Chapter 6: Animal and plant remains, snails, soils and radiocarbon dating

This chapter gathers together a series of specialist reports of broadly 'environmental' character, although the content of several of these has a direct bearing on aspects of burial rite and the placement of different types of remains on cremation pyres and within both cremation and inhumation burials. The evidence of radiocarbon dating is also included here. Most of the reports are the result of work carried out subsequent and supplementary to that of the post-excavation assessment. That on the remains of land snails, however, is based on work carried out as part of the assessment, as it was thought unlikely that further analysis would add significantly to the conclusions reached at that time. Samples were assessed for the preservation of pollen, but the condition of this material was so poor that the assessment report has not been included here. It can be found in the project archive.

UNBURNT ANIMAL BONES *by Lena Strid and Fay Worley*

Introduction

The OA excavations at Lankhills produced an assemblage of *c* 787 refitted fragments (*c* 10.6 kg) of hand-collected animal bone, plus a further 179 tiny fragments (weight 88 g) recovered from sieved samples from 22 contexts, mostly collected from graves. The hand-collected unburnt assemblage also derives principally from graves, with much smaller quantities of material from layers, ditches and pits and grave fills, and represents both mundane waste and possible and probable deliberate deposits. Some 11% of the hand-collected fragments (8% by weight) derived from disturbed or modern contexts. A full initial record of the assemblage (*c* 80% of the hand-collected bone) was made by Kris Poole at OA. Further material, including all that from the sieved samples, was recorded by Fay Worley at Fort Cumberland concurrently with work on the cremated animal bone (see below). Full datasets can be found in the project archive.

Methodology

Material was identified using reference collections at Oxford Archaeology and Fort Cumberland (English Heritage), along with relevant identification manuals (Schmid 1972; Cohen and Serjeantson 1996; Hillson 1996b). Attempts were made to identify all bone fragments to element and species, although ribs, vertebrae (except atlas and axis), and skull fragments were classed as large-, medium-, and small-sized mammal. The methods of Boessneck (1969) and Payne (1985) were used to distinguish between sheep (*Ovis*) and goat (*Capra*). Bones were recorded using the zoning systems of Cohen and Serjeantson (1996) for birds and Serjeantson (1996) for mammals.

Measurements were taken following von den Driesch (1976) for mammals, Cohen and Serjeantson (1996) for birds, but were restricted to long bones of mature specimens. Where possible, pigs were sexed on the basis of their canines (Schmid 1972), while morphological traits of the pelvis and horn cores were used to sex cattle and sheep/goat (Grigson 1982). Presence or absence of tarsometatarsi cockspurs was used to differentiate male and female domestic fowl (Sadler 1991), as was medullary bone in femora (Driver 1982).

Methods employed for ageing specimens were dental eruption/attrition, and epiphyseal fusion. Grant's methods (1982) were used for recording tooth wear in cattle, sheep and pig, with wear stages being assigned using standards set out by Halstead (1985) for cattle, Grant (1982) for pigs, and Payne (1973; 1987) for sheep. Fusion data were used to assign ages to cattle, sheep and pigs using data given by Getty (1975). Horses were aged through tooth crown heights (Levine 1982). As bird bones lack epiphyses, they were recorded as 'fused' or 'unfused.'

Recording included notes on the condition of the bones (graded as very good, good, fair, poor or very poor). Aspects of taphonomy (gnawing, root etching, burning, recent breaks and butchery marks (Lauwerier 1988)) and evidence for age at death (tooth attrition and epiphyseal fusion) were recorded where evident. A zoning system (Serjeantson 1996) was used to record the extent of each specimen.

Animal bone from sample residues was analysed separately from the hand collected remains in order to mitigate for recovery bias in the data, and to allow the recording method to be tailored to the characteristics of the sample (increased fragmentation and prevalence of burnt fragments compared with the hand-collected material). Animal bones from sample residues were recorded as precisely as possible to taxon and element, and evidence of age at death, taphonomy, butchery and pathology were recorded when present. The fragments from each residue were counted and weighed, with unburnt and burnt fragments counted and weighed separately. The completeness of each fragment was graded under 6 categories (<10%, 11-25%, 26-50%, 51-75%, 76-90%, 91-100%). Evidence of burning was recorded under four categories (unburnt, scorched, charred, calcined) and the predominant colour of the fragments noted. Evidence for tissue regression fractures on burnt bones was noted when present.

The assemblage

The evidence of species representation and skeletal element distribution suggests that most of the bones occurring in grave fills were not related to the burials themselves, but comprised disarticulated material derived from the fills of truncated earlier features or from layers cut by the graves. A small number of bones, however, were thought on the basis of their position or character to have been possibly or probably deliberately deposited and are discussed below.

Burial deposits

The earlier excavation at Lankhills revealed deposits of domestic fowl in six burials, and two dogs in one burial. The birds were mostly complete, and presumably represented symbolic meals for the deceased. The two dogs, one complete and the other fragmentary, were suggested to have had a role as guardians or companions (Clarke 1979, 367-368; Brothwell 1979, 239-241; Harcourt 1979, 244-245).

Eight burials in the present assemblage, including three cremation burials, contained possible ritual deposits of faunal remains (see Table 6.1). Three burials (530, 1547 and cremation burial 655) had horse skulls or parts of horse skulls placed in the grave fill. The identified fragments in Grave 530 included the left mandible and left and right premaxilla. A third mandibular molar and four maxillary incisors with only slight wear indicated that the animal was approximately 3.5-4.5 years old at death (based on eruption of the third molar). The skull (1543) in grave 1547 was complete (though fragmented) except for the mandibles, probably male and *c* 4-7 years old on the basis of the incisors (Habermehl 1975, 51). The skull (603) with cremation burial 655 was also largely complete but lacking the mandibles. It was also probably male and *c* 8 years old based on the incisors (ibid.).

Horse skulls are occasionally found in funerary contexts, as well as in ritual deposits elsewhere in Britain (cf. Luff 1982, 176-189) and cremated horse remains are a significant aspect of the cemetery at Brougham (Bond and Worley 2004, 325-6). Horses are associated with the Celtic goddess Epona, but evidence for the cult in Britain is scarce (Luff 1982, 189). However, horse sacrifices may also be associated with other deities and traditions, as perhaps at Brougham. The horse may also represent social status among the community.

The dog foot bones may possibly represent the remains of a dog skin, perhaps used to wrap the cremated remains. Such an interpretation was suggested in relation to the inhumation burial of a child from Asthall, Oxfordshire, in which the bones of three feet of a large dog were recovered (Booth *et al*. 1996), but the significance of the Lankhills example is less clear, the bones coming from a backfill deposit above the cremated remains. It is not unusual to find intact dogs in Roman burials. Interpretations of their significance range widely and include the deliberate killing of the deceased individual's pet, a status indicator, or a guardian of the dead (Philpott 1991, 204).

Other unburnt animal remains from cremation burials included a fragmented sheep/goat head from un-urned cremation burial 1160 (1107), identified from skull fragments, maxillary teeth and the majority of a left mandible among the material derived from sieved samples. The sheep or goat was 10-20 months old at death (following Legge 1992).

Individual birds, usually domestic fowl, are a very common type of animal deposit in graves. Philpott (1991, 202) suggests that they are mainly found in female cremations and in male inhumations. One skeleton of domestic fowl was found in Grave 870, an adult inhumation of unknown sex. The fowl was mostly complete, lacking the skull, wing tips and toes. The absence of skulls and feet has occasionally been interpreted as indicating the deposition of a cooked fowl (Lauwerier 1993, 77). However, the presence of tarsometatarsi renders it more likely that the small wing tips and toe bones were not retrieved during excavation. Furthermore, bird skulls are very fragile, and fragmented remains of the skull may have been missed during excavation. The presence of medullary bone indicates that the fowl was an egg-laying hen, killed during or at the very end of the breeding period (De Cupere 2001, 36).

