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Ancient Monuments Laboratory
Report 15/89

ECONOMIC ACTIVITIES AT ROCESTER, STAFFORDSHIRE, IN THE ROMAN, SAXON AND MEDIEVAL PERIODS; THE EVIDENCE FROM THE CHARRED PLANT REMAINS.

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Summary

Excavation of a Roman fort at Rocester uncovered the remains of most of a barrack block. Samples for charred plant remains produced a number of deposits which were rich in grain, chiefly a free-threshing wheat which was probabiy bread/club wheat (Triticum aestivum s.l.) and hulled barley (Hordeum vulgare). The grain had been fully processed and few chaff fragments were found, while significant numbers of weed seeds were found in only a few samples. A single fruit of beet (Beta vulgaris) was also found. Near the Roman occupation were some Saxon and Medieval oven/kilns and some Medieval pits. The phasing of these is provisional and it is intended to submit samples for radiocarbon dates which may alter their phasing. Free-threshing wheat and oats (Avena sp.) were the main cereals in these ovens/kilns. The Medieval pits were assumed to be associated with the oven/kilns but the main cereal in some of these was barley. The Medieval samples were generally weedier than the Roman ones, but only one of the Saxon sampies contained many weeds.

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ECONOMIC ACTIVITIES AT ROCESTER, STAFFORDSHIRE, IN THE ROMAN, SAXON AND MEDIEVAL PERIODS: THE EVIDENCE FROM THE CHARRED PLANT REMAINS

by Lisa Moffett

A programme of sampling for charred plant remains was undertaken at Rocester as part of the attempt to understand the economic activities on the site at different phases. Seeds and other botanical material can be preserved on archaeological sites if they become partially carbonised under reducing conditions in a fire. Normally the items which survive best are seeds and the denser parts of cereal chaff while lighter, less robust items tend to burn away completely. Charred plant remains usually consist of cereal remains and associated weed seeds as these tend to be the most likely materials to come in contact with fire.

Methods

Charred plant remains were extracted from the soil samples by water flotation decanting onto a 0.85 mm mesh sieve. The flotation was performed by environmental assistants and site staff at a location near the site. Samples were chosen by the archaeologist from those contexts which appeared the most promising. This included primary contexts such as ovens and hearths, features associated with these and other contexts where there was visible charred material. A large number of samples were taken in this way but since it was not cost-effective to analyse them all, further selection took place in the lab. A subsample at least of almost all datable samples was sorted by environmental assistants but only those that produced substantial numbers of identifiable plant remains or were deemed to be of special interest for archaeological reasons were further analysed. A total of forty samples from twenty-five features was analysed. Analysis of further material was not possible in the time available and appeared to be unnecessary in any case as preliminary scans of other samples suggested that they were likely to produce material similar to that already analysed, but in smaller quantity.

Plant remains were identified by the author using a low power binocular microscope, with reference to modern comparative material. Taxonomy of wild plants follows Clapham *et al*. (1987). All cultivated barley is identified under the general name of *Hordeum vulgare* and varietal characteristics (hulled, six-row etc.), where identifiable,

are given in English. The term Triticum aestivum s.l. is intended to include all free-threshing hexaploid wheats but does not include T. spelta.

The Roman period

There were twelve Roman samples analysed from nine different features. All of these features appeared to be in some way associated with the barrack block (Structure 1). Samples from two oven/hearth pits from the kitchen (F195 and F205, phase 2B) were analysed and these were the only features where the charred material was apparently in situ. The other features sampled were a pit that may have been in use during the life of the barrack (F216), a latrine pit (F143), a square pit within the barrack (F26), a black area on secondary flooring in the barrack (C1382), fill from the southern part of the barrack eastern wall trench (F141), and a black patch in the backfill of a barrack beam trench (F148). In all these features the charred material was part of the backfill of those features and therefore not necessarily directly associated with the function of the feature in which it was found. The latrine, unfortunately, was not waterlogged and therefore the botanical material relating to its use as a cesspit was not preserved. There was no recognisable difference between the charred material in the oven/hearths and that in the backfills. One of the oven/hearths (F195) was in fact very poor in charred seed material although it contained abundant quantities of wood charcoal.

Crop plants

The cereals found in the Roman phase were spelt (Triticum spelta), bread/club wheat (Triticum aestivum s.l.), possibly some emmer (Triticum cf. dicoccum) and hulled six-row barley (Hordeum vulgare) and rye (Secale cereale). Also present was a single fruit of beet (Beta vulgaris).

Wild beet is native to Britain but it favours coastal habitats. The presence of beet this far inland almost certainly points to its being in cultivation. Beet is known from other inland Roman sites at Denton, Lincolnshire (Conolly 1971) and Alcester (Moffett 1988), suggesting that cultivation of beets may have been fairly widespread. Vegetables are greatly under-represented in the archaeobotanical record, partly because the seeds are not the part used and they are seldom charred, since exposure to fire would happen only as the result

of rare accident. The importance in the diet of beet and other vegetables is undoubtedly much greater than the scanty record would suggest.

Rye is present in a very small amount. Although rye may have been a crop in Roman Britain (Helbæk 1952 and 1964) it also grows as a weed in cereals and its very slight presence here suggests that it may have been a weed rather than a crop. Cultivated oat can only be separated from wild oat by the base of the lemma (one of the enclosing chaff parts). Both of the two lemma bases found were of the wild type, suggesting that the few oat grains in the samples were also wild oat (Avena fatua or A. ludoviciana). Both of these species are highly successful weeds in cereals.

The presence of six-row barley is attested by the twisted or asymmetic grains which are characteristic of the lateral floret of six-row barley. These florets are sterile in two-row barley. In theory a population of pure six-row barley would have a ratio of two twisted grains to one straight grain, while pure two-row barley would have only straight grains. A mix of the two populations would result in a lower ratio of twisted to straight grains. In practice, however, barley grains are often too distorted by charring for it to be possible to reliably separate straight from twisted grains in sufficient numbers for this ratio to be meaningful. In general the ratios of twisted grains to straight was about 2.5:1 or 3:1. This is an over-representation of twisted grains probably due to the greater ease with which they can be recognised, but it does suggest that two-row barley was either not present or only in a very small amount.

