoric Fenland sites and would have offered a sensible alternative to storing grain underground in areas where the water-table could reach ground level. One posthole from Four-post Structure 10 was sampled, F.613. It contained one grain, two elements of glume wheat chaff and a little charcoal. Whilst these remains do not provide us with any information other than that spelt wheat was used in the Middle Iron Age, hoards of burnt crops would not be expected unless the granary and its contents had been destroyed by fire.

The richest charred botanical assemblage from across the whole site was found in the slag pit F.597. With its 111 elements of cereal chaff, 66.7% of which were definitely spelt with a further 30.6% of likely spelt, the assemblage clearly represents cereal processing waste. Unlike in the earlier periods where crop waste does not appear to have been burnt and/or buried, the development in metalworking seen across the site seems to have made use of such waste as kindling. The absence of any plant remains other than charcoal in the furnace F.611 could indicate that cereal processing waste was delegated to specific industrial activities.

Saddle querns and rubbing stones

Just as the remains of cereals and cereal processing waste were closely associated with the roundhouses at Bradley Fen, so too were the utensils used to convert them into flour for consumption. In total, fragments of two incomplete saddle querns and a large rubbing stone were recovered from the settlement swathe (Fig. 6.27). The first of these derived from clay-lined pit F.751 in Roundhouse 16 (Fig. 6.28). The quern fragment was burnt and had shattered into five pieces, two of which could be refitted. It displayed a pecked, but well-worn, concave grinding surface, tapered edges and a roughly hewn but broadly flat underside. It was accompanied by a large rubbing stone, with a pronounced convex surface which sat neatly on top of the reassembled fragments of quern. As with the

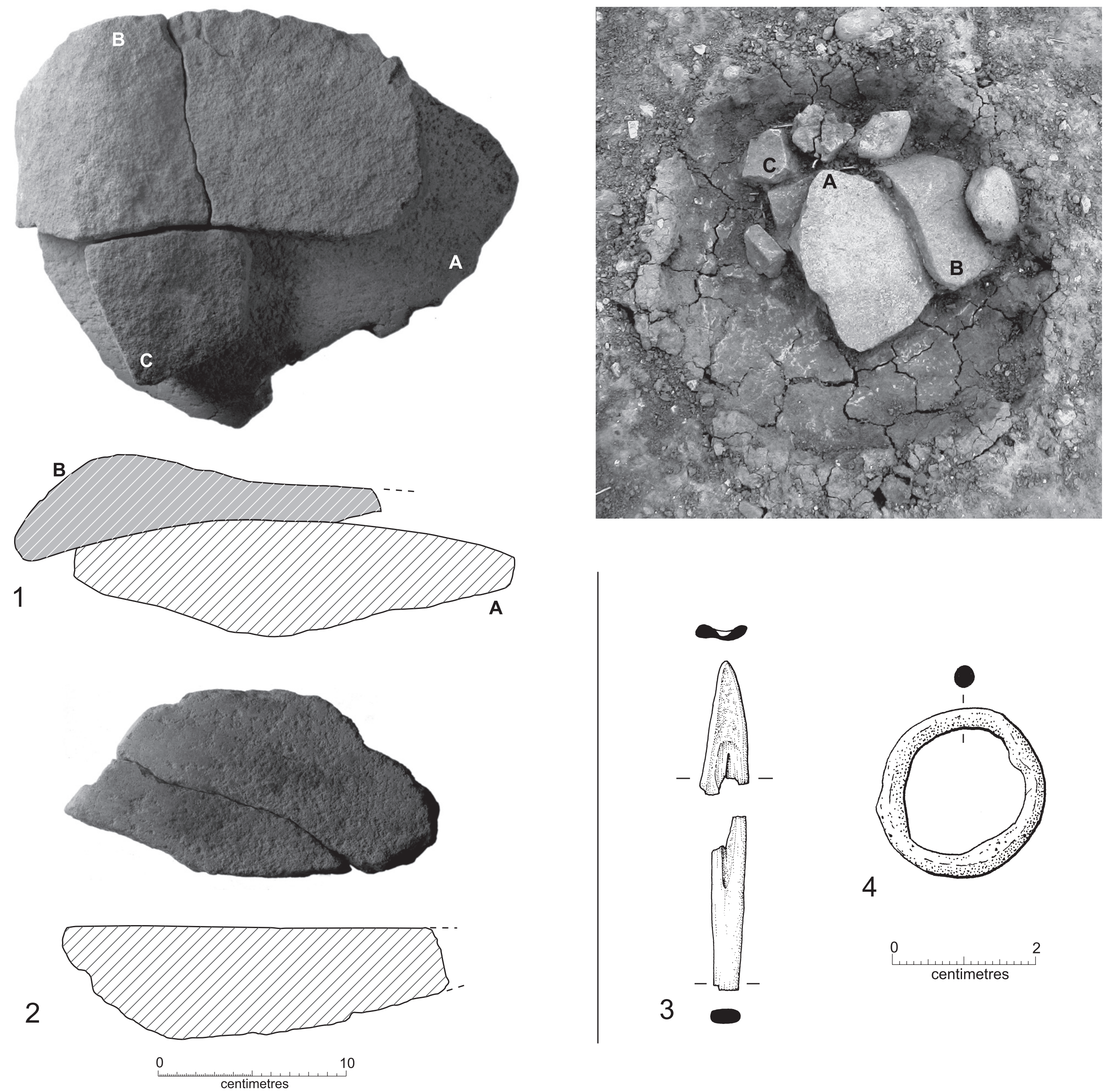


Figure 6.27. *Two incomplete saddle querns and a large rubbing stone, bone point and copper alloy ring.*

Early Iron Age examples from King's Dyke, these appear to have been deposited with some formality. Here, the pieces had been packed into the pit with other fragments of burnt stone and a broken triangular loomweight.

The second quern fragment was also recovered from a clay-lined pit (F.762), located just 12.2m north of Roundhouse 16 (Fig. 6.28). This comprised two refitting parts of a burnt, incomplete quern deposited alongside other fire-cracked stones (0.8kg) and three sherds of Middle Iron Age pottery. The surviving fragments displayed a slightly concave, worn grinding surface and a rough unfinished underside. This was made from a fine-grained metamorphic rock, probably derived from the Charnwood Forest district of Leicestershire. Interestingly, this region was highlighted as a potential source of worked stone in the Early Iron Age, as was the area around Ely, where the greensand quern and

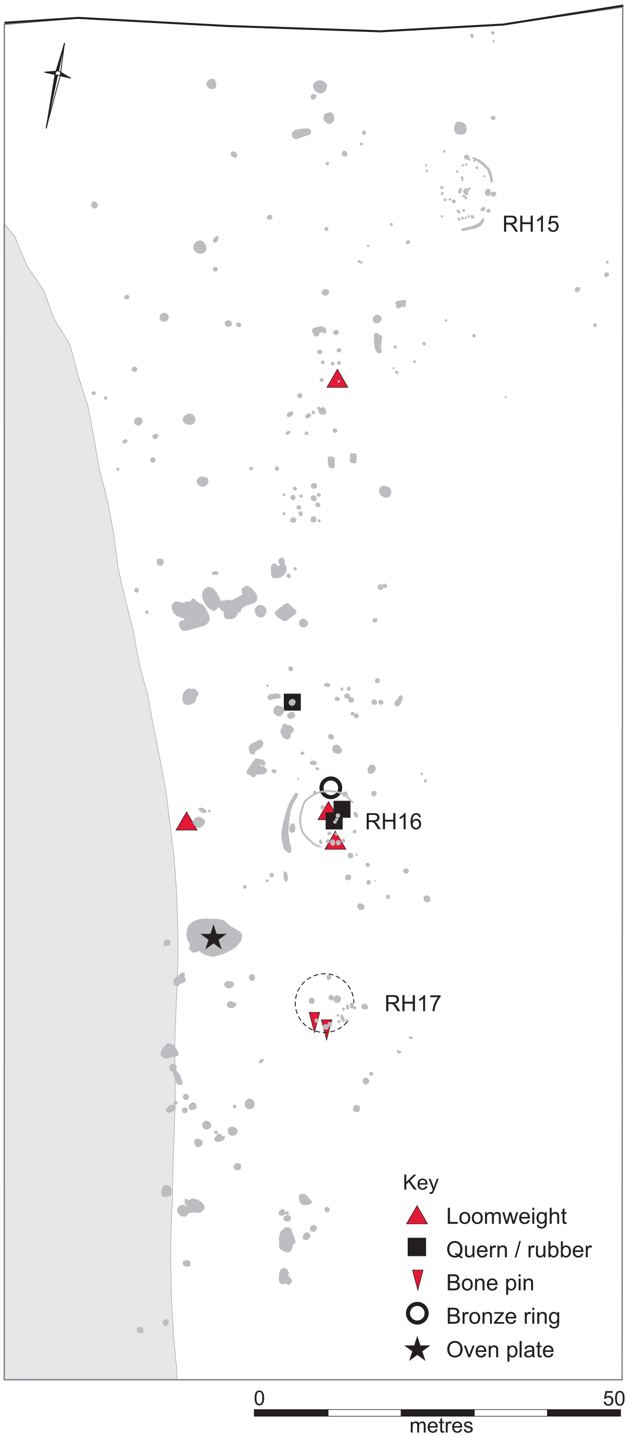


Figure 6.28. *Distribution of loomweights, querns, bone point, copper alloy ring and oven plate.*

rubbing stone from pit F.751 may have originated. These connections may be instructive and could imply that there was continuity in the networks through which worked stone was obtained in the first millennium BC.

Saddle quern catalogue (Simon Timberlake with stone identification and sourcing by Kevin Hayward)

Saddle quern 1 (Fig. 6.27): F.751 [751a], 1908g (total weight), five burnt and broken fragments of saddle quern made of a micaceous gritty sandstone.

1. Two adjoining fragments (total weight 1168g), dimensions: 200mm × 95mm × 25–50mm. Evenly ground but distinctly concave quern surface and a flat base.
2. Three non-adjoining fragments (total weight 740g), dimensions: 60mm × 70mm × 25mm; 90mm × 50mm × 30mm; 80mm × 70mm × 40mm. Burnt and heat-cracked.

Lithological description: Greensand (Lower Cretaceous). Variable fine light green (glauconitic) and micaceous calcareous sandstone. Closest outcrop 40km to southeast at Ely.

Saddle quern 2 (Fig. 6.27): F.762 [765], 990g (total weight), two adjoining fragments of saddle quern, dimensions: 200mm × 90mm × 20–50mm (total). Possibly an andesitic tuff. Heat-cracked, burnt and broken. The worked surface is flat to slightly concave in profile, with evidence for a considerable degree of surface wear and polish. There are faint traces of lineation indicating the rubbing direction. The keel or underside of the quern is convex and uneven, but relatively smooth.

Lithological description: Dark-grey/green banded metamorphic rock with black inclusions. Possibly from the Mountsorrell Igneous Complex or the older pre-Cambrian rocks of the Charnwood Forest district of Leicestershire (75km). Metamorphic (altered) rocks occur at the contact of the Mountsorrell Granite and the older intrusives from this region, including spotted hornfels (Fox-Strangeways 1903).

Rubbing stone 1 (Fig. 6.27): F.751 [751a], 3408g (total weight) dimensions: 250mm × 195mm × 30–60mm. A particularly large rubbing stone made of orthoquartzitic sandstone. This has a pronounced convex profile and is ground with areas of finer polish over its surface.

Lithological description: Greensand (Lower Cretaceous). Variable fine light green (glauconitic) and micaceous calcareous sandstone. Closest outcrop 40km to southeast at Ely.

The pottery (Matt Brudenell)

The fourth century BC saw the emergence of a new tradition of making and decorating pots in the Flag Fen Basin. The visual, tactile and functional distinctions which had marked different categories of jar, bowl and cup since the beginning of the Late Bronze Age began to break down. In their place, a more restricted range of slack-shouldered jar forms came to dominate the pottery service, with bowls and cups largely disappearing from the Middle Iron Age ceramic record.

These transformations underlie, and inform upon, changing attitudes to the way that foodstuffs were cooked, presented and shared on Middle Iron Age settlements such as Bradley Fen. Though this assemblage is relatively small (588 sherds weighing 5627g), the changes we can track in pottery from the Early Iron Age offer a sense of how culinary practices were transformed. Furthermore, the analysis of this

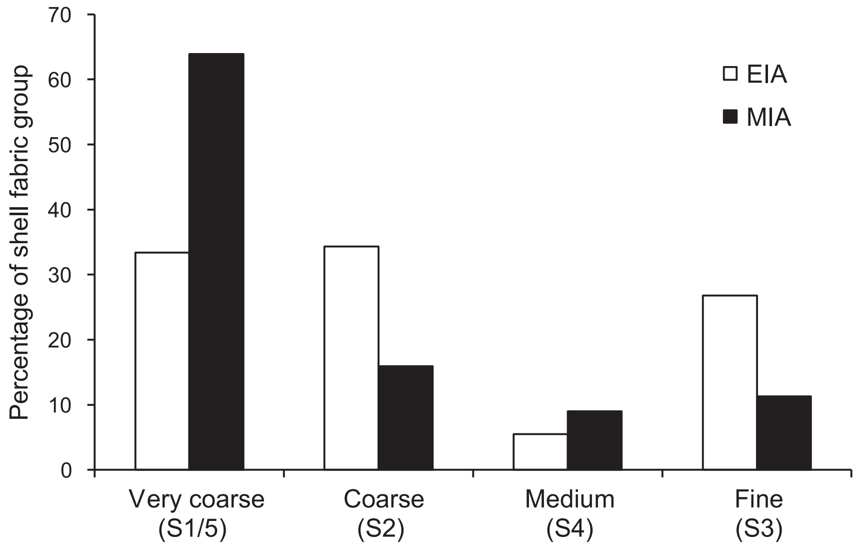


Figure 6.29. *Early Iron Age and Middle Iron Age pottery fabric composition.*

material provides the opportunity to examine changes in the way pots and pot fragments were treated in deposition.

Fabrics, forms and functions

Pottery was recovered from across the settlement, with dense concentrations occurring in and around Roundhouse 16 and 17 (Fig. 6.24). In total seven fabric types were distinguished in the assemblage, belonging to four major fabric groups (Table 6.15). Shell rich-fabrics dominated (92% by weight) and, while the inclusions had leached from many of the sherd surfaces, it is believed that most pots were produced using locally available fossiliferous Jurassic clays. Similar fabrics were observed in the Early Iron Age assemblage, though the overall frequency of shelly wares was considerably higher in the Middle Iron Age, with a clear emphasis on the coarse end of the inclusion size spectrum (Fig. 6.29). Moreover, the range of fabric types/recipes employed in this period was more restricted (7 types compared to 19), perhaps suggesting the development of more formalized manufacturing procedures. Alternatively, this reduction in fabric variability could indicate a lessening of inter-community networks of ceramic exchange, reflecting a greater emphasis on the household-level ceramic production and consumption.

Further insight into these mechanisms is hindered by the small size of the assemblage and a lack of petrological analyses on pot fabrics from Bradley Fen and most other sites across the Flag Fen Basin – an area of research which has been greatly neglected. There is nonetheless the sense that a more conservative potting tradition emerged after the mid fourth century BC. Whereas a myriad of vessel forms were constructed in the earlier first millennium BC, potting conventions in the Middle Iron Age were structured around the production of a relatively narrow range of slack and round-shouldered jars with short uptight or out-turned necks. These were accompanied by the occasional globular bowl, neckless tub and jar with stepped-shoulders and constricted mouths. Whilst in this context only 12 vessels were sufficiently intact to assign to form (including 37 sherds, 927g), their shapes are entirely in keeping with the new, restricted repertoire of the Middle Iron Age (Table 6.16).

In the Middle Iron Age, vessel shape seems disconnected from any obvious functional category, suggesting that vessel size/capacity was now the principal means by which functional distinctions were made and measured (Brudenell 2007, 264). Given the size of the Bradley Fen assemblage, it is only possible to make some general observations about vessel sizes, using measurable rim diameters as an index to vessel capacity. Of the 11 measurable rims present, 7 belonged to 'small pots' with mouth diameters of <15cm (Fig. 6.30). Of the remaining four, three are considered 'medium-sized pots' with diameters of 18–24cm and one is classified as a 'large pot', with a rim diameter of 32cm.

