GeoArch

Report 2019/19

Assessment of residues from Hartridge Farm, Newport (HFN-16-EX)

Dr Tim Young
23rd January 2020

Assessment of residues from Hartridge Farm, Newport (HFN-16-EX)

Dr T.P. Young

Abstract

The submitted material comprised a small assemblage of 30 main pieces with a total weight of 4.4kg from 9 stratigraphic contexts. Of this total 3 particularly large slag pieces contributed 3.9kg.

Of the three large pieces, one closely resembles SHCs from bloomsmithing on other sites in the region, a second is very large SHC of a more conventional form but of a size suggestive of having been formed during bloomsmithing, the third is of an irregular form, has a structure of amalgamated slag prills and is less certainly a conventional bloomsmithing residue, although that is the most likely interpretation.

The remainder of the assemblage comprises small weathered fragments of smithing slags and associated materials. Some of the residues differ from the larger charcoal fuelled SHCs in indicating the use of coal, presumably for blacksmithing.

The residues are all likely to have been generated elsewhere before deposition within the excavated area. The predominance of the large SHCs is unusual and may suggest their use for structural purposes.

The assemblage is thus interpreted as a small sample from a, presumably nearby, undertaking bloomsmithing. By comparison with other sites around the Severn Estuary, such a bloomsmithing site would most likely also be undertaking the smelting of iron, although no direct evidence was found for that at Hartridge Farm.

Contents

Abstract 1

Contents 2

Methods 2

Description of the assemblage
- General 2
- Smithing slags 2
- Ceramic materials 2
- Other materials 2

Distribution of the assemblage 2

Interpretation 3

Further work 4

References 5

Table 1. Summary Catalogue 4

Methods

All materials were examined visually, using a low-powered binocular microscope 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 November 2019 and was commissioned by Rhiannon Philp of Archaeology Wales.

Description of the assemblage

General

The submitted material comprised a very small assemblage of just 44.kg (30 macroscopic fragments plus a small quantity of finer debris), recovered from just 9 contexts. A total of 3.9kg was provided by just three slag pieces. All pieces capable of attribution are from the working of iron (smithing). No pieces were certainly from iron smelting. Non-ferrous metalworking was supported by a mould fragment that was not included with the submitted assemblage.

Smithing slags

All the identifiable slag within the assemblage from the working (smithing) of iron.

This material was dominated by three large pieces. One (a 1220g piece from context (1804)) closely resembles SHCs from bloomsmithing on other sites in the region. It is dense, plano-convex and has fuel dimpling of both upper and lower surfaces. At 120x110x70mm, deepest near probable proximal end, it is more equant than examples from Miskin, which tend to be elongate. This piece shows rust-staining indicative of the presence of iron inclusions.

The second (a 1160g example from context (866)) is a very large SHC of a more conventional form, with a fuel-dimpled lower bowl (like that of the first example), overlain by an arched slab of more siliceous, lining-derived slag, separated from the top of the bowl by friable, charcoal-rich slag. This SHC has a smaller bowl than the first (110x130x50 mm) but is overall deeper (85mm) because of the 35mm thick upper layers.

The third is of an irregular form, 115x140x85mm. The top of the bowl (55mm deep) shows a partial planar surface, overlain by a further 30mm of slag, but it is unclear if the surviving upper surface is original. The cake has a structure of amalgamated slag prills and/or granules, with some larger pieces (up to 60mm) themselves showing dimpled surfaces. The granular texture of the slag shows in places through onto the basal surface, but one side of the basal surface shows parallel smoothed swathes; it is unclear if these are the impressions of laths, tools or simply the result of becoming smoothed during the extraction of hot slag from hearth. This unusual piece is probably the result of slag flowing into the lower fuel bed chilling rapidly, so that a slag 'puddle' could not form. This might result from the lower part of the hearth being at lower temperature than the hearth that formed the previous two examples or that the slag had a higher solidus temperature, for instance from being more iron-rich.

In addition to these substantial slag pieces, a 110g fragment from (2591) shows a similar texture to the large (1520g) piece from (866), as probably does a small fragment (32g) from (1831).

Other small slag fragments were derived mostly from fracture of SHCs of unknown size. Small pieces from (1816) and (2591), both in the central part of the site, show evidence for the use of coal and are therefore likely to be fragments from blacksmithing slags, rather than bloomsmithing slags.

Ceramic materials

Small amounts of ceramic hearth lining were recovered from contexts (866) and (1853). In both cases the materials were in association with residues interpreted as being from the contact area of SHCs with the hearth wall.

Other materials

The collection from context (1853) included a single small (3g) sherd of dark grey sandy pottery.

