

Chapter 9: Extraction (and other Industries) in the  
Study Area: Discussion and Synthesis

i) Introduction

The limited direct evidence, principally derived from the study of lead pigs, for the Roman lead extraction industry in Derbyshire has been reviewed above within the context of the equally limited evidence for the industry in the rest of Britain. A number of better known comparative examples have also been outlined. The evidence itself is insufficient for firm deductions to be made regarding the economics of the industry. It is necessary rather to attempt to suggest models for various aspects of the industry using both the evidence and parallels. These are then compared with the possible evidence for direct and indirect economic stimulation that may have originated in the industry. The one or two other much more minor 'industries' (as opposed to crafts) that can be assigned to the study area, most notably the production of pottery, are examined at the end of the chapter.

ii) The Chronology of the Derbyshire Lead Industry

One of the points to emerge relatively clearly from the discussion of the lead pig evidence is that a number of aspects of the extraction industry changed over time. This appears to have been true of all the extraction areas for which we have reasonable numbers of pigs and some changes, such as

the imposition of tighter imperial control, seem to be common to all areas (and indeed to other parts of the empire). Changes in such things as the scale of production and the administrative structure of the industry may well reflect variations in its economic significance. It is therefore necessary to note that our models must allow for such changes. The circumstances of lead mining in the Hadrianic period may have been very different to those in the fourth century.

It will be as well to briefly review what has been deduced about the industry in chronological order. The date at which extraction began is unknown but appears likely to lie in the early Flavian period. Up until an imprecisely dated point in or before the Hadrianic period extraction appears to have been in the hands of private individuals and societies, at least some of whom appear to have moved north from the Mendips. There is no indication of imperial or military involvement but far more pigs are assignable to this time than any other. Whether this indicates high initial production is uncertain but it is quite possible that it rather reflects high pilfering and theft rates later considerably curtailed by imperial authorities. The pigs' inscriptions at this time indicate that the organisation of the industry owed much to that of the Mendip industry, though in this case without the imperial involvement.

At what point the administration of the system changed is uncertain. The imposition of tighter imperial control was

an empire-wide trend, but may have come to different production areas in Britain at different times. Indeed, it is possible that its imposition in the Mendips was a stimulus to the opening up of the Derbyshire field, the tightening of control in which may have come as much as forty years later. Far less is known of the period of tighter imperial control, its products being far less common. Again whether this indicates declining production or better security is uncertain. Moreover we have no certain evidence that mining continued after some point in the reign of Hadrian until the fourth century. Whether the fourth century evidence represents continuance of the industry or a revival it seems that its structure had changed again. The rough, uninscribed fourth century pigs suggest relatively unskilled production and probably a lack of systematic organisation.

### iii) The Administrative Framework of the Lead Industry

It seems from the above that we may isolate three phases in the administration of Derbyshire mining. Initial private exploitation owing much to practices in the Mendips, a tighter imperial control, and eventual deterioration into ?unadministered working. There is no evidence for a direct military involvement at any time and it can perhaps be speculated that, whereas this was necessary at the inception of the Mendip industry, the presence of experienced miners from further south obviated the need for the army ever to become involved.

It seems reasonable to suggest that the first phase of the industry was begun by prospectors in the wake of the military conquest of the south Pennines. Or even while peace temporarily existed between the Roman state and the kingdom of Brigantia. Most likely many prospectors would have had experience in the already established Mendip field, as it seems had C. Nipius Ascanius who may provide a parallel case in Flintshire. However, the pig evidence probably relates to a slightly later time when the industry had become more established. The details of the pig inscriptions suggest that its 'organisation' was based on that in the Mendips, the important difference being that there is nothing to suggest imperial involvement. The organisation is difficult to reconstruct in any detail but involved private individuals, who may have been miners, mine owners or smelters, and a society (perhaps suggesting a degree of capital intensity). Whether the two or three names known to us represent mining 'magnates' controlling much of the production or just a few of a much greater number of small operators cannot be certain. But the presence of a society and perhaps the relative obscurity of their pedigrees (above p.248) probably argue for the latter.

That they retained the phrase EX ARG(entariis) from the Mendip system may imply that their lead was smelted at one or more central location(s) (above pp.245 and 247), which might perhaps have had some official standing. But the

evidence here is too ambiguous for any certainty. What is clear is that they were all connected in some way by the place or area name Lutudarum (above p.247; below p.500). It may be that this name was used as more than just an origin mark. If it was a place name it may even imply some centralisation of smelting, on present evidence most likely at Carsington. However, the dispersed nature of the field may argue against the likelihood of this.

Parallel evidence is difficult to apply here. Both at Vipasca and in Medieval Derbyshire we have situations where there was certainly a governmental influence. At Vipasca quite tight imperial control and ultimate ownership, in Medieval Derbyshire the latter at least. This is the central feature that we cannot, on present evidence, attribute to the early phase of Derbyshire mining. This perhaps argues that the administrative frameworks seen in these two cases are also inappropriate. There may be a little supporting evidence for this. Carsington, the only good candidate for an administrative centre for the lead field, was perhaps not founded until the early-second century, (above p.98), by which time greater imperial control seems to have been established. Further, the number of lead pigs that entered the archaeological record before the imperial 'takeover' have already been noted as possible indications of dis-organisation. Indeed, it is only really the relatively standardised pig inscriptions which provide positive evidence

for an organised industry. Yet the detailed variations within these are considerable (below p.499) and their apparent uniformity may be as much due to their common antecedents in the Mendip industry as to the establishment of any organisation.

It is tentatively suggested here therefore that the early industry was little organised, consisting of independent miners or mining societies producing lead from their own mines without imperial control. Their terminology indicates that, initially at least, they were 'immigrants' from the Mendips.

The second phase of the industry, that of tighter imperial control, presents even less direct evidence, but paradoxically is easier to reconstruct. The solid evidence testifies, in the form of a single pig, to imperial control in or by the Hadrianic period. Though the pig tells us little more than this it is the crucial element missing from the earlier situation. There is now no mention of private individuals or societies (unless the two inscribed but undated Derbyshire pigs with private names relate to this period; above p.237). But there is good reason to assume their continued presence, as lessees not owners.

There are a number of arguments for this. Firstly, there is no evidence for state-run mining in the area. Secondly, and more persuasively, it seems totally in-

appropriate. The lead field was large and dispersed and would have needed a great number of officials to control. Unlike a site such as Rio Tinto in Spain there was no single large deposit to work, rather numerous smaller ones and direct mining by the state would have been very inefficient. As with the Medieval industry and with Vipasca the greatest returns would be provided by many small leased mines and the incentive of personal gain to prospect for new deposits. Thirdly, there is the evidence of Vipasca B, a text specifically of the period of which we are talking, and evidently an empire-wide code, which clearly envisages the mines to be worked by lessees. At this time too Carsington may have been established, providing a possible administrative centre for the area. The circumstances strongly suggest that, at this period, Vipasca B may provide a valid base from which to infer the nature of the area's organisation.

The picture gained from Vipasca B is, as we have seen (above p.295f), one of numerous relatively small operations carried on by lessees or leasing partnerships. The presence of such partnerships in this Lex data probably shows that capital costs, at least at the inception of a mining project, were anticipated to be higher than many individuals could afford. How applicable to the Derbyshire case this may have been is difficult to say since the deposits, being on or near

the surface, would be worked easier than in other parts of the empire. But the presence of partnerships in the earlier phase of the industry probably gives weight to the argument that reasonable sums of capital were needed. Indeed, it would not only be the actual cost of the mining that would have to be borne by a lessee. In addition to the cost of tools, pack animals and the wages or support of free or slave labour there would be the cost of processing the ore and then smelting it. As well as the cost of purchasing half the claim and probably buying out the state's half. At Vipasca we have a figure of 4,000 sesterces, a considerable sum, just for the state's share and we may suspect that a total initial capital outlay of 5,000 sesterces plus would in fact be involved. Whether the sum would be as great in Derbyshire must be doubted. At Vipasca we are dealing with a copper/silver Lex data and it may be that a different law covered lead/silver mining, and perhaps another non-argentiferous lead mining with which we are interested. However, capital expenditure must have been significant even given the likely lesser valuation of a lead mine and the ease of extraction.

There is sufficient ambiguity in Vipasca B such that we cannot be sure how common the 'buying out' of the state's share of a mine was. It seems entirely possible that many lessees rather paid half of their production, most likely in coin but conceivably in kind, to the state. Though this would



considerably reduce capital outlay it might increase the amount of time before a lessee showed a profit. Whilst much of the text of Vipasca B dealing with the continuous and safe working of mines is not directly relevant to Derbyshire since the Vipasca document deals with underground workings its implications are clear and relevant. Mines were expected to be worked continuously or were confiscated and ore was expected to be processed promptly. The mine was to be worked in a way which did not endanger its future workability. The latter was perhaps not as serious a concern in Derbyshire but we may still envisage that there may have been regulations enforcing such safety measures as leaving part of a vein intact every few yards to guard against the collapse of its sides.

The questions of continuous and prompt working and processing bring us to the question of how centralised the administration of the industry was and how a Lex data would be enforced in Derbyshire. Clearly in the dispersed Derbyshire field checking that all mines were officially leased and being worked continuously and profitably would be a major task that could only be achieved without massive manpower in one of two ways. The Medieval Barmoot court travelled around a aircuit of mining areas and this would be one way, the procurator metallorum's staff, perhaps with a military escort, travelling around to check on mining operations. The second way would be that adopted for the

checking of silver production at isolated centres in colonial America, the appointment of local officials. The lack of known settlements in Derbyshire argues against the latter. There are almost no bases that they could have used within the main lead field, sites such as Brough lying on its edges.

How actual production was checked is a much more difficult problem. We do not know whether smelting was in any way centralised, but it must be doubted in such a large area. The cost of transporting ore to one, or even two or three, centralised smelter(s) would be prohibitive and the use of many small smelting sites must be envisaged. Given this there would seem to be two ways in which production might be checked. Firstly again we have the possibility of the procurator and his staff travelling a circuit. This, however, seems to be a system easily open to abuse. The second possibility would be a monopoly market of some sort where producers could sell only to one or two designated 'merchants' or authorities, ?the army, the procurator himself and appointed merchants.<sup>1</sup> Although merchants are not specifically mentioned, the leasing of monopolies is a central feature of Vipsca A.

A monopoly system might work well in that a producer could sell only to a monopoly holder, ensuring that all production (ignoring the undoubted possibility of a black market) would flow through someone who was trusted to report figures

of production back to the procurator. But it would not necessarily entail the producer transporting the lead to a central place for its weight to be checked. In some ways such a system would be analagous to the first refusal to buy that was replaced by the payment of Cope in Medieval times (above p.302). A central problem, however, is whether there was actually any need to check production. The main reason why the state authorities in the person of the procurator would need to do so was if something was due to the state. That is if lessees were paying half their product to the state rather than 'buying them out'. As we have seen Vipasca B is ambiguous on this point. The only direct evidence from Derbyshire is the single Hadrianic pig which could be interpreted variously. It could represent lead cast from ore paid in kind to the state. Or casting by a lessee in officially sanctioned (?even officially provided) moulds to ensure uniform size of pigs. Or casting by the lessee of the state's share in an official mould though he used his own moulds for his share. However, in Britain as a whole all known Hadrianic pigs are very similar, all carrying the emperor's name alone. This suggests that there was an official hand in the casting of all pigs. Standardisation is clearly indicated but whether production levels were being checked must remain uncertain.

In contrast to the generalised provisions of Vipasca B which relate directly to mining administration Vipasca A

provides evidence on the extension of procuratorial administration into the support industries and social system that surrounded a mining operation. Its applicability to Derbyshire, as already noted (above p.313), is questionable for a number of reasons. Firstly its date is in doubt (above p.293), though it seems to relate to a time when Vipasca B was applicable. Secondly, it contains regulations issued by a local procurator, not by more central authorities and we have no evidence to prove that such regulations were issued by other procurators. Indeed Vipasca could be exceptional as an imperial estate (above p.292), though equally we cannot be certain that Derbyshire did not have that status. Most important, however, in suggesting that Vipasca A is less relevant to Derbyshire is the actual nature of the area compared with Vipasca.

The Vipasca area was centred on the town of Aljustrel and the provisions of Vipasca A are overwhelmingly directed at the creation of monopolies for certain support industries that can only be seen as being based within that town. If the town had not been the supply and service centre used by the vast majority of the miners the monopolies would have been unworkable. In Derbyshire, even if a mining administration and service centre did exist at Carsington, no monopoly can be thought of as affecting all the mining area. For the admittedly likely subsidiary northern parts of it Brough and Buxton, which can hardly have been under the

procurators jurisdiction, would have provided nearer service centres. Derby too will have provided competition as a service centre if mining extended as far south as the Duffield hearth suggests. Moreover, even if Carsington was the nearest settlement of any size for many miners it would still be a distant and rarely visited place. The level of demand for public baths, barbering and the like would be relatively small.

Monopolies of one sort or another often appear to have been a feature of centralised Roman mining communities (above p.298). They are also seen in other colonial mining enterprises (above p.308ff). But the size of the Derbyshire field makes it difficult to see how they could have been enforced. What was to stop peripatetic traders, or even barbers and the like, providing services without the authorities ever knowing? Thus, except in the immediate area of Carsington, it is unlikely that the evidence of Vipasca A is applicable to Derbyshire. The profitable practice of supplying credit to miners undertaken by officials in Spanish South America (above p.305) may be a different matter. But more direct evidence would be needed to pursue that matter further.

The third phase of the industry, the late Roman activity indicated principally by the two stratified pigs from Carsington and the Duffield hearth (above p.269), is very

difficult to assess. A few continental finds of pigs possibly to be attributed to Britain (Appendix 1 Nos.ADD 2, 2, 3 and 9) may suggest that British mining activity continued in the second and third centuries. But we cannot prove its continuity in Derbyshire between the Hadrianic period and the fourth century. Whether the industry was continuous or not though it is clear that by the fourth century there had been a decline of some sort. The Carsington pigs (Branigan, Housley and Housley 1986) are rough castings with no inscriptions and imply that there was no official administrative structure for the industry. However, without further evidence it is impossible to say more of its nature.

iv) Aspects of Technology, Labour, Transport etc.

The evidence such as it is for the technology in use, source of the labour force and modes and routes for the transport of the cast lead pigs has been discussed in the previous chapter (above p.268ff; p.255ff). It is insufficient for much further comment to be made except on a few specific matters. Little chronological change can be seen in any of these matters, but they are so poorly known that that is not surprising. The probably late Duffield hearth's small size might reflect a scaling down of the industry (which may be supported by analysis of the weights of lead pigs; below p.510ff). Yet we do not know how representative it is, nor

do we have earlier examples to compare it with.

Economically the cost of labour would clearly have been important, and it is regrettable that we have no evidence for its nature. The parallel Vipasca evidence suggests that both free and slave labour were important in Roman mining and it is not unreasonable to suggest that this was also the case in Derbyshire. But we are unable to say more than this. Transport again would be an important economic factor and the use of river and sea routes as opposed to the more expensive roads must have been significant in keeping costs down. Yet important details such as whether the miners or merchants (or indeed who ever the lead was sold to) bore this cost are unknown.

A matter which again we have little evidence on but which we may more safely speculate on is technology. Expensive and elaborate technology (in the widest sense) is unlikely to have been needed in Derbyshire. Major drainage and ventilation works would be unnecessary for surface working and, if silver was not a concern, no particularly advanced processing techniques are likely to have been in use. Doubtless this would be a factor in the relatively low cost of British lead indicated by Pliny (above p.217). Perhaps the most important resource required would have been fuel for the roasting/smelting processes. We have already seen that parallel cases suggest that fuel requirements,

probably in the form of charcoal, would have been great (above p.273). The distribution of pig finds from the production area (Fig.1) emphasises that this consideration probably made the wooded hills of the eastern margin of the field particularly important. It is possible that a further cost in the production of lead was the transport of ore to wooded areas to be smelted (or less likely of wood to smelting sites).

#### v) The Support Industries

Although so far we have concentrated on the mining industry itself it is important to remember that it could not have been a viable industry without a range of support services. As Edmondson (1987, 60ff) and Davies (1984, 100) point out other economic activities, particularly trade and agriculture, were greatly stimulated by mining, which often occurred in relatively remote areas lacking in natural resources other than ores. Strabo (Geography III, 2, 10) reports Polybius as numbering the population of the New Carthage silver mines as 40,000 though the mines are far too small for this number to have been working there. More detailed accounts from Potosi and Zacatecas in colonial America suggest something over 60% of the population were in support industries not mining (Edmondson 1987, 60). Thus, we have already seen how agriculture was stimulated for considerable distances by developments such as Zacatecas (above



p.309). As noted in Chapter 7 (p.211~~ff~~) the very limited work on the rural economy of the Derbyshire mining area may suggest a strong connection between agriculture and mining and this will be considered separately before moving on to the wider field of support industries.

#### a) The Connection with Agriculture

As we have seen in Chapter 7 the nature and extent of rural settlement within the study area is little understood and one or two excavated settlement sites at the moment constitute the bulk of our detailed knowledge of it. Perhaps the most important of these is Roystone Grange, a settlement with an arable and a pastoral enclosure forming a 'butterfly' shape. It lies in a valley to the east of the Buxton-Carsington road (Fig.8<sup>b</sup>) and may have been established in the early second century (Hodges and Wildgoose 1980). A small lead quarry, backfilled before the construction of part of the western enclosure wall across it, was identified here. The dating of the quarry is exiguous, resting on an Iron Age sherd, which could be residual, above the fill but below the ?second century wall. Though Hodges and Wildgoose (1980, 52) have speculated on whether 'Iron Age' pottery need have gone out of use before c.120.

This is the strongest evidence for lead extraction activity on a rural site. Galena is not an uncommon find on

some rural sites (e.g. Coombs Dale, Robin Hood's Stride, Pearson's Farm, Hay Top and Horsborough; Makepeace 1985, 107ff). But it alone is dubious as evidence for serious extraction except in very large quantities since it is so common in the area. There is, however, some evidence for lead processing or working of some kind from some rural sites. Again at Royston Grange there is some evidence from a hearth (Hodges and Wildgoose 1980, 51) and a little evidence also comes from the regrettably disturbed but important site of Rainster Rocks (Dool 1976, 20).

Bearing in mind the very few sites that have seen published excavations within the lead mining area this evidence is perhaps as full as one could expect and it seems quite possible that at least some farmers were involved in lead extraction in some small way. However, the connection between farming and lead mining may have been far more complicated than that. Though our evidence is more circumstantial and again it must be emphasised that it comes from very limited work in the rural sector. Hodges and Wildgoose (1980, 52) have suggested that many Roman communities in the White Peak were founded without Iron Age antecedents c.100-120 by immigrant groups. The suggestion that the settlers were not native to the area is based on the nature of the main house excavated at Royston. This was a sub-rectangular aisled building c.20 x 10 m which they argue characterises southern Coritanian vernacular architecture. It is a form

both alien to south Pennine traditions yet one which may be represented within the study area by other rectangular structures on rural sites (Hodges and Wildgoose 1980, 51f). This colonising wave they argue came in c.100-120 to set up 'independent farms of some substance' representing 'a major commitment to the lead industry' with lead subsidising an agricultural market economy.

This thesis is an attractive one in some ways, especially bearing in mind the parallel evidence from colonial America which emphasises the need for agricultural support for a mining community. However, there are several problems with it. Firstly, whilst there does not appear to have been an Iron Age presence at Roystone we have already seen (above p.173) that the Iron Age could have been largely aceramic, thus making its presence or absence difficult to ascertain on other sites, even if more than a handful had seen any excavation at all. Secondly, it is increasingly obvious that rectangular and circular elements are present in many rural sites (above p.193f), though as yet whether they are contemporary is usually unknown. Nor need rectangular structures necessarily have been houses, let alone aisled ones. If there was a native tradition of vernacular architecture in the south Pennines (which would anyway tend to question the idea of 'a virtual vacuum' into which Hodges and Wildgoose (1980, 52) suggest settlers moved)

it is as yet too early to identify it.

Yet, whilst the evidence remains insufficient either to prove Hodges and Wildgoose's ideas or to build up any coherent picture of rural settlement in the study area, certain indications do suggest a connection between farming and lead mining. The possibility of a proto-villa at Carsington (above p.185f), whilst it must remain only a possibility, could be significant if the site was indeed a major centre for the lead mining industry. The presence of two further 'butterfly' field systems in the vicinity (Wildgoose pers. comm.) may emphasise this. Similarly the nearby settlement of Rainster Rocks (above p.211i) appears to have both an unusually nucleated structure and material wealth, yet was clearly at least partly a farming settlement. As Hodges and Wildgoose (1980, 50) point out it may have been surrounded by a particularly dense rural settlement pattern and could have been a market centre. That both Rainster and Royston lay in the heart of the mining area and emerged in the earlier second century (above p.335 and p.211i) certainly strengthens the case for the development of farming at this time, be it by natives or by colonists. The settlement pattern as known at the moment clearly favours the southern part of the study area, though there are many problems in the evidence and the emphasis is not just on the mining area but also on the Dove, Hope and Wye valleys (above p.199 ff).

Though the problem of identifying any Iron Age precursor must be ever present, at least without far more excavation, the evidence at present does favour an expansion in rural settlement in the Roman period. If this expansion is genuine lead miners must rank, alongside the army and vicani of sites such as Brough, and the population of Buxton, high on any list of possible customers for its products. Nor should we be necessarily looking at the mining area itself as the only area where lead mining stimulated agricultural production. The parallel case of Zacatecas, even if on a larger scale, indicates that farming could be stimulated at some distance (above p.309f). Sites such as Wharncliffe (Makepeace 1985b) outside the mining area should not be disregarded. Indeed here we see just such an aisled structure as at Roystone. Further, more fertile areas outside the study area such as the Trent Valley or the Magnesian Limestone ridge to the east (e.g. Riley 1980) may have felt the effects of agricultural demand from the lead extraction industry.

Precisely what form the connection between agriculture and lead mining took must remain somewhat conjectural. Hodges and Wildgoose may be right in suggesting that lead mining on a small scale subsidised farming. However, the Roystone evidence is actually against this since the field boundary post-dates the quarry. Small-scale mining must anyway have only been a bonus to farmers, not their main

livelihood. Conceivably it would have been a way of paying taxes in kind. Surely more likely would be that farmers profited from mining by having a large market for their crops. Or that within family groups some members devoted themselves to farming while others were involved in mining. Such combination of occupations within a family group was common amongst Derbyshire families including miners in the nineteenth century , though by then the textile industry had supplanted agriculture as mining's usual partner (Hall 1978, 81f).

#### b) Other Support Industries

The comparative evidence from both Vipasca and colonial South America suggests that there are a range of non-agricultural support industries that should be expected to accompany a mining development. They fall into two categories, those that are specific to the needs of mining and those that would accompany any industry employing numbers of people. Thus, on the one hand, we have charcoal burners and presumably the makers of mining tools, perhaps of specialised footwear and clothing (note the inclusion of cobblers and fullers in Vipasca A; above p.294) and the suppliers of mules, doubtless very important in a dispersed mining area, and of slaves. On the other hand, we have general store keepers, butchers, pottery sellers, barbers and others involved in trade and service industries that would be represented in any area

where there was a market.

There is not any direct evidence for such service industries in Roman Derbyshire but this is not surprising. Charcoal burning is unlikely to be recoverable archaeologically and most other mining-specific services' products were inherently perishable. For more general services it is difficult to see how, even if we had evidence for, say, a pottery shop we could tell that it was selling to a mining market. The presence of its wares on mining sites would provide the evidence, but as yet we have no mining site to study. Given the lack of direct evidence the details of the size and location of these support industries must be largely conjectural. Thus, the supply of charcoal could have been achieved in one or more of a number of ways. We have already noted the circumstantial evidence for fuel supplies being concentrated in the east of the mining area. It may be that individual, or groups of, miners held and coppiced large areas of woodland there, employing freemen or slaves to do this and burn the wood to charcoal. Equally much the same could have been done by charcoal burners who were not miners. Coppicing and charcoal burning could also have formed an adjunct to farming in suitable areas.

Other of the support industries are more likely to have been based in one or more settlements and in this connection Carsington must have been important, and to a

lesser extent sites such as Brough. However, we have already noted that it might be quite a journey from some mines into Carsington. It might be all very well to visit it a few times a year for specialist goods, boots, mining tools etc., but perhaps not for more everyday supplies. Other possibilities exist however as the colonial American evidence shows (above p.310 f). Just as some Zacatecan shops were branches of those in Mexico City, they in turn opened branches in smaller centres. Moreover there were considerable numbers of merchants who traded with isolated sites by taking mule trains of goods around the area. The first of these examples is not perhaps applicable since there seem to be no settlements other than Carsington in the mining area of sufficient size to have had shops. Yet the second idea might easily be applied to the area.

Archaeology also provides a third scenario, the rural market. We have noted above (p.338) the possibility of some sort of market at Rainster Rocks, perhaps in the form of a gathering of farmers with produce and itinerant traders something along the lines of a Medieval fair. This practice would leave few traces but, if repeated throughout the area, could provide a mechanism for the supply of many isolated mines. In the same connection one wonders what the real significance of the find concentration around Stoney Middleton/Eyam (above p.318) and the concentration of rural



sites at Robin Hood's Stride (Makepeace 1985,139 f) is. At present however our knowledge of the rural environment is insufficient for further speculation on this possibility.

The full details of the agricultural production and other support services that attended the Derbyshire industry must remain uncertain. But it is important to remember that they provided a potential mechanism for the profits of mining to stimulate the area's wider economy. The existence of garrisons at forts provided a market for traders, who it seems from the fate of vici could not be supported by the indigenous population alone (above p.112f). Similarly, the 'mining market' may have attracted services that would otherwise not have existed, but which the whole population and not just miners could utilise. Indeed, the evidence perhaps suggests that mining created a greater 'spin off' economic effect than did local garrisons. In particular one wonders whether the growth of Buxton into a spa complex had anything to do initially with the patronage of miners. Perhaps particularly to rich mine lessees who left the day-to-day running of mines to foremen and lived in relative comfort in the more luxurious surroundings. Possibly a similar element could also be envisaged at Derby and, indeed, the potting and later metalworking industrial area at that settlement might have found a market in the mining community.

Unlike the Mendips, however, there does not seem to have

been a significant spin off industry in the most obvious field, that of the manufacture of objects in lead or pewter. The Mendip pewter industry of Camerton (Wedlake 1958) is not something that we should be surprised is not repeated in Derbyshire for there were no good sources of tin for Derbyshire. Though it must be a potential source for the lead used in pewter made in the north, such as at Langton villa, E. Yorks. where a plate mould indicates its production (Goodall 1972). Evidence for lead working hearths etc. in the area is limited and distinctly small-scale. While lead may have replaced more conventional materials in the production of some objects such as lamps, as it did in south and north Wales (Dearne in Bishop et al forthcoming), there is little evidence for its widespread usage in the production area. Indeed, Toller (1977, 2 and maps 1 and 6) in the only major study on a class of lead objects, shows that the distribution of lead coffins and ossuaria in fact closely reflects the distribution of wealth in Roman Britain and not that of production areas. The ease of availability in Derbyshire was presumably eclipsed by the value of the metal outside it. The only really identifiable (minor) 'spin off' was the use of lead glazes for pottery at Derby (e.g. Swann 1984, 125).

Paradoxically however, the service industries also provided a potential mechanism for the removal of mining profits

from the area. For example with the exception of Derbyshire ware (below) any pottery used in the mining area almost certainly came from at least as far away as south Yorkshire or Derby. Much of the profit on it may well have been made by the potters or by merchants based outside the study area. Equally we have noted above that agricultural production stimulated by lead mining could have lain at some distance from the mines. Particularly with the possibility that much trading was peripatetic there is no inherent reason why mercantile profits should have remained in the area.

vi) The Evidence for Economic Stimulation

There is a distinct difference between an area where there is a profitable industry and an area that profits from an industry. The demand for lead in the Roman world was significant and in Derbyshire it was extractable cheaply and in bulk. There can be little doubt that there were good profits to be made in doing so at least in the early empire. It follows also that there were opportunities for agriculturalists and for traders and the providers of services to make profits by supplying the mining community. Yet how much of this profit remained in the area is questionable as Hartley & Fitts (1988, 89) also point out. At least during the tighter imperial control period beginning in or by the time of Hadrian the state is likely to have taken a considerable part of mining profits. This would be in the form of the

payment for a lease and the buy-out price for the other half of the mine (or half of the production). If any part of the monopoly system seen in Vipasca A applied it would have skimmed further monies off. This would all presumably be in addition to normal taxes.

The mining profits that flowed into the coffers of merchants and farmers need not have gone entirely to merchants and farmers within the area either. Many may have profited though they lived further south or east. Perhaps most significantly it is entirely possible that the individuals likely to have done best out of mining, the lessees/owners of the mines, need not have lived in the area. If start up capital costs were significant as they seem to have been (above p.325f) many lessees/owners might well be investors from further south, indeed even from abroad. Thus, the majority of the mining profits could have flowed straight out of the area.

These points are important for the evidence for a stimulation of the economy by lead mining is rather sparse. The distribution of major sites within and on the periphery of the study area is concentrated like lead mining in the south. However, the existence of only one can be attributed to the lead industry with any confidence at all. Whilst the apparent prosperity of Buxton and perhaps Derby might have something to do with the industry with this one exception,

Carsington, major sites in fact conspicuously avoid the mining area (Fig.1). There is no evidence that these sites were reliant on lead mining. Rather their economic bases seem to be military or religious/healing (Chapter 6).

Carsington itself does suggest lead wealth since it has stone buildings (unusual in the area) including the isolated one excavated by Ling and Courtney (1981). There is no obvious alternative source of prosperity for it and its geographical position, lead working hearths and pig finds must argue that this was its *raison d'etre*. It is regrettable that more is not known of the site for it is still difficult to compare the strength of its economic base with that of a military vicus. However, the existence of at least one hypocaust and indications of better quality fittings, such as window glass, not usually suggested at other sites in the area probably hint at the presence of some wealthy individuals or government officials. Certainly there seem to be indications, in the density of roads (Chapter 5), of coin finds and of rural settlements (Chapter 7), that the south of the study area was rather more prosperous than the north. Yet how far this is an illusion created by the pattern of field work, which has been far greater in the south, is difficult to say. If it is a genuine difference lead mining may have played its part in creating wealth. This could well have been a major role

compared to other stimuli (Chapter 7 p.211i), yet the evidence remains mainly rural and ambiguous.

The effect on agriculture may well have been great and the density of settlement in the Carsington region and in other probable extraction areas such as Stoney Middleton/Eyam (Fig.8<sup>b</sup>) is interesting. Yet similar densities occur in the Wye Valley and Hope Valley (Fig.8<sup>a,c,d</sup>) which could be attributed to military or spa town demands for food. As yet we know insufficient about the nature, extent and foundation dates of such settlements to attribute their existence to lead mining with any confidence. The quality of finds from Rainster Rocks (Dool 1976; Smithard 1910) which include such unexpected items as a pair of dividers, show that this, again poorly known, site was more than just a large rural settlement. The source of its wealth might well be lead given its position in the heart of the lead field. If so it would be attractive to see it as a rural market, but further work is required to illuminate it.

If the lead industry did provide a significant stimulus to the economy of the study area that stimulus must on present evidence be seen as concentrated in one town, Carsington, perhaps with less direct effects, such as the residence of rich lessees, at Buxton or Derby, and in the growth of rural settlement. This picture would suggest that there were not great profits to be made from lead mining,

that the profits were taken out of the area or that the industry was run by very many small extractors, none of whom made a great profit. The second possibility seems by far the most likely though caution is still needed in assuming that there were great profits to be made in view of the still large gaps in our knowledge of lead extraction and our inability to quantify its production.

vii) Other Industries

Whatever the scale of lead mining profits that industry was clearly the most important in the study area. One or two other activities may however be termed industries with some caution. 'Industry' has a limited significance in an ancient context and it is difficult to establish a dividing line between an 'industry' and a 'craft'. However, we can perhaps differentiate the two by saying that an industry is an activity pursued systematically by numbers of people in an area aiming at a larger market than just one or two settlements.

Chief among the so defined industries other than lead mining that we can identify within the study area is the pottery industry producing Derbyshire ware. The products of the industry, in a distinctive 'rimply' fabric varying from orange to dark grey, were almost entirely limited to two types of jars, the roll rimmed and the lid-seated or bell-mouthed (e.g. Kay 1962, 42). The industry appears to have

begun in the late second century and flourished in the third century as supported by magnetic dates from kiln sites (Kay 1962, 41f). The principal excavated kiln sites were at Hazelwood and Holbrook (Kay, 1962) and at Duffield (Brassington and Webster 1988), with another two known at or near Shottle Hall (Kay and Hughes 1963; Br. 3 (1972, 314) and further examples suspected both there and at Milford (Brassington 1969).

The distribution of these kiln sites in a relatively small area again in the south of the region (Fig.1) is likely to reflect the quality of the local clay deposits, also used in Medieval and modern times (Kay 1962, 25). The availability of firewood and good communications would also have been important. Indeed, the distribution of the ware in the production area seems to cluster along roads/suspected trackways and dies out to the south east at the possible Trent trans-shipment point of Sawley (Kay 1962, 37ff). Although it has been suggested that the potters rotated the location of their kilns (Brassington and Webster 1988, 30) it is clear from the whorl marks on some pots that a number of different potters were at work at least at Hazelwood and Holbrook (Kay 1962, 31).

The predominance of jar forms (though narrow-necked jars and wide bowls are also known products; Brassington and Webster 1988, 24) may suggest that production was closely



tied to the transportation of an agricultural product. Impressions of the Celtic bean (*Vicia Faba*, var. *celticanana* Heer) have been found on some vessels (Kay 1962, 27). This may be supported by the concentration of finds to the north of the production area in agriculturally poorer regions (Kay 1962, 42).

No other pottery 'industry' is known in the area. The tilery which also produced some pottery at Grimscar near Slack was directed at supplying the local army and was a military operation (McWhirr 1979, 182f), as would have been a tilery suggested but unlocated near Melandra (Hart 1981, 108). Suggestions of a tilery at Carsington (Hart 1981, 108) have been demonstrated to be false (Ling and Courtney 1981, 71f and 82ff). The as yet unlocated production centres for 'Dales Ware' perhaps lay east of the Pennines (Hartley & Fitts 1988, 102). A second, presumably very small-scale, mining industry is possible in the vicinity of Castleton. Healy (1986, 133) makes clear that Pliny (Nat.Hist. xxxvii, 18-22) is talking of Fluorspar and not agate in connection with the highly prized vasa Murrhina and follows others in asserting that the Fluorspar variety was Derbyshire Blue John. However, Ford (1979) has argued convincingly that the source for the mineral was in fact in Persia (as Pliny stated) and that suggestions of extraction in Derbyshire were actually antiquarian inventions.

More likely is the possibility of some quarrying for marble at Hopton Wood, which stone has been found at Godmanchester and might have been transported by water (Hart 1981, 108). Similarly Gritstone from the northern part of the study area could have been quarried as it was further north where it was shipped down the R. Aire (Ramm 1978, 48). That in the south of the area could have been supplied to towns such as Leicester (Whitwell 1982, 131). As Hartley and Fitts (1988, 94) point out good building stone would have been an important resource.

Gritstone quern manufacture might also be considered a small industry. Manufacturing sites are known at Wharncliffe (Butcher 1957; Hart 1981, 108) and Stanton Moor (Hart 1981, 108) and recent further identifications are likely on the eastern borders of the study area (pers. comm. L. Wright). Whilst there may have been a trade in querns to the south and east (Hartley and Fitts 1988, 96; pers. comm. L. Wright), dating of quern types within the area remains problematic (Hart 1981, 106). Thus, it is difficult to be sure whether the production sites are Romano-British alone or had longer lives, and therefore on what scale querns were made. It may be that quern production was just an adjunct to farming.

Further activities that might in some cases have reached the scale of very small industries include tanning, spinning,

weaving etc. (e.g. Hart 1981, 108). But we are unlikely to be able to recover evidence for their existence, let alone scale. There is no evidence for the production of lime mortar from the Limestone of the area, but it could have occurred (Hartley and Fitts 1988, 95).

Notes

1. As Edmondson (1987, 39) points out the state is always likely to have represented a market for raw metal and this may be the implication of stamps on tin ingots from the Port-Vendres II wreck and on lead pigs from the Sea Salines wreck (though other interpretations are possible). Similarly Frere's (1987, 278) suggestion that there may have been a connection between the military building under Hadrian and the close imperial control of the industry should be borne in mind.

## Chapter 10: The Economy of the Roman South Pennines: Synthesis

### i) Introduction

In examining the economy of any ancient society it must always be remembered that the best that can be achieved is the production of a model that fits the evidence. The fullness and likely validity of that model is largely dependent on the quality of the evidence available. As has repeatedly been pointed out above the evidence for various elements of the economy of the Romano-British south Pennines is limited. The infrastructure of transport is reasonably well understood and the role of urban communities increasingly well documented. However, the near complete absence of information on rural settlement is a serious handicap to any economic survey. For the lead industry, to which this work has been particularly directed, there is far less evidence than one would like.

It would be entirely wrong given the problems of the evidence to claim that we can yet construct anything like a definitive model. Much must yet be confirmed or denied by excavation and some problems may be ultimately insoluble. Yet research can hardly proceed without the continuing process of modelling from existing evidence and revising models in the light of new evidence. Thus the following discussion is directed at outlining what seems to be the most likely pattern of the study area's economy on present

evidence, not at producing a rigid statement of fact.

ii) The Geographical Pattern

Throughout the apparent existence of a 'north-south divide' in the economy of the study area has been noted. The north of the area has less roads. It has less, shorter lived, and apparently exclusively militarily-based, urban sites than the south. Its rural settlement seems almost non-existent compared to the south; and it has no identifiable industry. If this geographical disparity is real the divide would appear to lie approximately at the headwaters of the R. Derwent. Perhaps along a rough line between Melandra and the present Ladybower reservoir. North of this, with the exceptions of Slack and its environs and Castleshaw, Romano-British evidence is very hard to seek.

There are reasons for thinking that the contrast was not as stark as it seems. The relative intensity of field-work, nature of the ground cover and presence or absence of modern urban areas all favour the recording of evidence in the south more than the north. Yet, very many discoveries would have to be made in the north to eradicate the disparity and it must at the moment be considered a real one. The reasons for the contrast are not perhaps difficult to see. The north has a basic lack of resources as against the south of the study area. It has no lead, no spa as at Buxton and its Gritstone and Coal Measure soils can never have had the

attraction of the Limestone ones of the White Peak. Two other factors may also have played a part. Militarily the north probably had less significance. The Hope Valley/Snake Pass transpennine route seems to have been important, but not the Longdendale route further north. Perhaps because the former was established early when the concern was for a route from advanced posts such as Templeborough to what was soon the major route centre of Manchester. Nor had the military anything else to protect in the north; again there was no lead, spa or major settlements.

The other possible factor was that the south of the study area represented the very edge of the upland military zone. Not far away were major urban centres, available models of romanitas peopled with potential founders of towns such as Buxton and perhaps rural colonists. Indeed, the south was surrounded by a horseshoe of urban sites which if nothing else might provide a demand for agricultural produce. Further north there were only two short-lived forts and Castleford to the east. Thus, the south may have had more pressure exerted on it to develop towns, monied economies and productive rural settlements.

