Chapter 8: Environmental Evidence

MAMMAL AND BIRD BONES *by Lena Strid*

Introduction

The animal bone assemblage largely derives from Junction 8N and Junction 9, and the majority of the material comes from Roman and medieval contexts (Table 8.1). A full record of the assemblage, documented in a MS Access database, can be found within the site archive.

Methodology

The majority of bones were recovered by hand during the excavation. A number of soil samples were taken and sieved through a 0.5mm mesh, but these samples produced little identifiable bone. Identification of the mammal and bird bone was undertaken at OA with access to the reference collection and published guides. All the animal remains were counted and weighed, and where possible identified to species, element, side and zone (Serjeantson 1996). Ribs and vertebrae were only recorded to species when they were substantially complete and could accurately be identified, or were from an identifiable articulated skeleton in which there could be no doubt as to their species. Undiagnostic bones were recorded as small (small mammal size), medium (sheep size) or large (cattle size). The separation of sheep and goat bones was undertaken using the criteria of Boessneck (1969) and Prummel and Frisch (1986), in addition to the use of the reference material housed at OA. Where distinctions could not be made, the bone was recorded as sheep/goat.

The condition of the bone was graded on a six-point system (0-5). Grade 0 equating to very well-preserved bone, and grade 5 indicating that the bone had suffered such structural and attritional damage as to make it unrecognisable. The minimum number of individuals (MNI) was calculated on the most frequently occurring bone for each species, using Serjeantson's (1996) zoning guide, and taking into account left and right sides. For the calculation of the number of identified fragments per species (NISP) all identifiable fragments were counted, although bones with modern breaks were refitted.

For ageing, Habermehl's (1975) data on epiphyseal fusion were used. Three fusion stages were recorded: unfused; in fusion; and fused. In fusion indicates that the epiphyseal line is still visible. Tooth wear was recorded using Grant's (1982) tooth-wear stages and correlated with tooth eruption (Habermehl 1975). Age was estimated using the methods of Halstead (1985), Payne (1973) and O'Connor (1988) for cattle, sheep/goat and pig respectively.

Measurements were taken according to von den Driesch (1976), using digital callipers with an accuracy of 0.01mm. Large bones were measured using an osteometric board, with an accuracy of 1mm.

Table 8.1: Number of identified bones/taxa in the M1 assemblages

	Junction 9	*Junction 8N*		
Species	*Roman*	*Roman*	*Medieval*	*Total*
Cattle	95	27	5	127
Sheep/goat	56	2	5	63
Sheep	1			1
Goat	4			4
Pig	19	3	12	34
Horse	18	49	3	70
Cat			1	1
Domestic fowl	1		1	2
Indeterminate bird	3	2	6	11
Small mammal			1	1
Medium mammal	52	3	36	91
Large mammal	150	45	21	216
Indeterminate	569	159	163	890
Total fragment count	968	290	254	1512
Total weight (g)	7296	1379	1634	10309

Preservation

The Roman assemblages showed a great range of bone condition (Table 8.2). Most bones were fairly to poorly preserved. The Junction 8N assemblage had a larger ratio of poorly preserved bones than Junction 9. There was little difference in the ratio of gnawed bones between these two sites, suggesting that the difference in bone condition is related to natural taphonomic factors. In all three assemblages, there were very few bones with gnaw marks from carnivores, probably dogs, suggesting that waste was disposed of securely soon after discard. There were no gnawed bones in the Roman Junction 8N assemblage, although the poor preservation may have obscured any traces of gnawing that were

Table 8.2: Preservation level for bones from the M1 assemblage

Site	*Date*	*N*	*0*	*1*	*2*	*3*	*4*	*5*
Junction 9	Roman	968	1.2%	18.3%	45.2%	22.4%	11.9%	0.9%
Junction 8N	Roman	290	0.7%	15.5%	14.1%	34.8%	26.2%	8.6%
Junction 8N	Medieval	254	0.8%	30.7%	52.0%	3.5%	13.0%	

originally present. A total of 23 bones had been burnt. Most of these occurred in the Junction 9 assemblage, although they only comprised 2.2% of the total number of fragments. The low number of burnt bones suggests that common cooking methods included boiling of meat or deboning before cooking.

Junction 8N: Roman assemblage

The Junction 8N Roman assemblage comprises 290 fragments (Table 8.3). All but four fragments derive from the early-mid-Roman phase. The majority of the identified bone consists of teeth. This may be connected to the overall poor bone preservation of the assemblage (see above), since enamel is more resistant to taphonomic destruction than bone. The cattle teeth in particular were very fragmented.

The Roman assemblage is dominated by cattle and horse, although due to the biased element preservation the intra-site species ratio cannot be discussed further. The lack of wild mammals is not unusual for Roman rural sites, excluding villas (King 1991, 16-18), indicating that game provided at most a very minor contribution to the diet, if any.

Two first phalanges, one of cattle and one of horse, were fused, and thus belonged to animals older than 20-24 months and 12-15 months of age respectively. Dental age estimation was possible for three cattle mandibles, showing a range of slaughter ages from young adult to old adult.

Junction 8N: medieval assemblage

The medieval assemblage from Junction 8N comprises 254 fragments (Table 8.4). A small number of bones from most of the common domestic species were present at the site, although dog was only indirectly represented in the form of gnaw marks on four bones. While not all body parts are present for the six taxa, there is no over-representation of skeletal elements that would suggest bias in the assemblage. The few ageable bones consist of a fused cattle first phalanx (>20-24 months at death), an unfused sheep/goat metapodial (<20-24 months at death) and a juvenile pig metacarpal. Sex estimation could be carried out on two pig teeth; one mandibular canine from a sow and one maxillary canine from a boar. A vertical cut mark below the P4 on the cat mandible indicates that the cat was skinned. Cat skins were common in the medieval period, albeit not associated with a high-social status (Luff and Moreno 1995; Hatting 1990; Magnell 2006).

Table 8 3: Junction 8N, Roman assemblage. Anatomical distribution of all species, including NISP, MNI and weight. Skeletal element used for MNI is marked with an asterisk

	Cattle *(Bos taurus)*	Sheep/goat *(Ovis aries/ Capra hircus)*	Pig *(Sus domesticus)*	Horse *(Equus caballus)*	HBird	Medium mammal	Large mammal	Indeterminate
Mandible	3*							
Loose teeth	23	2	3	47			1	
Rib						2		
Astragalus				1				
Phalanx 1	1			1				
Long bone					2	1	44	
Indeterminate								159
Total (NISP)	27	2	3	49	2	3	45	159
MNI	2	1	1	1				
Weight (g)	564	5	3	479	0	1	134	193

Table 8.4: Junction 8N, medieval assemblage. Anatomical distribution of all species, including NISP, MNI and weight. Skeletal element used for MNI is marked with an asterisk

	Cattle (*Bos taurus*)	Sheep/goat (*Ovis aries/ Capra hircus*)	Pig (*Sus domesticus*)	Horse (*Equus caballus*)	Cat (*Felis catus*)	Domestic fowl (*Gallus gallus*)	Bird	Small mammal	Medium mammal	Large mammal	Indeterminate
Skull fragments				1							
Mandible	1			1	1					1	
Loose teeth	1	2	5								
Vertebra								1		2	
Rib									2	3	
Scapula									1		
Humerus			3*				1		1		
Radius		2	1								
Ulna			1							2	
Metacarpal	1		1								
Pelvis										1	
Femur	1		1								
Tibia									1		
Tarsometatarsus						1					
Phalanx 2	1										
Indeterminate metapodial		1		1							
Long bone							5		31	11	
Indeterminate										1	163
Total (NISP)	5	5	12	3	1	1	6	1	36	21	163
MNI	1	1	3	1	1	1					
Weight (g)	90	20	88	1009	2	0	0	0	95	217	113

Junction 9: Roman assemblage

In contrast to the Junction 8N assemblage, no specific phase group dominates the Junction 9 material, which ranges from late Iron Age-late Roman in date (Table 8.5). As the individual phase groups are rather small the assemblage was analysed as a single unit.

As expected, domestic mammals dominate the assemblage (King 1991, 16-18) (Table 8.6). The paucity of wild taxa is consistent with Junction 8N, although considering the relatively small number of identified fragments, the perceived lack of evidence for hunting at these sites should be regarded with caution. Cattle is the most numerous taxon regardless of quantification method, followed by sheep/goat. The change in ratio between cattle and sheep/goat from two earlier phases to the late Roman phase is consistent with King's (1991) established theory of Romanisation in Britain leading to a reduction in the importance of sheep/goat and an increase in cattle and pig.

Both sheep and goat are present at the site. The four goat bones were recovered from the same late Iron Age/early Roman pit (2004; fill 2168), suggesting that they might derive from a single individual. Goats were rare in Iron Age and Roman Britain (King 1991, 16) and, as they have a higher milk yield than sheep (White 1970, 313), they may have been utilised mainly for dairy products.

Table 8.5: Number of identified bones/taxa in the Junction 9, Roman assemblages

Species	*LIA/ER*	*ER*	*MR*	*LR*	*RO*
Cattle	23	28	7	36	1
Sheep/goat	14	34	4	3	1
Sheep	1				
Goat	4				
Pig	4	8		7	
Horse	3	4	3	8	
Domestic fowl				1	
Indeterminate bird		1		2	
Medium mammal	8	33	7	4	
Large mammal	23	81	15	31	
Indeterminate	130	124	81	232	2
Total fragment count	210	313	117	324	4
Total weight (g)	2159	2499	750	1868	20

Most body parts of cattle, sheep/goat and horse were present in the assemblage, indicating that

Table 8.6: Junction 9, Roman assemblage. Anatomical distribution of all species, including NISP, MNI and weight. Skeletal element used for MNI is marked with an asterisk.

	Cattle *(Bos taurus)*	Sheep/goat *(Ovis aries/ Capra hircus)*	Pig *(Sus domesticus)*	Horse *(Equus caballus)*	Cat *(Felis catus)*	Domestic fowl *(Gallus gallus)*	Bird	Small mammal	Medium mammal	Large mammal	Indeterminate
Horn core	1										
Skull fragments	3	2			3	1				53	
Mandible	8*	8*								1	
Loose teeth	45	20			12	6					
Axis	1					1					
Vertebra									3	12	
Rib								1	14	20	
Sterum									1		
Scapula	3	3			1						
Humerus	6	2		1	2	3*					
Radius	4	7		1		1				1	
Ulna		2						1			
Carpal				1							
Metacarpal	5			1		2					
Pelvis	6	1									
Femur					1		1				
Tibia	4	4				1					
Calcaneus	1	1							1		
Astragalus		1									
Metatarsal	5	3	1			3					
Phalanx 1	3										
Phalanx 2		2									
Long bone								1	33	63	
Indeterminate											569
Total (NISP)	95	56	1	4	19	18	1	3	52	150	569
MNI	5	3			1	2	1				
Weight (g)	3075	301	3	59	205	1548	2	1	94	1022	986

Table 8.7: Junction 9, Roman assemblage. Cattle epiphyseal fusion

	Unfused	*Fusing*	*Fused*	*% unfused*
Early fusion (<1.5 years)			5	0%
Mid fusion (2-2.5 years)			6	0%
Late fusion (>3 years)	1			100%

these animals were slaughtered and butchered at the site. The pig bones derive from the skull and from meat-rich limb bones. The presence of skull elements suggests that despite the lack of foot bones, pigs were slaughtered on site, rather than brought in as meat.

Epiphyseal fusion data suggest that cattle and sheep/goat were mostly slaughtered as sub-adults and/or adults, whereas pigs were mostly slaughtered as sub-adults (Tables 8.7-9). The sheep/goat dental data show a wide age distribu-

Table 8.8: Junction 9, Roman assemblage. Sheep/goat epiphyseal fusion

	Unfused	*Fusing*	*Fused*	*% unfused*
Early fusion (<1 year)			4	100%
Mid fusion (1-2 years)		1	3	0%
Late fusion (>3 years)	2		2	50%

Table 8.9: Junction 9, Roman assemblage. Pig epiphyseal fusion

	Unfused	*Fusing*	*Fused*	*% unfused*
Early fusion (<1 year)			3	0%
Mid fusion (1-2.5 years)				
Late fusion (>3 years)	1			100%

Table 8.10: Junction 9, Roman assemblage. Dental analysis of cattle, using Halstead (1985)

N	0-1 months	1-8 months	8-18 months	18-30 months	30-36 months	Young adult	Adult	Old adult	Senile
5				3		1			1

Table 8.11: Junction 9, Roman assemblage. Dental analysis of sheep/goat, using Payne (1973)

N	0-2 months	2-6 months	6-12 months	1-2 years	2-3 years	3-4 years	4-6 years	6-10 years
4		1		1	1			1

Table 8.12: Measurements of sheep/goat bones from Junction 9 and from late Iron Age-early Roman sites in the ABMAP database

	Species	Element	Measurement	N	Mean	Min	Max
Junction 9	Goat	Metacarpal	Greatest length (GL)	1	105.5		
ABMAP	Sheep/goat			15	115.8	104.9	126.1
Junction 9	Goat	Metacarpal	Greatest breadth of the distal end (Bd)	1	25.2		
ABMAP	Sheep/goat			20	22.2	20.6	24.9
Junction 9	Sheep/goat	Tibia	Greatest breadth of the distal end (Bd)	1	22.4		
ABMAP				100	23.0	19.9	29.8

tion, whereas the cattle are dominated by 18-30 month old animals (Table 8.10-11). Juvenile remains were recovered from the early Roman phase, comprising one calf metacarpal, one sheep/goat scapula and one pig skull fragment. Two mandibular pig canines from the late Iron Age/early Roman phase belonged to boars, whereas one mandibular canine from the late Roman phase derived from a sow.