Identification of the wheats posed serious difficulties as there were extremely few diagnostic chaff fragments. Identification of wheat grains to species is difficult and unreliable. Most of the grains present had to be assigned simply to Triticum sp. A few glume bases (the lower parts of the floral bracts) of spelt were found, confirming the presence of this species but few grains could be identified as spelt. A few narrow grains with a clear dorsal ridge which was highest just slightly behind the embryo were tentatively identified as emmer but only one possible emmer spikelet fork was found. Of the grains which were both well-preserved and extreme enough in their morphological characters to assign to a type, the majority appeared to be a bread/club wheat type. These grains were broad and rounded, and lacked a dorsal ridge. A substantial number of them were very short and

round, with a steeply slanting embryo. This latter type is sometimes identified as Triticum aestivo-compactum Schlem. (club wheat). Club wheat is a form of bread wheat with short, compact ears. Examination of specimens in the author's reference collection suggests that club wheat does not always have short, round grains, but on the contrary sometimes has grains which are indistinguishable from most lax-eared bread wheats. Some lax-eared bread wheats, on the other hand, can have short, round grains. Other archaeobotanists have also previously noted this difficulty (G. Hillman pers. comm.) and it seems that the identification of short, round grains as Triticum aestivo-compactum may be invalid. All grains, therefore, which appeared to be free-threshing hexaploids were identified as Triticum aestivum s.l. One rachis node of bread/club wheat type was found.

Cereal bran (pericarp) fragments, uncharred in appearence, were also found in three samples. This was wholly unexpected as all the deposits were free-draining and bran normally survives only under favourable waterlogged conditions. A first suspicion, that the bran might be a modern intrusion, was eliminated when bran was observed still in place on some of the charred grains. The bran fragments were surprisingly pliable when handled with forceps. They were brown in colour, translucent, and the cross layer of cells was clearly visible. The conditions under which the grains became charred while apparently not charring some of their pericarps, though some change must have taken place to cause the bran to be preserved, is at present beyond the author's power to explain.

Weeds and other wild plants

Most of the other species in the samples are weeds of disturbed and cultivated ground or grassland species which appear to have flourished as cornfield weeds in the past. In the latter group may be the plant most abundantly represented, ribwort plantain (Plantago lanceolata). Unlike the common segetal weeds it is a perennial species. It has been suggested by Hillman in discussing the common pre-Saxon presence of heath grass (Sieglingia decumbens) in cereal assemblages that perennial weeds were able to flourish in ard-cultivated fields that would have been destroyed by efficient mould-board ploughing (Hillman 1982). Perhaps this also accounts for the presence of milkwort (Polygala sp.), another perennial plant of heaths and grassland.

Most of the weeds and other wild plants came from two samples. One

of these was mostly weeds and came from the lower level of the latrine (1345). This could represent a dump of mixed rubbish from several sources. Not all the weeds need necessarily represent crop weeds, therefore. The other sample (F26) produced more cereal grains than weeds, with barley and wheat in equal amounts, and could also represent a mixed deposit though the weeds could be contaminents that had not yet been cleaned from the crops.

Sloes (Prunus spinosa) and hazel (Corylus avellana) would have been collected for food. One of the sloe stones was mineralised rather than charred and found, unsurprisingly, in the lower level of the latrine.

Discussion

Half of the samples appear to consist of fully processed grain of wheat and barley. Weeds and chaff fragments were few in these samples and there were few of the small 'tail' grains which are usually eliminated during processing (Hillman 1981). The sample from the pit (216) was nearly pure wheat, and one of the samples from a hearth/oven (F205) was also dominated by wheat, while the other grain samples where dominated by barley. These samples represent the whole of the charred areas of the deposits from which they derive. Those from the secondary deposits therefore, represent dumps of charred grain ranging in size from under a third of a litre to just over three litres. The samples from hearth/oven 205 were also about one third of a litre of charred material, although in this case these were not pure grain deposits and a significant amount of the charred material was wood charcoal.

Although up to three litres of grain seems like a large amount, it would represent only a tiny fraction of the probable amount of grain being stored at the fort at any given time during its occupation. These charred grain dumps are probably not the result of any catastrophic accident but rather smaller accidents with grain being handled on a daily basis or even deliberate burning to control pests which may have been a serious problem (Buckland 1981, Osborne 1977). The burning of grain to control pests has been suggested as a possible reason for the much larger deposit of burned grain at Malton and other deposits of charred grain found in some northern forts (Buckland 1982). Thorough examination of the grain samples from Rocester, however, failed to reveal any sign of damage by grain beetles or any remains of the beetles themselves (P. Osborne pers. comm.). It is possible that the

grain may have been spoiled in ways that would not be detectable after the grain had been burned. Fungal or microbial activity, for example, might spoil the grain without being detectable in the charred material. Many of the grains in one sample (1261 from F141) were distorted in shape as if they had been compressed when soggy. Grain which has gone damp in storage often sprouts, and few visibly germinated grains were found in any of the samples but this might mean that spoiled grain was disposed of promptly before it had time to sprout.

Grain could also have become charred by accident if it was being parched prior to grinding. Most grain, especially in damp climates, needs to be parched to harden it before grinding or milling it for flour (Fenton 1978:375). Unparched grain is very inefficient to grind as it tends to crush rather than grind and clogs the quernstone. An experiment with a Roman rotary quern showed that parched grain was many times more efficient to mill than unparched grain (Curwen in Curwen and Hatt 1953:125-6). Hulled barley being used for human consumption also needs to be parched to make the adhering 'hulls' (the lemma and palea) brittle so that the grain can be threshed free (hummeled).

Spelt appears to have been the main wheat of Roman Britain and its presence at Rocester is not surprising. Emmer is also found sometimes on Roman sites, usually in small quantities, although it had declined in importance during the Iron Age. Bread wheat too is often found on Roman sites is small quantities but its presence at Rocester as the main wheat represented is in contrast to most contemporary sites so far studied in Britain. The only other example known to the author is the granary from the fort at South Shields at the eastern end of Hadrian's wall (van der Veen 1988).