However, the Romano-British evidence from the south of the study area does not indicate a homogeneous pattern of economic activity. There are concentrations and gaps, particularly in the rural settlement evidence. The eastern

moors with their poorer Gritstone soils, the plateau of the White Peak and moorland areas in the west were avoided or perhaps in the case of the White Peak used for rather transitory purposes such as transhumance. The emphasis for rural settlement was very much on Limestone valley slope sites. Equally urban centres reflect topography, choosing valley sites and therefore avoiding large tracts of land such as the east moors. Indeed, it is clear that the settlement pattern generally is principally made up of a series of settled valleys (the Hope, Wye, Derwent, Dove and Manifold) separated by sparsely used highland. This may have been a factor in the possibly greater prosperity of the south east of the study area, for there is less of a valley/highland division in the Dove/Derwent interfluvium. Yet this possible wealth may also have had much to do with the lead industry clearly active in this part of the region.

### iii) The Nature of the Economy

#### a) Agriculture

It is almost axiomatic that the largest sector of any ancient economy, at least in terms of the percentage of population involved, was agriculture. As we have seen attempts to calculate the population of the area, especially the rural population, are little more than vague guesses. The figures arrived at (Chapter 4) which put rural population



at less than half the total cannot be relied upon. Particularly since the total itself is unreliable in respect of the urban population. Yet, to what extent agriculture represented only the support for urban, mining and military communities as opposed to 'self sufficiency' may be a question with important implications. If there was no tradition of sedentary agriculture in the area and the Romano-British rural population were therefore 'colonists' it may be that we should not expect as great a number of them as otherwise.

If the size of the rural community must remain in doubt its activities are becoming clearer. The evidence is for mixed farming with both arable and pastoral elements being important. The relative emphasis on the two at specific sites and more generally remains to be established and may have varied considerably. Indeed, it may be that the lack of recognised settlement in the north and on the White Peak plateau reflects pastoral uses which leave less trace than arable cultivation, however, this remains as yet unsubstantiated. In the south of the study area a range of settlement types may reflect varying scales or types of agriculture. The single 'homestead' settlement with a few fields indicates nuclear, or in some cases perhaps extended, family groups perhaps growing some crops and running cattle and sheep on more open land; the ?mixed economy family farm.

There are also quite large agglomerations of buildings, fields and paddocks at sites such as Bank Top/Pilsbury. Such villages, as they must be assumed to have been, were again perhaps mixed agricultural communities. But the concentration of population may well have enabled more labour-intensive activities such as bulk cereal cultivation to have been undertaken.

Just as population figures are illusive for the rural sector the scale of its prosperity is somewhat obscure. Evidence of wealth outside urban sites is in the form of coins, high quality pottery and metal work for there is no refinement to be detected in the vernacular architecture. At present such indications of wealth are too often unassociated with known settlements, only a handful of find assemblages being from excavated sites as opposed to surface scatters. Whilst the latter may in some cases indicate the presence of unrecognised rural sites, and in others are clearly linked to known but unexcavated settlements, many finds cannot yet be definitely associated with rural activity. Indeed, not all rural find concentrations need belong to farming settlements since lead mining sites and perhaps rural markets should also be expected to have existed. Rainster Rocks is a case in point for it is difficult to know whether to attribute its significant find assemblage to successful farming, to mining, to a suggested rural market, or indeed to a combination of all of these. A further complication is the quality of the finds from the

caves in the south of the study area. Whilst some caves may have served as adjuncts to more open rural sites others may have had little connection with farming communities. Thus, Poole's Cavern at least may well have been a brooch workshop (Branigan and Bayley forthcoming; Branigan and Dearne research in progress).

Yet the finds patterns from rural areas, and particularly from the as yet few excavated settlements, are our only evidence for agricultural success. To take the finds from Staden (Makepeace 1983; 1987), we have one sherd and a few chips of samian, two mortarium sherds, fragments of perhaps seven black burnished vessels and of up to eighteen other coarse ones. Of metalwork there are two or three Roman brooches (one may be Iron Age) and a penannular brooch, a bronze finger ring and decorated sheet fragment, and an iron nail and hook. Though the site has not been completely excavated this is not a vast assemblage. Yet the very presence of any samian, mortaria or brooches must indicate that the farmer here made sufficient money to buy at least a few luxuries. Indeed, excavations of similarly sized vicus sites in comparison rarely yield as many bronze items, though usually more pottery (e.g. Brough where four of the five modern sites have yielded only three brooches and a few other bronze scraps; though the quantity of ironwork was higher and several lead items and a silver coin have been recovered).

The evidence of Staden is of a different class to casual rural finds not associated with known settlements. It is direct evidence for the prosperity of a single settlement, not indirect testimony of the wealth of an area. Extrapolation of the Staden evidence without more excavation elsewhere would be wrong. But, taken with the Rainster Rocks finds (which, rural market/mining functions or no, are from an at least partly agricultural site) and the less direct general find evidence it seems at present that the rural economy was probably operating at well above subsistence level, if not booming. Coin and general finds may particularly focus attention on the south east of the study area, including Rainster Rocks, and may perhaps hint at the role of lead in stimulating agriculture, or even directly providing the economic base for some sites. Indeed, two other excavated sites in this area may be mentioned. Continuing excavation at Royston Grange has produced a number of coins, two brooches, two bronze pins etc. (pers.comm. Clive Hart). The unpublished excavations at Hartshill produced a bronze penannular brooch, strainer, repousee disc and enamelled stud as well as iron work, lead items, imitation samian, a colour coated mortarium and a very fine millefiori glass bowl (Price 1985; pers.comm. Clive Hart; the finds are in Sheffield Museum).

The conclusion that the rural economy was working profitably, let alone that lead mining may have been behind its most successful elements, is of course tentative. Far

too few sites have been excavated to decide its real validity or to establish variations in wealth over time or from region to region. It remains possible that the excavated examples are unrepresentative, especially since most are in the south east of the area and two at least (Staden and Rainster) are near to major urban settlements. Surface finds from more isolated rural sites hardly match their finds as yet.

b) Lead

Industries in the ancient world were far fewer and smaller than today. Relatively few in fact probably deserved the full implications of the term, the organised large-scale production of something for a market over and above a localised area. The important mining concerns of the Roman empire were however such industries, and Derbyshire lead production seems certain to have held a place amongst them. Despite the probable lack of silver it is entirely likely that its lead production was of both provincial and empire-wide importance. Yet actually establishing the scale on which it was undertaken or the size of its output is impossible. We have no indication of how many people were involved, directly or indirectly, in it. Though it must be assumed to have been labour-intensive. We have only one town that seems likely to have been linked to the industry and evidence for mining and processing is almost non-existent. The lead pigs

stand virtually alone as our source for the industry.

Given these problems it is worth emphasising that the present work has drawn on comparative evidence, from other areas of Britain and the empire generally and from other times and continents, to try and produce a fuller picture of the probable Derbyshire industry. Thus, again we are dealing very much with a model not a statement of fact. The model suggests that there were substantial profits to be made from opening up areas of lead ores. Profits both for individuals and imperial authorities, from both mining itself and from associated commerce, agriculture and other 'support industries'. Yet these profits were not necessarily very evenly distributed. Private profits may have accrued primarily to a small number of people, perhaps those with the initial capital to expend. The bulk of a mining community need not have raised themselves far above a subsistence level. Undoubtedly in some cases mining profits were the basis of thriving urban communities. But, as at Zacatecas, the physical manifestation of the profit need not be great. Civic and private building of any pretension might be slow to come even to such boom towns.

These are important points to bear in mind when trying to assess the economic significance of the lead extraction industry to the study area. For the evidence that lead mining was creating wealth is limited. The most important evidence is the existence of Carsington (?Lutudarum). Its

stone buildings, particularly that outside the settlement, do suggest that something over and above the level of the military pay that supported sites such as Brough was available. No other source for this except the lead industry is obvious. It is regrettable that so little is known of the site for, bearing in mind the example of Zacatecas, factors such as its finds, size and speed of growth might tell us as much about its prosperity as its architecture.

Other evidence may reflect less direct stimuli to the economy of the area. The possibility that the lead industry drew numbers of colonists to set up farms such as Royston Grange to supply it with food is attractive. Colonial South America shows how agriculture could boom with a hungry mining community as customers. Equally rural markets could have been given a fillip and the emphasis on the south east of the study area in coin finds might also reflect the stimulation of the lead industry. Indeed, we have already commented on the wealth of finds from some sites in this area. However, much of this evidence remains problematic since it relates to the rural sphere. The existence of a wave of colonists requires more than a few sites with second century start dates as proof, the presence of rural markets remains as yet only a suggestion and the wealth of a few excavated sites may not be at all representative.

This is a problem that is eventually likely to be solved

by further excavation of rural sites. Less tractable is the problem of how far afield Derbyshire lead mining profits disseminated. Under Hadrian at least some of those profits almost certainly flowed into imperial coffers, leaving little trace in the study area except perhaps for some administrative spending on their collection. That further amounts were milked by administrators for themselves may be suspected. If the main non-imperial profits accrued to a few rich men these may also have disappeared. There is no inherent reason why these men should necessarily have lived near the mines. Buxton and Derby, let alone villas and towns far to the south, could in fact have felt the benefit of mining profits. Similarly it need not only be within the mining area that agricultural production might be stimulated.

On balance at the moment the stimulation of the industry on the economy of the area can be recognised. Most of all at Carsington, but also as an element in the general success of the south as opposed to the north of the study area. It may well be that it had an important effect on the agricultural economy of the area, providing the market on which settlements such as Royston Grange survived and generating the wealth found on sites such as Rainster Rocks. This requires further confirmation, but if it is confirmed it seems entirely likely that the lead mining industry represented a major underpinning to the area's success.



## c) The Military

There is clear evidence of the role of the military in the economy of the south Pennines in that, up until some point in the third century, they supported the military vici. There can be little doubt that all military vici within the area relied primarily on army pay for their existence. Though for one or two sites beyond the area (Castleford, Manchester, Derby) there may have been other important elements in their economies. The exact details of the ways in which the army supported civilians in vici are still uncertain. There were soldiers' dependants and traders and service providers, but there may also have been less obvious relationships. How large vici were is now becoming clear, though no reliable figures for populations can be deduced therefrom as yet. Economically vici present a clear-cut case of cause and effect. The placing of paid army units created a demand that civilians were happy to satisfy by trading outside the fort. The removal of the unit and so the demand (or the inability to pay for what was in demand) caused the close of the resultant settlement.

A far more difficult matter is the effect of the army presence on the rural population (as distinct from the effect of military vici; below). The matter of army supply has been alluded to in several chapters. We have seen (p.82ff) that grain supply from the local area would be far cheaper

and quicker than from southern England. Though supply to the study area perhaps from the east might make more sense in a national context. We have also seen that it is impossible to calculate local grain yields (p.170f). Though it is likely that any meat requirements for the military diet could be obtained locally. But even what the military diet consisted of is a matter fraught with difficulty. Davies (1971) concluded that meat was an important element in it, thus decreasing some estimates for the amount of grain required. But how far its composition reflected local availability is a matter on which there is little evidence. One wonders for instance what the local importance of leguminous crops may have been. Similarly, even if grain was the main non-meat element, how far an estimate of a third of a ton per year per man (Davies 1971, 123) is reliable is difficult to say.

If it is correct an auxiliary cohort will have needed somewhere in the region of 160 tons of grain a year. For the sites in the study area, in the later first century anyway, somewhere around 640 tons if all the forts had full cohorts. Deciding whether the area could produce this much grain, which as yet we cannot, is not enough. The military are unlikely to have been the only consumers. There are the inhabitants of vici and of Buxton and, later, Carsington to consider. Let alone the farmers themselves and probably a mining community. We have even less information on their

diets and no reliable figures for their numbers.

The potential impact of the army as customers for grain and meat supplies from rural producers was probably significant. Yet, we should not forget that only Brough was garrisoned through the majority of the Roman period, and that non-military needs may have had a more lasting and extensive impact. If the material wealth of Staden reflects the disposal of agricultural surpluses then they were probably being sold to the spa town of Buxton, not to the army. Similarly for Rainster Rocks and Royston Grange the obvious customers were Carsington and miners. Brough, for much of the period alone as a fort, may have found local supplies and it is notable that the few indicators of possible rural settlements in the north are in the vicinity of Slack and Castleshaw. Yet, the army cannot have remained as a major stimulating factor for long. Especially if any rural expansion occurred in the early second century, for forts were being closed by this point and Brough stood alone by c.140-60.

#### d) Urban Communities

We have already seen that military vici had a predominantly 'military economy'. Similarly, though the evidence is more inferential, Carsington seems likely to have been dominated by the lead industry. Only one urban site is left within the study area, Buxton. Though we know very little

of the site its economic base must have had much to do with its being a religious spa. The proliferation of rural sites and of metalworking evidence from caves in the Wye valley may hint at a wealthy, probably transient, population 'taking the waters' with money to spend on food and jewelery. Who these visitors were is uncertain. But an altar to Arnemetia probably suggests a military element even if the bulk of them were civilians. Access to Buxton may have been an important factor in the development of the road network and might even explain the presence of the mansio at Melandra. The significance of the presence of one of only two major spas in Britain in the study area should not be underestimated as a factor in the prosperity of the whole of the south of the region.

Whilst we have outlined the main economic bases of the urban centres within the study area there are more minor economic roles that some may also have fulfilled. Most must have played some role as road stations for travellers. From the apparently considerable provision at Melandra to just selling occasional supplies to them. Beyond the area Manchester particularly may have been a very important stopping place for such people. Some centres might have had administrative functions as well. We have no evidence for how the area was administered, but it is attractive to see such sites as Derby, if not Brough, acting as local administrative centres. A third role would be that of market

centre. This possibility is considered below since it is important for the degree of integration between various sectors of the economy.

iv) Quantification and Integration

As already implied quantification is largely impossible for the south Pennine economy. Comparisons between various sectors of the economy and between different parts of the area are possible, but must be provisional. Thus we have seen that there appears to be a north-south divide. That lead extraction and Buxton's spa could have been particularly important, and that the military need not have been as important as an economic stimulus (at least after the mid-second century) as some have thought. How far these various sectors were integrated with each other is perhaps as important as quantifying them. Only if the military, lead mining industry and those 'taking the waters' at Buxton provided a market served by rural farmers can the prosperity of the area really have been at all significant. Otherwise only the vicani, the residents of Buxton and the mine owners will have made money. The bulk of the population will have remained at subsistence levels.

This stimulation in the rural economy is the crux of deciding whether the area was prosperous. We have the first hints of such stimulation from the lead industry, and with Staden probably from Buxton. However, a similar pattern for

the effect of the military through vici, or more directly, is harder to ascertain. The failure of vici to continue after their garrisons removal is a significant fact. It suggests that any impact that military and vicanal demands had on the rural sector was either non-reciprocal or of limited significance. That is to say that either vici depended on rural production but that rural farmers had little interest in the services that a vicus could offer, or that local rural suppliers and vici were not trading to any great extent in the first place. The former is perhaps the more likely. We have seen that the limited evidence for stimulation in the north is in the environs of two forts, and that there is a cluster of settlements near Brough. Again quantification is impossible but some trade seems to be implied. Yet, that trade, be it due to its low level or rural reticence, does not seem to have been enough to keep vicani at vici when the army moved on. Vici do not appear to have been integrated into the economy to any great extent.

#### v) Money, Colonisation and Expansion

Although we have speculated on the necessity or otherwise of a monied economy in vici, the evidence clearly indicates the general use of coinage. Other forms of exchange, principally barter, may well have co-existed with it but money was clearly in circulation in urban and rural areas. Coins are found singly and in hoards in the rural

sector, at cave sites, and on rural sites; though their scarcity in vici remains surprising.

The use of money in the area was a Roman innovation. But this is hardly significant. The almost total lack of evidence for Iron Age material culture suggests that if there was an indigenous population then it was essentially not far above Bronze Age levels. The lack of evidence for the Iron Age in the area must at the moment be taken to imply its non-existence. Though it is entirely possible that this view may have to be modified. If the area was little populated though the implication is that there was a great economic expansion in the Roman period. The possibility that this was due to 'colonising' farmers attracted by the market presented by lead miners, spa visitors and initially perhaps the military and vicani must, if so, become a likelihood.

What exactly 'colonisation' would mean is more difficult. Official encouragement, by tax concessions or land grants, is possible. But so equally is personal enterprise. Indeed, the observed early second century foundation date of at least some farms could be significant. This is the time of the probable reorganisation of the lead industry, a convenient time for any encouragement of settlement in the lead field. Indeed, it is not impossible that the area was declared an imperial estate. It was also the time of major

reorganisations in the disposition of troops in Britain. It is possible that this may have released numbers of enterprising Romanised former vicani who could become colonists.



### Conclusion and Future Work

Conclusions about the economy of the south Pennines must be tentative. At the moment though the south of the area must be seen as far more developed than the north. This prosperity in the south seems likely to have rested on the development of three economic stimuli. Firstly, an important at first private and later imperially leased lead extraction industry. Secondly, a religious spa at Buxton; and thirdly, and perhaps less importantly, the stationing of military units in the area. These factors seem likely in turn to have drawn a wave of 'colonist' farmers, perhaps most importantly in the earlier second century, into the region. These farmers, probably not following an indigenous tradition of agriculture in the region, favoured the Limestone valley slopes and probably followed a broadly mixed farming regimen. They appear to have avoided areas to the north and east because of the poorer Gritstone soils, and the north in general since there was little market for their produce.

With the exception of Brough the military impact is unlikely to have been significant by the mid-second century, whatever its role in the initial attraction of settlers. Rather, lead and a spa seem to have been the main identifiable bases of the non-rural economy. This is stressed by there being the likely economic bases of the only urban areas to function without military subsidy. The success of the rural economy, for which we have as yet inconclusive hints, must

have depended principally on the continued profitability of these bases. Buxton continued perhaps down to the late fourth century and the lead industry, though pig finds leave a long gap unattested, clearly existed in some form in the fourth century. The dating of Carsington suggests that it may still have been profitable in the third century at least.

Exactly how much of the profits, particularly of the lead industry, circulated in the economy generally may be debatable. The imperial authorities and rich lessees may well have removed much of the profit not just from the industry but from the area. Yet it is probable that not only Carsington, but also sites such as Rainster Rocks and Royston Grange owed much of their prosperity, if not existence, to the profits that remained. Equally, many sites such as Staden, and indeed perhaps service and craft sectors such as the brooch makers of the Wye valley caves, are likely to have done well out of a potentially wealthy clientele at Buxton. The military were probably far less important to the area. Their continued support of Brough was not unimportant, but it seems to have ended at some point in the third century. Whether they had 'primed the pump' of economic development in the area before they left may be doubted. It appears to be the lead industry and the Buxton spa that were the significant forces in the study area.

The repeated qualification that the evidence for various sectors of the area's economy is limited highlights the fact

that there are many areas in which further work would be desirable. Above all the excavation of a representative sample of rural sites, and in the north surveys to confirm or deny their presence, is needed. Deductions from a handful of sites and from surface surveys must always be questionable. Equally the negative evidence for the lack of Iron Age settlement can hardly be conclusive without such excavation. For the lead industry the only hope at the moment of obtaining further evidence would seem to lie with the site of Carsington. Further work here would be desirable (as indeed it would at all lead production centres in Britain). Similarly elucidation of the settlement at Buxton might add much to our picture of the economy. However, this is only likely to occur with any redevelopment of the modern town. Continuing exploration of the military vici, particularly to define the density and nature of their structures and therefore to refine population figures, would also be desirable. In particular the little explored settlement at Slack, on present evidence the centre of any economic growth in the north of the area, needs to be better understood.

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N.B. For abbreviations used throughout see p.iii. Certain works relevant only to Appendix 1 do not appear here but in the bibliographical footnotes to the Appendix; see p.407.

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Appendix 1: A Catalogue of Romano-British Lead Pigs

As noted in Chapter 8 (above p.213) it has been necessary to compile the following complete list of Roman lead pigs found in Britain. A brief description of the form of the pigs has been given above (p.227). Although a number of such catalogues have been published (Way 1859; Gowland 1901; Besnier 1920, 1921a, 1921b; Webster 1952/3; Tylecote 1962; Tylecote 1986) none is entirely satisfactory. Way, Gowland & Besnier are all out of date and in places inaccurate. Webster's work, while still useful on many points, was in some ways insufficiently detailed and is again somewhat out of date. Tylecote's list includes a number of errors, fails in places to take account of modern scholarship and, in the 1986 edition, is badly typeset making it useless in places.

The catalogue is arranged chronologically as far as possible for each area, with pigs for which no production area can be given with certainty at the end. Two Addenda are provided. Addendum 1 lists pigs, and selected inscribed fragments, some not from pigs, that are of dubious Roman attribution, for which few details are available, or which may be the result of re-smelting scrap lead. Addendum 2 lists pigs found abroad for which a British attribution is suggested or likely but unproven. Extensive footnotes to each entry critically survey the present state of thought

on a number of aspects of each pig. They also correct numerous errors in many of the early accounts (some of which have been perpetuated in more recent works) as far as possible. A full bibliography is provided for each pig, though in the interests of brevity many second and third-hand notices of certain pigs have been omitted since they add nothing to the accounts cited.

The presence or absence of stops in the inscriptions and the dimensions of the pigs are not considered in detail since the former has little bearing on date, origin etc. and the latter is only a function of the weight, the shape of pigs being relatively standard. Expansions have been provided for the inscriptions where possible, but it should be noted that only in a few cases can these be absolutely certain and in many cases variant expansions are possible (see further below p.493ff). References in the footnotes and in the main text to this catalogue take the following forms:

No.1 = Appendix 1 Pig No.1

No.ADD 1,1 = Appendix 1 Addendum 1 Pig No.1

No.ADD 2,1 = Appendix 1 Addendum 2 Pig No.1



Pig No.DetailsPigs Assignable to the Mendips1<sup>1</sup>Casting Date: 49.Findspot/Date: 'Near Wookey Hole;' <sup>2</sup> in the reign of  
Henry 8th. <sup>3</sup>Weight: Unknown. Present Location: Lost.Inscription: (?top; ?cast) TI CLAVD CAESAR AVG P M TR  
P VIII IMP XVI DE BRITAN <sup>4</sup>

---

TI(berius) CLAVD(ius) CAESAR AVG(uſtus) P(ontifex)M(aximus)  
TR(ibunicia) P(otestas) VIII IMP(erator) XVI DE BRITAN(nis).

---

Tiberius Claudius Casear Avgustus, Pontifex Maximus,  
Tribunicia  
Potestas (for the) 9th (time), Emperor (for the) 16th  
(time),  
from/of Britain.

Analysis: None.Other Comments: Possibly a trophy or inscription not a  
pig. <sup>5</sup>2<sup>6</sup>Casting Date: Late Claudian/Neronian. Possibly before 60. <sup>7</sup>Findspot/Date: Blagendon (or Charterhouse); 1853. <sup>8</sup>Weight: 161 lbs. (73 kg). Present Location: British  
Museum. <sup>9</sup>Inscriptions: (top; cast) BRITANNIC M AVG L [I] I <sup>10</sup>  
(front; stamped; inverted) V ET [PL C] <sup>11</sup>  
V ETPL C

---

BRITANNIC(a) M(etalla) AVG(usti) L(egionis) II V ETPL C

---

(from the) British mines of (?Claudius/?Nero) Augustus  
(?under the control of) the second Legion V ETPL C

Analysis: Cu 0.04; Sb 0.02; As 0.01%; Au trace; Ag 0.0423% <sup>12</sup>  
Cu 0.0147%; Sb 0.022%; As 0.035%; Ag 0.0423% <sup>13</sup>

3<sup>14,15</sup>

Casting Data: Neronian. Perhaps before 60.<sup>16</sup>

Findspot/Date: Edge of old harbour, St. Valéry-sur-Somme; 1883.

Weight: 165.34 lbs. (75 kg). Present Location: Musée des Antiq. Nat., St. Germain-en-Laye.

Inscription: (top; cast) NERONIS AVG BRITAN L II<sup>17</sup>

NERONIS AVG (usti) BRITAN(nica) (metalla) L(egionis) II

(from the) British (mines of) Nero Augustus (?under the control of) the second Legion.

Analysis: Cu 0.0222%; Sb 0.0145%; As 0.0103%; Bi  
0.0004%; Fe 0.0017%; Zn 0.0172%; Ni trace;  
Ag 0.028%<sup>18</sup>

4<sup>19,20</sup>

Casting Date: 60.

Findspot/Date: Nr. Bossington, south of Stocksbridge, Hants. (Just north of the Roman road from the Mendips to Old Sarum/Winchester); 1783.<sup>21</sup>

Weight: 166 lbs. (75.295 kg).<sup>22</sup> Present Location:  
British Museum.

Inscriptions: (top; cast; some letters conjoined)

NERONIS AVG EX K IAN IIII COS BRIT<sup>23</sup>

(front; cast) K IVL P M COS<sup>24</sup>

(back; incised) EX ARGENT<sup>25</sup> C N[I]PI ASCA[VI]<sup>26</sup>  
?XXX

NERONIS AVG (usti) EX K(alendis) IAN(uariis) III CO(n)

S(ulis) BRIT(annica) (metalla). (?ex) K(alendis)

IVL (iis) P(ontificis) M(aximi) CO(n)S(ulis). EX

ARGENT(ariis). C NIPI ASCANI<sup>27</sup> ?XXX

(from the) British (mines of) Nero Augustus, from the

1st of January Consul (for the) 4th (time). From  
 the 1st July Pontefex Maximus, Consul. (From the)  
 (lead-) silver mines/works. (of) C Nipius Ascanius.  
 ?30 (?libra overweight)

Analysis: Cu 0.034%; Sb 0.006%; Ag 0.0019%<sup>28</sup>

Cu 0.013; Sb 0.0164%; As 0.0038%; Ag 0.00182%<sup>13</sup>

5<sup>29</sup>

Casting Date: Vespasianic. Perhaps before 71.<sup>30</sup>

Findspot/Date: Rookery Farm, Green Ore (Mendips);  
 1956.

Weight: 187 lbs. (85 kg). Present Location:

Wells Museum.

Inscriptions: (top;cast) IMP VESPASIAN AVG

(front;cast) BRIT [E]X ARG V [EB]<sup>31</sup>

(end;stamped) LXV (and inverted) TI CL  
 TRIF

?(back;applied strips) V or Λ<sup>32</sup>

IMP(eratoris) VESPASIAN(i) AVG(usti). BRIT(annica)

EX ARG(entariis) VEB (????????). 65. TI(berii)

CL(audii) TRIF(?onis) or TRIF (?erno)<sup>33</sup>

?5

(of) Emperor Vespasian Augustus. (from the) British  
 (lead-) silver mines /works (of/at) Veb ...

(of) Tiberius Claudius ?Trifo or ?Triferno 65

(?libra overweight) ?5

Analysis: Ag nil.<sup>34</sup>

Other Comments: Found with nos.6-8. From the same  
 mould as 8.

6<sup>28</sup>Casting Date: As no.5.Findspot/Date: As no.5.Weight: As no.5. Present Location: As no.5.Inscriptions: (top;cast) IMP VESPASIAN [AV]G(front;cast) [B]RI [T EX A] RG [VEB]<sup>35</sup>(front;stamped;inverted) IMP<sup>36</sup>

(Back;stamped) TI CL TRIF TI CL TRIF

(end;stamped) TI C[L TRIF] TI C[L TRIF]<sup>37</sup>

As the first two lines of no.5 then IMP (?eratoris). TI  
(berii) CL (audii) TRIF (?onis) or TRIF (?erno)<sup>33</sup>

As the first two lines of no.5 then ?Imperial. (of)

Tiberius Claudius ?Trifo or ?Triferno.

Analysis: Ag 0.05%<sup>34</sup>

Other Comments: Found with nos. 5, 7 and 8.

7<sup>29</sup>Casting Date: As no.5.Findspot/Date: As no.5.Weight: 189.51 lbs. (86 kg) Present Location: As no.5Inscriptions: (top;cast) IMP VESPASIAN AVG(back;cast) [B]RI[T] EX AR[G]VEB<sup>38</sup>

(back;stamped) TI CL TRIF

(end;stamped) LXIX<sup>39</sup>((other) end; twice;superimposed) TI CL TRIF<sup>40</sup>(top rim; stamped) IMP<sup>41</sup>(back;applied strips) V<sup>42</sup>

As the first two lines of no.5 then TI(berii) CL(audii)  
 TRIF(?onis) or TRIF(?erno)<sup>33</sup> . 68.TI(berii) CL(audii)  
 TRIF(?onis) or TRIF(?erno)<sup>33</sup> IMP(?eratoris).

---

As the first two lines of no.5 then (of) Tiberius  
 Claudius ?Trifo or ?Triferno 68 (?libra overweight).(of)  
 Tiberius Claudius ?Trifo. ?Imperial.

Analysis: Ag trace.<sup>34</sup>

Other Comments: Found with nos. 5, 6 and 8.

<sup>8</sup><sup>29,43</sup> Casting Date: As no.5.

Findspot/Date: As no.5.

Weight: 197.5 lbs. (89.5 kg) Present Location: As no.5

Inscriptions: (top;cast) IMP VESPASIAN AVG  
 (front;cast) BRIT EX ARG VEB<sup>44</sup>  
 (end;stamped) LXXIIX LRAD<sup>45</sup>  
 (end;scratched) X<sup>46</sup>

---

As the first two lines of no.5 then 78. LRAD .?10

---

As the first two lines of no.5 then 78 (?libra overweight)  
 LRAD.?10

Analysis: Ag trace.<sup>34</sup>

Other Comments: Found with nos.5-7. From the same mould  
 as no.5.

<sup>9</sup><sup>47</sup> Casting Date: As no.5.

Findspot/Date: Bitterne (Clausentium); 1918.

Weight: 162 lbs. (73.5 kg)<sup>48</sup> Present Location: Lost<sup>49</sup>

Inscriptions: (top; cast) IMP VESPASIAN AVG  
 (front; cast) BRIT EX ARG VEB  
 (front; stamped; twice) SOC NO [VEG] or [VEC]<sup>50</sup>  
 (back; stamped) VIII<sup>51</sup>

---

As the first two lines of no.5 then ?SOC(iori) NOVEG(??) or  
 NOVEC(??).8.

---

As the first two lines of no.5 then (of) the Noveg ...  
 or Novec ... partners 8(?libra overweight)

Analysis: None.

Other Comments: Found with no.10.

10<sup>41</sup>

Casting Date: As no.5.

Findspot/Date: As no.9.

Weight: 174 lbs. (79 kg)<sup>52</sup> Present Location: Southampton  
 (private collection)<sup>53</sup>

Inscriptions: (top; cast) IMP VESPASIAN AVG  
 (front; cast) BRIT EX ARG VEB  
 (front; stamped) SOC NOVEG SOC NO VEG or SOC  
 NOVEC SOC NO VEC<sup>50</sup> XLVI<sup>54</sup>  
 (front and end; stamped) LRAD<sup>55</sup>

---

As the first two lines of no.5 then ?SOC(iori) NOVEG(??)  
 or NOVEC(??).46.LRAD

---

As the first two lines of no.5 then (of) the Noveg ...  
 or Novec ... partners.46 (?libre overweight).LRAD

Analysis: Ag 0.00046%.<sup>56</sup>

Other Comments: Found with no.9.

11<sup>57</sup>

Casting Date: As no.5.

Findspot/Date: Charterhouse; 1876.<sup>58</sup>

Weight: 171 lbs. (77.5 kg)<sup>59</sup>      Present Location: The  
Priory, Roehampton,  
London SW1.

Inscriptions: (top;cast) IMP VESPASIAN AVG<sup>60</sup>  
(front;cast) BRIT EX ARG VEB<sup>61</sup>

As the first two lines of no.5.

As the first two lines of no.5.

Analysis: None.

12<sup>62</sup>

Casting Date: As no.5.

Findspot/Date: Charterhouse; 1876.

Weight: 182 lbs. (82.5 kg)<sup>63</sup>      Present Location: Bristol  
Museum

Inscriptions: (top;cast) IMP VESPASIANI AVG

IMP(eratoris) VESPASIANI      AVG(usti)

Emperor Vespasian Augustus

Analysis: None.

13<sup>64</sup>Casting Date: As no.5.Findspot/Date: Charterhouse; c.1874.<sup>65</sup>Weight: Fragment only. Present Location: Lost.Inscription: (top;cast) IMP VESPASIA [NI AVG]<sup>66</sup>

As no.12.

As no.12.

Analysis: None.14<sup>67</sup>Casting Date: 79.Findspot/Date: Manor Farm, Syde, Cirencester; 1962.<sup>68</sup>Weight: 74.38 lbs. (79.1 kg). Present Location:

Cirencester Museum.

Inscriptions: (top;cast) IMP.VESP.AVG VIIII BRIT EX AR<sup>69</sup>  
 (left end; stamped; five times) C P C<sup>70</sup>  
 (front; stamped; transversely) SOC NOVE [G]<sup>71</sup>  
 or [C]

IMP(eratoris) VESP(asiani) AVG(usti) (consulis) VIIII  
 BRIT(annica) EX AR(gentariis).SOC(iori) NOVEG(??) or  
 NOVEC(??). ? C(aii) P(ublui) C(??)

(of) Emperor Vespasian Augustus Consul for the 9th time.

(from the) British (lead-)silver mines/works. (of the)

Noveg ... or Novec ... partners.

(of) ?Gaius Publius C(???)

Analysis: Cu 0.005%;Ag 0.00324%<sup>72</sup>



15<sup>73</sup> Casting Date: Hadrianic.  
Findspot/Date: Near Sydney Buildings, Bath; 1809.<sup>74</sup>  
Weight: 195 lbs. (88.5 kg).<sup>75</sup> Present Location: Baths  
 Museum, Bath.<sup>76</sup>  
Inscription: (top;cast) IMP HADRIANI AVG

---

IMP(eratoris) HADRIANI AVG(usti)

---

(of) Emperor Hadrian Augustus

Analysis: Ag 0.002%.<sup>28</sup>

15A Elkington (1976) No.18 lists another pig from Bath (from Claverton Down), citing Skinner (BM mss.33673, f.105), said to have been found in 1819. It weighed 'about 150 lbs.' and had the inscription (top;cast) IMP HADRIANUS AVG. It was apparently melted down. Although the details differ it seems strange that the only two Hadrianic Mendip pigs should be found so close together only ten years apart. More problematic is the inscription. HADRIANUS is unparalleled, all other Hadrianic pigs (a remarkably homogeneous group) have HADRIANI in the genitive. Therefore, though not rejecting it out of hand, a question mark must attach to this pig.

16<sup>77,78</sup> Casting Date: 138-61.

Findspot/Date: Banks of R. Frome, Wade St., Bristol;  
 1865.<sup>79</sup>

Weight: 76 lbs. (34.5 kg). Present Location:  
 80  
 British Museum.

Inscription: (top; cast) IMP CAES A[<sup>81</sup>NTO]NINI AVG PII P P

---

IMP(eratoris) CAES(aris) ANTONINI AVG(usti) PII P(ater)  
 P(atriae)

---

(from the British mines of) Emperor Caesar Antoninus  
 Augustus Pius, Father of his country.

Analysis: Cu 0.024%; Sb 0.019%; Ag 0.0034%<sup>28</sup> 13  
 Cu 0.0116%; Sb 0.032%; Ag 0.00271%

Other Comments: Found with No.17.V.C.H. says from the  
 same mould as No.17 but Tylecote  
 disagrees (see No.17).

<sup>17</sup><sup>82,78</sup> Casting Date: As no.16.

Findspot/Date: As no.16.

Weight: 89 lbs. (40.4 kg). Present Location: Bristol  
 Museum.

Inscription: As No.16.<sup>83</sup>

---

As no.16.

---

As no.16.

Analysis: Ag 0.0261%<sup>56</sup>

Other Comments: Found with no.16.V.C.H. suggests from  
 the same mould as no.16 but Tylecote  
 (1986) disagrees (probably wrongly)<sup>83</sup>  
 and attributes its lightness to a  
 sloping mould. It may be that the (flat)

mould was filled while lying at an angle  
but the mould itself was not irregular.

18<sup>84</sup>

Casting Date: As no.16.

Findspot/Date: Charterhouse; 1873.

Weight: 223 lbs. (101 kg). Present Location: The  
Priory, Roehampton,  
London SW15.

Inscriptions: (top; cast) IMP CAES ANTONINI AVG P[II] P P<sup>85</sup>  
86  
(end; cast) O 'grooved hammer' stamp  
87  
(end; cast) 'palm leaf'

---

As no.16 plus circle, 'grooved hammer' and 'palm leaf'

---

As no.16 " " " " " " "

Analysis: Ag 0.0027%<sup>28</sup>

19<sup>88</sup>

Casting Date: 164-9

Findspot/Date: Bruton (16 miles S.E. of Charterhouse);  
89  
1700-23.

Weight: 50 lbs. (22.7 kg).<sup>90</sup> Present Location: Lost.

Inscription: (top; cast; in two lines) IMP DVOR AVG  
ANTONINI ET VERI ARMENIACORVM

---

IMP(eratorum) DVOR(um) AVG(ustorum) ANTONINI ET VERI  
ARMENIACORVM

---

Of the two Emperors, Augustus Antoninus and Verus  
(called) the Armenian.

Analysis: None.

20<sup>91</sup>

Casting Date: As no.19.

Findspot/Date: Wells;c.1530.

Weight: Unknown. Present Location: Lost.

Inscription: ? As No.19.<sup>92</sup>

As no.19.

As no.19.

Analysis: None.

21<sup>93</sup>

Casting Date: As no.19.

Findspot/Date: Charterhouse; c.1874.<sup>65</sup>

Weight: Fragment only. Present Location: Taunton Museum.

Inscription: (top; cast; in two lines) [IMP DVOR AVG A]  
 NTONINI [ET VERI ARMENIA]CORVM

As no.19.

As no.19.

Analysis: None.

Other Comments: Not from the same pig as no.22.<sup>94</sup>

22<sup>93</sup>

Casting Date: As no.19.

Findspot/Date: As no.21.

Weight: Fragment only. Present Location: As no.21.

Inscription: (top; cast; in two lines) [IMP DVOR AV]G  
 [ANTONINI ET VERI AR] MENIA [CORUM]

As no.19.

As no.19.

Analysis: None.

Other Comments: Not from the same pig as no.21. <sup>94</sup>

23<sup>95</sup> Casting Date: ?Roman <sup>96</sup>  
Findspot/Date: Charterhouse; 1822.  
Weight: c.100 lbs. (45 kg). Present Location: Lost.  
Inscription: ? DB or OB. <sup>96</sup>  
Analysis: None.

24<sup>95</sup> Casting Date: As no.23.  
Findspot/Date: As no.23.  
Weight: c.150 lbs. (68 kg). Present Location: As no.23.  
Inscription: As no.23.  
Analysis: None.

25<sup>95</sup> Casting Date: As no.23.  
Findspot/Date: As no.23.  
Weight: c.200 lbs. (90 kg). Present Location: As no.23.  
Inscription: As no.23.  
Analysis: None.