The measurable bones from Junction 9 are similar in size to contemporary bones from Romano-British sites in the Animal Bone Metrical Archive Project (ABMAP) database (Tables 8.12-13) (ABMAP 2009). The short length and large distal breadth of the goat metacarpal in comparison to contemporary measurements suggests that the measurements from the ABMAP database mainly derive from sheep, as they are more slender than goats. During the Roman period there is some evidence for increases in animal size, believed to be a result of focussed animal breeding, including the import of breeding animals (Maltby 1981, 185-92). As a result of the small sample size this trend is not visible in the M1 assemblages, and in any case the pattern is far from universal.

Butchering marks were recorded on eight bones. An early Roman cattle first phalanx had transverse cut marks mid bone on the lateral side. These probably derived from skinning. Cut marks on the proximal end of a late Roman horse metatarsal could derive from skinning or from disarticulation. The same context group (2040) also contained two other horse metapodials and a skull fragment, but no horse bones from meat-rich parts of the body.

Table 8.13: Greatest length of horse metacarpal at Junction 9 and from late Iron Age-early Roman sites in the ABMAP database

	N	Mean	Min	Max
Junction 9	1	213.5		
ABMAP	12	200.2	181.0	211.0

Cut marks at the glenoid on an early Roman pig scapula and distally on the medial side of a late Iron Age/early Roman goat humerus suggest disarticulation of these joints. One late Iron Age/early Roman sheep/goat tibia had cut marks on the distal part of the bone, which may have occurred during filleting or disarticulation. Filleting was otherwise recorded on one rib from a large mammal, which displayed transverse cut marks mid rib. Four parallel transverse heavy-cut/chop marks on the medial side of the ilium on a late Roman cattle pelvis would most likely derive from portioning of the carcass.

Small exostoses, possibly related to infection and/or muscle trauma, were found on the upper third half of the shaft on a late Roman horse metatarsal. Non-metric congenital traits were recorded on two early Roman sheep/goat mandibles, that had a foramen on the buccal side of the ramus below the premolars. Halstead and Collins (2002, 549) have suggested that this placement of an extra foramen is a characteristic indicator for sheep rather than goat.

Discussion

The two Roman settlements, Junction 8N and Junction 9, are difficult to compare. Although the main domestic taxa are present at both sites, the composition of the assemblages varies greatly, probably mostly due to preservation differences. Large assemblages in the area include those from Gorhambury villa, just north-west of Verulamium (Locker 1990) and from the Folly Lane shrine within Verulamium (Locker 1999). There are also minor reports on bones from secular deposits in Verulamium (Locker 1999; Wilson 1984).

With the exception of the shrine deposits, cattle is the dominant taxon in the Gorhambury and Verulamium assemblages. A predominance of sheep/goat is normally associated with a native economy, which continues in the Roman period on the rural non-Romanised sites (King 1991). However, the Iron Age phase at Gorhambury shows a predominance of cattle, and Locker (1990, 210) suggests that the environment in the area is particularly suitable for cattle compared to sheep. The predominance of cattle at Junction 8N and Junction 9 does not therefore necessarily indicate a high level of Romanisation at these settlements.

The high representation of pigs at Gorhambury suggests that the villa inhabitants were utilising nearby woods for pannage, while the low numbers of pigs at Junction 9, might indicate that the local landscape was less suitable for intensive pig farming. Another possibility is that the Junction 9 inhabitants were not able to use the existing landscape optimally for their own purposes, if the local resources were to an extent controlled by the occupants of villas, such as that at nearby Redbourn. Pigs are generally more frequent on villa sites than on other rural settlements (Cool 2006, 82-4). This might be connected to the fact that villa estates controlled more land than smaller settlements, which would enable them to keep larger number of animals. Alternatively, villas may have focussed on different agricultural products, and bought pigs for slaughter from surrounding settlements.

Medieval animal bone assemblages from Hertfordshire are rare. The few that have been published mostly derive from ecclesiastical or high-status sites (English Heritage 2008), and are thus not directly comparable to those from rural settlements. There is a small assemblage of 333 speciable bones from a croft at Gorhambury (Locker 1990), but there are not enough bones to allow an inter-site comparison of numbers of cattle, sheep/goat and pig. The NISP data suggest that sheep/goat were the most common taxa and that pigs were almost as common as cattle (ibid., 210). A large ratio of pig bones could indicate that there were forests suitable for pannage in the region.

CHARRED PLANT REMAINS *by Wendy Smith*

Introduction

In total 176 samples were collected during excavations and 116 of these were assessed (Smith 2008) for charred plant remains (CPR), the majority of which are of Roman date. Twenty-one of the samples assessed produced moderate to abundant CPR (excluding charcoal). Although several different areas of the M1 sites were sampled, these remains are only from two areas; Junction 8N and Junction 9. Several samples of 'moderate' quality (eg producing *c* 50-100 identifications in total) were excluded from the analysis, either because: the contexts remained unphased (evaluation sample 100); only relatively small quantities of CPR (sometimes poorly preserved) were available (in five medieval samples); or plant remains of this phase were already well represented (Roman samples). As a result, this report will only consider the 14 richer archaeobotanical assemblages recovered.

The results from 12 samples dating from the late Iron Age-early Roman/late Roman and two medieval samples (of 12th-13th-century date) are presented. Sample volumes range from 10-40l, but typically are 30-40l in volume. Samples are from a variety of features including a middle Roman corn dryer (corn dryer 7782 – samples 6088 and 6089), ditches (late Iron Age-early Roman/late Roman samples 2002, 2037, 2038 and 6024), a medieval kiln (sample 6017), a middle Roman organic layer (sample 102036), pits (late Iron Age-early Roman/late Roman pits samples 2001, 2033, 6018 and 6052, and medieval pit sample 6020) and a waterhole (late Iron Age-early Roman sample 2024). The analysis of archaeobotanical data from lesser rural Roman sites is considered to be limited in England (van der Veen *et al*. 2007, 207, fig. 2); therefore, the data presented are of regional and national importance.

Method

Samples were processed at OA using a modified Siraf-style flotation machine. The flot (the material which floats) was washed over a 0.25mm mesh sieve and the heavy residue (the material which does not float) was retained in a 0.5mm flexible nylon mesh. The heavy-residue fraction was then subsequently wet-sieved over a series of graduated rigid sieves at >10mm, 10-4mm, 4-2mm and >0.5mm. Both flots and heavy-residue fractions were dried at 30ºC. Heavy residues were sorted by eye by staff at OA; where abundant CPR were noted, the relevant heavy-residue fraction was retained.

Samples were sorted under a low-power binocular microscope at magnifications between x10 and x20. All sorted samples were then rechecked by the author to ensure that all identifiable plant remains had been extracted. Checking sorted flots and identification of sorted CPR was made using a low-power Leica EZ4D microscope at magnifications between x12.5 and x35. In addition, the author sorted the 4-2mm heavy-residue fraction for sample 6052 under a low-power binocular microscope at x12.5 magnification.

Several of the flots clearly were very rich and/or contained highly fragmented plant remains that were exceedingly time-consuming to sort. As a result, the riffling method (eg van der Veen 1984; van der Veen and Fieller 1982) was adopted, with a notional target of at least 250-300 quantifiable items, ideally 500, extracted. In all cases of sub-samples, the scores recorded in the tables are only for that portion of the flot sorted and are not factored back up to 100% of the flot/heavy residue. In two cases (samples 2001 and samples 6018) <200 quantifiable plant macrofossils were sorted from the sub-sample selected; however, both samples were extremely difficult to sort because of the highly fragmentary nature of CPR (including minute charcoal fragments) present. In addition, the initial estimate counts from primary sorting for both samples were artificially inflated by the inclusion of clearly modern seeds with black seed coats (eg *Chenopodium* spp./*Atriplex* spp.), which were subsequently disregarded for the analysis. Although it would have been satisfactory to return and sort a further sub-sample from each of these samples, it was considered that this would be unlikely to generate data that would greatly change the results already produced.

All CPR samples were fully quantified (with the proviso that highly fragmentary remains such as awns, glumes and minute fragments of indeterminate cereal/large grass caryopses were semi-quantified) and scores were based on whole seeds or plant parts. Quantification of cereal grain and grass caryopses was based on the apical end, primarily because the majority of cereal grain was missing the embryo end. Estimate counts (where fragmentary material was quantified in terms of whole seeds or plant parts) are indicated in the tables by an 'E' after the score. In a few cases, especially where modern seeds are black, the antiquity of the CPR is in question and this has been indicated by a '?' after the score in the tables.

Quantification of cereal grain sprouts (coleoptiles) was made on those coleoptiles which have the trefoil-shaped base (two rootlet bases and the base of the acrospire) fully preserved. This most likely under represents the quantity of coleoptiles present, but avoids quantification of highly fragmentary sprouts as if they were the same as the largely intact sprouts. The length of the coleoptiles has not been measured. In all cases the tip of the coleoptile was absent.

Identifications were made in comparison with the OA reference collection and illustrations or photographs in Floras and standard keys (eg Cappers *et al*. 2006; Stace 1997). Nomenclature for the plant remains follows Stace (1997) for indigenous species and Zohary and Hopf (2000) for cultivated species. The traditional binomial system for the cereals is maintained, following Zohary and Hopf (2000, 28, table 3; 65, table 5).

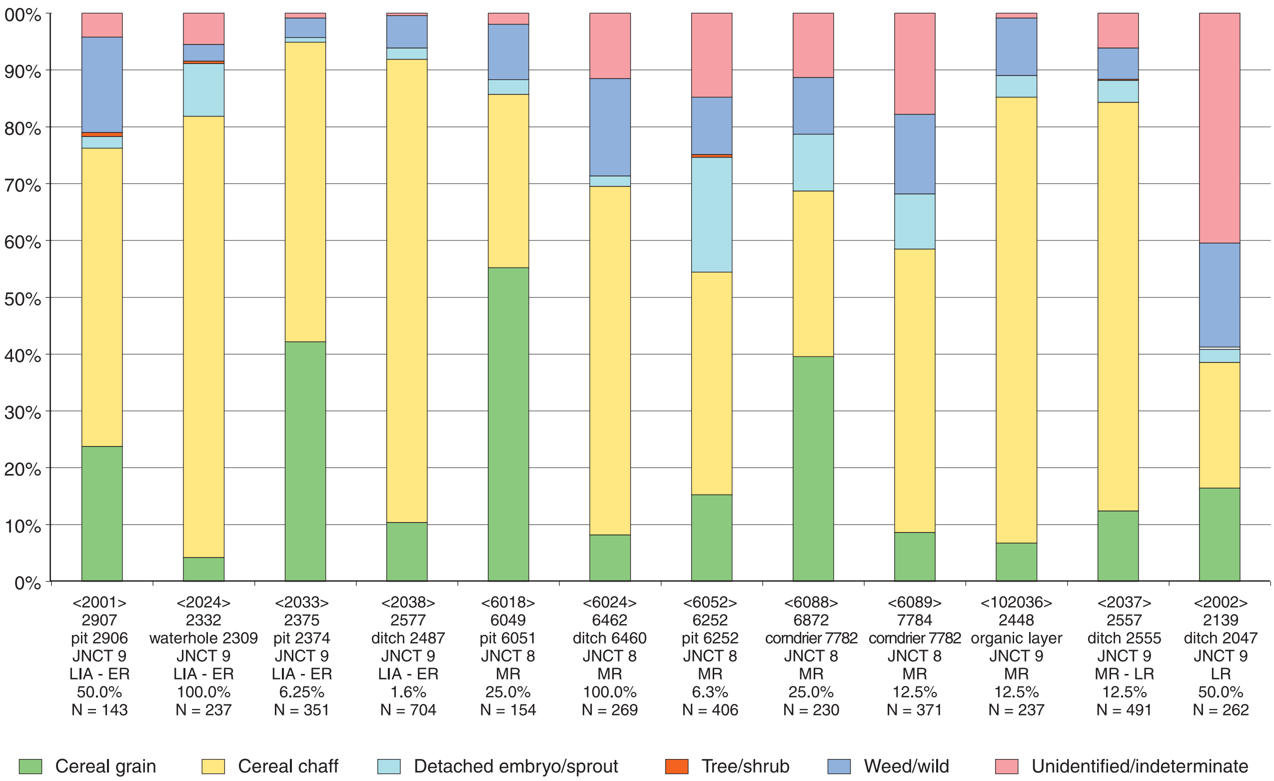

Fig. 8.1 Relative proportions of plant remain categories in late Iron Age/early Roman-late Roman samples from all sites