It is unfortunate from an archaeobotanical point of view that most of the northern Roman forts were excavated in before recovery of charred plant material was widespread. Although there are references to spreads of charred grain from some of these forts we do not know the species involved (van der Veen 1988). Only a few Roman forts have had their plant remains studied. At Isca the main cereals were spelt and possibly rye, although identification was hindered by extensive germination, with bread wheat a minor element (Helbæk 1964), and the material from the granary at Verulamium was apparently similar although the only published reference to this material the author was able to find was a footnote which does not say if the supposed if the supposed granary was military or civilian (Helbæk 1952). Some of the charred

grain from Malton was examined by Jessen and Helbæk, the majority of it being identified as 'various wheats', which could have included bread wheat (Jessen and Helbæk 1944). A large deposit of charred grain found at the legionary warehouse at Coney Street, York, consisted primarily of spelt, six-row hulled barley and rye, again germinated (Williams 1979). Waterlogged deposits from a ditch at Bearsden which may have derived from a nearby latrine produced cereal bran fragments, the majority of which were wheat (Dickson and Dickson 1988). Chaff fragments of emmer and spelt were also found in this deposit, but this does not rule out the presence of bread wheat, and the evidence from Rocester and South Shields shows that bread wheat grains can be present in considerable quantities with few or no accompanying chaff remains.

Assuming for the moment that the Roman military is likely to have bought as much of its grain as possible from the nearest available source then Romano-British farmsteads were providing the bulk of the grain used by the Roman army in Britain and therefore the cereals found in these settlements (the producers) ought to be the same as those found in the Roman forts (the consumers). This seems to be only partly the case. Although there may be few Roman forts from which archaeobotanical studies have been published there is substantially more information available from rural settlements, and a few non-military grain stores, mostly from towns, have also been studied. Spelt appears to be the dominent grain on almost all of these sites. Bread wheat, when present, always seems to be a minor element. Rye too, despite its abundance at Isca and Verulamium is a very minor element at most settlement sites. Although bread wheat is not abundant at some of the other Roman forts it seems unlikely that the abundance of bread wheat at Rocester and South Shields is entirely coincidental. The reasons for this, however, are at present obscure. Van der Veen (1988) suggested that the grain at South Shields may have been imported from the Continent.

It is possible that taphonomic factors are at least partly responsible for the apparent discrepancy. After all, it does not follow that because bread wheat is found on rural sites in small quantities that it was necessarily being produced in small quantities. The commonest item normally found on Romano-British rural sites is spelt chaff, probably the waste fraction from fine sieving being used for fuel (see Hillman 1981 and 1984). Due to the difference in structure between glume wheats like spelt and free-threshing wheats like bread

wheat, and resulting need to process them differently, the waste fractions from processing the two cereals are somewhat different. It is possible that the waste fraction from threshing bread wheat could have been used differently from spelt fine sievings and thus perhaps not come as frequently in contact with fire.

Differences in structure between the two cereals may also favour the survival of spelt. The chaff parts which enclose the grain in bread wheat are much thinner and more papery than those of spelt and therefore more susceptible to total destruction instead of charring in a fire. The rachis segments (the stem part of the ear) of bread wheat remain joined together after threshing while spelt rachis segments disarticulate during threshing. The fact that bread wheat rachises remain joined together means that they tend to get caught in the upper part of a fire where they are more likely to burn away (Hillman 1978) while smaller denser items such as spelt glume bases sift to the bottom of the fire where reducing conditions prevail and preservation by charring is more likely to take place. It is possible, therefore that bread wheat may be substantially under-represented on rural sites.

In contrasting the abundance of spelt chaff common on rural settlement sites with the abundance of bread wheat grain from Rocester, two different crop products are being compared as well as two different crops. Since this is likely to give an invalid result, the comparison should really be between similar crop products only. So far, however, there has been no report of abundant chaff remains from military sites, while cleaned grain stores from rural settlement sites are also rare. The army, of course, is likely to have bought its grain already processed and cleaned and therefore the likelihood of finding abundant chaff remains on military sites is probably small. As far as the author is aware deposits of bread wheat are not known from rural settlement sites, nor are storage deposits of fully cleaned spelt (spelt grains with little or no chaff or weeds), although some sites have produced deposits containing large amounts of spelt grains liberally mixed with chaff and weeds (Jones 1986, Moffett 1986).

This raises a number of questions. Was bread wheat grown by Romano-British farmers mainly for the Roman army or for sale generally and therefore not used by the farmers or stored for any great length of time at their settlements? If so, what happened to the waste products from the bread wheat processing? Was bread wheat imported after all, despite the expense because it was possibly the most reliable means of

providing the army with corn, at least in certain localities? Was bread wheat much consumed by civilians? Only systematic study of charred plant remains from more Roman consumer sites, both civilian and military, is likely to provide an answer.

The Saxon period

The Saxon period at Rocester is represented by four samples from three oven/hearth structures (F306, F341 and F305). The similarity between one of these ovens (F341) and one of the late Saxon ovens excavated at Stafford has been noted by Ferris (in prep.).

Crops and weeds

The crop plants represented in this period are a free-threshing wheat, probably bread/club wheat, rye, six-row hulled barley, oats and beans. Two grains of emmer or spelt were also found but these are likely to be residual.

Rye is the least well represented cereal but is known to have been cultivated in Staffordshire in the Saxon period from the evidence at Stafford, where not only grains but also chaff remains were found in abundance (Moffett 1987). Rye was cultivated in East Anglia (Murphy 1985) but there was no evidence for it in the Saxon period at Southampton (Monk 1978) and it was also rare at Winchester (Green 1979) suggesting the possibility of regional variation in its distribution, although more evidence may alter this view.

Bread/club wheat seems to have replaced spelt as the main wheat fairly early in the Saxon period although spelt may still have been grown locally in a few areas (Green 1979, Murphy 1985). Little is known about this transition, as the early Saxon period is even less well understood archaeobotanically than it is archaeologically.