26<sup>97</sup> Casting Date: As no.23.  
('several'  
pigs) Findspot/Date: As no.23.  
Weight: Unknown. Present Location: As no.23.  
Inscription: None.  
Analysis: None.

Other Comments: It is conceivable that these pigs are  
identical to nos.23-5 but it is

sufficiently likely that they are  
separate to list them.

Figs Assignable to Derbyshire27<sup>98</sup>Casting Date: Pre-Hadrianic<sup>99</sup>Findspot/Date: Yeaveley, Derbyshire; 1975.Weight: 131 lbs. (59.4 kg). Present Location: Derby  
Museum.Inscriptions: (top;cast) SOCIORVM LVTVD<sup>100</sup>  
(front;cast) BRIT EX ARG

---

SOCIORUM LVTVD (arensium) BRIT(annica) EX ARG(entariis)

---

(of the) Lutudarum partners. (from the) British  
(lead-) silver mines/works.Analysis: None.Other Comments: Found with no.28.<sup>101</sup>28<sup>98</sup>Casting Date: As no.27.Findspot/date: As no.27.Weight: 137 lbs. (62.1 kg). Present Location: As no.27.Inscriptions: As no.27.<sup>102</sup>

---

As no.27.

---

As no.27.

Analysis: None.Other Comments: Found with no.27.<sup>101</sup>

29<sup>103</sup>Casting Date: As no.27.Findspot/Date: Hexgrave Park, nr. Mansfield; 1848.Weight: 184 lbs. (83.5 kg). Present Location: British  
Museum.Inscription: (top;cast) C IVL PROTI BRIT LVT EX ARG <sup>104</sup>

---

C IVL(ii) PROTI(i) BRIT(?annica) LVT(?udarensis) EX ARG  
(entariis)

---

(of) C. Iulius Protius. ??(from the)British (lead-)  
silver works (of/at) Lutudarum

Analysis: Cu 0.008%; Ag 0.0082% <sup>28</sup>  
Cu 0.0028%; Ag 0.01026%; Sh 0.001%; Sb 0.0053% <sup>13</sup>

Other Comments: From the same mould as nos.30-33.30<sup>105</sup>Casting Date: As no.27.Findspot/Date: Rowdales, S. Cave, Brough-on-Humber  
(Petuaria); 1890.Weight: 133 lbs 5 ozs. (60.46 kg) but Present Location:  
<sup>106</sup>  
incomplete. Hull Museum.Inscription: As no.29.

---

As no.29.

---

As no.29.

Analysis: Cu 0.0037%; Sb 0.0089%; Fe 0.0032%; Ni 0.0002%;  
<sup>107</sup>  
Zn trace; Ag 0.0082%

Other Comments: From the same mould as nos.29 and 31-33.



31<sup>108</sup>Casting Date: As no.27.Findspot/Date: Brough-on-Humber (Petuaria); 1940.Weight: 190 lbs. 5 ozs. (86.3 kg) <sup>109</sup> Present Location:  
but slightly damaged. As no.30.Inscription: As no.29.

---

As no.29.

---

As no.29.Analysis: Cu 0.0062%; Sb 0.01%; Fe 0.003%; Ni 0.0017%;  
Zn 0.0247%; Ag 0.0104% <sup>107</sup>Other Comments: From the same mould as 29, 30, 32 and  
33. Found with nos.32-35.32<sup>108</sup>Casting Date: As no.27.Findspot/Date: As no.31.Weight: 191 lbs. 11 ozs. (87 kg). Present Location:  
As no.30.Inscription: As no.29.

---

As no.29.

---

As no.29.Analysis: Zn 0.0323%; Ag 0.0066% <sup>107</sup>Other Comments: From the same mould as 29-31 and 33.  
Found with nos.31 and 33-35.

33<sup>108</sup>Casting Date: As no.27.Findspot/Date: As no.31.Weight: 196 lbs. 4 ozs. (89 kg). Present Location:  
As no.30.Inscription: As no.29.

As no.29.

As no.29.

Analysis: Cu 0.0038%; Sb 0.0049%; Fe 0.0015%; Ni 0.0009%;  
Zn 0.009%; Ag 0.0056%<sup>107</sup>Other Comments: From the same mould as 29-32. Found  
with 31, 32, 34 and 35.34<sup>108</sup>Casting Date: ?As no.27.<sup>110</sup>Findspot/Date: As no.31.Weight: 80 lbs. 11 ozs. (36.6 kg). Present Location:  
?In private hands.Inscription: None.Analysis: Cu 0.0025%; Sb 0.0024%; Fe 0.0025%;  
Ni 0.0008%; Zn 0.0128%; Ag 0.0068%<sup>107</sup>Other Comments: Found with nos.31-3 and 35.

35<sup>108</sup>Casting Date: As no.27.Findspot/Date: As no.31.Weight: 193 lbs. 4 ozs. (87.7 kg). Present Location:As no.30.  
112Inscription: (top;cast) SOC LVT BRIT EX ARG

---

SOC(iorum) LVT(udarensium) BRIT(annica) EX ARG(entariis)

---

As no.27.

Analysis: Cu 0.0038%; Sb 0.0216%; Fe 0.0042%;  
107

Ni 0.001%; Zn 0.0137%; Ag 0.0068%

Other Comments: Found with nox.31-4. ?From the same  
115  
mould as No.36.36<sup>113</sup>Casting Date: As no.27.Findspot/Date: Brantingham, Ellerker (½ mile N. Brough-  
on-Humber); 1957.Weight: 175 lbs. 4 ozs. (79.5 kg). Present Location:  
114

but damaged.

As no.30.  
112,115Inscription: SOC LVT B [R] IT EX ARG

---

As no.35.

---

As no.35.

Analysis: None.Other Comments: ?From the same mould as No.35. 116

37<sup>117</sup>Casting Date: As no.27.Findspot/Date: Matlock; 1787.Weight: 173 lbs. (78.47 kg). Present Location: Lost.Inscription: (top;cast) TI CL TR LVT BR EX ARG

---

TI(berii) CL(audii) TR(?ifonis)<sup>33</sup> LVT(udarensia)  
or TR(?iferno)  
BR(itannica) EX ARG(entariis).

---

(of) Tiberius Claudius ?Trifonis or ?Triferno.

??(from the) British (lead-) silver works (of/at)

Lutudarum (or similar, cf Appendix 2).

Analysis: None.38<sup>120</sup>Casting Date: As no.27.Findspot/Date: Pulborough, Sussex; 1824.Weight: 184 lbs. (83.46 kg). Present Location: British  
Museum.INSCRIPTION: (top;cast) [TI] C[L T]R LVT BR EX ARG<sup>121</sup>

As no.37.

As no.37.

Analysis: Cu 0.017%; Ag 0.0034%<sup>28</sup>Cu 0.0047%; Sv 0.0347%; Sn 0.6%; Ag 0.0041%<sup>13</sup>Other Comments: Found with nos.39-41.

39<sup>120</sup>Casting Date: As no.27.Findspot/Date: As no.38.Weight: Unknown. Present Location: Lost. <sup>122</sup>Inscription: As no.37.

---

As no.37.

---

As no.37.Analysis: None.Other Comments: Found with nos.38, 40 and 41.40<sup>120</sup>Casting Date: As no.27.Findspot/Date: As no.38.Weight: Unknown. Present Location: Lost.Inscription: As no.37.

---

As no.37.

---

As no.37.Analysis: None.Other Comments: Found with nos.38, 39 and 41.

31<sup>120</sup>Casting Date: As no.27.Findspot/Date: As no.38.Weight: Unknown. Present Location: Lost.Inscription: As no.37.

---

As no.37.

---

As no.37.Analysis: None.Other Comments: Found with nos.38-40.42<sup>123</sup>Casting Date: As no.27.<sup>124</sup>Findspot/Date: Faxfleet B Quarry, Broomfleet (4m. W.  
of Brough-on-Humber); 1967.Weight: 175 lbs. (79.4 kg). Present Location:  
<sup>125</sup>  
Hull Museum.Inscription: (top;cast) SOC [IO] R LV [T] BR EX AR [G]<sup>126</sup>

---

SOCIOR(um) LVT(udarensium) BR(itannica) EX ARG(entariis)

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As no.27.Analysis: None.

43<sup>127,128</sup> Casting Date: As no.27.

Findspot/Date: Belby (10½ miles west of Brough-on-Humber); 1910.

Weight: c.112 lbs. (c.51 kg).<sup>129</sup> Present Location:  
Destroyed.

Inscription: (top;cast)<sup>130</sup> SOCIOR L[V]T BR EX ARG<sup>131</sup>

---

As no.42.

---

As no.42.

Analysis: None.<sup>132</sup>

44<sup>133</sup>

Casting Date: As no.27.

Findspot/Date: Churchover (Tripontium), Warwickshire;  
1966.

Weight: 172 lbs. 8 ozs. (78.3 kg). Present Location:  
Warwickshire  
Museum<sup>134</sup>

Inscription: (top;cast)<sup>112</sup> SOCIOR LVT BR EX ARG

---

As no.42.

---

As no.42.

Analysis: Cu 0.0083%; Sb 0.016%; Ag 0.0063%<sup>135</sup>

45<sup>136</sup>Casting Date: Hadrianic.Findspot/Date: Cromford Nether Moor, Wirksworth; 1771. <sup>137</sup>Weight: 127 lbs (57.6 kg). Present Location:

British Museum.

Inscription: (top;cast) IMP CAES HADRIANI AVG MET LVT <sup>138</sup>


---

 IMP(eratoris) CAES(aris) HADRIANI AVG(usti) MET(alla)  
 LVT(udarensia)
 

---

(from the) Lutudarum mines (of) Emperor Caesar Hadrian Augustus

Analysis: Cu 0.02%; Sb 0.012%; Ag 0.006% <sup>28</sup>Cu 0.087%; Sb 0.0056%; Ag 0.0082% <sup>13</sup>46<sup>139,140</sup>Casting Date: Unknown but probably Hadrianic. <sup>141</sup>Findspot/Date: Castleton, Derbyshire; before 1802 <sup>142</sup>Weight: Unknown. Present Location: LostInscription: (top;cast) IMP [?CAES HADRIANI AVG MET LVT] <sup>141</sup>


---

 ?As no.45.
 

---

?As no.45.

Analysis: None.



47<sup>143</sup>Casting Date: Unknown.Findspot/Date: Tansley Moor by Matlock; 1894.Weight: 176 lbs. (80 kg).<sup>144</sup> Present Location:

British Museum.

Inscription: (top; cast; many of the letters conjoined)<sup>145</sup>

P RVBRI ABASCANTI METALLI LVTVDARES

P RUBRI ABASCANTI METALLI LVTVDARE(n)S(is)

(?property of) P Rubri Abascanti. From the Lutudarum mine.

Analysis: Cu 0.0059%; Sb 0.0026%; Ni 0.0022%;Ag 0.0025%.<sup>107</sup> Cu 0.0048%; As 0.0005%;Ag 0.0035%; Sn 0.00004%; Sb 0.00447%<sup>13</sup>48<sup>146</sup>Casting Date: Unknown.Findspot/Date: Matlock Moor (or Bank); 1783.<sup>147</sup>Weight: 83/4 lbs. (37/8 kg)<sup>148</sup> Present Location:

British Museum.

Inscription: (top; cast; many of the letters conjoined)<sup>149</sup>

L ARVCONI VERECVNDI METAL LVTVD

L ARVCONI VERECVNDI METAL(li) LVTVD(arensis)

(?property of) L Arvconi Verecundi. From the Lutudarum mine.

Analysis: Cu 0.022%; Sb 0.008%; Ag 0.0035%<sup>28</sup>

- 49<sup>150</sup> Casting Date: Roman (?Third Century).<sup>151</sup>  
Findspot/Date: Carsington, Derbyshire; 1946.  
Weight: 144 lbs. (65.32 kg).<sup>152</sup> Present Location:  
 Owslow Farm,  
 Carsington.<sup>153</sup>  
Inscription: (base; incised) CCX or IIX<sup>154</sup>
- 
- CCX or IIX
- 
- 210 or 8 (?libra overweight)  
Analysis: None.
- 50<sup>155</sup> Casting Date: Roman.<sup>156</sup>  
Findspot/Date: Cromford Churchyard, Derbyshire; 1919  
Weight: ?c.112 lbs + (50.8 kg).<sup>157</sup> Present Location:  
 Lost.<sup>158</sup>
- Inscription: XXX<sup>159</sup>
- 
- XXX
- 
- 30 (?libra overweight)  
Analysis: None.
- 51 Casting Date: As No.50.  
Findspot/Date: As No.50.  
Weight: As No.50. Present Location: As No.50.  
Inscription: XV<sup>159</sup>
- 
- XV
- 
- 15 (?libra overweight)  
Analysis: None.

- 52<sup>160</sup> Casting Date: Roman. <sup>161</sup>  
Findspot/Date: Bradwell, Derbyshire; 1891. <sup>162</sup>  
Weight: 106 lbs. (48 kg). <sup>163</sup> Present Location:  
 Sheffield Museum.  
Inscription: None.  
Analysis: Cu 0.0045%; Antimony 0.0004%; Fe 0.0008%;  
 Nickel 0.0005%; Zn trace; Ag 0.0034% <sup>164</sup>
- 53<sup>165</sup> Casting Date: Roman. <sup>161</sup>  
Findspot/Date: Oker Hill, nr. Matlock, Derbyshire; 1846.  
Weight: Unknown. Present Location: Lost.  
Inscription: None.  
Analysis: None.
- 54<sup>167</sup> Casting Date: ?Fourth Century. <sup>168</sup>  
Findspot/Date: Carsington, Derbyshire; 1983.  
Weight: 124 lbs (56.5 kg). <sup>169</sup> Present Location:  
 Buxton Museum. <sup>170</sup>  
Inscription: None.  
Analysis: None.  
Other Comments: Irregular and rough. From the same  
 mould as and found with No.55.
- 55<sup>167</sup> Casting Date: As No.54.  
Findspot/Date: As No.54. <sup>169</sup>  
Weight: 102 lbs (46.3 kg). Present Location:  
 as No.54.  
Inscription: None.  
Analysis: None.  
Other Comments: Irregular and rough. From the same  
 mould as and found with No.54.

Pigs Assignable to Flintshire56<sup>171</sup>

Casting Date: Unknown but perhaps ?mid 60s.<sup>172</sup>  
Findspot/Date: Carmell, nr. Holywell, Flintshire; 1950.  
Weight: 134 lbs 8 ozs (61 kg). Present Location:  
 National Museum of  
 Wales, Cardiff.<sup>173</sup>  
Inscription: (top;cast) C NIPI ASCANI

---

C NIPI ASCANI<sup>27</sup>

---

(? property of) C Nipius Ascanius

Analysis: Ag 0.0037%<sup>174</sup>

57<sup>175,176</sup>

Casting Date: 74.

Findspot/Date: Nr. Tarvin Bridge, Gt. Broughton, nr.  
 Chester; 1838.

Weight: 177 lbs 15 ozs (80.7 kg).<sup>177</sup> Present Location:  
 Grosvenor Museum,  
 Chester.<sup>178</sup>

Inscriptions: (top;cast) IMP VESP AVG  $\bar{V}$  T IMP III<sup>112,179</sup>  
 (front;cast) DECEANGL<sup>180</sup>  
 (front; ?stamped) ?grooved hammer stamp<sup>181</sup>

---

IMP(eratoris) VESP(asiani) AVG(usti) T(iti) IMP(eratoris)  
 III DECEANGL(icum) (plumbum) or DECEANGL(icum)  
 (metallum)<sup>182</sup> ?grooved hammer stamp

---

Vespasian, Emperor (for the) 5th (time). Titus,  
 Emperor (for the) 3rd (time). Deceanglian (lead) or  
 (from the) Deceanglian (mines). ?grooved hammer stamp

Analysis: As 0.0026%<sup>183</sup>

58<sup>184</sup>Casting Date: 74.Findspot/Date: Roodee, Chester; <sup>185</sup> 1886.Weight: 190 lbs 3 ozs (86.3 kg). <sup>186</sup> Present Location:

As no.57.

Inscriptions: (top;cast) IMP VESP [A] VG V [T] IMP III CO [S] <sup>112,187</sup>  
<sup>188</sup>  
(front;cast) DECEANGL

As no.57.

As no.57.

Analysis: Ag 0.0026% <sup>189</sup>59<sup>190</sup>Casting Date: 76.Findspot/Date: Hints Common, Staffs; 1771. <sup>191</sup>Weight: 150 lbs 8 ozs (68.3 kg). <sup>192</sup> Present Location:

British Museum.

Inscriptions: (top;cast; 1st & 5th elements conjoined)

IMP VESP VII T IMP V COS

(front;cast) DECEA [N]G [L] <sup>193</sup>

IMP(eratoris) VESP(asiani) VII T(iti) IMP(eratoris)

V CO(n)S(ulis) Then as no.57.

Vespasian, Emperor (for the) 7th (time). Titus,

Emperor (for the) 5th (time). Consuls. Then as no.57.

Analysis: Cu 0.035%; Sb 0.006%; Ag 0.0022% <sup>194</sup>Cu 0.0198%; Sb 0.0069%; Ag 0.0028% <sup>13</sup>Other Comments: Found near to no.60. From the same  
mould as no.60.

60<sup>195</sup>Casting Date: 76.Findspot/Date: As no.59 (but known as 'the Tamworth  
196  
pig'); c.1830.Weight: c.150 lbs (68 kg). <sup>197</sup> Present Location:  
Tamworth CastleInscriptions: (top;cast) As no.59. <sup>198</sup>  
(front;cast) DECEANGL

As no.59.

As no.59.

Analysis: Cu 0.035%; Sb 0.0136%; Ni 0.001%; Fe trace;  
<sup>199</sup>  
Zn trace; Ag 0.0017%Other Comments: Found near to no.59. From the same  
mould as no.59.

200,201

61,  
'several  
pigs'Casting Date: 76.Findspot/Date: Halton Castle/Runcorn, Cheshire Coast;  
<sup>202</sup>  
before 1590.Weights: Unknown. Present Location: Lost. <sup>203</sup>Inscriptions: (top;cast) As no.59. <sup>204</sup>  
?(?front; cast) As no.60.

As no.59.

As no.59.

Analysis: None.

62<sup>200,201</sup>  
'several pigs'

Casting Date: 84-96.

Findspot/Date: As no.60.

Weights: Unknown.      Present Location: Lost.

Inscriptions: (top;cast) IMP DOMIT AVG GER  
(?front; cast) DECEANG [L]

---

IMP(eratoris) DOMIT(iani) AVG(usti) GER(manici)  
Then as no.57.

---

Emperor Domitian Augustus Germanicus

Then as no.57.

Analysis: None.

Other Comments: Found with no.61.

63<sup>205</sup>

Casting Date: Unknown. <sup>206</sup>

Findspot/Date: Commonhall St., Chester; 1849.

Weight: 164 lbs 1½ ozs (74.4 kg). <sup>207</sup> Present Location:

Grosvenor Museum  
178  
Chester.

Inscription: (top;cast) CAESARI [?S.....] NI[.]VADON <sup>112,206</sup>

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See note 166.

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See note 166.

Analysis: Ag 0.0019% <sup>28,183</sup>

Pigs Assignable to Yorkshire64<sup>208</sup>Casting Date: 81.Findspot/Date: Hayshaw Moor, Dacre, W. Yorks; 1735. <sup>209</sup>Weight: 156 lbs (70.8 kg). <sup>210</sup> Present Location:

British Museum.

Inscriptions: (top; cast; letters in 3rd-5th elements  
conjoined)

IMP CAES DOMITIANO AVG COS VII

??? (front; stamped) BRIG <sup>211</sup>(front; stamped) 'grooved hammer' stamp <sup>212</sup>IMP(eratori) CAES(ari) DOMITIANO AVG(uste) CO(n)S(uli)  
VII BRIG(anticum) (plumbum) or BRIG(anticum) (metallum)  
'grooved hammer' stampEmperor Caesar Domitian Augustus, Consul (for the) 7th  
(time) Brigantian (lead) or (from the) Brigantian (mines)  
'grooved hammer' stampAnalysis: Cu 0.014%; Sb 0.007%; Ag 0.00328% <sup>28</sup>Other Comments: Found with no.65. Probably from the  
same mould as no.65.



65<sup>213</sup>Casting Date: As no.64.Findspot/Date: As no.64.Weight: 155 lbs (70.3 kg).<sup>210</sup>Present Location:Ripley Castle, N. Yorks.<sup>214</sup>Inscriptions: (top; cast; letters in 3rd-5th elements  
conjoined)IMP CAES DO[MI]TIANO AVG COS VII<sup>215</sup>

(front; stamped) BRIG

As No.64.

As No.64.

Analysis: Cu 0.014%; Sb 0.007%; Ag 0.0066%<sup>28</sup>Cu 0.019%; Sb 0.0096%; Ag 0.0084%<sup>13</sup>Other Comments: Found with no.64. Probably from the  
same mould as no.64.66<sup>216</sup>Casting Date: Trajanic.Findspot/Date: Moor nr. Patley Bridge, Yorks; before 1885.<sup>217</sup>Weight: ?c.85 lbs (c38.5 kg).<sup>218</sup> Present Location: Lost.Inscription: (?top; ?cast) TRAJAN (? [IMP] TRAJAN [AVG])<sup>219</sup>

?IMP(eratoris) TRAJAN(i) AVG(usti)

?Emperor Trajan Augustus

Analysis: None.

67<sup>220</sup>Casting Date: Hadrianic.Findspot/Date: Hurst Mines, Swaledale; c.1847.<sup>221</sup>Weight: 70 lbs (77.1 kg). Present Location: Lost.<sup>222</sup>Inscription: (?top;?cast) [H]ADRIAN (? [IMP H]ADRIAN [I  
AVG]<sup>223</sup>)

---

?IMP(eratoris) HADRIANI AVG(usti)

---

?Emperor Hadrian Augustus

Analysis: None.

Pigs Assignable to Shropshire68<sup>224,225,226</sup>Casting Date: Hadrianic.Findspot/Date: Near Bishops Castle, Shropshire;  
225  
1767.Weight: 190 lbs 6 ozs (86.4 kg).Present Location:

Netley Hall, Shrops. 227

Inscriptions: (top; cast) IMP HADRIANI AVG 228  
(top rim; stamped; twice) MINB  
(sides; cast) 'palm leaf' 229  
(sides; stamped; three times)  
'grooved hammer' stamp. 229

---

IMP(eratoris) HADRIANI AVG(usti). MINB. 'palm  
leaf.' 'hammer'

---

.Emperor Hadrian Augustus. MINB. 'palm leaf'

'hammer'

Analysis: Ag 0.0082%<sup>28</sup>

69<sup>230,226</sup>Casting Date: As no.68.Findspot/Date: 'The Roveries,' Snead, Shropshire;  
1851.Weight: 190 lbs (86.2 kg).<sup>231</sup> Present Location:  
Liverpool Museum.Inscription: (top;cast) As No.68.  
(end;cast) 'palm leaf'<sup>232</sup>

---

IMP(eratoris) HADRIANI AVG(usti). 'palm leaf'

---

Emperor Hadrian Augustus. 'palm leaf'

Analysis: Ag 0.0079%<sup>28</sup>70<sup>233,234,</sup>  
226Casting Date: As no.68.Findspot/Date: Minsterley, Shropshire; 1851.Weight: 173 lbs (78.5 kg). Present Location: Lost.Inscription: (top;cast) As no.68.

---

As no.69.

---

As no.69.

Analysis: None.

71<sup>235,234</sup>Casting Date: As no.68.Findspot/Date: Snailbeach Farm, Minsterley,  
Shropshire; 1796.Weight: 193 lbs (87.6 kg).<sup>236</sup> Present Location:  
British Museum.Inscriptions: (top;cast) As no.68.(back;cast) 'palm leaf'<sup>229,237</sup>(end; stamped) SN<sup>238</sup>

---

As no.66. 'palm leaf.' S(?ta)N(num)?

---

As no.66. 'palm leaf' ?? lead from lead/silver ore ??Analysis: Cu 0.038%; Sb 0.004%; Ag 0.007%<sup>2</sup>Cu 0.0269%; Sb 0.0038%; Ag 0.0093%<sup>13</sup>

Pigs Not Assignable To Any Area72<sup>239,240</sup>Casting Date: Hadrianic.Findspot/Date: Theobalds Park, Cheshunt; ????<sup>240</sup>Weight: 185 lbs (84 kg). Present Location:

British Museum.

Inscriptions: (top; cast) IMP CAES HADRIANI AVG<sup>241</sup>  
(front; incised) LAV XX or PM XX<sup>242</sup>

IMP(eratoris) CAES(aris) HADRIANI AVG(usti).

LAV or P(?lumbum) M(?etallum) XX

Emperor Cesar Hadrian Augustus.

LAV or ?(from the) lead mines 20 (?libra  
overweight)Analysis: Cu 0.035%; As 0.0013%; Sb 0.0053%;  
Ag 0.00256%<sup>13</sup>73<sup>243,240</sup>Casting Date: Nervan.<sup>244</sup>Findspot/Date: Richborough, Kent; 1922/3.Weight: Fragment only. Present Location:Dover Castle.<sup>245</sup>Inscription: (top; cast) IMP NERVAE CA[ES]<sup>246</sup>

IMP(eratoris) NERVAE CAES(aris)

(of) Emperor Nerva Caesar

Analysis: None.

247

Addendum 1 Pigs of Dubious Date/Authenticity; 'Pigs' of ?Re-  
Smelted Scrap Lead; Selected Inscribed Objects/Possible  
Fragments of Pigs

i) Dubious Date/Authenticity

<sup>1</sup>248,249 Findspot/Date: Flint Castle; 1849.

Weight: Unknown. Present Location: Lost.

Inscription: None. Analysis: None.

<sup>2</sup>250,251 Findspot/Date: Wirksworth; ?Nineteenth Century.

Weights: Unknown. Present Location: Lost.

Inscription: None. Analysis: None.

<sup>3</sup>252,253 Findspot/Date: Saham, Norfolk; c1809.

Weight: Unknown. Present Location: Lost.

Inscription: None. Analysis: None.

<sup>4</sup>254,255 Findspot/Date: Charterhouse; c.1875.

Weight: 78 lbs (35.4 kg). Present Location: ?Lost.

Inscription: None. Analysis: None.

256

ii) 'Pigs' of Re-Smelted Lead ?

<sup>5</sup>257,258 Production Area: Unknown.

Findspot/Date: Camelon, R. Carron, nr. Falkirk,  
 Scotland; before 1849.

Weight: Unknown. Present Location: Lost.

Inscription: None. Analysis: None.

6<sup>259,260</sup>Production Area: Unknown.Findspot/Date: Kirkintulloch, Dunbartonshire; c.1826.Weight: Unknown. Present Location: Lost.Inscription: (top;?stamped) CCLXX<sup>261</sup> ?270 (?libra)Analysis: None.7<sup>262,263</sup>Production Area: Unknown.Findspot/Date: Roman fort at Bertha, R. Almond,  
Perthshire;<sup>264</sup> 1774.Weight: 73 lbs (33.1 kg). Present Location: Lost.Inscription: (?stamped) X J<sup>II</sup> XXXX<sup>265</sup>Analysis: None.8<sup>266,267</sup>Production Area: ?Flintshire.<sup>268</sup>Findspot/Date: Caerhun; 1928.Weight: Unknown. Present Location: ?Lost.<sup>269</sup>Inscription: None. Analysis: Ag 0.00418%<sup>270</sup>9<sup>271,272</sup>Production Area: ?S. Wales.<sup>273</sup>Findspot/Date: Prysge Field, Caerleon; 1927/9.Weight: Unknown. Present Location: Caerleon Museum.Inscription: (stamped) LEG II AVG

---

LEG(io) II AVG(usta)

---

(?Property of) the second legion Augusta

Analysis: None.



10<sup>274</sup> Production Area: ?S. Wales.<sup>273</sup> Date: ?Third  
Century<sup>275</sup>

Findspot/Date: Caerwent; 1947.

Weight: 37 lbs (16.8 kg) fragment. Present

Location: Nat. Museum of Wales, Cardiff.

Inscription: (top; cast; parallel to end)

[L] EG II AVG<sup>276</sup>

---

As no.9.

---

As no.9.

Analysis: None.

iii) Inscribed Objects/?Pig Fragments

11<sup>277</sup> Production Area: ?Derbyshire.<sup>279</sup> Date: ?Pre-Hadrianic.<sup>280</sup>  
(?pig) fragment<sup>278</sup> Findspot/Date: Brough-on-Humber (Petuaria);

before 1730.

Weight: Unknown.<sup>281</sup> Present Location: Lost.

Inscription: (stamped) B R EX AR[G]<sup>282</sup>

---

BR(?itannica) (?metalla) EX ARG(entariis)

---

(from the) British (mines). From the (lead-) silver mines/works.

Analysis: None.

12<sup>283</sup>  
small  
fragment

Production Area: ?Mendips.<sup>284</sup>      Date: Unknown.  
Findspot/Date: ?Lidney Park, Gloucestershire; c.1805.  
Weight: Unknown.      Present Location: Lost.  
Inscription: (stamped; twice) DOCCIVSF<sup>285</sup>

---

?

---

?

Analysis: None.

13<sup>286</sup>  
water  
pipe

Production Area: Flintshire.      Date: 79.  
Findspot/Date: Eastgate St., Chester; 1889-90.  
Weight: ?<sup>287</sup>      Present Location: Grosvenor  
Museum, Chester.  
Inscription: (cast) IMP.VESP VIII T.IMP.VII<sup>288</sup> COS.  
CN IVLIO. AGRICOLA LEG.AVG.PR.PR

---

IMP(eratoris) VESP(asiani) VIII T(iti) IMP(eratoris)  
VII CO(n)S(ulis) CN(aius) IVLIO(s) AGRICOLA  
LEG(atus) AVG(usti) PR(o) PR(aetor)

---

Vespasian, Emperor (for the) 9th (time). Titus,  
Emperor (for the) 7th (time). Consuls. Gnaeus  
Julius Agricola, Pro Praetorian Legate (had this  
laid)

Analysis: Ag 0.0017%<sup>289</sup>

Other Comments: Identical to and ?from same mould  
as No.14.

14<sup>286</sup>  
water  
pipe

Production Area: As No.13. Date: As No.13.

Weight: As No.13. Present Location: As No.13.

Inscription: As No.13 but initial letters missing.

---

As No.13.

---

As No.13.

Analysis: None.

Other Comments: Identical to and ?from the same  
mould as No.13.

15<sup>290</sup>  
water  
pipe

Production Area: As No.13. Date: As No.13.

Weight: As No.13. Present Location: As No.13.

Inscription: As No. 13 but first two elements lost.

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As No.13.

---

As No.13.

Analysis: None.

Other Comments: Pipe bore and lettering size  
greater than Nos.13 and 14.

Addendum 2 Pigs Found Outside Britain and Possibly  
To Be Attributed To Britain

Note: This addendum does not purport to be an exhaustive catalogue and includes only those items for which a British origin seems reasonably likely or has been repeatedly suggested. Whilst a complete review of the source of all known finds within the empire is long overdue it is beyond the scope of the present work and the pigs listed here are only those documented in English sources or notified to the author by Michele L'Hour, to whom I would like to record my particular thanks.

<p><sup>1</sup>291 Fragment. ?Not certainly from a pig.</p>	<p><u>Production Area</u>: Unknown. <sup>292</sup> <u>Date</u>: Unknown. <sup>293</sup>  <u>Findspot/Date</u>: Achlum, Holland; Before 1906.  <u>Weight</u>: Fragment. <u>Present Location</u>: Leeuwarden  Museum (Pays-Bas) Holland.  <u>Inscription</u>: (?stamped) P XXX</p> <hr/> <p>P(?ondo) XXX</p> <hr/> <p>30 (libra) ?Overweight  <u>Analysis</u>: None.</p>
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2<sup>294</sup>

Production Area: Unknown - Possibly British. <sup>295</sup>  
Date: 194-8 or 198-211. <sup>296</sup>

Findspot/Date: Lillebonne (Seine Inferieure), France; 1840.

Weight: 95.9 lbs. (43.5 kg) fragment. <sup>297</sup> Present Location:  
 Rouen Museum.

Inscription: (front; cast; in two lines)

I[MP CAES] L [SEPT SEVERI]

[PERTI] NACIS AVG PA [RTHICI ADIABENICI]  
 or [RTHICI ARABICI] 198,299  
 or [RTHICI MAXIMI]

IMP(eratoris) CAES(aris) L(ucii) SEPT(imii) SEVERI  
 PERTINACIS AVG(usti) PARTHICI ADIABENICI or ARABICI or  
 MAXIMI

(of the) Emperor Caesar Lucius Septimius Severus  
 Pertinax Augustus (conqueror of the) Parthian Adiabeni  
 or Parthian Arabs or All of Parthia.

Analysis: None.

3<sup>300</sup>

Production Area: As No.2. Date: 194-8 <sup>301</sup>

Findspot/Date: Sassenay nr. Chalon-sur-Saone (Saone et  
 Loire); 1855.

Weight: 190.25 lbs. (86.3 kg). Present Location:

Chalon-sur-Saone Museum

Inscriptions: (front; cast; in two lines)

[IMP CAES L SEPT SEVERI]

[?PERTINACIS] AVG PARTICI ADIABENICI <sup>302,299</sup>

(?top or side; stamped) DL'P LVICVC L VICVC

IMP(eratoris) CAES(aris) L(ucii) SEPT(imii) SEVERI  
 PERTINACIS AVG(usti) PART(h)ICI ADIABENICI then DL'P  
 LVICVC L VICVC<sup>303</sup>

---

(of the) Emperor Caesar Lucius Septimius Severus  
 Pertinax Augustus (conqueror of the) Parthian Adiabeni  
 DL'P LVICVC LVICVC

Analysis: None.

4<sup>304</sup>

Production Area: Unknown.<sup>305</sup>      Date: Unknown.

Findspot/Date: Alouettes, Chatenoy-le-Royal (Chalon-  
 sur-Saone), France; 1864.

Weight: 190.3 lbs. (86.3 kg).      Present Location: As no.3.

Inscription: (stamped) LEG XX BFLI DOC<sup>306</sup>DOC<sup>306</sup> BFLI  
 DOC<sup>306</sup> LEG XX

---

LEG(ionis) XX B (?ene)F(?iciarius) L(?egionis) I  
 (?Minervia)<sup>307</sup> DOC DOC B (?ene)F(?iciarius)  
 L(?egionis) I (?Minervia) DOC LEG(ionis) XX

---

(?from/to) the twentieth legion (?from/to) the  
 Beneficiarius (of) the first legion minerva DOC DOC  
 (?from/to) the Beneficiarius (of) the first legion  
 minerva DOC DOC (?from/to) the twentieth legion.

Analysis: None.

- 5<sup>308</sup> Production Area: Unknown.<sup>309</sup> Date: Unknown.<sup>310</sup>  
Findspot/Date: Rome; Before 1899.  
Weight: 183.8 lbs. (83.4 kg). Present Location:  
Unknown - ?Rome.  
Inscription: (stamped) T IVLI TR  


---

T(iberii) IVLI (i) TR(?ophimi) ?or TR(ifonis)<sup>311</sup>  


---

(of) Tiberius Julius Trophimus or Trifo or similar  
Analysis: None.
- 6<sup>312</sup> Production Area: ?British.<sup>313</sup> Date: Hadrianic (?c.138).<sup>314</sup>  
Findspot/Date: Saint Gervais I Wreck; 1979.  
Weight: c.187.5 lbs. (c.85 kg). Present Location: ?  
Inscription: (top; cast) IMP HADRIANI AVG  


---

IMP(eratoris) HADRIANI AVG(usti)  


---

Emperor Hadrian Augustus  
Analysis: None.
- 7<sup>312</sup> Production Area: ?British.<sup>313</sup> Date: (?c.138).<sup>314</sup>  
Findspot/Date: As no.6.  
Weight: As no.6. Present Location: As no.6.  
Inscription: (top; cast) IMP CAESAR ANTONINI AVG PII  


---

IMP(eratoris) CAESAR(is) ANTONINI AVG(usti) PII  


---

Emperor Caesar Antoninus Augustus Pius  
Analysis: None.

8<sup>312</sup>Production Area: ?British.<sup>313</sup> Date: As no.7.Findspot/Date: As no.7.Weight: As no.6. Present Location: As no.6.Inscription: As no.7.Analysis: None.9<sup>315</sup>A number of  
pigs, at  
least some  
of bun/  
irregular  
shapeProduction Area: ?British.<sup>316</sup> Date: Second-Fourth  
Century.<sup>317</sup>Findspot/Date: Ploumanac'h wreck, Cotes du Ponant,  
France; 1983-6.Weights: Details not yet available.Inscriptions: Details not yet available but include:

(stamped) tribal names of the

Brigantes and Iceni

(stamped) personal names

(stamped) numbers

(stamped) symbols

Analysis: None.



\*  
Notes

\* A number of references for individual pigs represent notes, rather than articles, often in obscure or early journals, or items in antiquarian gazeteers or general histories and have not been included in the main bibliography. They are cited in full in the relevant bibliographical notes. The following abbreviations are used throughout the notes to Appendix 1 only:

Besnier ... Besnier, M. (1920/1), 'Le Commerce du Plomb a l'Epoque Romaine D'apres Les Lingots Estampilles,' Rev.Arch. (1920) pp.211-44 and (1921) pp.36-76 and pp.99-121.

C.I.L. ... Hubner, A. (ed.) (1873), Corpus Inscriptionum Latinarum Vol.7: Inscriptiones Britanniae Latinae

C.I.L. xiii .. Bohn, O. (ed.) (1906), Corpus Inscriptionum Latinarum Vol.13: Inscriptiones Trium Galliarum et Germaniarum Latinae.

C.I.L. xv ... Dressel, H. (ed.) (1899) Corpus Inscriptionum Latinarum Vol.15; Inscriptiones urbis Romae Latinae.

E.E. ... Ephemeris Epigraphia: C.I.L. supplementum (Rome 1872-1903).

Gowland ... Gowland, W. (1901), 'The Early Metallurgy of Silver and Lead: Part 1 Lead,' Archaeologia 57 pt.ii, pp.359-422.

Tylecote ... Tylecote, R.F. (1986), The Prehistory of Metallurgy in the British Isles, London, Table 38.

V.C.H. Derbyshire ... Haverfield, F. (1905), 'Romano-British Remains,' in The Victoria History of the Counties of England: Derbyshire Vol.2, pp.191-264.

V.C.H. Hants ... Haverfield, F. (1900), 'Romano-British Remains,' in The Victoria History of the Counties of England: Hampshire Vol.1, pp.265-349.

- V.C.H. Nottingham ... Walters, H.B. (1906), 'Romano-British Nottinghamshire,' In The Victoria History of the Counties of England: Nottinghamshire Vol.1, pp.1-36.
- V.C.H. Shropshire ... Haverfield, F. & Taylor, M.V. (1908), 'Romano-British Shropshire' in The Victoria History of the Counties of England: Shropshire Vol.1, pp.205-78.
- V.C.H. Somerset ... Haverfield, F. (1906), 'Romano-British Somerset' in The Victoria History of the Counties of England: Somersetshire Vol.1, pp.207-72.
- V.C.H. Staffs ... Page, W. and Keate (1908) 'Romano-British Staffordshire' in The Victoria History of the Counties of England: Staffordshire Vol.1, pp.183-98.
- Way ... Way, A. (1859), 'Enumeration of Blocks or Pigs of Lead and Tin, Relics of Roman Metallurgy, Discovered in Great Britain,' Arch.J. 16, pp.22-40.
- Webster ... Webster, G. (1952/3), 'The Lead Mining Industry in N. Wales in Roman Times,' Flintshire Historical Society Trans., 13, pp.5-33, Table beginning p.20 (except where page nos. are cited).

