Pretia victoriae or just an occasional bonus? Analysis of Iron Age lead artefacts from the Somerset lake Villages

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SUMMARY

This paper looks at the evidence for the extraction of silver from lead ores in Iron Age and Roman Britain. Analysis shows that many of the lead objects from the Somerset Lake Villages were made from Mendip lead, but the chemical composition of these suggests that they were not produced from lead that had been de-silvered, but from smelted galena with variable silver contents. Furthermore, analysis of a Roman lead pig, made from Charterhouse lead ores, shows that it was made of chemically identical lead. Does this mean that silver was not extracted from British lead in the Iron Age and Roman periods? The evidence discussed and the results of the analyses suggest that silver was not always extracted from lead even when economical to do so. This was a cultural choice and not a technological limitation, one found in other times and places around the world.

INTRODUCTION

In his account of the conquest of Britain by the Roman army in AD 43, Tacitus gives us a list of the resources that Rome expected to gain from the invasion. These *pretia victoriae* include metals, notably gold and silver as well as copper and lead (Agr. xii). However, despite the assertions of Tacitus and other classical authors, finds of silver artefacts from Iron Age contexts are extremely rare. The extensive silver and silver-alloy coinages that appear in the south of Britain are limited to the final phases of the Iron Age and are relatively late (from around 70 BC) and the handful of silver objects known are either exceptional high-status torcs or exotic imports (Stead 1984, 882; Craddock and Craddock 1996, 52) . There is evidence that the Late pre-Roman Iron Age (LPRIA) silver coinage was struck from re-cycled Roman silver coin that was coming in as payment for other goods (Farley 2012,72) and the few other silver objects known could well have the same origin. Yet it has been assumed that Britain was producing silver in some quantity in the years leading up to the conquest and that the source of this silver was the lead ores (galena, cerussite and anglesite) that occur in several regions of the country. This paper questions that assumption and argues against indigenous silver production before the conquest.

In antiquity, silver was extracted from lead by the process of cupellation. This process involves the oxidation of lead to litharge (predominantly lead oxide) together with any other base metals present. The silver in the lead is left unaltered while the litharge is absorbed by a wood-ash, bone-ash or chalk hearth or lost as fume. Current evidence suggests that bone-ash cupels were a Roman introduction (Craddock 1995: 24; Salter and Northover 1992: 654). Oxidation is achieved by directing a blast of air (from bellows) across the surface of a pool of molten lead held at a temperature of around 1000°C. This process can be very efficient, leaving only 1% or less of lead in the silver produced when carried-out on a small scale; larger scale extraction usually requires a multi-stage cupellation (see Percy 1870; Sisco and Smith 1951). The waste litharge could then be re-smelted as if it were an ore, to reclaim lead metal, but taking with it many of the trace contaminants in the original lead ore which are mostly concentrated within it (except for arsenic and antimony, which will volatilise). It is therefore often assumed that lead ore was mined primarily for the silver in it and the production of lead metal was merely the bi-product of a silver industry.

Little work appears to have focussed on Iron Age lead production with most interest being placed on the Roman industry, especially the recovery of the 102 lead ingots or ‘pigs’ that make up what is regarded as the primary body of evidence (Gardiner 2001). Many of these Roman lead ingots carry imperial inscriptions that enable them to be dated quite closely as well as indicating a connection with silver production by carrying, as part of the inscription, the words EX ARG (from the silver mines). The earliest dateable ingots come from the Mendip region and carry inscriptions that date their manufacture to AD 49, barely six years after the invasion. This is a remarkably short period of time to prospect for mineral deposits, sink mines and construct smelting installations and start turning-out lead ingots, especially considering that this region of Britain was not fully secure until AD 47 (Mattingly 2007, 97). However, if there was an established native lead industry in the region already by the LPRIA, then the speediness of Roman production could be easily explained.

The production of lead in the Iron Age is well attested; lead objects are occasional finds in many Iron Age assemblages. Usually reserved for utilitarian artefacts such as spindle whorls and net sinkers, little scientific work has been done on these objects beyond a basic qualitative analysis (Coles and Minnitt 1995, 140-143). Indeed, the identification of objects as being made of lead has been found to be erroneous as alloys of lead and tin are often found through qualitative analysis. The proportions of the different alloy components are, however, not usually determined.