Oats were also definitely being cultivated as a crop in the Saxon period. Unfortunately there were no diagnostic chaff remains from Rocester and therefore the oats in these samples cannot be identified to species. It is possible that some of the oat grains may be from wild oats but the abundance of oat grains suggests that oat was probably a crop. Preservation was rather poor, but most of the grains identified in the tables as Avena/Large Gramineae are probably oat. Two species of cultivated oat were found at Stafford, the common oat (Avena sativa) and the bristle oat (Avena strigosa) (Moffett 1987).

Weed seeds were rare except in one sample (1466). Most of the

weeds present were those already found in the Roman period, with the addition of cornflower (Centaurea cyanus). Cornflower is native to the Mediterranean but has been found in Britain on Roman sites (Kenward and Williams 1979, Moffett 1986, Bowker n.p.). It does not seem to become really abundant until the 12th century (Grieg 1988) but it also found in the late Saxon period at Stafford and it may that this was when the plant first began to establish itself as a serious pest in cereals. The most abundant weeds in the sample are tare/vetchling (Vicia/Lathyrus) and corncockle (Agrostemma githago).

Discussion

One of the samples (1501 from F306) was very poor in charred remains, producing too low numbers of items for discussion of the sample composition to be meaningful. The other sample from this oven/hearth (1467) was dominated by grains of wheat and oats in roughly equal proportions. This sample was also not particularly rich in charred seed remains though it produced considerable quantities of wood charcoal. The sample from from F341 (1691) was a relatively rich deposit of almost pure barley. The fourth sample (1466 from F305) was even richer in remains and was dominated by oats, with a significant quantity of wheat grains and weed seeds.

At least two of these samples (1467 and 1691) appear to be representing fully processed and cleaned crops. Two crops are represented in 1467 but they are unlikely to have been grown together as a maslin (mixed crop), since wheat is normally a winter-sown crop, while oats are sown in the spring. It is probable, therefore that they became mixed in the oven. The higher percentage of weeds in 1466 suggests that the crop may not have been as fully cleaned, though the weeds may also have arrived in the oven separately, as waste from crop processing being disposed of in the fire. It is possible that the oats in this sample were destined to be used as fodder, and therefore had not been processed as carefully as a crop used for human consumption.

Although the structures of the oven/hearths were all different, there is no reason from the evidence of the plant remains to suppose that their functions were necessarily different. Although the function(s) cannot be positively deduced from the plant remains, it seems likely that these were parching/drying ovens which may have been used for a variety of purposes. As mentioned above, cereal grains mill more efficiently when parched. If oats and hulled barley are used as

food for humans they need to be parched so that the grains can be pounded free of their tightly enclosing inner chaff parts. Although cereals can be stored for some time without drying provided they were not harvested wet and they are stored where there is free circulation of air and a low temperature, there may have been occasions when it was necessary to dry the crop to prolong its storage life. The presence of beans suggests that crops other than cereals may also have been dried.

The Medieval period

Sixteen samples taken from four of the Medieval ovens (F47, F50, F286 and F304) and there were six samples from six pits apparently associated with them.

The crops and weeds

The crop plants from the Medieval period were similar to those from the Saxon period except that flax and cultivated vetch were also found. The cultivation of flax in Britain is ancient and the fact that it is found here only in the Medieval period is probably fortuitous. Cultivated vetch was introduced sometime early in the 13th century, on the evidence of historical documents (Currie 1988) though there is no reason to assume it could not have been cultivated in Britain much earlier. It is primarily a fodder crop but like many legumes it fixes nitrogen in the soil, helping to improve fertility. Vetch cultivation may have been associated with attempts by landowners at improvement in land management though documentary evidence suggests that it was never grown on a large scale (Campbell 1988).

Weeds were those which are familiar from a number of Medieval sites including Stafford. Vicia/Lathyrus was consistently the most common weed in all the samples. Fitzherbert, in the 1534 edition of his Husbandry complains that the tare is the worst of all weeds (Skeat 1882:30) and it seems possible that this was true at Rocester.

One possible ergot (a sclerotium of Claviceps purpurea) was found. Ergot is a fungus which can infects cereals and grasses, and is often associated with rye. Too high a consumption of bread made with contaminated flour causes a fatal disease known as ergotism. A single sclerotium, however, is not an indication that the crop was infested.

Discussion

The oven samples were remarkable similar in their composition, and

were either dominated by wheat with oats second or nearly equal in abundance, or by oats with wheat second in abundance. Barley and rye were very minor components. Why oats and wheat should be so consistently associated is a mystery. As noted above, they are unlikely to have been grown together, and whereas wheat was normally used exclusively for people, oats were used both for human food and for fodder. Most likely they became mixed in the ovens, presumably being processed in similiar ways.

Weeds were present in moderate amounts and chaff remains were very few. The samples are much less weedy than those from the Medieval ovens at Stafford, where there was a possibility that one or both of the ovens had been used for malting and that crop processing waste might have been used as fuel (Moffett 1988). At Rocester, grain parching or drying seems a more likely function for the ovens. There was no sign of large numbers of germinated grains which would indicate possible malting. Although these oven samples appear to be weedier than most of the Saxon samples, it is difficult to say if this is reflecting a difference in crop management or whether it is due to chance. Certainly one of the Saxon oven samples (1466) appears identical to the Medieval oven samples in this regard.

The pit samples tended to be sparser in charred material but one sample was comprised mainly of unidentified cereal and Vicia/Lathyrus, while two others were mostly hulled barley. These two latter samples were nearly pure grain with few weed seeds. It seems a trifle strange that the composition of the material in the pits is not quite the same as the material found in the ovens, as it would be logical to assume that the charred material in the pits was derived from the ovens. Possibly the difference could be seasonal, with the material in the ovens representing the last use(s) of the ovens, while the material in the pits was derived from earlier uses, but this implies that all the ovens went out of use at the same time of year, which seems perhaps unlikely. It is also possible that wheat and oats were used differently than barley and were therefore processed at a different time.

Acknowledgements

I would like to thank Iain Ferris and Simon Esmonde-Cleary for providing the samples and helpful archaeological information, and Peter Osborne for kindly examining the grain samples for beetle remains. Work on the plant remains from Rocester was funded by the English Heritage Commission.