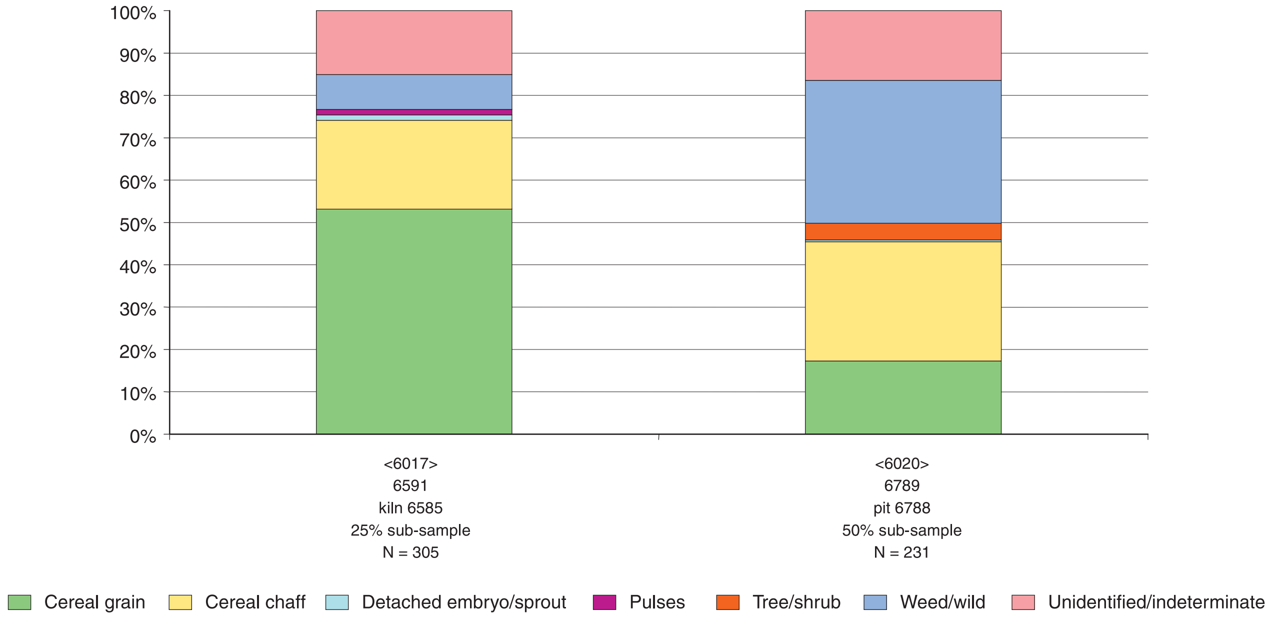

Fig. 8.2 Relative proportions of plant remain categories from medieval samples from Junction 8N

Results

The CPR recovered clearly separate out into Roman and medieval periods on the basis of the wheat (*Triticum* spp.) cultivated. Table 8.14 presents the quantified taxa list for all 12 late Iron Age-early Roman/late Roman samples analysed from the scheme. Table 8.15 and Fig. 8.1 present the relative proportion of various categories of plant remains (eg cereal grain, cereal chaff, weed/wild plants, etc) recovered. Table 8.16 presents the quantified taxa list for the two medieval (12th-13th-century) samples fully analysed. Table 8.17 and Fig. 8.2 present the relative proportion of various categories of plant remains recovered from the medieval CPR assemblage.

The late Iron Age-early Roman/late Roman CPR assemblage includes several samples (n = 8) dominated by cereal chaff remains, primarily of spelt wheat (*Triticum spelta* L.). One sample was clearly dominated by cereal grain (sample 6018 from pit 6051, context 6049) and the four remaining samples were fairly mixed assemblages of cereal grain (including detached embryos/sprouts), cereal chaff and accompanying weed seeds. The weed/wild component was often relatively small (Table 8.15 and Fig. 8.1) and may be inflated by the inclusion of indeterminate cultivated/wild oat (*Avena* spp.) and/or brome grass (*Bromus* spp.), both of which can be cultivated or considered a tolerated impurity of the main crop.

The two medieval assemblages are most likely not a reliable reflection of the full range of plant-related activities carried out in the medieval settlement centred on Junction 8N. Nevertheless, both samples are clearly dominated by remains of free-threshing-type wheat (*Triticum* spp. grain and rachis nodes), and smaller quantities of rye (*Secale cereale* L.). One possible barley (cf *Hordeum* sp.) grain was noted, but barley chaff was not observed in these samples. Sample 6017, from kiln 6585, was primarily comprised of cereal grain and chaff, with only a small weed/wild component (n = 25 or 8.2% of all identifications). Sample 6020, from pit 6788, was a fairly even mixture of cereal chaff (n = 65 or 28.1%) and weed/wild plant seeds (n = 78 or 33.8%), with a good deal of cereal grain (n = 40 or 17.3%) also present.

Discussion

The Roman assemblages appear to primarily comprise charred crop-processing by-products, with only one sample (pit sample 6018) strongly dominated by a single product, in this case primarily poorly preserved cereal and/or cereal/large grass caryopses. Consideration of the context and distribution of these remains may be informative. The weed/wild component from these Roman assemblages is limited, but is consistent with other results from Hertfordshire. The consistent presence of indeterminate cultivated or wild oat (*Avena* spp.) and/or brome grass (*Bromus* spp.) in the weed flora may suggest a tolerated impurity, if not a cultivated crop in their own right.

Crop-processing by-products vs. products in Roman samples

Cultivation of cereal crops for grain generates abundant waste or by-product material. In the case of the Roman samples, spelt (*Triticum spelta* L.) is the main cereal identified. Spelt is a hulled wheat which generally has two grains in each spikelet (segment)

Table 8.14: Late Iron Age-early Roman/late Roman CPR

Sample	**2001**	**2024**	**2033**	**2038**	**6018**	**6024**	
Context	**2907**	**2332**	**2375**	**2577**	**6049**	**6462**	
Context description	**Pit 2906**	**Waterhole 2309**	**Pit 2374**	**Ditch 2487**	**Pit 6051**	**Ditch 6460**	
Site	**Jnct 9**	**Jnct 9**	**Jnct 9**	**Jnct 9**	**Jnct 8N**	**Jnct 8N**	
Phase	**LIA-ER**	**LIA-ER**	**LIA-ER**	**LIA-ER**	**MR**	**MR**	
Sample vol. (l)	**40**	**40**	**40**	**15**	**30**	**40**	
Flot vol. (ml)	**40**	**8**	**300**	**325**	**100**	**55**	
Proportion of sample sorted	**50%**	**100%**	**1/16th**	**1/64th**	**25%**	**100%**	
Seeds per litre of sediment	**71.5**	**237.0**	**21.9**	**11.0**	**38.5**	**269.0**	
LATIN BINOMIAL							**ENGLISH COMMON NAME**
FLOT							
Cereal grain							
cf *Hordeum* sp.	-	-	3	-	-	-	possible barley
Triticum cf *dicoccum* Schübl	-	-	-	-	-	1	possible emmer
Triticum dicoccum Schübl./*spelta* L.	-	-	1	-	-	-	indeterminate emmer/spelt
Triticum dicoccum Schübl./*spelta* L. - tail grain	-	-	-	-	-	4	indeterminate emmer/spelt
Triticum spelta L.	-	-	-	-	-	-	spelt
Triticum spp. - indeterminate grain fragments (est. whole grain)	2	-	8	9	16 E	-	indeterminate wheat
Triticum spp. - indeterminate, germinated grain (est. whole grain)	-	-	2	1	1	-	indeterminate wheat
Triticum spp. - indeterminate tail grain	-	-	-	1	-	-	indeterminate wheat
Cereal - indeterminate	12E	-	59 E	32 E	43 E	7	cereal
Cereal/ POACEAE - indeterminate fragments (est. whole grain/ caryopsis)	20 E	10 E	75 E	30 E	25 E	10 E	cereal/large grass
Cereal/ POACEAE - indeterminate (semi-quantified minute fragments)	+++	-	++++	+++	+++	++	cereal/large grass
Cereal chaff							
Triticum cf *dicoccum* Schübl. - glume base	1	-	-	-	-	-	possible emmer
Triticum dicoccum Schübl./*spelta* L. - glume fragments (unquantified)	-	-	-	++++	-	-	indeterminate emmer/spelt
Triticum dicoccum Schübl./*spelta* L. - glume base	36 E	78 E	71 E	270	20 E	91 E	indeterminate emmer/ spelt
Triticum dicoccum Schübl./*spelta* L. - spikelet fork (=2gb) **	1	-	3	1	-	1	indeterminate emmer/ spelt
Triticum dicoccum Schübl./*spelta* L. - terminal spikelet fork (=2gb) **	-	-	2	-	-	-	indeterminate emmer/ spelt
Triticum spelta L. - glume base	2	6	20	102	5	15	spelt
Triticum spelta L. - spikelet fork (= 2 gb)**	-	0	-	-	-	1	spelt
Triticum cf *spelta* L. - glume fragments	-	-	-	-	-	++	possible spelt
Triticum cf *spelta* L. - spikelet fork (=2 gb)**	-	-	-	-	-	1	possible spelt
Triticum spp. - rachis nodes (often highly fragmented, estimate whole node)	25 E	100 E	84 E	150 E	21 E	30 E	indeterminate wheat
Triticum spp. - awn (unquantified)	-	-	-	++	-	+	indeterminate wheat
Cereal - unidentified rachis internode fragment	9 E	-	5 E	50 E	-	25	cereal
Cereal - unidentified basal rachis node	-	-	-	-	-	-	cereal
Cereal/ POACEAE - indeterminate, culm node	1	-	-	-	-	-	cereal/large grass

Sample	**2001**	**2024**	**2033**	**2038**	**6018**	**6024**	
Context	**2907**	**2332**	**2375**	**2577**	**6049**	**6462**	
Cereal/ POACEAE - indeterminate, culm base	-	-	-	-	1	-	cereal/large grass
Cereal/ POACEAE - indeterminate, rachilla	-	-	-	1	-	1	cereal/large grass
Deatched embryo/sprout							
Cereal/ POACEAE - indeterminate detached embryo	2	7	2	10	4	4	cereal/large grass
Cereal/ POACEAE - indeterminate detached coleoptile	1	8	1	1	-	1	cereal/large grass
cf Cereal/ POACEAE - indeterminate, detached sprout	-	-	-	1	-	-	possible cereal/large grass
cf Cereal/ POACEAE - indeterminate, small detached embryo/sprout	-	7	-	2	-	-	possible cereal/large grass
Pulses							
Pisum sativum L.	-	-	-	-	-	-	garden pea
Vicia spp./*Pisum sativum* L.	-	-	-	-	-	-	vetch/garden pea
Tree/shrub							
Corylus avellana L. - nutshell fragments (est. whole nut)	1	-	-	-	-	-	hazel
cf *Corylus avellana* L. - nutshell fragments (est. whole nut)	-	1	-	-	-	-	possible hazel
Sambucus nigra L.	-	-	-	-	-	-	elder
Weed/wild plants							
Ranunculus subgenus RANUNCULUS	-	-	-	-	-	1	buttercup
cf *Urtica dioica* L. - internal structure	-	-	-	-	-	-	possible common nettle
Chenopodium spp./*Atriplex* spp. - internal structure	-	-	-	-	-	-	indeterminate goosefoot/orache
Atriplex spp.	-	-	3 E	1	1	-	orache
Stellaria media L.	1	-	-	-	-	-	common chickweed
CARYOPHYLLACEAE - unidentified, small-seeded	-	-	-	-	-	-	pink family
cf *Fallopia convolvulus* (L.) Á. Löve - highly fragmented, est. whole seed	-	-	-	-	-	-	possible black-bindweed
Polygonum spp.	-	-	-	-	-	-	knotgrass
cf *Polygonum* sp.	-	-	1	-	-	-	possible knotgrass
Polygonum spp./*Rumex* spp./*Carex* spp. - internal structure	-	-	-	-	-	-	knotgrass/dock/sedge
Rumex cf. *acetosella* L.	1	-	-	-	-	-	possible sheep's sorrel
Rumex spp.	-	-	-	1	2	-	dock
cf *Rumex* spp. - small-seeded/immature	-	-	-	-	-	-	possible dock
Vicia cf *hirsuta* (L.) Gray	-	-	-	-	-	-	possible hairy tare
Vicia spp./*Lathyrus* spp.	2	-	5 E	-	-	-	vetch/vetchling
Melilotus spp./*Medicago* spp./*Trifolium* spp.	-	-	-	-	-	3	melilot/medick/clover
Lotus spp./*Melilotus* spp./*Medicago* spp./*Trifolium* spp.	-	-	-	-	-	-	bird's-foot-trefoil/ melilot/medick/clover
FABACEAE - detached hilum (?ancient)	-	-	-	-	-	4?	pea family
cf FABACEAE - immature	1	-	-	-	-	-	possible pea family