Regardless of archaeological period, deposits of articulated remains and skulls are often interpreted as possible ritual deposits. However, disarticulated remains may also be significant, and Philpott argues that animal jaw bones in graves may represent token offerings: the inedible part of the funerary meal (1991, 203). Complete mandibles occurred in two inhumation graves: a sheep/goat mandible in Grave 950 and a dog mandible in Grave 710. However, complete mandibles are not unusual in rubbish and other secular contexts, and thus these mandibles cannot be defined unequivocally as special deposits within the graves. Further dog remains comprised an incisor from Grave 1215 (1148) and a second metacarpal from Grave 1806 backfill (1771), both recovered from sieved samples. Neither bears any evidence of curation prior to deposition (for example modification or polish from handling) and they are considered to be incidental inclusions in the grave fills. The evidence for the role of dog in special deposits in this assemblage is therefore ambiguous. This contrasts with the evidence of the placement of two dogs in Clarke's grave 400 (above) and the occurrence of a dog as a cremation pyre good in Grave 1843 in the present site (see below).

Faunal remains not related to burial rituals

The faunal remains from Roman contexts not related to burial rituals comprise *c* 661 hand-collected bones, tabulated by general context type in Tables 6.2-6. Of these fragments, some 143 (21.6%)

Table 6.1: Burials containing possible ritual deposits of faunal remains

Context	*Grave No.*	*Burial type*	*Age (human)*	*Sex (human)*	*Animal species*	*Animal bones*
412	530	Inhumation	45+	Female	Horse	Skull (part) 3/254
738	870	Inhumation	Adult	?	Domestic fowl	Skeleton
779	710	Inhumation	36-45	Female	Dog	Mandible
896	950	Inhumation	45+	Male	Sheep/goat	Mandible
1543	1547	Inhumation	Neonate		Horse	Skull
603	655	Cremation	Adult	Male?	Horse	Skull
1107	1160	Cremation	Adult?	?	Sheep/goat	Skull/mandible fragments
1149	1215	Cremation	Adult	Male?	Dog	Foot bones

Table 6.2: Faunal remains from grave fills

	Cattle	*Sheep/ goat*	*Pig*	*Horse*	*Dog*	*Domestic fowl*	*Duck*	*Bird sp.*	*Frog/ toad*	*Medium mammal*	*Large mammal*	*Indet.*
Skull fragments		2								27	8	
Mandible	6	6	1	1	2					1		
Loose teeth	15	11	1	6								
Axis		1										
Vertebrae										4	5	
Ribs										9	18	
Coracoid						1						
Scapula		1		1							1	
Humerus	1		2	2					2		1	
Radius	2	2		1	1						1	
Scaphoid				1								
Ulna	1				1	2						
Metacarpal	1											
Carpometacarpus							1					
Pelvis	1	1							1		1	
Femur	3		1	1								
Tibia	1	4										
Fibula			1									
Tibiofibula									2			
Tibiotarsus						1						
Astragalus	4			1								
Metatarsal	3	3										
Phalanx 1		3										
Phalanx 2	1		1									
Phalanx 3		1										
Sesamoid											1	
Indet. Metapodial	1	1										
Long bone										49	48	
Indeterminate								2	6	13	14	205
TOTAL (NISP)	40	36	7	14	4	4	1	2	11*	103	98	205
MNI	4	3	1	2	2	1	1		1			
Weight (g)	1309	219	78	1216	39	5	1	0	2	185	1588	144

* = articulated remains

could be identified to taxon. Cattle is the most numerous species, closely followed by sheep/goat and horse (although the totals for all these are boosted by numbers of loose teeth).

The predominance of cattle and sheep/goat is common for Roman assemblages in the Winchester area and indeed for much of lowland Britain. The relatively high representation of horse is unusual, even for rural sites, and it is possible that this relates to other evidence for the special use of horse remains in some graves, but the total number of bones identified to taxon is low, and it would be unwise to draw far-reaching conclusions from such a small dataset. Similarly, the numbers of fragments related to context type are too small for meaningful analysis, except for the material from grave fills, which establishes the broad pattern of species representation.

The unburnt animal bone recovered from sample residues adds relatively little to the overall picture (Table 6.7). The majority of fragments were tiny indeterminate scraps of bone but some specimens were identifiable as sheep/goat (*Ovis aries/Capra hircus*), dog (*Canis familiaris*), water vole (*Arvicola terrestris*), bird, fish and anura. Water vole and fish remains were recovered exclusively from this material. The majority of unburnt animal bones from sample residues were probably not of funerary origin, but intrusive or residual in the grave fills, like the hand-collected bone; the single probable exception being mentioned above.

Table 6.3: Faunal remains from ditches

	Cattle	*Pig*	*Medium mammal*	*Large mammal*	*Indet.*
Skull fragment			1		
Tooth		1			
Vertebra				1	
Scapula	1				
Humerus	1				
Ulna	1				
Phalanx 1	1				
Long bone				3	
Indeterminate				47	5
TOTAL	4	1	1	51	5
Weight (g)	236	3	6	136	6

Table 6.4: Faunal remains from pits

	Cattle	*Sheep /goat*	*Horse*	*Dog*	*Domestic fowl*	*Medium mammal*	*Large mammal*	*Indet.*
Skull fragment							1	
Loose teeth		1		1				
Vertebra							1	
Ribs							1	
Tibiotarsus					1			
Astragalus			1					
Metatarsal	1	1						
Long bone						10	2	
Indeterminate								11
TOTAL	1	2	1	1	1	10	4	11
Weight (g)	119	11	51	3	2	21	71	32

BURNT ANIMAL BONE *by Fay Worley*

Introduction

The small assemblage of burnt animal bone provides evidence for the use of pig, sheep or goat, bird, dog, cattle, bird and possible equid pyre goods in the funerary tradition at the site, and adds to the growing dataset of faunal pyre goods known from Roman Britain. The presence of a dog and possibly equid pyre goods is unusual for sites of this period in Britain, dog having been found at only two sites, and horse at only one of 33 sites in a recent survey (Worley 2008).

Methodology

The burnt animal bone was identified as precisely as possible to taxon and element by comparison

Table 6.5: Faunal remains from layers and spreads

	Cattle	*Sheep/ goat*	*Pig*	*Horse*	*Medium mammal*	*Large mammal*	*Indet*
Skull fragments						8	
Loose teeth		2					
Scapula						1	
Ribs					4		
Femur			1				
Tarsal				1			
Metatarsal	1						
Phalanx 1				2			
Long bone					5	5	
Indeterminate							5
TOTAL	1	2	1	3	9	13	5
Weight (g)	80	11	22	79	24	99	6

Table 6.6: Hand-collected faunal remains (unburnt) occurring incidentally in cremation deposits

	Cattle	*Large mammal*
Loose teeth	4	
Vertebra		1
Carpal (magnum)	2	
Indeterminate		2
TOTAL	6	3
Weight (g)	37	24

Table 6.7: Unburnt animal bone from samples (total number of fragments)