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ROCESTER TOTAL SPECIES LIST

	Roman	Saxon	Medieval	Common name
Triticum dicoccum grains	+	-	+	emmer
Triticum dicoccum/spelta glume bases	+	-	-	
Triticum dicoccum/spelta grains	+	+	-	
Triticum spelta glume bases	+	-	+	
Triticum spelta grains	+	-	-	spelt
Triticum spelta/aestivum grains	+	-	-	
Triticum aestivum s.l. rachises	-	-	+	
Triticum aestivum s.l. grains	+	+	+	bread wheat
Triticum free-threshing rachises indet.	-	-	+	
Triticum free-threshing grains indet.	+	+	+	
Triticum sp. grains	+	+	+	
Triticum/Secale grains	+	+	+	
Secale cereale rachises	+	-	+	
Secale cereale grains	+	+	+	rye
Hordeum vulgare hulled straight grains	+	+	+	hulled barley
Hordeum vulgare hulled twisted grains	+	+	+	
Hordeum vulgare hulled indet. grains	+	+	+	
Hordeum vulgare indet.	+	+	+	
Avena sp.	+	+	+	oat
Cereal indet. grains	+	+	+	
Cereal/Gramineae large culm nodes	+	-	+	
Beta vulgaris fruits	+	-	-	beet
Vicia faba var. minuta	-	+	+	Celtic bean
Vicia sativa ssp. sativa	-	-	+	vetch
Vicia/Pisum	-	-	+	bean or pea
Linum usitatissimum	-	-	+	flax
Ranunculus acris/repens/bulbosus	+	+	+	buttercups
Ranunculus sardous	-	-	+	hairy buttercup
Ranunculus subsect Ranunculus	+	-	-	
Brassica rapa	-	+	-	wild turnip/mustard
Brassica/Sinapis	-	-	+	
Sinapis arvensis	-	-	+	charlock
Raphanus raphanistrum	+	-	-	wild radish
Polygala sp.	+	-	+	milkwort
Agrostemma githago	+	+	+	corncockle
Agrostemma githago calyx tips	-	-	+	
Stellaria palustris/graminea	+	-	-	stitchwort
Chenopodium/Atriplex	+	-	+	
Genista pilosa	+	-	-	hairy greenweed
Vicia hirsuta	-	+	+	hairy tare
Vicia tetrasperma	-	+	+	smooth tare
Vicia sativa ssp. nigra	-	+	+	common vetch
Vicia/Lathyrus	+	+	+	
Medicago lupulina	+	-	-	black medick
Medicago/Trifolium	+	-	+	
Trifolium sp.	+	-	-	clover
Potentilla sp.	+	-	-	
Prunus spinosa	+	-	+	sloe
Prunus spinosa [mineralised]	+	-	-	
Polygonum aviculare agg.	+	+	+	knotweed
Polygonum persicaria	+	+	+	red shank
Fallopia convolvulus	-	-	+	black bindweed
Rumex acetosella agg.	+	+	+	sheep's sorrel
Rumex sp.	-	+	+	dock
Corylus avellana nutshell frags.	+	+	+	hazel
Rhinanthus minor s.l.	+	-	-	yellow rattle
Plantago lanceolata type	+	-	+	ribwort plantain
Galium aparine	+	-	+	cleavers
Galium sp.	+	+	+	
Anthemis cotula	-	-	+	stinking mayweed
Tripleurospermum inodorum	-	-	+	scentless mayweed
Chrysanthemum segetum	-	-	+	corn marigold
Centaurea cyanus	-	+	+	cornflower
Centaurea cyanus flower heads	-	-	+	
Centaurea sp.	+	-	-	
Lapsana communis	+	+	+	nipplewort
Compositae indet.	+	-	+	
Eleocharis palustris/uniglumis	+	-	+	spike-rush
Carex cf. otrubae	+	-	-	false fox-sedge
Carex cf. nigra type	+	-	-	common sedge
Carex spp.	+	-	+	sedges
Poa sp.	+	-	-	meadow-grass
Cynosurus cristatus	-	-	+	crested dog's tail
Glyceria sp.	+	-	-	sweet-grass
Bromus mollis/secalinus	+	+	+	brome
Sieglingia decumbens	+	-	-	heath grass
Gramineae indet.	+	+	+	grasses
Claviceps purpurea	-	-	+	ergot