1. The only original record is: Leland, Assertio Incomparabilis Aricuri, London (1544), fo.23a (not consulted). Followed by: Camden, Britannia, (1st ed. 1586), p.104f (not consulted); Way (1854), p.279; Yates (1858), p.16; Way p.24f; C.I.L. No.1201; Scarth (1875), p.136; V.C.H. Somerset, p.340 No.4; E.E. ix, p.642; Gowland No.17; Besnier No.21; Davies (1935), p.149 n.5; Webster No.27 Elkington (1976) No.1; Whittick (1982), p.113ff; Tylecote No.27.
2. Webster gives the findspot as "Charterhouse near Wookey Hole." In view of the early finddate this seems a reasonable suggestion, though I know of no supporting evidence.
3. Tylecote and Elkington (1976) give 1544. This is clearly an error prompted by the publication date of Leland (1544). Webster gives c.1540 which may be approximately right.
4. Presumably cast not stamped and likely in more than one line. C.I.L., Gowland, Webster, Elkington (1976) and Yates (1958) give TRIB not TR. Camden (1586), Yates (1958) and Besnier give CLAVDIVS not CLAVD. Tylecote alone gives TRIB P VII not TR P VIIII and must be in error. Only the latter is important.
5. See Whittick (1982) and p.228{ above.
6. Gentlemans Magazine (1854) n.s.42 pt.ii, p.58; Way (1854), p.278; Proc.Soc.Ant. (1864/7) 2nd s. 3, p.198 and 439; Yates (1858), p.16; Way, p.23; C.I.L. No.1202; E.E. ix, p.262 and 642; Gowland No.14; V.C.H. Somerset, p.341 No.5; Knight (1915), p.517; Besnier No.22; Whittick (1932b), p.68; Davies (1935), p.149 n.5; Webster No.28; Gough (1967), p.15 Elkington (1976) No.5; Whittick (1982), p.116f; Tylecote No.17.
7. The only other pig with a legionary reference (No.3) is Neronian of 60. Whittick (1982, 166f) has pointed out that the very full form of BRITANNIC ought to make this pig earlier than No.3 (with only BRITAN). A late Claudian or early Neronian date is equally likely. On suggestions of a date c.49 see notes 10 and 11.
8. Though usually known as 'the Blagendon ingot' the proximity of Charterhouse means that it could have come from there. The find date is given as 1859 in C.I.L. but Whittick (1982, 166f, n.12) makes clear that this is a mistake. Note that Way's Blagdon is identical to modern Blagendon.
9. Not 163 lbs. (74 kg) as many authorities have it. The error was corrected by the British Museum in 1954 (Whittick 1982, 115) but is persisted with by Tylecote.

10. Tylecote follows Gowland (and e.g. Yates (1858); though he restored instead CLAVDII) in omitting the M. Gowland himself was presumably following Way, and Way (1854), though the latter's illustrations show vestiges of it. Whittick (1982) discusses the inscription in detail and convincingly rejects readings of L II as FI, FIL or IMP (as supported by Gowland, C.I.L., V.C.H., Way, Yates (1858) and Webster) and so the supposed reference to Britannicus and the date of c.49. I have examined the pig and M is faint but present. Only two vertical strokes are clear at the end (AVG I I). The latter is not an L and therefore only L [I] I seems likely.
11. This stamp has been read variously as V.EIP.C,FTPC.[ ], V.ETP.C, V.ETP.S and V.ETP (cf Gowland, C.I.L., V.C.H., Way, Tylecote and Webster n.12). However, Whittick (1982, 116f and plate VB) makes clear that the correct reading is V.ETPL.C.I have examined the pig and this is certainly the correct reading (V.ETPL.C with P and L conjoined) of one stamp. However, the other has a stop after ET (V.ET. [PL.C]). The interpretation of the stamp as referring to Q.Veranius and C.Pompeius Longinus Gallus, the consuls of 49 (supported by e.g. Webster) is also convincingly rejected by Whittick. See further above p.229.
12. The figures are Gowland's as confirmed by Smythe (cf. Whittick 1982, 115f).
13. The figures are Wyttenbach and Schubinger's (1973), as also quoted by Tylecote.
14. Gowland, p.379; C.I.L. xiii 3491; Besnier, p.50ff; Whittick (1932b), p.69; Davies (1935), p.149 n.5; Gough (1967), p.30; Elkington (1976) No.7; Whittick (1982), p.118. Webster and Tylecote omit this pig.
15. The legionary reference, form of the inscription and shape of the pig make a British (and at this date therefore a Mendip) origin almost certain.
16. The date ought probably to be before 60 since it has a fuller form of Britannica than No.3, but later than No.1; see note 7.
17. I.L.S. ?misprints I for L.
18. The figures are Smythe's quoted by Whittick (1982, 118).
19. Gentlemans Magazine (1783) 53 pt.ii, p.936; Gentlemans Magazine (1784) 54 pt.i, p.85; Way (1854), p.279; Way, p.26f; Wright (1888), p.273; Morris, R.H.J., Chester Arch. and Nat.Hist.Soc.J.(1890/1) n.s. 4, p.171ff;

- C.I.L. No.1203; V.C.H. Hants., p.323 n.2; Gowland No.27; Besnier No.26; Whittick (1932b), p.68f; Davies (1935), p.149 n.5; Webster No.29; Gough (1967), p.30; Elkington (1976) No.6; Whittick (1982), p.118f; Tylecote No.21.
20. Gowland, and Wright (1888), suggested a Flintshire or Shropshire rather than a Mendip origin and was followed by Tylecote (1962, Table 33). The view is maintained with a little qualification in Tylecote, p.66f. However, Whittick (1982, 119) and Whittick and Smythe (1935, 74) have pointed out how unlikely this is on geographical, analytical and dating grounds. The new analysis quoted by Tylecote (note 13) seems to question the validity of his own argument that the pig has a similar chemical composition to Nos.59 and 71. Earlier belief in inscriptional evidence for a Flintshire origin was due to misreadings of (?ex) K(alendis) IAN(auriis) as EX KIAN(gi), a formula no longer acceptable since the tribal name is established as Deceangli (Whittick 1982, 114), and the preposition EX is unknown except in EX ARG(entariis), EX K(alendis), and on the ?trophy (No.1). Tylecote's belief in a preposition on Flintshire origin marks is anyway erroneous (note 180 below). I concur with Webster, p.10 in unreservedly attributing it to the Mendips.
  21. Tylecote gives 1793 for no obvious reason.
  22. Corrected from 156 lbs. (70.8 kg) by the British Museum in 1954 (Whittick 1982, 118). Tylecote persists in the old weight, only metricating it, as in most instances imprecisely, to 70.9 kg. Way notes a 'hole' in the side.
  23. Lead blobs partly obscure both Ns but the reading is certain. An attempt has been made to saw the pig in half.
  24. Way is clearly in error with HVLPMCOS. Some sources give IXKIVL;/XKIVL; or EXKIVL (for EX K(alendis) IVL(ius)), while Webster, n.13 believes only IVL to be visible. I have examined the pig and there can be no doubt about reading IVL P M CoS. The first letter may be a K but it is indistinct. No letter precedes it. These are broadly Webster's conclusions as well.
  25. Gowland read only EXARGEN.
  26. Way (1854): CAPA C (?) N. Besnier and C.I.L.: CAPASCAS. Gough (1967): CNPASCIS (second and third letters conjoined). Way, C.I.L., Gowland, Webster, Elkington (1976) and Tylecote include XXX but Whittick (1982) makes no comment on it. I have examined the pig and

- the stamp is very difficult to read. C is certain but the rest is blurred. However, the reading is perhaps sufficiently likely to be confirmed in detail by my No.56.XXX might be present but I could not detect it.
27. It seems reasonable to suggest that the name was intended in the genitive and is not abbreviated (I am grateful to Dr. R. Maltby for discussing this point with me).
  28. The figures are Gowland's.
  29. Palmer and Ashworth (1956/7) pigs 1, 4, 3 and 2 respectively; J.R.S. (1957) 47, pp.226-30 pigs a, d, c and b respectively; Cockerton (1959); Cockerton (1962); Gough (1967), preface to the 2nd edit; Elkington (1976) Nos.14, 17, 16 and 15 respectively; Tylecote Nos. 64, 67, 66 and 65 respectively.
  30. Watkin (1877, 130f) and Whittick (1931, 259) note that after 1st July 70 Titus' name ought to appear with Vespasian's, as indeed it does on a number of Flintshire pigs (though it might well be 71 before news of Titus' elevation to Trib.Pot. circulated in Britain and was incorporated in moulds). However, of the ten Vespasianic pigs from the Mendips none mentions Titus and one (No.14) is of 79.
  31. The inscription is damaged but the reading cannot be doubted in view of pigs such as No.8, apparently from the same mould.
  32. Cf. Palmer and Ashworth (1956/7, 63), but very faint. I have examined the pig, under adverse conditions, but could not discern it. There may be some confusion with No.7 where a clear applied V is present but not recorded by Palmer and Ashworth.
  33. Again the genitive seems most likely. The suggestion of Triferno is from R.P. Wright (Cockerton 1962).
  34. The figures are Palmer and Ashworth's (1956/7)
  35. The inscription is badly damaged but the restorations cannot be doubted in view of e.g. No.8.
  36. I have examined the pig and there are marks before and after these letters. That in front is almost certainly the edge of the stamp but that after might be another P; cf. Palmer and Ashworth (1956/7, fig.5, pig 4).

37. Tylecote unaccountably gives the first impression of the stamp as XTI.C, but Palmer and Ashworth (1956/7, fig.5) is clear and I have examined the pig and can confirm it. The more extensive 'reading' by R.P. Wright (TRIFER(no)) given in Cockerton (1962) is not valid but is a possible expansion.
38. BRIT is damaged but cannot be doubted. A lead strip V has been superimposed over the cast A of ARG while the cast V of VEB is inverted. There can be little doubt that this is a misplaced correction. The G of ARG is also slightly damaged.
39. Wells museum read LX[I]X (pers.comm. L.A. Kerr). I have examined the pig and read LXIX, though the I is at an angle. Palmer and Ashworth (1956/7) read LXIIX, but this does not seem possible.
40. The stamp as figured by Palmer and Ashworth (1956/7, fig.5, pig 3) seems to consist of the end of the TI CL TRIF stamp (i.e. TRIF) with another impression (TR) superimposed. Palmer and Ashworth (p.63) suggest LRAD superimposed on a single impression of TI CL TRIF. This could be so but only the size of the R at the end seems to support it and we could be dealing with two TI CL TRIF dies. TRIFER (cf note 37) is certainly not present. I have examined the pig and the visible marks are:  $\overline{5}TR$ .
41. Palmer and Ashworth (1956/7, 63) stress that the reading is largely conjectural and in the same paper (p.83) R.P. Wright suggests that it is in fact another impression of LRAD. I have examined the pig but am unable to confirm or deny the reading.
42. I have examined the pig and the applied V is very prominent and may, since Palmer and Ashworth (1956/7) do not mention it, be that recorded for No.5 (cf. note 32).
43. A replica of this pig is displayed in Bristol Museum.
44. Tylecote has AER not VEB. He has presumably confused Nos.7 and 8. There is a little damage to the first E and much to the last B.
45. I have examined the pig and the L might be the edge of the stamp, whose character is notably coarse. The A has no cross bar and the D is only a partial impression.
46. Whether or not this is deliberate is uncertain. It is not very clear (pers.comm. L.A. Kerr, Wells Museum) and

on examining the pig under adverse conditions I was unable to detect it.

47. Dale (1918/19); Whittick (1932b), p.69; Richmond in Smythe (1939/40), p.145; Webster Nos.56 and 55 respectively; Palmer and Ashworth (1956/7), p.82ff; Gough (1967), p.27 and n.5; Elkington (1976) Nos.10 and 9 respectively; Tylecote Nos.69 and 68 respectively.
48. Usually recorded as 166 but inaccurately weighed; cf. Elkington (1976).
49. Whittick (1932b, 69, n.36) implies that both Nos.9 and 10, having formerly been at Tudor House Museum, were at Botleigh Grange near Southampton (he lists five Vespasianic pigs known in 1932: one at Bristol (No.12), one at Roehampton (No.11), one lost (No.13) and two at Southampton). However, R.P. Wright (in Palmer and Ashworth 1956/7, 82, n.9) noted that it was "apparently lost" though a few years earlier Webster had listed both Nos.9 and 10 as in private hands (presumably the source for Tylecote's attribution of both to Southampton). Elkington (1976) says that No.9 is lost and I am grateful to A. Fahy of Southampton Museum for confirming that it can no longer be traced.
50. This stamp has caused many problems and it is regrettable that pig No.9 appears to be lost and that it has not been possible to gain access to No.10. Dale (1918/19) recorded NOVEG SOC NO. Whittick's (1932b) SOC NOVEG is probably just a rationalisation. Elkington (1976), who has evidently had access to the remaining pig, gives NOV(a)EC SOC(ietatis) NO(vaec) for No.10 and SOC(ietatis) NO(vaec) (twice) for No.9. Richmond (1939/40) alone gives SOC NOVAEC (...). Webster (n.32) notes Dale and Richmond's readings but (p.8) seems to prefer the latter. It seems likely that earlier authorities simply printed the stamp on No.10 for No.9, since that was obviously what was intended. If this is so the remaining problem is Richmond's reading which has influenced later authorities to include an A in these stamps and that on No.14 (thus Webster p.8; Elkington No.9 and 10 and also No.8; and Tylecote No.23). The bulk of the evidence, including Elkington's first hand reading, Dale's original reading and the very clear identical stamp on No.14, must force the conclusion that Richmond was mistaken in his reading (or perhaps that he was in fact suggesting an expansion rather than giving a reading). This leaves the last letter of the stamp, of which readings differ on No.10 and which is incomplete on No.14 (note 72 below). It is clearly



either a G or a C but it is not possible to decide which. It is suggested here therefore that what should be read for No.9 is SOC NO [VEG] SOC NO [VEG] or SOC NO [VEC] SOC NO [VEC] and for No.10 [SOC] NOVEC SOC NO [VEG] or [SOC] NOVEC SOC NO [VEC].

51. The reading was confirmed in 1922 by R.G. Collingwood (Wright in Palmer and Ashworth (1956/7, 82, n.9)). Elkington (1976) says that it is on the back not the front as Wright states.
52. The weight of 178 lbs. (80.8 kg) given by Dale (1918/19) was corrected by Wright in Palmer and Ashworth (1956/7, 82, n.9 and 83) to this. Tylecote persists with the old weight.
53. Clearly the pig was available for R.P. Wright's inspection in 1951 (Wright in Palmer and Ashworth (1956/7, 82f, n.9 and 13)), but he does not say where it was. Tylecote implies that it is at Southampton (but see note 49 above). Elkington (1976) says that it is in a private museum in Southampton and I am grateful to A. Fahy of Southampton Museum for confirming this.
54. Read only as VI by Dale (1918/19). It is extensively discussed in Palmer and Ashworth (1956/7, 82-7) by R.P. Wright and L.S. Palmer. Wright reads IIVI (which indeed is the visible mark) and suggests that it is a mistake for VIII. Palmer contends that XLVI was intended but not completed. The latter seems more likely if, as seem the case, numerical inscriptions are intended as overweight marks. See further below p.508ff.
55. Wright in Palmer and Ashworth (1956/7, 83, n.13) is the only authority to record that parts of the same dye as used on No.8 are also to be seen on this pig.
56. The figures are quoted by Webster without a reference and have been converted from dwt/ton.
57. Scarth (1876/8); Scarth, H.M., (1877), J.Brit.Arch.Ass. 33, p.106; Watkin (1877), p.130; V.C.H. Somerset, p.341 No.6; E.E. iii, p.141 and No.121a; Gowland No.18; Besnier No.22; Whittick (1931), p.256ff; Webster No.30; Gough (1967), p.25ff; Elkington (1976) No.13; Tylecote No.28. Note that many of the early accounts, some of which I have omitted, are inaccurate. The most reliable description (with notes on the nature and causes of earlier errors) is Whittick (1931).

58. Whittick (1931) gives "June (?July) 1876" in agreement with Scarth (1876/8). Tylecote prefers 1875.
59. The original given weight (143 lbs. (64.8 kg)) (Gowland and others following Scarth (1877) was corrected by V.C.H. and confirmed by Whittick (1931, 257). Tylecote's weight is inaccurate because it has been rounded up.
60. Not IMP VESP AVG as printed by Gowland. Whittick (1931, 257) saw the pig and corrected the reading, though Watkin (1877) and Scarth (1876/8) had it right.
61. VEB was misread by Scarth (1876/8), V.C.H., E.E., and others as VE or VI, but, as several authorities point out, Nos.8, 9 and 10 make the reading obvious and Whittick (1931, 258) distinguished the E and B on a squeeze.
62. Scarth (1876/8); Scarth, H.M. (1877), J.Brit.Arch.Ass. 33, p.106; Watkin (1877), p.131; V.C.H. Somerset, p.341 No.7; E.E. iii, p.141 and No.121b; Gowland No.19; Webster No.31; Gough (1967), p.28; Elkington (1976) No.11; Tylecote No.78. Besnier ignores it (?believing it to be identical to No.11).
63. E.E. mistakes it for No.13. Scarth (1877) gives 296 lbs. (134.3 kg), perhaps mistaking it for No.15. Gowland gives 224 lbs. (101.6 kg), mistaking it for No.18. See Webster, p.24, n.15.
64. Scarth (1873/6; Scarth (1875), p.139; Watkin (1876), p.353; V.C.H. Somerset, p.341f, No.8; E.E. iii, p.141 No.121c; Besnier No.23; Webster No.32; Gough (1967), p.25ff; Elkington (1976) No.12; Tylecote No.79. Gowland seems to have overlooked this pig.
65. Watkin (1877) says Autumn 1873.
66. The reconstruction seems certain. BRIT EX ARG could have been on the side but certainly is impossible; it is only a top fragment.
67. J.R.S. (1963) 53, p.162; Elkington (1976) No.8; Elkington and Viner (1985); Tylecote No.23 (citing pers.comm. Whittick 1963).
68. Elkington (1976) has 1952; ? a typographic error.
69. The contraction AR is unparalleled but I have examined the pig and there is no room for a lost G.

70. Last letter retrograde. I have examined the pig and one of the impressions is particularly good. It is clear that the stamp is complete with stops between all the letters and the stamp edges appearing. We are presumably dealing with a private name and Gaius Publicus C ... seems a reasonable suggestion. There is too little to decide the case but the genitive seems most likely.
71. The V and E conjoined. Only a fragment of the last letter remains and it might be a C or a G. Tylecote gives NOVAE but is definitely in error; on the problems associated with this stamp see note 50 above.
72. The figures are Tylecote's, who carried out the analysis (pers.comm. S. Clewes, Corinium Museum).
73. Markland, J.H. (1829), Archaeologia 22, p.421; Bateman, T. (1849/50), J.Brit.Arch.Ass. 5, p.79; Way, p.34; Way (1866), p.278; C.I.L. 1209d; V.C.H. Somerset, p.342 No.9; Gowland No.21; Webster No.52; Besnier No.27d; Gough (1967), p.29; Elkington (1976) No.19; Tylecote No.31.
74. Markland (1829) gives 1809; others (e.g. Way, p.34) give 1822, though Way was aware of a discrepancy. Way (1866) gives 1852. It was in fact found in 1809 by James Goodridge (pers.comm. S. Bird, Roman Baths Museum).
75. Not 83 lbs. as one antiquarian source had it (cf. Way, p.34).
76. Elkington (1976) is in error with AVGVST (I have examined the pig).
77. Gentlemans Magazine (1866) n.s.54 pt.i, p.211; Scarth (1864/7), p.198; Way (1866); Watkin (1876); Nicholls (1879/80), p.320-8; Gowland No.15; C.I.L. 1210; V.C.H. Somerset, p.342; Besnier No.24b; Whittick (1932b), p.69; Webster No.34; Gough (1967), p.28; Elkington (1976), No.22; Tylecote No.18.
78. Nicholls (1879/80) suggested an origin at Penpark Hole, Gloucestershire rather than in the Mendips but this cannot be accepted. See further above p.289f.
79. Watkin (1876) has 1866 but the notice by Scarth (1864/7) is for 1865.
80. But at present on loan to the National Maritime Museum, Greenwich.
81. Webster notes damage to the first I. Nicholls (1879/80) believed that he could see AN[TO]NINI. Way (1866) saw

- only A [NTON]INI. The reconstruction cannot be doubted. The damage is due to a raised blob of lead (pers.comm. G.R. Hutchinson, National Maritime Museum).
82. As note 77 above but V.C.H. No.12 and Elkington No.21.
83. I have examined the pig and the inscription is identical to No.16 with a raised lead blob (cf. note 81 above) obscuring the end of the A,NTQ and the beginning of the next N. There seems therefore a good case for mould identification with No.16.
84. Scarth (1873/6), p.188; Scarth (1875), p.138; Watkin (1876), p.353; E.E. iii, p.141 No.121d; V.C.H. Somerset, p.342 No.10; Besnier No.24a; Whittick (1931), p.260; Webster No.33; Gough (1967), p.28; Elkington (1976) No.20; Tylecote No.29. Gowland has no number for this pig.
85. The right hand end of the casting is poor (Scarth (1873/6); Whittick (1931)) but Tylecote's omission of PP is unjustified. Whittick (1931, fig 28) makes clear that two letters are present and can hardly be anything else.
86. A  $1\frac{3}{4}$ " (4.445 cm.) diameter ring rather than a letter (cf. Whittick (1931, 261ff)).
87. See note 229 below.
88. Stukeley, W. (1723), Intinerarium Curiosum Iter.vi, 151 (not consulted); Horsley (1732), Inscriptions in Somerset, p.328 No.10 (not consulted); Ward (1743), Phil.Trans.Royal Soc. 49, p.699 (not consulted); Stukeley, W. (1757), The Medalllic History ... of ... Carausius I, p.167 (not consulted); Camden (1806 Gough edit.), Britannia I, p.14 (not consulted); Way, p.34; Gowland No.20; Besnier No.25a; Webster No.36; Gough (1967), p.29; Elkington (1976) No.23; Tylecote No.30.
89. The first report was in 1723 and it was clearly found earlier that century.
90. This seems likely to be a rough figure. Gowland gives "c.50 lbs."
91. J.R.S. (1951) 41, p.141 No.7 citing B.M. mss. Cotton, Julius C. vi #37; Webster No.37; Elkington (1976) No.24; Tylecote No.80.
92. The pig is known to have been of M. Aurelius and Verus and so is likely to have had the same inscription as No.19.

93. Scarth (1873/6); Scarth (1875), p.139; Watkin (1876), p.353; E.E. iii p.141; V.C.H. Somerset, p.342f Nos.14 and 15; Besnier Nos.25a and 25b; Webster Nos.38 and 39; Gough (1967), p.29; Elkington (1976) Nos.25 and 26; Tylecote Nos.81 and 82. Gowland ignores both items.
94. Cf. Whittick (1961, 108, n.20) who notes that they are poured differently. There could be doubt that they are even from full pigs since No.22 has a flat back and rounded corners (pers.comm. S.C. Minnitt, Somerset Museum Service). Conceivably they may be 'test castings.'
95. Gough (1967), p.23 citing the diaries of Rev. John Skinner (B.M. Add. mss. 33673, f117 and 33651, f112); Webster No.40; Elkington (1976) Nos.2-4; Tylecote No.60 (citing loc cit 33651, f103).
96. Noted only by Elkington (1976) and apparently uncertain. If DB or OB was present (on one or all of the pigs) no expansion can be suggested and it may call a Roman date into question.
97. Gough (1967), p.23 citing as in note 95, 33673, f104.
98. Dool, J. (1975), Bulletin of the Peak District Mines Historical Society 6 No.2, p 111f; Dool and Hughes (1976); Br. (1976) 7, p.382f.
99. There is no certain dating evidence but for the reasons why they ought to be pre-Hadrianic see above p.233f.
100. The first stroke of the first V cut with a cold chisel (pers.comm. R. Langley, Derby Museum).
101. Tylecote says that Nos.27 and 28 are from the same mould. Dool and Hughes (1976) stress that they are not and, since Tylecote does not indicate that he has seen the pigs, their opinion must be preferred.
102. The crossbar of the T in LVTVD cut with a cold chisel (pers.comm. R. Langley, Derby Museum).
103. Proc.Soc.Ant. (1848) i, p.295; Gentlemans Magazine (1849) 69 pt.i, p.518; Bateman, T. (1850), J.Brit.Arch.Ass. 5, p.79; Thompson (1852/3), J.Brit.Arch.Ass. 8, p.55; Way, p.36; Gowland No.4; C.I.L. No.1216; V.C.H. Nottingham, p.27 and fig.9; V.C.H. Derbyshire No.3; Besnier No.38a; Davies (1935), p.161 n.4; Smythe (1939/40); Webster No.8; Tylecote No.1; Lane (1986) No.15.

104. Proc.Soc.Ant. (1848) misread BRIT as ARIT and was followed by Gentlemans Magazine (1849).
105. Haverfield, F. (1890) Arch.J. 47, p.257; E.E. ix 1265; Gowland No.5; V.C.H. Derbyshire No.4; Besnier No.38b; Smythe (1939/40); Webster No.9; Tylecote No.2; Lane (1986) No.17.
106. Some authorities give 135 lbs. (61.2 kg) but Hull Museum records it as 133 lbs 5 ozs (pers.comm. D. Crowther). The pig, though some such as Smythe (1939/40, p.142) note that it is damaged, is in fact, in the author's opinion, most likely to be a partly used pig. I have examined the pig (and its mould fellows No.29 and Nos.31-3) and estimate that about 2/10th of it is missing, though the inscription is still intact. Smythe (op cit) suggested that it would originally have been c.190 lbs (86.2 kg). However, its (undamaged) depth is not as great as that of its mould fellows which weigh 184-196 lbs. and an original weight around 180 lbs. (81.6 kg) seems to be indicated.
107. The figures are Smythe's (1939/40).
108. Smythe (1939/40), p.139; J.R.S. (1941) 31, p.145f No.15; Webster No.10; Tylecote No.3; Lane (1986) Nos.18, 19, 20 and 21 (Lane does not list my No.34).
109. Cf. Tylecote. Confirmed by D. Crowther, Hull Museum. I have examined the pig and little weight is likely to have been lost.
110. Though uninscribed this pig seems likely to be of similar date since it was found with Nos.31-5.
111. This pig does not appear to be at Hull Museum with the other pigs from the find. A mss. note on the Hull Museum card implies that it was not donated with the rest (pers.comm. D. Crowther, Hull Museum).
112. The inscription is not enpanelled.
113. J.R.S.(1958) 48, p.152; Tylecote No.73; Lane (1986) No.22.
114. One corner of the pig is missing and the original weight was perhaps nearer to 177 lbs. (80.3 kg).
115. The inscription is rather abraded and the R of BRIT is not visible, though the restoration cannot be doubted.

116. I have examined both pigs and it is difficult to be certain of mould identity since No.36 is abraded. However, it does seem quite likely.
117. Pegge (1787); Bateman (1848), p.135; Way, p.25; Watkin (1885), p.73; Gowland No.10; C.I.L. 1215a; V.C.H. Derbyshire, No.6; Besnier No.35; Smythe (1939/40), p.141; Davies (1935), p.161 n.4; Webster No.3; Tylecote No.25; Lane (1986) No.11.
118. Both Webster and Tylecote give the find date as 1777, but Pegge (1787) clearly indicates that it was April 1787.
119. Pegge (1787) erroneously gives IVT not LVT.
120. Gentlemans Magazine (1824) 94 pt.i, p.194 and p.320; Way, p.26; C.I.L. 1215b; Gowland Nos.6, 7, 8 and 9 respectively; V.C.H. Derbyshire Nos.710; Besnier No.35b; Smythe (1939/40); Webster Nos.4, 5, 6 and 7 respectively; Tylecote Nos.8, 9, 10 and 11 respectively; Lane (1986) Nos.24-7.
121. The reading is generally agreed. Gentlemans Magazine (1824) read ] I CL and PVT. Way's illustration shows ghosts of TI CL. Webster prints TI ..., inexplicably seeming to imply that it is the known letters that are lost. I have examined the pig and TI is certainly lost. C is present but the next two letters are also lost (though perhaps due to recent deterioration since Haverfield (V.C.H. Derbyshire) read ]CL.TR).
122. Webster, apparently followed by Tylecote, lists it as "once at Parnham Hall" (Parnham Park in earlier accounts) "Sussex, but now apparently lost."
123. Bartlett (1967); Kingston upon Hull Museum Bulletin (1968) 1, p.2ff; Lane (1968) No.23. This pig was evidently overlooked by Tylecote.
124. The 'associated' pottery is of no use in dating since the find context is unknown and the site has yielded material of the late second to mid fourth centuries at least (cf. Kingston upon Hull Museums Bulletin (1968) with a far more detailed account than Bartlett (1967)).
125. I am grateful to D. Crowther of Hull Museum for confirming that they hold this item, which I have examined.
126. Though Bartlett (1967) and Kingston upon Hull Museums Bulletin's (1968) restorations (as here) cannot be doubted the inscription is damaged. The I is lost, the O damaged and hardly detectable, the T lost and the G also barely visible.

127. J.R.S. (1941) 31, p.146 No.17; Webster No.18; Tylecote No. 72; Lane (1986) No.16.
128. Tylecote believes it to be of Yorkshire origin, which seems very unlikely in view of note 131 below.
129. The weight can only be regarded as approximate. J.R.S. (1941) gives it as "about a hundredweight."
130. The abbreviated forms LVT (see note 131) and BR suggest that it was in one line as usual, although J.R.S. (1941) makes no comment.
131. J.R.S. (1941) gives SOCIOR L F BR EX ARC, but in view of the poor records it is quite likely to be a misreading. ARC makes no sense and must be ARG, especially since the preposition EX occurs. The F of the second element could easily be a mistake for a damaged T and there can be little doubt that a V should be restored before it since no other restoration would make sense. Webster follows J.R.S. (1941) in these reconstructions but Tylecote chooses to ignore them; his Yorkshire attribution must fall if LVT is accepted.
132. Tylecote gives a silver content. Since the pig was scrapped it is impossible that he could have analysed it. It is in fact one of a number of typesetting errors in Tylecote and the analysis is meant to apply to No.52 (his No.75).
133. Reynolds (1966/7); J.R.S. (1967) 57, p.206 No.21; Tylecote No.24; Lane (1986) No.28.
134. On loan from Rugby Archaeological Society (pers.comm. J. Pickin, Warwick Museum).
135. The figures are Reynolds' (1966/7).
136. Pegge (1779) Archaeologia 5, p.369ff; Camden (1806 Gough edit.) Britannia ii, p.433 (not consulted); Bateman (1848), p.134; Yates (1858), p.10; Way, p.31f; Watkin (1885), p.72; C.I.L. 1208; E.E. ix, p.643; V.C.H. Derbyshire No.1; Gowland No.1; Besnier No.36; Smythe (1939/40); Webster No.14; Tylecote No.14; Lane (1986) No.3.
137. Watkin (1885), Webster and Tylecote give 1777 without comment. It may be that they were drawing on Yates (1858) and that there has been some confusion with No.37, for which they give the same, erroneous, date; cf. note 118 above. Lane (1986) erroneously follows them.



138. Pegge (1779) misread MEI LVI for MET LVT, as did Yates (1858), though the latter realised what was implied. I have examined the pig and G and ME are faint but certain.
139. Mawe (1802) Manual of Mineralogy (not consulted); Phillips (1848), Proc.Yorks.Philos. Soc; Way, p.36; Gowland No.11; C.I.L. 1213; V.C.H. Derbyshire No.14; Besnier No.37; Webster No.15; Tylecote No.26; Lane (1986) No.2.
140. Haverfield (V.C.H. Derbyshire) notes that the single original source (Mawe 1802) is not corroborated, but the idea that he mistook it for my No.59 is unlikely.
141. There can be no certainty about the rest of the inscription and therefore the date. However, since the only imperially inscribed pig from Derbyshire except this (No.45) is Hadrianic it is suggested that this pig should be restored and dated similarly.
142. Not 'in 1802' as Lane (1986) has it, cf. the discussion in V.C.H. Derbyshire.
143. Cox (1893/5); Haverfield (1893/5); E.E. ix 1266; Gowland No.3; V.C.H. Derbyshire No.11; Besnier No.33; Smythe (1938), p.64; Smythe (1939/40); Webster No.1; Tylecote No.12; Lane (1986) No.12.
144. Gowland and V.C.H. Derbyshire give 175 lbs. (79.4 kg) following Cox (1893/5).
145. Gowland does not separate P and RVBRI (which indeed do not have a stop between them) and misses out the I of ABASCANTI since it is conjoined with the T. Smythe (1938) omits the last LI of METALLI and ES of LVTVDARES. I have examined the pig and the reading is clear.
146. Pegge (1785) Archaeologia 7, 170ff; Camden (1806 Gough edit.) Britannia ii, p.423 (not consulted); Way, p.35f; Watkin (1885), p.72; Gowland No.2; C.I.L. 1214; V.C.H. Derbyshire No.2; Besnier No.34; Smythe (1939/40); Webster No.2; Tylecote No.13; Lane (1986) No.10.
147. Tylecote says before 1783 but Pegge (1785) can hardly imply a date before 1783.
148. There seems to be disagreement. Way and Watkin (1885) give 83 lbs. Pegge (1785) gives 84 lbs. It has not been possible to verify which is correct.

149. Pegge (1785) misread the last part as LVND. Gowland misses out the final I of VERECVNDI which is conjoined with the D.V.C.H. Derbyshire gives ARVCONII for no good reason. I have examined the pig and there is a lead blob over part of the second V. The triangular decorations at either end of the enpanelling are unique.
150. Cockerton (1953b); J.R.S. (1953) 43, p.129; Palmer and Ashworth (1956/7); Lomas (1960); Tylecote No.70; Lane (1986) No.6.
151. Though there is no certain dating evidence all the finds from the site are of the earlier third century (Lomas 1960, 116).
152. Lane (1986) gives 151 lbs. 8 ozs. (68.7 kg) for no obvious reason.
153. Tylecote says that it is lost but it is in fact still in the hands of the finder, Mr. F. Oldfield (pers.comm. M. Stanley, Derbyshire Museums Service).
154. These three poorly struck marks have caused some debate. Cockerton (1953b) and J.R.S. (1953) read CCX and were followed by Tylecote, but Palmer in Palmer and Ashworth (1956/7, appendix) suggests that the number IIX was intended. I tend to support the latter but certainty is probably impossible. See further below p.508ff.
155. J.Brit.Arch.Ass. (1919) n.s. 25, p.268; Cockerton (1962); Lane (1986) Nos.4 and 5. Other authorities seem to have overlooked these items.
156. The Roman numerals are not necessarily proof of date but the shape of the pigs seems to be consistent with other Roman examples.
157. They are said to have weighed 'over 2 cwt' together (Cockerton 1962), but their exact individual weights are unknown.
158. No source gives a present location.
159. No details of whereabouts the marks were or how they were made are available, though they are most likely to have been stamped.
160. Arch.J.(1895) 52, p.33; V.C.H. Derbyshire No.13; Evans (1911); Besnier, p.55; Webster No.16; Tylecote No.75; Lane (1986) No.1.
161. There could be doubt about a Roman date as with all un-inscribed pigs but the shape of the pig is the same as stratified examples 54 and 55. V.C.H. Derbyshire notes coins of 250-70 in the vicinity.

162. V.C.H. Derbyshire, Webster and Tylecote prefer 1894.
163. V.C.H. Derbyshire gives 112 lbs. (50.8 kg). It is possible that this is right since a piece has detached from the pig (records cited in note 164).
164. The figures are from an unpublished analysis by J.A. Smythe (I am grateful to P. Beswick of Sheffield Museum for allowing me access to the correspondence in which this is contained).
165. Bateman (1848), p.159; Watkin (1885), p.72ff; Way, p.37f; V.C.H. Derbyshire No.12; Besnier, p.55; Webster No.15; Tylecote No.77; Lane (1986) No.9. Gowland ignored this pig.
166. As with all uninscribed pigs there could be doubt about the date but the shape is the same as stratified examples 54 and 55.
167. Br. (1984) 15, p.282; Branigan, Housley and Housley (1986) pigs 1 and 2 respectively; Lane (1986) Nos.7 and 8.
168. The dating is given by mid-late fourth century pottery from the pit in which the pigs were found (cf. Birss in Branigan, Housley and Housley (1986)). A broad fourth century date is perhaps safest in view of the imprecise pottery dating and the fact that it gives a deposition not casting date. Whilst the casting date could be considerably earlier than the deposition date this is probably unlikely.
169. Lane's (1986) given weight (for only one of the pigs) of 120 lbs. (54.4 kg) is wrong.
170. Pers.comm. K. Branigan and M. Bishop, formerly Curator, Buxton Museum.
171. Davies, E. (1950) Arch.Camb. 101 pt i, p.83f; J.R.S. (1951) 41, p.142; Webster No.26; Whittick (1982), p.120; Tylecote No.74.
172. See above p.231f where a pre-Vespasianic date is argued for. Whittick (1982, 120 n.31) notes that there is little basis for J.R.S.' (1951) second century attribution. It is presumably based on the character of the lettering and leaf stop (which Whittick (1982, 121 n.33) agrees is reminiscent of mid-second century types). However, virtually no work has been done on

comparing lettering and stop types on stone and lead and the nature of the material and techniques (moulds cut in reverse not carved in positive) is likely to have caused significant differences, quite apart from the likelihood that pig moulds, unlike many inscriptions on stone, were often made by non-specialists uninterested in the style of the work. Indeed, the pig is exceptional itself in the quality of its lettering (Whittick 1982, 121 n.33), largely due to the relatively short legend that it carries and this makes comparison with other pigs difficult.

173. Large and notable leaf stop between second and third elements.
174. Whittick (1982, 121 n.33) and others citing J.A. Smythe pers. comm.
175. Way, p.27f; Williams (1886), p.67 No.1; Morris (1892), p.68; Gowland No.28; C.I.L. 1204; E.E. ix, p.642; Collingwood (1924), p.437; Besnier No.28; Whittick and Smythe (1935); Webster No.19; Wright and Richmond (1955) No.196; Tylecote No.36.
176. Tylecote's list is so badly typeset that this pig is partly confused with one of the Shropshire pigs. For his No.36 the first seven columns apply to (my) No.57, while the next four apply to (my) No.70 with the correct entries for (my) No.57 printed a line lower. This means that (my) No.70 has no number and only half an entry. Clearly the first seven columns for my No.57 should have been one line lower. See also note 226 below.
177. The weight was recorded as 179 lbs. (81.2 kg) up to 1952/3 when Webster published this "revised weight" (Webster n.7), though the source of the revision is not stated and Wright and Richmond (1955) did not follow him. Chester Museum still record 179 lbs. (pers.comm. G. Lloyd-Morgan) and there may be doubt as to which is correct (it has not been possible to re-weigh the pig).
178. Why Tylecote feels the need to add a question mark is unknown.
179. The restorations are obvious but there seems to be some disagreement about the lost parts. Way, C.I.L. and Wright and Richmond (1955) all printed IMP VESP V T IMP III COS, presumably for IMP VESP [A]V[G] [V]T IMP III [COS]. Webster gives it as IMP VESP [AVG] V T IMP III COS, while Tylecote gives the same but omits the AVG. I have examined the pig and AVG is certainly entirely visible;

its previous partial or whole omission is inexplicable. Further, though there is a large lead blob after III, there is certainly insufficient room for COS to have been present.

