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Assessment of archaeometallurgical residues from Burlescombe (ACD1753 & ACD1767)

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Abstract

The investigated materials comprised a large collection (126kg), almost entirely of residues from ironworking (smithing; 111kg). There was a total of just 3kg of identifiable iron smelting slag. The collection also included 11kg of concretions believed to be cored on corroded metallic iron.

The iron smelting residues comprised dense slags from 'slag pit' non-tapping iron smelting furnaces, with evidence for a coarse wood pit-packing. Such slags are known elsewhere in the area from the late Saxon smelting sites at Town Farm, Burlescombe, and Culmstock Road, Hemyock.

The smithing slags showed a remarkable diversity of smithing hearth cake morphology, texture and size. Overall, the cakes produced during smithing ranged from 68g to 3115g in weight, with a mean weight of 510g, based on an assemblage of 103 approximately complete examples. The presence of the larger SHCs provides strong evidence for at least some of these residues having been produced during bloomsmithing (the working of raw blooms to produce a usable iron). Details of the morphology of the SHCs are paralleled in early medieval bloomsmithing assemblages from Ireland (no equivalent assemblage has been described from Britain), despite some significant differences in the technologies employed in the two areas. The variability of the assemblage suggests that although bloomsmithing was important, some blacksmithing (the end use of iron) was also being undertaken near the site.

The unusual character of the assemblage and its likely early medieval age impart significance to the assemblage; it appears almost unique in southern Britain. On a regional perspective, the cluster of late Saxon iron smelting sites around the NW Blackdown Hills has produced no evidence for the working of the blooms produced. It has been inferred that the bloomsmithing was undertaken at, or close to, the estate centres. Although the limited excavation at Burlescombe produced no metallurgical features, the presence of a primary slag deposit suggests that this may be first record of such a site. It is possible that the forge producing the waste was outside the bounds of the excavated area (full excavation did not cover 100% of the examined area), but must have been close by.

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Methods

All materials were examined visually, using a low-powered hand lens where required. As an assessment, the materials were not subjected to any high-magnification optical inspection, not to any form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

This assessment was conducted in April 2018 and was commissioned by Naomi Payne of AC Archaeology.

Results

General description of the assemblage

The investigated materials comprised a large collection (126kg), almost entirely of residues from ironworking (smithing; 111kg). There was a total of just 3kg of identifiable iron smelting slag. The collection also included 11kg of concretions believed to be cored on corroded metallic iron.

The assemblage was retrieved during two phases of archaeological works, an evaluation (ACD1753) and a subsequent small excavation (ACD1767) by AC Archaeology.

The assemblage is catalogued by context and bag in Table 1 and summarised by class of residue and context in Table 2.

Archaeometallurgical residues

Iron smelting residues

A total of just 3kg of smelting slag was recovered, of which only 70g came from the main slag deposit (1005).

Context (1005) produced a 70g fragment of dense slag with large charcoal moulds and partially non-wetted flow lobes on its basal contact with pale grey sediment of the slagpit floor.

The pieces from contexts (1008) and (1015) were large (1445g and 1560g respectively) blocks of furnace bottom slag, bearing the impressions of large fragments of wood, representing the remains of the pit-packing of a slagpit-style non-slag tapping furnace.

Smithing hearth cakes and related slag

The assemblage included 89.5kg of material referred to smithing hearth cakes and associated material. Of this, some 52.4kg was present as 103 examples of intact smithing hearth cakes, and of these 96 were sufficiently free of any accretionary coating as to be classifiable into some provisional groupings (Table 3).

In a typical smithing side-blown smithing hearth, as was employed in early periods, slag accumulates in the hearth from three main components: iron and iron oxides lost from work piece, ceramic melted from hearth where the hot-zone of the hearth impinges on the structure around the blowhole and from the inorganic component (the ash) of the fuel. The latter source is typically of low importance where charcoal was the fuel (as was the case here), but may be significant where coal was employed. A lesser input in bloomsmithing is smelting slag entrained in the iron being worked. The melted ceramic is rich in silica and this acts as a flux to produce a relatively low melting point slag in combination with the iron oxides. Material lost from the workpiece (which is held in the fire at a level above that of the blowhole) will descend and react with the silica rich partial melt, that will tend to slough from the wall and migrate away from the wall into the hot-zone.

In circumstances where there is little or no reaction with iron, the partially-melted hearth ceramic may cool to form a **lining slag pad** or sheet, either in front of the blowhole or, more commonly, down-wall from the blowhole.

Where sufficient descending iron oxides react with the partial melt, the lower melting point slag produced may form descending prills, that flow downwards from and potentially drip below, the less fluid partial melt. This forms a characteristic morphology that was labelled by Young (2012a) as a '**tongue**'. Tongues are typically thin (<30mm) and have approximately parallel upper and lower bounding surfaces. The upper surfaces may be smooth, often pale partially melted ceramic, but may sometimes be altered to a maroon superficial colour through surficial oxidation. The lower surfaces are typically formed of pendent prills, often of greenish glassy or dull, more iron-rich, slag and sometimes with a rusty coating.

Thicker accumulations of similar prilly lining-influenced material may develop the more characteristic plano-convex, or biconvex form of smithing hearth cakes. In the provisional classification of the material from Burlescombe, these have been termed **low-density/intermediate SHCs**.

In slag cakes where the iron content is more elevated, the cake may become dominated by prills of dense iron slag, often rather loosely amalgamated into a porous, poorly consolidated mass. These masses may, or may not, adopt the overall plano-convex form of a typical smithing hearth cake, but all have been grouped together provisionally here as **SHCs formed of prills of dense slag**. Some examples show layers of partially-melted lining slag on their upper surfaces and these are separately identified in the provisional subdivision adopted here.

More classic, coherent, SHC shapes are generally formed of dense iron slag, without a prilly internal texture. In these, the accumulated slag has formed a more-or-less fluid puddle, rather than a series of discrete flows. These **dense SHCs** incorporate a very wide range of morphologies (see below), but for the purposes of this assessment have only been subdivided on the presence or absence of partially-melted lining slag on the upper surface.

The division of the assemblage of the intact SHCs and related materials into these various classes, each discussed in more detail below, is presented in Table 3.

One widespread characteristic of the SHC-like slag cakes was a very wide attachment area between slag and hearth wall. Many examples of well-formed burrs (rounded slag protrusions where the impingement of the hot-zone on the wall allows the slag to react and to erode into the hearth wall) were over 100mm wide, and in many examples more planar attachment zones were over 70mm tall, extending over most of the distance between the blowhole and hearth floor.

Lining slag pads
Five lining slag pads were identified. These showed the form of a tongue on their upper surfaces, but the bases did not show pendent prills. They ranged from 134g to 288g, with a mean weight of 201g. The interpretation of these bodies is somewhat uncertain. It is possible that they represent bodies that would have formed true tongues, but which formed so close to the substrate they could not form descending prills. On the other hand, it is also possible that tongue like simple lining slag pads are not analogous in heir mode of formation, and these materials should be excluded from the SHC-related categories.

Tongues
Eleven intact tongues were identified. They were commonly slightly smaller than the lining slag pads, ranging from 68g to 410g, with a mean weight of 144g. Although the classic tongue (as described by Young 2012a) is somewhat elongate, several examples were closer to semi-circular in plan.

Low-density/intermediate SHCs
These masses were larger than the slab-like tongues with which they share a common structure. The nine examples placed in this category ranged from 118g to 698g, with a mean of 270g.

SHCs formed of prills of dense slag
The prilly SHCs and related structures were common, with 17 examples placed into this category. They ranged from 114g to 1150g, with a mean of 409g. The reason for the development of prilly SHCs is uncertain – for many assemblages lack them entirely. Further work is required to understand the interplay of slag composition, hearth temperature, fuel type, ash bed type and hearth shape.

SHCs formed of prills of dense slag with lining slag on upper surface
Some five examples of prilly SHCs showed a distinct lining slag layer on their upper surface. These examples ranged from 182g to 818g, with a mean of 408g. This distribution is narrower than for the prilly SHCs without a lining slag layer, but the mean is similar and suggests that there may be little difference in their origin.