MATERIALS AND METHODS

This study presents the chemical and isotopic analysis of Iron Age lead objects from secure archaeological contexts considered to be made from lead extracted from Mendip lead ores. All the objects analysed came from the excavations at the lake village sites of Glastonbury (Bulleid and Gray, 1911; Coles and Minnitt, 1995), Meare West (Gray and Bulleid, 1953) and Meare East (Coles, 1987) dating to between around 250 and 50 BC, with the exception of the Roman lead pig, which was found at Chewton Mendip (Green Ore) in 1997 and can be dated to between AD 69 and AD 79 by its inscription. A total of 25 objects were sampled; 11 from Glastonbury, five from Meare East and eight from Meare West, with the lead pig being included for comparative purposes (Table 2). An additional sample of galena excavated from an Iron Age context at Meare West was also included with the samples sent for lead isotope analyses.

Samples for analysis were removed from the selected artefacts using a small (0.8mm) drill or by scraping with a sharp scalpel blade. All corroded material was avoided to ensure only clean metal for analysis.

The analysis was conducted in two stages. First the chemical composition was determined by atomic absorption spectrometry (AAS). Two dissolution methods were used creating two sample solutions; one used an aqua regia dissolution described in Hughes et al (Hughes et al. 1976) for the determination of lead, tin, copper, bismuth, antimony and zinc whilst the other dissolved the sample in only nitric acid and was used for the determination of lead and silver (the average of the lead content measured in both solutions is presented in Table 3) . Calibration of the instrument was by matrix matched solutions taking into consideration the findings of Rehren and Prange (1998, 186). The second solution was then used for lead isotope determinations on the lead and lead alloy objects that were conducted at the NERC Isotope Geochemistry Laboratory, Keyworth, Nottinghamshire (the samples from the two pure tin objects were not included for obvious reasons).

Standard reference materials for the chemical analysis used were PR7 and PR8 (MBH analytical, UK), containing (ppm):

Table 1

Samples from the SRMs were dissolved in the same way as the archaeological samples giving a dilution factor of around 1000. Instrumental precision was between <1% and 20% depending on how close the measurement was to the limit of detection. Accuracy according to the SRMs is better than 10% relative.

**RESULTS AND DISCUSSION**

***Chemical analysis***

*Lead and tin*. Over half (60%) of the objects are made of fairly pure lead, but 20% are pure tin and a further 20% are an alloy of lead and tin. The alloys contain between 84% and 8% lead and between 16% and 92% tin, however, as the scatterplot shows (Fig. 1) the compositions are polarised, with only three objects spanning the middle-ground; the alloys are either tin-rich (over 70% tin) or lead-rich (over 90% lead) with the greatest variation being seen with the tin-rich alloys.

Studies of Roman pewter suggest three levels of tin content were commonly employed; 50%, 75% and 95%. The higher two of these ranges fit with the tin contents found in this assemblage. These appear, however, to relate primarily to vessel type, with large plates making-up the 75% group and flagons the 50% and 95% group (Beagrie 1989: 172-175). Furthermore, the reasons for these compositions appear elusive, although small additions of lead (~5%) will slightly increase the hardness of tin (from 5 HV to 13 HV) and may therefore explain the 95% tin group. It is, however, difficult to relate these findings to the Lake Village assemblages under discussion here. The high-tin objects could be described as decorative rather than utilitarian; rods, rings, the ‘bracelet’, and potentially the small increase in hardness engendered by the addition of a few percent of lead may explain its presence in the high tin objects.

*Silver.* The silver contents are very varied, ranging from below the limit of detection of the technique (approx. 10ppm in the metal, given the sample size and dilutions) to 740 ppm. This range is consistent with the silver levels found in other ancient lead (Anguilano 2012: Conophagos 1980: Gale and Stos-Gale 1981: Gale, Stos-Gale and Davis 1984: Merkel 2007: Stos-Gale and Gale 1982), containing between 50ppm and 800ppm and which suggests that at least some of the Iron Age lead was not having its silver extracted, retaining silver levels in excess of 250 ppm (Fig. 2). It also indicates that some of the lead ores being exploited did contain what are usually regarded as economically viable levels of silver (see below) but that it was not being extracted in the Iron Age.