The predominance of small vessels is fairly typical of Middle Iron Age assemblages from the region, with peaks in rim diameter frequency commonly centring upon 12–14cm (Hill with Horne

Table 6.15. *Middle Iron Age fabric groups.*

Fabric	Fabric group	No./wt (g) sherds	% fabric (by wt.)	No./wt (g) burnished	% fabric burnished (by wt)	No./wt (g) Scored	MNV (burnished: scored)
G1	Grog	17/200	3.6	-	-	2/20	3 (-:-)
Q2	Sand	36/112	2.0	-	-	1/5	1 (-:-)
S1	Shell	266/3310	58.8	-	-	56/1173	23 (-:3)
S2	Shell	163/1287	22.9	18/314	24.4	23/215	12 (1:1)
S3	Shell	87/582	10.3	39/205	35.2	5/99	3 (-:-)
SQ1	Shell & sand	13/121	2.2	2/12	9.9	-	1 (-:-)
SQ2	Shell & sand	5/15	0.3	-	-	-	- (-:-)
Total	**-**	**588/5627**	**100.1**	**59/531**	**9.4**	**87/1512**	**43 (1:4)**

Table 6.16. *Middle Iron Age forms.*

Form	Description	No./wt (g) sherds	No. vessel	No. burnished	No. scored	Rim diam. (cm)
A	Slack shouldered jars with upright necks	15/287	5	-	2	10–24
D	Slack shouldered jars out-turned necks	3/47	1	-	-	13
E	High round shouldered jars with short upright necks	14/451	4	-	1	13-18
B	Jars with stepped shoulders and upright/ out turned necks	2/23	1	-	-	14
J/H	Jars with marked/angular shoulders and slightly out-turned necks	3/119	1	-	-	13
Total	**-**	**37/927**	**12**	**-**	**3**	**10–24**

2003, 148, fig. 73; Hill & Braddock 2006, 171, fig. 5.72). These small capacity vessels, holding around 1–2 litres of foodstuffs, seem to have been general purpose cooking and serving pots – four of the seven vessels in this category retaining traces of sooting on the exterior or carbonized food crusts on the interior. In light of their size, they could only have held food for one or two people, perhaps suggesting that most meals were prepared and consumed with only a few participants at each sitting. We may envisage, then, a rather different dining aesthetic to that which occurred in the Late Bronze Age and Early Iron Age. Not only was the Middle Iron Age meal structured by a different service of ceramic utensils, but potentially, patterns of participation and dining etiquette may have been markedly different.

Decoration and date

One of the defining characteristics of Middle Iron Age pottery from Bradley Fen is the occurrence of scoring on the shoulder and body of vessels. This is a decorative practice which lends the name 'Scored Ware' to the region's later Iron Age ceramic tradition (Elsdon 1992). Random scoring was identified on a total of 87 sherds (1512g) in the assemblage. It was almost exclusively applied to the shelly wares (particularly coarse fabric S1), with only one sandy sherd (5g) and two grog-tempered sherds (20g) displaying the treatment. This decorative tradition, whose heartland lies in the Nene, Welland and middle Trent Valleys, had a long currency, potentially spanning the fourth century BC to the mid first century AD. However, patterns emerging from sites around the lower Ouse, on the southern fringes of the Scored Ware 'style-zone', suggest that there are some chronological trends in the frequency of scoring, with 'low' sherd count percentages under the *c.* 20% mark characterizing both 'early' and 'late' manifestations of the tradition (Brudenell 2013; Webley 2013).

The Bradley Fen assemblage falls within such a low bracket, with only 14.8% of sherds scored (26.9% by weight). Typologically, the assemblage probably belongs to the earlier end of the Middle/later Iron Age, as there are several vestigial Early Iron Age traits on

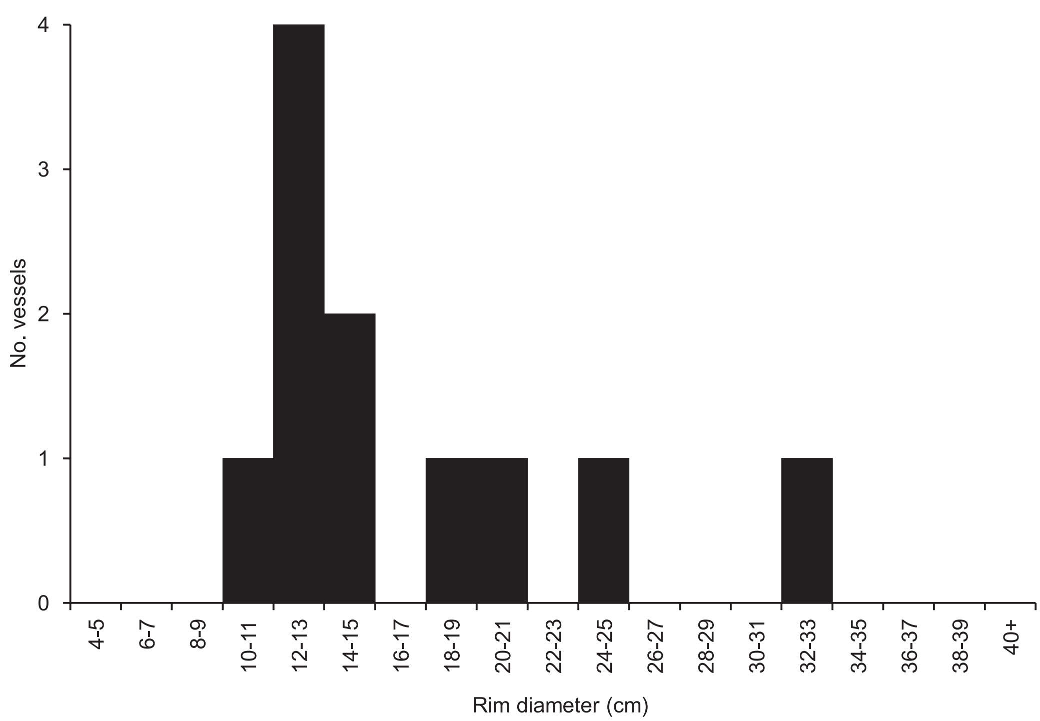


Figure 6.30. *Middle Iron Age pottery rim diameters.*

Table 6.17. *Middle Iron Age rim-top decoration.*

Decoration	Vessel zone	No vessels	No./wt (g) of sherds
Fingertip impressions	Rim-top	10	20/466
Fingernail impressions	Rim-top	1	1/6
Weak cabling	Rim-top	1	1/8
Tool impressions	Rim-top	1	1/18
Total	**-**	**13**	**23/498**

some of the vessels. Noteworthy among them are the footring base and two rims displaying an internal thickening or marked flange on the lip (Fig. 6.31 nos. 1, 8 and 9); mouldings more commonly associated with the earlier Iron Age. Some of the vessel forms in the Middle Iron Age assemblage also recall earlier first millennium BC types, particularly the small marked-shouldered jar from pit F.602 (Fig. 6.31 no. 4). Similarly, there is an unusually high level of rim-top decoration, with 13 of 29 different vessel rims ornamented (44.8%; Table 6.17). Such high frequencies are normally associated with earliest/Early Iron Age assemblages, such as those from Tower Works or Vicarage Farm, Fengate (Brudenell with Hill 2009, 189), though it should be stressed that the preference was for shoulder decoration on the King's Dyke/Bradley Fen Early Iron Age material.

These observations aside, the absolute dating of the pottery is anchored by two AMS radiocarbon determinations deriving from a charred seed from pit F.597 and carbonized residue on the exterior on a Scored Ware vessel from pit F.1011 (Fig. 6.31 no. 13). The seed from F.597, a pit which yielded 25 plain (un-scored) sherds of pottery (244g), generated a date of 360–90 cal BC (Beta-262622: 2160±40 BP). This was associated with a large dump of slag deriving from furnace F.611, which has a comparable archaeomagnetic date of 310–80 BC (see Noel above). The suggestion of an *earlier* Middle Iron Age attribution for the pottery is better supported by the date from the Scored Ware vessel in F.1011 (associated 8 sherds, 314g), calibrated to 390–180 cal BC (Beta-262621: 2220±40 BP). Combined, these serve to place the assemblage somewhere between 390–90 BC, although typologically, a date closer to the beginning of this timeframe is favoured, perhaps centring on *c.* 350–200 BC.

Discussion – dining and deposition

In very broad terms, the scale and character of the Middle Iron Age assemblage at Bradley Fen reflects a fairly typical domestic ceramic repertoire of this period. Overall, the range of vessels is restricted, with the service focused on small-capacity containers which probably fulfilled a variety of culinary roles. Though it is difficult to make too many generalizations, we are most likely looking at the remains of pottery repertoires geared towards the cooking and serving of meals within small groups, presumably based around the family/household. In some respects, this picture is not that different to the preceding period. However, in the Middle Iron Age we lose sight of the way in which some pots were involved in episodes of formal dining. Whereas in the Early Iron Age it was possible to distinguish distinctive types or services of vessels used in these settings (finewares, profusely decorated coarseware and large to very large-sized jars (see Chapter 5)), in the Middle Iron Age these fade from view. This may be because the residues of such activities were no longer singled out for formal deposition. In other worlds, certain pots may still have been reserved for feasts or other special occasions, but since they were rarely treated in a distinctive manner in depositional acts, they are hard for us to pinpoint (the exception perhaps being the burnished jar in pit F.1094 (Fig. 6.31 no. 16), which was found alongside a sheep bone deposit).

On the other hand, there is no impression that Middle Iron Age pots were made with a view to fulfilling such specialized roles in formal dining. Though a case could be made that the decorated late Tène-style globular bowls of this period played such a part, these are a later development of the second and first centuries BC and are absent from the Bradley Fen assemblage. Overall, there is little sense of distinctiveness in this ceramic repertoire, suggesting pots were no longer used as vehicles for marking different kinds of consumption event. In many respects they were much more utilitarian.

This change in their social significance is perhaps also reflected in the context and condition we find their fragments at Bradley Fen. Unlike for the Early Iron Age, there were very few pottery deposits dominated by large refitting sherds derived from just one or two pots (the exceptions being deposits in pits F.1094 and F.1011). Instead, the vast majority of feature assemblages were characterized by mixed groups of sherds from multiple different vessels in varying states of fragmentation. In fact, there is little to differentiate these pottery deposits, other than by the quantities of material interred (Table 6.18). In nearly all instances, pottery was just one element of a matrix of refuse materials – the constituent parts originating from a range of different and possibly unconnected practices (see Brudenell & Cooper 2008). These speak of midden-ing patterns and give a general sense of the physical conditions of the land surface in the settlement. In this context, there are few signs that individual pot fragments were afforded any sort of 'special' treatment in depositional acts. This is in contrast to some of periodic

Table 6.18. *Middle Iron Age pottery – quantities of material interred.*

Deposit size	Weight range	Number of features	% of features
Small	0–100g	49	72
Medium	101–250g	14	21
	251–500g	4	6
Large	501–1000g	1	2
	1000g+	-	-
Total	**-**	**68**	**100**

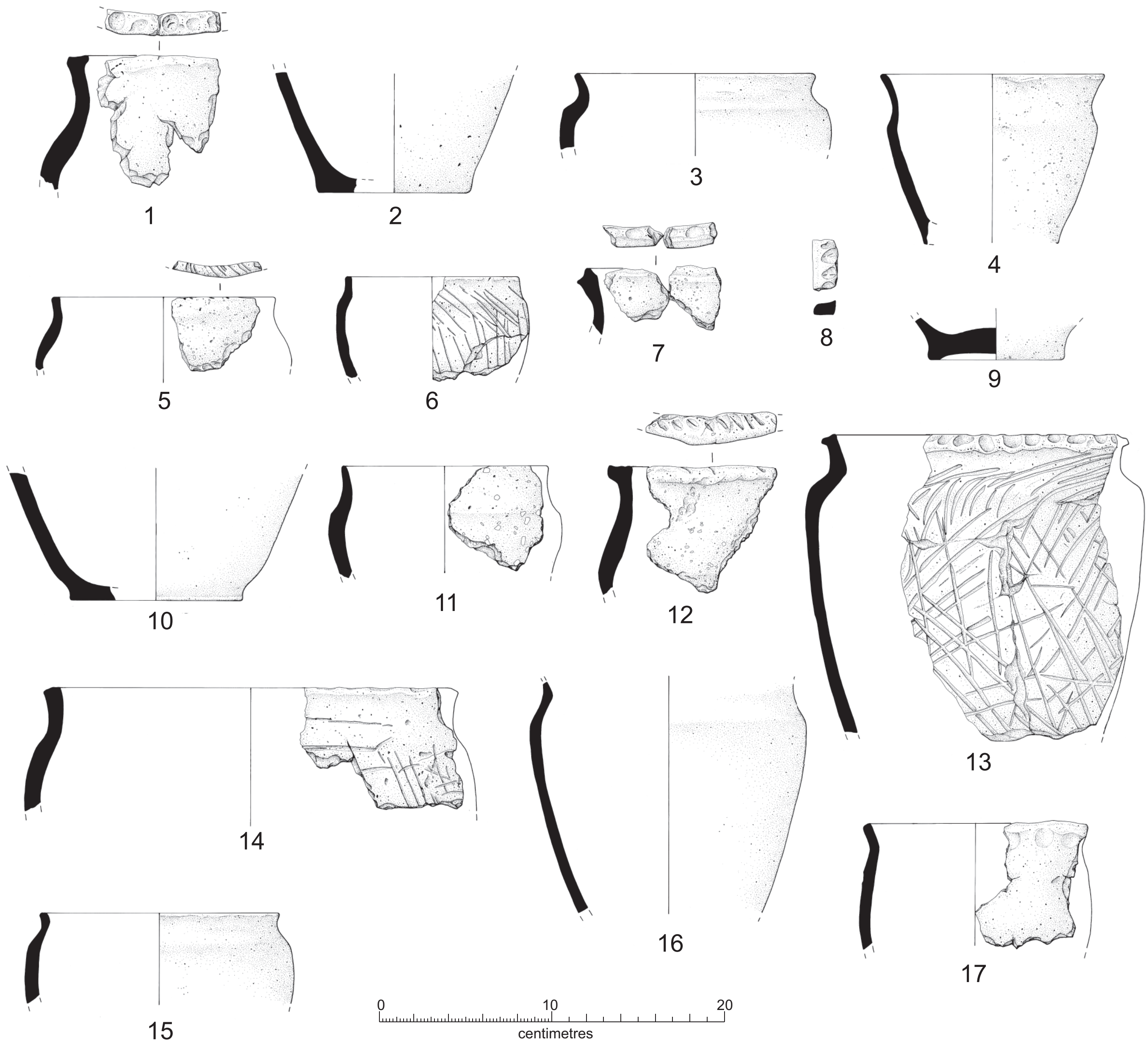


Figure 6.31. *Middle Iron Age pottery illustrations. 1. Form E, fabric S1, fingertip-impressed rim-top. Slag pit F.597 [568]; 2. Base of jar, fabric S2. Slag pit F.597 [568]; 3. Form B, fabric G1. Clay-lined pit F.602 [561]; 4. Form H, fabric S1. Clay-lined F.602 [561]; 5. Form E, fabric S1, tool-impressed rim-top. Gully F.541 [496], Roundhouse 15; 6. Form A, fabric S2, scored neck, shoulder and body. Clay-lined pit F.992 [1069], Roundhouse 17; 7. Peaked, lid-seated rim with fingertip impressions on interior lip, fabric S1 Intercutting pit cluster pit F.784 [788]; 8. Internally flanged rim with fingertip impressions on rim-top, fabric S4. Clay-lined pit F.983 [1060]; 9. Foot-ring base, fabric S2. Waterhole F.831 [855]; 10. Base of jar, fabric S4, burnished. Clay-lined pit F.922 [1069] and pits F.993 [1070] and F.997 [1074], Roundhouse 17; 11. Form A, fabric S1. Clay-lined pit F.1064 [1129]; 12. Form E, fabric S1, fingertip-impressed rim-top. Waterhole F.1064 [1150]; 13. Form E, fabric S1, fingertip-impressed rim-top and deeply scored neck, shoulder and body. Pit F.1011 [1088]. Carbonized residue on exterior radiocarbon dated to 390–180 cal BC (Beta-262621: 2220±40 BP); 14. Form A, fabric S1, fingertip-impressed rim-top and scored neck and shoulder and body. Clay-lined pit F.1096 [1186], Roundhouse 16; 15. Form A, fabric G1. Pit 1099 [1191], Roundhouse 16; 16. Shoulder and body of burnished jar, fabric S3. Pit F.1094 [1187], Roundhouse 16; 17. Form D, fabric SQ1. Ash 'rake-out' pit F.995, [1072].*

practices in the Early Iron Age, again suggesting that a rather different set of values were attached to ceramic remains in this period.

Material traditions and technologies

While less visually spectacular than some of the standout finds from the excavation, the discovery of a Middle Iron Age forge at Bradley Fen must be listed as one of the most significant, and certainly one of the rarest, in this region. Ferrous slag and cinder are fairly commonplace on Middle Iron Age settlements, implying that some aspects of metalworking, such as smithing, were widespread and organized at fairly a local level. However, metalworking debris in the quantities recovered from Bradley Fen is far more unusual for this period. Whilst is it is hard to argue that production was still anything but small-scale in nature, by the standards of other contemporary sites in Cambridgeshire, the residues of this *in situ* metalworking are far more abundant and varied (Table 6.19). In fact, more than in quantity, it is the *range* of metallurgical practices evidenced at Bradley Fen, and the fact that we can identify a dedicated workshop area within the settlement, that makes this site particularly significant.

As detailed by Timberlake, Doonan & Hommel below, the slags, furnace conglomerates, hearth bottom fragments and clay refractories indicate that iron smelting, smithing and copper alloy casting were all undertaken. The evidence for smelting is the most surprising, as this was a more specialized process, with hints that Jurassic ironstone was used as an ore, probably obtained from deposits immediately west of Peterborough on the Jurassic Ridge. Based on the character of the debris, Timberlake, Doonan & Hommel argue that the technology employed was bloomery smelting, with each smelt from a bowl-furnace like F.611 potentially producing 1–2kg of iron. The total quantity of slag and furnace conglomerate suggests this smelting was small-scale and unlikely to constitute a full-time activity. That being said, the fact that the furnace lining was replenished on occasions indicates that this was not a one-off event, but an episodic activity at Bradley Fen, occurring frequently enough to justify maintaining the furnace and a discrete metalworking area within the settlement.