ROMAN SAMPLES

Feature:	143	143	143	26	141	148	-	216	195	205	205	-
Sample no.:	1250	1307	1345	1075	1261	1272	1382	1399	1366	1378	1380	1424
Phase:	2AA	2AA	2AA	2A	2A	2A	2A	2A	2B	2B	2B	2B
Soil sample size (litres):	4	16	18	18	1	5	13	11	17	5	3	43
Total flot (mls.):	50	150	200	450	70	240	3100	665	288	375	400	804
% of flot analysed:	100	67	50	91	23	17	1.3	6	11	13	6	22
No. of items per litre of soil:	11	2	20	41	1096	238	3390	2814	4	955	1278	3
Crops												
Triticum dicoccum spikelet forks	-	-	-	-	-	-	1cf.	-	-	-	-	-
Triticum dicoccum grains	-	-	-	-	-	-	1	3cf.	-	3cf.	-	-
Triticum dicoccum/spelta glume bases	-	-	-	2	-	-	3	-	-	-	-	-
Triticum dicoccum/spelta grains	-	1	-	-	-	-	1	3	-	2	-	-
Triticum spelta spikelet forks	-	-	-	-	-	-	2	2	-	-	-	-
Triticum spelta glume bases	-	-	-	2	-	-	1	1	-	-	-	-
Triticum spelta grains	-	-	-	-	-	-	2	-	-	1cf.	-	-
Triticum spelta/aestivum grains	-	-	-	2	-	-	9	76	2	9	9	5
Triticum aestivum s.l. rachis nodes	-	-	-	-	-	-	1	-	-	-	-	-
Triticum aestivum s.l. grains	2cf.	1	-	46	-	28	21	559	-	76	11	-
Triticum sp. grains	2	14	1	178	194	18	68	928	3	105	142	-
Triticum/Secale grains	-	-	-	2	-	-	-	1	-	-	-	-
Secale cereale rachises	-	-	-	1	-	-	-	-	-	-	-	-
Secale cereale grains	-	-	-	2	-	-	1	3	-	2	-	-
Hordeum vulgare hulled straight grains	-	-	2	2	1	6	32	-	-	17	2	1
Hordeum vulgare hulled twisted grains	-	-	2	9	4	18	86	2	-	75	9	2
Hordeum vulgare hulled indet. grains	37	3	12	183	41	124	370	60	3	221	46	4
Hordeum vulgare indet.	-	3	5	26	-	9	7	6	-	39	2	-
Cereal indet. grains	3	2	1	65	12	14	65	53	-	67	6	8
Cereal bran present	-	-	-	-	-	-	*	*	-	*	-	-
Cereal/Gramineae large culm nodes	-	-	1	-	-	-	-	-	-	-	-	-
Beta vulgaris fruits	-	-	-	1	-	-	-	-	-	-	-	-
Wild species												
Ranunculus acris/repens/bulbosus	-	-	14	4	-	-	-	-	-	-	-	-
Ranunculus subsect Ranunculus	-	-	-	1	-	-	-	-	-	-	-	-
Raphanus raphanistrum	-	-	-	1	-	-	1	-	-	-	-	-
Polygala sp.	-	-	-	1	-	-	-	-	-	-	-	-
Agrostemma githago	-	-	-	1	-	1	-	4	-	-	-	-
Stellaria palustris/graminea	-	-	-	1	-	-	-	-	-	-	-	-
Chenopodium/Atriplex	-	-	1cf.	1	-	-	1	-	-	-	-	-
Genista pilosa	-	-	1cf.	-	-	-	-	-	-	-	-	-
Vicia/Lathyrus	-	-	1	10	-	-	-	-	-	-	-	-
Medicago lupulina	-	-	1	-	-	-	-	-	-	-	-	-
Medicago/Trifolium	-	-	1	-	-	-	-	-	-	-	-	2
Trifolium sp.	-	-	-	3cf.	-	-	-	-	-	-	-	-
Potentilla sp.	-	-	-	1	-	-	1	-	-	-	-	-
Prunus spinosa	-	1	1	-	-	-	-	-	-	-	-	-
Prunus spinosa (mineralised)	-	-	1	-	-	-	-	-	-	-	-	-
Polygonum aviculare agg.	-	-	-	1	-	-	1	-	-	-	-	-
Polygonum persicaria	-	-	-	-	-	-	1	-	-	-	-	1
Fallopia convolvulus	-	-	-	-	-	-	-	2	-	-	-	-
Rumex sp.	-	-	4	1	-	-	-	-	-	-	-	-
Corylus avellana nutshell frags.	-	-	-	25	-	-	-	-	-	-	-	2
Rhinanthus minor s.l.	-	-	3	-	-	-	-	-	-	-	-	-
Plantago lanceolata type	-	-	69	30	-	-	-	-	-	-	-	-
Galium aparine	-	-	1	-	-	-	-	-	-	-	-	-
Galium sp.	-	-	-	1	-	-	-	-	-	-	-	1
Anthemis cotula	-	-	-	-	-	-	1	-	-	-	-	-
Centaurea sp.	-	-	6cf.	-	-	-	-	-	-	-	-	-
Lapsana communis	-	-	1	-	-	-	-	-	-	-	-	-
Compositae indet.	-	-	-	-	-	-	-	-	-	-	-	1
Eleocharis palustris/uniglumis	-	-	1	1	-	-	-	-	-	-	-	-
Carex cf. nigra type	-	-	2	-	-	-	-	-	-	-	-	-
Carex cf. otrubae/vulpina	-	-	1	-	-	-	-	-	-	-	-	-
Carex spp.	-	-	1	18	-	-	-	1	-	-	-	-
Sieglingia decumbens	-	-	2	2	-	-	-	-	-	-	-	-
Glyceria sp.	-	-	1	-	-	-	-	-	-	-	-	-
Poa sp.	-	-	-	1	-	-	-	-	-	-	-	-
Bromus mollis/secalinus type	-	-	6	1	-	-	-	-	-	1	1	-
Avena fatua/ludoviciana lemma bases	-	-	-	-	-	-	2	-	-	-	-	-
Avena sp.	-	1	-	7	-	-	9	9	-	2	2	-
Gramineae indet.	-	-	22	18	-	1	2	16	-	1	-	-
Gramineae culm nodes	-	-	-	2	-	-	-	-	-	-	-	-
Unidentified	-	-	11	7	-	-	-	-	-	-	-	-
% wheat	-	-	<1	34	77	14	18	91	-	31	70	-
% barley	-	-	12	33	18	78	66	4	-	57	28	-
% cereal indet.	-	-	<1	10	5	7	11	3	-	11	3	-
% chaff + weeds	-	-	84	21	0	1	5	2	-	<1	1	-
% other	-	-	3	<1	0	0	0	0	-	0	0	-