According to Gardiner (2001), the levels of silver in the 32 Roman lead pigs that have been analysed are also highly variable, ranging from undetectable to 560 ppm for both inscribed and un-inscribed pigs, with 75% of these containing between undetectable levels and 120 ppm. On the basis of these data Gardiner concludes that the EX ARG inscription is not indicative of de-silvered lead and that ‘there is no clear pattern regarding this activity’ (*ibid*, 12). Tylecote (1986) presents supporting data from work by Smythe (1923) who looked at two lead pigs from Brough-on-Humber and concluded that these had not been de-silvered because of galena fragments remaining in the smelted lead. The silver contents of both pigs are very low, being 100 ppm and 60 ppm respectively and so might otherwise be taken to be lead from which the silver had been extracted.

The identification of lead that has had silver intentionally removed from it is difficult; low levels of silver in lead may be due to the smelting of ores naturally low in silver or the de-silvering of originally silver-rich lead by cupellation and subsequent smelting of the litharge or the re-working of cupellation debris (Rehren & Prange 1998). Rehren and Prange suggest two important intersecting silver concentrations; at or below 100 ppm for residual silver in re-worked cupellation debris and the level of silver in lead ores below which de-silvering is no-longer deemed economic (*Ibid* 189). The concentration of silver, below which would have been regarded as uneconomic, would, however, be controlled by specific local circumstances. Tylecote (1986) suggests a level for economic de-silvering of between 400ppm and 600ppm depending on economic and other circumstances.

The results of the analysis of excavated lead and other metal production debris from a Roman fort in the lead/silver mining region of *Metalla Tricorniensa*; the Mt. Kosmaj area of modern Serbia, have been used to suggest that around 100 ppm is the amount of silver remaining in lead metal that had been cupelled, but this assumes that the lead metal found on site was indeed produced from recycled litharge (Merkel 2007). The concentrations of silver in lead metal from Rio Tinto, Spain (2nd - 1st century BC) and Lavrion, Greece (5th century BC), also believed to have been cupelled, are, however, broadly consistent with the Serbian data, having silver concentrations of 70ppm to 300 ppm (Craddock et al. 1992) and 150 ppm to 190 ppm (two analyses only) (Conophagos 1980) respectively. The rarity of litharge found on these large production sites is also seen as evidence for the recycling of litharge and the extraction of lead metal from it (Merkel 2007,66; Rehren et al. 1999,302).

Lead produced during the Aegean Bronze Age, however, was not de-silvered. The lead metal was produced from lead smelted from ores with relatively low silver contents, but yielding considerably higher levels of silver than those found in the litharge found on the same sites (Gale and Stos-Gale 1981; Stos-Gale and Gale 1982; Gale et al. 1984). Mycenaean litharge, for example, contains between 14ppm and 50ppm silver whilst the lead metal contains between 400ppm and 600ppm, considerably more than the 100ppm suggested by Rehren and Prange and therefore showing that the lead found here could not have been produced from smelting the litharge (Stos-Gale and Gale 1982, 484). This apparent change could be a chronological effect; that in the Bronze Age litharge was not smelted, but in the Classical period it was. Unfortunately, such a conveniently simple linear model does not fit the available data, indeed, a similar separation between lead smelting for lead metal and lead smelting for silver has been found in South America in the 15th century AD. In this case, Peruvian lead objects were found to contain an average of 300ppm of silver and so suggests a similar situation to that in Bronze Age Greece; that the metal is the result of smelting argentiferous lead ores and is not lead reclaimed from litharge (Howe and Petersen 1994). This suggests that separation of lead smelting activities into those where lead was the prime aim and those where silver was the prime aim are social and economic choices and not simply constrained by technological development. The explanation put forward for this widespread but rather counter-intuitive situation has been, for the Aegean, that scarcity of fuel made it un-economic to smelt litharge for its lead metal as supplies of lead for every-day use would have been available in the form of the lead metal smelted from the occasional batch of low-silver ore, presumably determined by assay (Gale et al. 1984, 405). In Peru, the explanation proffered is that lead metal was produced from low-silver local lead ores, whereas silver was extracted from high-silver lead ores brought-in from outside the region (Howe and Petersen, 1994, 194). This may also suggest that different social structures were involved with metal procurement and processing, with every-day lead production to meet local needs using local low-silver ore deposits and conducted locally, while silver production involved accessing more distant resources and cupellation took place some distance from the settlement sites. Such a separation between local lead production and the extraction of silver from lead ores brought some distance suggests that silver production was not only regarded as different, but an activity that was valued more highly by society, requiring and justifying greater resources (fuel and transport).