Distribution of the assemblage

The assemblage was very small, with just 44.kg of residues (30 macroscopic fragments plus a small quantity of finer debris), recovered from just 9 contexts. Of those 9 contexts, 6 produced only a single fragment of residue.

Two areas produced multiple fragments: the interior of a roundhouse in the SE of the site and two, presumably successive, ditches in the centre of the site.

Context (866), in the interior of a roundhouse in the SE of the site, produced two large SHCs from opposite sides of the structure and two small fragments, one of

slagged hearth lining and one of the contact between the hearth lining and a SHC. The presence of large SHCs (these weight 1520g and 1160g), but a lack of a significant quantity of smaller material, might suggest that these pieces have been moved to that location as, for instance, packing material for post-holes.

The ditches [1815] and [1852] in the centre of the site yielded 36g (3 pieces) and 167g (11 pieces plus a number of very small fragments of comminuted residue) respectively. The relative abundance of small material here might suggest this is more likely to be a primary deposit of waste into the ditch, although derivation by in-situ fragmentation of larger pieces is also possible.

Interpretation

The archaeometallurgical residues from this site form a slightly unusual assemblage. The SHC assemblage is strongly skewed towards large examples – potentially either evidence for metallurgical activity including particularly 'lossy' smithing, or a bias introduced by the preferred use of large SHCs for structural purposes.

'Lossy' smithing means that episodes of iron working have entailed the loss of large amounts of iron from the workpiece into the hearth. Typically, SHCs contain about 50% iron by weight, so the three large examples in this assemblage suggest losses of 600 to 800g of iron during a work period – a considerable amount of iron to be lost. Lossy processes include the primary working of raw blooms into consolidated iron or other welding-intensive smithing work.

For the Roman period, SHCs from blacksmithing on rural sites are typically quite small. Most assemblages from rural sites (and even some from urban sites) yield SHCs with weights below 500g. For some sites, the average SHC weight is as low as 130g. Examples of such assemblages include:

Exminster (Young 2014b): mean 127g, max. 482g.
Clevelands (Young 2018a): mean 125g, max. 530g.
Uffington (Young 2015): mean 137g, max. 614g.
Ebrington (Young 2016): mean 180g, max. 628g.

For typical more urban sites the average SHC in the assemblages may be much heavier – perhaps 230g to 400g. Examples of these assemblages include:

Neath (Young 2014a): mean 244g, max. 630g.
Carmarthen (Crew 2003): mean 227g, max. 820g.
Bulmore (Young 1999): mean 270g, max. 770g.
Cowbridge (Barford 1996): mean 403g, max. 700g.

The difference has been suggested to be the intensity and continuity of the work passing through smithies in different settings. SHCs from Roman blacksmithing appear to be almost entirely below 1000g in weight; those that are heavier are almost always associated with sites that are partly or mainly processing blooms. Examples of such assemblages include:

Kingstone (Young 2012): mean 555g, max. 1035g.
Dymock (Young & Kearns 2010): mean 1032g, max. 3895g.
Lockleaze (Young 2018b): largest fragment 956g.
Miskin (Thomas 2000): only complete SHC 2225g

The three large SHC examples from Hartridge Farm differ in detail. One, a 1220g example from (1804), was a dense cake with a flat, dimpled top, which bore clasts of metallic iron. This example resembles (in terms of texture and general morphology; it is actually less elongated) examples of bloomsmithing slags of Roman age from sites at Miskin (Thomas 2000), Lydney (Young 2019) as well as other iron production sites in the area.

In contrast, the only slightly smaller example (1160g) example from context (866), although broadly similar, has a marked upper layer of lining-influenced slag arching over the surface of the lower, dense, bowl component. The flow of partially melted lining slag onto the upper surface of the slag as it forms is a standard part of the process of the generation of smithing slag. The precise control on whether lining slag is preserved on top of a SHC is not known.

The third large SHC is again different. This example is the largest (1520g) and also comes from context (866). The texture is unusual (it comprises amalgamated prills of slag, without clear flow direction), in some respects more resembling an unusually small slag block from a non-tapping iron smelting furnace. The external surface is also unusual, showing broad smooth swathes across the rounded basal surface. There are few parallels for the unusual microstructure, but there may be some similarity with the large porous, and very iron-rich, slag cakes from Coldharbour (Lyonshall; Young 2006). The largest SHC from Coldharbour was over 2kg in weight and had an open, granular texture. It was interpreted as having been generated during bloomsmithing, with a particularly low input into the slag from the hearth lining.

The slags mostly show indication for the use of charcoal as fuel, but small pieces from (1816) and (2591), both in the central part of the site, show evidence for the use of coal.