Evidence for smithing was found in the form of slag, a hearth bottom and hammerscale. The latter, reported on by Timberlake, was largely indicative of secondary smithing activities, with the types of scale characteristic of blacksmithing work carried out on an iron billet (forging and welding) and/or the re-working of iron objects on an anvil. In terms of distribution, there is a broad correlation between Iron Age features yielding magnetized material interpreted as hammerscale and features with slag and other 'macro' metalworking debris (Fig. 6.32). The distribution of the latter was primarily centred upon the area of four-post structures, suggesting smithing was mainly conducted to the north of the furnace F.611. Interestingly, this area was home to two ash-rich rake-out pits F.609 and F.610, both of which yielded hammerscale and were likely associated with nearby smithing hearths. The second smaller cluster of hammerscale was found to the south around furnace F.611 itself, indicating that some smithing activities was also conducted alongside smelting in this workshop area.

Given the extent of hammerscale sampling, it is probably unwise to try and tie down the zoning of metalworking activities too closely. Indeed, the interpretation of this evidence is not without its challenges. For instance, it needs be noted that magnetized material was also recovered from some Bronze Age contexts on the site. This can simply arise from burning in domestic hearths (Timberlake pers. comm.), or could potentially relate to Iron Age hammerscale introduced by later bioturbation. Taphonomic factors therefore skew the distribution patterns, and so the results presented here have been filtered to remove material from non-Iron Age features and those yielding low frequencies of diagnostic scale in the analysed fractions (samples <10%). Nonetheless, the weight of the evidence points to both smelting and smithing occurring in central area of the site, around and adjacent to furnace F.611.

The same might also be argued for copper alloy casting, based on the distribution of the crucibles (Fig. 6.32). These were recovered from features to the

Table 6.19. *Material class encountered in the metalworking assemblage*

Class	Class description
Unprocessed or partly roasted ore	Bog iron and ?ironstone
Fired refractory	Fired/partially fired clay material with no attached slag
Slagged furnace/ hearth lining	Fired refractory ceramic with attached slag materials
Furnace conglomerate	Heterogeneous mass of slag with fuel and ore inclusions
Porous slay nodule	Low density porous slag nodule
Dense slag nodule	Dense slag nodule with low porosity
Slag runs	Discrete irregular slag forms which retain flow texture
Smithing hearth bottom fragments	Fragments of plano-convex slags associated with iron smithing
Hammerscale	Platy iron/iron oxide scale <10mm & globular spheroidal scale consisting of iron oxide and iron silicates.

Figure 6.32. *Distribution of iron slag, crucible fragments and hammerscale.*

west of furnace F.611, between Roundhouse 16 and the intercutting pit cluster. Analysis of their internal residues points to the casting of tin bronze, though traces of lead and arsenic were also identified. The crucibles themselves were of pyramidal form and, with capacities around 30–50ml, were capable of casting small to medium sized copper alloy objects (e.g. pins, fibulae, rings etc.). Surprisingly, however, no slag or moulds were recovered and, barring a single copper alloy ring from the buried soil above Roundhouse 16

(Figs 6.27 & 6.28), the site yielded no metal artefacts whatsoever – not even scrap, or tools associated with the metalworking process (hammers, tongs, pokers etc.). What was manufactured at Bradley Fen can therefore only be guessed at. Still, the recovery of a significant quantity of Iron Age metalwork along the western end of the Flag Fen post-alignment provides a partial insight into the range of artefacts once used by the Basin's inhabitants. Whilst this picture is clearly biased by the character of long-held depositional traditions of metalwork in watery contexts (traditions focussed on weapons (particularly swords), item of dress and display), finds such the decorated scabbard mount from Flag Fen (Coombs 2001, 281, fig. 10.11, no. 273) and more recently, the decorated La Tène II iron sword from the Must Farm palaeochannel (Robinson et al. 2015, fig. 5.14), attest to the quality of craftsmanship in certain items from the region.

Of course, these need not have been made locally. But could it be that some were manufactured at Bradley Fen? At present, this is impossible to answer, though it is undoubtedly the *only* site excavated in the Flag Fen Basin with evidence of a clear metalworking focus, arguably *capable* of making some of these artefacts. Whether or not the artisan skills were possessed by this community is another matter, but it certainly provides an additional context with which to understand the metalwork from the Basin. What seems clear is that the residents of Bradley Fen were not engaged in these activities full time and, even though elements such as smelting were specialized pursuits, this was to all intents and purposes an ordinary 'domestic' setting, as opposed to an extra-ordinary 'industrial' site.

This leaves question hanging as to how these activities were organized and whether they were in any way controlled by the patronage of local elites. Again, without knowing what kinds of artefacts were being produced at the site, this is hard to gauge, but there is no indication that the inhabitants of the settlement – presumably the metalworkers themselves – were of 'higher status' than those from contemporary settlements in the Basin. Indeed, artefact repertoires are remarkably uniform across all types of Middle Iron Age site in the region, implying that social standing was rarely reflected in the range of domestic utensils recovered. Nor too are there signs that site architecture, such as the size of roundhouse, provides a straightforward index to status, even though the scale of enclosure projects may hint at the occupants' ability to muster external workforces. Either way, both gauges would hardly suggests that the settlement at Bradley Fen was anything other than a standard farmstead, since the structures are small, unenclosed and yielded few finds that might invoke a sense of elevated position.

The metalworking assemblage (Simon Timberlake, Roger Doonan and Peter Hommel)

The metalworking assemblage from Bradley Fen had a combined weight of 50.32kg and was predominantly composed of iron slag and fired refractory material. Crucible fragments were recovered (see below), but accounted for less than 1% of the total weight of debris recovered. Approximately 91% of this came from of a single dump of mixed slag in pit F.597 (Fig. 6.33). Other material totalled 4.34kg, of which 39% came from feature F.611. The remaining material was more widely spread in secondary contexts, yet there was a clear concentration with a 30m radius of F.597.

For the purposes of this report, material has been categorized into groups according to their formal characteristics, with quantification by class and context given in Tables 6.19 and 6.20. The descriptions which follow are complemented by a series of scientific analyses (metallographic and chemical) undertaken on a sample of assemblage, with serves to characterize its properties and the various technical processes responsible for its formation. The characterization relied on comparative analysis with The University of Sheffield's Archaeometallurgical Reference Collection (TUSARC) and followed guidelines established by Bayley et al. (2001).

The results show evidence for a range of metallurgical activities including iron smelting, iron smithing and copper alloy working. The presence of an iron smelting furnace (F.611) was also confirmed and the material recovered from pit F.597 provided further indications of its superstructure. Moreover, analysis points to the presence here of other metallurgical features, such as melting furnaces, casting pits and iron smithing hearths which have not survived. These now can be better understood in light of the characterization of the associated finds.

Iron metalworking

Evidence for ferrous metallurgy was found in the form of fired refractories and slagged refractories, furnace conglomerates, slag nodules and runs, smithing hearth bottoms, ores and hammerscale. These are discussed in turn below.

Fired refractory and slagged refractory

This class of material made up a significant proportion of the assemblage investigated, representing 36% of the total weight, with F.597 contributing by far the greatest proportion. The fired refractory and hearth lining exhibited a range of colours from light blue-grey to orange, reflecting the range of atmospheres encountered in the furnace. The refractory itself was a sandy fabric with void impressions of organic material (most likely dung) and frequent large quartz inclusions (up to 11mm).

The morphology of the refractory material offered clues to the size and structure of the furnace. One fragment from F.597 had

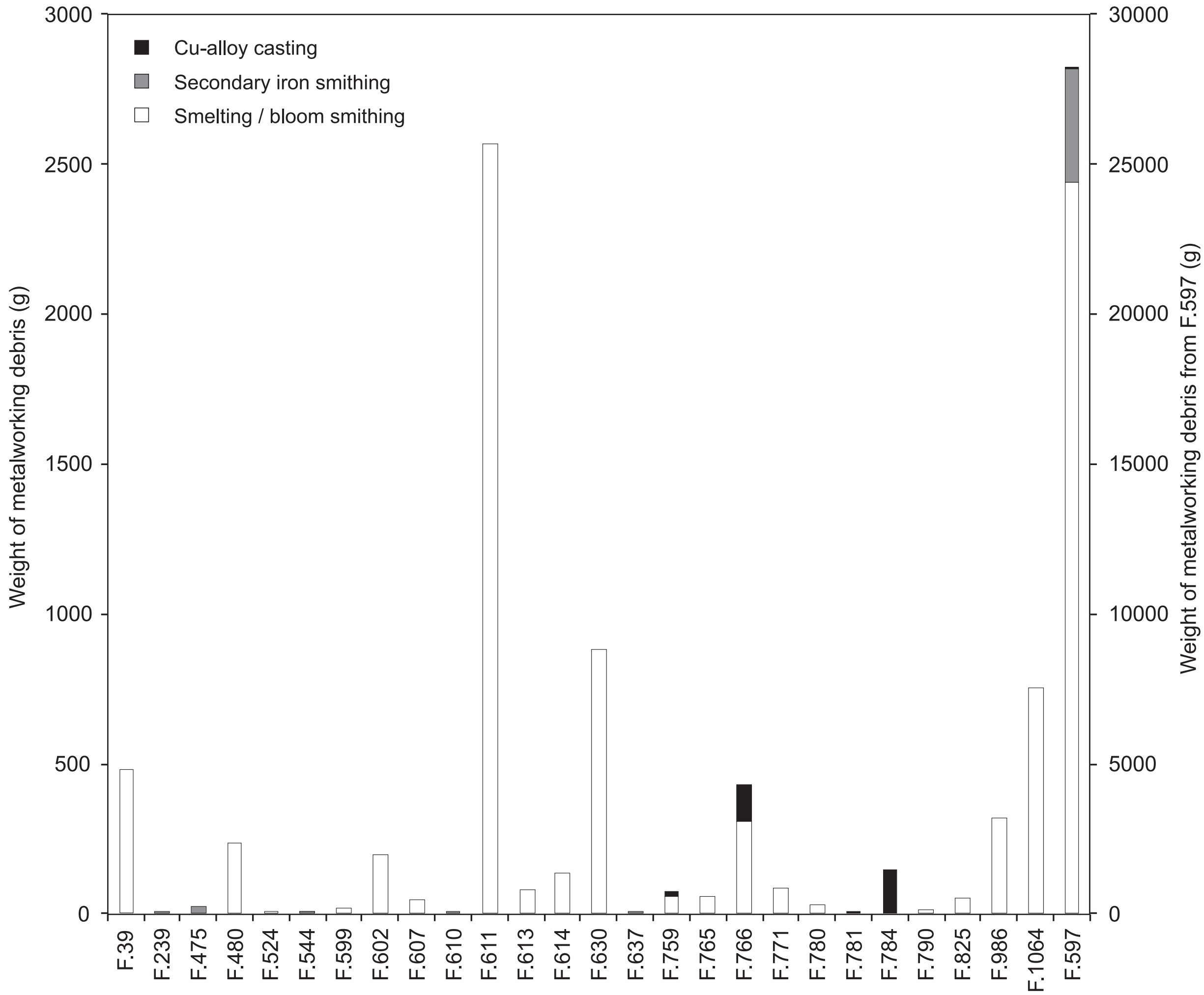


Figure 6.33. *Categories of metallurgical debris and an estimation of the formative metallurgical processes (by weight) associates with all Iron Age features. Note that the right-hand axis is used for material from F.597 only.*

a pronounced curvature suggesting that the furnace had a diameter of approximately 0.32m. This matches the aperture of the *in situ* furnace of F.611, from which it probably derived. The shape of other pieces also indicated the presence of an arched aperture in its superstructure, presumably to facilitate access to and/or withdraw the bloom. Such an opening could potentially be used to tap slag from the furnace, but there was little evidence for significant masses of tap slag amongst the assemblage and this would not be expected within a furnace of this date.

In total, refractory (furnace lining) was recovered from just four features within a 25m radius of F.611, with 99.5% of this derived from F.597. The extensive vitrification noted on many pieces, coupled with the mineral suites recorded during microstructural analysis (see Fig. 6.34), confirm that the material had been exposed to temperatures of at least 1200°C. Vitrification and erosion is expected at such temperatures and can destroy metallurgical furnaces. However, there is evidence that successive layers of refractory clay had been applied over slagged lining, indicating that the furnace had been relined/ repaired on several occasions (Fig. 6.34 no. 6). This was one strategy by which metalworkers managed to maintain high temperatures whilst using local clays which may not have been ideal for such applications. More importantly, it suggests that iron smelting was a prolonged activity rather than a single event at Bradley Fen.

Furnace conglomerate

Furnace conglomerates are significant accumulations of slag and, in a complete state, will resemble the cavity of the furnace base (slag cakes). They are normally heterogeneous with consolidated areas, commonly including pieces of charcoal, ore fragments and gas voids. Once fragmented, the conglomerates are difficult to identify and are often classed as non-diagnostic dense slags. In contrast to smithing hearth bottoms, which tend to be well-formed slag cakes with a distinct plano-convex profile, furnace conglomerates are usually irregular and variable in form. Their identification is significant though, for they are normally considered to be indicative of iron smelting activity, in other words, the production of iron from primary resources (McDonnell 1986).

At Bradley Fen, furnace conglomerates accounted for 24% by weight of the total slag assemblage and some 43% by weight of the denser iron smelting slags. The majority of this material came from F.597. Furnace conglomerate fragments tended to be large, with some examples of the slag cakes weighing in excess of 1kg, but with smaller pieces frequently weighing more than 200 to 300g. Most examples of these did not form coherent dense slags, but rather comprised a mixture with both dense and porous regions (Fig. 6.35). One of the largest examples had a diameter of approximately 22cm, which is similar to the diameter calculated from fragments of slagged refractory, suggesting a furnace diameter of *c*. 25cm (Cleere 1972; Crew 1991).

Approximately 85% of the furnace conglomerate came from pit F.597, with 5% from the smelting furnace F.611, another 5% from well F.1064 and 3% from posthole F.986 in Roundhouse 17.

Slag nodules and runs

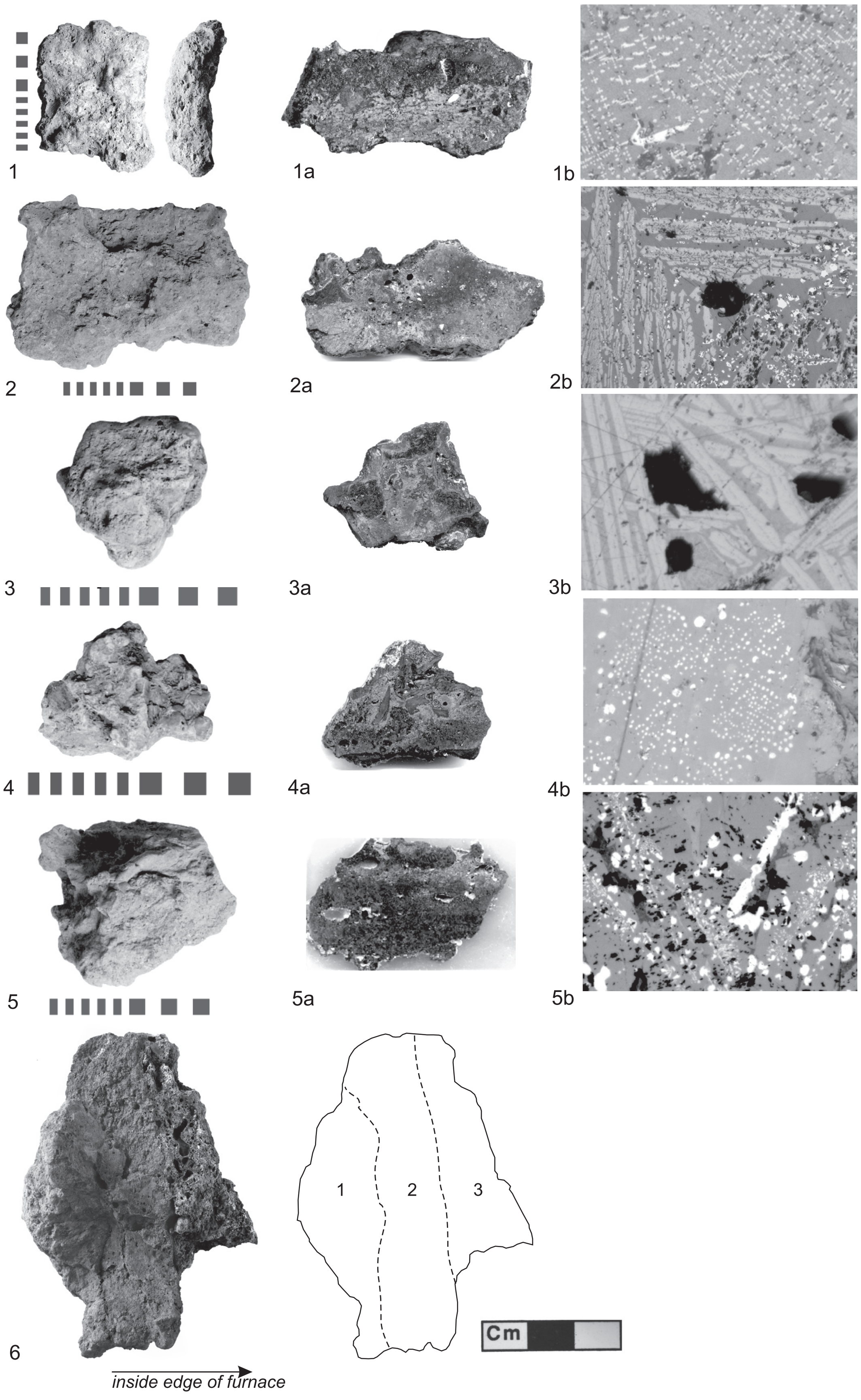
Three types of slag nodules were recorded: low density porous nodules, dense nodules and slag runs (16.09kg). Not surprisingly most of these (87%) were recovered from pit F.597, with smaller quantities from the smelting furnace F.611 (6%; *in situ.* slag debris?) and pit F.630 (6%).