This separation of lead metal production and the extraction of silver from silver-rich lead ores is worth considering in a broader context and casts some doubt on the assumption that lead metal with low levels of silver is always going to be a by-product of silver extraction simply because it makes economic sense to the modern mind; to the ancient mind, more conscious of resource curation and social status, it may not.

Furthermore, in the Roman world, litharge was a product that had its own market. Lead oxide, red lead, made from litharge was used as a cheaper alternative pigment to cinnabar for wall paintings, painting sculpture and fabrics, it also had a large market as a component for medicines and even cosmetic rouges (Rehren et al. 1999; Walton and Trentelman 2009, 846). Analysis of litharge-based pigment used on fabrics has shown that litharge from silver extraction in Spain was being traded to Egypt and that it retained between 30ppm and 100 ppm silver (*Ibid*). Analyses of litharge from Greek sites have silver contents of between 1ppm and about 100 ppm (average of 50ppm) and therefore agree well with the litharge-pigment analyses (Tselios 2009; Gale and Stos-Gale 1981, 210). Litharge was a marketable commodity in itself and was often too valuable in its own right to be recycled to retrieve the lead metal it contained. This suggests that lead metal in antiquity need not be regarded as predominantly the by-product of silver production; rather it is the use to which smelted lead metal was put when found to retain levels of silver not deemed worthwhile extracting *at the time*. It also provides an alternative reason for the lack of litharge on sites such as Lavrion. Thus the driving force behind the extraction of silver from argentiferous lead was more likely to have been determined by the balance between the value of the silver extracted and the cost (in terms of available resources) of that process; if the market value of, or demand for, the silver was relatively low, then it might not be worthwhile extracting silver from lead ores relatively poor in silver, which would require manpower and large volumes of fuel. Clearly this equation is going to change according to market forces and this may occur quite frequently.

In the light of this discussion, the silver levels in the Lake Villages lead and their variability argue against them being produced from lead reclaimed from litharge.

*Other trace elements.* Apart from silver, only the concentrations of copper, bismuth, antimony and zinc were measured in the Lake Village objects. These are potentially the most useful set of trace elements, being recognised as those most frequently found in ancient lead (Craddock 1995, 211). These and other trace metals (with the exception of gold or silver) in the original lead will be oxidised during cupellation and absorbed with the lead into the cupel. This results in the concentration of these trace metals in the litharge and subsequently high levels of these metals in the reclaimed lead. Arsenic and antimony, however, will not be concentrated in the litharge as they volatilise easily and will be lost as fume. The Spanish litharge from which the Egyptian red pigment was produced clearly shows this enrichment (Walton and Trentleman 2009). Comparison of the Iron Age lead with Spanish litharge (both the Egyptian red lead pigment and litharge) shows some important differences (Fig. 3a and b). In particular, the levels of bismuth and zinc are significantly higher in litharge, copper is generally higher in litharge but antimony remains broadly the same in both litharge and metal. These differences could simply be down to the use of different ores, but zinc and copper are found associated with many lead ores; zinc blende (zinc sulphide, sphalerite) and copper-pyrite (copper sulphide) often being found alongside galena (Percy 1870, 94-100). Thus the observed differences in zinc and copper concentration are probably due to the concentration effects of cupellation and therefore diagnostic of cupelled metal. Furthermore, analyses of litharge (Gale and Stos-Gale 1981; Stos-Gale and Gale 1982; Gale et al. 1984; Anguilano 2012; Bode 2008) support the contention that lead metal produced from smelting litharge will be characterised by relatively high levels of trace elements that were concentrated in the litharge during cupellation.

Lead metal retrieved from lead/silver working sites, alongside litharge, (such as Keos and Lavrion) contain higher levels of copper and zinc than the litharge, whilst the levels of silver are lower. In particular, the lead metal from Grobnica, a Roman necropolis site near the Roman lead/silver smelting sites at Kosmaj (Merkel 2007, 57), has trace element levels similar to the lead metal from Lavrion and Keos (Fig. 4). The Iron Age lead also has similar silver contents to the Greek and Serbian lead samples, but is generally lower in copper, which may be due to differences in the ore composition.

The trace element data also supports the contention that Iron Age lead was not produced from reclaimed litharge. It was simply the result of smelting relatively low-silver lead ores with rather variable silver contents. The Roman lead pig also fits within the range of trace elements found for the Iron Age lead, suggesting that it is no different from the Iron Age material and so unlikely to be produced from litharge.

