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Summary

This large area excavation produced relatively little bulk metallurgical debris. Evidence of limited scale iron smithing in the Iron Age and Roman phases was supported by hammerscale from environmental soil samples.

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Introduction

Stanwick lies within the area of the Raunds Area Project. The excavation programme at Stanwick, undertaken by English Heritage's Central Excavation Unit between 1984 and 1991 was aimed primarily at investigating the transition of an Iron Age site into a Roman Villa. Excavation strategy varied throughout the period of the project. Eventually this resulted in large areas being machine stripped down to the point where archaeological features could be seen cutting into the natural sandy clay, but not being excavated beyond the extent of earlier 2m wide traverses across the area. With such a large proportion of the features only partially excavated, the material examined was regarded as a sample rather than the total recoverable assemblage.

There is some evidence for Bronze Age and early Iron Age occupation in the area, however, the site appears to be intensively occupied only from the later Iron Age, with ditches indicating the location of houses, boundaries and enclosed farmsteads. The initial Roman impact appears remarkably slight, with the continued occupation of circular houses, use of traditional ceramics and fabrics, unchanging economy and life style. Thus, the identification (or existence) of any well defined Iron Age-Roman transition is not clear. The mid to late Roman phases are characterised by an increase in the number of farmsteads together with an expansion of some of the existing farmsteads (one now referred to as a villa) and the contraction of others. In the late Roman period major changes were made to the Villa, which combined a working farm with luxury accommodation. In a final phase, probably fifth century, changes to the villa indicate that it reverts to a farm, with corn drying ovens being cut through the mosaic and hypocaust floors.

Although no metallurgical structures, such as hearths or furnaces, were found on the site, 16 large and 4 small boxes of bulk metallurgical debris were recovered. Examination of this debris, together with a further 2 boxes from the environmental soil samples, was carried out to identify the industrial processes which produced them and to assess the potential of the assemblage for further analysis. Material already classified as fired clay may have included some hearth linings, but had already been sent to a separate specialist.

The examination strategy involved the visual examination of all material. Contexts which contained diagnostic debris were recorded. Generally, no quantification of the categories was made; most contained only a few fragments, but where larger quantities (above about 5kg) were present, an estimate of the weight was made.

The findings of the visual examination are tabulated below:

Metalworking debris from Stanwick, Northants

context	sample	slag interpretation	phase/date	context information
2	bulk	smithing hearth bottom(s) + flake hammer scale		plough furrow
3033	envi.	flake hammerscale	no information	
3281	envi.	flake& spheroidal hammerscale	no information	
3619	bulk	smithing hearth bottom(s)		layer
4091	bulk	smithing hearth bottom(s)	machine stripped	layer
4502	bulk	smithing hearth bottom(s)	plough soil	layer
4503	bulk	smithing hearth bottom(s)	plough soil	layer
4661	bulk	lead waste	machine stripped	layer
4900	envi.	flake hammerscale	no information	
8009	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
8070	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
8080	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
8084	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
8085	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
8121	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
8273	bulk	smithing hearth bottom(s)		courtyard layer of 8251
8745	bulk	smithing hearth bottom(s)	no information	
8864	bulk	smithing hearth bottom(s)	C4	pit fill
8888	envi.	flake hammerscale	no information	
8932	bulk	smithing hearth bottom(s)	mid-late Roman	rubble spread
9035	bulk	smithing hearth bottom(s)	C2, C4	layer
9336	bulk	smithing hearth bottom(s)		furrow fill
9346	bulk	smithing hearth bottom(s)	mid-late Roman	furrow fill
9811	bulk	smithing hearth bottom(s)		ditch fill
10832	envi.	flake hammerscale	no information	
45016	bulk	smithing hearth bottom(s)	no information	