The most common of these were the dense slag nodules (46%). The majority of these would appear to derive from fragmented furnace conglomerate, being characterized by an absence of porosity and signs of having been completely molten. Most had at least one fractured surface, indicating that they were derived from a greater mass of slag, perhaps being broken off during the separation of the iron bloom from the slag, possibly during the primary smithing of the bloom. Inclusions were rare in these nodules, although a few examples of charcoal were noted alongside a small number of gas cavities. Most of the fragments retained quite angular facets and were not particularly worn, suggesting that they had not been exposed on the surface for any length of time. Without detailed compositional analysis it can sometimes be difficult to attribute this slag to specific processes, although visual examination did suggest these were generically related to the furnace conglomerate/ slag cake and slag runnel. The failure to detect copper in any of this slag through the extensive use of XRF confirms that all the slag was derived from ferrous metallurgy.

The second most common kind of slag nodule were the low density porous (LDPN) or vesicular slags (39%). These tended to be lower in density because of the presence of gas bubbles and their more irregular shape. On their own they are a difficult category to tie to a single process, yet these are to be expected in the range of slags recovered from smelting or smithing processes, although they are much more likely in smelting contexts. A number of the examples from Bradley Fen had small inclusions of charcoal and were quite poorly preserved, with many of the slag minerals having corroded to iron oxides. It was commonplace for these porous slags to have worn facets, although it was apparent that many were fractured, presumably being derived from larger masses of slag such as the furnace conglomerates, which were subsequently reduced by smithing.

The third class of slag comprised slag runnels (14%). These were typically small, with the majority of examples weighing <20g. The shape of these slags suggested that they had formed by molten slag solidifying amongst a compressed mass of charcoal. Many facets had charcoal impressions. Most examples appeared to be whole, suggesting these they had developed as complete runs and were not derived from a large mass. Presumably this class of slag nodule would have fused with the furnace conglomerates had they remained molten for longer. Similar material has been reported by Tylecote (1992), Crew (2000) and Paynter (2007). The material had a noticeable acoustic quality, producing a metallic

Figure 6.34 *(opposite). Slagged refractories. 1. F.597 <291> ; 1a. Sectioned sample: High porosity, yellowish-grey, curved refractory material with a slagged and vitrified glassy layer on one surface. 145 × 125 × 45mm, low density, low magnetism, dark grey streak. In cross-section three distinct layers could be clearly determined and inclusions of quartz and large pebbles could be seen; 1b. Microstructure: Slagged hearth/furnace lining with iron metal and other compounds occasionally occurring near the vitrified surface. Attached slag materials are frequently glassy. Iron oxides distributions were varied from wüstite to magnetite (10–35%). In some iron-depleted areas of fine-grained iron silicates, occasional irregular magnetite crystals surround small areas of fine-grained wüstite. In other areas (i.e. around the edges of the slag material) iron oxides dendrites (wüstite?) were interspersed with a complex glassy matrix; 2. F.597, [568] <295>; 2a. Sectioned sample: Vitrified red-grey mass of fired clay and slag. 175 × 125 × 55mm, medium density, low magnetism. Extremely varied and heterogeneous mass of ceramic and slag; 2b. Microstructure: Large vitrified mass of ceramic with attached low-porosity slag material. Predominantly iron silicate (fayalite) laths interspersed with occasional concentrations of free iron oxide spinels (magnetite). A number of concentrations of globular a-ferrite were also noted; 3. F.597, [568] <295>; 3a. Sectioned sample: Greenish-grey, moderate-low porosity slag with a significant amount of attached refractory material. 75 × 75 × 45 mm, medium density, low magnetism. Dense slag material in close association with highly porous, corroded areas (charcoal voids); 3b. Microstructure: Moderate-high porosity slag nodule with highly variable composition. Iron oxides are rare when present, very fine and difficult to discriminate. Iron silicate present as fayalite with oriented lath structure; 4. F.611 <300>; 4a. Sectioned sample: Mixed greenish grey slag and refractory material with large charcoal inclusions evident. 100 × 80 × 50mm, low density, low-moderate magnetism, fine crystalline fracture, many voids of eroded charcoal. In cross-section, apparent heterogeneity with highly crystalline slag material interspersed with charcoal, large voids and other concretions; 4b. Microstructure: Porous and heterogeneous slag lump with inclusions of charcoal and many large voids. Predominantly iron silicates of large blocky crystal structures interspersed with glass matrix. Iron oxide predominantly wüstite (<5–15%) but with localized concentrations of spinels; 5. F.1064 [1150a] <908>; 5b. Sectioned sample: Dark-grey, medium porosity with some attached refractory material. 116 × 102 × 75mm, medium density, low magnetism, fine crystalline fracture, light grey streak. Small inclusions of quartz and clay; 5b. Microstructure: Large and highly variable slag microstructure. Predominantly low porosity with some areas of moderate porosity and occasional large voids. Obscured groundmass by brittle fracture pull out. Iron silicate structures were variable, ranging from equi-axed to lath fayalite. Wüstite predominant iron oxide accompanied by occasional iron spinels (magnetite). 6. Evidence of furnace relining.*


1
1a
1b
2
2a
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4a
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5a
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1
2
3
Cm
inside edge of furnace

Table 6.20. *Quantification of metalworking debris examined. FC + SC = furnace conglomerate + slag cake; DN + LDN + SRN = dense slag nodule + low density nodule + slag runnel; SR + FR = slagged refractory + fired refractory (hearth lining); SHB = smithing hearth base; HS = smithing hammerscale from bulk samples (only samples >1g recorded); Crucible = Cu-alloy crucible; * denotes feature dated to the Early Iron Age.*

Feature	FC + SC	DN + LDN +SRN	SR + FR	SHB	HS	Crucible	Smelting/ bloom smithing	Secondary smithing	Copper-alloy casting
31	-	-	-	-	2g	-	-	2g	-
39	-	36g	-	-	-	-	480g	-	-
239	-	-	-	-	6g	-	-	6g	-
473	-	-	-	-	2g	-	-	2g	-
475	-	-	-	-	24g	-	-	24g	-
480*	-	10g	-	-	<1g	-	237g	-	-
524	-	6g	-	-	-	-	6g	-	-
544	-	-	-	-	6g	-	3g	3g	-
597	10430g	13960g	17803g	3760g	17g	10g	24390g	3777g	10g
599	2g	19g	-	-	-	-	21g	-	-
600	-	-	-	-	2g	-	-	2g	-
602	-	-	-	-	1g	-	195g	1g	-
607	-	48g	-	-	-	-	48g	-	-
609	-	-	-	-	2g	-	-	2g	-
610	-	-	-	-	4g	-	-	4g	
611	666g	986g	55g	-	4g	-	2566g	4g	-
613	-	22g	12g	-	-	-	82g	-	-
614	-	20g	-	-	-	-	137g	-	-
630	-	882g	24g	-	-	-	882g	-	-
637	-	-	-	-	4g	-	-	4g	-
653	-	-	-	-	2g	-	-	2g	-
759	-	3g	-	-	-	16g	58g	-	16g
765	-	-	-	-	-	-	56g	-	-
766	-	56g	-	-	-	120g	311g	-	120g
771	84g	-	-	-	-	-	84g	-	-
780	-	30g	-	-	-	-	30g	-	-
781	-	-	-	-	<1g	6g	-	-	6g
784	-	-	-	-	-	148g	-	-	148g
790	-	14g	-	-	-	-	14g	-	-
825	50g	-	-	-	-	-	50g	-	-
986	316g	-	-	-	-	-	320g	-	-
991	-	-	-	-	2g	-	-	2g	-
1064	652g	-	-	-	-	-	754g	-	-
1154	-	-	-	-	2g	-	-	2g	-
Totals (kg)	**12.2+**	**16.09+**	**17.89+**	**3.76**	**0.08**	**0.3**	**30.72**	**3.83**	**0.3**

ring when handled. There were a few instances of slag runs which had developed into larger masses (Fig. 6.36). Whilst such examples superficially resemble tap slags their low incidence and very short length (typically <70mm) suggests that the smelting technique was not reliant on the tapping slag.

Microstructurally, this group of slags is variable, with microstructures ranging from lath fayalite with no iron oxides to equi-axed fayalite with frequent iron oxides (including both wüstite and magnetite, see Fig. 6.36). This range of structures is also visible in individual furnace conglomerates and suggests that a common process was responsible for all these products.

Overall, this class of slag (slag nodule) forms a significant part (35%) of the smelting slag assemblage and is not uncommon for iron smelting of this period. The presence of slag prills/runs have been noted at other Iron Age sites (Dungworth pers. comm.) although their explicit reporting is not common.

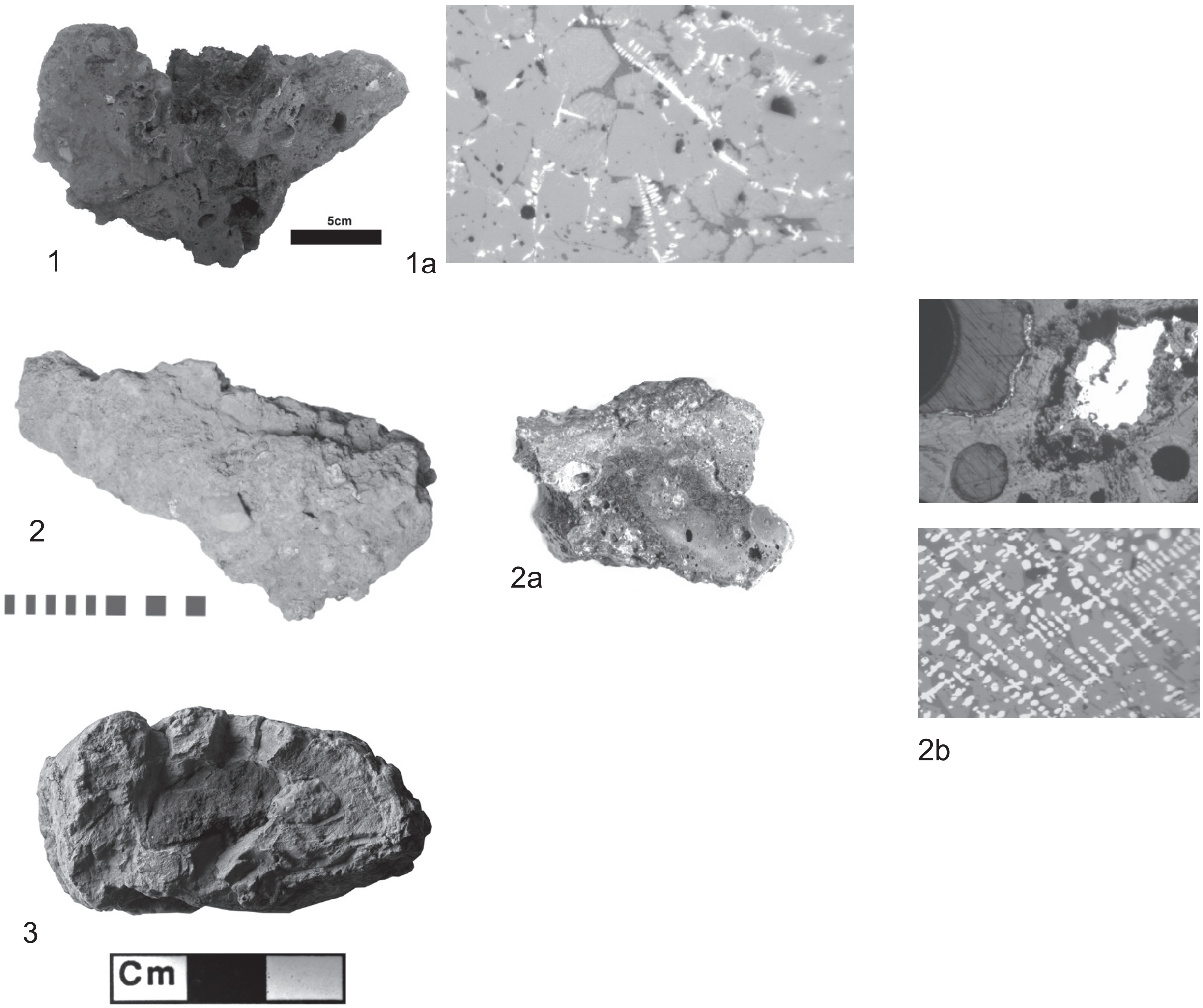


Figure 6.35. *Furnace conglomerates. 1. F.597, [568] <296> Sectioned sample: Greyish-black slag conglomerate. Dense but with significant porous zones. Numerous inclusions of charcoal (preliminary identified as oak). 213mm × 143 × 160 mm. Low magnetism. Porosity appears to be from gas (rounded voids) and eroded charcoal (angular voids); 1a. Microstructure: Extensive zones of equi-axed fayalite with common wüstite dendrites and low porosity. In zones with higher porosity microstructure, this alters to lath fayalite and glass. Wüstite is the predominant iron oxide; 2. F.597, [568] <291>; 2a. Sectioned sample: Greenish-grey. Moderate-low porosity slag with a significant amount of attached refractory material. 75 × 75 × 45 mm, medium density, low magnetism. Dense slag material in close association with highly porous, corroded areas (charcoal voids); 2b. Microstructure: Heterogeneous microstructure, ranging from glassy areas with inclusions of a-ferrite and charcoal to extensive regions of fayalite with well-developed wüstite dendrites. 3. F.597 [568] <291> Bog iron ore nodule, see description below.*

Smithing hearth bottoms

One complete (sample <298>) plus 6–7 incomplete or possible examples of smithing hearth bottoms (SHBs) were recovered from the slag dump F.597. This complete SHB had a diameter of *c.*110mm and a mass of 248g. It is also possible that other SHBs may have been misidentified as being small slag cakes/ smelting furnace bottoms.

Smithing hearth bottoms form as slag within the base of shallow bowl-shaped forging hearths through the accretion of hammerscale re-melted in the fire and also its reaction with the clay refractory linings. Often these are magnetic due to the amount of free iron and iron oxide (wüstite) present.

The presence here of perhaps half a dozen SHBs confirms that forging of the recently produced iron billet into objects was almost certainly taking place on site and most likely within the vicinity of the smelting furnace(s). However, the absence of any smithing hearths or dedicated forge area holds little potential for understanding how different metalworking activities were articulated spatially around this site. Nevertheless, the dumping of these SHBs into the slag pit from its northern side might suggest that these missing hearths lay on the northern edge of the ironworking/ metalworking area. Soil samples (in the form of standard 10 litre environmental bulk samples) were collected from the vicinity of the contexts producing evidence

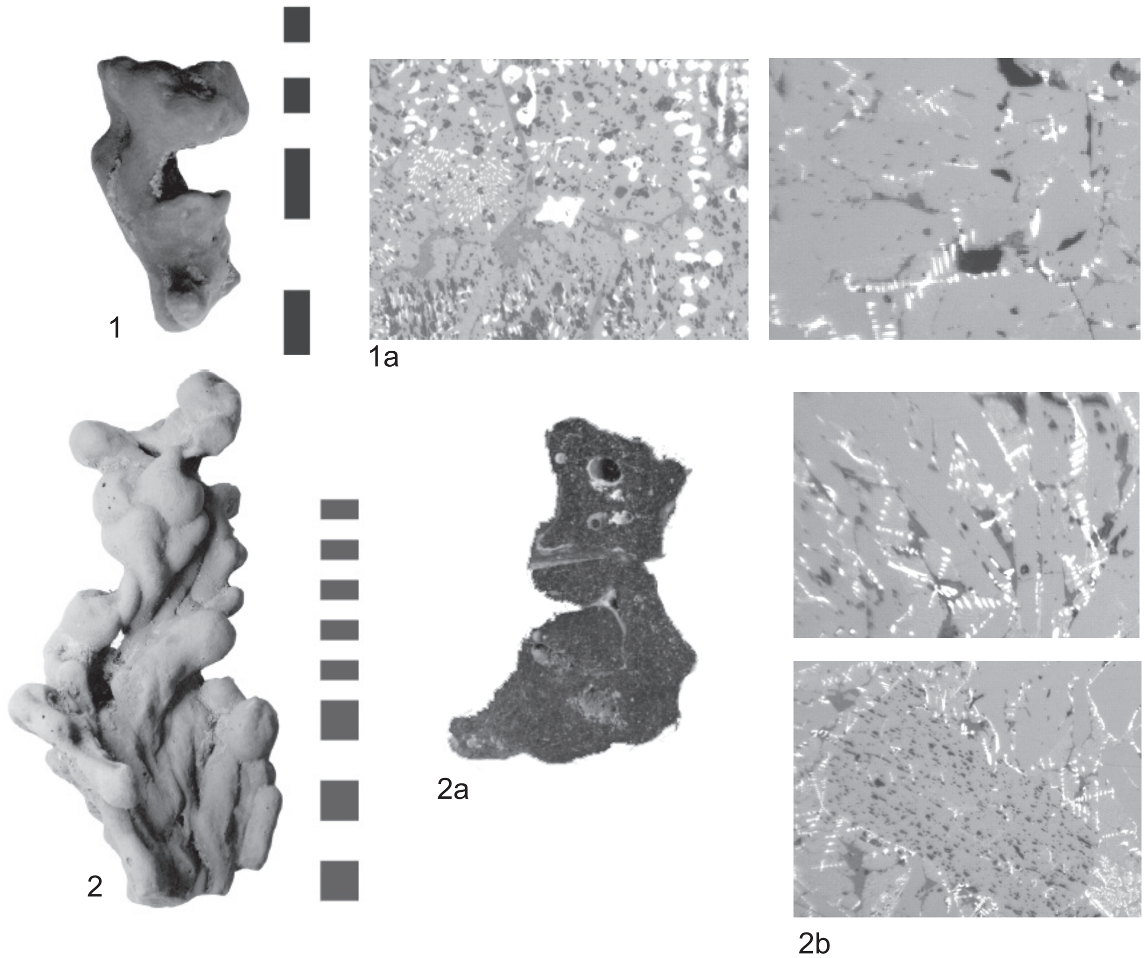


Figure 6.36. *Slag runs. 1. F.597, [568] <291>, dense slag nodules. Greenish-grey to grey. Rare porosity. Up to 70mm in length. Low magnetism. Appearance suggests solidification around a charcoal mass; 1a. Microstructure: Heterogeneous microstructure, ranging from lath fayalite with no iron oxides to well-developed equi-axed fayalite with frequent wüstite dendrites; 2. F.611, [571] <300>, accumulation of slag runs/prills. Greenish-grey to grey. Dense. 130 × 70 × 25mm, low magnetism, fine crystalline fracture; 2a & b. Microstructure: Dense slag accumulation with occasional large contraction pores. Predominant iron silicate (fayalite) laths, with frequent wüstite dendrites accompanied by glassy matrix. Some instances of inclusions which appear to be fragments of a highly vesicular slag.*

of metalworking. These samples were sieved, then scrutinized for hammerscale (see below). Given the low distribution and also re-deposition of SHBs, the relative density of hammerscale across this site might be another way of helping to define the context and whereabouts of secondary iron smithing.