180. Way, Besnier and Tylecote make the last letter an I, but I have examined the pig and it is certainly an L. As C.I.L. notes the N is retrograde. On former errors in the spacing on this and similar inscriptions see Whittick (1982); the error is still perpetuated by Tylecote. There can be little doubt about the intended legend and Baty's (in Collingwood (1924)) DEGEANGL must be dismissed.
181. Not previously noted. A chisel-like mark appears at the top left corner of the front face and the raised area below it has a series of criss-cross marks thus: ~~XXXX~~. Whether the mark is ancient and or deliberate may be debatable. Cf. note 229 below.
182. As Whittick (1982, 114 n.4) points out the expansion DE CANGI (tanis metallis) (Besnier, 50ff; Laubenheimer-Leenhardt 1973, p.198 n.8) must be firmly rejected.
183. Confirmed by Whittick and Smythe (1935).
184. Williams (1886), p.67f No.3; Watkin, W.T. (1887) Arch.J. 44, p.124; Shrubsole, G.W. (1887) Chester Arch. and Nat. Hist.Soc.J. n.s.1, pp.76-90; Morris (1892); Watkin, W.T. (1892) Arch.J. 49, p.222; Gowland No.29; E.E. vii No.1121; E.E. ix, p.642f; Besnier No.29; Whittick and Smythe (1935); Davies (1949), p.146 No.2; Webster No.20; Wright and Richmond (1955) No.197; Tylecote No.37; Mason (1987), p.153.
185. As Mason (1987) points out the pig was found in a collapsed timber structure, perhaps a wharf, though some caution is needed in regarding the Roodee area as the canabae harbour (pers.comm. G. Lloyd-Morgan).
186. The weight is as revised by Webster (cf. note 177 above). Chester museum still record it as 192 lbs. (87 kg) and there must be doubt as to which is correct (it has not been possible to have the pig re-weighed).
187. Webster restores COS without comment at the end. Wright and Richmond (1955) for some reason give [CO]S. I have examined the pig and CO is certainly visible though the S is lost. The damaged A and T cannot be doubted but have previously been recorded as readable, which they are not. Much of the inscription is poorly preserved.

188. E.E. vii, Besnier and Tylecote read DECEANGI (E.E. with the N retrograde). E.E. ix and Webster give DECEANGL which from my examination is certainly right. Again Tylecote perpetuates the error of putting a space between DE and CEANGI.
189. There is dispute. Whittick (1932b, table 2) gives less than 7 dwt/ton (0.001%) while Webster (followed by Tylecote) gives 17 dwt/ton (0.0026%). However, since Whittick and Smythe (1935) give 0.00261% one suspects that Whittick (1932b) is a typographical error for 17 dwt/ton.
190. Gentlemans Magazine (1772) 42, p.588; Gentlemans Magazine (1773) 43, p.61; Greene, R. (1782) Catalogue of Rarities in the Lichfield Museum, p.42 (not consulted); Gentlemans Magazine (1783) 53, p.693f and 936; Camden (1806 Gough edit.) Britannia ii, p.503 (not consulted); Way, p.28; Gowland No.50; C.I.L. 1205; Besnier No.32a; Webster No.21; Whittick (1982), p.121ff; Tylecote No.22; V.C.H. Staffs. p.190 with further bibliography.
191. A number of misunderstandings have arisen about this and No.60, most of which are corrected in a comprehensive note in Whittick (1982, 121ff), where further bibliography is also given. He makes clear that the find was in 1771 not 1772 as Webster and Tylecote have it.
192. This is clearly the correct weight as confirmed by the British Museum in 1954 (Whittick 1982, 123). Webster, Tylecote and others are in error with 152 lbs. (68.9 kg).
193. DE CEA given by some is clearly wrong (Whittick 1982, 122). Tylecote's DECEA G is due to a failure to restore the lost letters, which are restored by Webster. I have examined the pig and a ghost of the N is present. The L was probably present but is lost.
194. The figures are Gowland's as cited by both Whittick (1982, 123) and Tylecote.
195. Norris, H. (1899) History of Tamworth Castle, p.5 (not consulted); E.E. ix No.1264; Besnier No.32b; Webster No.22; Whittick (1982), p.122ff. Gowland ignores this pig; Tylecote has no number for it but discusses it in a footnote to his No.22.
196. The find was not at Tamworth Castle as some have implied. The find date of 1838 given by Webster following earlier accounts derives from Moreton, W. (1900 edit.) Guide to Tamworth Castle, p.15ff. Earlier sources give c.1830

or c.1833. 1838 might be a reading error for 1833. For full details on both points see Whittick (1982, 122 n.39).

197. Though still extant no one seems to have obtained an exact weight for this pig.
198. Webster omits this. Whittick (1982, 122 and plate IVB) makes clear that it was present when he took a squeeze in 1930-3, though it was evidently inobvious. It is no longer detectable because of decay and had disappeared by the time that Whittick tried to take another squeeze in 1969 (pers.comm. R. Sulima, Tamworth Museum).
199. The figures are Whittick's (1982, 123), citing J.A. Smythe private record.
200. Camden, *Britannia* (1590 edit., p.488), (1607 edit., p.463), (1806 Gough edit., iii, p.45 and p.61) (not consulted); Horsley (1732) *Britannia Romana*, p.316 (not consulted); Stukeley, W. (1757), *The Medalllic History ... of ... Carausius*, p.177 (not consulted); Way, p.28f; Watkin, W.T. (1886) *Roman Cheshire*, p.294; Gowland Nos.30-49; Besnier No.30; Webster Nos. 24 and 23 respectively; Thompson, F.H. (1965) *Roman Cheshire*, p.102; Tylecote Nos.38-57. For No.62 only C.I.L. 1206.
201. Nos.61 and 62 represent a find of about twenty pigs, the relative numbers of each type, and indeed whether other types were present, being unknown, somewhere on the Cheshire coast (?perhaps in the area of the R. Mersey). The details are very limited, the only original record being Camden (1590).
202. The find is often dated to before Camden (1607). Webster dates No.61 to before the 1594 edition, but dates the simultaneous discovery of No.62 to before the 1590 edition and thus, if his second dating is correct, the discovery of Nos.61 and 62 ought to be dated to before 1590.
203. Camden (1590) gives COSS. This is unparalleled and seems likely to be an error for COS, though complete certainty is impossible.
204. DECEANGL on these items is not explicitly recorded by Camden (1590) but is very likely. It may have been with or separate from the main inscription (Whittick 1982, 114 n.6). By parallel to all other examples, it is most likely to have been separate.
205. Way, p.31; Williams (1886), p.67 No.2; Gowland No.51; C.I.L. 1212; E.E. iii, p.141; Besnier No.31; Whittick (1931), p.258 n.1; Whittick and Smythe (1935); Webster

No.25; Wright and Richmond (1955) No.198; Tylecote No.58.

206. The inscription is most curious, quite apart from the problems caused by the severe damage to the top and loss of letters. The NI was supplied by R.P. Wright (Webster n.10; Wright and Richmond (1955)) and may be just visible, though it is not directly before VADON; there is at least one space or letter between them as Wright and Richmond (1955) indicate. The S after CAESARI was suggested by Whittick (1931, 258 n.1) and traces of it do seem to be present. The lettering itself is unusual in that the letters are long and thin suggesting that the inscription was considerably fuller or longer than usual. CAESARI, let alone CAESARIS, is unparalleled as the first element of a pig inscription and is the longest form of the term recorded on one.

Yates (1858), p.13 proposed to read the end as VADOM, giving the possibility of VA DOM(itiani), but the letter is certainly an N; besides no other pig has the name at the end and too many letters are left unexplained.

Some ten letters/spaces are probably required between CAESARI and NI judging from the spacing (which is presumably the implication of Wright and Richmond's (1955) comment, their 'middle' 15 letters presumably including the S, NI and the space after it). Therefore it seems more likely that a long name such as

VESPASIANI rather than, say, HADRIANI, should be restored. If so we might have CAESARI [S VESPASIA] NI VADON, though the NI could easily in fact be a damaged [I]MP and there is sufficient doubt as to the number of letters damaged (as well as the possibility that some could be conjoined) to postulate alternatively CAESARI [S VESPASIANI I]MP VADON. The expansion of VADON is unknown. Wright and Richmond (1955) note that there is no connection with Sandonio as suggested by Watkin, W.T. (1886) Roman Cheshire, p.161. A possibility might be to read CAESARI [S IMP VESP VII T I] MP V ADON (similarly to No.59) or CAESARI [S VESPASIANI I] MP V ADON. However, ADON is no more explicable than VADON. In either case we are likely dealing with a name either of a lessee (which seems less likely since no lessee's name appears in a cast inscription also mentioning an emperor) or a place/area (which again is problematic in that other Flintshire pigs have the entirely sufficient DECEANGL on their sides). If we are dealing with a place name it seems possible that it could be derived from Vadum (used in the sense of the



bottom of a well). Perhaps also worth considering is the possibility that there is a reference to a donative (A DON(atio) or similar) either in the sense of the pig being a gift or even perhaps, poorly expressed, being a rental payment or similar, or in the sense that the silver extracted from the lead was destined to be used for a donative. However, only further finds to provide parallels for the inscription are really likely to shed light on the matter.

207. As note 177. The pig is still recorded by Chester Museum as 168 lbs. (76 kg).
208. Kirkland, S. (1735), 'A letter concerning two pigs of lead found nr. Ripley ...' in Phil.Trans.Royal Soc. 41, p.560; Ward, J. (1756), 'Some considerations on a draught of two large pieces of lead ...' in Phil.Trans.Royal Soc. 49, pp.686-70; Archaeologia (1779), 5, p.370; Yates (1858) p.9; Way, p.29f; Gowland No.13; C.I.L. No.1207a; E.E. ix, p.643; Besnier No.41; Rainstrick (1926/7), p.81; Anon. (1926); Rainstrick (1930); Webster No.48; Tylecote No.15.
209. C.I.L. and Rainstrick (1930) have 1734 but this is based on a later account by Stevens (cf. Way, 30), and the earlier account by Kirkland, clearly implying that it was January 1735, must be preferred.
210. Rainstrick (1926/7) gives c.175 lbs. (79.4 kg) for No.64. His information was presumably imprecise or he confused this with another pig. Anon. (1926) gives 156 and 155 lbs. for Nos.64 and 65, as does Rainstrick (1910).
211. E.E. read BRIC. Way omits it altogether, but Rainstrick (1910) and Webster believed that it was faintly to be seen. I have examined the pig but could find no trace of it.
212. This has not previously been recorded but is present at the lower edge of the front face. Cf. note 229 below.
213. As note 178 but C.I.L. No.1207b; plus Camden (1806 Gough edit.) Britannia iii, p.293 (not consulted).
214. It was at Craven Museum, Skipton in the 1920s (pers.comm. J. Mansergh, Craven Museum) as noted by Anon. (1926) and Rainstrick (1910). Tylecote seems to follow Webster who followed Anon. (1926). Whittick (1982, p.114 n.7) places it at Ripley Castle and I am grateful to the staff there for confirming that it is indeed still in the hands of Sir Thomas Ingleby.

215. I am grateful to the staff of Ripley Castle for confirming the damage to the inscription. Parts of the first O and T in Domitiano are also damaged.
216. Lucas (1885), p.50; Anon. (1926), p.182; Rainstrick (1926/7), p.81; Whittick (1932b), p.72; Webster No.51; Tylecote No.72. A number of authorities (C.I.L., Gowland, Besnier etc.) ignore or were not aware of this pig. Other pigs from the area are known but are seventeenth/eighteenth century (Rainstrick 1934, 217).
217. The find date is not recorded but must be before Lucas (1885) wrote, perhaps quite a few years before.
218. Lucas (1885) says "about half the weight of those now smelted." Webster, Tylecote and Rainstrick (1926/7) all concur in estimating this at about 85 lbs.
219. Lucas (1885) says that it was stamped with the name of Trajan. However, it seems far more likely to have been a cast inscription and a rather fuller one than recorded, at least IMP TRAJAN AVG, though Lucas may not have been able to read it or have been informed of it. BRIG might also have been on the side by parallel but it cannot be certain.
220. Speight, H. (1897), Romantic Richmondshire, p.207; Anon. (1926), p.182; Rainstrick (1926/7), p.81; Whittick (1932b), p.72; Webster No.50; Tylecote No.59. Again some authorities ignore this pig.
221. Speight (1897) says it was found "some 50 years" earlier.
222. Webster (n.28) is right to point out that the pig is not, and never was, in the British Museum; though Speight (1897) never implied that it was.
223. Speight (1897) says that it "bore the name of Adrian." It must be assumed that this was cast. Whether he was anglicising the name or it was damaged is unknown, but it seems likely that the original inscription was at least IMP HADRIANI AVG. BRIG might also have been present.
224. Gentlemans Magazine (1786) 56 pt. ii, p.924f; Muchison, Sir R., Silurian System (London 1839), p.279 (not consulted); Phillips (1855) Trans. of the Yorkshire Philosophical Society, p.89 (not consulted); Cochet (1856), Bulletin Monumental, p.408 (not consulted); Wright (1857), p.175; Way, p.32f; Roberts, E. (1860), J.Brit.Arch.Ass 16, p.350; Way (1866), p.279 n.5;

Watkin (1879), p.351; Wright (1888), p.277; Gowland Nos.23 and 24; C.I.L. Nos.1209a and 1209b; E.E. ix, p.643; V.C.H. Shropshire, p.263 Nos.1 and 2; Besnier Nos.27a and 27b; Whittick (1931), p.263ff; Whittick (1932a); Webster Nos.43 and 44; Webster (1975), p.100; Tylecote Nos.32 and 33.

225. This pig has frequently been regarded as having been two separate items. However, Whittick (1932a, 131-5) has convincingly shown that one of these items was an unintentional invention on the part of Way, p.33. The complex story of this misunderstanding is too long to repeat here but was based on the misreading of MINB by a single observer. Despite the antiquity of the original accounts Whittick (1932a, 131-5) brings forward sufficient evidence to be fairly sure that the find was at Aston near Snead, three miles from Bishops Castle. The find date is confused but 1767 seems to be fairly reliable. For the various erroneous dates and the reasons for their citation see Whittick (1932a, 131ff). Webster and Tylecote persisted in regarding the pigs as separate, though Webster (p.10f) notes Whittick's (1932a, 131ff) views. Tylecote gives the find date of his pig No.43 as 1869 for no good reason since his pig (as opposed to Way's spurious one; Webster's No.44) is clearly that reported as found in 1767 in Gentlemans Magazine (1786).
226. Again Tylecote's table is completely misleading in regard to my Nos.57, 68, 69 and 70. One suspects that parts of the table have been updated from Tylecote (1962, tables 33 and 34) without the necessary typesetting changes. For his pig No.34 column seven gives the (now defunct) 'lost' that belongs to his (spurious) pig No.33, column eight gives the inscription for the spurious pig (see note 232 below), column nine gives no C.I.L. number and column ten gives no silver content. The correct entries (i.e. Liverpool, IMP HADRIANI AVG (without LEG XX), No.1209e and 23 gt Ag.) are a line lower. This means that the entries in these columns for his pig No.35 (my No.70) are forced down to the line for his No.36 (my No.57) when the problem is solved by introducing two lines for the entry.
227. The pig was at Birmingham University in 1932 (Whittick 1932a, 133, n.23), but Webster and Tylecote say that it is in private hands at Netley Hall, Shropshire. I have been unable to confirm or deny this.
228. This stamp seems most likely to be MINB as supported by Whittick (1932a), E.E. and Webster, Watkin (1879) and

Gowland read VWINP/, Gentlemans Magazine (1786) read WINP and V.C.H. gave MINB or MINP (the N retrograde), while Tylecote omits the last letter entirely (see also notes 226 and 232). The misinterpretation of this stamp as LEG XX was probably at the bottom of Way's spurious pig (see note 225). On the expansion see below p.503.

229. The 'palm leaf' and 'grooved hammer' marks were noted by Whittick (1931, 262ff), though other obscure accounts had previously recorded them. I have now identified two further possible occurrences of the 'grooved hammer' stamp (No.57 (note 181) and No.64 (note 212)). Whilst the palm leaf is cast and clearly deliberate the 'grooved hammer' is a 'stamp' and Webster (p.8 n.18) has suggested that its presence on pig edges may be a result of an impact while in a sacking sling (though his experiments failed to prove this). The mark on No.56 in particular must call the interpretation of the marks as deliberate stamps into question since it is associated with a ?chisel mark. See further below p.506ff.
230. Cove Jones (1852), Proc.Soc.Ant. 1st series 2, p.204f; Way, p.34; Way (1866), p.279; Watkin (1879), p.352; Watkin, W.T. (1888), Shropshire Archaeological Soc. Journal 11, p.277; Wright (1888), p.277; Gowland No.25; C.I.L. No.1209e; V.C.H. Shropshire, p.263 No.4; Besnier No.27e; Whittick (1931), p.263ff; Whittick (1932a), p.130; Webster No.46; Whittick (1982), p.119 n.23; Tylecote No.34.
231. Gowland gave 190 lbs. but Webster (n.24) says he is in error and follows V.C.H.'s 185 lbs. (83.9 kg). However, Whittick (1982, 119 n.23) confirmed that the weight is in fact c.190 lbs.
232. See note 229. Tylecote also gives LEG XX, but this is a typesetting error and should be for his No.32/3 (my No.68) and therefore is a misreading of MINB anyway; see note 228 above. Only three fronds of the leaf survive (pers.comm. R. Lang, Liverpool Museum).
233. Bagshaw, S. (Sheffield 1851) History and Gazeteer of Shropshire, p.678; Way (1866), p.279; Watkin (1879), p.352; Gowland No.26; C.I.L. No.1209f; V.C.H. Shropshire, p.263f; No.5 and p.34; Besnier No.27f; Whittick (1931), p.263ff; Whittick (1932a), p.129ff; Webster No.47; Tylecote No.35.

234. Several authorities have questioned whether, in view of the similar find spots and the sole original source for No.70, Bagshaw (1851), Nos.70 and 71 are not identical (e.g. Webster n.25). The weights are different but Webster is right to point out how 173 could be a miscopy of 193. The problem is insoluble but the precedent of regarding them as separate is continued here.
235. Ellis (1838), British Museum Townley Gallery Library of Entertaining Knowledge, p.291; Bagshaw, S. (Sheffield 1851), History and Gazetteer of Shropshire, p.678; Way, p.32; Watkin (1879), p.351; Gowland No.22; Besnier No.27c; Whittick (1931), p.263ff; Whittick (1932a), p.129ff; Webster No.45; Tylecote No.20.
236. Ellis (1836) is in error with 191 lbs. (86.6 kg).
237. 12.5 cm long.
238. Webster (n.23) is the only authority to record this. I have examined the pig and it is certainly present, very clear and has a mark before it, though this seems unlikely to be a letter. On the expansion see below p.504.
239. E.E. ix No.1264a; Besnier No.40; Davies (1935), p.15, n.5; Webster No.53; Whittick (1982), p.112; Tylecote No.71.
240. For a discussion of the most likely source see below p.491f. The find date does not appear to be recorded.
241. The H is damaged.
242. The stamp is faint and inspection by the author indicates that only one X can be considered certain. It has been read variously. The second element may be XX (or conceivably /X for IX). The first is given as LAV by E.E., though as Webster (n.30) says Davies'(1935) restoration LVICVC is beyond proof and seems unlikely (it must be suspected that the reading was dictated by a desire to prove a connection with French pigs such as C.I.L. xiii 2612a (cf. Webster, p.12f)). Webster's own reading, PM, is markedly different but might be suggested to be P(lumbum) M(etallum). See further below p.508ff.
243. J.R.S. (1920) 11, p.239; Bushe-Fox (1926), p.42 and plate xi; Webster No.54; Tylecote No.83.

244. I.E. 96-98, Tylecote gives 96-169; presumably this is a printing error.
245. Previously at Richborough but now at Dover Castle (pers. comm. A. Moore).
246. The casting is curious in that there is a notable 'step' down between the V and A. Clearly the mould was poorly made with the A on a ridge in its base (I am grateful to A. Moore for providing the photographs on which this observation is based).
247. Although a number of pigs have been listed in the main catalogue for which few details are available Pigs Nos. ADD 1, 1-4 are too uncertain to list there. None are certainly Roman, one (No. ADD 1,4) may not even be a pig and Nos. ADD 1, 2-3 are little more than vaguely suggested finds without corroboration. The likely modern pig noted by Lane (1986) No.30 is omitted.
248. J.Brit.Arch.Ass. (1849/50) 5, p.297; Way, p.38.
249. There is no direct dating evidence but its proximity to the Medieval castle must arouse suspicion, though it is of Roman shape not the boat shape that the few known Medieval examples seem to be (Tylecote, p.71). It is conceivable that it is Roman and was brought to the castle as a curiosity or to be re-used having been found, but equally possible that it is Medieval and that a tradition of casting in the Roman shape continued in the relative isolation of N. Wales.
250. Bateman (1848), p.135; Way, p.37.
251. An unspecified number of uninscribed pigs. There are too few details to be certain of a Roman date, or indeed of whether this is not just the reporting of a rumour.
252. Woodward (1831), Archaeologia 23, p.369; Yates (1858), p.15; Way, p.37.
253. Three uninscribed pigs. The details are too sketchy, particularly given the unexpected find spot, to be sure of a Roman date.
254. Scarth, H.M. (1876) Proc. of the Bath Natural History and Antiquarian Field Club 3, p.340; Scarth (1876/8), p.157; V.C.H. Somerset, p.337.
255. An uninscribed mass, often assumed to be a bun ingot. However, Whittick (1961, p.109 n.27) feels it may have been like pig No.34. Either way a Roman date is far from certain.

256. For Nos. ADD 1, 5 - 7 Roman dates are to be presumed but must be far from unquestionable. That the inscriptions do not seem to accord with those of normal pigs and that they are all from Scotland, distant from any production area, must give rise to the suspicion that this is the re-smelting of scrap lead. No. ADD 1,8 being wedge-shaped and from a vertical mould, as well as being uninscribed must be far more likely to be re-smelted scrap lead than fresh lead from the mines (Webster n.39). Nos. ADD 1, 9 and 10, being fragments with unparalleled Legionary references standing alone, in the case of No. ADD 1, 10 perhaps from a broken tile stamp, must be more likely to be re-smelting than mine-fresh pigs.
257. Wilson, D. (1863) Archaeology and Prehistoric Annals of Scotland (2nd edit.) ii, p.64 (not consulted); McCaul (1863) Britanno-Roman Inscriptions, p.33 (not consulted); Watkin, W.T. (1874) Arch.J. 31, p.354; E.E. iii, p.141; E.E. ix, p.643; V.C.H. Derbyshire, p.230f; Davies (1935), p.161 n.4.
258. This was long recorded as identical to No.45 on the authority of Wilson (1863), but it seems likely to have been uninscribed (see V.C.H. Derbyshire, p.230f).
259. Way, p.37; C.I.L. No.1219; E.E. ix, p.143; Webster No.60 and n.37 citing Skinner (B.M. Add. MSS.33686 flo.54/8).
260. There is doubt about a Roman date (cf. Webster n.37) and the use of Roman numerals is no proof.
261. Or PCCLXX (P(ondo) 270) or ECXX (220 (?libra)). See Webster n.37.
262. Cant (ed) (Perth 1774), The Muses Threnodie, p.21 and 25 (not consulted); Way, p.36f; C.I.L. No.1220; Webster No.61.
263. Again the use of Roman numerals is no proof of date and the use of J, if it is not a miscopy of I, tends to argue against a Roman date. Yet the findspot argues for a Roman date.
264. Webster n.38.
265. Way gives exactly this. Webster omits the upper line.  
C.I.L. gives II. See further below p.508ff.  
-CXJXXX
266. Arch.Camb. (1936) 90, p.222; Webster No.62.

267. A wedge-shaped ingot cast in a vertical mould (Webster n.39).
268. Re-smelted or not the lead likely originated in Flintshire given the findspot's proximity to the production area.
269. Webster leaves his present location column blank and I have been unable to trace the pig. It is certainly not at Cardiff or Chester and is probably now lost.
270. The figure is that given by Webster and has been converted from oz. and dwt/ton.
271. Arch.Camb. (1932) 87, p.49ff; Webster No.58 and p.10 n.31.
272. This may be a lead seal not a pig fragment (pers.comm. Caerleon Museum), though the item could not be located in the museum to check this.
273. Though it must be suspected that these items represent re-smelting (note 256 above) the lead may well have originally had a S. Wales origin. For a discussion of the possible S. Wales industry see above p.281f.
274. J.R.S. (1948) 38, p.101; Webster No.57; Tylecote No.84.
275. It was found with third century material; cf. J.R.S. (1949).
276. ?Re-used tile stamp; J.R.S. (1948).
277. C.I.L. No.1217; V.C.H. Derbyshire No.5; Besnier No.39; Corder and Richmond (1942), p.28; Tylecote No.85.
278. Of what it is a fragment is not certain. Many have viewed it as a pig fragment, and the inscription may well support this, but it is possible that it is from an object marked to show that it originated at a British lead works.
279. There is no proof but the large number of Derbyshire pigs from this area, and the lack of those from any other source, must make it most likely to be Derbyshire lead.
280. The presence of EX ARG should make it pre-Hadrianic; see above p.233ff.
281. Tylecote gives a weight (59.42 kg) but this is a typesetting error. The weight is actually for his pig No.86 (my No.27).
282. The last letter slightly damaged, but the restoration is obvious. I follow V.C.H. in assuming the inscription was otherwise as given, though some early sources gave BREXARVM due to incorrect conjectures about the



expansion (cf. Corder and Richmond 1942).

283. Arch.J. (1892) 49, p.190 and p.234; C.I.L. No.1218; E.E. ix, p.643; V.C.H. Somerset, p.344; Webster No.59.
284. The findspot makes a Mendip origin likely.
285. The reading is Webster's. C.I.L. gave DOCCIVSI. E.E. gave DOCCIASI (S retrograde; A without cross bar). V.C.H. suggested that it was impressed from a samian stamp. There can be no connection with the French pig C.I.L. xiii 2612b (Webster, p.12).
286. Proc.Soc.Ant. (1899/1900) n.s. 18, p.97f; Whittick and Smythe (1935); Wright and Richmond (1955) No.199 (with further bibliography); E.E. ix No.1039; Tylecote table 43.
287. It has not been possible to establish the weights.
288. The last G is damaged. The pipe is broken in two between the L and I of IVLIO. Most elements are separated by well-formed triangular stops.
289. The figures are Tylecote's, presumably following Whittick and Smythe (1935).
290. Br. (1971) 2, pp.289-304; pers.comm. G. Lloyd-Morgan, Chester Museum.
291. C.I.L. xiii No.10029, 27; Besnier No.49.
292. Suggestions of a British origin (e.g. Besnier) rest on the find's proximity to Britain in an area without lead mining. Gaul must be an equally likely source and there is not even proof that the piece comes from a pig.
293. Neither source gives a date.
294. Yates (1858), p.21f; Gowland, p.379; C.I.L. xiii No.3222; Besnier No.46; Elkington (1976) No.27.
295. The shape and inscriptional form certainly allow of a British origin, though there are no exact parallels. Davies (1935, 159) went as far as to attribute these items to Shropshire for which there is no evidence, even if his unlikely reading of the inscription to include a legionary reference were accepted.
296. The date could be as No. ADD 2, 3 or later (see note 301), depending on the expansion of the last element.

297. Elkington (1976) gives 31 lbs. (14 kg). It has not been possible to confirm the weight.
298. This is the reading (with PA [ARTHICI ADIABENICI]) given by Besnier. It is perhaps partly confirmed by No. ADD 2, 3. However, it is certainly possible that the expansion could be PA [ARTHICI MAXIMI] since there is no certainty that this and No. ADD 2, 3 are identical. Gowland read E not L in the first line. C.I.L. records the E of CAES as present. Davies' (1935, 159) restorations cannot be accepted.
299. I am grateful to Dr. D.L. Kennedy for discussing the main inscription of Nos. ADD 2, 2 and 2, 3 with me. The form Parthici Adiabeni standing alone in No. ADD 2, 3, and perhaps in No. ADD 2, 2 is unusual. Parthici Arabici Adiabeni (in that order) is usual before 198 when Parthici Maximi replaces it.
300. Yates (1858), p.22f; Gowland, p.379; C.I.L. xiii No.2612a; Besnier No.47; Webster, p.12f.
301. Since the titles Parthicus Arabicus Parthicus Adiabenicus were replaced by Parthicus Maximus in the 2nd Parthian War (probably in 198) this must be between the taking of the titles in 194 and 198 (I am grateful to Dr. D.L. Kennedy for drawing this to my attention).
302. The reading is Besnier's except for PERTINACIS which it seems reasonable to add by parallel to No. ADD 2, 2. Webster seems to imply that this inscription is on the side and DL'P etc. on the top.
303. Expansions are hard to suggest. Perhaps 550 P(ondo); but 550 libra would be 411.8 lbs. (186.8 kg) which makes little sense as an intended or as an over weight mark. The second element can hardly be a number and might be a name (?L(ucius) VICUC(?); ?LU(c)I(us) CUC(?)) but there can be no certainty.
304. C.I.L. xiii No.2612b; Besnier No.48; Webster, p.12.
305. A British attribution (e.g. Besnier) is conceivable but Besnier's arguments are weak. The phantom pig bearing LEG XX has already been dismissed (note 225 above) and the coincidence of the stamp DOCCIUSI (No. ADD 1, 12) with DOC here must be just that (Webster, p.12). However, the presence of the legionary stamp might indicate at least a British connection. Besnier's expansion (followed by Webster), B(ene)F(iciarius)

L(egionis) I, for Legio I Minerva, suggesting inter-legionary cooperation is ingenious but cannot be entirely certain.

306. Retrograde.

307. Except for LEG XX the explanation, which is Besnier's, must be less than certain (note 305 above) but no alternative is obvious. DOC can only be guessed to be a name (? of the Beneficiarius).

308. C.I.L. xv 7919; Besnier No.67.

309. Besnier noted the private name parallel to e.g. No.5. However, this does little to establish a British origin since we clearly have a different individual here and even a family connection must be debatable.

310. Neither authority gives a date.

311. Besnier suggested TR(ophimi) but TR(ifo) and a number of other expansions are possible.

312. L'Hour (1984), p.26 and pers.comm. L'Hour. I am most grateful to M. L'Hour for drawing these items to my attention.

313. The form of the pigs and the exactly paralleled inscriptions make a British origin very likely, but without a reference to Britain or a phrase peculiar to it certainly is impossible.

314. The presence of pigs of Hadrian and A. Pius (Nos. ADD 2, 6, 7 and 8) in one cargo must argue strongly for a deposition date in the early years of the latter's reign, though for how long old moulds would remain in use and how long old pigs might be stockpiled cannot be certain.

315. As note 312 above but p.75.

316. L'Hour (1984) favours a British origin and if references to the Icani are present this seems very likely. References to the Brigantes could be more problematic since there were continental tribes with the same name.

317. The roughness of the castings may favour the later part of this date range.

Appendix 2: The Inscriptions and Weights of Lead Pigs

i) Introduction

Although the evidence provided by the known corpus of British lead pigs is primarily discussed in Chapter 8 a number of matters, principally of inscriptional interpretation, require further discussion but seem more suited to an appendix. The vexed question of whether Roman lead producers were working to one or more standards of weight in the production of their pigs has also been reserved for this Appendix. Although it may have some technological implications, it is of limited significance to the economics of the lead mining industry.

ii) Uninscribed and Dubiously Attributed Pigs

Two inscribed pigs catalogued in Appendix 1 cannot be attributed to a production area with any certainty. Pig No.72 is Hadrianic and was found at Cheshunt, north of London. A struck inscription on the side has been read variously as LAV X; PM XX; and LVICVC (Appendix 1 note 242). The latter pushes the evidence beyond acceptable limits, as perhaps does the former part of PM XX. Only the first reading may present the possibility of an interpretation that might give a source. It might be a misspelling of Lutudarium as Lautudarium (or a correct spelling with the second letter re-struck since the first strike was inverted). However, this would seem to involve too much special

pleading, besides which it would be unique as a stamped rather than cast reference to Lutudarium.

It has been noted that the lettering on this pig is similar to that on pig No.56 from Flintshire (Whittick 1982, 121 note 33). Although this alone cannot stand as evidence of a similar origin, the fact that its silver content is only 0.00256% may suggest that it has been desilvered (see above p.261ff) and support either a Mendip or Flintshire attribution. Of other known Hadrianic pigs without attribution marks one (No.15) is from the Mendips, one (No.67) is from Yorkshire (though in this case it is so badly recorded that the lack of an attribution mark may only indicate that it was not recorded), and the rest (Nos.68-71; though No.68 does have some form of ancilliary inscription, see below p.503) are from Shropshire. However, Yorkshire and Shropshire do not seem to have desilvered their lead (above p.261ff) and can therefore probably be ruled out. On balance it seems impossible to decide which production area this pig came from, but Flintshire and the Mendips are probably the strongest candidates.

The other unassigned inscribed pig is No.73, a part used pig from Richborough and the only Nervan pig known. Since it was part used it seems likely to have been at its intended destination when it entered the archaeological record. Certainly this must make the nearest production area (the Mendips) the strongest candidate, though as pointed out below p.517ff) simple distance may not have

been the only factor in lead supply in Roman Britain.

Twenty-four pigs, groups of pigs or possible fragments of pigs are listed in Appendix 1 which are either totally without inscription or bear only numerical inscriptions. Only three of these are undoubtedly Roman (Nos. 34, 54 and 55) and some have been relegated to the Addenda of Appendix 1 because of doubts about their date (or about whether they are true pigs); cf. Nos. ADD 1, 1; ADD 1, 2; ADD 1, 3; ADD 1, 4; ADD 1, 5; ADD 1,6; ADD 1, 7; ADD 1, 8. Of the rest (Nos.23-6 and 49-53), all from the Mendips or Derbyshire, there can be little doubt that we are dealing with true pigs cast in the Roman shape. It is this shape that a Roman date must be based on, later pigs apparently being boat-shaped (Tylecote 1986, p.71). It seems likely that the recorded numbers of uninscribed pigs are less representative of those discovered over the years than for inscribed pigs since they will have been less impressive to antiquarian, and even modern, finders and therefore less likely to have been recorded.

### iii) The Significance of Elements of the Inscriptions

This section aims to assess the possible significance of various elements found in the inscriptions on Romano-British lead pigs, excluding the self-explanatory imperial names and titles, private names and numerical inscriptions

(which are considered separately below).

a) The Main Cast Inscriptions

As noted in the introduction to Appendix 1 (p.407) the question of the expansions and readings to be applied to the pigs is a difficult matter because of the degree of abbreviation involved. It is now necessary to discuss the interpretations that have been put forward in the catalogue. The four earliest Mendip pigs (No.1-4) have relatively straightforward main cast inscriptions. No.1 may be a trophy not a pig (above p.228) but has a straightforward, if rather full, set of imperial titles followed by DE BRITAN(nis). This is probably to be rendered simply as from or of Britain. It is the only occurrence of a preposition with BRITANNICA or similar and, bearing in mind that this may be a trophy, it would be inappropriate to add 'mines' to it.

No. 2 is also fairly obvious, though it may differ considerably from initially apparently similar inscriptions on slightly later pigs (below). It, and No. 3, record only that the lead comes from the British mines of the emperor under the control of the second legion. No. 4 appears to be somewhat transitional. It has the rather full imperial titles of No. 1 yet EX ARGENT appears for the first time, legionary references disappear and a private name occurs

(see further below). Whether in this case we should continue to read '(from the) British (mines of) ... ' or whether we should read '(from the) British (lead-) silver mines/works ... ' as is suggested below for slightly later pigs it is difficult to say but the former may be preferable.

Excluding these pigs and the early Flintshire pig (No.56) with only a private name, the main cast inscriptions fall into four categories. The simplest is where we have only an imperial name/titles (and in some cases an ancillary origin mark such as DECEANGL(i)). These pigs (No. 15-22, 45-6, 57-62 and 64-73) pose little problem and are probably best read in the genitive either as '(of) Emperor Caesar ... Augustus' or perhaps '(from the British mines of) Emperor Caesar ... Augustus' (on the origin marks see p.500ff below).

Secondly we have the Mendip Vespasianic pigs bearing, typically IMP VESPASIAN AVG / BRIT EX ARG VEB (Nos. 5-14). These pigs, far more standardised in their inscriptions than their predecessors, generally have their legend in two lines. The great abbreviation at the end of No. 14 may be the result of an unsuccessful attempt to compress it into one line, while No. 13 may be incomplete (Appendix 1 note 66). Only No. 12 of this group fails to carry the second line. Here we come upon the major problem of exactly what the elements BRIT, EX ARG and VEB are intended to mean, how they are connected to each other and whether they are to be read



separately from the Imperial name.

As is argued below (p.501) VEB (???) seems most likely to be the name of a place or an area. BRIT is clearly standing for British, but in what sense? If it is disconnected from the rest of the inscription we might read, on the parallel of pig No. 2, BRIT(annica) (metalla), '(from the) British (mines)' (or indeed BRIT(anicum) (plumbum), 'British (lead),' or just BRIT(annica), '(from) Britain'). Less likely would be to take it with the first line of the inscription as with earlier pigs without private names on them and read '(from the) British (mines of) Emperor Vespasian Augustus.' However, it seems more reasonable since the inscription is in two parts to suggest that BRIT relates solely to the second line and read '(from/of the) British EX ARG VEB.'

This of course depends upon the interpretation that is put on EX ARG. This term, the longest form of which is on pig No. 4 (EX ARGENT(ariis)), has been much debated and is problematic in that we do not have more than EX ARG to go on in most cases. Some authorities have taken it to indicate that the lead has been cupelled to remove the silver from it (e.g. Davies 1935, 10f). However, as a number of writers have pointed out the expression occurs on a number of pigs with high silver contents which can hardly have been cupelled (e.g. Webster 1952/3, 9; Tylecote 1986, 69). Indeed, it is

argued above (p.261 ff) that Flintshire lead (on which the term was not used) was desilvered and Derbyshire lead (on which it was used) was not. Further evidence is provided by the presence of Galena in some lead pigs bearing EX ARG which must have come directly from the charge being smelted rather than being dropped on to a cooling pig (Webster 1952/3, p.9 note 25). This galena could not have survived the cupellation process. The generally preferred interpretation now is 'from the (lead-) silver mines or works' (e.g. Whittick 1982, 118).