Context	Sample	Cremation burial/ other feature	Sheep/goat	Dog	Large	Medium mammal	Bird mammal	Fish	Anura	Water vole	Micro-mammal	Indet.	Total	Weight (g)
607	496-7	655	-	-	1	-	-	-	-	-	-	7	8	1
808	722	1060	-	-	-	-	1	-	-	3	-	15	19	3
983	829	1180	-	-	-	1	-	-	-	-	-	-	1	<1
1107	901	1160	4	-	-	50	-	-	-	-	-	-	54	48
1121	936	1195	-	-	-	1	-	-	-	-	-	-	1	1
1148	957	1215	-	1	-	-	-	-	-	-	-	-	1	2
1264	1100	Pit 1261 backfill	-	-	-	1	-	1	-	-	-	41	43	5
1328	1149	Grave 1324 backfill	-	-	-	-	-	-	-	-	1	-	1	<1
1526	1236	Pit 1623 cremation deposit	-	-	-	1	-	-	-	-	-	-	1	3
1628	1416	Pit 1623 cremation deposit	-	-	-	1	-	-	-	-	-	-	1	<1
1661	1368	1724	1	-	-	-	-	-	-	-	-	-	1	13
1673	1367	Pit 1671 truncating burial 1724	-	-	-	3	-	-	-	-	-	-	3	1
1686	1378	Fill of pit 1680	-	-	-	10	-	-	1	-	-	-	11	4
1728	1382	1742	-	-	-	-	-	-	-	-	-	3	3	1
1749	1385	1904	-	-	-	1	-	-	-	-	-	-	1	1
1750	1386	1904	2	-	-	-	-	-	-	-	-	-	2	<1
1770	1405	1806	-	-	-	-	-	-	-	-	-	1	1	<1
1771	1401	1806	-	1	-	-	-	-	-	-	-	1	2	2
1777	1502	Gully 470	1	-	-	1	-	-	-	-	-	11	13	1
1788	1488	1786	-	-	-	1	-	-	-	-	-	-	1	<1
1795	1421	Pit 1799	-	-	-	1	-	-	-	-	1	-	2	<1
1844	1427	1845	3	-	-	4	-	-	-	-	-	2	8	1
Total	-	-	11	2	1	76	1	1	1	3	2	82	179	88

Table 6.8: Burnt animal remains from sample residues

Feature	*Context*	*Sample*	*Description (calcined unless stated ,< > denotes sample number)*	*Weight (g)*	*No. frags*
Un-urned burials					
910	869	713	**Sheep/goat** molar, 6 **medium mammal** maxilla/mandible fragments, 18 tooth fragments, 16 indeterminate fragments (10 **medium mammal**-sized) and I possible human tooth enamel and root fragment.	11	42
915	872	706	**Pig** right humerus fragment and **medium mammal** indeterminate.	3	2
945	888	756	Three **large mammal** indeterminate fragments (charred).	2	3
1060	808		A **large mammal** indeterminate (charred) and scorched long bone fragment. Seventeen **medium mammal** fragments including two scorched skull fragments and six scorched indeterminate fragments; a charred long bone fragment and two indeterminate fragments. 43 further indeterminate fragments (21 only scorched).	19	62
1065	911	712	Two **large mammal** flat bone fragments.	3	2
1160	1107	901	**Medium mammal** rib fragment (charred), **medium mammal** cranial fragment, long bone fragments and 16 indeterminate fragments.	6	19
1255	1187	1554	79 very small **medium mammal**-sized indeterminate fragments and one **medium mammal**-sized cranial fragment were recovered from spits 4 and 7.	4	80
1724	1661	1368	Seven indeterminate fragments (five scorched) and two **medium mammal**-sized skull fragments.	3	9
1742	1728	1379-80	Two cranial, two long bone and five indeterminate fragments, none of which could be positively identified as non-human. Also one **medium mammal**-sized indeterminate fragment.	10	14
Possible *bustum* burials					
655	607	496-500	A **bird** long bone and possible bird indeterminate in <497>, **cattle** mandible fragment in <498> and indeterminate fragments in <499> and <500>.	9	5
1180 (truncated)	983	829-831	**Cattle** left ulna (scorched) and **large mammal** flat bone in <830>, two **large mammal** long bone fragments were recovered from <831>. Two **medium mammal** cranial fragments, 14 **medium mammal** long bone and nine **medium mammal** indeterminate fragments (six charred) and six scorched indeterminate fragments from <829> (some **medium mammal**-sized fragments may be human). Eight charred **medium mammal**-sized indeterminate fragments were recovered from <831>.	21	43
1806	1770	1404-6	Two refitting **large mammal** long bone fragments (might be human, one charred) in <1404> and <1405>, **large mammal** long bone, skull and indeterminate fragments in <1405>, **bird** longbone (charred) **medium mammal**-sized possible radius, alveolar, long bone and two indeterminate fragments <1406> .	14	11
1845	1843-4	1427	A near complete **dog** skeleton together with two **sheep/goat** phalanges (see Table 2).	302	1100+
Cremation debris					
1623	1628	1416-7	A scorched equid sacrum fragment and eight charred **large mammal** indeterminate fragments including a sacral or vertebral process and other irregular fragments from <1417>. A charred **sheep/goat** metapodial fragment and five charred **medium mammal** indeterminates, together with 61 calcined **medium mammal**-sized fragments (including cranial and longbone fragments) were recovered from <1416>.	21	78
Other burials ([a] inhumation)					
785 [a]	756		**Medium mammal** vertebra	<1	1
1335 [a]	1238	-	21 **medium mammal**-sized fragments including 4 skull fragments, 2 tooth roots and 15 long bone fragments, 218 indeterminate fragments and seven scorched indeterminate fragments.	65	246
1904	1749	1385	Five **medium mammal**-sized indeterminate fragments .	1	5
Pit fills ([b] truncates 1724)					
1261	1264	1100	Fifteen **medium mammal** indeterminate fragments (six charred)	1	15
1671 [b]	1673	1367	**Large mammal** long bone (may be human), indeterminate, three **medium mammal** rib fragments (two charred), three **medium mammal** indeterminate fragments possibly including a cranial fragment.	3	8
Post holes ([c] under 1904)					
1743 [c]	1744	1388	Nine **medium mammal-**sized indeterminate fragments (one charred). All could be human.	1	9
Gullys					
470	1777	1502	Two **medium mammal** indeterminate fragments (one charred).	<1	2
Total	499g	1783+			

with the English Heritage reference collection held at Fort Cumberland, Portsmouth, and textual reference sources. Evidence of age at death, taphonomy, butchery and pathology was recorded when present. The number of fragments from each sample residue was counted (if less than 200) and weighed, and the completeness of each fragment was graded under seven categories (unknown, <10%, 11-25%, 26-50%, 51-75%, 76-90%, 91-100%). Evidence of burning was recorded under four categories (unburnt, scorched, charred, calcined) and the predominant colour of the fragments noted. Evidence for tissue regression fractures (Pope *et al.* 2004, 436) on burnt bones was noted when present. Unburnt animal bone from sample residues is reported by Strid and Worley (above). A full record of the burnt animal bone, recorded in a Microsoft Excel spreadsheet, can be found with the site archive.

Results

Burnt animal bone was recovered from the sample residues of 22 contexts representing 10 cremation burials (six un-urned, four *busta*), one deposit of cremation debris in a pit, a further cremation burial, two inhumation burials, five pit fills, a gully and a posthole fill (see Table 6.8). In total, 0.5 kg of burnt bone was recorded. The weight of bone recovered from each context varied considerably, from less than 1 g to 302 g from burial 1845. The majority of the burnt animal bone was well calcined and highly fragmented (<10 mm) leading to a low proportion of identifiable fragments. Some fragments from context 983 (cremation burial 1180) had a vitreous appearance, suggesting that they were fleshed when cremated; this may also have been the case for all the burnt faunal remains. One fragment from burial 1724 (context 1673) and one from burial 1845 (context 1843) exhibited patches of orange staining, suggesting that they had been in close proximity to iron objects. No other taphonomic modifications (gnawing, root etching or butchery marks) were identified on the burnt bones.

Despite the highly fragmented nature of the assemblage, sheep/goat (*Ovis aries/Capra hircus*), pig (*Sus scrofa*) cattle (*Bos taurus*), dog (*Canis familiaris*), bird and equid remains were identified among the burnt bones, but the majority of specimens were identified as medium or large mammal size. The majority of crematory deposits contained a minimum of one taxon utilised as pyre goods, but burials 655, 1180 and 1845, cremation debris 1623 and pit 1671 (truncating burial 1724) each contained at least two taxa, and burial 1806 contained three taxa (large mammal, medium mammal and bird). The minimum number of taxa in each burial is within the range seen at other Roman sites in Britain. Age-at-death could be estimated from the state of epiphyseal fusion for two faunal pyre goods: the dog from burial 1845 and the pig from burial 706. No pathological lesions or non-metric traits were identified on any animal pyre goods.