Dense SHCs
Thirty-eight examples of SHCs were referred to this category. These ranged form 116g to 1740g, with a mean weight of 544g. This wide range reflects the diverse morphologies placed into this provisional class. In general, the most common form of dense slag cake was plano-convex and appeared to be formed of uniformly dense slag. SHCs in which the bowl was lined by a thin crust and filled by porous charcoal-rich microstructures were apparently less common, although cutting of appropriate examples will be required to comment with certainty on the internal structure. Concavo-convex slag cakes with an open, smooth-surfaced bowl and plano-convex varieties with a smooth haematised top were rare in the collection.

Some of the smaller dense SHCs showed a very iron-oxide rich composition, with a porous, wispy upper surface apparently formed of hard iron oxides. Examples of some larger cakes appeared to show such morphologies as just the lower unit of more complexly-structured SHCs.

One particular morphology of note in the collection has been provisionally termed multi-lobate. These SHCs have a basal surface formed of dense, microdimpled to smooth slag, which is not of constant curvature over the base of the bowl, but which forms a series of broad, rounded lobes. The lower lobes of such slag cakes may commonly be formed of slag with a metallic surface lustre. The lower parts, at least, of such cakes appear to indicate poorly fluxed conditions with a high iron-loss from the work piece.

Dense SHCs with lining slag on upper surface
The presence of a distinct pad of lining slag-type material above dense SHCs has been commonly observed in material from Ireland, and led Young (2012a) to postulate that some tongues represent such pads that were not fused onto an underlying dense slag, but acted as a route by which the fluxing reaction occurred, dripping fluid slag through the fuel bed to allow formation of the dense SHC below.

In the present collection, there were eleven intact examples of this kind, including many of the heaviest slag masses recovered. They ranged in weight from 248g to 3115g, with a mean of 1288g.

The underlying dense slag cakes were of various forms, but a combination of features characterise the largest examples. These include a concentric structure to the upper surface of the slag cake and a tendency for a multi-lobed base (see above).

Accreted and indeterminate slag
Some of the slag is not specifically identifiable to a more detailed class. In some cases, this is due to an overgrowth of accretion which obscures the underlying slag from detailed inspection. This class of concretion has only been employed where the form of the concretion indicates clearly that a substantial lump of slag lies at its core.

In other cases, slag is not identifiable to a more specific category, because it does not display appropriate characteristics to permit identification. This is usually because the piece is too small to display appropriate features, but, for instance in the case of charcoal-rich slags, the fragment might need to be quite large before confident visual interpretation of its origin would be possible.

Hearth lining
The collection included just 1.3kg of hearth lining material. Several pieces formed moderately large slabs, sufficient to indicate that the ceramic was almost certainly from a clay wall bearing a blowhole, rather than from ceramic tuyères. A single fragment from context (303) bore a small part of a blowhole margin, suggesting a 25-30mm diameter hole.

Two fragments showed a right-angled overhanging margin to the ceramic, with pendent slag prills and erosion of the ceramic. These pieces could be interpreted as the lower margins of block tuyères, but in the absence of any other evidence for tuyères, it is more likely that they originated at the base of a clay wall built above (and overhanging) the margin of a cut hearth-pit. Such an arrangement appears to be typical of early floor-level smithing hearths in Britain.

Lining slag
This category contained approximately 2kg of partially melted, sandy or gravelly, often very dark, glassy slag for which there was no evidence for an origin within the hearth, rather this material remained closely associated with the wall. It did not form discrete masses equivalent to smithing hearth cakes.

Distribution of the material

The assemblage derives from two evaluation contexts (total of 7.7kg) and eight excavation contexts (total 118.2kg of residues) (Table 2).

Of the contexts from full excavation, 9.9kg of came from context (1003), a wide deposit on the upslope (eastern) side of the terrace [1017]. This was recorded as overlying the earliest deposit (1008) in the central hollow. Context (1008) produced an assemblage of 2.4kg, including some smelting slag. To the downslope (western) side of the central hollow on the terrace, the deposits of context (1007) produced 4.5kg of residues. In the evaluation, Trench 3 context (1007) was overlain by context (304), which produced just 1kg of residues.

The central hollow contained a thin deposit, context (1006), covering the interface with earlier contexts (1003), (1004), (1007) and (1008). This context produced 3kg of residues. The main fill of the central hollow, context (1005), produced 96.2kg of residues, from an estimated excavated volume of less than 1 cubic metre of deposit (context (1005) had a mapped area of 5m NS and 2m EW, with a maximum thickness of 0.45m; it was investigated via a centrally placed excavation slot 2m wide).

Further south on the terrace, the thinner deposits of context (1013) and (1016) produced a combined total of less than 0.6kg of residues.

Context (1015) produced a single piece of smelting slag (1.5kg).

Interpretation

The presence of smelting slag resembling that of some of the local early medieval smelting operations and of smithing slags for which the closest analogues are to be found in Irish early medieval material provide good, if slightly circumstantial evidence for an early medieval age for the present assemblage.

Interpretation of the of the smithing slag assemblage at this stage may be approached through two routes – the evidence from individual residue pieces and the evidence from the weight-frequency distribution of the overall assemblage.

The range of SHC morphology is particularly large, as is the overall range of size and weight. The residues range from examples dominated by the input of melted hearth ceramic, through to very dense, iron-rich examples, in which the ceramic input was very low. It is not possible to determine with precision the precise controls on these features, but factors such as the time since the hearth was last relined, the size of the fuel particles, and the condition of the blowhole, will all play a role alongside the task being undertaken and the size of the workpiece, as significant factors.

Some simple interpretations may be made, however. The variety of SHCs probably reflects a genuine variety of task – the range being greater when iron is being refined from raw bloom, as well as fashioned. The observed hearth ceramic and the large area SHC-wall attachments argue against the use of an Irish-style of technology, employing a ceramic tuyère, rather than a blowhole in a clay wall. The large size of some of the slag cakes indicates a large amount of iron loss (a typical dense SHC is approximately 50% iron). Although high iron loss might indicate long work periods between hearth clearances, it is more normal for it to indicate high-temperature and 'lossy' processes, such as bloom compaction. It is also likely that the very high-iron dense cakes indicate loss of iron from the workpiece in larger pieces, rather than a gentle 'rain' of iron oxides that is more easily fluxed by the hearth ceramic and which is more commonly seen in blacksmithing (the end use of iron).

It is also worth noting that the assemblage appears not to include SHCs with a morphology (e.g. large cakes with a thick lower crust of bladed olivine, separated from a thin, smooth-surfaced, upper slag layer by large voids) that has tentatively been associated with remelting as a refining technique in assemblages from Ireland (e.g. at Camlin; Young 2011b). Remelting provides a means to adjust both the content in the iron of both phosphorus and carbon, allowing, amongst other things, the production of carbon steels from high phosphorus raw iron.

At the assemblage scale, the weight-frequency statistics may be employed to compare assemblages as a whole. These are illustrated by numerical parameters in Tables 4 and 5 and graphically, as plots of cumulative weight and cumulative frequency, in Figure 1. Since there is so little data from the British early medieval, comparative datasets are drawn both from wider period of British history and from Ireland.

For British sites interpreted as being involved in the end-use of iron (blacksmithing), the weights of SHCs are generally low, with mean weights for blacksmithing assemblages of Roman age (Table 4: Cleevelands, Exminster, Uffington, Ebrington, Neath and Ware) and earlier medieval age (Tidworth, Worcester) typically being below 300g. At the upper end of this range, the assemblage from Hen Gastell contains a proportion of SHCs of greater than 800g, which may be an indicator of some component of iron processing. The blacksmithing sites appear to divide into two groups, particularly shown on the cumulative weight plot, corresponding to a dominantly rural group of sites and a dominantly urban group of sites, interpreted as a pattern driven by the intensity of the work.

The weight-frequency statistics for the Burlescombe assemblage show greatest similarity, amongst the British data, with the material from Kingstone, a late Iron Age to Roman bloomsmithing site to the north of the Forest of Dean. The Kingstone assemblage does, however, lack any SHCs with the weights of the largest examples rom Burlescombe. The SHCs from Dymock are few in number, so the statistics are particularly unreliable, but suggest a distribution closer to those of some of the Irish specialist iron-production sites.

The Irish examples include assemblages with extraordinarily large SHCs (up to 11kg at Clonfad), reflecting the production of exceptionally large pieces of iron at some of these sites (those at Clonfad being used, at least in part, for the production of ecclesiastical hand bells; Young 2012a). To allow for visualisation of this, Figure 1a shows the Irish data on a scale to show the whole weight range, and Figure 1b redisplays the data to the same scale as the British examples in Figure 1c.