This is not necessarily to say that the term was not, at least when first coined, connected to desilverisation. The key is perhaps pig No. 4, which we have already noted seems to be somewhat transitional. It is the only pig on which the term occurs in isolation, notably incised not cast, and indeed it is the earliest pig to carry it. This also seems to be the first pig to be desilvered (above p.261 ff) and the first with a private name on it. It seems reasonable to suggest that the advent of these three features is connected. That is that desilverisation began with the involvement of private ?lessees and that EX ARG was in some way connected to it. As already noted it can hardly have been an actual checking mark showing that the lead had been desilvered for the term is later used on undesilvered lead. However, it may indicate that the lead had passed through an officially sanctioned smelter, where in the Mendips the

desilverisation would have taken place, but which in Derbyshire simply smelted and cast the lead into pigs.

This interpretation would fit well with reading '(from the) British EX ARG VEB' for we would be talking of a single phrase indicating the origin of the pig: '(from the) British (lead-) silver works (at) VEB (???)'. This would seem to be far more logical than following the example of No. 2 and restoring an unexpressed metalla after BRIT. It also makes sense in the context of our third main group of cast inscriptions, the Derbyshire pigs, carrying a single line inscription with a private or society name followed by combinations of BRIT, EX ARG and LVT (Nos. 27-33 and 35-41).

It is notable that the use of BRIT EX ARG is restricted to those pigs with private or society names. It seems likely that its disappearance at the same time as society and private names cease to appear implies a change in the organisation of the industry (see further above p.227ff). If it were the imperial authorities (or at an earlier date the legions) who were doing the smelting then there would be no need to point out that the lead had come from a sanctioned smelter. Thus, there seems little problem in reading the Derbyshire inscriptions in much the same vein as those from the Mendips, even though desilverisation was not occurring. If this is the case the general import of the inscriptions on Nos. 27-33 and 35-41 is clear, that they were produced

by the named individual or society and had passed through a British (lead-) silver works (BRIT EX ARG).

Yet closer inspection shows that the matter may not be so simple. If we were to take the Mendip inscriptions as exact parallels we ought to be looking for the name of the smelter as well. Clearly there is a name of a place or an area on these pigs, Lutudarum, but it does not appear in the same position in the inscriptions as the term VEB (???). There are three distinct variations. On Nos. 27-8, 35-6 and 42-4 we have SOC LVT BRIT EX ARG (variously abbreviated). This could be read simply as '(of the) Society of Lutudarum. (from the) British (lead-) silver works,' especially since the inscription is in two lines on Nos. 27-8. However, the other two variations, a private name with BRIT LVT EX ARG and a private name with LVT BRIT EX ARG, are open to more than one reading. For the first we may have '(from the) British Lutudarum (lead?) silver works,' but '(from the) British (mines). (from the) Lutudarum (lead-) silver works' or 'British (lead) (from the) Lutudarum (lead-) silver works' are both also possibilities. Similarly the second allows of the possibility of '(from the) Lutudarum (mine). (from the) British (lead-) silver works' (cf the parallel of Nos. 47-8 below) or of any of the expansions for the first if the order of the inscription is not adhered to. Exactly what is meant by these inscriptions must therefore remain unknown, though

the general sense appears to be that the pigs were produced by those named at a British (lead-) silver works, perhaps at Lutudarum.

This leaves the final group of pigs, the private ones from Derbyshire numbered 47 and 48 and bearing private names followed by abbreviations of METALLI LVTVDARENSIS, which seem to be unique with the Hadrianic example (No. 45) in explicitly claiming to be '(from the) Lutudarum mine.'

#### b) Elements of the Cast and Stamped Inscriptions

Various elements both in the main cast inscriptions and in other stamped inscriptions found on lead pigs have not been discussed in detail above but require brief comment since their reading, or at least significance, is debated or not immediately obvious. It will be best to take each in turn.

#### Lutudarum

We have already noted above the occurrence of the name Lutudarum and its derivatives in the main cast inscription of Derbyshire pigs. It is used in all cases as an origin mark of some sort, and in all cases is cast as with VEB (???) (below). Whether the name is that of a town or a general mining area is unknown, though the possible use of it to denote an individual mine and perhaps an official smelter

(above ) may lend weight to arguments that it was a place. The name also occurs in the Ravenna Cosmography and is discussed further above (p.287f), where it is suggested that if it is a place the best candidate for the name is Carsington.

### VEB (???)

The letters VEB are found cast on to most Vespasianic pigs from the Mendips and it has already been suggested (above p.495f) that they form part of a longer attribution phrase. There seems little doubt that the letters are an abbreviation of a place or area name, though an expansion is not obvious. Rivet and Smith (1981, p.145, p.379 and p.487) concur that VEB is likely to represent a name. But they tentatively assign the name ?ISCALIS to Charterhouse, the main Mendip mining settlement and therefore the prime candidate for the name if it was that of a place. The discovery of four pigs with the mark at nearby Green Ore, where they could have been cast, (Nos. 5-8) might suggest that the name is in fact for a general mining area not a specific place, but this cannot be certain. Elkington (1976, 194) has suggested that the name might be preserved in the modern place name of Ubley near Charterhouse. The restriction of the name to Vespasianic times probably indicates that it was unnecessary to indicate the origin of

Mendip lead in pre-Vespasianic times. It was the only production area in Britain being exploited at the time, and in post-Vespasianic times when imperial control over the operation may have been extended (above p.244f) it was perhaps again felt unnecessary to identify producing regions. Alternatively, since the name is exclusively used on private/society pigs, it is possible that it applied to some specific site used by the private miners.

### BRIG

This term, stamped onto both the well-recorded Yorkshire pigs (Nos. 64 and 65), and, it must be suspected, on the badly recorded Nos. 66 and 67, can hardly be other than a reference to the territory of the Brigantes. The correct expansion is likely to be either BRIG(anticum) (plumbum) 'Brigantian lead' (Whittick 1982, 114) or BRIG(anticum) (metallum) 'from the Brigantian mines' (Rivet and Smith 1981, 278-80). Clearly it is an origin mark denoting lead from northern Britain except the Derbyshire field which, though perhaps lying within the tribal territory of the Brigantes, we have already seen had its own mark, Lutudarum. The significance of the presence of references to the Brigantes on the recent pig finds in the Ploumanac'h wreck (ADD 2, 9) must await further publication of the finds.

DECEANGL

This term, which occurs cast on to the side of all known Flintshire pigs except the early and private No. 56 and the enigmatic No. 63. has in the past been consistently misinterpreted as DE CANGL(icum), even though no pig has a space between E and C (Whittick 1982, 113; and notes to Nos. 57-62). This was to fit in with an erroneous reading of the tribal name (now accepted to be Deceangli) in Tacitus Annales xii, 32 (Whittick 1982, 114 n.4; Rivet and Smith 1981, 331). The correct interpretation is clearly an origin mark, probably to be expanded DECEANGL(icum) (plumbum) 'Deceanglian lead' (Whittick 1982, 114) or DECEANGL(icum) (metallum) 'From the Deceanglian mines' (Rivet and Smith 1981, 331). The relatively full abbreviation on the pigs tends to suggest that the name was not well-known, or that there were other tribes with similar names (Rivet and Smith 1981, 330; but see also Webster 1975, 7f who disagrees).

MINB

One Shropshire pig (No. 68) carries two impressions of a stamp on the rim around the main inscription probably best read as MINB (Appendix 1, note 228). Webster (1975, 100) reads it as a name, M(arcus) IN(??) B(??), but this is unconvincing without fuller expansions being suggested. That it occurs on a Hadrianic pig is perhaps against it being an



origin mark since the only origin mark known to continue into Hadrianic times is Lutudarum. Given that the reading is debated and no expansion is obvious it would be unwise to speculate further.

V.ET PL.C and V.ET.PL.C

One legionary stamped pig from the Mendips (No. 2) carries two versions of a stamp, V.ET PL.C and V.ET. [PL.C] (on the reading see Appendix 1, note 11). Suggestions that it refers to the consuls of 49 cannot be accepted (Appendix 1 note 11). The meaning of the stamp is uncertain, though it is tempting to suggest a partial expansion such as V.ET PL(umbum).C. The initial letter might just be connected to VEB (above), but such extreme abbreviation at such an early date seems unlikely.

SN (??? S(ta)N(um) )

SN is stamped on the end of pig No. 71 (Hadrianic from Shropshire). It has not previously been explained but it is possible that it should be expanded S(ta)N(um), as used by Pliny (Nat.Hist.xxxiv, 164; and cf Healy 1986) for lead smelted from lead/silver ore. This is however conjectural, though it might be appropriate since Shropshire lead does not seem to have been desilvered (above p.261 ff).

IMP

IMP occurs frequently as an element of the main

inscription on lead pigs, but it also occurs as an isolated stamp on two pigs (Nos. 6 and 7). Both are part of the Vespasianic hoard from Green Ore on Mendip and both contained IMP in their main cast inscriptions as well. There could be doubt about both examples of the stamp. The impression on the front of No. 6 has marks of uncertain character, that may or may not be the edges of the stamp, before and after it, while on No. 7, stamped on the rim, the impression is almost illegible. However, if the readings are accepted, we seem to have two examples of an ancillary imperial stamp. It is particularly interesting that the stamp occurs on only two of the four identical pigs from the hoard. One wonders if the stamp is not being used to differentiate the pigs that are to be paid to the authorities as some form of rent or due by the ?lessee whose name appears on all the pigs, TI.CL.TRIF. The presence of the IMP stamp as well as that of TI.CL.TRIF certainly tends to argue against him being an imperial official, for if he was one stamp would surely be sufficient as a checking mark. Nor can the stamp have any connection with desilverisation since it only occurs on two of four pigs (one of which has not been desilvered, though this might be accidental (above p.265f)). Firm conclusions about the significance of the stamps are not possible with only two examples with debated readings. However it may be that they pertain to the important, and relatively obscure,

matter of the imperial authorities' role in Vespasianic mining.

### NOVEG

Pigs 9, 10 and 14 (Vespasianic from the Mendips) carry a society name in various stamps, SOC NOVEG, or perhaps SOC NOVEC. It can perhaps be expanded SOC(iorum) NOVEG(orum), SOC(iorum) NOV(a)EG(orum) or SOC(ietatis) NOVEG or NOV(a)EG (or for any of these with NOVEC not NOVEG). However, certainty is impossible and no origin for the name has yet been suggested.

### c) Marks and Symbols

Whittick (1931, 261ff) was the first to point out the presence of three types of marks on some pigs. One, a cast circle seen only on the end of pig No. 18, is clearly deliberate, as is the second, a cast 'palm leaf' on Nos. 18, 68 (on both sides), 69 and 71. The third, the so-called 'grooved hammer stamp' may not be deliberate but has now been detected on pigs 18, 57, 64 and (in three places) on No. 68.

The first mark might be decorative, though decoration seems inappropriate and unparalleled, but it is notable that it occurs with both other marks under discussion and on the heaviest pig known (below p.514). The palm leaf occurs on

pigs from both Shropshire and the Mendips all of which are Hadrianic or later and in three instances with other marks and stamps of uncertain significance, (No. 18 with the cast circle and 'grooved hammer stamp;' No. 68 with MINB and the 'grooved hammer stamp;' and No. 71 with SN). There are parallels to suggest that the palm branch may have had an imperial significance (Whittick 1931, 262), and the fact that it occurs in two producing areas may suggest that its importance was more than local. It is perhaps possible that it was some form of checking mark, though one would expect it to be stamped not cast if this were the case. Or indeed that it identified pigs in some way reserved for the imperial authorities as was suggested above (p.505) for the IMP stamp on earlier pigs. It should also be noted that a similar device occurs on some lead seals of Cohors II Nerviorum that may record lead or silver shipments from mines near Whitley Castle (Richmond 1936; above p.280).

The 'grooved hammer stamp' was suggested by Webster (1952/3, 8 n.18) to be accidentally caused by coarse sacking being wrapped around the pig and it then being heavily struck, though his experiments failed to prove this. Further evidence in favour of these marks being accidental must be provided by the fact that most are on the edges of the pigs where accidental damage would be most likely, and by the nature of the 'stamp' on No. 57. This occurrence of the mark appears on the raised area of lead that appears to have been caused

by the impact of a ?chisel immediately above it. Even if this 'stamp' were to be excepted as deliberate it seems difficult to regard it as of much importance since it would be easy to forge quite apart from being relatively difficult to detect.

To conclude, the 'grooved hammer stamp' must on present evidence be dismissed as a significant marking. However, the cast circle and palm leaf seem far more important and their restriction to Hadrianic and later pigs may strengthen the suspicion that they relate in some way to the imperial role in mining at this date. The cast circle may in addition have some connection with weight standards in operation at this time (below p.514ff).

#### d) Numerical Inscriptions

Thirteen of the items catalogued in Appendix 1 bear inscriptions which seem best interpreted as numerical. All these marks are stamped or incised after casting except for a V of applied strips, which may or may not have numerical significance, on No. 7 (and or No. 5; on the problem of which pig carries it see Appendix 1 notes 32 and 42). The pigs with known sources are all from the Mendips or Derbyshire, with four unprovenanced, and range in date from Nero to Hadrian with a number of others that cannot be dated.

The pigs are No. 4 (XXX for 30); No. 5 (LXV for 65);

No. 7 (LXIX for 69 and the applied strip (?for 5)); No. 8 (LXXIIX for 78); No. 9 (VIII for 9); No. 10 (IIVI for VIII or XLVI (8 or 46) see Appendix 1 note 54 and further below); No. 49 (CCX for 210 or, more likely, IIX for 8); No. 50 (XXX for 30); No. 51 (XV for 15); and No. 72 (a legend that may include one or more numerical elements of which the most likely is XX (20) or IX (9), see Appendix 1 note 242).

These eleven pigs are relatively reliably recorded and complete but three others are not, the fragment No. ADD 2, 1 with P XXX (perhaps P(ondo) XXX and therefore a weight of 30 (librae)), and the ?resmelted pigs Nos. ADD 1, 6 and ADD 1, 7 with, respectively CCLXX (270), and a complex inscription perhaps including X (10), if it is not used as a letter, and XXX with II above presumably for 32.

The significance of these marks is debatable, and it may be that more than one explanation is required for them all (in particular the ?resmelted pigs). However, it seems unlikely in view of the size of some of the numbers that we are generally dealing with batch numbers or the like, or with measurements of the weight of silver extracted (particularly since Derbyshire lead was probably not desilvered, above (p.266ff)). The most likely explanation seems to be that most anyway are overweight marks, much as Parker (1974) has argued numerical inscriptions on late Spanish pigs are. This suggestion will be discussed in detail in the next section.

iv) The Weights of British Lead Pigs

There have been a number of attempts to discover what, if any, standard was used in the casting of Roman lead pigs in Britain, of which Palmer and Ashworth's (1956/7) is probably the most successful. They point out that if the numerical inscriptions noted above are regarded as overweight marks in librae and therefore deducted from the actual weights of the pigs a figure in the range 138-143 lbs. (62.6 - 64.9 kg) is obtained.<sup>1</sup> The variation within this range is easily accounted for by weighing inaccuracies and wear and tear on the pigs.

Of the numerical inscriptions seven are sufficiently clear in their reading (including Nos. 10 and 49 for which there are two possible but very different readings) and occur on complete pigs of known weight so that they are useful to test Palmer and Ashworth's proposition against. Of the others Nos. 50, 51, ADD 1, 6 and ADD 2, 1 are of unknown weight, No. 72 has such an uncertain set of marks that they may not even include numerical elements. The numerical element(s) on No. ADD 1, 7, even if properly recorded, seem unsafe to use since it is likely to be a block of resmelted scrap lead. Out of this admittedly small sample of seven useful pigs six do indeed fall within or just fractionally outside Palmer and Ashworth's range. The exception is No. 9 which gives an adjusted weight of 155.262 lbs. (70.43 kg)

once nine librae are removed in line with the numerical inscription on it.

When all known complete pigs (as opposed to ?resmelted blocks) whose weights are established are tabulated (Fig.11), we find a range from 50 lbs. (22.7 kg) No. 19) to 223 lbs. (101.2 kg) No. 18). It is clear that the majority of pigs form a group between 150 and 200 lbs. (68.04 - 90.72 kg) with particular peaks between 170 and 200 lbs. (77.112 - 90.72 kg). Palmer and Ashworth's suggested weight standard in fact falls some way below the peak groupings and is represented by only four pigs on Fig.11 (none of which in fact have weights within their specific range). It therefore seems clear that if they are right to derive a weight standard from numerically marked pigs then that standard was regularly exceeded, for all six pigs whose adjusted weights are within their range lie, in quite a broad spread, in or near the peak groups.

This raises the question of why the other pigs in the peak groups do not carry excess weight marks. In this connection it should be remembered that the only numerically inscribed pig of those available to test the proposition against that does not give an adjusted weight within Palmer and Ashworth's range (No. 9) gives a higher adjusted weight (155.262 lbs. (70.43 kg)). This might suggest that there was a higher weight standard in the 155 lbs. region, perhaps



one more often achieved, or at least approached, necessitating fewer pigs to carry overweight marks. It is to be noted that only Nos. 9 and 49 carry overweight marks of a few librae, most marks involve weight discrepancies of 20-50 lbs. (9-22 kg). It seems likely that weighing was fairly approximate and only relatively large discrepancies thought to be worth noting. Indeed, Tylecote (1986, 57) suggests that Roman furnaces, like those of the seventeenth century, yielded about 75 kg (165.3 lbs.).

If either, or both, of these weight standards did exist it seems likely that they were only very general and perhaps not universally acknowledged. The considerable variations in pig weights, at least within the 150-200 lbs. (68.04 - 90.72 kg) peak group, may well be due to variations in the size and efficiency of furnaces. Indeed, it is likely that norms of furnace yield dictated any weight standards rather than vice versa. Certainly attempts to deduce a standard, a fodder weight, of which pig weights represent subdivisions must be treated with caution. Palmer and Ashworth (1967/7) suggest that their standard is related to a fodder similar to the early modern Derbyshire one. They give this as 2,820 lbs. (1,279 kg), and, indeed, one twentieth of this would be 141 lbs. (64 kg), roughly in the centre of their suggested standard range. However, reliance on early modern fodder weights is dangerous since they varied throughout the country

and at least one authority gives the Derbyshire fodder, where there were in fact two different fodder standards in operation, a different value (on these early modern fodders see Price, Muckelroy and Willies 1980, 24f; and Blanchard 1971, 138f). Nor does the possible standard at 155 lbs. (70.3 kg) bear any logical relationship to Palmer and Ashworth's fodder.

The suspicion that we are dealing with vague weight standards with little or no official standing is reinforced by the fact that we have pigs of different weights from the same moulds without numerical inscriptions which could be taken as attempts to indicate variation from a norm (e.g. Nos. 29-33). The finding of the light, uninscribed pig No. 34 with the inscribed and more normal weight pigs Nos. 31-3 and 35 again suggests that weight standards were not considered of paramount importance. Though the fact that it is uninscribed could be taken to suggest that some attempt was being made to show that it was not normal (assuming that it was produced at the same smelter as those found with it).

There do seem to be some trends in the weight of pigs revealed by Fig. 12 that suggest that standards, however vague, existed and indeed changed over time. Though there are no significant variations in weight by production area there does seem to be a strong correlation between weight

and date. Whatever the significance of the peaks between 150 and 200 lbs. (68.04 - 90.72 kg) it is notable that all the dated pigs therein are Hadrianic or earlier. Indeed, only one dated pig in the range 110-200 lbs. (49.9 - 90.72 kg) is post-Hadrianic (No. 54; a fourth century pig from Derbyshire). Outside this range the only Hadrianic or earlier pig is No. 34 (above) which may be the casting resulting from an insufficiently charged furnace (or indeed the excess left after a full pig had been cast), explaining its lack of inscription.

Although the only dated post-Hadrianic pigs except for those from a fourth century context in Derbyshire (Nos. 54 and 55) are from the Mendips it is notable that they are all (except No. 54) lighter than 110 lbs. (49.9 kg) or heavier than 200 lbs. (90.72 kg). Generally Fig.12 seems to suggest that post-Hadrianic pigs tend to be lighter than earlier ones, with the uninscribed fourth century Derbyshire examples Nos. 54 and 55 representing the upper part of a spectrum from 50 to 130 lbs. (22.68 - 58.9 kg). One pig, the exceptionally heavy No. 18 at 223 lbs. (101.15 kg) which we have already noted (above p.508 f) uniquely carries both certainly deliberate non-inscriptional marks, seems to contradict this conclusion.<sup>2</sup> However, it is notable that its weight is approximately three times that of the identically dated No.16, though rather less than three times that of the again con-

temporary No. 17. It therefore seems possible, given that any standards may have been rather vague, that in post-Hadrianic times some form of double standard may have been in use. This might indicate either the use of two types of furnace, a large and infrequently fired one and a smaller more frequently fired one, or a differentiation in production perhaps to suit larger and smaller customers or reflecting different transport methods (e.g. mule panniers and carts).

The sample of post-Hadrianic pigs is far too small to prove this hypothesis. But it is notable that in the Mendips, the only area for which we have a dated sequence of pigs of any length, the light post-Hadrianic pigs in fact run against a trend for pigs to get heavier. From the Neronian pigs in their probable chronological order at 161, 165 and 166 lbs., through the Vespasianic pigs, mostly in the 170-190 lbs. range, to the 195 lbs. of Hadrianic pig No. 15 and the 223 lbs. of the Antonine No. 18. It is therefore quite possible that it is not pig No. 18 that is anomalous but the pigs representing subdivisions of its standard. That three of the latter have survived compared to one heavy example would not be surprising. Theft of such a heavy object would be less likely (perhaps the reason for the gradual increase in weight) and theft seems to be one of the principle ways in which pigs entered the archaeological record (above p.250ff).

Notes

1. The marks are certainly not underweight indicators for, if they were, they would give the pigs an adjusted weight range of 149.98 - 255.89 lbs. (68-116 kg), with no two pigs even of approximately similar weight.
2. As Whittick (1931, 261) points out the pig could not have been produced as the result of a 'bumper filling' of a mould for the non-inscriptional marks, clearly intentional parts of the mould, would not have appeared with a smaller filling.

Appendix 3: The Economic Geography of Lead Supply  
Within Britain

i) Introduction

The conclusions reached in Chapter 8 regarding the desilverisation of British lead (p.261 ff) and the distribution of lead pigs from known production areas (p.255 ff) may with a number of qualifications be taken further in an attempt to define something of the economic geography of the supplying of lead within Britain. However, given the number of assumptions inherent in the exercise and the hypothetical nature of many of the conclusions it has been thought more appropriate to describe this in an appendix and not in the main text. Taking the conclusions regarding desilverisation and pig distribution as guidelines a series of analysed lead objects are considered in terms of the likely origin for their lead, allowing the refining of the guidelines. Based on these refined guidelines a number of 'Areas of Economic Precedence' and 'Areas of Economic Competition' are suggested. Whilst the present work raises a number of interesting questions the technique is likely to be superseded in the near future by lead isotope analysis, a brief resume of which is given at the end of the Appendix.

ii) The Guidelines and Qualifications

The guidelines for identifying the source of lead used for objects rely on two factors. Firstly, that only the lead

coming from the Mendips and Flintshire seems to have regularly been desilvered (and therefore contain 0.005% or less silver), whilst other lead mining areas did not desilver their lead. Secondly, that the pig finds in Britain from known production areas indicate something of the areas reached by lead from various production centres. Combining these elements it can be suggested that desilvered lead south of the midlands ought to be of Mendip origin and that desilvered lead in and north of the midlands ought to come from Flintshire. Undesilvered lead ought to be from Shropshire in the Wroxeter region (and perhaps other parts of Wales). From Yorkshire in a limited area probably mostly east of the production centres; and of Derbyshire origin elsewhere (guidelines cannot be suggested north of Yorkshire).

Underlying these guidelines are a number of assumptions and judgements of probability, the validity of which are in some cases untestable and it will be as well to state these at the outset. Firstly, it is being assumed that the observed distribution of sourced lead pig finds is representative. Although this distribution includes some seventy items many group around the production areas and are of limited use in this exercise. Thus, for instance, the evidence for the penetration of Flintshire lead into the midlands is principally confined to the presence of pig Nos. 59 and 60 in the area. Similarly the suggestion that

Yorkshire lead was principally restricted to an area to the east of the production centres is based solely on probability, there being large centres that might be expected to be customers for the production there. Secondly, we are assuming that we can establish from silver contents whether a pig or an object has been desilvered. We have already seen Chapter 8, p.261 ff) that this is reasonably likely in many cases, but that we have a few cases of Derbyshire pigs that might have been desilvered but could alternatively represent undesilvered ore naturally very low in silver. This problem is unsolvable and must remain a primary source of error in our discussions.

Thirdly, it has necessarily to be assumed that the objects that we are to test our guidelines against are both made from the production of only one lead producing area, and that their findspots are reasonably near their point of fabrication from raw lead. Both assumptions could be challenged. In the first case the resmelting of scrap lead is likely (indeed the 'pigs' Nos. ADD 1, 5-10 probably represent the practice) and it is conceivable that lead originally from desilvering and non-desilvering areas could become mixed. Borderline cases of desilvered lead must therefore be treated with special caution. In the second case it is possible that an item made of lead from one region could be transported to a distant part of the country, and it is



impossible to allow for this. However, the corpus of objects considered below are in general not the sort of items that are likely to have been moved far. They are too small and mundane, too large and heavy or the debris of lead working (on the problems of objects clearly far from lead sources see further below p.529).

Fourthly, it is being assumed that lead prices were responsive to transport costs and that price was the sole factor in deciding the source of supply used in any particular area. The latter almost certainly requires some qualification as is shown below (p.530), and indeed the possibility that the pre-transport cost of lead in some areas was greater than in others has already been touched on (Chapter 8, p.258f) and will be returned to below. The former is probably valid as a generalisation, though the composition of transport costs might be complex, perhaps including elements such as economies obtained by transport as ballast in empty boats (Chapter 5, p.76ff; Chapter 8, p.259f), and must be accepted as an assumption for the exercise to proceed.

Fifthly, our guidelines can only be applied to the period after c.60 since Mendip lead was not desilvered before this date (Chapter 8, p.264). Also the dating of many of the objects to be considered below is in terms of broad periods which may introduce an element of error since we have little

information on the termination dates of the various areas' industries. Finally, as will become apparent the uncertainty regarding a possible extraction industry in south Wales (Chapter 8, p.282) means that some items below cannot be attributed to any area with confidence.

### iii) Testing the Guidelines

Keeping the assumptions and qualifications stated above in mind the guidelines may now be tested against a corpus of analysed and provenanced objects. Regrettably few such objects have been published<sup>1</sup> but Tylecote (1986, table 43) has provided details of a small number to which three objects from recent excavations at Brough-on-Noe just north of the Derbyshire lead field may be added (Bishop et al forthcoming).<sup>2</sup> For each item the provenance, type of object and the date of its deposition is given first followed by comments on its relationship to the guidelines.

#### a) Chester; 'Agricola' water pipe (cf. ADD 1, 13) (A.D. 74)

It has already been noted (above p.266) that this item, at 0.0017% silver, has almost certainly been desilvered which is in accordance with our guidelines since its proximity to Flintshire must indicate that the lead originated there.

#### b) Bath; Lead sheet (A.D. 44-100)

Similarly to the last piece this lead, at 0.0027-0.0048% silver, has been desilvered and agrees with the guidelines

since it must from its location be likely to come from the Mendips. It may be noted that since it has desilvered its dating is likely to be post-60 since Mendip lead was probably not desilvered before this (above p.264).

c) Caerleon: Lead sheet (A.D. 75-400)

This sample is low in silver at 0.002% and so probably desilvered. Our guidelines would suggest that this indicates a Mendip origin, however, as already noted, the possibility that there was an extraction industry in south Wales itself means that it would be unsafe to draw this conclusion with any confidence.

d) Wroxeter: Water pipe (A.D. 78-380)

Again this sample tends to agree with our guidelines in that its findspot must suggest a Shropshire origin for the lead and its relatively high silver content of 0.0056% implies non-desilverisation; though it is not sufficiently low to absolutely guarantee it.

e) Sittingbourne, Kent; Coffin (A.D. 250-400)

This lead is extremely unlikely to have been desilvered at 0.0098% silver and our guidelines would therefore suggest a Derbyshire origin.

f) Merlin's Cave, Wye Valley; Lump (A.D. 100-400)

Again the high silver content (0.00263%) makes desilverisation here very unlikely. Our guidelines would therefore rule out a Mendip origin at this date. However, again a south Wales origin might be possible, the other candidate being Shropshire.

g) Richborough, Kent; Lump (A.D. 43-338)

This lead does not seem to have been desilvered at 0.0078%. However in view of its date range it would be unwise to speculate from our guidelines on its origin since it could come from the Mendips where desilverisation is unlikely before c.60, or from Derbyshire.

h) Folkeston Villa; Mass (A.D. 78-388)

The silver content (0.0072%) suggests a lack of desilverisation and our guidelines would point to a Derbyshire origin.

i) Green Ore, Mendips; Casting (A.D. 69-79)

Since Green Ore has already been mentioned (p.281) as one of the main processing sites of the Mendip industry there can be little doubt that this sample is Mendip lead. However, it appears to contradict our guidelines in that it is clearly undesilvered at 0.04% silver.

j) Heronbridge, Chester; Lead sheet (1st or 2nd century)

As with a) a Flintshire origin is to be expected from the findspot and the low silver content (0.0022%) indicating desilverisation is in line with our guidelines.

k) Caerhun, Conway; Piece (Roman)

Again geographically a Flintshire origin for this lead is to be expected and, in line with our guidelines, the silver content of 0.0043% may suggest desilverisation. We have already noted however that borderline evidence for desilverisation, which this perhaps is, must be treated with caution.

l) Holborough, Kent; Coffin (1st or 2nd century)

Much the same comments must attach to this sample at 0.003% silver as to g) above.

m) Usk; Lead sheet (Roman)

The silver content here must make this a borderline case for desilverisation and even if it were not our guidelines could not be used because of the possibility of a south Wales field.

n) Springhead, Kent; Rivet (Roman)

The silver value of 0.026% suggests desilverisation and

our guidelines would suggest a Mendip origin.

o) Springhead, Kent; Casting (Roman)

In contrast to the above desilverisation here at 0.0067% seems unlikely and the guidelines would suggest a Derbyshire origin, though the possibility that it could date to before 60 and so could be of undesilvered Mendip lead exists.

p) Springhead, Kent; Casting (Roman)

At 0.0103% silver the same applies here as for o).

q) Camerton, Somerset; Lump (Roman)

There is a complete absence of silver here and this agrees with our guidelines in that the findspot indicates that the lead must be from the Mendips (and again probably after 60).

r) Castledykes, Strathclude; Mass (Roman)

This piece is particularly interesting since it is one of only three pieces from north of the known production areas. Its silver content (0.0029%) may well indicate desilverisation but the problem of the known low silver content for some Derbyshire pigs, which may be natural, complicates the matter. See further below.

s) Boxmoor, Herts; 'Ingot' (3rd or 4th centuries)

This item with 0.01-0.02% silver is unlikely to have been desilvered and our guidelines would suggest ought to come from Derbyshire.

t) St. Albans; Lump (Roman)

The likelihood here is that this item with 0.003% silver has been desilvered. Our guidelines suggest that it ought to be from the Mendips.

u) Silchester; Bar, pump and pipe (Roman)

At 0.0023%, nil and nil respectively the silver contents here seem to assure that this is desilvered lead and this would agree with our guidelines in view of Silchester's proximity to the Mendips.

v) Corbridge; Lamp (Roman)

This item contains no silver and must surely have been desilvered. Its geographical position means that our guidelines do not apply. See further below.

w) Ireby, Cumbria; Vat (Roman)

The same applies for this item. It is argued below that it fits in well with our guidelines however since it is likely to be of Flintshire lead.

x) Brough-on-Noe, Derbyshire; Lamp (?80-120)

The low (0.0031%) silver content of this item ought to suggest desilverisation and it therefore contravenes our guidelines since it comes from the vicinity of the Derbyshire extraction area.

y) Brough-on-Noe, Derbyshire; Strip and two weights (?80-120)

In contrast to x) from the same site our guidelines are vindicated here since desilverisation is unlikely at 0.0061%, 0.0057% and 0.0058% respectively.

This corpus of evidence raises a number of points. Firstly, though six out of eight objects from the environs of production areas obey our guidelines (a, b, d, j., r and y), two do not (i and x). In neither case can there be much doubt about the origin of the lead; i) comes from a production site and x) from immediately north of a lead field. Yet i), from the Mendips, appears not to have been desilvered while x), from Derbyshire, could have been. The latter should cause less surprise than the former for we have already noted that the variability of Derbyshire silver contents is a major source of error in the guidelines, making it uncertain whether Derbyshire ores were ever desilvered. Indeed, ore this poor in silver (at 0.00139-0.00418%), though there is no proof that it was being smelted (Chapter 8, p.277f), was recovered from the fort at Brough where the object was found



and a series of fifteen other objects analysed by Smythe (1938) gave silver values from 0.00139-0.00767%.

x), unlike other analysed Mendip products except pig No. 6, has not been desilvered, though this may be because its silver content is low; indeed it lies well below the possible threshold of economic desilverisation (0.06%). Whatever the reason though it is clear that object x) questions the validity of our guidelines. However, the results from beyond the production areas do seem to provide some interesting correlations with the pig distribution. Most striking is the evidence from south east England where we have already seen (Chapter 8, p.258f) that there are Derbyshire pigs relatively close to ones from the Mendips. That this is not an isolated phenomenon is suggested by the presence in the above corpus of both clearly desilvered and clearly undesilvered items from south east England. Thus, we have undesilvered lead in Kent (e) and at Folkestone (h) that post-dates the beginnings of desilverisation in the Mendips, with further undesilvered pieces from Kent (g, l and o) that we cannot be sure of the date of. Equally though we have desilvered lead from Kent (n).

This does tend to suggest that two different sources of lead are in use in the same area and it is in contrast to the south west of England where we have two objects (q and u) that geographically ought to come from the Mendips, both of which are desilvered. Similarly, north of London we have

desilvered and undesilvered lead in the same region (s and t).

Regrettably the evidence from south Wales (c, f and m) does not allow us to make any headway on the question of whether lead supplies were indigenous, from the Mendips or both, for we have desilvered, borderline and undesilvered objects. This leaves three objects from north of the known production areas. One, w), is particularly interesting since it comes from a coastal location in the north west and is desilvered. The nearest production area, Flintshire, would seem to be a logical source for this lead and since it has been desilvered it seems even more likely and suggests the movement of lead by sea up the west coast. Object r) could perhaps be seen in the same light, but, along with the desilvered v), it is involved in the far more difficult matter of army lead supply for which there is very little evidence.

Whilst we have noted the very limited nature of the evidence for a direct military involvement in lead extraction itself (Chapter 8, p.276 ff) it does seem likely from the inscriptions and findspots of some of the ?resmelted lead 'pigs' (Nos. ADD 1, 5-10) that the army collected and re-used old lead. Whether fresh lead supplies were obtained by the military from specific areas, such perhaps as from the Alston deposits which could have been worked by Cohors II Nerviorum, or simply from the nearest field cannot be certain. However, it should be noted that the possibility exists that military

lead supply could have been influenced by the supply of other commodities. Thus, the transport of Mendip lead to garrisons in the north of Britain might be both economic and convenient if it travelled together with cargoes of black burnished pottery.

Object v), which is a lamp, also illustrates a further problem that we have touched on. Although the nearest production centres to its findspot are those of Yorkshire it could in fact have come from much further away, being the possession of someone (particularly since it is likely to have belonged to a soldier) who could have moved to Corbridge. The likelihood of this is underlined by the fact that it is made of lead with no trace of silver and so must be most likely to be from the Mendips or Flintshire.

iv) Areas of Economic Competition and Precedence

Although the examination of the above corpus of evidence has underlined that there are a number of problems in using the guidelines that were derived from the pig distribution and desilverisation sections it is worthwhile taking the observations to their logical conclusion by suggesting a hypothetical model for the supply of lead in Britain. It seems that this may be best achieved by suggesting a number of 'Areas of Economic Precedence' (AEP s) and 'Areas of Economic Competition' (AEC s). For our purposes an AEP may

be defined as "that part(s) of Britain where lead from a particular production area was sufficiently competitively priced as to find an exclusive market." An AEC may be defined as "an area where two or more production areas could supply lead at competitive prices." It will be noted that the definitions are in terms not of equal but of competitive pricing. This is because a production area could still maintain an AEC or even AEP where its lead was more expensive than another area's if, for instance, it could supply in greater bulk or a quicker time. The price is competitive given the supply conditions.

The evidence for defining these AEPs and AECs is that of the pig distribution considered in (Chapter 8 (p.255 ff)) and of the objects discussed above, which evidence will not in general be repeated, and does not allow of much precision. It is broad regions with which we are concerned. The AEPs and AECs outlined below are shown on Fig. 15.

#### AEPs

##### a) Flintshire

Flintshire probably enjoyed an AEP covering North Wales and the adjacent Chester area from where most of its pigs come. This may have extended west of the Pennines into Cumbria and even south west Scotland. There is no evidence to suggest whether the same may have been true for the west coast of Wales.

## b) Shropshire

Shropshire probably held a small AEP in its production area, extending to the Wroxeter area and perhaps central east Wales but we have little evidence on the point.

## c) Yorkshire

Yorkshire again yields little evidence but its AEP likely included the production area and probably areas to the east including York, Aldborough, Carlisle and ?Malton.

## d) Mendips

There can be little doubt that the Mendip AEP included all of the south west peninsula (though except for Exeter and a few forts demand was likely low). Its southern limit was the coast at least as far east as Bitterne but to the north and east it is harder to define. For the north a line between London and Gloucester may be reasonable, though the situation in London itself with its excellent water communications could have been complex. To the east item u) above perhaps suggests that Silchester was within it, but nearer the south coast the Pulborough pigs suggest that it was further west.

## e) Derbyshire

The Pennines south of Yorkshire and perhaps as far west

as Manchester are likely to have been included in a Derbyshire AEP, but it probably did not extend south of the Pennines. The area between the Humber and the Wash may also have been included since all other production areas are distant from it. But whether Derbyshire enjoyed any AEP north of this we cannot say for Yorkshire may have provided competition.

### AECs

#### a) Mendips/Derbyshire

There seems to be evidence both from the pig distribution and from the corpus of evidence above for suggesting an AEC in Kent and other areas of south east England. It seems to extend along the south coast as far west as at least Pulborough and perhaps includes the *Isle of Wight*. There seems little doubt that the areas in competition are the Mendips and Derbyshire.

A second AEC, between Derbyshire and the Mendips or Flintshire (or even both) appears to be likely north of London including East Anglia and parts of central southern Britain.

#### b) Derbyshire/Flintshire

An AEC between Derbyshire and Flintshire lead is suggested by the pig distribution in the central midlands south of Derby, though its eastern and southern boundaries

are difficult to gauge. To the west it presumably stopped short of Wroxeter.

#### Unattributed Areas

Much of Wales, particularly the south has been left unattributed since there is doubt about whether there was an indigenous lead extraction industry in south Wales. Another area that is not attributed is that north of the Mendip AEP where we have no evidence and the south Wales question is again a problem. Little can be said either of much of northern England or southern Scotland.