Ores

Just two examples of possible iron ore were recovered from this ironworking/ smelting assemblage. The piece recovered from pit F.597 was associated with iron slag. Samples of ore (particularly bog iron) are not commonly encountered at sites with low levels of smelting evidence, given that most of the iron mineral collected for smelting is fairly effectively processed. Usually the iron ore is found in association with roasting pits, of which none have been encountered at Bradley Fen.

<291> F.597 [568] NE quadrant (Fig. 6.35 no. 3): Part of a broken, relatively soft and concentrically layered (chemically precipitated) nodule of yellowish-brown limonite (goethite). This example resembles the nodular type of bog iron ore. No evidence of heat treatment (enrichment roasting). 60mm diameter; weight 58g. Not sectioned or examined microscopically. Approximately 60% FeO.

<815> F.514 [468]: An example of iron mineral weighing *c.* 600g was recovered from pit F.514. Examination using low magnification microscopy revealed an oolitic type groundmass accompanied by biogenic structures (no carbonate was present). One face of this stone appears to have dissolved into sinuous cavities, the latter forming a hardened and possibly vitrified iron-rich skin, suggesting contact with an intense heat, either through roasting, or else through its inclusion within an iron smelting furnace. Iron slags produced in the bloomery process tend to contain approximately 70% FeO, meaning that the ore normally needs to be greater than this value to produce a successful iron bloom. XRF analysis of this sample found the iron content to be 68% FeO. Analysis initially suggested that this was likely to be a fragment of Jurassic ironstone. However,

Table 6.21. *Bulk percentage of iron, manganese and nickel within iron ores and slag (PXRF analysis). SC = slag cake; FC = furnace conglomerate; DN = dense slag nodule; SRN = slag runnel; SR = slagged refractory (furnace lining).*

Cat. no.	Feature	Context	Material	Iron (Fe)	Fe error	Manganese Mn	Mn error	Nickel (Ni)	Ni error
815	514	468	Iron ore?	49.992	1.128	0.394	0.055	0.009	0.02
291	597	568 NE	Bog iron ore	42.167	0.88	1.268	0.075	0.011	0.022
295	597	568 NE	FC/SR	9.489	0.166	0.083	0.024	0.014	0.007
296	597	568 NW	FC	46.173	1.052	0.465	0.058	0.035	0.028
298	597	568 SE	SC/SR	48.406	1.148	0.192	0.05	0	0.021
300	611	571	FC	45.985	1.011	0.49	0.057	0.003	0.019
300	611	571	FC	33.241	0.654	0.281	0.046	0.002	0.017
621	986	1063	DN	46.54	0.974	0.304	0.049	0.007	0.025
908	1064	1150	FC	49.167	1.149	0.836	0.07	0.025	0.023
314	630	591	SRN	37.298	0.807	0.674	0.063	0.037	0.019

it is plausibly a piece of (sandy) bog iron, although quite different from sample <291> examined above.

Overall, the concentration of iron oxide (iron %) present within <815> would normally be considered marginal (i.e. at the lower limit of what was feasible) for smelting in a bloomery furnace (see Table 6.21). This raises the question as to whether these were rejected pieces, or whether they were samples of an ore that was first roasted in order to enrich it (in iron) sufficiently to smelt. Given that the above analyses of the slag suggest a variable but often higher iron content (up to 49% Fe) than present in the nodular bog iron <291>, the implications are that if it was used, the ore would first have had to be enriched by roasting, effectively converting this from limonite (FeO.OH) to hematite (Fe_2O_3) as the principal mineral. Most early bloomery slags contain between 60 and 75wt% iron oxide, thus any ore containing much less than this would have proved difficult to smelt (Dungworth 2011).

Interestingly, the 'nodular ore' (<291>) appears to be richer in manganese (up to 1.5 % MnO) than the 'sandy ore '(<815>), whilst the concentric nodular structure of the former suggests a slightly different genesis. Buchwald (2005) for instance refers to the collection and use of 'lake ore' in Scandinavia, a somewhat similar precipitate of colloidal iron hydroxide which is higher in manganese (0.9 to 4wt%) and phosphorus and which forms discrete flattened round nodules up to 5cm in diameter which were often collected from existing/former lake beds. Typically a slag formed from the smelt of such an ore would end up slightly enriched in manganese and phosphorus, whilst the level of these impurities within the iron (metal) itself would have been correspondingly reduced. This does put into question as to how representative this particular sample was of the type of ore smelted; with the composition of the sandy 'bog iron' (or else a combination of the two different ores) more closely reflecting the actual composition of the slags produced. Either way, the iron, manganese and even nickel contents of the potential ore samples and slags appears to be consistent with a model which suggests that both of these were (or might be) genetically associated and that 'bog irons' (consisting both of lake bed nodules and true bog 'iron pan' layers) might have formed the basis of this small, but locally resourced iron smelting operation.

At the rather similar fen-edge setting of Colne Fen, Earith in Cambridgeshire, a 30cm thick iron pan (bog iron) deposit was recently discovered at the western end of the Rhee Lake basin (Boreham 2004). Following this discovery several utilized iron nodules were collected from the nearby Langdale Hale Iron Age/Romano-British settlement and were subsequently analysed by Chris Salter. One of these ironstone nodules possessed a rather similar concentric structure to <291>. This sample was identified at the time as being an example of a *roasted* 'bog iron', implying (but certainly not proving) its exploitation as an iron ore, or alternatively as a convenient source of red pigment.

Hammerscale

At total of 129 bulk environmental samples from Bradley Fen yielded residues containing magnetic material and, within these, all of the magnetic grains recovered from the 2mm–4mm sieved fractions were examined. At this size the majority of grains were probably hammerscale; most of those produced during forging being between 1mm and 3mm in diameter. This meant that the fraction containing the smallest hammerscale (<1–2mm diameter) was neither assessed nor recovered.

Amongst the coarser material were the categories of large platy hammerscale and hollow spheroidal hammerscale (usually >3mm), most of which was produced from hammering-out the slag still accreting to the hot and semi-molten iron bloom following its removal from the iron smelting furnace. The secondary smithing products, on the other hand, were all associated with anvil forging. This included the thin black shiny to dull platy fragments of iron oxide, the smaller spheroidal hammerscale more typically being a product of the welding of iron, often reflecting higher temperatures as well as the use of a sand flux. Other important information to record was the presence or absence of fresh/abraded hammerscale – a possible means to distinguish between contemporary and redeposited material. An analysis of the non-hammerscale magnetics was likewise considered to be essential to the quantification of ironworking activities. The latter included burnt clay, 'oxidized lumps' (iron oxides which may or may not be related to the ironworking) and the charcoal-rich magnetics. The latter are most probably nodules formed around powder charcoal and finely disseminated hammerscale 'dust'.

Approximately 138g of magnetic residues were looked at; the features containing the most magnetics with the highest percentage of confirmed hammerscale in them being F.597 (38g), F.475 (24g), F.544 (6g), F.239 (6g), F.611 (4g) and F.610 (4g). Whilst the highest concentration of iron scale still seems to be associated with the slag pit (F.597), the radius of activity is much greater than for the smelting, with a moderately important concentration of activity associated with Roundhouse 15, some 65m to the north of this. All of these features contained the sorts of material produced just as a result of secondary smithing, i.e. scale produced from the blacksmithing of an iron billet or from the reworking of iron objects on an anvil. Only one sample (from F.544) contained material which could have derived from the primary smithing of an iron bloom, although here redeposition must have occurred – the feature being Middle Bronze Age in date. However, the complete absence of non-hammerscale slag fragments within samples from any of the features distant to F.597 and F.611 dictates against the possibility of smelting within these areas.

Platy hammerscale was detected in small to moderate amounts (e.g. 5–10 grains and over) within the following features: F.30, F.514, F.534, F.597, F.602, F.619, F.622, F.629, F.635, F.637, F.653, F.695 and F.752 (but these are only recorded in Table 6.20 where >1g was recovered and weighed). More significant accumulations of platy hammerscale were noted within features F.597, F.637 and F.653, the latter perhaps suggesting the proximity of an anvil, hearth or workshop floor.

Spheroidal hammerscale, perhaps formed from the anvil welding of objects, was detected in small to moderate amounts (i.e. between 5–10 clearly identifiable grains and over) within the following features: F.473, F.573, F.597, F.609, F.635, F.637, F.675, F.680, F.691 and F.1154. Of these, F.473, F.597, F.637 and F.1154 had spheroidal hammerscale in significant amounts.

Less clear-cut smithing activity might be suggested by the recovery of both sorts of hammerscale, sometimes in more or less equal amounts and sometimes associated with other magnetics, for instance charcoal pellets (with scale) and burnt clay. This undifferentiated secondary smithing activity was recorded in the following features: F.31, F.239, F.420, F.433, F.439, F.443, F.445, F.446, F.473, F.503, F.536, F.544, F.573, F.596, F.600, F.607, F.610, F.611, F.613, F.621, F.624, F.626, F.627, F.628, F.632, F.633 and F.637. Once again, significantly high concentrations of both types of hammerscale were recorded from the charcoal and silt-filled smelting furnace F.611. In addition to this were the 'oxidized lumps', some of which might include the oxidized remnants of hammerscale (sometimes making up between 40 and 50% of the residues within many of the 129 samples examined). However, within Figure 6.32 only the confidently identifiable spheroidal and platy hammerscale distribution from Middle Iron Age features is shown.

The results of this analysis of the environmental sample residues suggests that most hammerscale is likely to derive from secondary iron smithing; both the forging and, possibly, also the welding activity taking place at the anvil and forge hearth(s) located within various 'workshop' areas. Narrowing this down slightly, one of these may lie within the vicinity of the Four-post Structures 5–7, to the north of slag pit F.597, with another area to the east and west of the smelting furnace F.611 and finally one within the area of Roundhouse 15 (Fig. 6.32). One should bear in mind, however, that this feature sampling was primarily undertaken for the recovery of organic environmental evidence. Hammerscale distribution patterns can be used to locate workshop areas, but typically this would be determined from soil sampling carried out on a grid basis during the excavation of the floor levels of huts or other structures believed to be associated with ironworking activity (Bayley et al. 2001).

Copper alloy metalworking

Evidence for copper alloy metalworking was found in the form of a small number of crucible fragments and pieces of mould (Fig. 6.37). The only copper alloy artefact recovered from the site was a ring found in the buried soil immediately above Roundhouse 16 (Figs 6.27 & 6.28).

Crucibles

The Bradley Fen assemblage contained a small number of crucible fragments derived from a variety of features (F.597, F.759, F.766, F.781 and F.784 (see Fig. 6.32 for distribution)). Most of this fragmented crucible and broken clay mould (just 0.3kg in total) came from within a 20m wide radius of pit F.766; the latter containing some 40% of the assemblage (as crucible). The majority of the remainder of this (*c.* 49%), consisting both of crucible and mould fragments, came from pit F.784, located just 5m to the southwest of slag pit F.597.

Most of the crucible fragments were worn and in pieces smaller than 2cm, highlighting the friability of the fabric and also the possibility that these had remained exposed in working areas prior to burial (Fig. 6.37 nos. 1–4). The rim sherds along with larger fragments of body sherds suggested that the type of crucible used at Bradley Fen was probably of a typical Iron Age form: a three sided 'inverted pyramid' shaped crucible (Bayley 1989; Howard 1983) which is more fully described from Gussage All Saints in Dorset (Wainwright 1979; Spratling 1979, 132, fig. 99). However, the fortunate survival of at least two shallow pouring spouts on some of the rim pieces has enabled a slightly different shape of crucible to be suggested, a combination perhaps of a circular and pyramidal form. Similar shaped crucibles are suggested by the metalworking and crucible finds from the Late Iron Age site at Park Farm East, Ashford in Kent (Lucas & Paynter 2010).

In a few instances, it could be shown that an extra outer layer of gritty clay had been added to the walls of these crucibles (see Fig. 6.37 no. 4), perhaps as a means of enhancing resistance to thermal shock and also preventing undue cooling of the melt during its transit from the hearth to mould (Bayley 1989). Vitrification patterns on all of these fragments confirmed that the crucibles were heated from above and would have been filled to about two thirds their total volume with molten copper alloy. It was apparent that there was some variation in crucible form with wall thickness (not including the extra outer layer) ranging between 5 and 9mm. The fragments were too small to accurately reconstruct the range of crucible sizes, but it seems likely that the average internal diameter (based on wall thickness and the larger surviving rims) would have been around 60–70mm and, as such, might have been capable of holding about 30–50ml (approximately 200–400g) of copper alloy. These crucible capacities would thus have been capable of casting small to medium sized Iron Age bronze objects.

A total of seven crucibles were sampled by thin section petrography, in order to characterize their fabric. This was found to comprise a reduced-fired friable clay micromass with poorly sorted quartz inclusions and larger voids from burnt-out organic matter. The density of the minor quartz inclusions in the fabric suggests that these were naturally occurring in the clay matrix, whereas the coarser quartz fraction seems to have been deliberately added as temper, no doubt in an effort to enhance the refractory properties of the crucible. The same may be true of the organic material, which was either added for thermal resistance, or was already present in the clay micromass upon preparation (Howard 1983).