The cumulative data curves for Irish sites only show two sites plotting entirely towards the lighter end of the diagram (i.e. the left) than the Burlescombe assemblage, with a third plotting partially so. These sites, Ballykillaboy, Garryleagh and Coolamurry respectively are interpreted as blacksmithing sites. Coolamurry (12th - 13th century) shows some larger SHCs and this has been interpreted as the result of

smiths needing to finalise the processing of iron distributed in an incompletely processed form. The later sites at Garryleagh and Ballykillaboy were part of a distribution network in which fully processed iron circulated, allowing the SHCs to more closely resemble those of the British blacksmithing sites mentioned above.

Irish sites with mean SHC weights higher than that of Burlescombe and with cumulative curves plotting well to the right, are specialist iron production sites. Varying maximum sizes of iron pieces were produced and there were also differing amounts of iron end use on the same sites. Ballinglanna and Borris were specialist sites, with almost no fashioning of the finished iron; Clonamacnoise, Woodstown and Clonfad were all settlement sites with both production of large amounts of iron and the end use of the iron in blacksmithing. The statistics for the 6th to 8th century site at Gortnahown are closest to those of Burlescombe. Gortnahown was a site both producing and using iron. Like Clonfad it produced iron bells, but only small ones, the size of modern goat bells, so only needing a much smaller size of iron billet. Gortnahown also differs from the other large iron production sites in having produced no evidence for the use of the large ceramic tuyères that for such a characteristic of most Irish early medieval smithing sites.

In summary, the weight-frequency statistics, show the Burlescombe assemblage as having the closest similarity amongst the studied British assemblages with a late Iron Age to early Roman specialist bloomsmithing site at Kingstone and amongst the Irish examples, with a site both producing and using iron of early medieval age at Gortnahown. This probably suggests that Burlescombe could be interpreted on the same basis as either a specialist site refining relatively small blooms, or as a more generalist site, with bloom refining as a significant component of its broader activity. The evidence from the varied SHC morphology which suggests a wide range of tasks were being undertaken, would suggest that an interpretation of a more generalist site, both refining iron blooms and working the iron produced would appear most likely.

Discussion

The conducting of bloomsmithing in central locations, compared with the dispersed locations in which smelting was undertaken, has long been proposed. Little evidence for smithing has been found in the early medieval smelting sites investigated in the area around the Blackdown Hills (Rainbird & Young 2015; Reed *et al*. 2006; Young 2014c, 2016a, 2017) and centralised bloomsmithing at the estate centres assumed. At Hemyock, it appears likely that any such operation would have been close to, or within, the built-up area of the modern village, with the three known early medieval smelting sites lying to the south and west (Churchills Farm, Young 2016a; S of Culmstock Rd, Rainbird & Young 2015; N of Culmstock Rd, Young 2017). For the broadly contemporary operations at Burlescombe, the known smelting activities are to the north of the village (Reed *et al.* 2006; Valentin & Jones, 2012), with gain no smithing location known. Both Burlescombe and Hemyock areas are interpreted as probable Wessex royal estates.

Further afield, a similar lack of evidence for smithing is apparent in current understanding of the early medieval smelting sites at Clearwell Quarry (Pine *et al.* 2009), Emersons Green (Young & Young 2013), Ramsbury (Haslam 1980) and Millbrook (Tebbut 1982).

One site of this general period has, however, produced some useful evidence for the organisation of the bloomsmithing process: South Hook, Pembrokeshire (Young 2006a, 2010a, 2010b). The evidence for smithing at this site was limited to a small quantity of slag, including five probably complete SHCs. These had weights of 704g, 756g, 776g, 1115g and 1440g. Chemical analysis of the smithing slags revealed the rather surprising information that they were unlikely to have been produced during processing of the blooms produced on South Hook site. The smithing slags had a different chemical signature (described as Group 2) to the smelting slags (referred to Group 1), suggesting that South Hook may have been a location working blooms from multiple smelting sites. The analysed smithing debris may have been produced by the smithing of blooms originally produced to the west of South Hook, on the evidence of their high zirconium content, suggestive of a relationship with the outcrop of the Skomer Volcanic Group.

There is great potential for the Burlescombe site (or at least the site producing the residues found on the Burlescombe site, since on metallurgical features were encountered in the small area of complete excavation) to represent the central forge for the Burlescombe centre of iron production, for at least a part of the early medieval period. It is likely that the forge was also producing finished ironwork as well as processing the raw metal. Further detailed investigation should help elucidate and characterise the operations being undertaken.

Further work

The residue assemblage is certainly of regional and probably national significance. There is great potential for further investigation of the residues to aid understanding of the activities on the site, of the early Blackdown Hills iron industry more generally and with understanding of the technology of bloom processing in the period.

It is strongly recommended that further work investigates the assemblage through analysis of a wide range of the residue types, involving bulk elemental analysis, microstructural and microanalytical characterisation of the slags and metallurgical investigation of any surviving metallic iron present in the concretions. A wide-ranging programme of analysis across the range of materials present will be necessary to characterise the potentially wide range of processes involved. Such a programme of investigation would complement the recent detailed investigations of the primary smelting of early medieval age in the same area.

The methodology for such a programme should be based on that of previous studies of comparable early medieval assemblages at Clonfad (Young 2012a) and Woodstown (2014e) in Ireland, and particularly of the assemblage from South Hook, Pembrokeshire (Young 2010b).

X-radiography of the iron-bearing concretions might aid with the identification of any pieces containing artefacts, rather than offcuts or waste. It would also aid the targeting of metallographic analyses to the best-preserved pieces of metal.

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Figure Caption

Figure 1. Cumulative weight and cumulative frequency plots for selected sites:
a. selected sites from Ireland
b. selected sites from Ireland displayed to same scale as (c)
c. selected sites from Britain

Table 1: summary catalogue of retrieved as archaeometallurgical residues, listed by context and bag. Weights in grams.

context	Bag #	bag wt	Item wt	Item no	notes
					ACD1753
303		4630	1210	1	slightly accreted (-80g?) large SHC, folded almost double, 200x130x50mm
			1175	8	fragments of accreted SHC
			830	1	110x120x65mm, double layer SHC, dense slightly dished upper plate; rough/microprilly base
			440	1	slightly incomplete dense SHC with dished, possibly very slightly haematised smooth top, microdimpled base
			314	1	conical SHC, 70x100x55mm, surface slightly accreted
			536	1	internally prilly SHC with very wide wall attachment, 80x120x60mm, slightly down-angled with respect to wall, attachment undercut by irregular bleb extending back 20mm, top microdimpled
			20	1	mixed-oxidation fired lining
			94	3	slagged oxidised lining, one piece with 25-30mm diameter b/h margin fragment, lining gravelly
303	1	2070	622	1	100x110x70(30)mm, accreted thin SHC, unclear how much of up-standing lump is accretion,
			474	1	100x100x50(30)mm, very dense small neatly-formed, plano-convex SHC with rounded slag lumps adhering to upper face
			442	1	100x110x50mm, mass of poorly compacted slag prills in overall plano-convex shape
			170	1	ovoidal dense concretion
			354	1	accreted slag lump
304	1	624	152	1	part of a dense, but strongly lining-influenced thin cake, dimpled base, dull top, gravelly
			134	1	lining slag mass, biconvex, 65x75x45mm, microdimpled irregular base, lobate raised top with gravel
			328	2	accreted SHC fragments
304		424	224	1	down-sloping SHC with wide attachment, 65x110x40mm; wide well-formed burr across entire width; base microdimpled, top with abundant charcoal
			194	3	varied SHC fragments
					ACD1767
1003	1	2565	1000	1	130x130x70mm, well-formed SHC; deep, vertical wall contact; surfaces obscured by accretion
			818	1	deep triangular SHC with extensive wall attachment, 120x130x80mm, irregular; smooth top around voids with patches of lining slag, body accreted but probably prilly as certainly are the edges
			732	1	irregular accreted lump - just possibly rolled-up SHC
1003	2	5660	824	1	120x135x65mm, dished-topped SHC, dipping away from wall contact; top shows dimples, base rough with some tiny pills/dimples showing against sediment contact, small area missing (add 70g)
			552	1	heavily-accreted mass of prills descending away from large wall contact; probably not complete
			226	1	70x80x50mm, SHC, dense, pyramidal deepest at contact; top flat, very slightly dimpled
			3005	7	very heavily accreted material, probably all SHCs except for one which is cored on iron
			40	2	stones
			1030	5	more lightly-accreted SHC fragments
1003	3	1745	350	3	concretions
			352	1	incomplete maroon surface down-wall sheet; probable lower end shows fracture onto relatively conventional SHC profile
			728	7	fragments of dense SHCs
			118	1	60x65x40mm, dense maroon surface, gravelly, glassy-surfaced lump - intermediate between small SHC and tongue
			188	1	accreted small SHC, 70x90x35mm