The only dog pyre good was recovered from burial 1845. This burial contained the greatest weight of burnt animal bone from the site and the majority could be attributed to a single dog skeleton. All regions of the skeleton were identified in the assemblage (see Table 6.9) indicating that the pyre good comprised a complete carcass. The dog was a male (a baculum was present) and at least 18 months old at death (all long bones were fully fused). Although withers heights should not be estimated from cremated remains due to their variable shrinkage during burning, a radius, a mandible and a skull fragment were similar in size to those of a 0.46 m tall modern dog skeleton held in the English Heritage Comparative Collection (AML #14). The dog from Lankhills would therefore have been around this size or larger, certainly large enough to have been a working animal, and within the upper half of the estimated height range of dogs from Roman Britain (see Harcourt 1974; Clarke 1995).

Sheep/goat pyre goods were recovered from three contexts (burials 910 and 1845, and cremation debris 1623). The sheep/goat in 910 was represented by a tooth together with 40 other medium mammal tooth, jaw and indeterminate fragments, probably representing either a sheep/goat mandible or head. No other faunal pyre goods were recovered from this burial. The sheep/goat from 1845 was represented by charred first and second phalanges, possibly indicating the utilisation of a sheep foot in the cremation. The sheep/goat in 1623 comprised a charred metapodial fragment together with five charred medium mammal-sized indeterminate fragments and 61 calcined medium mammal-sized fragments, including cranial and long bone fragments. This assemblage might be interpreted as a more substantial portion of a sheep/goat than that included in 910 or 1843, comprising at least the head and one leg. The charred fragments may be part of the same pyre good as the calcined bones, but subject to less intense burning, perhaps as a result of being positioned on the periphery of the pyre. Charred large mammal and equid remains were also recovered from this burial (see below).

The single pig pyre good was represented by a humerus fragment from an individual aged over 12 months old at death, recovered from burial 915. An indeterminate fragment was the only other burnt animal bone from this burial.

A scorched equid sacrum fragment together with eight charred large mammal-sized fragments was recovered from cremation debris 1623; a context also containing sheep/goat pyre goods (see above). Like the charred sheep/goat remains, the sacrum may have been burnt on the pyre, or alternatively it may represent residual material scorched by contact with the hot pyre debris. The rarity of equid pyre goods from Roman Britain together with the minimal level of burning on this single equid specimen favours the second interpretation.

Table 6.9: Burnt animal remains from burial 1845

Context	*Sample*	*Description (calcined unless stated)*
1844 (backfill)	1427	Charred **medium mammal** incisor root. Scorched medium mammal long bone fragment and 20 **medium mammal**-sized indeterminate fragments (including eight scorched and one charred).
1843	1428	Fragments of **dog** bones from the head (two tooth fragments), both forefeet (left scapho-lunar carpal, metacarpals I, III and IV; right metacarpal IV; a metapodial, two first phalanges, three second phalanges and two third phalanges that may be from any foot) and hind leg (tibia fragment). 32 **medium mammal**-sized fragments (including our long bone, two rib blade, one flat bone).
1843	1429	Fragments of **dog** bones from the head (two canine tooth fragments, seven tooth roots and six fragments from the mandible and maxilla), both forelimbs (left and right humeri; left radius; right ulna), both forefeet (left and right cuneiform and pisiform carpals; left metacarpal III; three metapodials, four first phalanges and three second phalanges that may be from any foot), the hips (two acetabular pelvis fragments) and a baculum. **Sheep/goat** bones comprised a charred first and second phalanx. **Medium mammal**-sized fragments comprised two long bone fragments, two sternal fragments, 13 rib blade fragments, 16 vertebral fragments (from at least seven vertebrae, including thoracic lumbar and caudal vertebrae) and >200 (69g) of indeterminate fragments.
1843	1430	Fragments of **dog** bones from the head (skull, mandible and tooth fragments, one charred, one scorched), right forefoot (right metacarpal I and scapho-lunar carpal), left hind foot (left calcaneum), hips (a sacrum fragment) and an indeterminate foot (two metapodials, one first phalanx, three second phalanges and one third phalanx). **Medium mammal**-sized fragments comprised thirteen skull fragments, eight rib fragments, 22 vertebral fragments (from at least eight vertebrae including lumbar and cervical vertebrae), seven long bone fragments, a charred sesamoid and >500 (58g) of indeterminate fragments.
1843	1431	Fragments of **dog** bones from the head (mandible and cranial fragments), left and right forelimbs (left scapula and humerus, right radius), left and right hind limbs (left and right femora, left tibia), left and right hind feet (left and right calcanea; right cuboid and metatarsals II, IV and V; left astragalus and metatarsal IV) and indeterminate foot bones (a sesamoid, four metapodials (one charred), eight first phalanges, three second phalanges and five second phalanges). **Medium mammal**-sized fragments comprised five skull fragments, sixteen vertebral fragments (from at least seven vertebrae including cervical, lumbar and caudal vertebrae), a scapula fragment, seven long bone fragments, twelve rib fragments and 133 indeterminate fragments.

Cattle pyre goods were recovered from burial 655 and possibly burial 1180. Burial 655 included a calcined mandible fragment together with three indeterminate fragments and a bird bone, and burial 1180 contained a scorched ulna fragment together with six scorched indeterminate fragments, a large mammal-sized flat bone fragment and two large mammal-sized long bone fragments (which are not certainly non-human). Like the equid remains (above), the cattle ulna might be a residual bone scorched by contact with hot pyre debris. No unburnt faunal grave goods were recovered from this burial so it is unlikely to have been an intentional grave good.

Bird pyre goods were recovered from two burials (655 and 1806). Both comprised single long bone fragments and neither could be identified any more specifically.

Un-urned burials 945, 1060, 1065 and 1806, and pit 1671 (which truncated burial 1742), contained burnt large mammal remains, with no specimens identifiable to individual large mammal species. Similarly, burials 1160, 1255, 1335, 1724, 1742, 1806 and 1904; pits 1671 (which truncated burial 1742) and 1261; posthole 1743 (underlying burial 1904); gully terminal fill 1777 and inhumation 785 contained burnt medium mammal remains, with no specimens identifiable to individual species.

Discussion

Burnt animal bones were recovered from the burials of 11 adults (including three female/probable females and five male/probable males) and a 2-year-old child. The remaining deposits of burnt animal bone may also represent animals burnt during cremation ceremonies, but not interred in burials or disturbed from burial contexts. The range of species comprised domestic taxa including cattle, possible equid, sheep/goat, pig and dog. The only bird remains could not be identified to species.

While cattle, pigs and sheep/goats are relatively common pyre goods in Roman cemeteries in Britain, dogs and equids are not. The funerary provenance of the burnt equid bone is uncertain. If it was a pyre good, it would join only nine others from Roman Britain, all recovered from the cemetery at Brougham, Cumbria (Bond and Worley 2004). Dogs were the least common domestic taxon pyre good in utilised in Roman Britain (Worley 2008) only three examples having been identified at two other Roman cemeteries: Brougham, Cumbria (Bond and Worley 2004) and St Stephen's, Hertfordshire. A dog listed in the grave catalogue for Folly Lane Hertfordshire (Niblett 1999, 116), was not identified by osteologists recording the assemblage (Mays and Steele 1999) and is therefore not considered here. The Brougham assemblage included dogs in two features; one of the dogs, like the Lankhills example, was represented by a complete skeleton. We cannot know whether the dogs were burnt as the pets of the deceased, as their protectors or as funerary sacrifices, perhaps to honour the 'divine shades' (see Henig 1984b, 193). The dog at Lankhills was included in the cremation burial of a young child. This in itself is unusual; only three other Romano-British burials of single infants buried with faunal pyre goods were identified in Worley (2008). The dog pyre goods from other sites were all recovered from the graves of unsexed adults and sub-adults.