APIACEAE - unidentified, small-sized	1	-	-	-	-	-	carrot family
Prunella vulgaris L.	-	-	-	-	-	1	selfheal
LAMIACEAE - small sized	-	-	-	-	-	-	mint family
Plantago major L.	-	-	-	-	1	-	greater plantain
Plantago media L./*lanceolata* L.	-	-	-	-	-	-	hoary/ribwort plantain
Euphrasia spp./*Odontites* spp.	-	-	-	-	-	-	eyebright/bartsia
Galium spp.	1	-	-	-	-	-	bedstraw
cf *Arctium lappa* L.	1	-	-	-	-	-	possible greater burdock
Carduus sp./ *Cirsium* sp.	-	-	-	1	-	-	thistle
Tripleurospermum inodorum L.	1	1	-	-	-	-	scentless mayweed
ASTERACEAE - internal structure, small-sized achene	-	-	-	-	-	-	daisy family
ASTERACEAE - internal structure, medium-sized achene	-	-	-	-	-	-	daisy family
cf *Lolium* sp. - rachis node	-	-	-	-	-	-	possible rye-grass
cf *Poa annua* L.	1	-	-	-	-	10	possible annual meadow-grass
Avena cf *fatua* L. - pedicel fragment	-	-	-	-	-	1	possible wild oat
Avena spp. - awn (semi-quantied fragments)	++	+	+	+	+	++	indeterminate wild/cultivated oat
Avena spp. - floret base	-	-	-	1	-	-	indeterminate wild/cultivated oat
cf *Avena* spp. - floret-base fragment	-	-	-	-	-	-	possible indeterminate wild/ cultivated oat
Avena spp./ *Bromus* spp.	2	-	-	27	5 E	4 E	indeterminate wild/ cultivated oat/ brome grass
Bromus spp.	1	2 E	-	9	-	-	brome grass
cf *Bromus* spp.	-	-	1	-	-	-	possible brome grass
POACEAE - small-sized caryopsis	10	3	1	-	6	21	grass family
POACEAE - medium-sized caryopsis	-	1	-	-	-	1	grass family
POACEAE - large-sized caryopsis	-	-	1	-	-	-	grass family
POACEAE - basal rachis node	1	-	-	-	-	-	grass family
Carex spp. - three sided	-	-	-	-	-	-	sedge
Unidentified	1	2	-	-	3	11	-
Unidentified - seed coat fragment	1	-	2	2	-	-	-
Unidentified - ?bark/ ?leaf, curled fragment	-	-	-	-	-	-	-
Unidentified - bud	1	-	-	-	-	-	-
Unidentified - bud fragments	-	-	-	-	-	-	-
Unidentified - bud scale	1	-	-	-	-	-	-
Unidentified - capsule fragment or pod	-	-	-	-	-	-	-
Unidentified - possible thorn	-	1	-	-	-	-	-
Indeterminate	-	10 E	-	1	-	20	-
Indeterminate - highly vitreous, amorphous	2	-	1	-	-	-	-
Other charred remains							
Fungal body (unquantified)	+++	-	-	-	-	+	
Unidentified - insect larva	-	1	-	-	-	-	

Sample	**2001**	**2024**	**2033**	**2038**	**6018**	**6024**	
Context	**2907**	**2332**	**2375**	**2577**	**6049**	**6462**	
HEAVY RESIDUE							
Cereal grain							
Triticum cf *dicoccum* Schübl. - germinated grain	-	-	-	-	-	-	possible emmer
Triticum spelta L.	-	-	-	-	-	-	spelt
Triticum sp. - indeterminate	-	-	-	-	-	-	indeterminate wheat
Cereal - indeterminate	-	-	-	-	-	-	cereal
Cereal / POACEAE - indeterminate	-	-	-	-	-	-	cereal/large grass
Cereal chaff							
Triticum cf. *spelta* L. - glume base	-	-	-	-	-	-	possible spelt
Tree/shrub							
cf *Corylus avellana* L. - nutshell fragments (est. whole nut)	-	-	-	-	-	-	possible hazel
Weed/wild							
Avena spp./*Bromus* spp.	-	-	-	-	-	-	indeterminate cultivated/wild oat/brome grass
Bromus sp.	-	-	-	-	-	-	brome grass

Sample	**6052**	**6088**	**6089**	**102036**	**2037**	**2002**	
Context	**6252**	**6872**	**7784**	**2448**	**2557**	**2139**	
Context description	**Pit 6252**	**Corn dryer 7782**	**Corn dryer 7782**	**Organic layer**	**Ditch 2555**	**Ditch 2047**	
Site	**Jnct 8N**	**Jnct 8N**	**Jnct 8N**	**Jnct 9**	**Jnct 9**	**Jnct 9**	
Phase	**MR**	**MR**	**MR**	**MR**	**MR-LR**	**LR**	
Sample vol. (l)	**40**	**10**	**10**	**40**	**40**	**30**	
Flot vol. (ml)	**60**	**65**	**70**	**150**	**85**	**100**	
Proportion of sample sorted	**1/16th**	**25%**	**1/8th**	**1/8th**	**1/8th**	**50%**	
Seeds per litre of sediment	**25.4**	**57.5**	**46.4**	**29.6**	**61.4**	131.0	
LATIN BINOMIAL							**ENGLISH COMMON NAME**
FLOT							
Cereal grain							
cf *Hordeum* sp.	-	-	-	-	1	-	possible barley
Triticum cf *dicoccum* Schübl	-	-	-	-	-	-	possible emmer
Triticum dicoccum Schübl./*spelta* L.	-	25	1	-	-	-	indeterminate emmer/spelt
Triticum dicoccum Schübl./*spelta* L. - tail grain	-	1	3	-	-	-	indeterminate emmer/spelt

Triticum spelta L.	1	3	4	-	-	-	spelt
Triticum spp. - indeterminate grain fragments (est. whole grain)	-	-	3	3	5	7	indeterminate wheat
Triticum spp. - indeterminate, germinated grain (est. whole grain)	5	-	1	-	-	-	indeterminate wheat
Triticum spp. - indeterminate tail grain	-	-	-	-	-	-	indeterminate wheat
Cereal - indeterminate	-	37 E	5 E	3 E	40 E	21 E	Cereal
Cereal/POACEAE - indeterminate fragments (est. whole grain/ caryopsis)	15 E	25 E	14 E	10 E	15 E	15 E	cereal/large grass
Cereal/POACEAE - indeterminate (semi-quantified minute fragments)	+++	++++	+++	++	+++	+++	cereal/large grass
Cereal chaff							
Triticum cf *dicoccum* Schübl. - glume base	-	-	-	-	-	-	Possible emmer
Triticum dicoccum Schübl./*spelta* L. - glume fragments (unquantified)	-	-	-	-	-	-	indeterminate emmer/spelt
Triticum dicoccum Schübl./*spelta* L. - glume base	69 E	14 E	108 E	85	200	26	indeterminate emmer/spelt
Triticum dicoccum Schübl./*spelta* L. - spikelet fork (=2gb) **	-	1	-	2	-	3	indeterminate emmer/spelt
Triticum dicoccum Schübl./*spelta* L. - terminal spikelet fork (=2gb) **	-	-	-	-	-	-	indeterminate emmer/spelt
Triticum spelta L. - glume base	13	23	46	14	27	5	spelt
Triticum spelta L. - spikelet fork (= 2 gb)**	-	1	-	-	1	-	spelt
Triticum cf *spelta* L. - glume fragments	++++	-	++	-	+++	-	possible spelt
Triticum cf *spelta* L. - spikelet fork (=2 gb)**	-	-	-	-	-	-	possible spelt
Triticum spp. - rachis nodes (often highly fragmented, estimate whole node)	75 E	27 E	30 E	75 E	100 E	15 E	indeterminate wheat
Triticum spp. - awn (unquantified)	++++	+	++	-	-	+	indeterminate wheat
Cereal - unidentified rachis internode fragment	-	-	-	10 E	25 E	9	cereal
Cereal - unidentified basal rachis node	-	-	1	-	-	-	cereal
Cereal/POACEAE - indeterminate, culm node	-	1	-	-	-	-	cereal/large grass
Cereal/POACEAE - indeterminate, culm base	-	-	-	-	-	-	cereal/large grass
Cereal/POACEAE - indeterminate, rachilla	1	-	-	-	-	-	cereal/large grass
Deatched embryo/sprout							
Cereal/POACEAE - indeterminate detached embryo	-	9	18	2	1	3	cereal/large grass
Cereal/POACEAE - indeterminate detached coleoptile	10	13	1	-	13	3	cereal/large grass
cf Cereal/POACEAE - indeterminate, detached sprout	-	-	-	1	-	-	possible cereal/large grass
cf Cereal/POACEAE - indeterminate, small detached embryo/ sprout	72	1	17	6	5	-	possible cereal/large grass
Pulses							
Pisum sativum L.	-	-	-	-	-	-	garden pea
Vicia spp./ Pisum sativum L.	-	-	-	-	-	-	vetch/garden pea
Tree/shrub							
Corylus avellana L. - nutshell fragments (est. whole nut)	-	-	-	-	-	-	hazel
cf *Corylus avellana* L. - nutshell fragments (est. whole nut)	1	-	-	-	1	-	possible hazel
Sambucus nigra L.	-	-	-	-	-	1	elder
Weed/wild plants							
Ranunculus subgenus RANUNCULUS	-	-	-	-	-	-	buttercup

Sample Context	6052 6252	6088 6872	6089 7784	102036 2448	2037 2557	2002 2139	
cf *Urtica dioica* L. - internal structure	-	-	-	-	-	1	possible common nettle
Chenopodium spp./*Atriplex* spp. - internal structure	-	-	-	-	-	2	indeterminate goosefoot/orache
Atriplex spp.	-	1	-	-	-	2	orache
Stellaria media L.	-	-	-	-	-	1	common chickweed
CARYOPHYLLACEAE - unidentified, small-seeded	-	-	-	-	-	1	pink family
cf *Fallopia convolvulus* (L.) Á. Löve - highly fragmented, est. whole seed	-	-	-	-	-	1	possible black-bindweed
Polygonum spp.	-	-	-	-	-	1	knotgrass
cf *Polygonum* sp.	-	-	-	-	-	-	possible knotgrass
Polygonum spp./*Rumex* spp./*Carex* spp. - internal structure	-	-	1	-	-	1	knotgrass/dock/sedge
Rumex cf *acetosella* L.	-	-	-	-	-	-	possible sheep's sorrel
Rumex spp.	2	-	1	7 E	3 E	-	dock
cf *Rumex* spp. - small seeded/ immature	-	-	-	-	-	1	possible dock
Vicia cf *hirsuta* (L.) Gray	-	-	-	-	-	1	possible hairy tare
Vicia spp./*Lathyrus* spp.	-	3	-	-	-	2	vetch/vetchling
Melilotus spp./*Medicago* spp./*Trifolium* spp.	-	-	-	1	-	-	melilot/medick/clover
Lotus spp./*Melilotus* spp./*Medicago* spp./*Trifolium* spp.	-	-	-	-	1	-	bird's-foot-trefoil/melilot/medick/clover
FABACEAE - detached hilum (?ancient)	-	-	-	-	-	-	pea family
cf FABACEAE - immature	-	-	-	-	-	-	possible pea family
APIACEAE - unidentified, small sized	-	-	1	-	-	-	carrot family
Prunella vulgaris L.	-	-	-	-	-	-	selfheal
LAMIACEAE - small sized	-	1	-	-	-	-	mint family
Plantago major L.	-	-	-	-	-	-	greater plantain
Plantago media L./*lanceolata* L.	-	-	2	-	-	-	hoary/ribwort plantain
Euphrasia spp./*Odontites* spp.	-	-	-	-	-	1	eyebright/bartsia
Galium spp.	-	-	-	-	-	2	bedstraw
cf *Arctium lappa* L.	-	-	-	-	-	-	possible greater burdock
Carduus sp./*Cirsium* sp.	-	-	-	-	-	-	thistle
Tripleurospermum inodorum L.	-	-	-	-	2	1	scentless mayweed
ASTERACEAE - internal structure, small-sized achene	-	1	-	-	1	-	daisy family
ASTERACEAE - internal structure, medium-sized achene	1	-	-	-	-	-	daisy family
cf *Lolium* sp. - rachis node	-	-	-	-	-	1	possible rye-grass
cf *Poa annua* L.	5	-	-	2	2	-	possible annual meadow-grass
Avena cf. *fatua* L. - pedicel fragment	-	-	-	-	-	-	possible wild oat
Avena spp. - awn (semi-quantied fragments)	++	++	++	+	++	++	indeterminate wild/cultivated oat
Avena spp. - floret base	2	-	1	-	1	-	indeterminate wild/cultivated oat
cf *Avena* spp. - floret-base fragment	-	-	-	-	-	1	possible indeterminate wild/cultivated oat
Avena spp./*Bromus* spp.	5 E	3	5 E	1	9	1	indeterminate wild/cultivated oat/brome grass