Metalworking debris from Stanwick, Northants				
context	sample	slag interpretation	phase/date	context information
45017	bulk	blast furnace slag	plough soil	sub-division of lower plough soil
45020	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
45026	bulk	blast furnace slag	plough soil	sub-division of lower plough soil
45028	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
45831	envi.	flake &spheroidal hammerscale	no information	
46096	envi.	spheroidal hammerscale	no information	
46581	bulk	smithing hearth bottom(s)	C2, C3;C4	robber trench
46658	bulk	smithing hearth bottom(s)		machined layer
47338	bulk	smithing hearth bottom(s)	mid. Roman	pit fill
48150	envi.	flake & spheroidal hammerscale	no information	
48159	envi.	spheroidal hammerscale	Iron Age	ditch fill
65512	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
65514	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
65517	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
65518	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
65519	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
66201	bulk	smithing hearth bottom(s)	C4	ditch fill
66310	bulk	smithing hearth bottom(s)		layer
66325	bulk	smithing hearth bottom(s)		layer
66352		flake hammerscale	no information	
67406	bulk	smithing hearth bottom(s)	C4	ditch fill
67408	bulk	smithing hearth bottom(s)	C4	ditch fill
67427	bulk	smithing hearth bottom(s)		ditch fill
80109	envi.	spheroidal hammerscale	no information	
81288	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
81293	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
81365	envi.	spheroidal hammerscale	no information	
81492	bulk	smithing hearth bottom(s)		ditch fill
81590	bulk	smithing hearth bottom(s)		cut
81598	bulk	smithing hearth bottom(s)		cut fill
81866	bulk	smithing hearth bottom(s)		layer
82003	bulk	Pb dribbles and blobs. Cu alloy blobs	unstratified	
82408	envi.	flake &spheroidal hammerscale	no information	
82557	bulk	smithing hearth bottom(s)	Iron Age;C1	pit fill
83628	bulk	coke/clinker?	no information	
83676	bulk	smithing hearth bottom(s)		
84134	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
84145	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
84295	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
84300	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
84545	envi.	flake hammerscale	no information	
84563	envi.	flake hammerscale	no information	
84568	envi.(60g)	flake (& few spheroidal) hammerscale		ash layer

Metalworking debris from Stanwick, Northants				
context	sample	slag interpretation	phase/date	context information
84603	envi.	spheroidal hammerscale	no information	
84618	bulk	fuel ash slag		pit fill
84723	envi.	flake hammerscale		ash layer
84726	envi.	flake hammerscale	no information	
84843	envi.	flake hammerscale	no information	
84915	envi.	flake & spheroidal hammerscale	no information	
84965	envi.	flake hammerscale		pit fill
84990	envi.	flake hammerscale	no information	
84995	envi.(20g)	flake hammerscale		ash layer
85207	envi.(50g)	flake & spheroidal hammerscale		ashy layer in square enclosure
85207	bulk(40kg)	smithing hearth bottom(s)		ashy layer in square enclosure
85231	envi.	flake hammerscale	no information	
85765	envi.	spheroidal hammerscale	no information	
85767	envi.	flake hammerscale		
86195	bulk	smithing hearth bottom(s)		
86197	envi.	flake hammerscale		layer
86217	envi.	flake hammerscale	no information	
86237	envi.	flake hammerscale	no information	
86260	envi.	flake hammerscale		
86266	bulk	smithing hearth bottom(s)		rubble & soil layer
86315	bulk	smithing hearth bottom(s)		layer
86322	envi.	flake hammerscale	no information	
86394	bulk	smithing hearth bottom(s)		cut fill
88003	envi.	flake & spheroidal hammerscale	no information	
88003	bulk	smithing hearth bottom(s)	no information	
88103	envi.	flake hammerscale	no information	
88109	envi.	flake hammerscale		fill of well
88113	envi.	flake hammerscale	no information	
88114	envi.	flake hammerscale	no information	
89163	envi.	flake hammerscale	no information	
89166	envi.	flake hammerscale	no information	
89167	envi.	flake hammerscale	no information	
89514	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil
89518	bulk	smithing hearth bottom(s)	plough soil	sub-division of lower plough soil

Material clearly diagnostic of smithing *ie* the hot working of iron, was identified as **smithing hearth bottom(s).** These are recognisable by their characteristic plano-convex form, having a rough underside and a smoother, vitrified upper surface often hollowed as a result of downwards pressure from the air blast of the tuyère. Hearth bottoms are of largely fayalitic (iron silicate) composition and result from high temperature reactions between the iron, iron scale and silica from either the sand used as flux or from the hearth lining. Compared with assemblages from other sites, the Stanwick material is exceptional in the high proportion of smithing hearth bottoms. This may be a genuine phenomena, either due to the nature of the smithing activity or because these, larger and uniform, slag lumps were selected in antiquity, for purposes such as road metalling. Otherwise it might be suspected that some selection was carried out at the time of excavation. Although there is no record of this being deliberately carried out, it was evident that in contexts where larger amounts of slag were examined (eg 85207) a much wider variety of types were found with undiagnostic types predominating.

Further evidence for the smithing of iron was found in the form of the micro-slags, **hammerscale**. Most slag had been cleaned and only a couple of the bulk slag bags contained sufficient soil to check for hammerscale, with a magnet. However, as the "slag" had been saved from environmental samples, this provided a reliable means of locating the hammerscale. Ultimately the distribution of these micro-slags should assist in determining the location of iron working on the site, because they are much more likely to remain *in situ* than the bulk slags, which may have been transported elsewhere for uses such as hard-core.