The use of coal for blacksmithing on sites also employing charcoal for bloomsmithing is a common feature within the area (e.g. Kingswood, Young 2017; Lydney, Young 2019; Lockleaze, Young 2018b; and probably Cardiff Castle, Young & Kearns 2011). Unlike the medieval period when iron was commonly smelted within managed woodland but bloomsmithing was undertaken at central locations, much, possibly most, Roman iron smelting was associated with settlement locations. Thus, most Roman sites yielding bloomsmithing slags also produce smelting slags. This has not been identified at Hartridge Farm.

The Hartridge Farm site has a very similar location to many other sites where iron was produced in the Roman period, along the margins of the wetlands to the west of the Severn Estuary and across much of the Severn Vale, up to the Cotswold scarp, to the east (see, for instance, Allen & Fulford 1987, Fulford & Allen 1992, Price 2000, Thomas 2000, Young 2009a,b, Young 2017).

It seems likely that iron production and working took place close to the Hartridge Farm site, but not within the excavated area. The assemblage probably represents random stray dispersals, but the abnormally high proportion of very large SHCs suggests that these may have been moved onto the site preferentially, perhaps as construction material, for instance as post-hole packing material.

The presence of a mould for a significant copper alloy casting (not included within the archaeometallurgical assemblage reported upon here), is again an indication of metallurgical activity of some technological skill having taken place close to the site.

Further work

Bloomsmithing slags may retain chemical evidence for the iron ores employed to smelt the blooms, the working of which resulted in their production. Elemental analysis of the slags may thus produce some provenancing evidence.

The slags are, as described above, all likely to be somewhat divorced from their original place of formation, although that is assumed to have been local. Nor is there any direct material evidence for the likely iron smelting that would have accompanied the bloomsmithing.

The residues are thus probably capable of producing further archaeologically-useful information from further analysis, but the value of that evidence is arguably reduced by the derived nature of the residues. It is unlikely that the activities were directly part of the excavated site.

Whether or not further work on these materials is commissioned, the materials are potentially capable of generating additional information and should therefore for a part of the deposited archive from the site.

References

ALLEN, J.R.L. and FULFORD, M.G. 1987. Romano-British settlement and industry on the wetlands of the Severn Estuary. *Antiquaries Journal*, **67** ,237 -289.

BARFORD, P.M. 1996. The metalworking debris from Bear Barn and the Bear Field. Pp. 205-209 in: J. Parkhouse & E. Evans, Excavations in Cowbridge, South Glamorgan, 1977-88. BAR, British Series, 245pp.

CREW, P. 2003. Slags and other iron-working residues. pp. 333-340 *in:* H. James, *Roman Carmarthen: Excavations 1978-1993*. Britannia Monograph Series 20, Society for the Promotion of Roman Studies 2003.

FULFORD, M.G. and ALLEN, J.R.L. 1992. Ironmaking at the Chesters villa, Woolaston, Gloucestershire: survey and excavation 1987-91. *Britannia*, **23**, 159-215.

PRICE, E. G. 2000. Frocester: A Romano-British settlement, its antecedents and successors. Gloucester and District Archaeological Research Group.

THOMAS, G., 2000. A chemical and mineralogical investigation of bloomery iron-making in the Bristol Channel Orefield, UK. Unpublished PhD thesis, Cardiff University.

YOUNG, T.P. 1999. *Iron-working residues from Bulmore*. GeoArch Report 1999/01. 2pp.

YOUNG, T.P. 2006. *Archaeometallurgical residues from Coldfurrow, Lyonshall, Herefordshire*. GeoArch Report 2006/09. 12pp. & 2 plates.

YOUNG, T.P. 2009a. *Archaeometallurgical residues from Crickhowell Road, Trowbridge, Cardiff*. GeoArch Report 2009/02. 11pp.

YOUNG, T.P. 2009b. Archaeometallurgical residues. 155-159. *In:* M. Brett, E. R. McSloy and N. Holbrook. A Roman enclosure at Crickhowell Road, Trowbridge, Cardiff. Evaluation and excavation 2005–06. *Archaeologia Cambrensis*, 158, 131-166.

YOUNG, T.P. 2012. *Archaeometallurgical residues from the Brecon to Tirley gas pipeline*. GeoArch Report 2012/18, 75pp.

YOUNG, T.P. 2014a. *Archaeometallurgical residues from Dwr-y-Felin School, Neath (GGAT 677 & 716).* GeoArch Report 2013/27. 53pp.

YOUNG, T.P. 2014b. *Assessment of archaeometallurgical residues from Milbury Farm, Exminster, Devon (ACD478).* GeoArch Report 2014-09. 16pp.