Bromus spp.	4	1	-	-	3	2	brome grass
cf *Bromus* spp.	-	1	1	-	-	4	possible brome grass
POACEAE - small-sized caryopsis	16	10	40	10	3 E	14	grass family
POACEAE - medium-sized caryopsis	3 E	1	-	2	2	5	grass family
POACEAE - large-sized caryopsis	-	-	-	-	-	2	grass family
POACEAE - basal rachis node	-	-	-	-	-	-	grass family
Carex spp. - three sided	-	1	-	1	-	-	sedge
Unidentified	30 E	1	25	1	15 E	90 E	-
Unidentified - seed coat fragment	-	-	-	-	-	-	-
Unidentified - ?bark/ ?leaf, curled fragment	-	-	1	-	-	1	-
Unidentified - bud	-	-	-	-	-	4	-
Unidentified - bud fragments	-	-	-	-	-	+	-
Unidentified - bud scale	-	-	-	-	-	1	-
Unidentified - capsule fragment or pod	-	-	-	-	-	1	-
Unidentified - possible thorn	-	-	-	1	-	-	-
Indeterminate	30 E	25 E	40 E	-	15 E	5 E	-
Indeterminate - highly vitreous, amorphous			-			4	-
Other charred remains							
Fungal body (unquantified)	-	-	-	+++	-	-	-
Unidentified - insect larva	-	-	-	-	-	1	-
HEAVY RESIDUE							
Cereal grain							
Triticum cf *dicoccum* Schübl. - germinated grain	1	-	-	-	-	-	possible emmer
Triticum spelta L.	-	-	1	-	-	-	spelt
Triticum sp. - indeterminate	5	-	-	-	-	-	indeterminate wheat
Cereal - indeterminate	27 E	-	-	-	-	-	cereal
Cereal/POACEAE - indeterminate	8 E	-	-	-	-	-	cereal/ large grass
Cereal Chaff							
Triticum cf. *spelta* L. - glume base	1	-	-	-	-	-	possible spelt
Tree/ Shrub							
cf *Corylus avellana* L. - nutshell fragments (est. whole nut)	1	-	-	-	-	-	possible hazel
Weed/ Wild							
Avena spp./*Bromus* spp.	2	-	-	-	-	-	indeterminate cultivated/wild
oat/brome grass							
Bromus sp.	1	-	-	-	-	-	brome grass

Table 8.15: Summary statistics for late Iron Age-early Roman/late Roman CPR

Sample	**2001**	**2024**	**2033**	**2038**	**6018**	**6024**	**6052**	**6088**	**6089**	**102036**	**2037**	**2002**
Context	**2907**	**2332**	**2375**	**2577**	**6049**	**6462**	**6252**	**6872**	**7784**	**2448**	**2557**	**2139**
Context description	**Pit**	**Waterhole**	**Pit**	**Ditch**	**Pit**	**Ditch**	**Pit**	**Corn dryer**	**Corn dryer**	**Organic layer**	**Ditch**	**Ditch**
	2906	**2309**	**2374**	**2487**	**6051**	**6460**	**6252**	**7782**	**7782**		**2555**	**2047**
Site	**Jnct 9**	**Jnct 9**	**Jnct 9**	**Jnct 9**	**Jnct 8N**	**Jnct 8N**	**Jnct 8N**	**Jnct 8N**	**Jnct 8N**	**Jnct 9**	**Jnct 9**	**Jnct 9**
Phase	**LIA-ER**	**LIA-ER**	**LIA-ER**	**LIA-ER**	**MR**	**MR**	**MR**	**MR**	**MR**	**MR**	**MR-LR**	**LR**
Sample vol. (l)	**40**	**40**	**40**	**15**	**30**	**40**	**40**	**10**	**10**	**40**	**40**	**30**
Flot vol. (ml)	**40**	**8**	**300**	**325**	**100**	**55**	**60**	**65**	**70**	**150**	**85**	**100**
Proportion of sample sorted	**50.0%**	**100.0%**	**6.25%**	**1.6%**	**25.0%**	**100.0%**	**6.3%**	**25.0%**	**12.5%**	**12.5%**	**12.5%**	**50.0%**
Seeds per litre of sediment	**71.5**	**237.0**	**21.9**	**11.0**	**38.5**	**269.0**	**25.4**	**57.5**	**46.4**	**29.6**	**61.4**	**131.0**
TOTAL COUNT (FLOT)	**143**	**237**	**351**	**704**	**154**	**269**	**360**	**230**	**370**	**237**	**491**	**262**
TOTAL COUNT (HR)	**0**	**0**	**0**	**0**	**0**	**0**	**46**	**0**	**1**	**0**	**0**	**0**
TOTAL COUNT BOTH FLOT & HR	**143**	**237**	**351**	**704**	**154**	**269**	**406**	**230**	**371**	**237**	**491**	**262**
Summary by plant category (for both Flot + HR)												
Cereal grain	34	10	148	73	85	22	62	91	32	16	61	43
Cereal chaff	75	184	185	574	47	165	159	67	185	186	353	58
Detached embryo/sprout	3	22	3	14	4	5	82	23	36	9	19	6
Pulses	0	0	0	0	0	0	0	0	0	0	0	0
Tree/shrub	1	1	0	0	0	0	2	0	0	0	1	1
Weed/wild	24	7	12	40	15	46	41	23	52	24	27	48
Unidentified/indeterminate	6	13	3	3	3	31	60	26	66	2	30	106
RELATIVE PROPORTION (for both Flot + HR)												
Cereal grain	23.8%	4.2%	42.2%	10.4%	***55.2%***	8.2%	15.3%	39.6%	8.6%	6.8%	12.4%	16.4%
Cereal chaff	***52.4%***	***77.6%***	***52.7%***	***81.5%***	30.5%	***61.3%***	39.2%	29.1%	***49.9%***	***78.5%***	***71.9%***	22.1%
Detached embryo/sprout	2.1%	9.3%	0.9%	2.0%	2.6%	1.9%	20.2%	10.0%	9.7%	3.8%	3.9%	2.3%
Pulses	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tree/shrub	0.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.2%	0.4%
Weed/wild	16.8%	3.0%	3.4%	5.7%	9.7%	17.1%	10.1%	10.0%	14.0%	10.1%	5.5%	18.3%
Unidentified/indeterminate	4.2%	5.5%	0.9%	0.4%	1.9%	11.5%	14.8%	11.3%	17.8%	0.8%	6.1%	40.5%†

†The unidentified component of this flot was biased toward the recovery of 90 unidentified fragments of seed coat/internal structure of seed, which possibly are better considered as weed/wild. With this revision, approximately 52% of the plant remains recovered would be weed/wild. However, because there is no certainty what this seed coat may be, it has been scored here as unidentified/indeterminate. Bold italic indicates the dominant plant category (>50% of all identifications) for a sample

Table 8.16: CPR from medieval deposits

Sample	**6017**	**6020**	
Context	**6591**	**6789**	
Context description	**kiln 6585**	**pit 6788**	
Site	**J8N**	**J8N**	
Phase	**MED phase 1 L12-13C**	**MED phase 1 L12 - 13C**	
Sample vol. (l)	**40**	**30**	
Flot vol, (ml)	**75**	**200**	
Proportion of sample sorted	**25%**	**50%**	
Seeds per litre of sediment	***40.7***	***15.4***	
LATIN BINOMIAL			**ENGLISH COMMON NAME**
FLOT			
Cereal grain			
cf *Hordeum* sp.	1	-	possible barley
Secale cereale L./*Triticum* spp.	1	-	indeterminate rye/wheat
Triticum sp. - free-threshing type	79	23	free-threshing-type wheat
Triticum sp. - free-threshing type, tail grain	1	1	free-threshing-type wheat
Cereal - indeterminate	55	8	cereal
Cereal/POACEAE - indeterminate	25 E	8 E	cereal/large grass
Cereal/POACEAE - indeterminate, minute fragments	++++	-	cereal/large grass
Cereal/POACEAE/?FABACEAE - indeterminate, minute fragments	-	++	cereal/large grass
Cereal chaff			
Secale cereale L. - rachis node	3	7	rye
cf *Secale cereale* L. - rachis node	2	8	possible rye
Triticum sp. - indeterminate, free-threshing-type rachis node	37 E	6 E	free-threshing-type wheat
Triticum sp. - indeterminate, rachis node fragments (est. whole rachis node)	12	-	free-threshing-type wheat
Cereal - indeterminate, basal rachis node	5	-	cereal
Cereal - indeterminate rachis internode	5	13	cereal
Cereal/POACEAE - culm node	-	26	cereal/large grass
Cereal/POACEAE - culm base	-	5	cereal/large grass
Detached embryo/sprout			
Cereal/POACEAE - detached embryo	4	1	cereal/large grass
Pulses			
Vicia spp./*Pisum sativum* L.	4 E	-	vetch/garden pea
Tree/shrub			
Crataegus monogyna Jacq.	-	9	hawthorn
Weed/wild Plants			
Chenopodium spp.	1	-	goosefoot
CHENOPODIACEAE/CARYOPHYLLACEAE - internal structure family	1	-	indet. goosefoot family/pink
Montia fontana L.	-	1	blink
CARYOPHYLLACEAE - unidentified, small-sized	-	1	pink family
Polygonum spp./*Rumex* spp./*Carex* spp. - indeterminate, internal structure	1	1	knograss/dock/sedge
Rumex spp.	1	2	dock
cf *Rumex* spp.	-	1	possible dock
Vicia spp./*Lathyrus* spp.	2	1	vetch/vetchling
Lotus spp./*Medicago* spp./*Melilotus* spp./*Trifolium* spp. medick/melilot/clover	1	-	bird's-foot-trefoil/
Euphrasia spp./*Odontites* spp.	-	2	eyebright/bartsia
Galium spp.	1	-	bedstraw

Table 8.16: CPR from medieval deposits – continued

Sample	6017	6020	
Context	6591	6789	
Lapsana communis L.	-	1	nipplewort
Anthemis cotula L.	8 E	-	stinking chamomile
Tripleurospermum inodorum (L.) Sch. Bip.	-	28	scentless mayweed
ASTERACEAE - unidentified, small flower calyx (ribbed)	-	1	daisy family
Avena spp./*Bromus* spp. oat/brome grass	7	-	indet. cultivated/wild
POACEAE - unidentified, small-sized caryopsis	2	39	grass family
Unidentified	30 E	11	-
Unidentified - capsules/seed pod - fragments	4	1	-
Unidentified - four-chambered capsule fragment (? *Ilex aquifolium* capsule top)	1	-	-
Indeterminate	10 E	25 E	-
Indeterminate - congealed, highly fragmented/clinkered (?pulse & cereal frags)	1	-	-
Indeterminate - congealed, high vitreous amorphous object	-	1	-
OTHER REMAINS			
Fungal bodies (unquantified)	-	+++	-

of the cereal ear. Although rarely grown today, hulled wheats do have a number of properties which would have been advantageous to past farmers. In particular they can tolerate poor soil conditions and can resist a range of fungal diseases (Nesbitt and Samuel 1996, 42). During threshing, cereal ears of spelt will break up into individual segments known as spikelets, which contain grains surrounded by tough chaff. At this point the farmer could either store or further process the spikelets of hulled wheat. Storage of hulled wheat in spikelet form is well known archaeobotanically and may serve to protect the grain from insect predation (Nesbitt and Samuel 1996, 52).