context	Bag #	bag wt	Item wt	Item no	notes
1005	1	2945	554	1	two-layer SHC; 95x95x40mm dished SHC, upper layer 95x60x40; -probably two smithing events with downwards clearance between
			190	1	80x100x40mm, SHC/tongue; upper layer irregular gravelly lining slag, below which dimpled prills, locally rusty; below which fragment of dense dimpled sheet lying on floor
			384	1	dense prilly SHC with top obscured; 80x95x55(40)mm
			182	1	multi-lobed dense shiny basal SHC fragment; shiny layer has abundant tubular vesicles; the overlying slag has more lining, separated by moderately large rounded void
			1050	1	very heavily accreted probable SHC material
			486	4	SHC fragments
			86	2	vitrified lining material
1005	2	3030	138	1	75x60x35mm, neatly conical low-density SHC/tongue; dished top; basal section microprilly
			628	1	115x110x60mm, dense SHC with wide contact to wall/burr; SHC dense but porous with charcoal moulds; prilly; biconvex
			292	1	100x80x70(30)mm, small porous SHC with deep fuel moulds on top overlain at a distance by a tongue-like mass of prilly lining slag, covering only proximal end of lower mass
			116	1	65x60x30mm, small dense plano-convex lump; probably SHC; but just possibly the basal dense section of a larger mass
			22	1	slagged lining
			92	2	concretions on iron
			732	4	dense concretions, probably including slag as well as iron
			674	5	SHC fragments
			316	1	80x85x60(40)mm, deep prilly mass, probably SHC
1005	3	3695	2225	1	130x180x100(75)mm; multi-layer large transverse SHC; lower bowl has smooth surface, dense, multi-lobed mass 120mm in diameter; upper bowl more porous, probably charcoal-rich, top of bowl planar with concentric structure marked by slightly lobate ridges, central pile of lining slag; burr partly spalled-off, but appears very wide
			984	1	130x140x80(50)mm; neat SHC with very wide attachment (burr is maximum width), top of SHC at least 30mm below b/h with lots of down-wall flow against wall, separate from SHC; SHC base shows some flow lobes, top largely obscured
			140	1	gravelly tongue; 70x90x35mm; deeply dimpled base irregular gravelly top
			122	1	neat semi-circular tongue; 60x95x45(30)mm; gravelly maroon top with raised edges; deeply dimpled/prilly base
			42	1	dense rusty slag nub
			44	1	worn(?) pale gravelly lining slag in plano-convex nub
			132	1	equant lump of prilly iron slag
1005	4	4155	1270	1	slightly accreted large SHC; 145x145x70mm; contact 90mm wide, neatly and symmetrically conical, but surfaces obscured
			1235	1	large accreted mass, probably an SHC, but no details visible
			456	1	slightly altered and possibly deformed SHC fragment; crust 25mm with tubular vesicles, overlain by slag with voids of up to 40mm - resembles remelting slag
			446	1	partially-accreted large SHC fragment - possibly with deep bowl
			562	1	accreted SHC with flared shape, incomplete
			138	1	lining slag sheet, gravelly, mostly with sandy basal contact; so differs from a tongue; distal end has developed maroon-surfaced flow lobes; very gravelly
1005	5	4225	62	1	concretion
			2705	1	concretion; medium sized SHC attached to large equant mass, all containing much iron
			1025	12	SHC fragments
			175	1	concretion
			114	1	lining slag with lining inclusions - complex zone from along overhang of ceramic

context	Bag #	bag wt	Item wt	Item no	notes
			128	3	small blebby slag masses or tongue fragments
1005	6	3720	892	23	fragments of iron slag - all probably from SHCs
			952	9	accreted slag fragments - all potentially SHC fragments
			56	2	vitrified lining
			28	2	tongue fragments
			14	1	small non-wetted piece of amalgamated flow lobes
			38	1	flowed dense lining slag
			96	1	burr with thin curving slag sheet attached - possibly just down-wall flow, possibly a link into a lower SHC?
			160	1	fragment from a dense shiny multi-lobed SHC base; internally vesicular and sugary-textured (but no tubular vesicles)
			714	12	concretions on iron (although some also contain slag)
			22	1	stone
			90	1	large part of a small SHC with a maroon gravelly top, smooth base
			252	1	thick crust fragment, some tubular vesicles, passes up to interface with sugary texture and voids
			396	1	small dense mass, deepest at wall; attached to wide area attachment; possibly deformed by down-curving of distal lip; 70x100x70mm; top dips at 45 degrees to wall
1005	7	4095	164	1	attachment and proximal end with dark raised flow lobes
			42	1	vitrified lining
			846	1	half of large compound cake, bowl formed by c.20mm crust, then 15mm darker then 15mm like basal crust forming an upper pad; top slightly dimpled; base rough with sediment; 50mm thick 140mm across
			620	1	dense neat slightly double-layer SHC, 90x100x55mm, slight external discontinuities with lower bowl
			710	1	120x110x45mm; rough cake with spikey top, irregular rough base
			568	1	60x120x75mm; 90x70mm attachment behind vey irregular mass of microprilly slags
			994	4	heavily accreted slag fragments
			132	1	mass of gravelly lining slag, 75x60x50mm
1005	8	3625	1150	1	unusually large block of mainly prilly slag, appears to have filled hearth from high b/h down to base, 100x120x110mm; base very crudely multi-lobed, attachment 100x70mm, wall slightly overhanging
			502	1	90x110x80mm; irregular deep SHC; top flat, gravelly glass; lower parts charcoal-rich; wall probably slightly overhanging
			686	1	80x95x45mm dense slag bowl, above which accretion, with then highly inclined tongue-like low-density mass; probably two separate items but just possibly one
			288	1	low dense tongue-like gravelly SHC; inclined, and possibly bent, downwards from sharp overhang below ceramic; 110x115x40mm
			876	3	heavily accreted slag blocks
			106	4	dense slag fragments
1005	9	2930	1565	1	concretion, possibly two accreted SHCs stuck together
			208	1	60x100x50mm; slightly dished lining slag block; smooth top, prilly base; unclear if folded hot, of formed in that 'U'-shape
			870	1	box like SHC fragment; dense slag down wall and across floor with big central void; hint of concentric rings on one side; much missing; 110x(110)x60mm
			268	1	part of dense concavo-convex medium sized SHC
1005	10	3335	314	6	concretions
			1480	8	fragments of SHCs with dense iron-rich thick crusts
			274	1	concretion
			226	1	burr area fragments
			90	2	slagged or vitrified lining
			556	5	fragments of SHCs with prilly texture