***Lead isotope analysis***

The lead isotope analyses point to a predominantly Mendip origin and the piece of galena excavated at Meare West Village also came from Mendip, specifically Charterhouse. The evidence for metalworking in the Villages has been reported in detail elsewhere (Coles and Minnitt 1995, 138-143) and there is no specific evidence for lead smelting or working. The finds of lead metal objects and lead ores, however, suggest that lead smelting was being conducted on or near the settlement.

Of the objects made from an alloy of tin and lead, half of the total number analysed (four out of eight) came from Glastonbury and these comprise about one third (36%) of the Glastonbury objects. Of the remaining half, two objects each came from Meare East and Meare West. Perhaps more usefully, the lead isotope analyses showed that a significant proportion of the alloyed objects (38%) contained lead from Charterhouse and so suggests that the alloying was done locally. Only one alloyed object has a Bristol area lead source and this was an alloy containing only 16% tin. The remaining four alloyed objects (50%), however, contain lead from Cornwall or Devon, or lead that seems to be from a combination of sources.

Of all the objects (lead and lead alloy), eight out of the 22 objects (36%) were made of Charterhouse lead, one object from Green Ore lead (4%), three objects from Cornish/Devonshire lead (14%), seven objects from lead from the Bristol area (32%) and three objects from lead that seems to be from a mixture of sources (14%). Thus the majority of the lead and lead alloy objects were made from local lead, predominantly lead from Charterhouse. Some lead was coming from Cornwall/Devon and much of this seems to have been alloyed with tin.

The Roman pig is also made of Mendip lead and can be attributed specifically to Charterhouse, alongside the piece of galena from Meare West and eight of the Iron Age lead and lead alloy objects. This, of course, makes an interesting connection between Iron Age lead ore extraction at Charterhouse and the Roman lead industry and, given the dating suggested by Coles and Minnitt (*Ibid*; 200-206), presents evidence for Iron Age mining at that location at least two hundred years before the conquest. This is further corroborated by recent analysis of a speliothem from the mine that identifies three main periods of pre-Roman mining at Charterhouse; 1800-1500 BC, 1100-800 BC and one that is relevant to this study, 350-0 BC, which brackets the dating of the Lake Villages nicely (McFarlane et al. 2014).

Two silver coins of the Dobunni, the local tribal group, were also sampled for analysis (G.215 and G.918; Somerset Museums Service numbers 62.N.31 and 90/1991). Both coins are the same type (Mack 382, VA 1078-1) and are dated from the late 1st century BC to early 1st century AD, so are slightly later than the lead objects and indeed post-date the abandonment of both sites around 50 BC. The coins have silver bullion contents of 27% and 32% respectively and contain 1.2% and 0.2% lead. The remainder of the alloy is copper with low levels of the usual trace elements.

The lead isotopes of one of the coins (G215) is a close match for one of the Glastonbury village objects that appears to have a mixed isotopic composition (see above) suggesting that its silver was derived from Mendip ores. The other coin, by contrast, has isotope ratios that place it nowhere near to the Mendip samples, but it does match isotope ratios found in Roman silver denarii of the Julio-Claudian Emperors that represent recycled silver from Spanish sources (Butcher and Ponting 2014, 225-226).

**CONCLUSION**

The Iron Age communities of Meare and Glastonbury used lead to make a broad array of artefact types. A large proportion of this lead was extracted from ores from the Mendips, in particular Charterhouse and the Bristol area. Some lead was also coming from Cornwall and Devon and some of the lead was alloyed with varying amounts of tin. Two objects were found to be made of pure tin with no lead.

The main question addressed here has been whether the lead used for artefacts in the Iron Age was a by-product of silver production. Comparison of the chemical composition of the lead objects with the analyses of lead objects from a number of lead/silver production sites as well as finds of litharge suggests that the lead used for objects at Meare and Glastonbury was not produced by smelting litharge. Furthermore, no litharge has been found on any of the village sites, only lumps of galena. The silver contents of the lead are very variable and are frequently above the 100ppm level estimated to be diagnostic of de-silvered lead. Some of the silver contents are well below the 100ppm level and so might suggest de-silvering, but similar ranges of silver contents are found in the comparative analyses, where they are explained as the result of smelting low-silver lead ores. Other trace elements found in lead ores are found to be concentrated during the cupellation process and are passed-on into the lead metal produced from smelted litharge. The Iron Age lead has relatively low levels of these other trace elements, and so suggests that the metal was smelted from galena with variable silver contents and not from litharge.