The Roman plant remains are primarily dominated by crop-processing by-products (cereal chaff and weed seeds), even when the samples were taken from deposits directly associated with corn dryer 7782. The generally poor preservation and highly fragmented nature of these remains (not just cereal grain, but including chaff and weed/wild seeds) makes speculation on which particular stage in the crop-processing sequence (*sensu stricto* Hillman 1981; 1984; 1991; Jones 1984; 1987; 1996) problematic. Regardless, a pattern of recovering charred cereal by-products is apparent from both the Junction 8N and Junction 9 samples from all Roman phases (Table 8.15 and Fig. 8.1).

One exception to this pattern is middle Roman pit sample 6018 (from pit 6051) where cereal grain dominates (n = 85 or 55.2%). It is notable that the cereal grain group from this sample consists almost entirely of fragmented indeterminate cereal and/or cereal/large-grass caryopses. Indeed, in the case of the latter grouping, minute fragments of indeterminate cereal/large-grass caryopses were particularly

Table 8.17: Summary statistics for medieval samples

Sample	6017	6020
Context	**6591**	**6789**
Context description	**kiln 6585**	**pit 6788**
Site	**JNCT 8**	**JNCT 8**
Phase	**MED phase 1 L12 - 13C**	**MED phase 1 L12 - 13C**
Sample vol. (l)	**40**	**30**
Flot vol. (ml)	**75**	**200**
Proportion of sample sorted	**25.0%**	**50.0%**
Seeds per litre of sediment	**40.7**	**15.4**
TOTAL COUNT	**305**	**231**
Summary by plant category		
Cereal grain	162	40
Cereal chaff	64	65
Detached embryo/sprout	4	1
Pulses	4	0
Tree/shrub	0	9
Weed/wild	25	78
Unidentified/indeterminate	46	38
RELATIVE PROPORTION		
Cereal grain	***53.1%***	17.3%
Cereal chaff	21.0%	28.1%
Detached embryo/sprout	1.3%	0.4%
Pulses	1.3%	0.0%
Tree/shrub	0.0%	3.9%
Weed/wild	8.2%	33.8%
Unidentified/indeterminate	15.1%	16.5%

Bold italic indicates the dominant plant category (>50% of all identifications) for a sample abundant, and they are frequently observed in nearly all of the Roman-period samples. Whether the fragmented grain and/or cereal/large-grass caryopses reflect poor preservation or mechanical damage during excavation and/or processing, or are representative of the conditions of deposition, is not clear.

It is likely that at these M1 sites spelt was stored in a partially threshed state, with the spelt grain still encased within its spikelet (individual segments of the cereal ear, with two grains contained within their surrounding chaff). Spelt stored in this way would then need to be processed (most likely by pounding the spikelets) producing spelt grain (the product) and a by-product of spelt glume bases, intact spikelets and any accompanying weeds of crop (eg Nesbitt and Samuel 1996). There are a number of uses for such by-products (eg Hillman 1984), many of which would not include charring and therefore are unlikely to be detected archaeobotanically. However, it is also possible to use such material as fuel and this would be one of the easiest means of disposing of unwanted cereal crop-processing by-products and may also have advantages for cereal parching/malting, since cereal chaff fuels would have a taste-neutral impact on parched or malted grain (eg Hillman 1982, 138). Subsequently, when the firing chambers of kilns/ovens were raked out, the spent fuel could be disposed of, if the ash was not of use. In this case, disposal appears to have taken the form of dumping into features such as pits and ditches.

In general, there appears to be a pattern where CPR recovered from what are deemed secondary contexts (eg ditches and pits; n = 8 samples), but possibly also the waterhole and 'organic layer' samples (Table 8.15 and Fig. 8.1), produce samples that are either dominated by cereal chaff remains (primarily of spelt *Triticum spelta* L. and/or indeterminate wheat (*Triticum* spp.) rachis node fragments) or are composed of fairly even mixtures of cereal grain, cereal chaff and any accompanying weed seeds. In addition, the samples from the corn dryer (most likely a primary context) have a substantial cereal chaff component (n = 185 or 49.9% for sample 6089 and n = 67 or 39.2% for sample 6088), although clearly occurring in mixtures with cereal grain and weed seeds. This pattern suggests that the late Iron Age-early Roman/late Roman inhabitants of settlements centred on Junction 8N and Junction 9 were using crop-processing by-products as fuel. Given the recovery of similar remains from both corn dryer samples (samples 6088 and 6089), it seems likely that the cereal crop-processing by-products were regularly used as fuel, most likely in the corn dryer(s) on site.

Weed/wild plants in the Roman samples

The weed/wild flora is generally fairly limited, in all cases <20% of an assemblage was categorised as weed/wild plants and in many cases this component was 10% or less of the assemblage. With the exception of brome grasses (*Bromus* spp.) and indeterminate cultivated/wild oat (*Avena* spp.) which is discussed separately below, most of the weed/wild plant remains are consistently dominated by limited number of taxa. The samples frequently include goosefoot and/or orache (*Chenopodium* spp./*Atriplex* spp.; n = 5 samples) and dock (*Rumex* cf. *acetosella* L./*Rumex* spp.; n = 7 samples), but almost always include small-sized grass caryopses (n = 13 samples). Where preservation is good to excellent, several of these small-sized caryopses have been securely identified as annual meadow-grass (*Poa annua* L.) type on the basis of the cell pattern, size and shape of the caryopsis and in comparison with modern comparative specimens. The inclusion of such small-sized weed seeds (*c* 1.6 x 0.6mm; information from Cappers *et al*. 2006) suggests that these may have arrived with the spelt still within the seed head (technically a panicle).

Oat and brome: a tolerated impurity or a crop in its own right?

Indeterminate cultivated/wild oat (*Avena* spp.) and brome grass (*Bromus* spp. – also known as 'chess' or 'rye brome', although specifically this refers to *Bromus secalinus* L.) and variously indistinguishable oat/brome (*Avena* spp./*Bromus* spp.) caryopses were recovered from all 14 Roman-period M1 samples. Both oat and brome grass can in fact be crops in their own right or, at the very least, a tolerated impurity which is of similar size to cereal grain, does not adversely affect the taste of the cereal-based product and, possibly more relevantly, is difficult to fully remove from cereal grain (eg Campbell 2000, 48; de Moulins 2006, 69-71). At present both brome and the indeterminate wild/cultivated oat are classified as a weed/wild plants primarily because it cannot be assumed that they were actually cultivated intentionally; however, given their relative abundance in some samples (eg n = 36 out of 40 weed/wild identifications in sample 2038) perhaps they should be considered as a crop in their own right, even if not necessarily for human consumption. Certainly, Campbell (2000, 50) has speculated that brome was cultivated for fodder at early Iron Age Danebury (and environs) and was then replaced by oat in the late Iron Age. At the M1 sites, when identifications could be made to species level, oat (*Avena* spp.) was more frequently identified. Whether the generally low level of oat/brome in these samples indicates a tolerated contaminant, a relict from a previous crop or separate crops inadvertently mixed in storage, remains unclear.

Comparison of Roman M1 assemblages with other Hertfordshire Roman assemblages

Charred assemblages of Roman date are relatively scarce in Hertfordshire (English Heritage 2004).

Two sites have produced results that are not directly comparable. At St Albans, a report by Lambert and Godwin (nd) on plant macrofossils from a high-status 1st-century AD cremation burial remains unpublished and a small assemblage of mineralised plant remains (believed to be from cess) has been reported from Folly Lane (Murphy and Fryer 1999).

Two other sites in Hertfordshire, however, have assemblages which are more directly comparable to the M1 Roman CPR assemblage. An assemblage of charred cereal grain, with no chaff and very few contaminants was studied from a 3rd-4th century AD (dating based on van der Veen 1989) corn dryer stokehole at Foxholes Farm by Monk (1989). The assemblages were relatively small with both emmer (*Triticum dicoccum* Schübl.) and spelt (*Triticum spelta* L.) grain identified. Analysis of samples from a corn dryer and a well from Boxfield Farm, Chells, Stevenage (Murphy 1999), has produced results remarkably consistent with those generated from the M1 samples. Most notably, the Boxfield Farm assemblages are strongly dominated by spelt (*Triticum spelta* L.) and Murphy (ibid., 137, 142) interprets the abundant remains of spelt glume bases/spikelet forks recovered from the corn dryer as evidence for the use of cereal-processing waste mixed with wood fuel for grain parching/malting. As in the M1 Roman CPR assemblages, emmer wheat was not identified in the Boxfield Farm assemblages. A charred assemblage associated with a well (Well CAB) was also recovered at Boxfield Farm, and included spelt chaff, as well as culm fragments of grasses and/or cereals, which Murphy (ibid., 142) interpreted as 'cereal processing and spoilt hay, burnt as refuse' subsequently redeposited into the well, possibly after it fell out of use. Although it would be tempting to view the charred spelt remains from Well CAB as spent fuel, other possibilities are plausible as Murphy (ibid.) rightly points out.

Medieval CPR

Medieval assemblages from Hertfordshire are limited (eg English Heritage 2004[1]) and are primarily from waterlogged deposits from major towns (eg Hertford; Robinson 1977) or villages (eg King's Langley; Paradine 1977). CPR from 2l samples from an oven, believed to be of similar date to the Junction 8N samples (12th-13th century), were analysed from Abbey Mill, St Albans (Murphy 1993). Unfortunately, most of the cereal grain recovered could not be securely identified to species and the weed/wild plants were much more diverse. The M1 samples only produced small quantities of vetch/vetchling (*Vicia* spp./*Lathyrus* spp.), whereas the Abbey Mill medieval oven produced a wider range of taxa, with stinking chamomile (= stinking mayweed; *Anthemis cotula* L.) and goosefoot/fat hen (*Chenopodium* spp.) frequently observed.

Conclusions

Late Iron Age-early Roman/late Roman CPR assemblages from Junction 8N and Junction 9 have produced assemblages dominated by spelt (*Triticum spelta* L.), suggesting that at least in this area of Hertfordshire spelt was cultivated throughout the entirety of the Roman period. Only one assemblage was dominated by cereal grain, eight were clearly dominated by cereal chaff remains and the remainder contained mixtures of varying proportions of cereal grain, cereal chaff and accompanying weeds of crop. It is notable that two corn dryer deposits had different compositions with one sample dominated by cereal chaff (sample 6089; n = 185 or 49.9%), whilst the other comprised a mixture of cereal grain (sample 6088; n = 91 or 39.6%), cereal chaff (n = 67 or 29.1%) and weed/wild plants (n = 23 or 10.1%). It is proposed that these remains indicate the regular use of spelt crop-processing by-products as fuel (possibly with the inclusion of accidentally charred grain) and, indeed, this also appears to be the case for a series of samples studied from a corn dryer at Boxfield Farm, Chells (Murphy 1999).

The two 12th-13th-century samples are dominated by remains of free-threshing-type wheat (*Triticum* spp.), but some evidence for rye (*Secale cereale* L.) is also present. Like the Roman samples, these assemblages are mixtures of cereal grain, cereal chaff and weed/wild plants. The only other published medieval assemblage of this date is from a kiln at Abbey Mill, St Albans (Murphy 1993).

THE WOOD CHARCOAL *by Denise Druce*

Introduction

Following the assessment of over 100 samples by Challinor (2008), 15 samples were selected for further charcoal analysis. The selected samples came from a number of different feature types, including pits, ditches, a hearth and a kiln, plus four from cremation burials. The material ranged in date from the Neolithic to the medieval period. The samples were selected for full analysis to determine the taxonomic composition of the material in order to provide information about the selection of wood fuels, and to see if there were possible changes in wood taxa available or selected over time.

Methodology

The samples were processed using a modified Siraf flotation machine, the flots being collected onto a 250μm mesh, air-dried, and sub-sampled where necessary. Analysis of the samples followed standard procedure where *c* 100 fragments >2mm in size were extracted and identified. The charcoal was initially sorted into groups based on the features visible in transverse section using a Leica MZ6 binocular microscope at up to x40 magnification. Representative fragments of each group were then fractured to reveal both radial and tangential sections, which were examined under a Meiji incident-light microscope at up to x400 magnification. Identifications were made with reference to Schweingruber (1990), Hather (2000), and modern reference material.