context	Bag #	bag wt	Item wt	Item no	notes
			94	1	dense prills with flat gravelly top
			148	3	fragments with strong lining influence
			30	2	dense slag fragments
			106	1	appears to be single large flow lobe/prill with gravel in top (somewhat similar to 94g piece above)
1005	11	3286	474	1	85x100x50mm; plano-convex SHC; microprilly base; obscure top, lobate top margins, dense
			704	1	105x105x70mm, probable biconvex SHC, coated in fine charcoal-rich material
			178	2	vitrified lining
			306	1	80x90x50mm, conical cake or just possibly proximal end of cake
			684	12	SHC fragments
			262	1	heavily accreted small SHC?
			420	5	concretions, probably on slag
			60	2	concretions
			162	1	multi-lobed base, porous rough slag, dense
			32	1	lobate lining slag
1005	12	2825	870	4	SHC fragments
			16	1	lining slag bleb
			226	1	large wide burr
			362	1	90x85x45mm; flat topped SHC; burr-like mound one end of base, other end rough - multi-lobate type?
			66	1	55x85x20mm, gravelly lining slag sheet, not a tongue
			142	1	60x90x60mm, tongue-like mass; bent in gentle 'U' with lump of gravelly slag on upper centre; gravelly lining slag with dense prilly/dimpled base
			202	1	125x70x35mm, elongate gravelly tongue-like mass; glass generally dark; base finely dimpled rather than prilly
			342	1	80x100x60mm, conical low density SHC, planar glassy top, somewhat prilly base - like thick tongue
			362	1	85x100x50mm, heavily-accreted SHC, possibly lobate edges but no other details
			224	1	85x70x35mm, dense bowl, wispy prilly top; multi-lobate smoothish base; upstanding pillar of charcoal-rich slag 20mm high in centre of top
1005	13	3825	698	1	prilly mass with textures like a giant tongue; 105x120x95mm; dark gravelly glassy slag above, greener flow lobes below; possibly thickens away from wall; base has a concave depression - unclear if coincidental, the floor, or whether the mass rested on an iron -rich slag
			622	1	large tongue-like mass attached to concretion (-212g); 100x120x50mm; really only 30mm thick but edges rolled up
			730	9	concretions probably on iron
			874	12	concretion on slag/heavily accreted slag
			268	6	blebby lining slags, some with attachments, one with iron, one with maroon top, but none a complete mass
			60	1	fragment of tongue? maroon gravelly top and green prilly base
			126	1	angular fragment of very dense, wustite-rich slag, probably from a burr
			70	1	dense slag with very large charcoal moulds; non-wetted flows on base - smelting slag
			178	6	smithing slag fragments, probably from SHCs
			114	2	dense prilly slags with small fuel dimples
			80	1	thin sheet of slag with sediment contact/fuel contact on base and large unroofed voids and remnants of maroon top - possibly a down-wall piece or from just in front of b/h
1005	14	4210	924	1	130x130x80(65)mm; very well-formed SHC; deep symmetrical bowl with well formed microprilly base and dimpled/wispy top; burr raised above SHC top level, 90mm wide 40mm tall with 15mm overlap and 30mm deep
			446	1	prilly mass with glassy flat top; attached to wall; 110x110x60(40)mm
			428	1	multi-lobed base from dense cake; micro-dimpled base; surviving flat top with charcoal-rich material above
			418	1	100x80x70(25)mm thin SHC with microdimpled base and flat top, with tall pile of concretionary charcoal-rich material - possibly original slag
			174	1	90x65x40mm, semi-circular gravelly lining slag mass; base gravel rather than prilly, so not a true tongue

context	Bag #	bag wt	Item wt	Item no	notes
			550	1	fragment from centre of cake with thick crust and deep 'V'-shape; bowl 70mm deep with 20mm hollow; rough microprilly base; narrow tubular vesicles
			178	1	fragment of SHC crust
			420	1	fragment of SHC with deep 'V'-profile; bowl 55mm with 20mm hollow; smoothish hollow with concentric ridges on planar margin outside; microprilly base
			54	1	slagged lining
			48	1	irregular lining slag sheet fragment
			72	2	concretions
			496	5	SHC fragments
1005	15	4345	934	5	concretions
			680	2	fragments of concavo-convex SHCs with deep, smooth, bowl interiors; crusts with tubular vesicles; multilobed bases and possible iron inclusions
			252	1	fragment from a multilobed base; open textured and rough internally; micro-prilly/micro-dimpled externally
			354	5	SHC fragments
			120	1	fragment of concavo-convex SHC with deep smooth bowl
			292	1	fragment of burr from very dense cake; microprilly externally below burr; large internal voids
			356	1	multi-lobate base fragment with internal open texture, wispy top, incomplete
			348	1	very irregular mass of lining and dense slag, possibly hot deformed
			136	1	tongue-like lump - upper surface is single convex lobe of glassy slag, lower prilly, rusty entraining charcoal; unclear if a discrete entity
			238	1	prilly dense slags attached to a wide attachment, 100x60x50mm
			260	1	100mm wide attachment with train of dense prilly materials sloping down in front, 100x100x45mm
			182	1	80x75x35mm; prilly dense open small mass with glassy/gravelly top
			188	1	70x95x20mm; semi-circular lining slag pad; like tongue; gravelly top, dense base
1005	16	3960	810	1	115x120x70mm, dense SHC with attachment 100mm wide, below attachment is strange high, broad ridge parallel to wall - either a big tool-mark or a previous, now depressed attachment; open-texture very dense slag
			514	1	85x100x55mm; dense SHC; irregular, top dished but obscured; base has strange broad oblique ridge
			536	1	115x80x60(45)mm; irregular very dense but porous SHC; hint of concentric structure; base multi-lobate; very irregular with charcoal
			324	1	95x110x50mm; SHC with tongue-like textures and very ide attachment; very gravelly top, rusty base
			206	1	slag sheet from down-wall of b/h; rear has strange lobes probably around large stones in wall; top rough, curved - probably pulled from base outwards during extraction; possibly classifiable as a SHC
			148	1	70x80x40mm; irregularly biconvex, glassy SHC or tongue
			344	1	probably incomplete prilly SHC attached to gravelly wall
			58	1	irregular pad of gravelly lining slag,
			42	1	prilly slag in concretion
			58	1	pale gravelly lining slag sheet, deeply dimpled base
			28	1	black glassy lining slag lump
			240	2	very dense concretions
			550	8	SHC fragments
			26	1	concretion
			68	1	lining slag sheet, or tongue, dark glassy gravelly top, rusty green lobes/dimples on base
1005	17	3905	1105	1	10x235x70(45)mm; dense, extremely neat SHC; flat top with scatter of lining slag in centre; attachment wide, 100mm, with SHC extending asymmetrically from it; base accreted
			186	6	vitrified slagged lining

context	Bag #	bag wt	Item wt	Item no	notes
			124	1	burr
			26	1	lining-influenced slag fragment
			20	1	burr fragment
			32	1	stone
			1225	8	concretions
			332	2	fragments of oxide-rich dense SHCs, with thick crusts and open wispy/spikey tops
			402	2	prilly slag lumps - parts of SHCs
			438	2	heavily-accreted rounded slag pieces
1005	18	4830	420	1	80x120x40mm; dense SHC, slightly deformed during extraction on one side; may be elongate; slightly multi-lobed base, rough, flat top
			548	1	80x90x70mm, probably slightly incomplete prilly SHC, well layered
			250	1	70x100x35mm; SHC with deep fuel impressions on the top, charcoal-rich despite density
			278	1	70x100x40mm, prilly plano-convex SHC, gravelly top, loosely prilly, rusty base, like giant tongue; fairly wide attachment
			334	1	irregularly prilly mass, 70x90x50mm, dense
			212	1	70x85x30mm, thin dense SHC, has angled slag fragment accreted to top (not included in measurements)
			1640	3	concretions, mainly on slag
			1010	6	slag fragments, variable accretion
			35	1	vitrified lining
			85	1	tongue fragment
1005	19	3280	546		incomplete - dense proximal end of SHC, probably missing distal parts, extremely dense
			746		120x120x90(50)mm; open bowl filled partially with charcoal-rich slag; rough base; possibly corroded
			236		65x100x55mm; 90mm wide attachment bearing asymmetric very dense mass in front
			404		130x90x70(30)mm; 30mm wide attachment bearing narrow protruding dense slag, forming crude bowl 30mm deep
			502	6	fragments of SHCs
			178	2	tongue fragments
			66	1	black glassy ling slag attached to pale lining
			246	1	open-textured charcoal-rich SHC with large area attachment, incomplete
			204	1	concavo-convex SHC; very thin, smooth top, microdimpled base, incomplete
			144	1	unusual burr, 80mm wide, drops off into SHC in front - suggests that face of wall eroded back 50mm from its original location
1005	20	4115	302	1	80x100x50(35)mm; SHC with accreted prilly bowl; flow lobes on one side; partial coverage of top with lining slag mass
			606	1	extremely dense fragment of SHC with prilly base and vertical sandy contact
			418	1	possibly incomplete prilly SHC of irregular shape
			208	1	60x90x35mm; SHC with extremely neat bowl base and dished smooth top
			878	8	concretionary material rich in iron; concretion contains abundant smithing fines
			166	5	fragments of lining slag masses
			104	1	irregular mass, possibly SHC, has burr at one end then arcuate pale slag with dimpled base and open vesicles on top
			52	1	slag fragment as 104g piece above
			286	5	SHC fragments
			66	1	tiny plano-convex mass with non-wetted very shiny contacts, lobed, very dense- foot of wall piece?
			218	1	irregular prilly mass - not clearly SHC
			114	1	possible SHC, very open-textured mass of dense prills with contact on one side
			96	1	prilly mass, tongue-like in shape but unclear if complete
			68	1	SHC fragment
			254	1	fragment from a large prilly SHC with dished dense top