SAXON AND MEDIEVAL OVENS

Feature:	306	306	341	305	47	47	47	47	47
Sample no.:	1467	1501	1691	1486	1126	1138	1140	1141 /1166	1156
Phase:	3A	3A	3A/B	3B	4	4	4	4	4
Soil sample size (litres):	41	7	8	5	7	5	3	2	8
Total flot size (mls.):	1399	20	78	165	50	23	15	3	5
% of sample analysed:	15	100	26	23	100	100	100	100	100
No. of items per litre:	21	3	275	327	42	38	43	67	15
Crops									
Triticum dicoccum/spelta grains	–	–	2	–	–	–	–	–	–
Triticum aestivum s.l. rachises	–	–	–	–	–	–	1	2	–
Triticum aestivum s.l. grains	–	–	6	–	–	–	–	–	–
Triticum free-threshing sp. grains	11	7	–	15	30	16	13	17	8
Triticum sp. grains	37	5	6	28	54	45	30	27	23
Triticum/Secale grains	5	1	–	17	10	4	1	16	–
Secale cereale rachises	–	–	–	–	–	–	–	3	–
Secale cereale grains	–	2	–	22	3	3	4	6	1
Hordeum vulgare hulled twisted grains	–	–	34	–	–	–	–	–	–
Hordeum vulgare hulled straight grains	–	–	12	–	–	–	–	–	–
Hordeum vulgare hulled indet. grains	–	–	478	–	4	11	6	4	1
Hordeum vulgare indet. grains	2	–	11	–	2	1	–	1	–
Avena sp. grains	4	2	5	16	10	8	8	3	21
Avena/Large Gramineae grains	29	3	2	106	36	17	10	7	36
Cereal indet.	37	4	15	66	100	64	32	42	–
Cereal/Large Gramineae culm bases	–	–	–	–	–	1	–	–	–
Vicia faba	–	–	1cf.	1	–	–	–	–	–
Vicia/Pisum	–	–	–	–	–	–	–	1	–
Linum usitatissimum	–	–	–	–	1	–	–	–	–
Wild species									
Ranunculus a/r/b	–	–	–	1	–	–	–	–	1
Brassica rapa	–	–	–	1	–	–	–	–	–
Agrostemma githago	–	–	–	12	–	–	–	–	–
Chenopodium sp.	–	–	–	–	–	1	–	–	1
Vicia hirsuta	–	–	–	1	3	–	1	–	1
Vicia tetrasperma	–	–	–	2	–	–	1	–	–
Vicia sativa ssp. nigra	–	–	–	2	–	–	–	–	–
Vicia/Lathyrus	3	–	–	24	29	18	20	3	16
Polygonum aviculare agg.	–	–	–	1	1	–	–	1	1
Polygonum persicaria	–	–	–	2cf.	–	–	–	–	–
Rumex acetosella agg.	–	–	–	4	–	–	–	–	1
Rumex sp.	–	–	–	3	1	–	1	–	4
Corylus avellana nutshell fragments	1	–	–	1	–	–	–	–	–
Plantago lanceolata type	–	–	–	–	2	1	–	–	–
Galium aparine	–	–	–	–	1	–	–	–	1
Galium sp.	–	–	–	1	–	–	–	–	–
Anthemis cotula	–	–	–	–	–	–	1	–	–
Chrysanthemum segetum	–	–	–	–	–	–	–	–	1
Centaurea cyanus	–	–	–	1	–	–	–	–	–
Lapsana communis	–	–	–	2	–	–	–	–	–
Carex sp.	–	–	–	–	–	1	–	–	–
Bromus mollis/secalinus group	–	–	1	–	–	–	–	–	–
Gramineae indet.	1	–	–	3	2	2	–	1	4
Unidentified	–	–	–	2	2	–	1	1	–
% wheat	37	–	2	11	29	32	33	33	26
% rye	0	–	0	6	1	2	3	4	1
% barley	2	–	93	0	2	6	5	4	1
% oat	25	–	1	44	16	13	14	7	47
% cereal indet.	32	–	3	22	38	35	25	43	0
% chaff + weeds	3	–	<1	16	14	12	26	8	26
% other	1	–	<1	<1	<1	<1	0	1	0

Percentages not given for samples with less than 100 identified items.

MEDIEVAL OVEN SAMPLES

Feature:	50	50	50	50	50	50	286	286	304	304	304
Sample no.:	1134	1143	1160	1172	1225	1226	1427	1432	1465	1480	1484
Soil sample size (litres):	6	2	10	5	13	7	9	4	6	8	14
Flot size (mls.):	50	20	125	40	100	75	122	12	56	68	60
% of flot analysed:	100	100	25	100	50	67	25	100	38	24	50
No. of items per litre:	82	76	155	142	85	139	10	5	23	19	18
Crops											
Triticum dicoccum grains	-	-	-	-	1cf.	-	-	-	-	-	-
Triticum spelta glume bases	-	-	-	-	-	-	1	-	-	-	-
Triticum aestivum s.l. rachises	1	-	3	7	-	1	-	-	-	-	-
Triticum aestivum s.l.	4	2	-	-	6	11	-	-	-	-	-
Triticum free-threshing rachises	-	-	-	-	-	2	-	-	-	-	-
Triticum free-threshing sp.	48	8	60	85	30	48	4	-	5	7	21
Triticum sp.	88	57	16	84	102	136	4	6	12	8	36
Triticum/Secale	14	14	13	22	10	16	-	-	4	-	9
Secale cereale rachises	-	-	6	-	-	-	-	-	-	-	-
Secale cereale	32	8	13	12	17	48	1	-	5	1	5
Hordeum vulgare hulled straight grains	-	-	1	-	-	-	-	-	-	-	-
Hordeum vulgare hulled twisted grains	-	-	2	-	-	-	-	-	-	-	-
Hordeum vulgare hulled	15	10	12	14	5	3	-	5	-	1	-
Hordeum vulgare indet.	4	1	3	3	4	-	-	-	2	-	-
Avena sp.	4	5	6	19	33	31	-	-	-	1	-
Avena/Large Gramineae	54	6	22	129	100	75	-	-	2	6	15
Cereal indet.	159	8	127	218	151	115	8	4	9	6	19
Cereal/Large Gramineae culm nodes	-	-	-	1	-	-	-	1	-	-	-
Vicia faba	-	-	-	1	1cf.	-	-	-	-	-	2cf.
Vicia sativa ssp. sativa	-	-	-	1	-	-	-	-	-	-	-
Vicia/Pisum	-	-	-	1	1	-	1	-	-	-	-
Wild species											
Ranunculus acris/repens/bulbosus	-	-	-	-	-	3	-	-	-	-	-
Ranunculus sardous	-	-	-	-	-	1	-	-	-	-	-
Sinapis arvensis	-	-	-	-	-	1cf.	-	-	-	-	-
Agrostemma githago	2	3	3	2	1	5	-	-	2	-	2
Agrostemma githago calyx tips	-	-	1	1	-	-	-	-	-	-	-
Chenopodium/Atriplex	1	1	1	8	19	35	1	2	-	-	-
Vicia hirsuta	4	2	6	2	2	4	-	-	-	-	-
Vicia tetrasperma	-	-	-	-	1	-	-	-	-	-	-
Vicia sativa ssp. nigra	-	-	1	-	1	-	-	-	-	-	-
Vicia/Lathyrus	54	20	70	86	48	64	2	-	10	5	16
Medicago/Trifolium	-	-	-	-	-	1	-	1	-	-	-
Polygonum aviculare agg.	-	-	-	-	1	4	-	-	-	1	-
Polygonum persicaria	-	-	-	2cf.	1	3	-	-	-	-	-
Polygonum hydropiper	-	-	-	1	-	1	-	-	-	-	-
Polygonum sp.	-	-	-	-	-	1	-	-	-	-	-
Fallopia convolvulus	-	-	-	-	-	2	-	-	-	-	-
Rumex acetosella agg.	-	-	1	-	1	-	-	-	-	-	-
Rumex sp.	1	3	3	5	3	7	-	-	-	-	-
Plantago lanceolata type	-	-	1	-	-	1	-	1	-	-	-
Galium aparine/spurium	1	-	-	-	-	1	-	-	-	-	-
Galium sp.	1	-	1	2	1	-	-	-	-	-	-
Anthemis cotula	-	-	-	-	7	-	-	-	-	-	-
Tripleurospermum inodorum	-	-	2	-	-	-	-	-	-	-	-
Chrysanthemum segetum	-	1	-	-	1	-	-	-	-	-	1
Centaurea cyanus	1	-	1	1	-	-	-	-	-	-	-
Centaurea cyanus flower heads	-	-	1	-	-	-	-	-	-	-	-
Lapsana communis	1	-	1	-	1	1	-	-	-	-	-
Compositae flower head	-	1	-	-	-	-	-	-	-	-	-
Carex sp.	-	-	1	-	-	-	-	-	-	-	-
Cynosurus cristatus	-	-	-	-	-	-	-	1	-	-	-
Bromus mollis/secalinus group	-	-	3	2	1	12	1	-	-	-	1
Gramineae indet.	6	1	17	3	-	19	1	1	2	1	1
Claviceps purpurea	-	-	-	-	1cf.	-	-	-	-	-	-
Unidentified	-	2	1	3	-	3	-	3	1	1	1
% wheat	28	44	17	24	25	30	-	-	-	-	44
% rye	6	5	3	2	3	7	-	-	-	-	4
% barley	4	7	5	2	2	7	-	-	-	-	0
% oat	12	7	7	21	24	16	-	-	-	-	12
% cereal indet.	35	14	36	39	29	20	-	-	-	-	22
% chaff + weeds	16	22	31	17	17	26	-	-	-	-	16
% other	0	0	0	<1	<1	0	-	-	-	-	2