Overall, the inclusion-micromass-void ratio is approximately 40:25:35. This inclusion density is very high for a fabric of this kind and certainly contrasts with other examples from sites such as Broom, Bedfordshire (20:65:15) and Meare Lake Village, Somerset (10:70:20). This suggests that whilst the basic recipe for crucibles is often comparable (clay, quartz temper, organic temper), there exists

Figure 6.37 *(opposite). Crucible and mould fragments. Crucibles: 1. F.784 [788] <455>; 2–3. F.766 [763] <1172>; 4. F.759 [761] <390>. Moulds: 5–8. F.784 [788] <455>. Nos. 1–3 are shallow bowl-shaped crucibles, whereas no. 4 is a deeper variety displaying a secondary coating of clay on the exterior presumably added for strength and better insulation. Some or all of the crucibles are probably triangular in shape. No. 2 retains a partial poring spout. This crucible may be of more rounded form.*

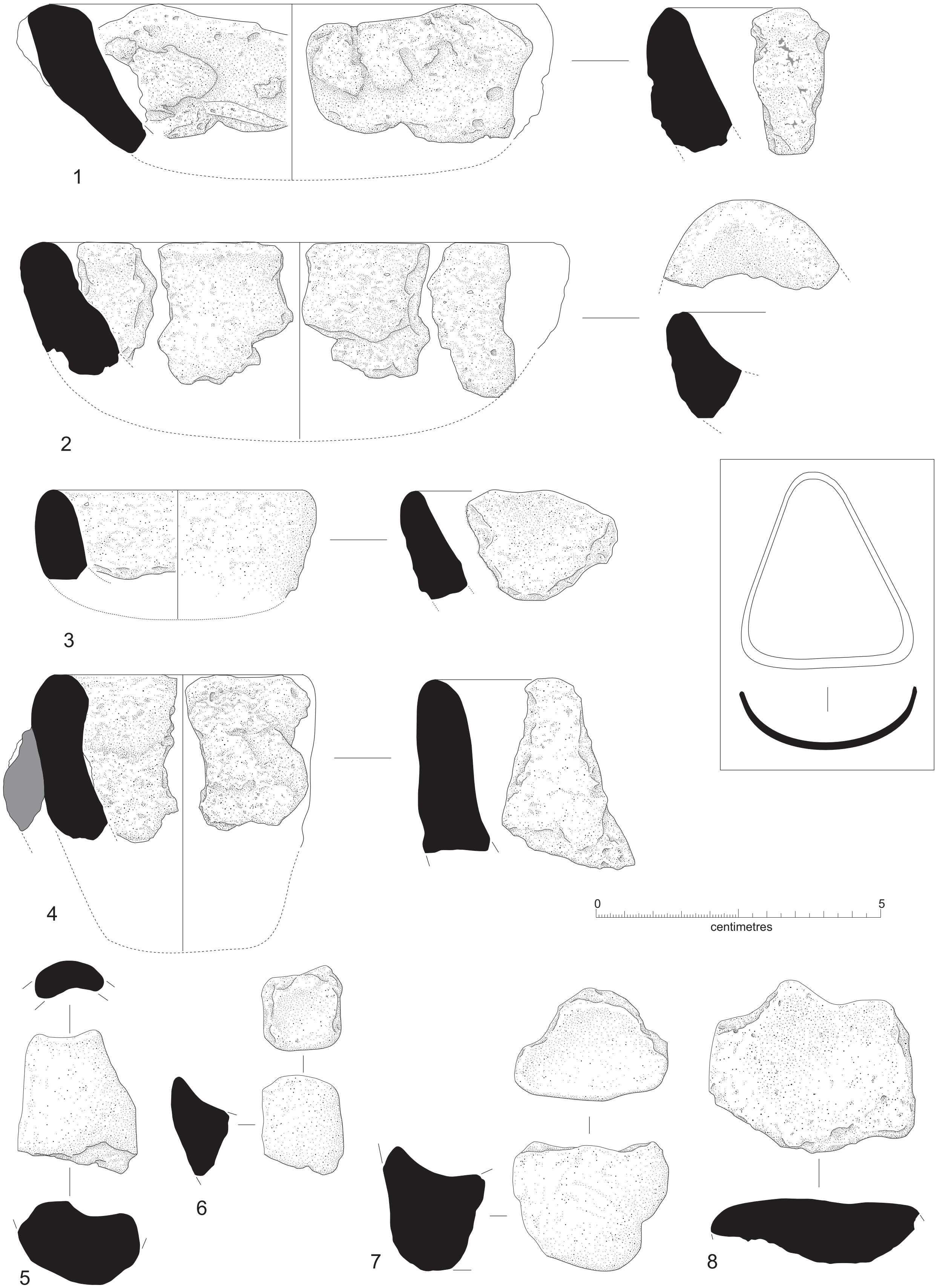

1
2
3
4
0
5
centimetres
5
6
7
8

Table 6.22. *Results of qualitative XRF analysis of crucible residues. +++>50kppm; ++>10kppm; +>5kppm; tr>1000ppm; nd, no detection.*

Catalogue no.	Feature	Context	Copper (Cu)	Tin (Sn)	Lead (Pb)	Arsenic (As)
-	759	761	++	tr	nd	nd
819	-	-	+	+	nd	nd
468	-	-	+++	+++	nd	+
1172	766	768	tr	tr	nd	nd
455	784	788	tr	+	nd	nd
455	784	788	+	tr	nd	tr
455	784	788	tr	nd	nd	nd
455	784	788	+	+	nd	nd
455	784	788	tr	nd	nd	nd
455	784	788	tr	nd	tr	nd
455	784	788	tr	nd	nd	+
455	784	788	++	+	nd	nd
455	784	788	++	++	nd	+
455	784	788	+	+	tr	tr
455	784	788	+	nd	nd	nd
455	784	788	+	nd	nd	nd
455	784	788	++	+	nd	nd
455	784	788	++	++	nd	nd
455	784	788	+++	+++	tr	++
455	784	788	+++	+	nd	tr
455	784	788	++	+	nd	nd
455	784	788	+	+	nd	nd
-	766	768	++	++	nd	+
-	766	768	tr	tr	nd	nd
-	766	768	++	+	nd	nd
-	766	768	tr	nd	nd	nd
-	766	768	++	tr	nd	nd
-	766	768	+++	+	nd	tr
-	766	768	tr	nd	nd	nd
-	766	768	++	++	tr	tr

some variation in the proportion of the various ingredients, with Bradley Fen appearing to have highly tempered wares. However, the properties of these ingredients were clearly understood and proved effective for heat resistance, since whilst many fragments were extremely friable and heavily vitrified, the surface of the crucibles survived.

In addition to these studies, a programme of qualitative XRF analysis of was undertaken on a selection of crucible fragments to establish the likely composition of the copper alloy melted (Table 6.22). The results show that in instances where alloy was detected, the most common was tin bronze. However, residues of lead and arsenic were also noted, which is common for the Iron Age (Dungworth 1996).

Mould fragments

Some 38g (13 pieces) of finely broken (10–35mm diameter) mould fragments were recovered from F.784, with some possible fragments also from F.766 (Fig. 6.37 nos. 5–8). Most of these consisted of well-fired (but non-slagged) buff-coloured clay, rarely with a dark grey reduced interior (i.e. the traces of a partition lining on the internal surface of the mould). These very small areas of mould surface revealed little of the nature of these castings, except for the presence of curved and possibly cylindrical surfaces, as well as round and possibly ball-shaped terminals, in all probability less than 15mm diameter. It is possible that these represent the very smallest fragments of mould pieces used for the casting of the side-links for bridle bits, some good examples of which have been studied in some detail from Gussage All Saints, Dorset (Spratling 1979; Foster 1980).

Assemblage summary

The assemblage suggests that iron smelting, iron smithing and copper alloy casting were all undertaken at Bradley Fen. However, whilst the various slag types (furnace conglomerates, slag prills and slagged refractories) recovered support the argument for iron smelting, the quantity of the slag produced is hard to reconcile with this being a significant production centre. The furnace conglomerates are not large, suggesting that a single smelt might have produced as little as 3kg of iron. Indeed, the quantity of slag from this site implies that this was unlikely to have been a major activity, even though the evidence of repair and relining of the furnace suggests some continuity of practice.

The absence of tap slag and the presence of significant furnace conglomerates suggests that this was a bloomery smelting process; one which might have been undertaken in a shaft furnace (see possible reconstruction in Figure 6.12), with the slag collecting in a round/ cylindrical slag pit underneath (as with F.611) and the iron bloom forming above this at the level of the inserted tuyere(s). At the end of each smelt, the bloom would have been extracted manually, perhaps through a temporarily sealed arched opening just above ground level or, more likely, by either dismantling the front wall or completely demolishing the structure. This would also have been necessary in order to remove the slag from the slag pit. Alternatively, it is possible that the whole top (superstructure) of the furnace could have been lifted off, only to be replaced and rebuilt on the same spot, relining this with clay prior to its re-use. Another possibility is that some, or all of the smelting was undertaken within a low shaft or extended bowl furnace (perhaps with a domed or beehive-shaped superstructure above it); the latter taking a charge of only 6–10kg of ore (Cleere 1972).

Although the evidence is not conclusive, the presence of several smithing hearth bottoms and small platy hammerscale within features surrounding the furnace (F.611) and main slag pit (F.597), support the idea that a small amount of iron smithing took place within the vicinity of the smelting area and, potentially, several other locations around the site (such as near the four-posters and in/around Roundhouse 15). There is clear evidence also for a limited amount of copper metallurgy. The finding of numerous small crucible fragments plus a small number of non-diagnostic mould fragments suggests copper alloys were being melted and cast into objects on site. The volume of the crucibles suggests small to medium artefacts were being produced in a range of alloys which include tin bronze and leaded tin bronze.

In assessing the scale of production, it seems most likely that smelting was undertaken in order to satisfy the needs of the local community. Most likely, this was an episodic event that was practiced as and when needed, or deemed appropriate, and probably relied on local specialists (cf. Ehrenreich 1985).

Significance and wider context (Simon Timberlake)

Apart from Bradley Fen, almost nothing is known of iron production or the sources of iron ore within the fens of North Cambridgeshire and West Norfolk during the Iron Age. Whilst the current study falls short of conclusively demonstrating local exploitation of bog iron (one piece of possible ironstone having been also identified), the evidence provided above does point strongly towards it. The inference being that the ubiquity of bog iron deposits, which lay close to the settlements that sprung up along the fen-edge during the Middle Iron Age, allowed for a certain degree of self-sufficiency in iron prior to the exploitation of the much richer and more abundant Jurassic ironstones of the Northamptonshire and West Lincolnshire orefield – the latter becoming a focus of an important iron industry during the Late Iron Age-Roman period (Bayley et al. 2008). It is likely, however, that the smelting of bog iron was already part of a long-standing tradition in Britain by the time we see it being practised at Bradley Fen.

Iron production, linked to the flowering of the rich metalworking tradition of the Early-Middle Iron Age Arras Culture in East Yorkshire, was centred upon the extensive bog iron deposits of the Foulness Valley in the Yorkshire Wolds (Halkon & Millett 1999). Short shaft furnaces, similar to the example suggested at Bradley Fen, were being used to smelt this ore and turn it into iron blooms at Welham Bridge and other sites in the Holme-on-Spalding-Moor area of the Wolds (see Halkon 1997; Halkon & Millett 1999) during the Early Iron Age (400–200 BC). The scale and importance of this industry might best be assessed by noting the size of just one of the slag piles at Welham Bridge (5.54 tonnes), the quality of the ironwork produced (swords and chariot burials) and the importance attached to the craftsmen metalworkers (a pair of blacksmith's tongs and a hammer were found within the grave of a young male at Rudston).

This sort of comparison is useful in that demonstrates the presence of an important Eastern England tradition of iron production centred upon the exploitation of bog iron deposits within fenland areas. At both sites we are probably looking at a well-developed technology of iron production centred upon slag pit-based shaft furnaces, slag dumps (Halkon 1997; Clogg 1999), the hot working of iron blooms (Crew 1991) and skilled blacksmithing. For this reason, the difference in the scale of production between these two areas is of interest. Smaller-scale, more localized production of iron from bog ores may be a phenomenon of the Middle Iron Age, perhaps initiated in response to the expansion of the Arras Culture influence, or perhaps even engendered by its eclipse. It may be relevant to note here that the earliest ironworking evidence from Bradley Fen probably dates from the Early Iron Age, yet this evidence consists just of 10g of smelting slag from a single feature (F.480). Alternatively, a quite different explanation for the small-scale of this activity might be the paucity of suitable bog iron deposits within the Flag Fen Basin. This is something we know very little about at the present time, yet it is a subject clearly worthy of future research.

It may be useful at this point to mention the discovery of iron smelting slag and the base of a probable smelting furnace or roasting hearth at the nearby Elliott Site, Fengate. The quantity of slag associated with this was small (<350g) and the activity seems more likely to be Middle–Late Iron Age in date, but the form of metalworking resembles that seen at Bradley Fen and, in all probability, utilized the same local bog iron from the Fen (Timberlake 2009, 99). The Bradley Fen copper metalworking evidence seems minor in comparison with that of the ferrous metallurgy, although this activity may well have taken place in similar parts of the site. Interestingly, a single confirmed example of a crucible fragment came from Storey's Bar Road, Fengate. This contained the residue of tin oxide, with a little copper and lead, confirming that it had probably been used for melting a leaded bronze, but was last used for melting tin (Craddock 1984, 174–75). This broadly similar analysis to that of the Bradley Fen crucibles, alongside a similar sort of reconstruction based on the surviving rim sherd (ibid., fig. 123) implies that the same sort of small-scale metalworking activity was probably taking place at Cat's Water, on the opposite side of the Flag Fen Basin. Considering the volume of metalwork recovered from Flag Fen and the fairly unique nature of the assemblage, we might be looking at a very long-standing tradition of small-scale metalworking and recycling of metal which began here in the Late Bronze Age and continued into the Iron Age (see Coombes 2001).

In conclusion, this is a potentially important find of metalworking based on a relatively small amount of surviving evidence. The material does, however, raise some interesting questions about local resource exploitation, the self-sufficiency of this fen-edge community and its connections with the surrounding iron-rich world of Eastern England.

Textile production (Matt Brudenell)

As in the previous chapter, evidence for textile production was limited to finds from the fired clay assemblage (Fig. 6.38). Totalling 231 fragments weighing 3691g, this was dominated by small undiagnostic pieces of fired clay, but included parts of four different loomweights (8 pieces, 1543g) derived from four separate features (see Fig. 6.28 for distribution). The two most complete were of definite triangular form of the type common to Iron Age sites across southern Britain (Fig. 6.38 nos. 1 and 2). Both were made in sandy clays of Fabric 1, as were most of the Late Bronze Age and Early Iron Age examples. Indeed, the overall fired clay fabrics frequencies were remarkably similar to those recorded in the previous chapter (Table 6.23), suggesting similar and probably local sources (on site?) of sandy clay continued to be used for the production of loomweights, oven furniture, daub and so forth, but very rarely it would seem, pottery. This favoured shell-rich clays, though as the loomweight in Fabric 8 demonstrates, these were occasionally employed, perhaps when left over or unprocessed potting clay was available.

Three of the four loomweights were recovered from structures. The two semi-complete examples in Fabric 1 were derived from the interior pits of Roundhouses 16 (possibly where a loom was based) and were part of formal deposits. The weight from pit F.1096 was interred alongside a dump of sheep bones, whereas that from F.751 was placed beside a fire-cracked quern and a large rubbing stone. In terms of context and artefact association, these mirror some

Table 6.23. *Fired clay quantification by fabric. For fabric series see Chapter 5.*

Fabric	No. fragments	Weight (g)	% by weight	Fragments of note
1	163	3160	79.8	2 partially intact triangular loomweights (6 fragments, 1424g) 1 fragment of an oven plate (257g) 1 piece of daub with scored surface (19g)
2	10	151	3.8	-
3	2	6	0.2	-
4	15	99	2.5	1 piece of wattle impressed daub (51g), pole 26mm in diameter
5	1	34	0.9	-
6	6	67	1.7	-
7	1	96	2.4	Possible fragment of triangular loomweight
8	5	46	1.2	Fragment of a loomweight (28g)
9	28	302	7.6	1 piece of moulded daub (19g)
Total	**231**	**3961**	**100.1**	**-**

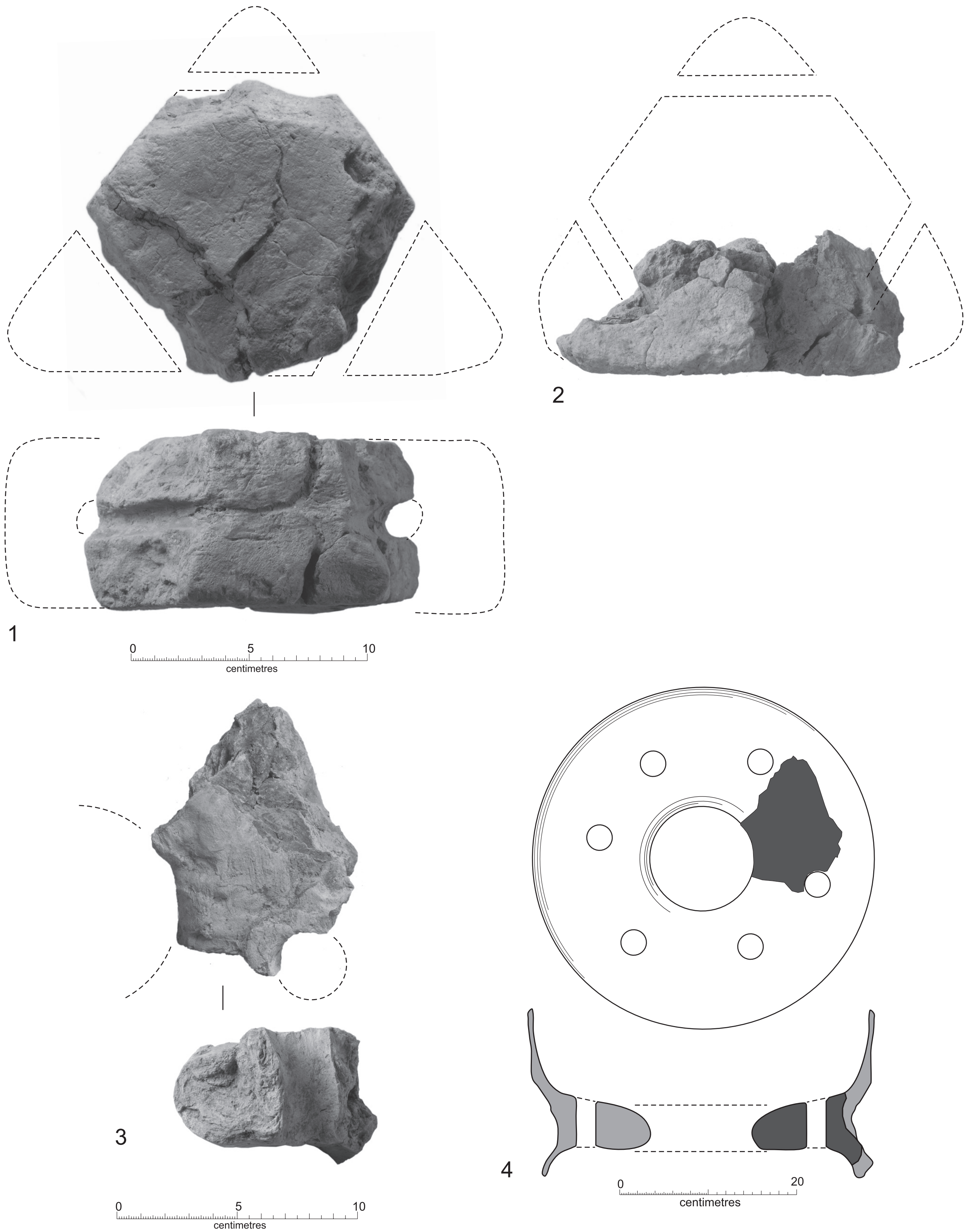


Figure 6.38. *Fired clay objects. 1–2. Triangular loomweights; 3. Oven plate; 4. Oven plate reconstruction.*

Loomweight catalogue

1. Fabric 1, five refitting fragments of a triangular loomweight, 73mm in width with two perforated suspension visible (12mm in diameter). Pit F.751 [751a], 272g (Fig. 6.38 no. 2)
2. Fabric 7, possible corner fragment of loomweight. Posthole F.578 [538], 96g (not illustrated)
3. Fabric 8, possible fragment of a loomweight with perforated suspension hole (19mm in diameter). Well/waterhole F.831 [855], 23g (not illustrated)
4. Fabric 1, fragment of a triangular loomweight, 67mm in width, broken along all side of the three perforated suspension holes (14mm in diameter). Pit F.1096 [1188], 1052g (Fig. 6.38 no. 1)

of the loomweight deposits in the Early Iron Age buildings at King's Dyke, providing another common connection between the two sites. Of the remaining two fragments, one was utilized as post-packing in Four-Post Structure 8 (F.578, Fabric 2), whilst the other was interred as part of a more generalized body of refuse in well/waterhole F.831 (Fabric 8).