context	Bag #	bag wt	Item wt	Item no	notes
			126	1	tongue, 55x95x35mm, green glassy sandy top, base rusty lining slag with deep dimples
			106	1	tongue, prilly sandy lining slag, 60x80x40mm
			68	1	dense tongue fragment
1005	21	4445	390	3	concretion involving iron
			48	1	slagged vitrified lining, showing overhang on base of block - a planar face and base - suggesting either base of block tuyère or base of clay wall above cut of pit
			270	1	75x75x50mm, neatly-formed compact dense SHC, rough/microdimpled base and finely dimpled top
			342	1	fragment from base and burr of extremely dense SHC
			1545	10	SHC fragments
			158	1	90x70x35mm, dense SHC with gravelly lining slag-rich planar top and deeply dimpled prilly base
			366	1	curved prilly mass with straw-rich accretion; not certainly a complete SHC
			300	1	85x95x40mm; with small knob on base, plano-convex SHC with flat gravelly top; prilly dimpled base; neatly conical
			242	1	80x100x40mm, prilly SHC with dimpled top; rusty, charcoal and scale rich accretion
			342	1	110x85x35mm; oval SHC with prilly base and dense bowl, top obscured by accretion
			350	1	80x95x50mm, dense prilly mass attached to wall with semi-circular burr, but not necessarily from tuyère
			40	1	curved maroon-topped dense slag sheet, shiny top, sediment contact base
			32	1	blebby lining slag mass
			12	1	small accretion on iron?
1005	22	3355	1305	1	accretion, dense gravelly outside, probably contains SHC
			602	3	concretions
			64	2	deeply vitrified lining
			80	2	lining slag lumps, irregular prilly, partially oxidised surface on one
			286	3	probable smithing slags but with dense flowed material, in one instance with flow lobes around medium charcoal
			406	4	SHC fragments
			210	1	incomplete SHC, 80x90x35mm; neat, vesicular, dimpled base and open large vesicles on preserved top
			186	1	prilly dense mass with wall contact
			200	1	irregular prilly mass
1005	23	3520	1555	1	140x140x120(50)mm; dense bowl with some gravel, then thick interlayer with thinner dense sheets, culminating in 70x90mm pinnacle covered in sandy lining lag
			1940	1	heavily accreted (-200g) large SHC, with large charcoal clast; 150x130x60 bowl; unclear how much slag the accretion on top is hiding, where seen the slag is very dense in peripheral low lobes
1005	24	4110	876	1	very well-formed SHC, elongate, 120x100x75(40); neat dense bowl; slightly concentric on top, overlain by irregular wall slags; lower part of contact planar, angled above (bent during extraction?); sandy basal contact extends long one side, other side with medium charcoal,
			878	1	elongate SHC, 120x90x70(40)mm; distinct upper lobed lining pad; lower well formed, prilly on one side
			82	1	tongue-like disk of sandy lining slag with rusty lobes on base, 65x85x20mm
			376	1	open, prilly, transverse mass with possible tool grip mark on burr on one side; 80x115x65mm
			180	1	incomplete small disc-like SHC, 60x90x30mm; top wispy, possibly ex-fuel moulds, base microdimpled
			340	1	probable SHC, but surface obscured by accretion
			100	1	iron slag mass with slightly prilly base, 60x65x35mm; smooth but open top; downwards prills with fuel dimples on base
			594	5	SHC fragments of various densities
			148	1	channel-like piece, with dense base formed of flow lobes - possibly a foot of wall piece?
			88	1	slab of lining slag
			436	2	irregular concretionary masses with corroded iron

context	Bag #	bag wt	Item wt	Item no	notes
1005	25	3725	528	1	110mm wide x 50mm deep dense SHC fragment; abundant tubular vesicles; flat top, microdimpled base, c50%?
			702	1	accretion, contains iron but possibly mainly an SHC
			882	1	accreted SHC (-60g), 130x120x65mm; bowl angular, so could be in foot of wall
			346	5	accretions, probably on slag
			432	6	SHC fragments, mainly rather blebby slags
			42	1	irregularly semi-lobate slag nub
			104	3	vitrified and slagged lining
			106	1	65x80x30mm; irregular dense rusty semi-circular tongue-like mass, bur uncertain if complete
			248	1	80x100x40mm; dense disk-like SHC with shiny surface at proximal base, slightly concentric structure, accumulating odd slag blebs
			170	1	SHC fragment with gravel
			103	1	50x90x35mm, extremely gravelly dense tongue-like semi-circular sheet, rusty base, glazed gravel on top
			48	1	irregular slightly lobate lining slag mass
1005	none	3130	3115	1	attachment 150x100mm;base has straw-rich accretion; top shows concentric lobes of lining influenced slag; wall slightly forwardly inclined (60 degrees?) proximal end of base has raised area of microprilly grey slag
1006	1	3020	1340	1	140x100x100(65)mm; deep, dense, slag bowl with flat top with pile of accreted lower density slag on top; accretion contains bone, unclear how much of this is accretion and how much slag
			846	1	100x110x70mm; deep dense slag bowl covered by 20mm thick dense slag slab which has slightly lobate edges
			504	1	90x110x50mm; wide attachment with slab of prilly dense slag attached; not a good SHC shape, but appears complete
			316	1	large piece of SHC crust - probably from open bowl
1007	2	2440	2020	1	excellent compound cake, bowl 130x150x50mm; deep central area of cake covered by pad of slag 40mm thick; attachment up to 60mm above bowl top and 80mm wide - as glassy slag in front of vitrified wall, with gravel
			406	1	concretion
1007	3	2065	986	5	concretions
			82	1	burr fragment
			88	1	tongue/lining slag pad fragment
			82	1	mass of gravelly lining slag, equant
			16	1	vitrified lining
			24	1	dense gravelly slag fragment
			272	1	open-textured, prilly, poorly consolidated SHC, 75x85x40mm; unclear if complete, charcoal rich
			272	1	conical mass, shape of SHC, but flowed on all sides to smooth form; 60x80x50mm; possibly displaced SHC left in blast?
			240	1	small dense mass with large attachment, 70x70x50mm
1008	1	2440	1445	1	irregular large block of iron slag bearing very large charcoal piece. Probably a fragment from a non-tapping furnace
			990	1	100x110x80mm, block of dense lag, possibly an SHC, prilly base has sediment inclusions, could also be FB fragment
1013	1	208	142	1	open-textured prilly slag fragment, poorly consolidated SHC probably
			62	1	stone
1015	1	1565	1560	1	large block of FB with extremely large charcoal moulds to 70x40x30mm
1016	1	792	358	2	accretion
			220	1	part of burr region of low density, mainly finely prilly cake, with large maroon surface lobes at proximal top; strongly lining-influenced
			208	2	fragments of open-textured cakes

Table 2: classes of archaeometallurgical macro-residue by context. Weights in g.

Context	Smithing hearth cakes (SHC)	Other smithing slag	Slag coated in accretion	Concretions	Indeterminate slag	Hearth lining	Lining slag	Smelting slag	*total*
ACD1753									
303	4868	0	1529	170	0	114	0	0	*6681*
304	898	0	0	0	0	134	0	0	*1032*
ACD1767									
1003	5836	0	3337	750	0	0	0	0	*9923*
1005	70431	228	11467	8756	2372	1097	1814	70	*96235*
1006	3006	0	0	0	0	0	0	0	*3006*
1007	2886	0	0	1392	0	16	194	0	*4488*
1008	990	0	0	0	0	0	0	1445	*2435*
1013	142	0	0	0	0	0	0	0	*142*
1015	0	0	0	0	0	0	0	1560	*1560*
1016	428	0	0	0	0	0	0	0	*428*
total	*89485*	*228*	*16333*	*11068*	*2372*	*1361*	*2008*	*3075*	*125930*

Table 3: working groups of smithing slag cakes (SHCs and related materials). Weights in g.