CHARCOAL AND CHARRED PLANT REMAINS FROM THE CREMATION BURIALS

by Dana Challinor

Introduction

The assessment of the charred plant remains and charcoal was carried out by Dr Ruth Pelling (2005) and showed that a number of the cremation deposits from Lankhills produced significant quantities of charcoal worthy of full analysis. The material offered the potential to characterise fuel use from a range of cremation-related deposits, including one urn burial, five un-urned burials, four *bustum* burials and two deposits of pyre debris. A posthole sample was also examined. Most of the cremation burials were of 4th-century AD date, but a few pre-date the main phase of use of the cemetery (AD 300-350) and might be as early as the 1st-2nd century. Pelling also noted the widespread presence of charred tubers which might indicate the use of turves as fuel. Some limited analysis of these remains was carried out and the results – both from the analysis and from the assessment – are discussed in this report. Dr Wendy Smith at Oxford Archaeology kindly assisted with the identifications of the charred plant remains.

Methodology

Charcoal

The charcoal samples were analysed in full, following standard procedures outlined below. Large assemblages were divided to provide an optimum number of *c* 100 fragments which were >2 mm in size. Where samples contained less than this, 100% of the charcoal was identified. Cremation burials which had been excavated in spits were recorded appropriately so that any differences within the spit assemblages could be determined. The charcoal was fractured and sorted into groups based on the anatomical features observed in transverse section at x7 to x45 magnification. Representative fragments from each group were then selected for further examination in longitudinal sections using a Meiji incident-light microscope at up to x400 magnification. Identifications were made with reference to Schweingruber (1990), Hather (2000) and modern reference material. The maturity of the wood was noted where possible and the presence of roundwood, sapwood and heartwood is noted in the tables. Distinguishing between heartwood and sapwood is difficult in charcoal, so the quantities of each are not statistically reliable. Classification and nomenclature follow Stace (1997). The figures are based upon fragment count as a means of quantification, but it is acknowledged that there are limitations to this method.

Charred plant remains

Samples which were analysed for charcoal and noted by Pelling as containing tubers were examined for charred plant remains. A rapid sorting of the samples was undertaken using a binocular microscope at x7 to x45 magnification, and a range of tubers and seeds were extracted for identification. The aim was to characterise the charred material and provide a broad quantification. The material was subsequently examined and photographed by Dr Wendy Smith at Oxford Archaeology. Given the limited sorting of the samples, it is likely that the charred remains, and in particular small weed seeds, are under-represented. Some identifications referred to in the text are derived from the assessment (Pelling 2005) and should be treated as unconfirmed.

Results

Charcoal

The results by fragment count are given in Table 6.10. Additional data, including roundwood counts and a breakdown of the species composition per spit within the burials, are included in the archive. The preservation of the charcoal was generally good, although the majority of samples were dominated by small-sized (<4 mm) fragments. This made it difficult to determine maturity in ring porous taxa. Only two samples – 722 and 957 – produced large fragments of >10 mm in size. Although a number of small roundwood fragments were noted, none were complete enough to examine age/diameter. In general, the samples were primarily composed of trunkwood, with lesser quantities of roundwood which might have derived from kindling. Context 1121 (sample 936) was the only sample to produce a significant quantity of immature stems – mostly *Corylus* (hazel), but also *Quercus* (oak), Maloideae (hawthorn group) and *Acer* (field maple).

Notes on identification

Twelve taxa were positively identified. The taxonomic level of identification varies according to the anatomical similarity between genera. Most of those given to species level are based upon the likely provenance and period, ie where a genus is represented by a single species. The only non-native taxon

Table 6.10: Charcoal from the cremations and related deposits

	Group number	*915*	*945*	*1060*	*1195*	*1215*	*1724*	*1742*	*1786*	*1798*	*1806*	*1845*	*2060*	*-*	
	Cremation type	*Un-urned*	*Pyre debris*	*Un-urned*	*Grave-shaped*	*Grave-shaped*	*Un-urned*	*Un-urned*	*Un-urned*	*Pyre debris*	*Grave-shaped*	*Grave-shaped*	*Urn*	*Grave backfill*	*Posthole*
	Context number	872	888	808	1121	1148	1661	1728	1788	1628	1770	1843	424	428	1744
	Sample number	706	756	722	936	957	1368	1379-1383	1488	1416	1403-1406	1428	1554	258	1388
	Volume floated	10	10	90	120	-	20	5	10	12	25	10	2	6	0.7
	% flot identified	100	100	12.5	6.25	1.56	12.5	100	100	12.5	100	12.5	100	25	100
Juglans regia L.	walnut	58													
Fagus sylvatica L.	beech										14r				
Quercus sp.	oak	6r	56r	58hr	29r	57rs	113hr	21	57r	116r	27r	13	36r	1	46rhs
Betula sp.	birch		11												
Alnus glutinosa Gaertn.	alder							14r							
Corylus avellana L.	hazel	2		10r	52r	25r						37r			2r
Alnus/Corylus	alder/hazel	1					1	21r	6		9r	10r	2	2	
Betulaceae	birch family		2												
Populus/Salix	poplar/														
willow			3r	4											
Prunus spinosa L.	blackthorn							1					22	85	
Maloideae	hawthorn, pear, apple	3		52r	11r	29r	4		1			52r	15r		17r
Acer campestre L.	field maple				6								16	13	1
Hedera helix L.	ivy					1									
Fraxinus excelsior L.	ash				2r	4r						21			
Indeterminate		6	3	1	3	2		7			4	4	5	3	4
Total		76	72	124	107	118	118	64	64	116	54	137	96	104	70

identified was *Juglans* (walnut) from cremation 915. It is of particular interest since walnut is thought to have been introduced to Britain by the Romans.

JUGLANDACEAE: *Juglans regia* L., walnut. The fragments from sample 706 were quite small and there is possible confusion with *Betula,* although walnut has large pores and simple perforation plates. It was not always possible to check the distinguishing characteristics, but comparison with modern reference charcoal suggested that the pores in transverse section were too large for *Betula.*

FAGACEAE: *Fagus sylvatica* L., beech; *Quercus* sp., oak

BETULACEAE: *Betula* sp., birch; *Alnus glutinosa* Gaertn., alder; *Corylus avellana* L., hazel. See notes on walnut for possible confusion with *Betula* (above); scalariform perforation plates, and smaller pores confirmed the presence of *Betula* in sample 756. This sample also produced two fragments of charcoal which had aggregate rays. It is likely that they were *Alnus* or *Corylus*, but the pieces were too small to check the longitudinal sections, and since *Betula* does (rarely) have aggregate rays, the identification was left at family level. *Alnus* and *Corylus* have very similar anatomies and given the small size of the charcoal, it was not always possible to check the perforation plates which are the main distinguishing feature.

SALICAEAE: *Salix* sp., willow; *Populus* sp., poplar; rarely possible to separate on anatomy.

ROSACEAE: *Prunus spinosa* L., blackthorn; distinguished from other *Prunus* species by its wide ray widths.

Maloideae, subfamily including *Pyrus* sp., pear; *Malus* sp., apple; *Sorbus* sp., rowan/service/whitebeam and *Crataegus* sp.(hawthorn); all are anatomically similar.

ACERACEAE: *Acer campestre* L., field maple.

ARALIACEAE: *Hedera helix* L., ivy.

OLEACEAE: *Fraxinus excelsior* L., ash.

Indeterminate fragments were not identified because of poor preservation or an unusual cellular structure. Some bark fragments were included in this category. It is likely that the indeterminate fragments represent additional specimens of taxa positively identified at the site.