Discussion

With its pristine site plan, ordered zoning of architectures and activity areas, the remains of this final phase of prehistoric settlement at Bradley Fen presents a coherent and comparatively comprehensible picture of occupation (Fig. 6.39). There is certainly the impression that this was a small, fairly short-lived farmstead-type settlement comprising perhaps two household groups, for the most part engaged in a typical range of activities and agricultural practices for the period/region. Novel though it is to find an open Middle Iron Age settlement in this landscape *not* superseded by a phase of ditching or enclosure, its importance to the study of the Flag Fen Basin is not rooted in the character of its architectural imprint. Whilst this has its points of interest, providing only the second large-scale aperture on a Middle Iron Age fen-edge site around the Basin (the first being Cat's Water), the real significance rests in the depth or altitude at which the settlement lies, the evidence it has for metalworking, and finally, the light it throws of the character of the region's Iron Age mortuary rites.

Low-lying settlement

As stated at the beginning of the chapter, the Middle Iron Age settlement at Bradley Fen is remarkable low-lying for the period. With the core of the settlement swathe squeezed between the 1.4 and 2.5m OD contours, this fen-embracing site occupied a band of ground that was previously thought to have been inundated by the mid first millennium BC. In fact, in relative terms, the highest point in this occupation scatter stands 0.2m *below* the southern edge of the Cat's Water settlement (2.7m OD), which is conventionally used as the bench-mark for the model of the Basin's Middle Iron Age fen-edge (e.g. French 2001d, 403). This model now looks in need of revision, with the implication that there could be many more sites of Middle Iron Age origin within this contour range.

At this juncture, it is important to acknowledge that such a statement does not amount to a point blank denial that the fen-edge extended above the 2.0m OD contour during the course of the Iron Age. The contrast in the heights recorded for the lower limits of settlement at Cat's Water (2.7m OD) and Bradley Fen (1.4m OD) should not be seen as a problematic, erroneous, or detrimental to our understanding of where the fen-edge was located in this period. On the contrary, these differences should be greeted much more positively, for they provide us with an archaeological gauge to the extent of basin-wide inundation during the Middle Iron Age. As such, the two fenward limits of settlement documented on opposite shores of the Flag Fen Basin serve as a measure of peat growth *within* the three hundred year timeframe of this period sequence – in effect, they bracket the lower (Bradley Fen) and upper (Cat's Water) limits of inundation (Fig. 6.40). Consequently, we can no longer sustain a model of a *static* Middle Iron Age fen-edge, anchored to a single contour. But more important than recognizing a dynamic, progressively upward shifting fen-edge in this period, we can use the peat and the altitude of fen-margin settlement as a measure of time, allowing us to explore a finer grained Middle Iron Age sequence in the Basin.

By this logic, and keeping with the concepts of the Age-Altitude model espoused throughout this volume, we can be confident that fen-edge settlement at Bradley Fen pre-dates that at Cat's Water, because of its lower-lying position. Indeed, given the relative heights of the two sites, the structures of the former were probably inundated by the time the lowest-lying buildings at the latter were erected. In other contexts in the region, without a programme of absolute dating and Bayesian modelling, it might prove difficult to tie down the temporal relationship between two non-adjacent Middle Iron Age sites. This is less of an issue here, though we do need to clarify the chronological

Spatial-temporal configuration 4 – the arrival of fen-edge settlement

Of all the patterns articulated by these spatial-temporal configurations, the Middle Iron Age is by far the most striking in that it reveals a pronounced convergence of activity and, for the very first time, a sharply defined lower margin or fen-edge. In this representation, occupation is shown as a vertically delineated throng of pits and postholes apparently amassed up against an invisible but nevertheless precipitous boundary. Nothing infringes this line, although you get the impression that all is being drawn irresistibly to its position in the landscape. In this sense, the relationship between *occupation* and *edge* is genuinely magnetic and whereas before settlement was detached from this margin, it now actively embraced it. Most saliently, this edge-bound agglomeration is representative of Middle Iron Age settlement elsewhere in the Fens and if, for example, the adjacent Cat's Water settlement was articulated in the same manner, an almost identical silhouette would be produced.

One other attribute of this spatial-temporal configuration is the realization that Middle Iron Age settlement generated the clearest or most lucid silhouette. At the evaluation stage of this particular landscape, Middle Iron Age activity was by far the easiest to detect and, as a consequence, came the closest to being designated 'site' status. Unlike the archaeology of the earlier periods, its intensity and location fitted the received criteria as to what constituted a 'site' in the context of the fen. Given different circumstances, the focus of the Bradley Fen investigations could have been a Middle Iron Age settlement swathe to the exclusion of all else.

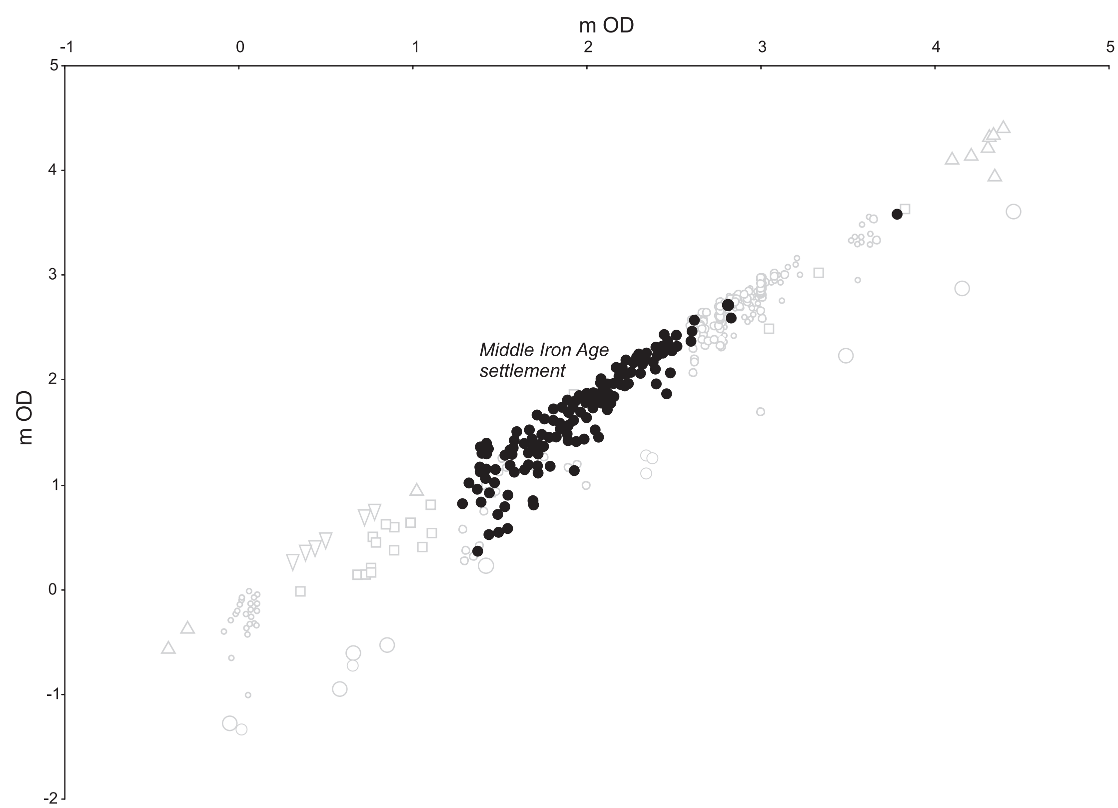
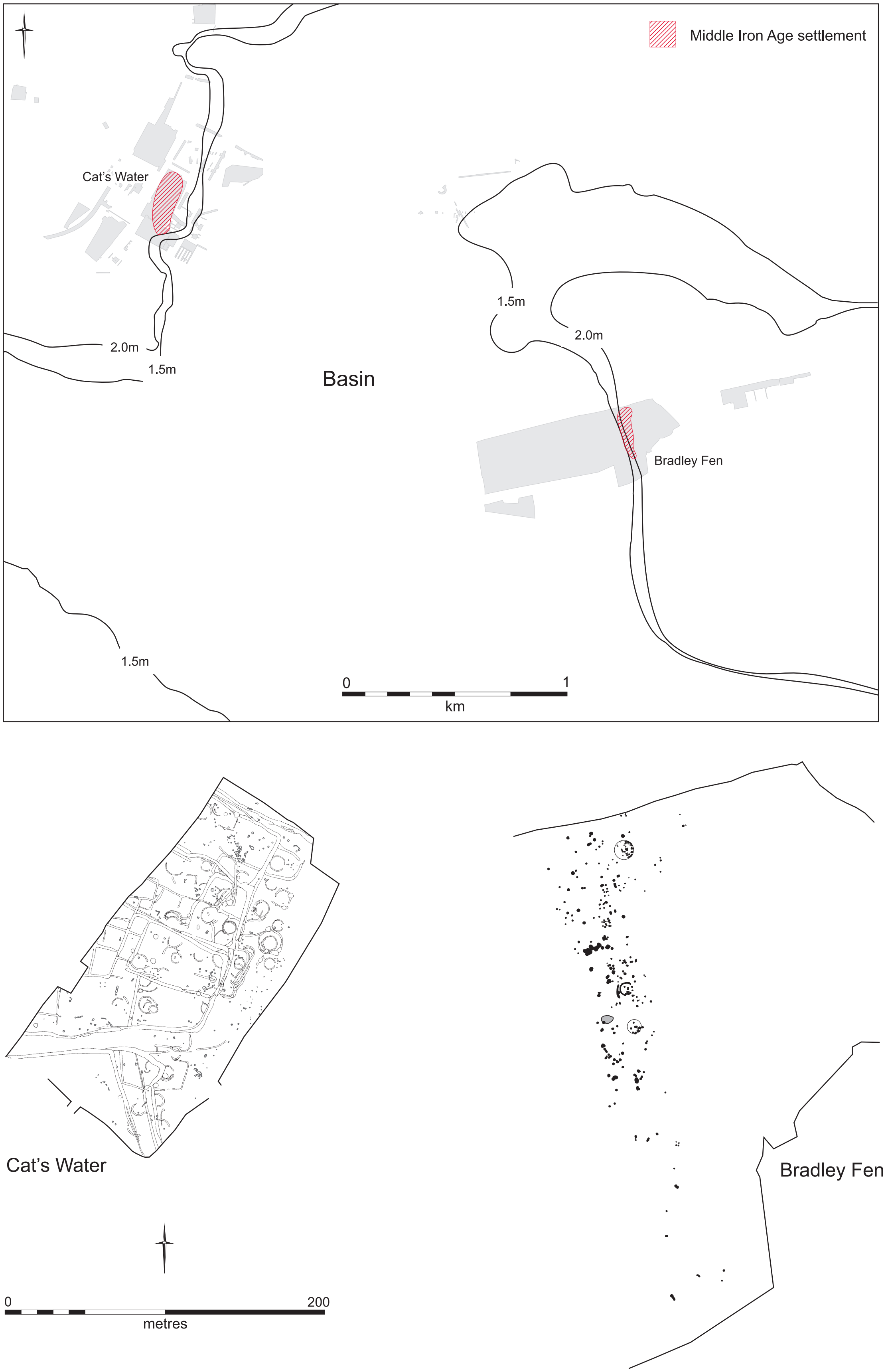


Figure 6.39. *Spatial-temporal configuration 4 – the arrival of fen-edge settlement.*


Middle Iron Age settlement
Cat's Water
1.5m
2.0m
2.0m
1.5m
Basin
1.5m
Bradley Fen
1.5m
0
1
km
Cat's Water
0
200
metres
Bradley Fen

parameters of the Bradley Fen occupation. The three scientific dates obtained for the site (including the archaeomagnetic date) locate the settlement broadly between *c.* 350 and 100 BC. This fits comfortably with the typo-chronological dating of the pottery, which, importantly, contains no later La Tène style decorated pots, no Late Iron Age wares, or any signs of influence from 'Belgic'-related ceramic traditions. In fact, Brudenell's analysis of this material points to a number of attributes which suggest the assemblage belongs to the beginning of the Middle Iron Age sequence, prior to *c.* 200 BC. This would accord well with two of the scientific dates and would not conflict with the third. It also works in relation to the dating of Cat's Water, which although quite a long-lived settlement, contains a significant wheel-made ceramic component, suggesting its main *floruit* was during and after the first century BC.

With these sequences and timeframes in mind, we can begin to see that the contrast in the architectural imprint of settlement at Bradley Fen and Cat's Water reflect their differences in date. This is clearly evident in the footprint of their structures, with the Bradley Fen roundhouses sharing greater affinities with the late phase Early Iron Age structures at King's Dyke, than the more typical eaves-defined buildings we commonly associate with the (later) Middle Iron Age – structural types ubiquitous at Cat's Water (Fig. 6.40). Connections with earlier traditions are also evident in the continuities traced in depositional practices.

More generally, the overall difference in the open and enclosed nature of remains at Bradley Fen and Cat's Water are telling of broader shifts in the grammar of occupation in the Middle Iron Age sequence. Clearly, enclosure was not a prerequisite for settlement on the damp-ground contours of the fen-edge, despite the obvious advantages in drainage this would have afforded. Rather, these changes were guided by other concerns, some likely bound up with concepts of place, ownership and descent. Though it is probably too simplistic to suggest a wholesale switch from open to bounded settlement during this period, there was a trend towards enclosure as time progressed. Certainly, on a regional level, there is mounting evidence that enclosure was a *later* (or post-*c.* 200 BC) Middle Iron Age development. Even at Cat's Water there are hints that a series of unenclosed structures at the eastern fen-edge fringes of the settlement pre-date the establishment of the slightly higher-up compound system (Fig. 6.40). Indeed, similar stratigraphic relationships are repeated elsewhere on Iron Age sites in Cambridgeshire (Evans et al. 2013, 153–249). However, a detailed unpicking of these general trends is currently lacking, which is unfortunate, given the number of recent opportunities to investigate Iron Age sites in the region. The problem is that we have not sought to properly refine our understanding or dating of changes within the Middle Iron Age sequence. Radiocarbon dating is often viewed as a lower priority on sites of this period, despite pottery chronologies remaining relatively vague. We are also limited by the fact that 'pristine' open settlements like Bradley Fen are seldom found. Indeed, one observes that many open settlements of this period are only discovered because they lie beneath or immediately adjacent to more conspicuous enclosures. The open components are often unannounced until the area is stripped and, as the enclosures are the features most receptive to identification by conventional prospecting techniques (aerial photography, geophysics and trial trenching), these normally define the focus of excavation, *not* the slighter remains.

Figure 6.40 *(opposite). Cat's Water and Bradley Fen Middle Iron Age settlements (Cat's Water site plan after Pryor 1984, fig.18).*

Fortunately, conditions in the Flag Fen Basin provide the opportunity to start developing a fine grained perspective on the Middle Iron Age sequence. Although the scale and character of most investigations beneath 2.0m OD mean that we have not yet uncovered a site to directly mirror Bradley Fen in the Basin, we can be confident that enclosed settlement is *not* a feature of the *earlier* (pre-*c.* 200 BC) Middle Iron Age landscape below this contour. At Fengate, for instance, with the exception of the Power Station (Pryor 2001) and Elliott Site excavations (Evans & Beadsmoore 2009), fieldwork between 1.4 and 2.0m OD has been small scale and predominately trench-based. Whilst this proved successful in locating ring-ditches and Bronze Age field boundaries in this zone, conspicuous in their absence are ditch-enclosed Iron Age settlements.

These apertures have, however, uncovered a scattering of Middle Iron Age features, but since trenching is far less effective at locating and making sense of the low density pit and posthole scatters that characterize open settlement, it is hardly surprising that a site comparable to Bradley Fen has not yet been identified. In fact, even the remains at Bradley Fen scarcely registered in the evaluation programme (Gibson & Knight 2006). These issues aside, the point stands that the only settlement remains of Middle Iron Age origin below the 2.0m OD contour in the Flag Fen Basin are unenclosed. These may still be few and far between, but are nonetheless worthwhile highlighting since reference to them is often fleeting in the published literature.