#### v) Conclusion and Isotope Analysis

The discussions above have produced no definite conclusions, but rather a hypothetical model based on fairly limited evidence to which many qualifications must attach. Although certain elements of the hypothesis, such as the existence of AEPs in and around production areas themselves, are more likely to be correct than others it is the suggested AECs that are of the most interest. In particular the possibility that Derbyshire and Mendip lead could compete in south east England if proven would raise many questions about the relative economics of lead extraction in the two areas. The possibility that it was the onus of desilvering their lead that made the Mendips so easy to compete with has already been discussed in this context (Chapter 8, p.259f).

However, it is clear that, even with much fuller evidence, further progress on the economic geography of lead supplies within Roman Britain cannot advance beyond the stage of a highly qualified hypothesis on the basis of silver content/geographical location techniques. The future clearly lies with new techniques for the identification of lead sources. One, the provenancing of ore by trace element contents remains at an early stage because of the lack of a data base of ores in situ (Jenkins 1988). More advanced and probably more promising is lead isotope ratio analysis which has been used with success in the Mediterranean (e.g. Stos-Gale, Gale and Papastamataki 1988). This technique measures the relative contents of lead isotopes  $Pb^{206}$ ,  $Pb^{207}$  and  $Pb^{208}$  which provide a 'fingerprint' indicating the geological age of the ore used. Since many lead deposits are of different ages this allows conclusions to be drawn as to the most likely area for the ore to have been mined in.

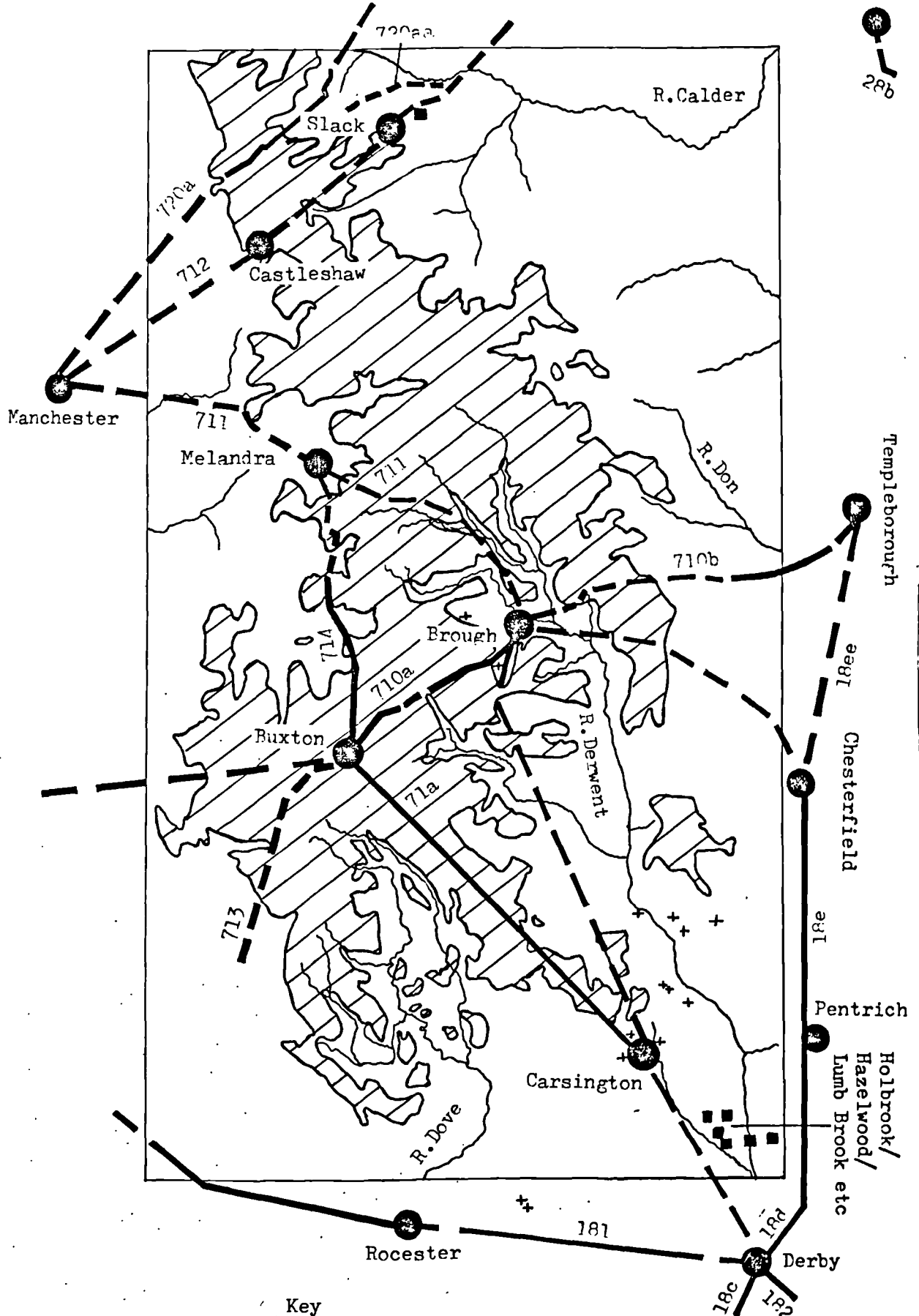
Only one attempt has so far been made to use this technique for Romano-British lead sourcing (Brill and Wampler 1967). Its conclusions must be treated as provisional since its stated remit was a broad study of samples from across the empire, based on a limited range of evidence. Several interesting conclusions, such as some further evidence in favour of an indigenous south Wales extraction industry (Brill and Wampler 1967, 70), emerge from this work. But it



is not yet clear whether isotope ratio variations within particular ore bodies are sufficiently limited to allow lead to be provenanced to a particular area (Brill and Wampler 1967, 74). Nor, indeed whether the isotope ratios of lead from different areas of Britain are sufficiently different to allow their identification (compare Brill and Wampler 1967, Fig. 2 Nos. 47 and 50 from the Mendips and Derbyshire respectively). Clearly much further work is required before this technique can provide reliable evidence for the study of the Romano-British lead industry. But its application may eventually allow much more to be said about the economic geography of lead supply than at present.

Notes

1. Indeed, the lack of detailed studies of even individual classes of lead objects in Britain is notable. The only readily available one known to the author is the study of coffins and ossurria by Toller (1977) which is lacking in some respects and contains virtually no analytical data.
2. Objects not certainly of Roman date have been omitted.



Key

- 71a Road Number (Margary)
- Land over 1,000ft
- Rivers
- Major Sites
- Tileries/Potteries
- Lead Pigs
- Roads (Course Known)
- Roads (Course Presumed)

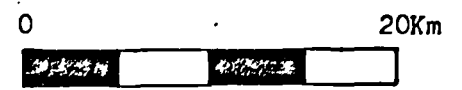


Fig.1: The Study Area and Environs



Key



Coal Measures



Gritstones



Limestone



Limestone Shales



Permian/Mesozoic



Mineral Veins (Simplified)

Fig.2 The Study Area: Solid Geology  
(Excepting Igneous)



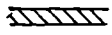
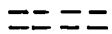


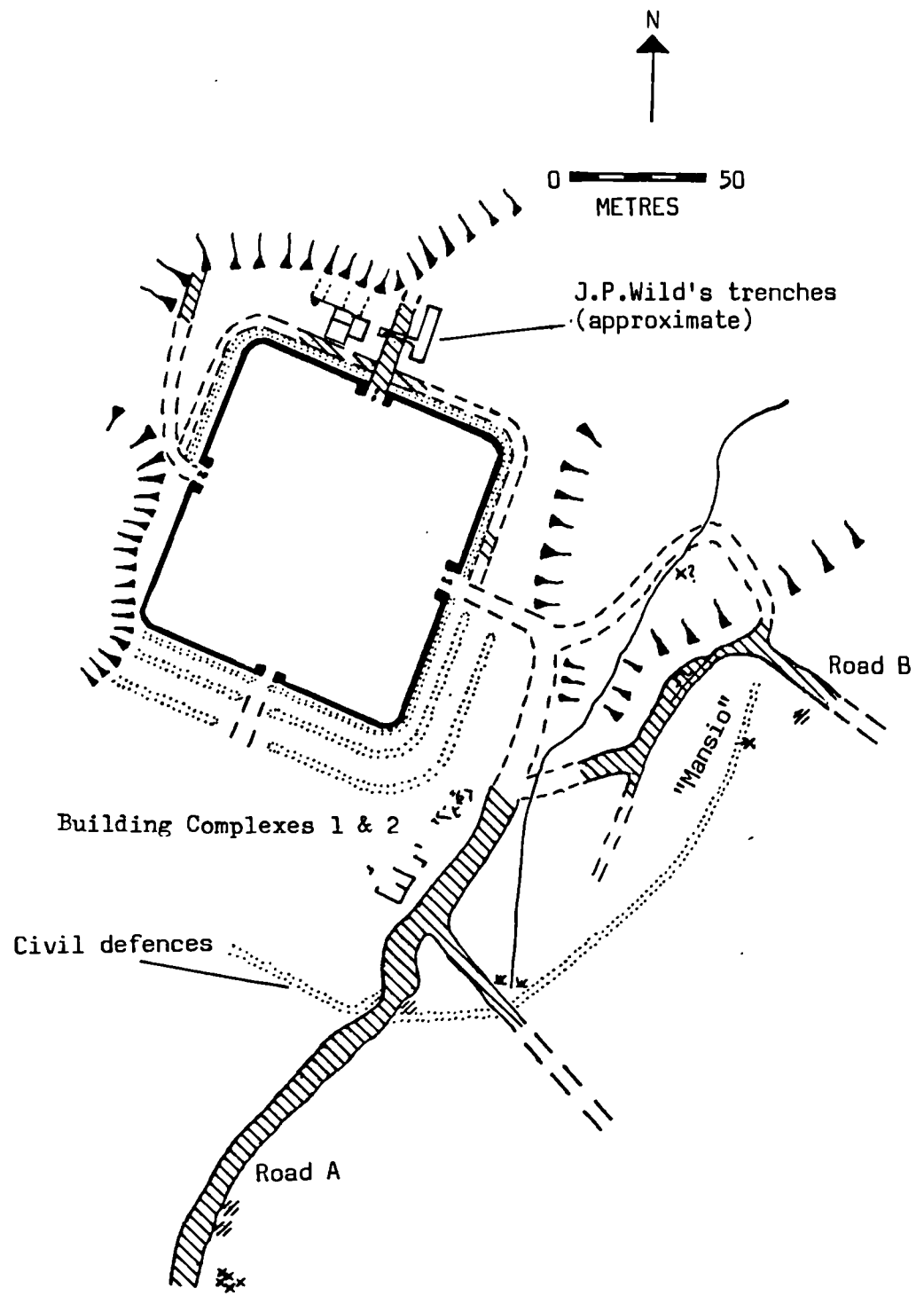
Key	
Roads known	
Roads presumed	
Ditches	
Burials	x
Burning	

Fig.3:Melandra:The Fort and Vicus



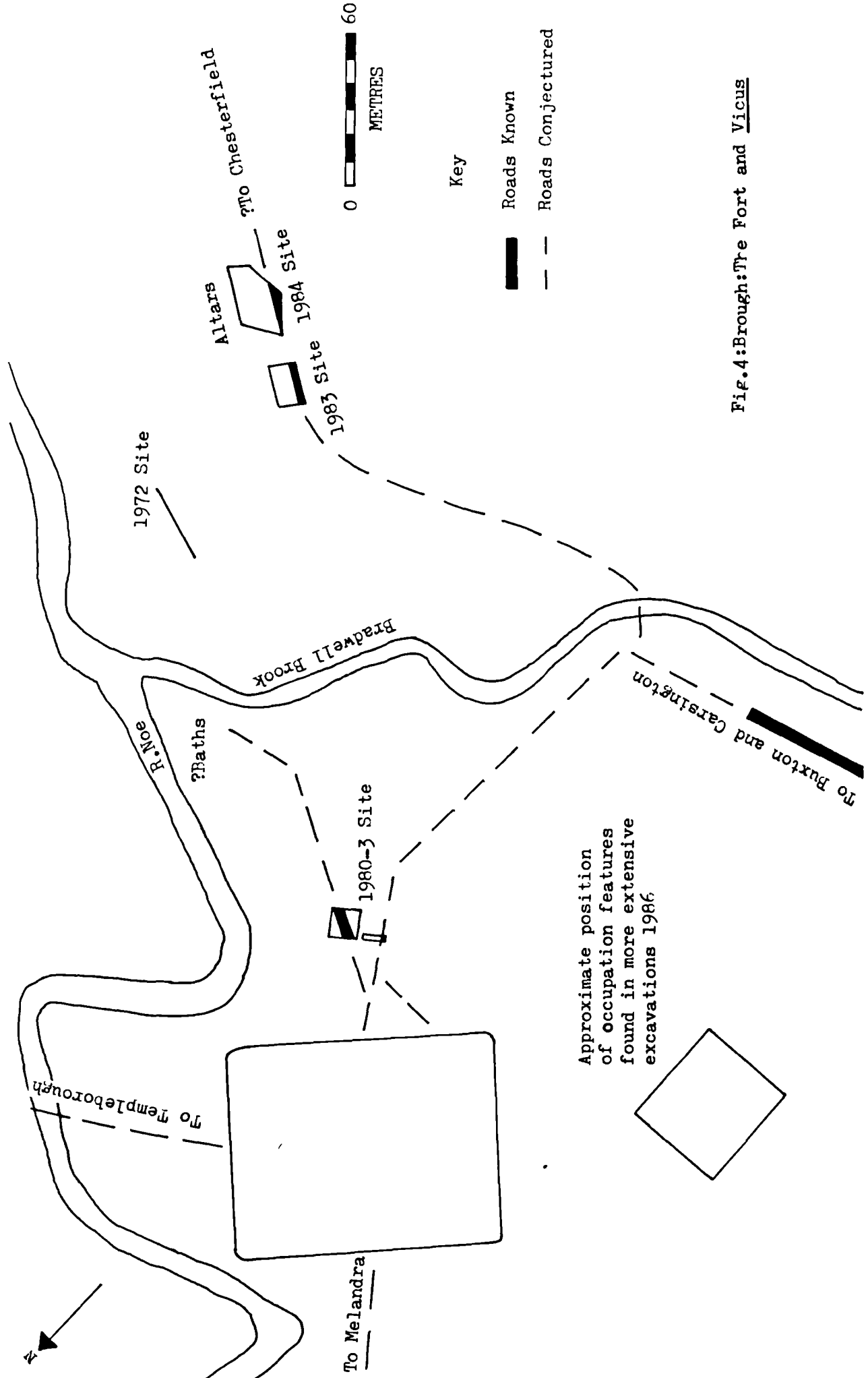


Fig. 4: Brough: The Fort and Vicus

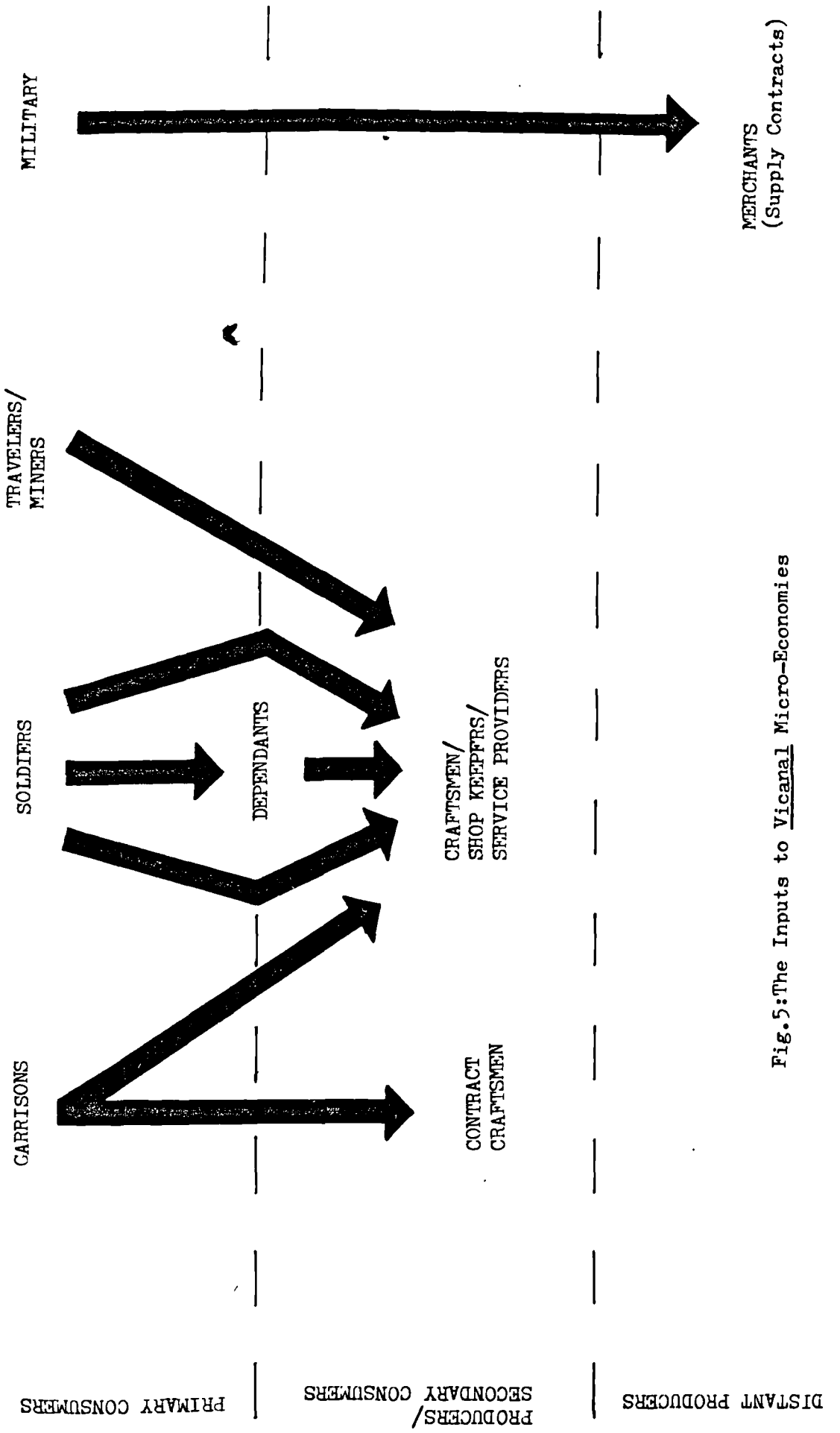


Fig.5: The Inputs to Vicinal Micro-Economies

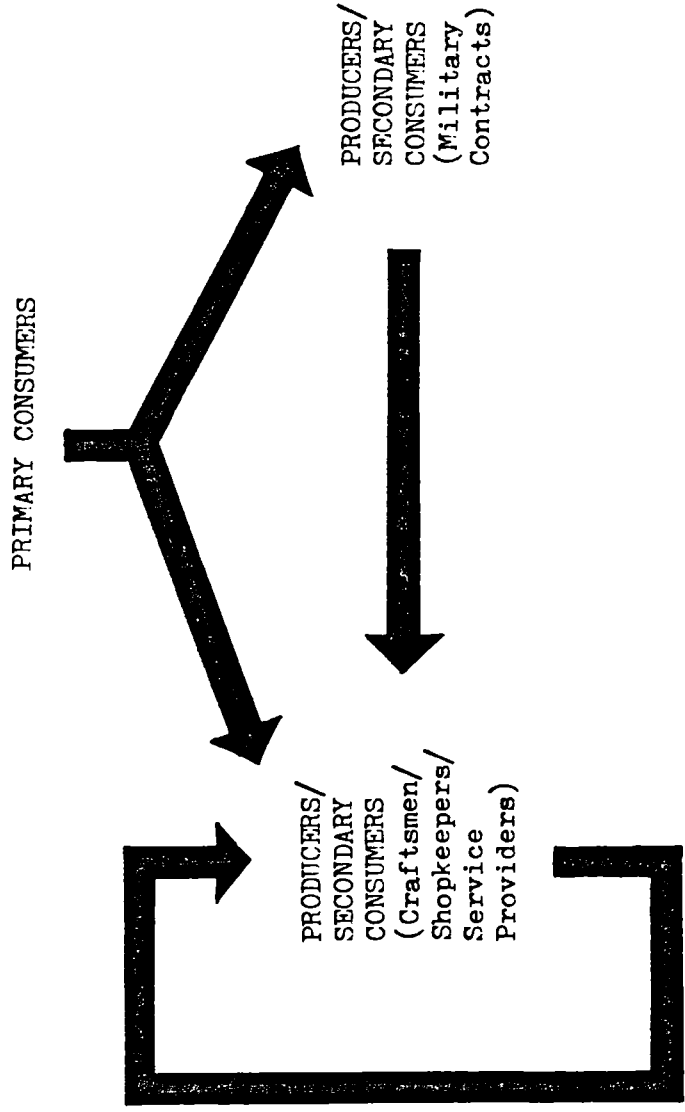


Fig.6: The Circulation of Money in Vicinal Micro-Economies



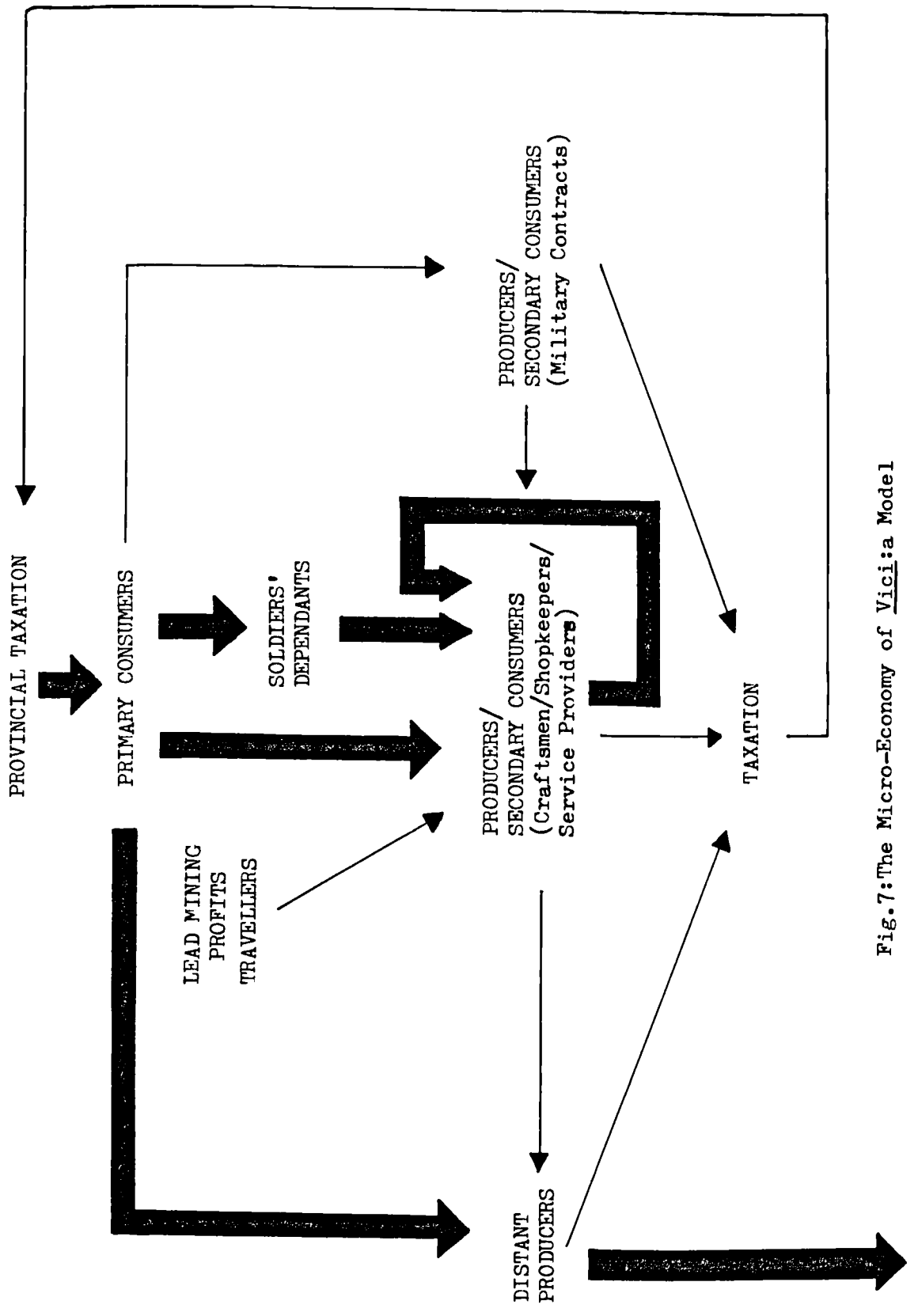


Fig. 7: The Micro-Economy of Vicia Model

KEY TO FIG.8

■ Major Site                      ■ Tilery/Possible Fortlets & Signal Stations

● Rural Settlement Known from Field Survey

○ Possible Rural Settlement Known from Field Survey

□ Aerial Photograph Site (Rectangular Enclosures)

▣ Aerial Photograph Site (Curvilinear/Irregular Enclosures)

△ Utilised Cave                      ≡ Celtic Fields

Finds not Directly Associated with Sites (Burials are Excluded)

P Coarse Pottery                      ⊕ Finewares

C Single Coin                          ⊙ Multiple Coin Find

• Bronzework                          A Altar

I,II,III,IV Century of find where dated (I/II = Range of Dates;  
I-II = Date within this Period)

∪ Beehive Quern                      ⊖ Rotary Quern                      ⊕ Type Unknown

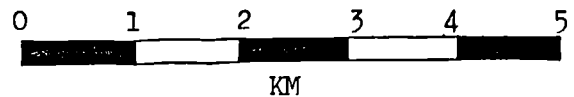
⊙ Quern 'Factory'


— Road (Course Known)                      - - - Road (Course Assumed)

712 Road No. (Where Allocated by Marjary)

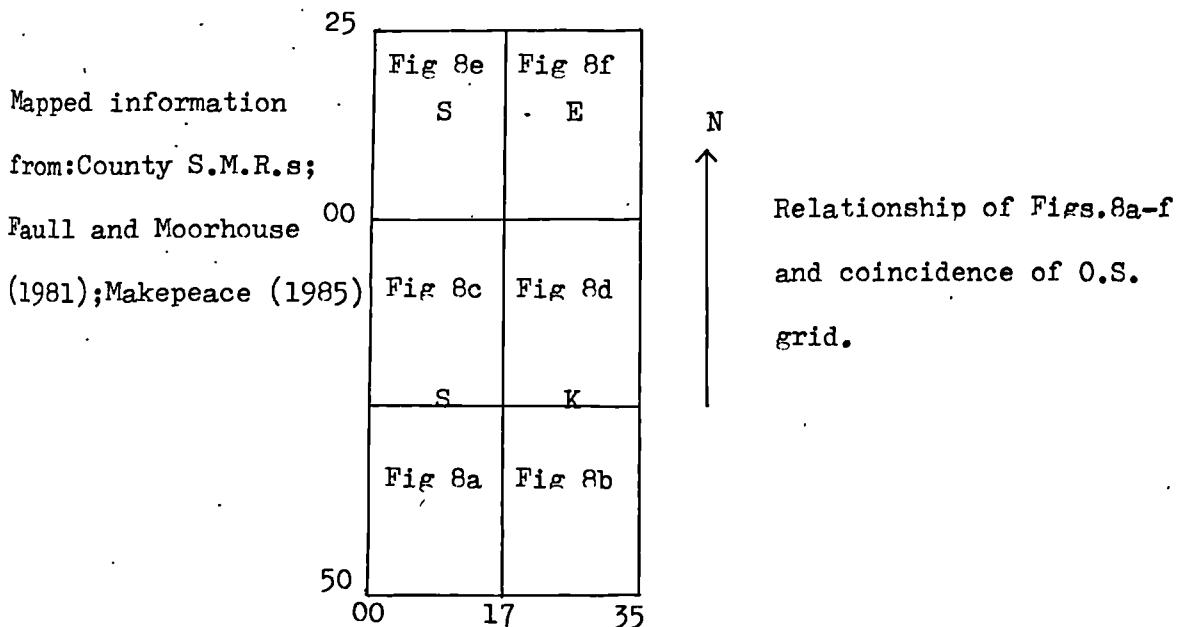
LP Lead Pig

Scale:



 Land Over 1,000 ft

 River



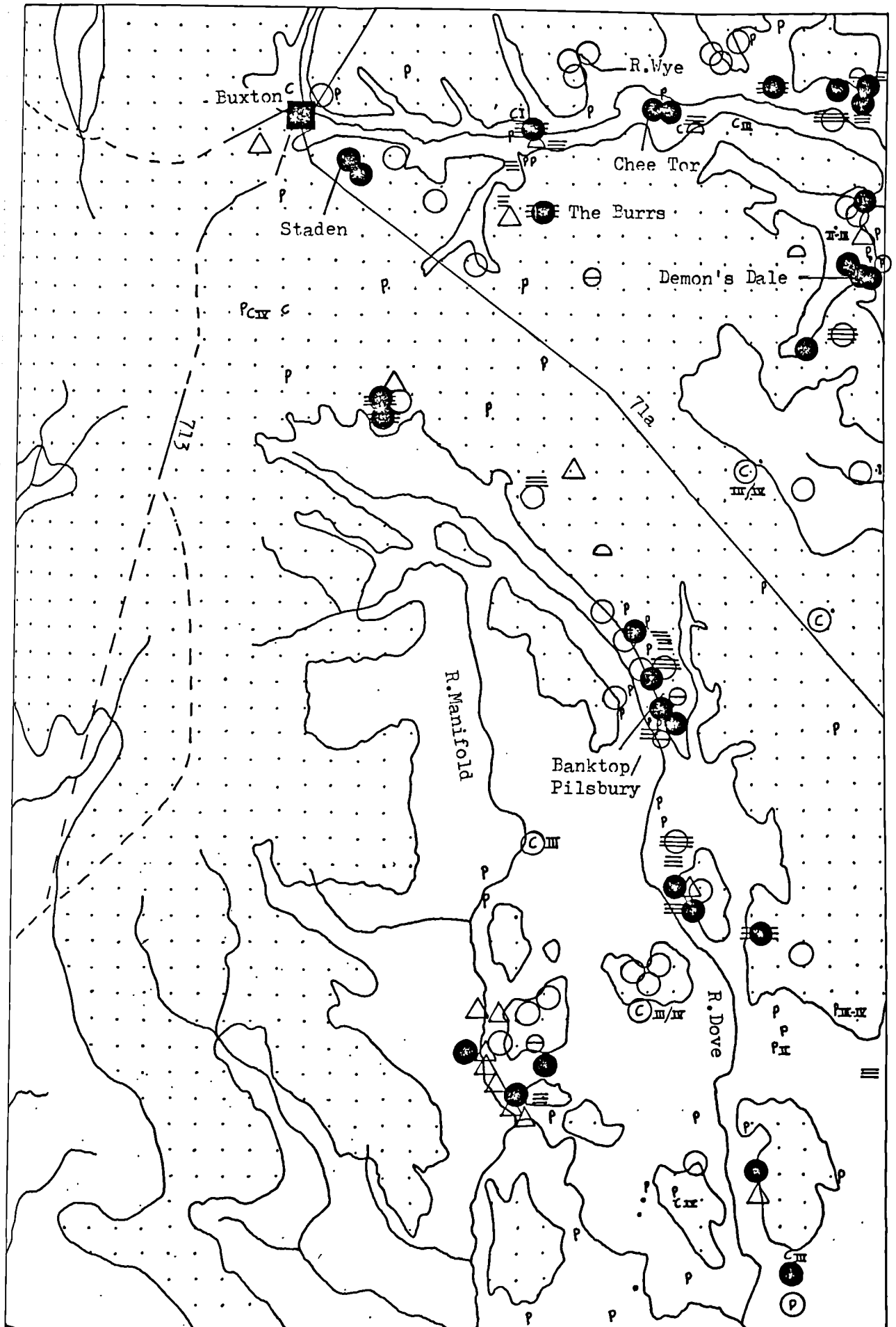


FIG. 8a Rural Settlement-S.W. Area

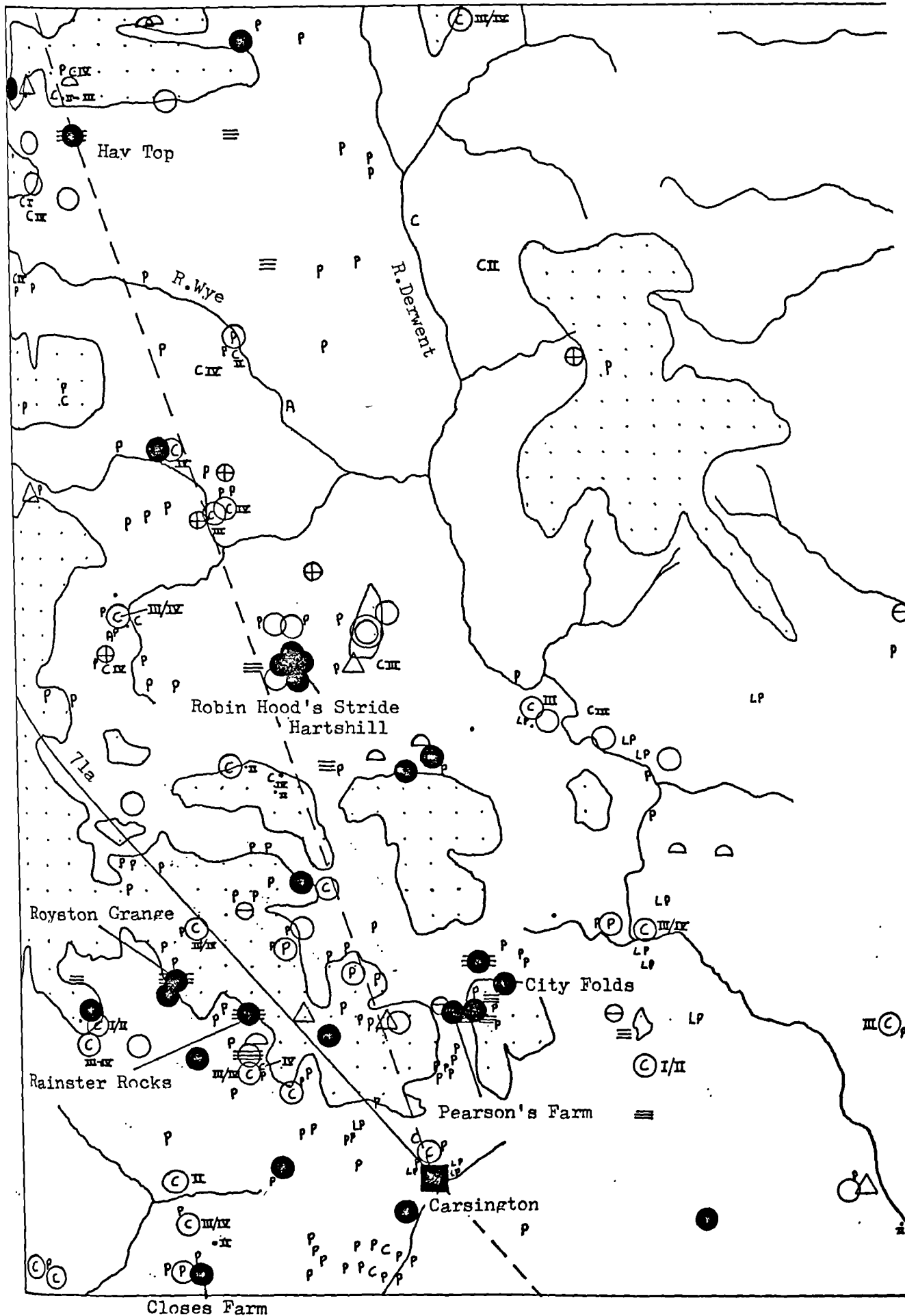


Fig. 8b Rural Settlement-S.E. Area

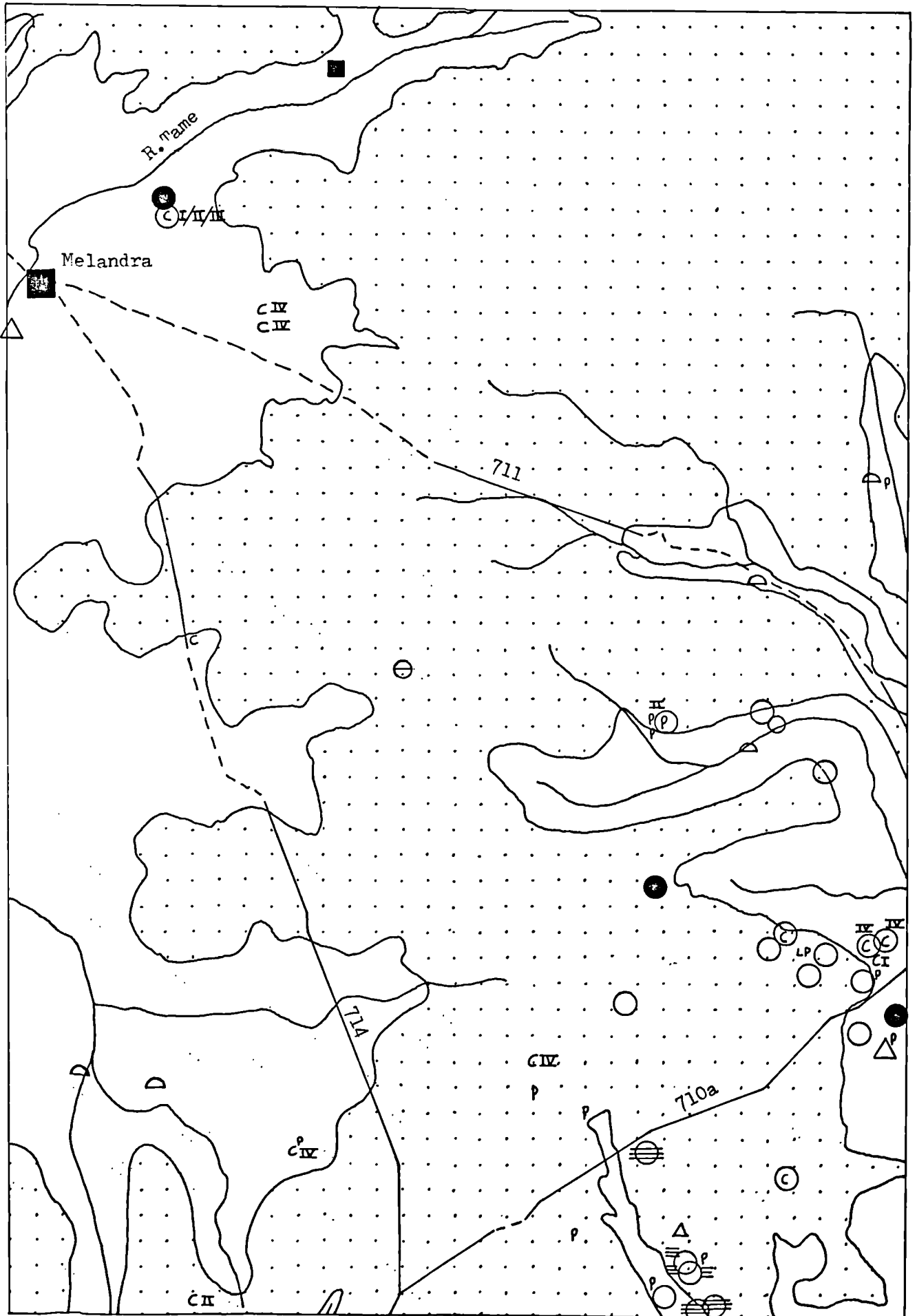


Fig. 8c Rural Settlement-Central W. Area

2024/10/27

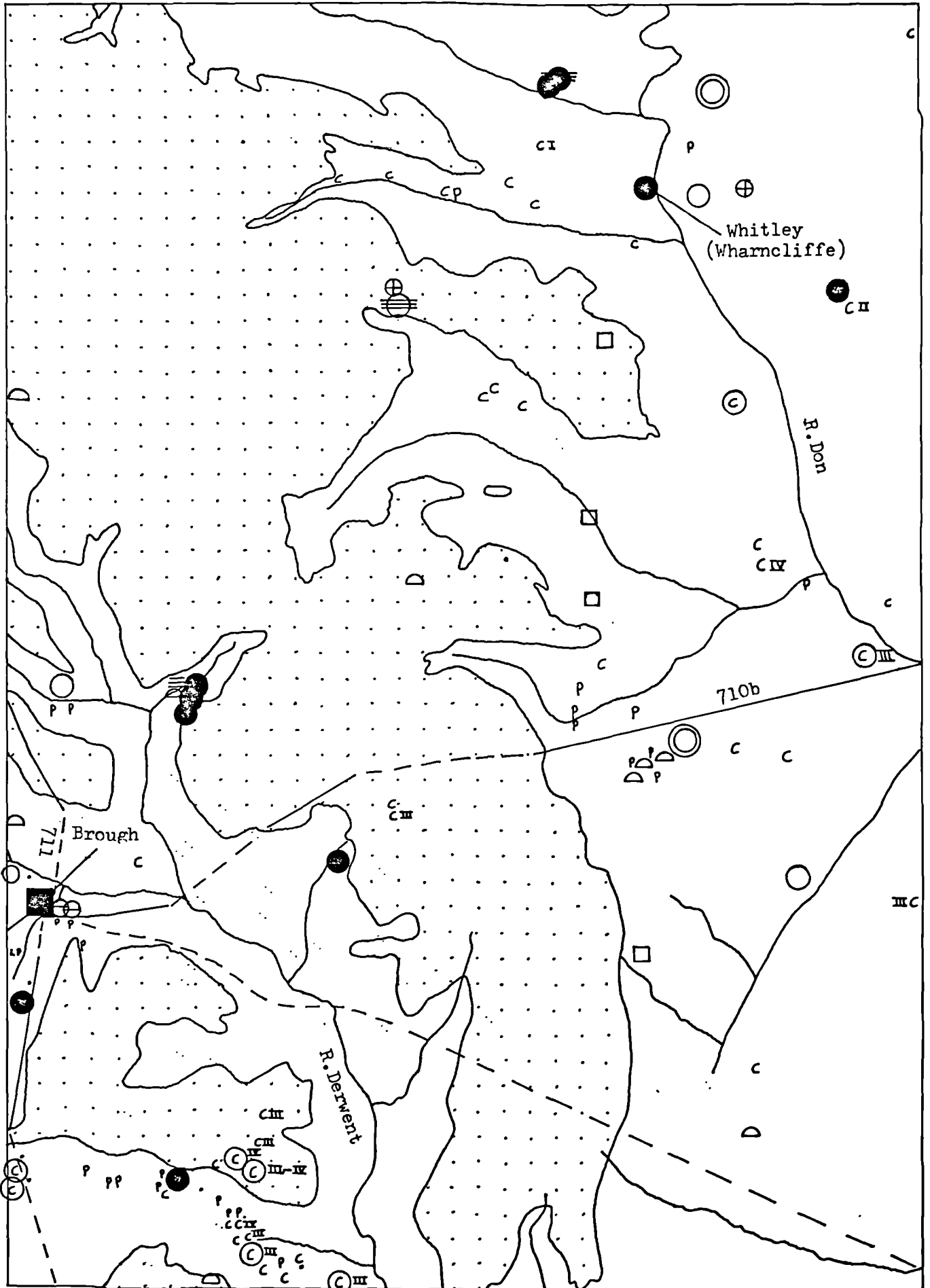


Fig.8d Rural Settlement-Central E. Area

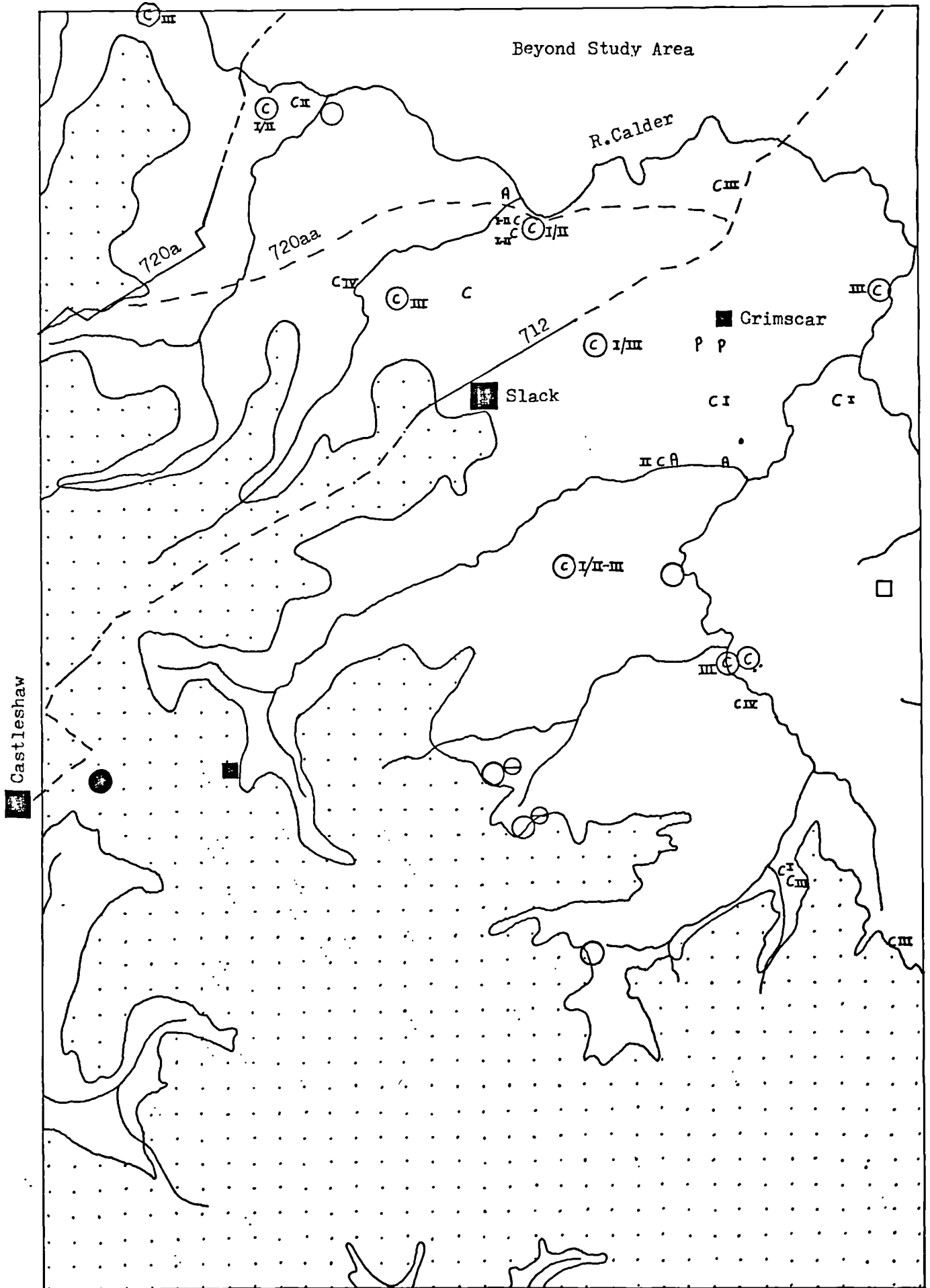


Fig. 8e Rural Settlement—N.W. Area

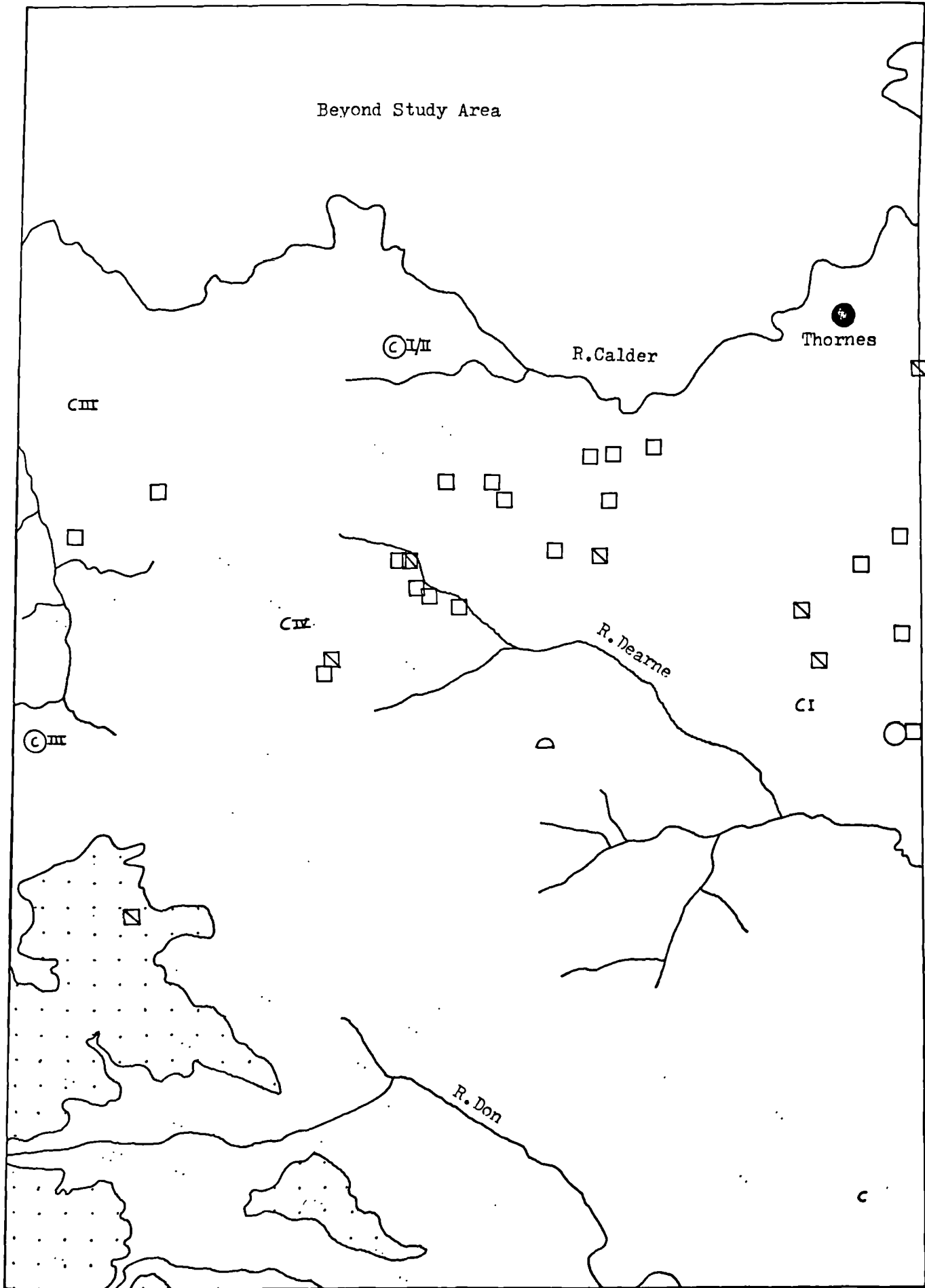


Fig. 8f Rural Settlement-N.E. Area



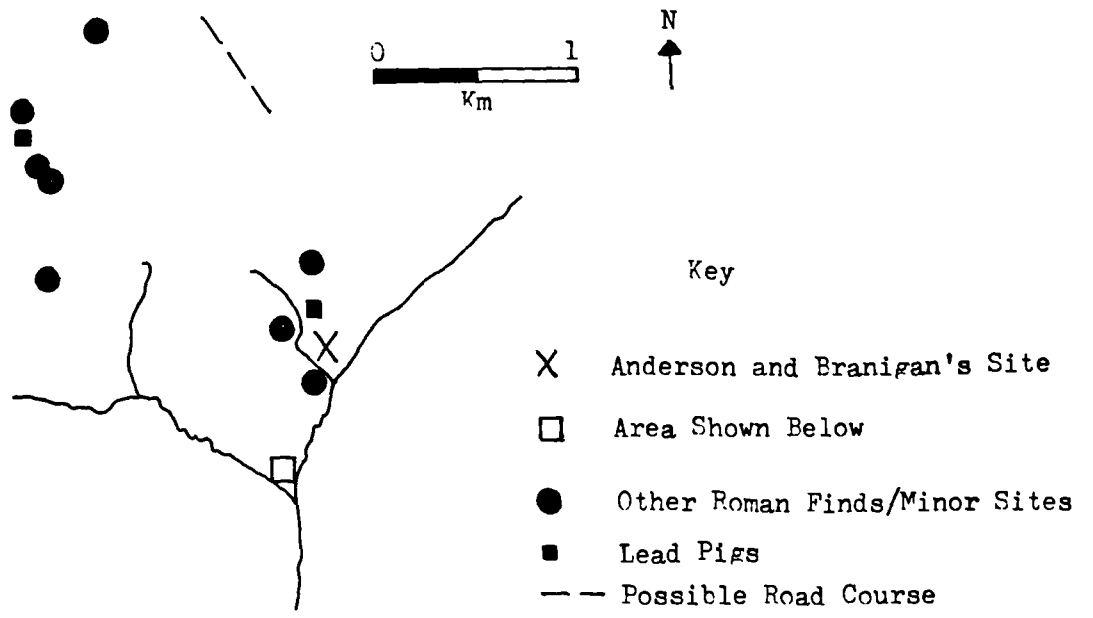
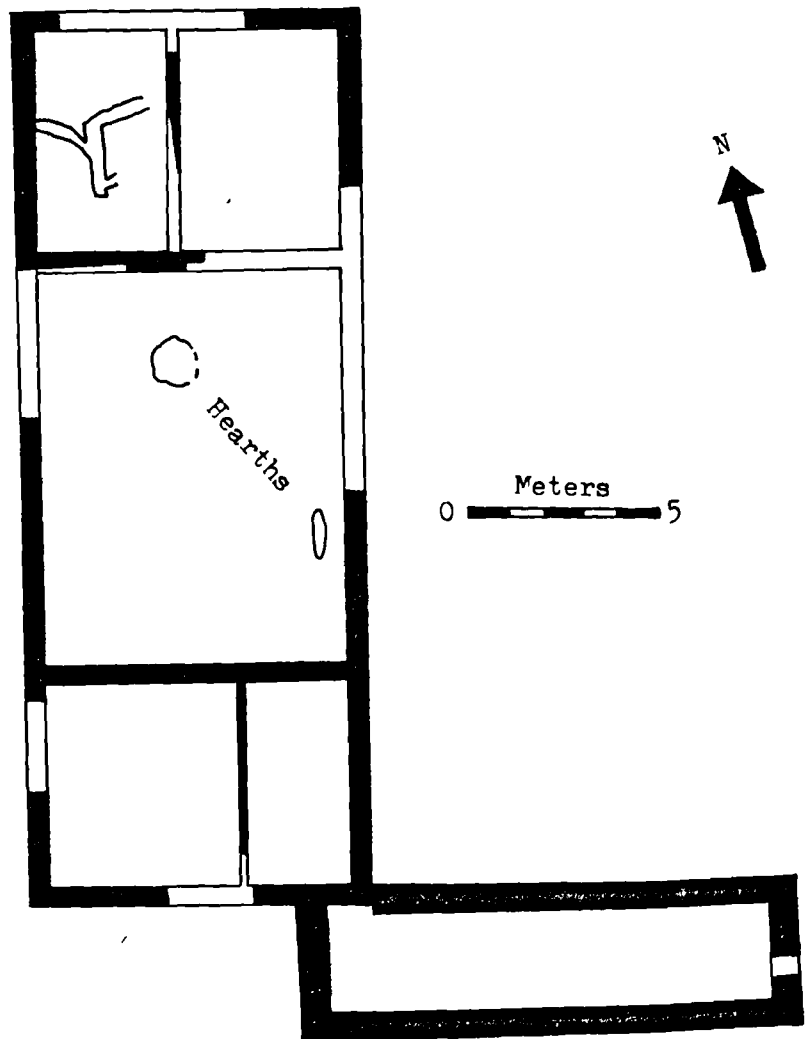


Fig.9: Carsington-The Building Outside the Settlement  
 (After Ling and Courtney; and Branigan forthcoming)



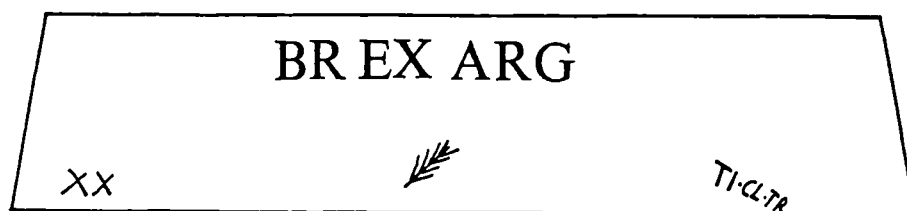
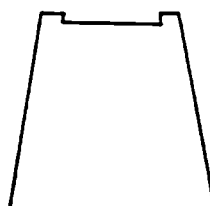
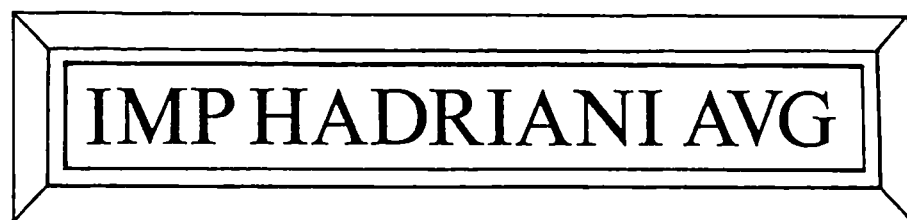
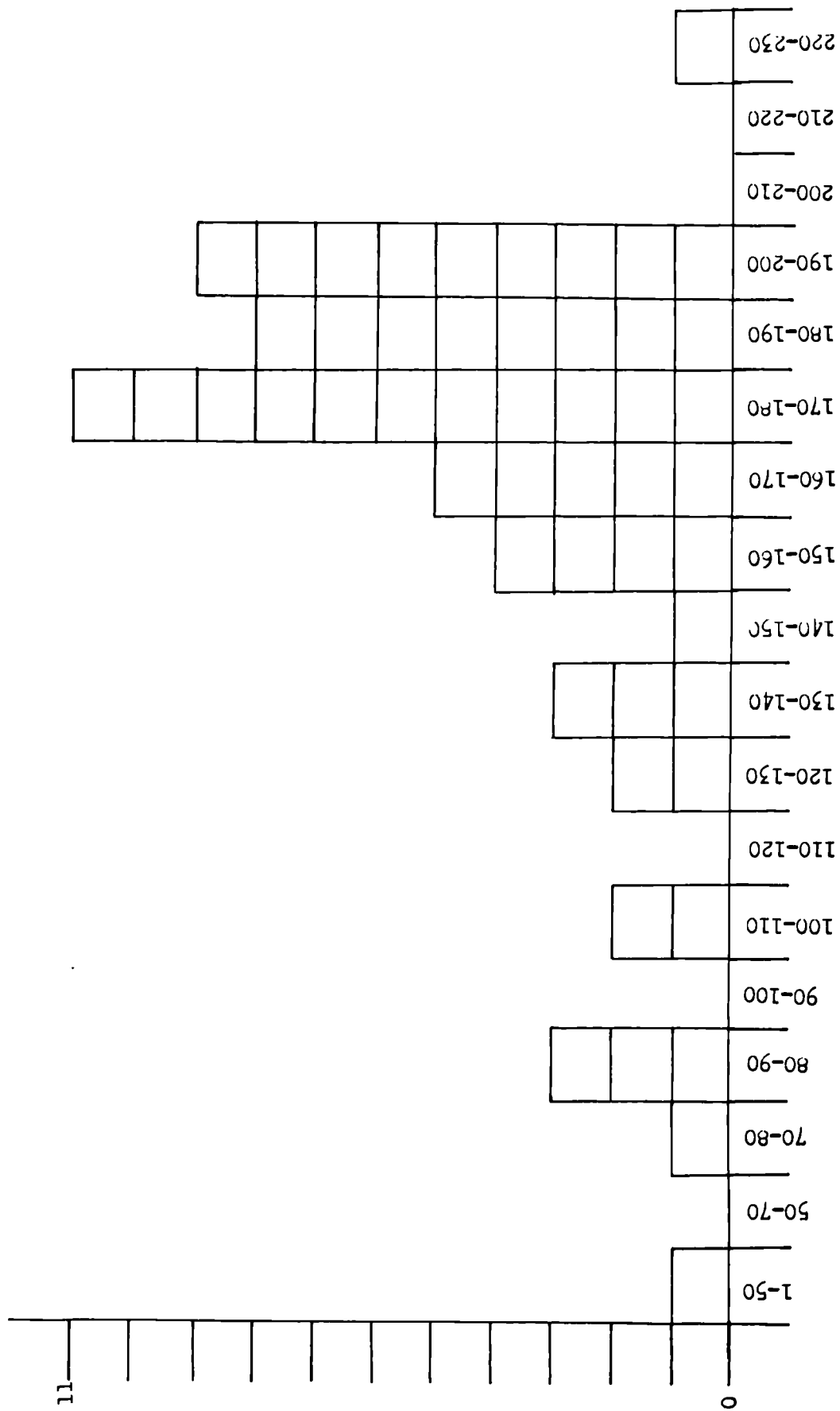


Fig.10: The Form of Romano-British Lead Pigs



Weight Divisions (Lbs.)

Fig. 11: The Weights of Romano-British Lead Pigs  
(Well Recorded, Reasonably Complete Examples Only)

Number of Pigs

11

0

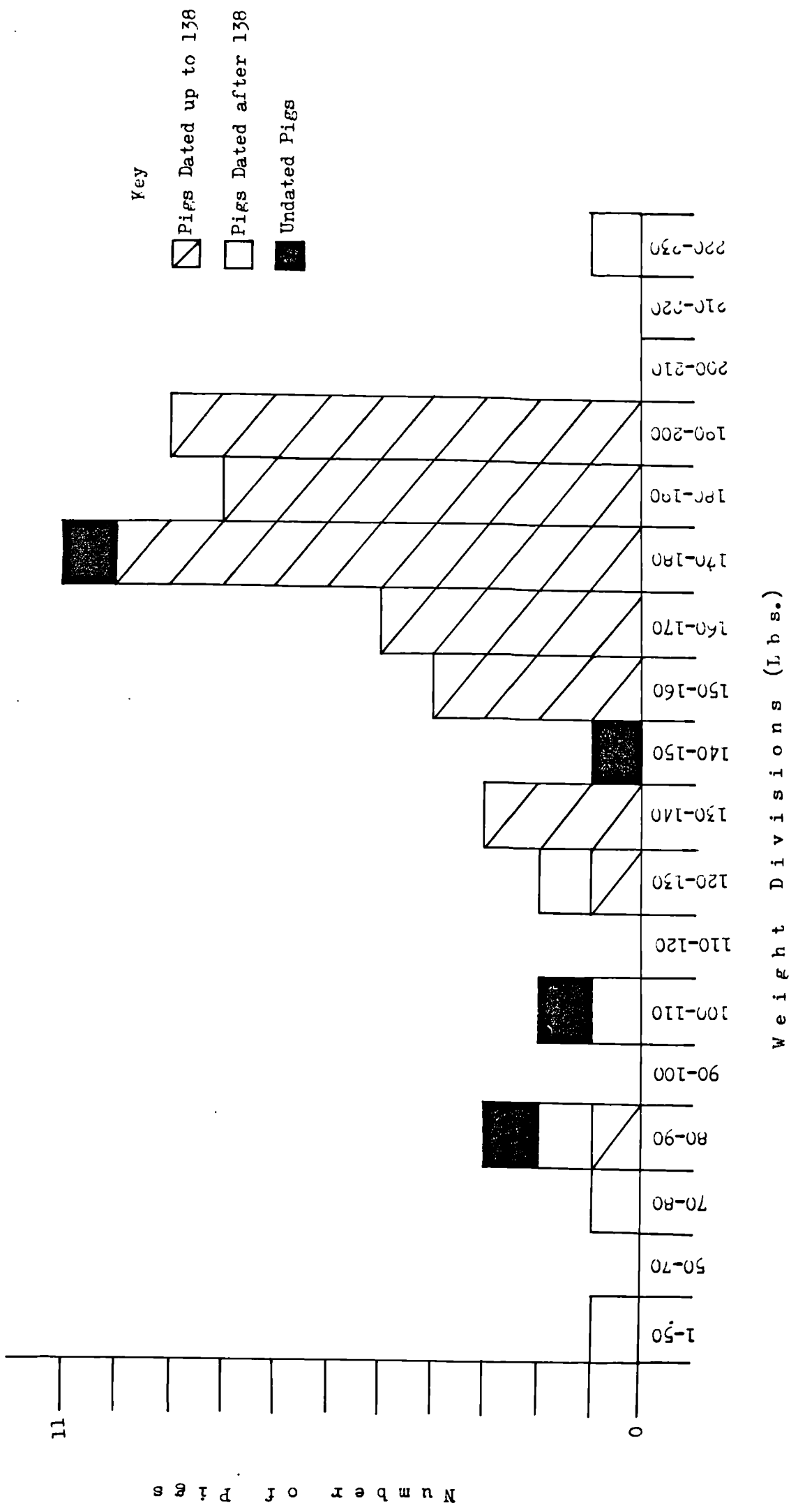
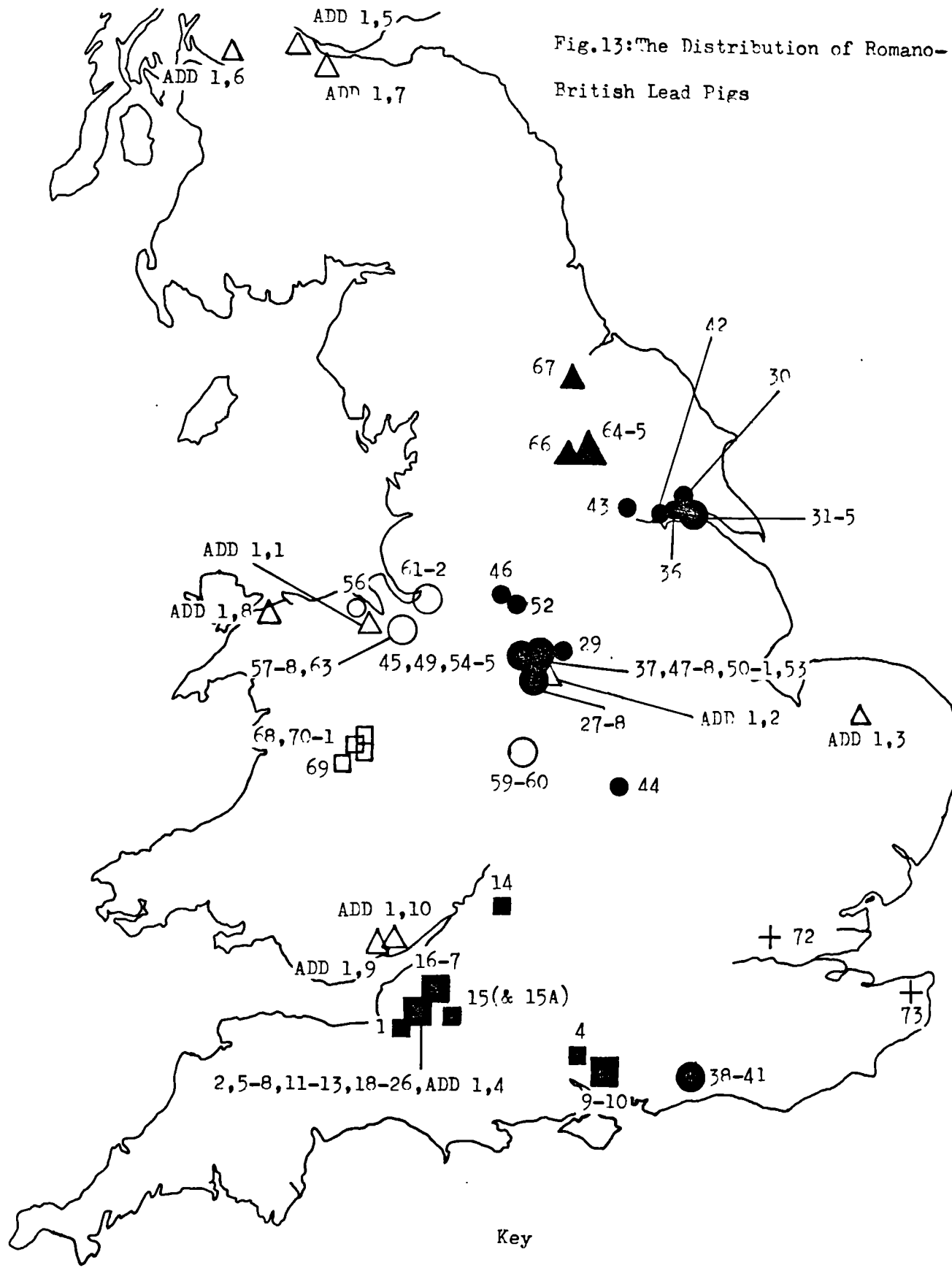
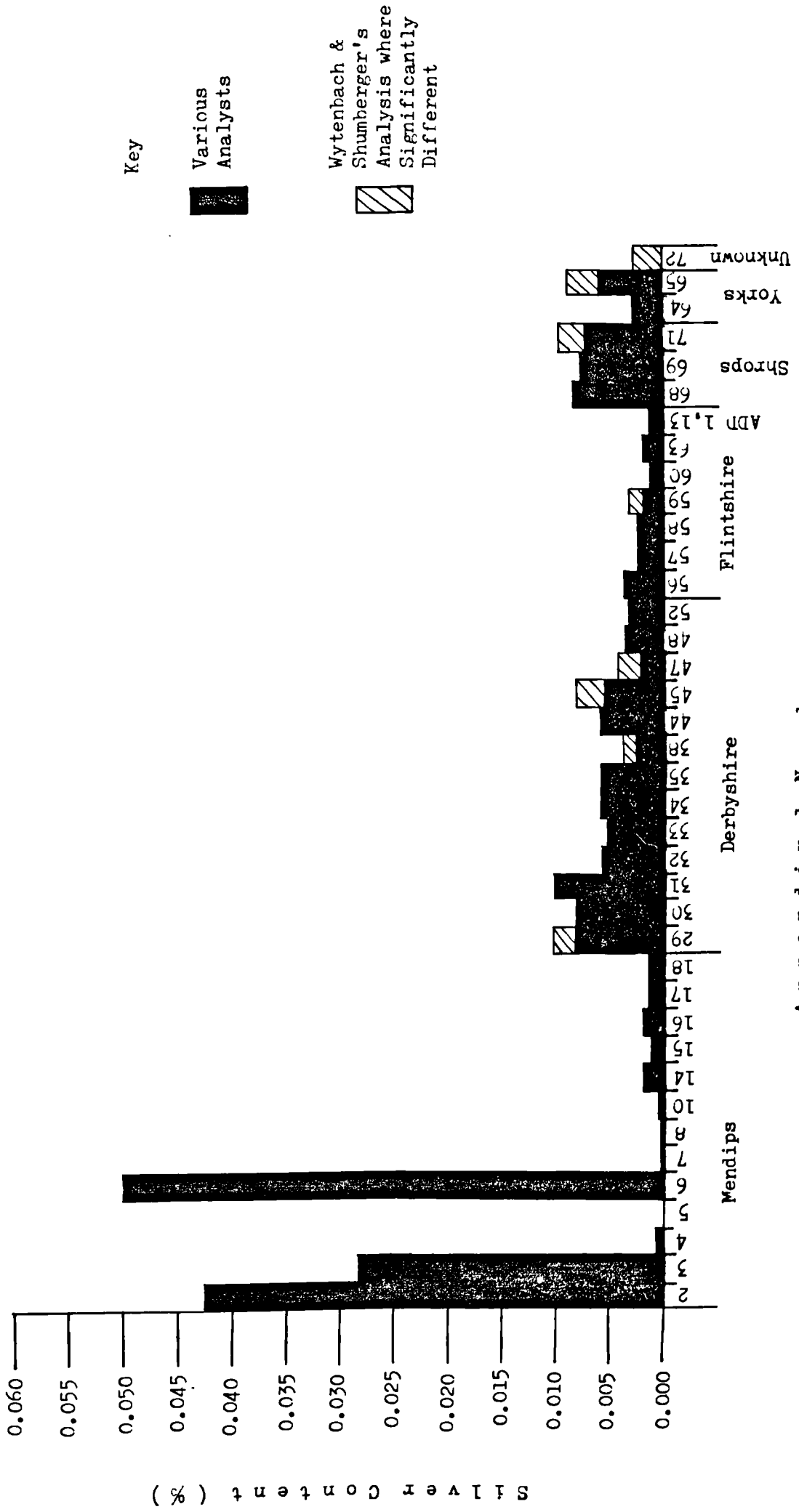


Fig.42: The Weights of Dated Romano-British Lead Pigs (Well Recorded, Reasonably Complete Examples Only)

Fig.13: The Distribution of Romano-British Lead Pigs

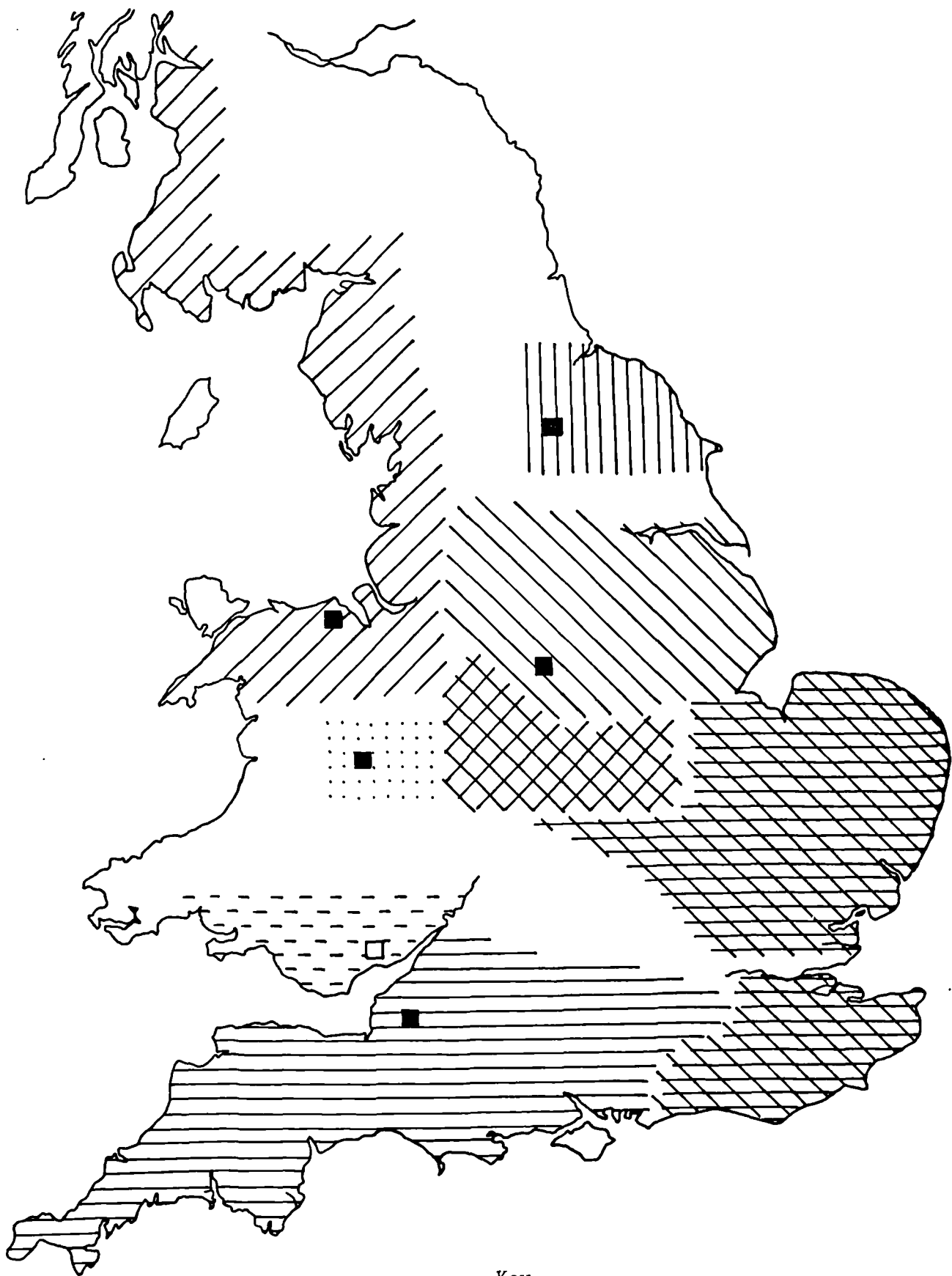


- |   |                       |   |                                |
|---|-----------------------|---|--------------------------------|
| ● | Derbyshire:2+ Pigs    | □ | Shropshire:Single Pig          |
| ● | Derbyshire:Single Pig | ▲ | Yorkshire:Single Pig           |
| ○ | Flintshire:2+ Pigs    | ▲ | Yorkshire:2+ Pigs              |
| ○ | Flintshire:Single Pig | △ | ?Resmelted 'Pigs'/Dubious Pigs |
| ■ | Mendip:2+ Pigs        | + | Unknown Production Area        |
| ■ | Mendip:Single Pig     |   |                                |
- 54/ADD 1,1      Appendix 1 Numbers



Appendix 1 Numbers

Fig.14: The Silver Contents of Romano-British Lead Pigs



Key

- |                              |                                |
|------------------------------|--------------------------------|
| ■ Production centre          | ⋯⋯⋯ Shropshire A.E.P.          |
| □ Possible Production Centre | - - - ?S.Wales A.E.P.          |
| — Mendip A.E.P.              | ⊗ Mendip/Derbyshire A.E.C.     |
| /// Flintshire A.E.P.        | ⊘ Derbyshire/Flintshire A.E.C. |
| \\ Derbyshire A.E.P.         |                                |
| Yorkshire A.E.P.             |                                |

Fig.15: The Economic Geography of Lead Supply in Roman Britain