Percentages not given for samples with less than 100 identified items.

MEDIEVAL PIT SAMPLES

Feature:	290	291	292	295	300	318	339	10
Sample no.:	1438	1454	1455	1483	1461	1500	1544	1029
Phase:	4	4	4	4	4	4	4	5A/B
Soil sample size (litres):	23	8	9	15	9	7	7	2
Flot size (mls.):	185	80	45	190	350	85	42	25
% of flot analysed:	44	33	44	26	7	35	48	100
No. of items per litre:	60	54	21	6	2	82	4	149
Crops								
Triticum aestivum s.l.	–	–	–	–	1	8	–	–
Triticum free-threshing sp.	98	11	33	5	1	3	–	62
Triticum sp.	16	3	11	5	7	5	1	68
Triticum/Secale	45	–	–	–	–	1	–	13
Secale cereale	54	–	1	–	–	–	–	7
Hordeum vulgare hulled twisted	–	16	–	4	23	12	–	–
Hordeum vulgare hulled straight	–	4	–	1	5	3	–	–
Hordeum vulgare hulled unreferable	6	85	2	24	214	157	7	–
Hordeum vulgare indet.	4	7	1	3	11	2	4	2
Avena sp.	11	1	–	2	2	–	1	5
Avena/Large Gramineae	44	9	21	4	–	6	–	27
Cereal indet.	142	6	26	–	3	3	–	83
Vicia faba	2	–	–	–	–	–	–	–
Vicia/Pisum	2	1	1	–	–	–	–	3
Wild species								
Ranunculus acris/repens/bulbosus	1	–	–	–	–	–	–	–
Brassica/Sinapis	1	–	–	–	–	–	–	–
Agrostemma githago	29	–	–	–	–	–	–	–
Chenopodiaceae indet.	3	–	–	–	–	–	–	–
Vicia hirsuta	6	–	–	–	–	–	–	–
Vicia/Lathyrus	109	1	4	1	–	–	–	20
Prunus spinosa	1	–	–	–	–	–	–	–
Polygonum aviculare agg.	–	–	1	1	–	–	–	–
Rumex sp.	6	–	–	–	–	–	–	–
Corylus avellana nutshell fragments	1	–	–	–	–	–	–	–
Plantago lanceolata type	–	–	–	1	–	–	–	–
Galium aparine	–	–	–	–	–	–	–	1
Galium sp.	–	–	1	1	–	–	–	–
Centaurea cyanus	1	–	–	–	–	–	–	–
Lapsana communis	5	–	–	–	–	–	–	–
Compositae indet.	1	–	–	–	–	–	–	–
Eleocharis palustris/uniglumis	–	–	–	1	–	–	–	–
Carex sp.	–	–	–	–	–	–	1	–
Bromus mollis/secalinus group	7	2	–	–	–	–	–	4
Gramineae indet.	17	–	–	4	–	–	–	3
Unidentified	–	1	1	–	–	–	–	–
% wheat	19	10	–	–	–	8	–	44
% rye	9	0	–	–	–	0	–	7
% barley	2	77	–	–	–	87	–	<1
% oat	9	7	–	–	–	3	–	11
% cereal indet.	31	4	–	–	–	2	–	32
% chaff + weeds	30	<1	–	–	–	0	–	9
% other	<1	<1	–	–	–	0	–	1

Percentages not given for samples with less than 100 identified items.