Group	Number	Min. wt	Max. wt.	Mean wt.
Lining slag pads	5	134	288	201
Tongues	11	68	410	144
Low density/intermediate SHCs	9	118	698	270
SHCs formed of prills of dense slag	17	114	1150	409
SHCs formed of prills of dense slag with lining slag on upper surface	5	182	818	408
Dense SHCs	38	116	1740	544
Dense SHCs lining slag on upper surface	11	248	3115	1288

Table 4: Comparison of the SHC weight-frequency distribution with that of other assemblages from southern Britain, ordered by mean weight. Weights in gram.

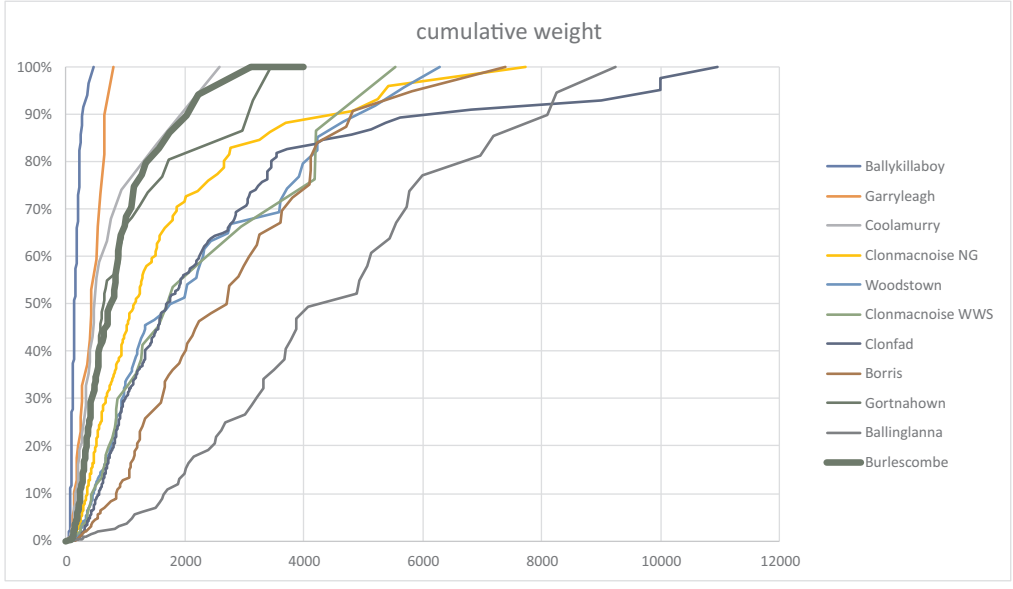
Site:	Cleevelands	Exminster	Uffington	Ebrington	Neath	Ware	Tidworth	Hen Gastell	Worcester 35 Mill St/ Willow St	Marsh Leys Farm	Burlescombe	Kingstone	Dymock
Reference:	Young 2016b	Young 2014ba	Young 2015b	Young 2016d	Young 2013, 2014a	Young 2014d	Young 2016c	Young 2015a	Young 2007, 2009b	Young 2005a, 2011a	This report	Young 2012b	Young & Kearns 2010
	RB	RB	RB	RB	RB	RB	EM	11th-12th	12th	RB	EM?	RB	RB
count	176	107	57	37	47	70	12	7	51	30	103	15	10
min. wt	44	32	36	53	74	36	80	72	74	60	68	230	112
max. wt	530	482	614	628	630	952	680	1000	782	824	3115	1035	3885
mean wt	125	127	137	180	244	246	265	260	285	333	510	565	1032
% <150g	73%	77%	72%	46%	32%	44%	33	57%	24%	23%	15%	-	20%
% <500g	99%	100%	98%	97%	89%	82%	75	86%	86%	77%	65%	47%	60%
% >1000g	-	-	-	-	-	-	-	-	-	-	11%	7%	20%
% >3000g	-	-	-	-	-	-	-	-	-	-	2%	-	10%

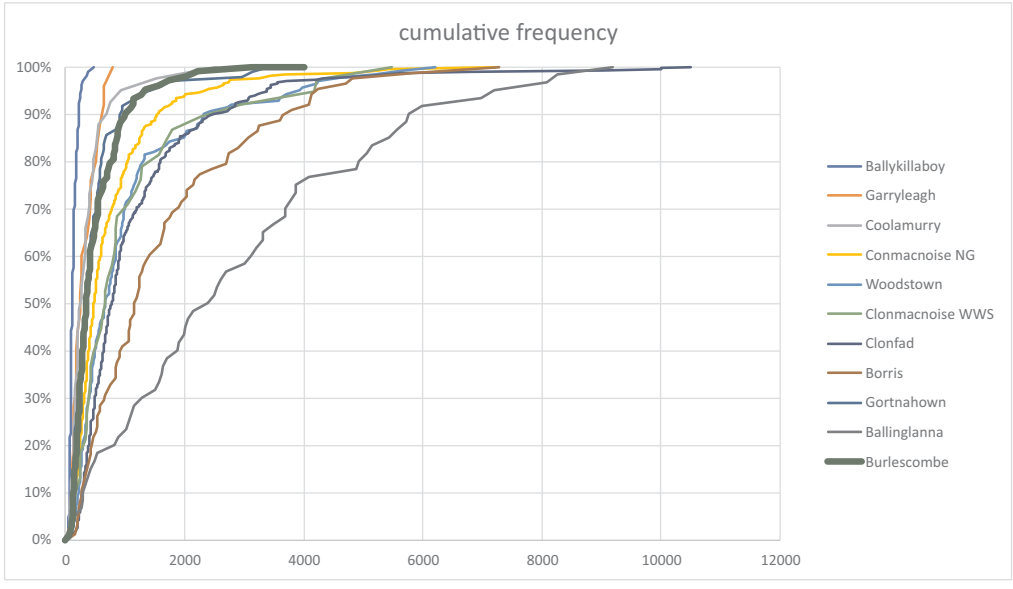
Table 5: Comparison of the SHC weight-frequency distribution with that of assemblages from Ireland, ordered by mean weight. Weights in gram.

Site:	Ballykillaboy Co. Kilkenny	Garryleagh Co. Cork	Coolamurry Co. Wexford	Gortnahown	Burlescombe	Clonmacnoise New Graveyard	Woodstown	Clonmacnoise Waste Water Scheme	Clonfad	Borris	Ballinglanna
Reference:	Young 2010c	Young 2009f	Young 2008	Young 2009d	This report	Author's unpub. data	Young 2006b, 2009a, 2014e	Young 2005b	Young 2012	Young 2009b	Young 2009e
Date	15th-17th	13th-14th	12th-13th	EM	EM?	EM	EM	EM	EM	EM	EM
count	113	25	41	98	103	258	140	38	375	88	60
min. wt	50	84	62	78	68	54	68	124	60	154	86
max. wt	478	802	2588	3450	3115	7815	6310	5540	11000	7440	9267
mean wt	139	316	386	498	510	762	1060	1087	1177	1618	2902
%<150g	70%	28%	83%	17%	15%	8%	4%	8%	1%	-	3%
%<500g	100%	76%	95%	68%	65%	52%	40%	39%	30%	22%	17%
%>1000g	-	-	5%	8%	11%	33%	29%	32%	35%	59%	78%
%>3000g	-	-	-	2%	2%	3%	8%	8%	7%	16%	42%