Charred plant remains

The data on the charred plant remains are presented in Table 6.11. Two types of tubers were identified to species level: *Conopodium majus* (Gouan) Loret (pignut) and *Arrhenatherum elatius var. bulbosum* (Willd.) St-Amans (false oat grass). A third tuber type was noted in context 1416, with a small rounded, dense structure and stalk attachment, but this was not positively identified. There was a lot of variation in the specimens: some of the *Conopodium* were compressed and flattened in appearance and varied in size considerably (Figure 6.1). There appeared to be a range of immature *Conopodium* tubers in context 1628, which suggests that they were burned prior to May when the tubers are mature enough to merit gathering. This also suggests that, although the tubers are edible, these were not deliberately gathered for food. The *Arrhenatherum* tubers ranged from long and thin to fat and conical (Figure 6.2). Numerous small rootlet/rhizome structures were recorded in some samples; one of these was attached

Fig. 6.1 Tubers of Conopodium majus from sample 1430, showing internal structure and variation in size

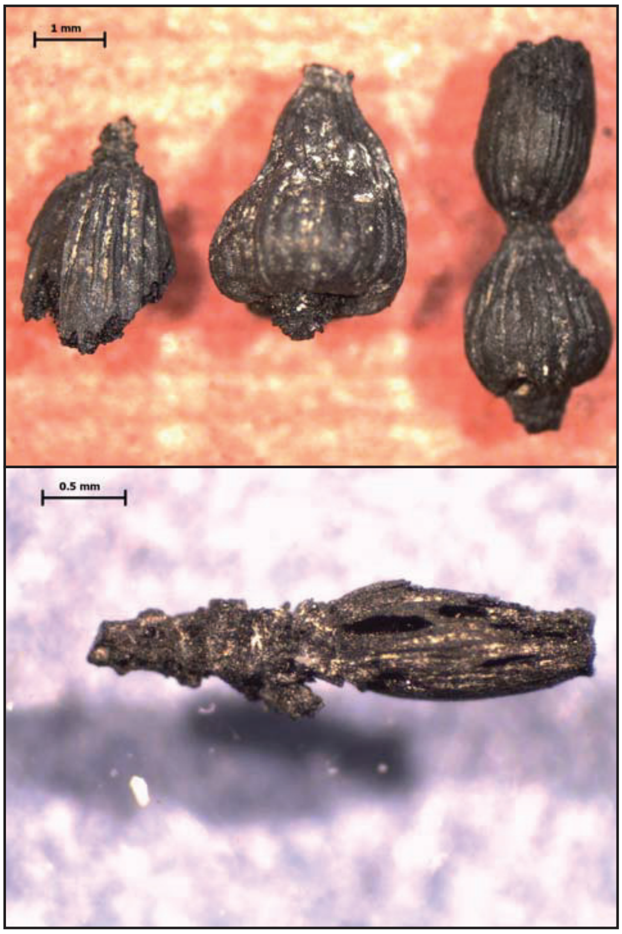

Fig. 6.2 Tubers of Arrhenatherum elatius (false oat grass) from samples 1488 (left) and 1416 (right) showing variation in size, and rootlet attachment

Table 6.11: *Charred plant remains from charcoal samples*

Group number		*1195*	*1724*	*1742*	*1786*	*1798*	*1806*	*1844*		*1845*		*2060*
Cremation type		*Grave-shaped cremation*	*Un-urned cremation burial*	*Un-urned cremation burial*	*Un-urned cremation burial*	*Pyre debris*	*Grave-shaped cremation*	*Grave-shaped cremation*	*Grave-shaped cremation*	*Grave-shaped cremation*	*Grave-shaped cremation*	*Backfill of cremation grave*
Context number		1121	1661	1728	1788	1628	1770	1844	1843	1843	1843	428
Sample number		936	1368	1379-1383	1488	1416	1406	1427	1428	1430	1431	258
Tubers/Roots												
Conopodium majus (Gouan) Loret	pignut				+	++	+	+	+	++	+	
Arrhenatherum elatius var. *bulbosum* (Willd.) St-Amans	false oat grass		+		++			+		+		+
Indeterminate – tuber type 3					+							
Indeterminate - rhizomes/ rootlets/twiglets		+		++ +	++++		++		++	+		
Indeterminate – root bark					+							
Seeds												
Ranunculus sp.	buttercups					+					+	
Rumex sp.	docks							+		+		
Prunus spinosa L.	blackthorn			+								
Fabaceae	legumes					+					+	
Asteraceae – seed head	daisies	+										
Asteraceae - seed	daisies		+							+		
Poaceae	grasses			+				+				
Avena sp.	oat						+					

+=<5; ++=5-25; +++=25-100; +++=>100

to an identifiable *Arrhenatherum* tuber (Figure 6.2, right). The preservation of this fine, rooty material was exceptional, suggesting insufficient combustion. Some carbonised molluscs were noted in the richer samples (eg 1416).

Weed seeds were infrequent, and included *Ranunculus* sp. (buttercups), *Rumex* sp. (docks), small-seeded legumes of *Trifolium*-type (clover), Poaceae (grasses), and a couple of *Carduus*-type (thistle) Asteraceae (daisy family) seeds. The Asteraceae seeds were consistent with the type which would have come from the composite seed heads recovered from context 1121, although this particular sample did not produce seeds. The weed species noted were dominated by low-growing grassland taxa. One cremation burial (1742) produced several *Prunus spinosa* (blackthorn) seeds. *P. spinosa* was also identified in the charcoal from this deposit, and it is likely that the fruit entered the pyre attached to the wood, since there is no general evidence for the deliberate deposition of food remains. This suggests that the cremation took place in autumn when the tree is in fruit.

Cereal remains in the analysed samples were rare. A couple of *Avena* sp. (oat) grains were identified from cremation 1806. Pelling, in the assessment, noted the presence of *Triticum* sp. (wheat), *Hordeum vulgare* (barley) and *Avena* sp. (oat) in low quantities throughout various features across the site. The paucity of remains led her to conclude that it is unlikely that the deposits represent deliberately placed offerings in the graves or cremations.

Discussion

The charcoal from Lankhills derives largely from wood remains of cremation-related deposits. The posthole sample (context 1744) produced an assemblage similar to those of the cremations, suggesting that it might represent remains from related activities. It is clearly not the burnt remains of a sole post, since several species are represented. In any case, the exact provenance for the charcoal from this deposit is uncertain. In the case of the cremation burials, the charcoal in the archaeobotanical assemblage will have come from several potential sources of wood selected for use on the pyre, including fuelwood, pyre structure, coffin/bier and artefacts. An initial examination of the type of cremation-related deposits at Lankhills will be useful in interpreting the charcoal remains.

Burial type and pyre debris

Three distinct cremation burial types were examined – urned, un-urned and *bustum*. None of these showed obvious evidence of burning *in situ*, although several of the grave-shaped burials contained bone in anatomical order, consistent with *bustum* burials. The paucity of charcoal in these burials refutes this interpretation. The evidence from other sites with genuine *busta* or *in situ* cremations indicates that a large volume of charcoal and large-sized pieces of charcoal are preserved in these features (eg Challinor 2006). This is not the case at Lankhills, where only one grave-shaped, anatomically arranged burial (1806) produced enough charcoal to merit analysis, and this assemblage was still poor and small. Apparently, these features had been cleaned – to a large extent – of charcoal, which seems unlikely in a *bustum* which is specifically designed to act as pyre site and grave. The urned deposits, as might be expected, had also been mostly cleaned of charcoal and only one – 2060 – produced analysable data. With the possible exceptions of burials 1060 and 1215, the small size of the charcoal suggests that larger fragments were deliberately and carefully avoided when the bone was collected for burial, particularly given that the bone remains were of good size (Clough, this report).

The two samples of pyre debris (contexts 888 and 1628) were spreads of material, rather than discrete burials. It is usually assumed that pyre debris is likely to contain more types of wood than burials of bone collected from the pyre since the remains of more than one pyre may be represented (Gale 1997). The Lankhills pyre debris is unusual in that oak is predominant in both assemblages. Indeed, context 1628 is the only assemblage to produce a single taxon. Given the taxonomic diversity of many of the other burials at Lankhills, the charcoal from contexts 888 and 1628 suggests that a single pyre is represented in each case.