YOUNG, T.P. 2015. *Assessment of archaeometallurgical residues from Uffington, Oxfordshire*. GeoArch Report 2015-30. 12pp.

YOUNG, T.P. 2016. *Assessment of archaeometallurgical residues from Ebrington, Gloucestershire (EGE09 ex).* GeoArch Report 2016/21. 18pp.

YOUNG, T.P. 2017. *Ironworking residues from Kingswood, Gloucestershire (ACW451)*. GeoArch Report 2017/06. 93pp.

YOUNG, T.P. 2018a. *Archaeometallurgical residues from Cleevelands, Bishop's Cleeve, Gloucestershire*. GeoArch Report 2018/12, 104pp.

YOUNG, T.P. 2018b. *Assessment of archaeometallurgical residues from Lockleaze (Ding Crusaders)*, GeoArch Report 2018/24, 24pp.

YOUNG, T.P. 2019. *Assessment of archaeometallurgical residues from Lydney B Phase II*. GeoArch Report 2019/07, 42pp.

YOUNG, T.P. & KEARNS, T. 2010. *Evaluation of archaeometallurgical residues from Kyrleside, Dymock, Gloucestershire (32523 & 33787)*. GeoArch Report 2010/19, 5pp.

YOUNG, T.P. & KEARNS, T. 2011. *Evaluation of metallurgical residues from the New Interpretation Centre, Cardiff Castle, Cardiff [ST181765]*. GeoArch Report 2011/02, 27 pp.

Table 1: summary catalogue of submitted materials. Assm = assemblage of small pieces

context	find	s wt	l wt	no	notes
866		62	48	2	thickly-slagged, oxidised fired, sandy hearth lining; has very coarse quartz in ceramic, leading to a grain-rich slag too.
			14	5	lining slag together with denser slag, suggesting the wall contact area of a SHC; all seven pieces probably come from a fragmented whole
866	19		1520	1	large plano-convex mass, unusual convex-faced mass, top irregular but partly planar, but unclear if original, base partly blebby/granular, but one side shows parallel smoothed surfaces - unclear if impressions of laths, tool or smoothed during extraction; texture very unusual, comprises granules of slag, fused together, but no flow structures and no crust development. 115x140x85(55). Fragments up to 60mm, the largest of which show dimpled surfaces. Some of the fragments show surface expression on the basal surface
866	20		1160	1	110x130x85(50) mm, complex SHC; bowl well-formed dimpled with charcoal moulds; lining-influenced slab is arched over the top of the bowl, dipping away both laterally and anteriorly, with charcoal-rich slag on top of bowl below arch.
1804	122		1220	1	large plano-convex SHC; top planar with deep dimples, base dimpled, patches of rust suggest iron inclusions; 120x110x70mm, deepest near probable proximal end
1816		4	2	1	spalled slag fragment representing dark-surfaced flow lobe in fine-grained slag; slag locally vesicular; texture hints at coal-fuelled slag, but not certain
			2	1	tiny fragment of vesicular maroon/purple surfaced slag, with clast of probable coal shale
1831			32	1	very weathered and lime-encrusted rounded nub fragment of blebby slag, with some rusting; charcoal inclusion; reminiscent of texture of 1520g piece from (866)
1853		170	65	1	fragment of highly weathered blebby slag, vesicular, with large charcoal clast, possibly from near SHC margin
			72	10	rounded, grey, sometimes finely vesicular, slag prills/lobes, with dimples and fuel impressions; none a clear smelting slag
			30	assm	debris, weathered slag, highly weathered pale gravelly material (lining/lining slag), some passing into highly-weathered vesicular iron slag
			3	1	small sherd of very dark grey sandy pottery
2188		7	7	2	broken fragment of highly vesicular weathered iron slag; microprilly surface with deep dimples; charcoal contacts
2301			40	1	slag sheet, very weathered, but probably a fragment from a SHC; shows patches on one surface of a more strongly lining-influenced composition
2559			46	1	dimpled broken nub of iron slag, rich in coke and shale fragments, with blebs of (partially) melted ceramic, presumably coal shale.
2591			110	1	worn/corroded fragment of grey basal crust with slightly brown/red granular internal slag; shows some resemblance to 1520g piece from 866; slag vesicular with some voids, some of which hold degraded charcoal fragments.

GeoArch

geoarchaeological, archaeometallurgical & geophysical investigations

Unit 6, Block C,
Western Industrial Estate,
Caerphilly,
CF83 1BQ

Office: 029 20881431
Mobile: 07802 413704

E-Mail: Tim.Young@GeoArch.co.uk
Web: www.GeoArch.co.uk