Results

The results of the analysis by fragment count are shown in Tables 8.18-20. Eleven taxa were positively identified, including six to species level. The results are discussed chronologically. The taxonomic level of identification varied according to the observed genera/family and/or the state of preservation. In many cases the fragments could only be taken to an approximate level of identification (ie to family level) as some of the key diagnostic features that are needed to distinguish the species were not observed. In other cases, the level of identifications was limited due to the similarities of species within a family or subgroup, such as Maloideae (referred to as hawthorn-type in the text), which could be hawthorn, apple, pear or one of the whitebeams, as charcoal from these cannot be separated anatomically. In general, the

Table 8.18: Charcoal analyses. Neolithic, Bronze Age and late Bronze Age-early Iron Age samples. Numbers given are actual counts. h = heartwood present, s = sapwood present, r = roundwood present

Date		**Neolithic**	**MBA**	**LBA-EIA**	**LBA-EIA**	**LBA-EIA**
Feature type		**Cremation**	**Cremation (unurned)**	**Cremation Pit**	**Pit**	**Pit**
Sample number		**2053**	**2052**	**117**	**2080**	**119**
Context number		**5082**	**5067**	**117909**	**5423**	**119711**
Cut/feature number	**5081**	**5066**	**117908**	**5422**	**119712**	
Location		**Jnct 8S**	**Jnct 8S**	**Jnct 8S**	**Jnct 8S**	**Jnct 8S**
% >2mm flot identified		**100%**	**50%**	**6.25%**	**25%**	**12.5%**
Corylus avellana	hazel	1	1	11		
Fagus sylvatica	beech	1			179	
Maloideae	hawthorn, apple, pear etc	3		35r		
cf *Prunus avium*	wild cherry			2		
Prunus spinosa	blackthorn	1				
Quercus sp.	oak	31h	207h	64h	1	137h
Indeterminate		3	3	9	7	1
Total		**40**	**211**	**121**	**187**	**138**

Table 8.19: Charcoal analyses. Late Iron Age-early Roman and mid-Roman samples. Numbers given are actual counts. h = heartwood present, s = sapwood present, r = roundwood present

Date		**LIA/ER**	**LIA-ER**	**LIA-ER**	**MR**	**MR**	**MR**
Feature type		**Beam-slot**	**Ditch**	**Kiln**	**Cremation (urned)**	**Hearth**	**Hearth**
Sample number		**103**	**102037**	**2042**	**6008**	**6021**	**6084**
Context number		**112217**	**2725**	**2721**	**6292**	**6753**	**7366**
Cut/feature number		**112215/7229**	**2644**	**2638**	**6289**	**6752**	**7365**
Location		**Jnct 8N**	**Jnct 9**	**Jnct 9**	**Jnct 8N**	**Jnct 8N**	**Jnct 8N**
% >2mm flot identified		**6.25%**	**25%**	**0.4%**	**100%**	**3.125%**	**1.562%**
Corylus avellana	hazel			12			
Alnus/Corylus	alder/hazel	1		1			
Fagus sylvatica	beech				1		
Fraxinus excelsior	ash	79r					
Maloideae	hawthorn, apple, pear etc		1r	9	2r		
Quercus sp.	oak	14h/r	267r	121r	63h	193h/r	221h
Salicaceae	willow/poplar		1				
cf Salicaceae			2				
Ulex sp./*Cytisus scoparius*	gorse/broom	3					
Indeterminate		21	8	4	4	6	1
Total		118	279	147	70	199	222

Table 8.20: Charcoal analyses. Late Roman and medieval samples. Numbers given are actual counts. h = heartwood present, s = sapwood present, r = roundwood present

Phase		**LR**	**MED Phase 1 (L12-13C)**	**MED Phase 2 (L12-13C)**
Feature type		**Ditch**	**Kiln/oven**	**Pit**
Sample number		**2002**	**6017**	**6014**
Context number		**2139**	**6591**	**6408**
Cut/feature number		**2047**	**6585**	**6406**
Location		**Jnct 9**	**Jnct 8, north**	**Jnct 8, north**
% >2mm flot identified		**25%**	**50%**	**12.5%**
Acer campestre	field maple	2		
Corylus avellana	hazel	5r	2r	
Alnus/Corylus	alder/hazel	18		
Fagus sylvatica	beech		83r	169r
Fraxinus excelsior	ash	20r		1
Maloideae	hawthorn, apple, pear etc	16r	4r	
Prunus avium	wild cherry	11		
Prunus spinosa	blackthorn	3		
Prunus sp.	blackthorn/wild cherry			2r
Quercus sp.	oak	30r	1	20h
Salicaceae	willow/poplar			2
Ulex sp./*Cytisus scoparius*	gorse/broom			1
cf *Ulex/Cytisus*				3
Indeterminate		11	10	5
Total		116	100	203

preservation was good. The fragments categorised as indeterminate came either from distorted wood, from very small roundwood, or were highly vitrified.

Neolithic

The charcoal assemblage from the Neolithic pit (context 5082) was radiocarbon dated (NZA-32714) to 3800-3640 cal BC (95.4% confidence; or 3760-3650 cal BC, 68.2% confidence), though relatively small (only 40 fragments >2mm in size), was dominated by oak heartwood (*Quercus* sp.) with a few fragments of hawthorn-type (Maloideae) and other short-lived species such as hazel *(Corylus avellana*) and blackthorn (*Prunus spinosa*). A single fragment of beech (*Fagus sylvatica*) charcoal was also identified, which, if contemporary with the feature, is an early record for beech. Beech pollen has been recorded in the south-east of England in deposits as early as the middle Neolithic (Birks 1989; Rackham 2003), but records for it are still quite patchy. More importantly, one of the earliest identifications of beech charcoal comes from Hazelton North, Gloucestershire, which was dated to the early Neolithic. Beech charcoal has been found from later Neolithic deposits at Abingdon, Oxfordshire and Mount Pleasant in Dorset (Smith 2002).

Bronze Age

The charcoal from the middle Bronze Age unurned cremation burial (context 5067), radiocarbon dated (NZA-32713) to 1370-1090 cal BC (95.4% confidence; or 1260-1130 cal BC, 68.2% confidence), was dominated by oak heartwood with a single fragment of hazel. The material is consistent with other evidence from Bronze Age cremation features discovered to date. Oak charcoal was the dominant wood fuel used in Bronze Age cremations at Pepperhill/Cobham (Challinor forthcoming), Dartford (Druce 2011), and at Barrow Hills and Gravelly Guy, Oxfordshire (Thompson 1999; Gale 2004). There is increasing evidence to suggest that wood was being specifically selected for pyre construction during the Bronze Age period. The existing studies suggest that the presence of a single species, such as oak, may indicate the selection of a single tree or shrub for the bulk of the pyre construction (Thompson 1999), which itself may have been related to the status, sex or age of the body (Gale 2007).

Late Bronze Age-early Iron Age

The assemblage from the late Bronze Age-early Iron Age cremation pit 117908 (fill 117909) was quite mixed and although dominated by oak and hawthorn-type contained several fragments of hazel and wild/bird cherry (*Prunus avium/padus*). The identification of the latter is potentially significant as bird cherry tends to be restricted to northern England and Wales (Hather 2000) and until recently wild cherry was thought to be a Roman introduction; although there are now enough prehistoric finds of its wood and stones to dispel this theory (Rackham 2003).

The charcoal assemblage is clearly quite different to the middle Bronze Age cremation deposit, and may indicate less stringent species selection or a differing approach to the cremation process. Again, this could have been based on the status, sex or age of the body, or may just reflect a temporal change. It is interesting to note that the second dominant wood species in the assemblage is hawthorn-type (which includes hawthorn, apple, pear or whitebeam), and although its presence is less common, it has been associated with other Bronze Age cremation deposits in southern England (Challinor forthcoming). Challinor (2007) suggests that hawthorn wood, though quite dense, would not have been the ideal choice for the pyre structure and that it was more likely to have been used for fuel; its abundance in this context would most certainly correlate with this. It has also been suggested that apple or pear wood, which is included in this type, may have been selected for its pleasant aroma when burnt (ibid.).

The late Bronze Age-early Iron Age pit 5422 (fill 5423), was overwhelmingly dominated by beech charcoal, with a single fragment of oak. The burning efficiency of seasoned beech wood has already been highlighted (see above), and although there is no direct evidence of industrial activity associated with the pit, it is possible that the material represents some sort of industrial debris.

The other late Bronze Age-early Iron Age assemblage, from pit 119712 (fill 119711), which formed part of a pit scatter, consisted exclusively of oak. The material may, again, be derived from 'industrial' or non-domestic activity, but this interpretation must remain tentative given the lack of other evidence.

Late Iron Age-early Roman

The sample from the late Iron Age-early Roman possible beam-slot (context 112217) was the only sample dominated by ash (*Fraxinus excelsior*) charcoal, including ash roundwood. The sample also contained frequent oak charcoal fragments and one fragment of alder/hazel (*Alnus glutinosa*/*Corylus avellana*). It was also the only prehistoric/Roman sample to contain fragments of gorse/broom (*Ulex* sp/*Cytisus scoparius*). The dominance of ash from this feature is interesting, as, after oak, ash was the preferred timber tree (Rackham 2003). However, if the charcoal is the remains of burnt timber then it is hard to explain the presence of roundwood.

The other recorded fragments may represent residual material, or burnt domestic debris, fallen into the void left by the beam. This may be supported by the unique presence of gorse/broom in this context, which is commonly used as fodder or as brushwood (Edlin 1949). Its presence indicates that heathland had developed in parts of the surrounding area by the late Iron Age-early Roman period, which is broadly consistent with evidence from other sites in the south-east such as Dartford (Druce 2011) and Pepperhill/Cobham, Kent (Challinor forthcoming).

The late Iron Age-early Roman ditch fill (context 2725) was overwhelmingly dominated by oak charcoal, but the observed lack of tyloses on the wood may suggest that the material came from either immature wood or branchwood. The assemblage taken from the late Iron Age-early Roman kiln (2721), which cut the ditch, contained a very similar assemblage of immature oak/oak sapwood. It is certainly possible that oak wood was specifically selected for firing the kiln. It is also possible that the ditch assemblage represents the waste material generated by the same or similar activity. The abundance of immature oak wood or oak sapwood in the samples is interesting and may reflect the use of branch wood rather than trunk wood. If this was the case, it is possible that the material represents the waste or off-cuts generated from another activity such as construction. Both samples contained some short-lived species, including willow/poplar, hawthorn-type and, in the case of the kiln, hazel. It is possible that these fragments are incidental and represent general debris or that they represent the remains of kindling.

Middle Roman

The three mid-Roman samples from Junction 8N were all dominated by oak charcoal; the two hearth contexts (6753 and 7366) contained no other wood species, however, the urned cremation fill (6292) contained two fragments of hawthorn-type (Maloideae) roundwood and one fragment of beech. Tyloses were observed on some of the fragments in all three of the samples, which suggests that at least some of the wood came from mature trees.

There is no direct evidence of industrial activity associated with the hearths and if they served purely a domestic function the presence of mature oak wood suggests that there was very little pressure on local oak woodland resources in the area during the Roman period. A similar picture is emerging from the south-east in general, where the overall dominance of mature oak in many Roman samples, such as those from Stansted/Braintree (Challinor 2007), Pepper Hill (Challinor 2006) and Dartford (Druce 2011), may indicate a plentiful supply of mature oak woodland.

The oak-dominated cremation burial deposit is in keeping with many other Roman cremation burial assemblages from the London area (Robinson 1996; Challinor 2006; 2011), and the south-east generally (Challinor 2007), where a single species, usually oak or ash, is used for the pyre. The presence of a few fragments of short-lived wood is also common and may represent the remains of kindling or fuel wood.

Late Roman

The assemblage from the fill (context 2139 in cut 2047) of late Roman ditch 2490 at Junction 9 was, like that from the medieval rubbish pit (see below), much more mixed than those from earlier periods. It contained a relatively diverse range of taxa including abundant oak, ash, hawthorn-type and alder/hazel (including five positively identified hazel fragments). The sample also contained a number of wild cherry fragments, a few blackthorn-type fragments and was the only sample from the site containing field maple (*Acer campestre*). This sample contained abundant CPR, which suggests that at least some of the charcoal may represent crop-processing or cooking debris (Challinor 2008).

The assemblage was notable for its abundant roundwood, and, like the assemblage from the medieval rubbish pit is likely to represent the debris generated from a number of domestic activities. The material was probably gathered from nearby, easily accessible, resources and may be representative of the surrounding landscape during this period, which appears to have supported oak, ash and hazel woodland, and hawthorn-/blackthorn-type and field maple. Ash trees often develop as secondary woodland in areas that were once cleared. Hawthorn, blackthorn and field maple are commonly found at woodland margins or form part of hedgerows. The charcoal evidence indicates a formerly cleared and, probably, well-managed landscape containing woodland and hedgerows.