Selection of fuelwood

The cremation assemblages from Lankhills are generally characterised by taxonomic diversity, containing an average of four taxa per sample. This level of diversity is unusual, since cremation deposits are often dominated by a single taxon – a trend observed at both prehistoric sites (Thompson 1999) and Romano-British ones (Challinor 2007). Both the 1st/2nd-century burials and the late 4th-century burials produced diverse assemblages (Fig. 6.3). In contrast, the early-mid 4th-century cremations, representing the main use of the cemetery, tend to be dominated by a single species – usually oak – although the material from the urn and related assemblage from 2060 was more mixed. The significance of this is difficult to gauge, but there appears to be a pattern worth noting. In general, diversity of taxa suggests a more indiscriminate gathering of wood for fuel, and the single taxon burials may represent a ritual choice (as suggested at some prehistoric sites, eg Thompson 1999).

The selection of fuelwood is determined by a number of factors, including availability, burning properties and ritual considerations. The amount of wood required to cremate a human body is estimated at 300-500 kg (McKinley 1994), but this will depend upon the burning properties of the species chosen. Oak and ash are commonly utilised in Britain since they would provide the necessary high calorific heat to cremate a human body (Gale 1997), and these species were overwhelmingly dominant on the A120 sites in Essex (Challinor 2007), and the Pepper Hill cemetery in Kent (Challinor 2006). Hazel, beech, maple, blackthorn and the members of the Maloideae family – hawthorn apple, pear, service – all make good quality fuel, but alder and willow/poplar do not burn so well unless very well seasoned. It is notable that three of the burials with a range of taxa in the charcoal, contained unburnt bone (1060, 1195, 1215) indicating that the optimum temperature for the cremation of a human body had not been reached (see Boston and Marquez Grant, Chapter 5 above). These burials were all dated to the late 4th century and were in close proximity to each other. Their assemblages are similar; oak, hazel and hawthorn group forming the main fuelwood and a few other taxa in lesser quantities. Perhaps there was not sufficient wood to complete the cremation.

Pyre construction

In the absence of confirmed pyre locations, the evidence for the pyre construction is indirect. According to Vitruvius, a bier was placed on a pyre constructed of logs, each layer placed at right angles to the next (Hope 2007). Experimental evidence suggests a similar structure, built from large logs infilled with brushwood which acts as kindling and allows the circulation of air (McKinley 1994). Studies of *busta* and pyre sites in Kent (Challinor 2006) and Essex (Challinor 2007) have shown that oak and ash were usually used for the pyre construction, and also largely as fuelwood, with a few other lesser taxa for kindling. The assemblages at Lankhills are not easy to interpret in terms of timber construction, but the presence of *Arrhenatherum* (false oat grass) and *Conopodium* (pignut) tubers in nine burials/pyre deposits may relate to pyre construction.

There is evidence from other Roman sites which suggests that a wooden pyre was sometimes placed on top of a structure made out of turves or that the pyre was constructed over a pit or scoop (Campbell 2007). The widespread recovery of tubers and small rhizomes may reflect the exposure of roots and underground parts of plants to charring in the pit sides (ibid.). At Westhampnett, West Sussex, pyre sites were identified by a variety of shallow channels cut into the ground and filled with charcoal indicating this form of pyre construction (Gale 1997). Any comparable evidence from Lankhills would have disappeared through truncation at the site. However, there are two key pieces of evidence which suggest that the construction of the pyres over a pit was likely at Lankhills. Crucially, the associated remains of tubers, low growing grassland weeds and carbonised molluscs make the burning of subground or turves in cremation probable. The presence of burnt molluscs, in particular, is relevant as these would not be present if the plants had been uprooted for use as kindling (Mark Robinson, pers. comm.). Secondly, burning a pyre

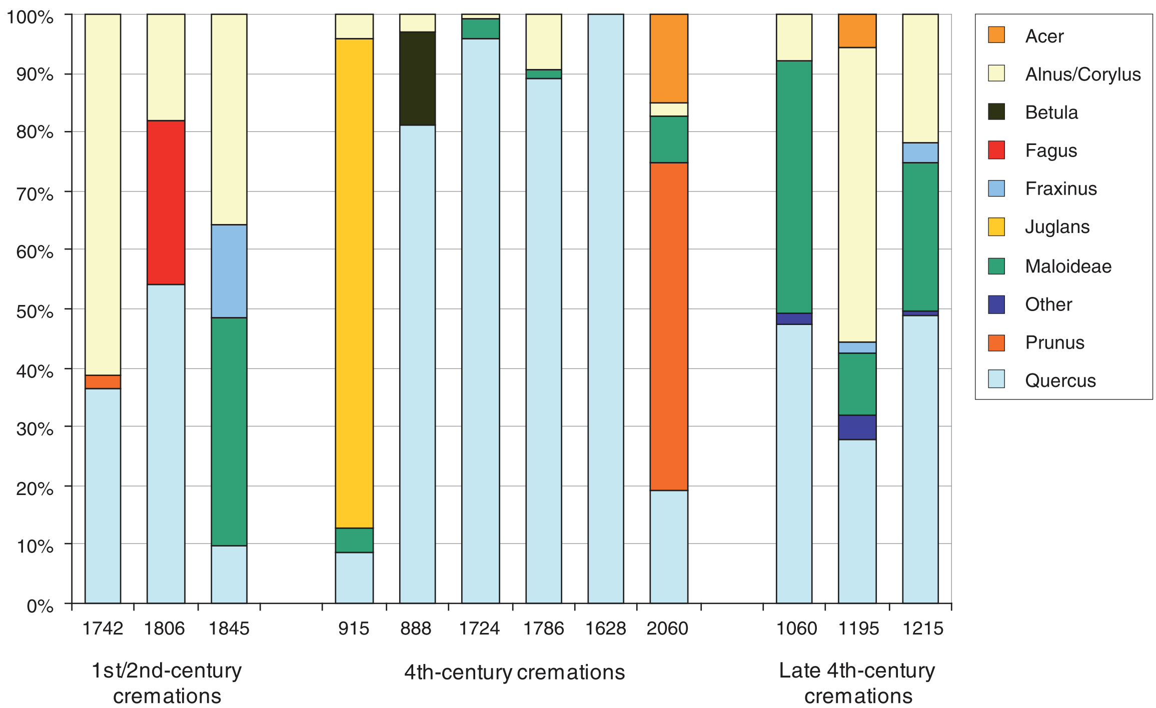

Fig. 6.3 Graph showing percentage of charcoal taxa per grave by phase (based upon fragment count)

over a pit would result in more reducing conditions, favouring the preservation of charcoal and charred remains. This would explain the excellent preservation of tubers and small rootlets in some of the samples.

Links with age/gender

The selection of fuelwood according to the gender or age of the deceased has been explored at other sites and two factors are suggested as relevant. The first is the sacred or ritual connotations of different woods. Tacitus (in the first century AD) noted that the German people observed the custom of burning the bodies of celebrated men with certain types of wood (*Germania*, 27). At Brougham, Cumbria a possible link between *Prunus* spp. (cherry/blackthorn) and male cremations has been suggested (Campbell 2004), but this is not supported by evidence from Kent (Challinor 2006) and Essex (Challinor 2007). Burial 2060 contained a significant quantity of blackthorn, but this was an infant burial, and unsexed. In this case, there were two samples analysed from this burial; from the urn itself and from the backfill of the grave. Similar assemblages were found in both, supporting the suggestion that some of the grave material may have derived from the disturbance of the urn. However, there was a greater quantity of blackthorn in the backfill, which might suggest mixing of pyre debris. Of course localised practices may have varied, and the evidence from Lankhills is inconclusive. One possible link is that the two 4th-century burials which were dominated by oak were probably female. However, since the other oak-dominated assemblages were unsexed, this association is tenuous.

Availability of fuelwood and pyre goods

The selection of wood for fuel will, of course, be influenced by availability in the local woodlands. However, the nature of the context will also be an affecting factor. Where people usually followed the 'principle of least effort' for the gathering of firewood (Shackleton and Prins 1992), this does not necessarily apply for cremation purposes. The dataset from Lankhills offers little useful insight into changes or the availability of certain taxa for use as fuelwood. The exploitation of mixed deciduous oak woodland is indicated, since oak is present in all of the samples. The latest (late 4th-century) cremations still produce a reasonable quantity of oak, and are not dissimilar in diversity to the earliest (1st/2nd-century) cremations. With the exception of the walnut, all of the taxa identified at Lankhills are native and could have been locally collected. It is worth noting that there is some beech in the assemblage, which represents secondary woodland in the area, often from plantings in later periods (Cox 1997).