Hammerscale conforms to two types. The first, **flake hammerscale**, consists of "fish-scale" like fragments of the oxide/silicate skin of the iron which become dislodged due to mechanical and thermal shock during hot working. **Spheroidal hammerscale** results from the solidification of small droplets of liquid slag expelled during higher temperature hammering of the iron, particularly when two components are fire-welded together, but also during the primary smithing of the iron bloom into a billet or bar. At Stanwick, flake hammerscale appeared to be the predominant constituent. This suggested that the iron smithing activities from which they derive was the shaping of metals rather than complex forging and welding of composite items.

Apart from fragments of modern blast-furnace slag from plough-soil contexts (45017 & 45026), no slag diagnostic of the smelting of iron was identified. It can therefore be assumed that much of the non diagnostic slag present in the assemblage also derives from iron smithing. Exceptions to this were the couple of spills/dribbles of lead and copper alloy and some of the fired clay. The spills did resemble metal casting waste. However, in the absence of supporting evidence in the form of crucibles, moulds and non-ferrous corrosion products on slags, a more likely explanation would be that these result from metallic artefacts accidentally melted.

Some contexts produced large lumps of over-fired clay of bloated appearance. These may have once formed part of metallurgical hearths, but other sources might be suggested, such as the destruction by fire of wood and daub structures, which may generate very high temperatures. Quantities of vitrified hearth lining, found in Context 58207 was more typical of metalworking hearth debris, having a compositional gradient from bloated/cindery surface to unmodified clay backing, whilst the over-fired clay mentioned above was more massive and of homogeneous consistency.

One structural feature selected for careful study was a probable corn-dryer (86689) of unusual form, consisting of two pits connected by a flue and containing several fills, one of which included some hammerscale. However, the small quantity of the hammerscale and absence of other debris, apart from 5g of undiagnostic fuel ash slag, does not suggest any metalworking purpose for this structure. Attention should be paid to the following contexts which produced considerable quantities of hammerscale:

84568: 4th century, "Ashy layer spreading over a large area."
84995: 4th century/Medieval, "Layer of grey ash below mortar surface (84614) in area of room (85015). Cobbled surface (84996) below."
85207: 3rd-4th century, "Layer of ashy soil... square enclosure to south of villa road."

It should be noted that the context 85207 also produced a greater quantity of bulk slags (c40kg) than any other on the site.

Conclusions

The diagnostic components of the slag and debris, were exclusively associated with iron smithing. No slags characteristic of smelting, *i.e.* the primary production of iron from its ore, or the working of non-ferrous metals were identified. In the absence of clear evidence of smelting or non-ferrous metal working, most of the "undiagnostic slags" can be assumed also to derive from iron smithing.

Even taking into account the restricted proportion of features which were excavated, the quantity of bulk slag produced by such extensive excavations is minimal. To some extent this is contrasted by disproportionately large quantities of hammerscale. This may reflect the unusually zealous examination of sieving residues. Some concentrations of hammerscale are certainly sufficient to suggest smithing activity in their immediate vicinity. The scale of such activity cannot be judged from such limited evidence and care should be taken not to overstate the economic importance to iron smithing at Stanwick.

There is little evidence for the nature of the artefacts being produced on the site, except that the work was probably directed predominantly to the forging of simpler objects which did not require much high temperature welding. The site was not involved in the primary smithing of blooms; the iron would most probably have been brought to the site in bar or billet form. The source of this bar could not be determined, but smelting furnaces are known to have operated in this area in the Roman period, at Laxton, Bulwick and Wakerley (Jackson and Tylecote 1988).

Potential for further work

It is unlikely that any further analysis (by physico-chemical means or otherwise) of the debris itself would contribute significantly to the understanding of the exact nature and significance of blacksmithing at Stanwick. It is recommended that the other artefacts and excavation records from contexts showing greatest evidence of ironsmithing be studied in the light of the above results in case these provide complimentary evidence which would support the above conclusions.

Storage of slag

Iron working slag, being predominantly fayalitic, is not prone to deterioration and requires no special storage treatment. Much of the slag from Stanwick came from undated contexts, particularly the plough-soil, and there is little value in retaining this in the site archive. It is recommended that all the slag should be saved from those contexts which provide the best evidence for ironworking, and at least representative samples from the other secure contexts.

References

Jackson, D.A. and Tylecote, R.F, (1988) Two New Romano-British Iron working Sites in Northamptonshire- A new type of Furnace?. *Britannia* Vol 19. 275-298.