Does this mean that British lead was not extracted for its silver content in the Iron Age and Roman periods, despite Tacitus’ assertions of silver as a ‘prize of victory’? The combination of little artefactual evidence and the conclusions from the analyses presented here would suggest that silver was not a desired material during most of the Iron Age and was therefore not extracted from lead even where the levels in the ore would have made it worth-while to do so. This appears to have been a cultural choice and not a technological limitation and is one found in other times and places around the world. In the Roman period silver was being extracted on a large scale in several regions, so it would seem logical to our minds that they would have done so in Britain. Support for this has been found in the discovery of lead pigs with an inscription meaning ‘from the silver mines’, and there are also finds of litharge from several sites such as Green ore, Somerset (Ashworth and Palmer 1970), Chew Valley Lake, Somerset (Rahtz and Greenfield 1977), St. Algar’s Farm, Frome, Somerset (Dunster and Dungworth 2012), Hengistbury, Dorset (Salter and Northover 1992) and Pentrehyling, Shropshire (Bayley and Eckstein 1998), which all present evidence for cupellation during the Roman period. Furthermore, Tacitus tells us it was so. But compared to other parts of the empire where silver was being extracted on a large scale (Kosmaj, Serbia; Rosia Montana, Romania; Sierra Morena, Spain etc.), the evidence for Britain is remarkably sparse. Couple this to the ambiguous evidence from the pigs themselves, with many presenting evidence (such as the example given here) against being produced from smelting litharge, then the picture becomes one of sporadic silver extraction, with more lead being produced from ores that contained silver that was not worth extracting at the time. A similar picture is found in the Aegean Bronze Age, Classical Greece and 14th century Peru, and as a model works well for the evidence available. Research into Julio-Claudian silver coins (Butcher and Ponting 2014) suggests that the price of silver fluctuated during the early principate, first rising and then falling back, changing the relationship between silver and gold as coinage metals. Control of silver production would have been one lever that the Roman state had that might enable it to control the fluctuations in the price of silver and so we should not be surprised that silver was not continuously extracted in all provinces. Additional costs, such as labour, fuel and transport would also figure in the end-cost of silver bullion, and there is evidence that indicates that bullion was cheaper closer to source (*ibid*). If the market for British silver was the Imperial mint in Rome (or Lyon prior to AD 64), then the cost of production of British silver would need to be somewhat lower than that of silver from southern Gaul, or from recycling worn coin, to offset the increased cost of transport.

The dating of the Charterhouse pig suggests that the Roman state moved in and took over the indigenous lead extraction industry, producing lead pigs within six years of the conquest; presumably the fact that there was a pre-existing industry was the reason for such speed. But was this industry also involved in the cupellation of silver? The lead from the Lake villages was not de-silvered and, indeed, there is no archaeological evidence for cupellation. But the villages were abandoned around 50 BC, nearly a century before the conquest. During this interval Britain’s southern tribes adopted coin use and the Dobunni were no exception, issuing coins of gold and silver alloys up to the conquest, often imitating Roman coins that must have become increasingly familiar. It is in this pre-conquest period that we also see the first British silver artefacts, such as the Snettisham torcs, dated to the middle of the first century BC (Collis 1984, 161). Yet there is no clear evidence for cupellation from the LPRIA; the material from Hengistbury head is now believed to date from the Early Roman period (Salter and Northover 1992, 654), but silver certainly began to be used on a substantial scale. Todd (2007, 65) regards the use of Mendip silver for Dobunnic coinage as a ‘safe assumption’, but the analytical evidence suggests that the picture is more complex. Analytical work looking at the coinage of the Iceni suggests that Roman silver denarii were being recycled into indigenous silver coinage (Farley 2011,97-98) and the analysis of one of the Dobunnic coins presented here would support this. The other coin, however, has lead isotope ratios that suggest the Mendips as the source of its silver. So it may be that indigenous silver extraction did start in the century before the conquest, fuelled by the need for silver for the new Roman style coinage, but it must have been small scale, leaving no identifiable archaeological traces.

**ACKNOWLEDGEMENTS**

A great debt of gratitude is owed to Stephen Minnitt of Somerset Museums Service for the initial discussions that led to this project, for facilitating access to the objects analysed and for support in the funding application. I am very grateful to Thilo Rehen and Paul Craddock for commenting on earlier drafts of the paper. The analytical work was generously funded by the Somerset Archaeological & Natural History Society.

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