Medieval

The sample taken from the medieval kiln/oven (context 6591) contained mainly beech charcoal, a single fragment of oak, and a few fragments of hazel and hawthorn-type roundwood. The excellent burning properties of seasoned beech have already been mentioned (see above), and beech is likely to have been specifically chosen to provide the sustained heat required to fire the kiln. Although beech is recorded in earlier features (as evidenced from this and other sites), there is an increasing body of evidence to suggest that it became more commonly used during the medieval period in southern England (see summary tables in Smith 2002; Challinor forthcoming; Druce 2011). This shift may have been as a consequence of pressure on other local woodland resources such as oak (Challinor forthcoming) and/or changes in the nature of the wooded environment due to decades of woodland management.

Although the sample from the medieval pit (context 6408) was also dominated by beech, it generally contained a much more mixed assemblage (six species/types). As well as beech, it contained abundant oak, a single fragment of ash, and several fragments of gorse/broom, willow/poplar (Salicaceae) and blackthorn type (*Prunus* sp). The pit is one of several surrounding a post-built structure and has been interpreted as a rubbish pit. The charcoal evidence tends to corroborate this, the diverse assemblage being likely to have originated from a number of different activities.

Conclusion

The charcoal assemblages from the prehistoric and mid-Roman cremation burial features were dominated by a single taxon, which is consistent with other Bronze Age and Roman cremation assemblages, and may represent the selection of a single tree, in this case oak, for pyre construction. The assemblage from the late Bronze Age-early Iron Age cremation pit was dominated by oak and hawthorn-type and may represent the remains of both pyre and fuel wood.

The charcoal assemblages from many of the other, non-cremation, features from all periods of the site were also dominated by a single taxon of either oak or beech. The material may represent the debris associated with some sort of industrial use, as is the case for the medieval kiln, as both oak and seasoned beech burn particularly well, and would have provided the sustained heat required. However, this interpretation must remain tentative given the lack of other supporting evidence.

The dominance of ash in the late Iron Age-early Roman beam-slot is potentially quite interesting in that this was the only feature in which ash formed the bulk of the assemblage, and may represent the remains of the timber. The other material from the beam-slot, however, is likely to represent the debris generated from a range of different activities associated with the structure. The presence of gorse/broom in this context is consistent with other charcoal evidence from the south-east, and indicates the development of areas of heathland by the late Iron Age-early Roman period.

Although the pollen and charcoal evidence for beech points to its presence in the south-east by the middle Neolithic, its history and spread in Britain are still relatively poorly understood. There are very few prehistoric charcoal assemblages dominated by beech, therefore the evidence significantly adds to the existing datasets and suggests that it was locally available in the area, possibly from the Neolithic period and most certainly from the Bronze Age.

THE CREMATED HUMAN BONE *by Nicholas Márquez-Grant*

Introduction

Cremated remains came from two contexts of possible late Bronze Age-early Iron Age date at Junction 8S, from single late Iron Age-early Roman deposits at Junction 9 and Area M, and from two early Roman burials (represented by four contexts) at Junction 8N.

Methods

All the cremation burials were examined. Table 8.21 presents the contexts that were examined in this study, alongside other observations.

Table 8.21: Summary of cremated human bone

Context	*Site*	*Context type*	*Period*	*Weight of human bone (g)*	*Observations*
2013	Junction 9	Fill of 2012	LIA-ERB	7.5	-
3040	Area M	Ditch 3036	MIA-LIA	1	-
5067	Junction 8S	Fill of 5066	LBA	56	-
5243	Junction 8S	?stakehole	Unphased	15	-
6291	Junction 8N	Fill of 6289	ERB-MRB	223	contents of cremation urn SF 6051
6292	Junction 8N	Fill of 6289	ERB-MRB	17	?part of above
6295	Junction 8N	Fill of 6293	ERB-MRB	233	associated with cremation urn SF 6054
6298	Junction 8N	Fill of 6289	ERB-MRB	10	?associated with ancillary vessel SF 6052

The aim was to ascertain the minimum number of individuals (MNI) represented by the cremated bone sample, the demographic profile of those individuals and any information regarding lifestyle as suggested by pathological lesions, and other osteological indicators, as well as to identify evidence relation to the cremation process.

In accordance with recommended practice (McKinley and Roberts 1993), samples were wet sieved and sorted into >10mm, >4mm and >2mm size categories. The sorted bone and the residues were then examined. Osteological analysis was undertaken by following the recommendations set out by McKinley (2004) and using standard methodologies for ageing and sexing etc. Detailed records for each deposit are contained in the project archive.

Material smaller than 4mm was not sorted and analysis at this level only focused on the general colour and bone elements represented. Any identifiable fragments such as dental crowns, hand and foot bones and other fragments that may provide additional useful data such as the MNI count and age determination were also noted. All data were recorded on OA laboratory recording sheets for cremation deposits.

Results

Weight and skeletal part representation

The deposits ranged in weight from 1-233g (Table 8.22). The most-represented bone fragment on the basis of weight (obviously there is more bone in a femur than in a radius) is the lower limb, followed by skull fragments and upper-limb bones. The axial skeleton is also represented.

The fragments from the skull were mainly from the frontal, parietal and occipital bones. No temporal bones were identified. Some skull fragments revealed the coronal, sagittal ad lambdoid sutures. Very few skeletal landmarks were identified in the bones, with only the surpraorbital margins present in some deposits (contexts 6291 and 6295). Facial bones, such as the maxilla were rarely present (only in context 6295). A right zygomatic (context 6295) was recovered. The mandible was also poorly represented. Few parts were present and these were mainly parts of the body with alveoli (again from context 6295). Some dental roots were recovered and did provide some data on the age of the individual. In addition, contexts 6291 and 6295 included some dental fragments representing at least one tooth in each context.

Vertebrae and ribs were incomplete, very fragmented and also poorly represented. Most remains belonged to pedicles and bodies of vertebrae and shafts of ribs. No atlas or axis vertebrae were identified.

Shoulder as well as the pelvic girdle was poorly represented. Some body portions of the scapula and some clavicle shaft fragments (in context 6291) represented the shoulder girdle. With regard to the pelvis, no sciatic notch, no acetabulum and no pubis were identified, and neither was the sacrum, there-

Table 8.22: Summary of weights for each of the human cremated bone deposits

	Context number								*Total*
	2013	*3040*	*5067*	*5243*	*6291*	*6292*	*6295*	*6298*	
Skull	0	0	7	0.5	53	2	19	0	81.5
Axial	0	0	2	0	7	0.5	13	0	22.5
Upper limbs	3	1	5	0.5	28	0	39	3	79.5
Lower limbs	4	0	10	7	24	10	75	5	135
Long bone (unidentified)	0	0	9	6	5	2	14	2	38
Unidentified	0.5	0	23	1	25	3	73	0	125.5
TOTAL (g)	7.5	1	56	15	223	17	233	10	562.5

fore most of these fragments were from the body of the ilium.

All the major long bones in the skeleton, including the humerus, radius, ulna, femur, tibia and fibula, were clearly identified. Many of the epiphyses were missing post-mortem, but there were two portions of the distal epiphysis of a humerus (context 5067) and a portion of articular surface probably belonging to a proximal radius (context 6295).

Hand bones were identified in a number of deposits. A possible carpal bone (lunate?) was found in context 6295. Metacarpal shafts were identified in contexts 6291 and 6295, while a portion of a metacarpal head was identified in context 5067. Portions of proximal hand phalanges (shaft and head portions) were also found in these three latter contexts. Amongst the foot bones, only metatarsal shafts were represented, these coming from contexts 6291 and 6295.

Many fragments (22.3%) could not be identified. These came largely from the sorted 4-2mm-sieve size, and were largely long-bone fragments. Other common unidentified fragments were portions of trabecular bone.

The largest fragment measured 29.5mm (a humerus shaft from context 3040), followed by a tibia shaft from context 6291, measuring 28.4mm.

MNI, sex and age determination

None of the deposits included the remains of more than one individual. The material from 6291, 6292 and 6298 is consistent with derivation from a single (adult) individual. On this basis, the remains derive from a minimum of six individuals, four of whom are likely to be adults (>18 years of age) on the basis of bone dimensions and the texture of the skull and long-bone fragments. Unfortunately, no epiphyses were preserved to appreciate fusion of the epiphyses with the shaft and also no third molars were available to confirm the adult age (>18 years) of the individuals. With regard to cranial suture closure, although in context 6291 enough fragments with sagittal and lambdoid sutures appeared to be open, this is insufficient to indicate this was a young adult. Two individuals (3040, and 5243) could not be aged, although the dimensions of the bones suggest that they are older than a child.

Although maxillary and mandibular fragments from context (6295) preserved a total of five alveoli, indicating that the teeth were lost post-mortem, tentatively this may indicate that the individual was probably not a person of old age (>46 years) when he or she died, since considerable tooth loss may be regarded as an indicator of old age. No sex could be attributed to the adult skeletons as diagnostic bones were absent.

Non-metric traits

Only one non-metric trait, the supraorbital foramen, could be scored for presence or absence. The left supraorbital margin found in deposit 6291 presented a supraorbital foramen.

Palaeopathology

Most of the recovered fragments could not be observed for pathological changes. There was no evidence for ante mortem tooth loss (in five dental sockets from 6295).

Fragmentation

Fragments between 4mm and 10mm in length were the most frequent, with the exception of context 3040 where only one fragment was recovered (Table 8.23). This was in fact the longest shaft fragment, measuring 29.5mm, and was probably part of a humerus. This was followed by fragments from contexts 6291 and 6295 with maximum fragments measuring 28.4mm (humerus) and 23.1mm (tibia) respectively.

[Table 8.23]

Colour

Most of the cremated bone was white in all contexts, or predominantly white, with hues of blue/grey in contexts 3040, 5243 and 6295. There were no fragments in darker colours such as deep blue, brown or black. Thus, for the assemblage complete or intense combustion of all the organic component of the bone had taken place. This generally occurs at temperatures above 700ºC (Holden *et al*. 1995).

Table 8.23: Percentage of human bone fragments larger than 10mm, between 10mm and 4mm, and smaller than 4mm

	Context number							
	2013	*3040*	*5243*	*5067*	*6291*	*6292*	*6295*	*6298*
>10mm	0g (0)	1g (100)	0g (0)	0g (0)	29g (13.0)	0g (0)	8g (3.4)	0g (0)
10-4mm	7.5g (100)	0g (0)	15g (100)	56g (100)	113g (50.6)	17g (100)	184g (78.9)	10g (100)
<4mm	0g (0)	0g (0)	0g (0)	0g (0)	81g (36.3)	0g (0)	41g (17.5)	0g (0)
TOTAL (g)	7.5	1	15	56	223	17	233	10

Discussion

Overall, there was no clear pattern of under representation of skeletal elements, although truncation was a factor affecting most if not all of the deposits examined. Unsurprisingly, therefore, bone weights were low, the largest individual deposit (6295) weighing 233g and the three contexts from burial 6289 producing a combined total of 250g of cremated bone. The weight of bone of an adult cremation from modern crematoria ranges from about 1000 to 3600g (McKinley 2000, 404), therefore none of these contexts can be considered as fully recovered or presenting most of the individual. In some cases, it is possible that only 'token' deposits had been buried, but generally the effects of truncation make it impossible to judge the extent to which this practice may have been observed. It is very doubtful that the tiny amount of material from Area M indicates the original presence of a burial in this context.

Bone fragments were usually not large, with only a few deposits having fragments larger than 10mm. Amongst the factors that affect fragmentation are the cremation itself, collection and burial of the human remains, deliberate fragmentation by the mourners or grave diggers, taphonomic factors (for example, soil characteristics and ploughing) and the much later process of archaeological excavation, and post-excavation processing (McKinley 1994). It is possible that cremated bone was fragmented deliberately in order to fit it into its urn. This may have been the case for some of the recovered cremations.

Further information on the funerary rite is limited, due to the truncation affecting the material and the limited sample size. However, the clear fissuring of some of the larger bone fragments suggests that the bodies were cremated while fleshed. Little warping, which is also a typical pattern observed in cremated bone that was fleshed when burning (Reverte 1986; Ubelaker 1989), was observed, but this may be due to the high fragmentation and lack of >10mm fragments to allow more accurate observation of this effect.

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[1] The record for post-medieval Hemel Hempstead reported by Scaife (2003) is incorrect as only a late Bronze Age/early Iron Age sample is reported.