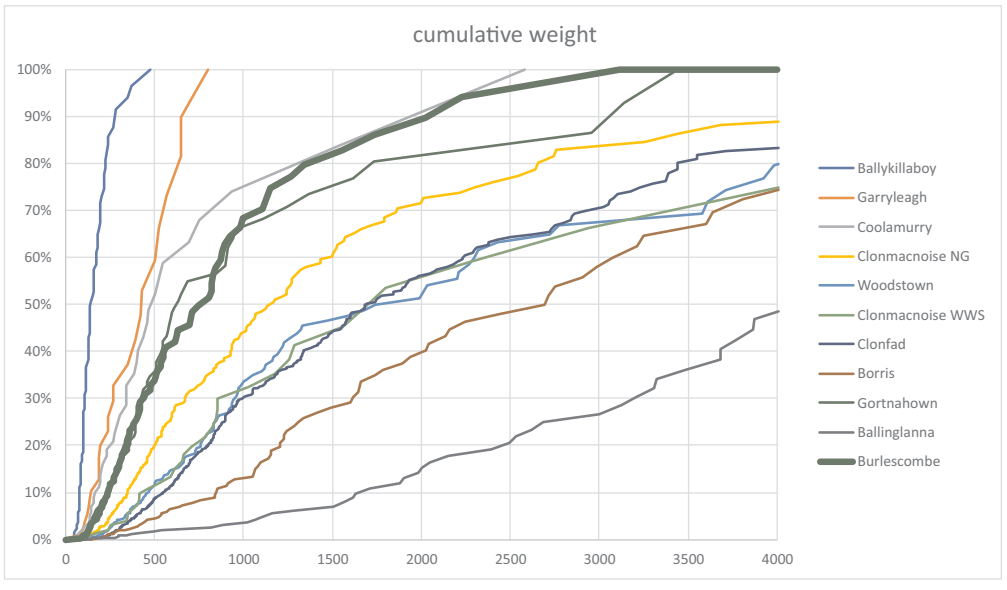
Figure 1

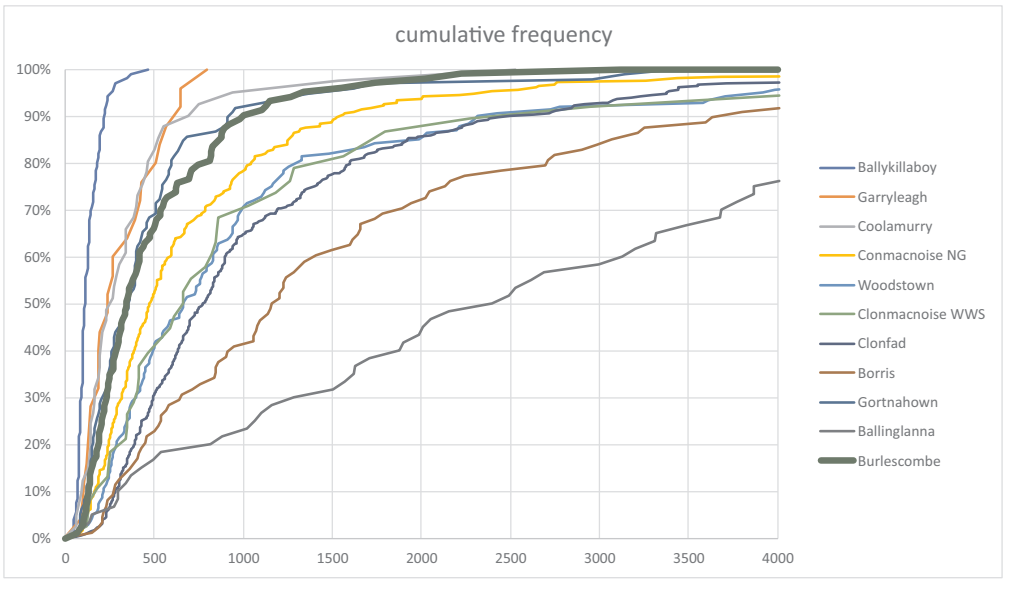
a. early medieval and medieval assemblages from Ireland



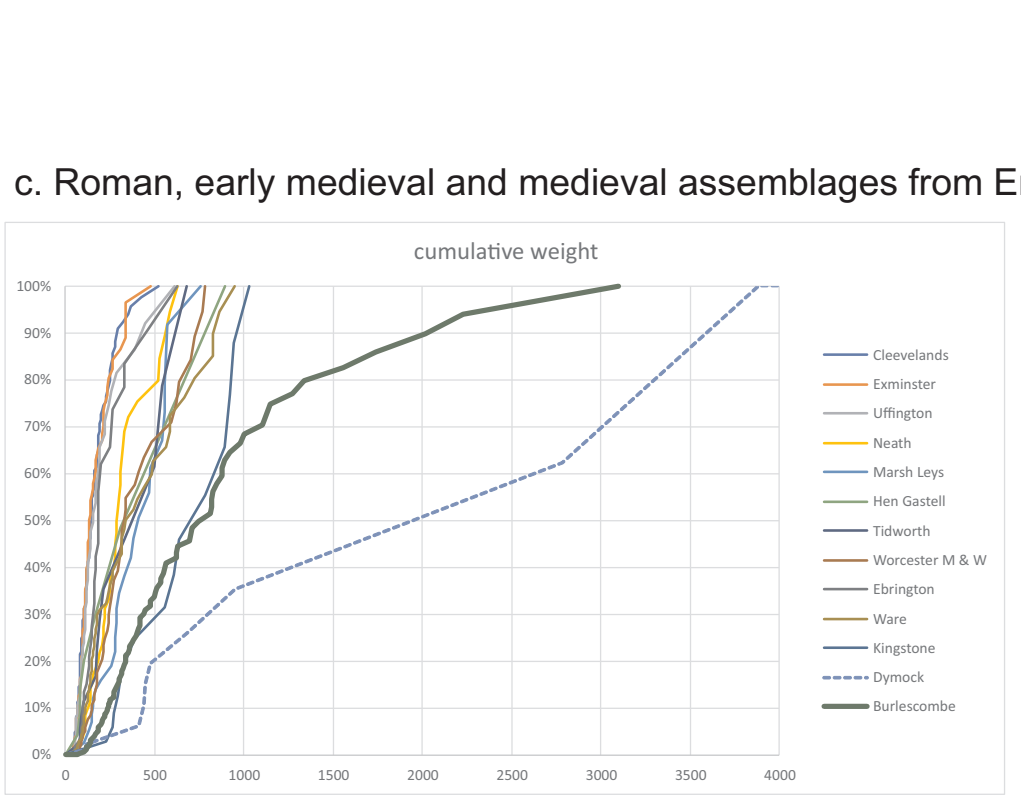


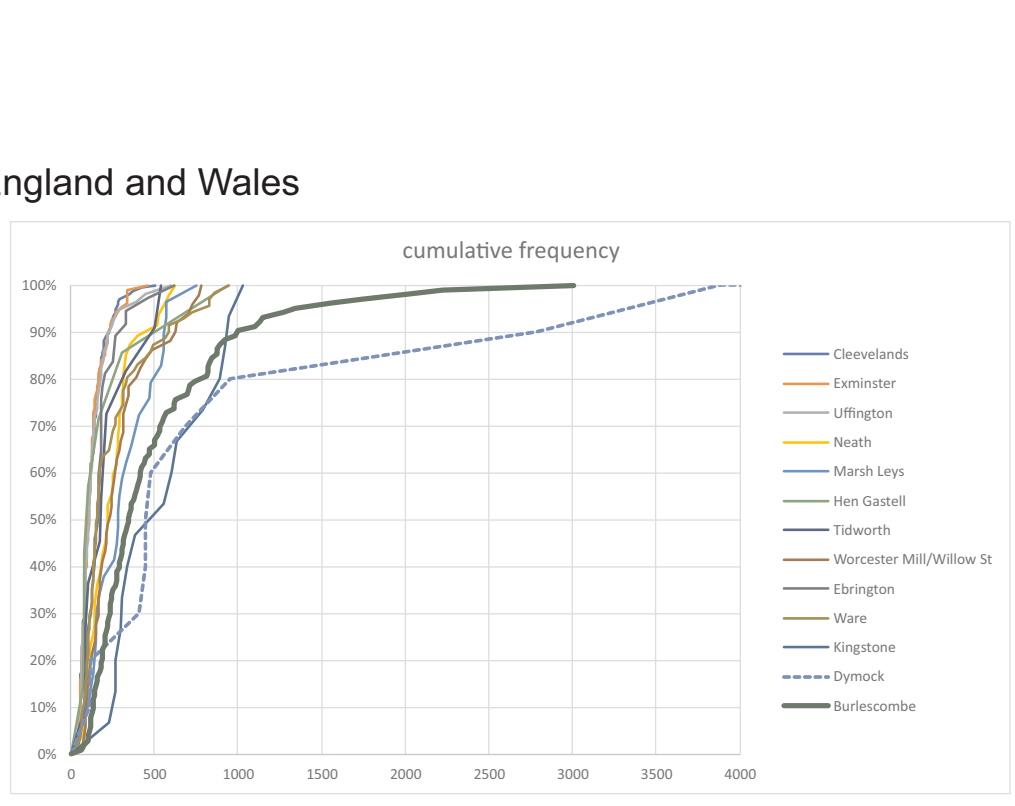
b. early medieval and medieval assemblages from Ireland





c. Roman, early medieval and medieval assemblages from England and Wales





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