The first and most significant derive from the recent excavations at the Elliott Site (Evans & Beadsmoore 2009). At its eastern edge, a Middle Iron Age ditch (F.234/235) was traced to a depth of at least 1.6m OD, where it exited the excavation area. This ditch line, associated with a series of pits, originated in the adjacent Cat's Water settlement and provides the first concrete evidence that remains from here extended down the terrace edge. Other excavations immediately east of Cat's Water (the Cat's Water 1990 and 1997 excavations (see Pryor 2001, 38–50)) were recorded as devoid of further Iron Age features. However, the interpretation of two abutting ring-gullies (F73 and F75) within the Area 2 'henge' monument requires re-evaluation. Lying at *c.* 1.4m OD, these finds-free gullies are highly reminiscent of Middle Iron Age eaves-defined roundhouses. In fact, this point was duly noted in the publication (ibid., 46), but an Iron Age date was ultimately dismissed on the tenuous grounds that neither feature was filled with alluvium. Yet with Evans (2009a, 18) having subsequently recategorized the henge monument as an earlier Bronze Age ring-ditch, Pryor's interpretation of the smaller of the two interior gullies (F73) as a Neolithic 'micro-henge' can no longer stand. Nor can the argument for a definite pre-Iron Age attribution, since deposits of alluvium have proved not to be uniform across the Basin and recent excavations at the Must Farm palaeochannel have shown them to post-date the deposition of La Tène II metalwork (Robinson et al. 2015, 257–60).

Elsewhere at Fengate, other components of low-lying *earlier* Middle Iron Age settlement were uncovered at the Power Station Site, where an Iron Age attributed 'gravel platform'/spread was identified at *c.* 1.2m OD (Pryor 2001, 59). More significant, however, are the passing references (ibid., 61) to pottery-associated Iron Age pits and waterhole features in Area 1 around the northern arm of Ditch 9 (F.12). Unfortunately, none are reproduced on the published site plans, but they definitely lie below 1.75m OD and, given their rough location, probably fall between the 1.4 and 1.6m OD contours (the pottery being reported on by Barrett 2001, 252–54). Finally, on the opposite side of the basin, we can note another Middle Iron Age waterhole below 2.0m OD at Northey Landfall (F.292), just south of the area where the Flag Fen post-alignment crosses onto Whittlesey Island (Britchfield 2010, 61–62). Again, the reference is somewhat tucked away in the report, but a closed group of Scored Ware pottery (dated *c.* 350–200 BC) was recovered from the feature together with a fragment of human bone (Ferrante de Ruffano 2010, 125; Pryor 2010, 121).

These strands of evidence built toward a picture of extensive *earlier* Middle Iron Age activity on both sides of the Flag Fen Basin between 1.4 and 2.0m OD – a contour range once considered to be too wet for settlement in this period. Whilst some of these features may have been relatively isolated, attesting to task-specific activities on the damp-ground contours (e.g. waterholes for livestock), others will have formed parts of permanent farmstead-type settlements akin to Bradley Fen. More importantly, there are no hints that any of the remains were enclosed at this stage in this landscape, meaning we are seeing a very long tradition of open Iron Age settlement in the Basin, spanning the period from *c.* 800 to 200 BC.

The draw of the fen-edge

Aside from the more nuanced patterns in settlement form and date we can now piece together for the Middle Iron Age in the Flag Fen Basin, we must also acknowledge broader trends in the contemporary landscape sequence, namely the draw of settlement towards the damp-ground margins of the fen-edge. Importantly, this 'colonization' was not just limited to the context of the Flag Fen Basin. Rather it was a wider phenomenon of the period, traceable across the contemporary fenland margins in Cambridgeshire, as demonstrated by the spate of excavations in the Lower Ouse environs (e.g. Colne Fen (Evans et al. 2013), Over (Evans et al. 2016) and Haddenham (Evans & Hodder 2006b)) and on the Isle of Ely (e.g. Wardy Hill (Evans 2003), Hurst Lane (Evans et al. 2007, 41–66), Watson's Lane (Evans et al. 2007, 70–71) and West Fen Road (Mortimer et al. 2005; Mudd & Webster 2011).

In looking for causation then, we cannot simply seek out a strict, locally specific explanation for this pattern. Although one attractive possibility is that land pressure caused by the progressive inundation of the low-lying terraces, forced some communities to settle by the fen-edge in the Middle Iron Age, there are no clear indications that this 'pressure' existed, or why its effects suddenly came into focus at this point. If this had been the case, we might have expected to also see dense settlement on the higher slopes at Bradley Fen and King's Dyke. But instead, these lie empty until the Roman period. In other words we have no obvious signs of a 'push' toward the fen-edge. On the contrary, the settlement pattern suggests that this landscape zone was viewed much more favourably and was sought out settlement for the first time.

Yet the question remains as why this shift occurred. As already discussed in this chapter, the temptation is to fall back on an economic explanation and cite the opportunities for exploiting fenland resources from this zone. However, the faunal record from Bradley Fen is ostensibly terrestrial and domesticated in its character, with next to no wetland species or wild fauna present. In fact, this pattern is quite common for Iron Age sites in fen-edge settings in the region (Evans 2003, 137) and, although one can point to instances of more intensive marshland exploitation (e.g. Haddenham (Evans & Hodder 2006b)), this may be a *later* Middle Iron Age development and a piece-meal one at that. If a case was to be made on grounds of economy, then is more likely that the move to the fen-edge reflects the growing significance of cattle (as 'wealth' amongst other things) and the control of the rich pastures in this zone. Cattle were certainly the mainstay of the livestock economy at Bradley Fen and other contemporary sites in similar locations (Evans 2003, 138). But even then, patterns are not as uniform as one might hope for, undermining the temptation towards simple land-use modelling.

The explanation must nevertheless relate to some broader socio-cultural factors, which on one level, probably involved an 'economic' component. Indeed, our difficulty in understanding these changes partly stems from our field of focus and the tendency we have to look at fen-edge communities without considering their socio-economic relationships to other settlements further inland. These connections were no doubt complex, with different threads articulated at varying social and geographic scales. Though our perspective on these is limited by the landscape window of this volume, the site's querns, from Ely and the Charnwood Forest district of Leicestershire, serve as a reminder of the existence of more extensive exchange networks beyond the Basin itself. As too does the ironstone iron ore fragment from the site, likely to have derived from the Jurassic Ridge in Northamptonshire. Given the bulk of these items, most were probably transported over water, along the river valleys and around the fen-margins. In fact, this may have provided another impetus for settling the fen-edge, offering communities greater access to exchange networks and routes of communication.

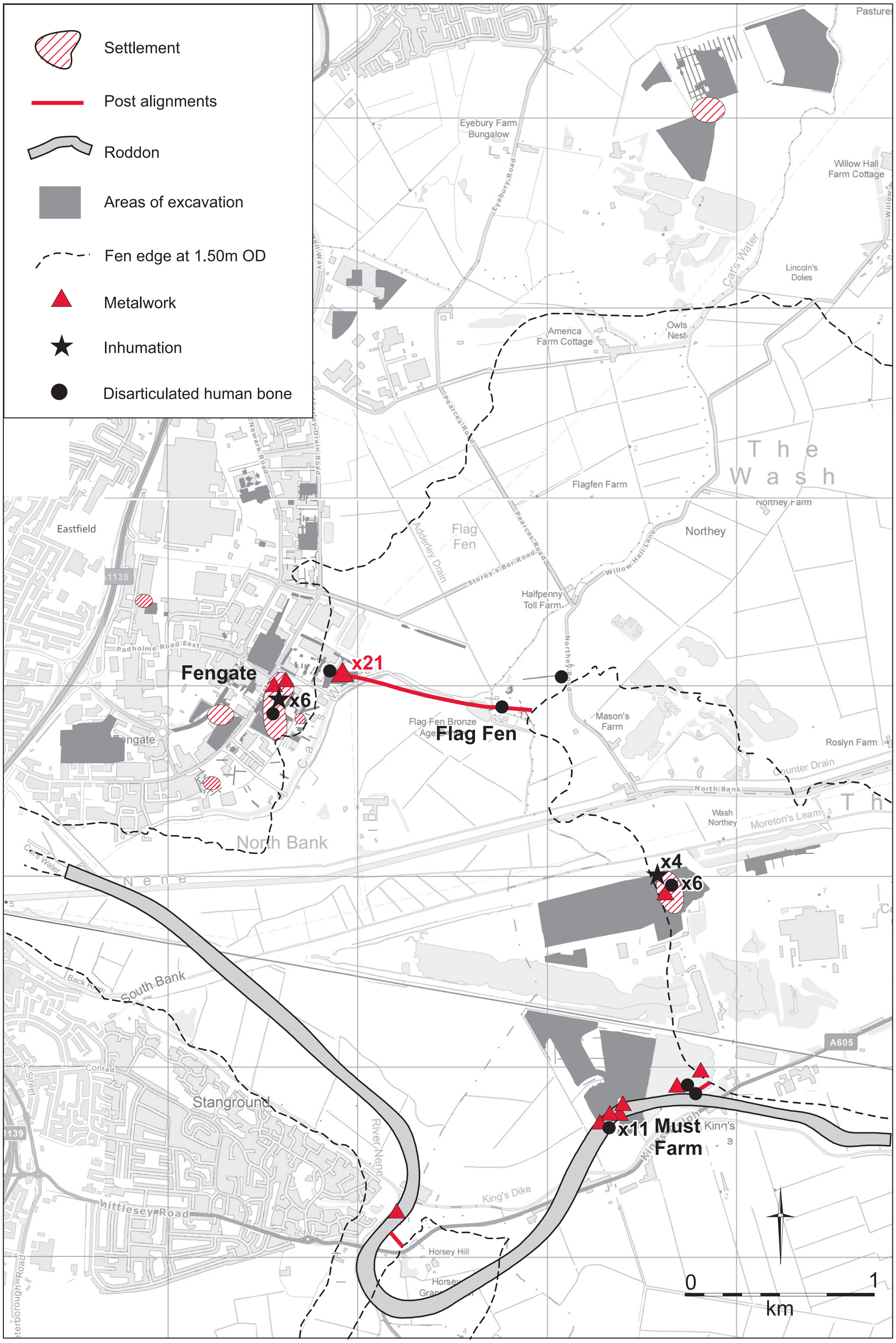
On balance, it remains something of a struggle to explain why settlement was suddenly drawn to the fen-edge from the beginning of the Middle Iron Age, both at Bradley Fen and elsewhere. As is often the case in prehistory, it is easier to observe the consequences of such changes than it is to pinpoint their causation. In this context at least, it is clear that the arrival of fen-edge settlement marked the final demise of a long-lived cultural grain in the landscape, which had structured systems of land allotment and tenurial relationships in the Basin since the earlier Bronze Age. This signified a major reworking of these rights and expectations in the Middle Iron Age, with the fen-edge now harnessed as the primary line of demarcation in the landscape. Moreover, it reflects a very different orientation to things, giving the impression that the landscape axis now 'worked' from the wet-edge upwards, instead leading down towards it.

The dead and metalworking

Whilst our picture of landscape structure is still a little hazy for the Middle Iron Age, the excavations at Bradley Fen have afforded greater resolution on the character of mortuary practices and contexts of metal-working in the Basin. Admittedly, human remains are not especially numerous at the site, but the variability in their context and treatment is intriguing. This ranged from burial in a formal grave cut (F.781), the insertion of a bound and partially putrefied body in a posthole (F.613), to the deposition of disarticulated remains in a series of damp-ground pits and the watery contexts of peat itself. In many respects, each of these interments has a unique story, adding to the impression that diversity was at the heart of mortuary practices in this period. At Bradley Fen, as on other Iron Age sites in Cambridgeshire and large parts of southern Britain, it is clear that bodies of both the newly dead and older disarticulated 'dry' remains were being openly manipulated and modified within the confines of the settlement.

Yet, set against the backdrop of these broader trends, the spatial distribution of disarticulated elements at Bradley Fen indicates a very specific pattern of deposition along fen-fringe and the wetland itself. In actual fact, all these contexts can be regarded as wet, being either in-fen, or peat-filled to varying degrees. Though some of the body parts may have been brought to the water/water's edge for deposition from places of dry-ground excarnation, the recovery of the disarticulated skeleton from the peat (Skeleton [901]) suggests the wet was also considered an appropriate context for burial. In this instance, the body had broken up in the water, with the missing elements potentially having been scavenged, washed further afield, or possibly even removed by the community. This last scenario is not as farfetched as it initially sounds, as Dodwell's analysis hints that the polished skull fragment in F.1018 rested in a watery context prior to its final deposition in the pit.

Whether or not the other remains from the peat derived from similar washed-out bodies or represent bones removed from dryland settings is harder to tell. (Given the distances from the shoreline – fragment SF 246 and Skeleton [901] were 35–40m out from the dry edge – some were potentially deposited from boats.) Whatever the circumstances, we must remember that that the bones recovered from this wetland context constitute a series of chance finds, as the peat could not be intensively investigated. They are, therefore, likely


Settlement
Post alignments
Roddon
Areas of excavation
Fen edge at 1.50m OD
Metalwork
Inhumation
Disarticulated human bone
Fengate
x21
x6
Flag Fen
Flag Fen Bronze Age
x4
x6
x11
Must Farm
Eastfield
North Bank
South Bank
Stanground
The Wash
Northey
Flagfen Farm
Eyebury Farm Bungalow
America Farm Cottage
Owls Nest
Willow Hall Farm Cottage
Lincoln's Doles
Halfpenny Toll Farm
Mason's Farm
Roslyn Farm
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Moreton's Leam
King's Dike
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to represent a tiny fraction of the off-shore human bone at Bradley Fen, with the inference being that burial in watery contexts was the common mortuary rite in the Iron Age of this area. In short, it seems plausible that *most* of the community's dead ended up in the fen interior and/or in fen-side features along the whole of the Basin's perimeter. Indeed, this pattern can be appreciated when we plot all the known disarticulated human remains from the Flag Fen Basin confirmed, or considered, to be of Iron Age origin (Fig. 6.41) – though very few are securely dated. Given the limited opportunities to investigate in-fen settings and Iron Age fen-edge features in general, this distribution is quite remarkable and clearly demonstrates how the remains from Bradley Fen fit within a wider mortuary tradition.

Interestingly, the landscape patterning of disarticulated human remains is not dissimilar to the known distribution of Iron Age metalwork in the Basin, though this largely clusters around the western end of the Flag Fen post-alignment at the Power Station site (Fig. 6.40). The single copper alloy ring from Bradley Fen adds little to this picture (though the site's paucity of metalwork mirrors that at Cat's Water). Of far greater significance, however, is the evidence of metalworking activities (iron smelting, smithing and copper alloy casting), with identifiable workshop areas and an iron smelting furnace located at the heart of the settlement. Although the quantities of slag suggest that production was limited in magnitude (which is the norm for Middle Iron Age sites beyond regions rich in iron ore), by the comparative standards of the East Anglian context, the scale of debris is unprecedented for a site of this date. It is certainly a first among equals with regards to production and offers by far the most pristine picture of Iron Age metalworking practices from the surrounding area. Its importance is elevated further still because of the rich finds of Iron Age metalwork in the Basin and, understandably, begs the question of whether some of these items were actually made at Bradley Fen. Unfortunately, this is impossible to answer, though it is arguably the first site found where this is at least a possibility.

In terms of the activities themselves, iron smelting is the most surprising, since all the known smelts of the period in eastern England lie in Northamptonshire, on the ironstone-rich Jurassic Ridge. A potential connection to this region is, however, provided by the ironstone fragment from slag pit F.597, raising the possibility that the Bradley Fen metalworkers were familiar with this resource. The presence of a bog iron nodule in F.597 might even suggest that sources of a local ore were also being sought. The fen-edge would certainly be the place to procure and extract this mineral deposit, though there is no conclusive evidence that this occurred. However, with further analytic work anticipated on the recent finds of the Iron Age metal from adjacent Must Farm palaeochannel, some of these issues may reach resolution in future volumes in this series.

Figure 6.41 *(opposite). Distribution of Middle Iron Age settlement, metalwork and human remains.*

Pattern and Process

The King's Dyke and Bradley Fen excavations occurred within the brick pits of the Fenland town of Whittlesey, Cambridgeshire. The investigations straddled the south-eastern contours of the Flag Fen Basin, a small peat-filled embayment located between the East-Midland city of Peterborough and the western limits of Whittlesey 'island'. Renowned principally for its Bronze Age discoveries at sites such as Fengate and Flag Fen, the Flag Fen Basin also marked the point where the prehistoric River Nene debouched into the greater Fenland Basin.

A henge, two round barrows, an early fieldsystem, metalwork deposition and patterns of sustained settlement along with metalworking evidence helped produce a plan similar in its configuration to that revealed at Fengate. In addition, unambiguous evidence of earlier second millennium BC settlement was identified together with large watering holes and the first burnt stone mounds to be found along Fenland's western edge.

Genuine settlement structures included three of Early Bronze Age date, one Late Bronze Age, ten Early Iron Age and three Middle Iron Age. Later Bronze Age metalwork, including single spears and a weapon hoard, was deposited in indirect association with the earlier land divisions and consistently within ground that was becoming increasingly wet.

The large-scale exposure of the base of the Flag Fen Basin at Bradley Fen revealed a sub-peat or pre-basin landscape related to the buried floodplain of an early River Nene. Above all, the revelation of sub-fen occupation helped position the Flag Fen Basin in time as well as space.

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