Walnut was introduced to Britain by the Romans, but it is rarely found in the archaeological record, as wood or charcoal, at least before the medieval period (Smith 2002). It is thought to have remained an exotic and failed to naturalise in the same way as sweet chestnut, another Roman introduction (Rackham 2006, 27), but there is no reason to assume that the walnut from Lankhills did not come from home-grown timber. It is a medium dense wood, with reasonable burning properties, but was not generally used for fuelwood, as it is valued for its usefulness for furniture and decorative qualities (Gale and Cutler 2000). It seems likely that the walnut might have come from a decorative artefact placed on the pyre. It is also plausible that some of the diversity of species at Lankhills derives from wooden pyre goods, but this is impossible to determine from the charcoal.

Conclusions

The charcoal record from Lankhills contrasts with other Roman cemetery sites in the general lack of consistency in the selection of fuelwood for cremation. However, most of the cremations from Lankhills are unusually late in date for cremation practice and most relevant published data are of early-mid Roman date. Significantly, the examination of charcoal from two Romano-British cremations (one dating to the 1st century AD and the other to the 4th century AD) at Hyde Street, Winchester, revealed great taxonomic diversity in both assemblages (Gale 2004). Oak, hawthorn group, cherry/blackthorn, beech, birch, ash, field maple and possible willow/poplar were all identified. The strikingly similarity of this species list to that of Lankhills perhaps indicates a localised practice with indiscriminate selection of fuelwood, or some pressure on the availability of resources. The latter possibility is not borne out by the evidence from the early-mid 4th-century burials which were dominated by oak. Finally, there is evidence from the charred plant remains at Lankhills to suggest that some pyre construction consisted of a wooden structure built over a pit, which caused the burning of tubers, rootlets and molluscs. In general, the charcoal was small in size and quantity, indicating careful removal of bone from pyre debris prior to burial.

LAND SNAILS *by E C Stafford*

Introduction

The solid geology at Lankhills is Lower Chalk and the calcareous natures of the soils at the site are therefore generally conducive to the preservation of mollusc shell. Forty-three samples from a variety of feature types; pits, ditches, graves and layers dating from the 4th to early 5th centuries AD, were assessed to ascertain if the molluscan assemblages retrieved could provide data on the local site

Table 6.12: Assessment of mollusc assemblages

Feature type	Cremation					Ditch							Ditch					
Feature number	764					1307							1419					
Subgroup	845					1318							1420					
Drawing no	223					240							243					
Volume processed (kg)	0.3	0.2	0.1	0.2	0.2	1	1	1	1	1	1	1	1	0.8	1	1	1	1
Spit	1	2	3	4	7	-	-	-	-	-	-	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	0.00-0.05	0.05-0.10	0.10-0.15	0.15-0.20	0.20-0.25	0.40-0.45	0.45-0.50	0.05-0.10	0.10-0.15	0.15-0.20	0.20-0.25	0.25-0.30	0.30-0.35
context	766	766	766	766	766	1312	1312	1312	1312	1312	1308	1308	1421	1421	1421	1421	1421	1421
sample no.	1555	1555	1555	1555	1555	1521	1521	1521	1521	1521	1522	1522	1494	1495	1496	1497	1498	1499
TAXA																		
Catholic species																		
Cochlicopa spp.	+				+								+					+
Trichia hispida (Linné)	++	+	+	+		+							++	+++	++	++		
Open country species																		
Truncatellina cylindrica (Férussac)	+																	
Vertigo pygmaea (Draparnaud)														+	+			
Pupilla muscorum (Linné)	++	++	++	++	++	+							+	++	+		+	+
Vallonia costata (Müller)	++			+									++	++	++	+	+	+
Vallonia excentrica (Sterki)	++	++	+	++	+	+							++	++	+			+
Helicella itala (Linné)	+		+	+	+								+	++			+	
Shade-loving species																		
Carychium tridentatum (Risso)														+	+			
Acanthinula aculeata (Müller)																		
Discus rotundatus (Müller)								+										
Vitrea spp.								+		+	+		+	+				
Aegopinella nitidula (Draparnaud)														+			+	
Oxychilus cellarius (Müller)								+	+					+				
Total estimated number	40	15	15	15	10	3	0	3	1	1	1	0	40	60	25	10	4	6

Table 6.12 (continued): *Assessment of mollusc assemblages*

Feature type	*Buried soil*		*Grave*							*Pit*				*Pit*			
Feature number	-		*1619*							*1623*				*1645*			
Subgroup			*1622*							*1623*				*1645*			
Drawing no	*255*		*255*							*255*				*256*			
Volume processed (kg)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Spit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
context	*1629*	*1629*	*1632*	*1632*	*1630*	*1630*	*1628*	*1620*	*1620*	*1626*	*1627*	*1627*	*1627*	*1652*	*1652*	*1652*	*1652*
sample no.	*1319*	*1326*	*1320*	*1321*	*1322*	*1323*	*1327*	*1324*	*1325*	*1331*	*1330*	*1329*	*1328*	*1338*	*1339*	*1341*	*1342*
TAXA																	
Catholic species																	
Cochlicopa spp.	++	++	++	++	+	+	++			++	+++	+++	++	+	+	+	
Trichia hispida (Linné)	+++	+++	+++	++	++	++	++			+++	++++	++++	+++	+++	++		
Open country species																	
Truncatellina cylindrica (Férussac)		+					+					+					
Vertigo pygmaea (Draparnaud)												+					
Pupilla muscorum (Linné)	+++	++++	+++	+++	+++	+++	+++	+		++++	++++	++++	+++	++++	+++	+++	+++
Vallonia costata (Müller)	+++	+++	++	++	++	+	++	+	+	+++	++++	++++	+++	+	+	+	+
Vallonia excentrica (Sterki)	++++	+++	+++	+++	+++	+++	+++	+		++++	+++	++++	+++	+++	+++	+	
Helicella itala (Linné)	++	++	++	++	++	++	++	+		++	+++	+++	++	++	++	++	
Shade-loving species																	
Carychium tridentatum (Risso)																	
Acanthinula aculeata (Müller)														+			
Discus rotundatus (Müller)					+	+		+						+	*		
Vitrea spp.				+													
Aegopinella nitidula (Draparnaud)	+				+	+											
Oxychilus cellarius (Müller)																	
Total estimated number	150	130	150	60	100	80	80	10	1	200	>200	>350	170	150	100	50	30

Table 6.12 (continued): Assessment of mollusc assemblages

Feature type	*Ditch*							
Feature number	*1830*							
Subgroup	*450*							
Drawing no	*268*							
Volume processed (kg)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Spit	-	-	-	-	-	-	-	-
Depth (m)	*0.00-0.05*	*0.05-0.10*	*0.10-0.15*	*0.20-0.25*	*0.25-0.30*	*0.30-0.35*	*0.35-0.40*	*0.40-0.45*
context	*1811*	*1811*	*1809*	*1809*	*1808*	*1808*	*1809*	*1808*
sample no.	*1447*	*1448*	*1449*	*1451*	*1452*	*1453*	*1454*	*1455*
TAXA								
Catholic species								
Cochlicopa spp.	++	++	++	+	+	+	+	
Trichia hispida (Linné)	++	+++	+++	+++	++	+		
Open country species								
Truncatellina cylindrica (Férussac)							+	
Vertigo pygmaea (Draparnaud)								
Pupilla muscorum (Linné)	++++	++++	++++	+++	++	++	+++	++
Vallonia costata (Müller)	++	++	+++	+++	++	++	+	
Vallonia excentrica (Sterki)	+++	++++	++++	+++	+	++	++	++
Helicella itala (Linné)	++	+++	++	+++	+	+	++	
Shade-loving species								
Carychium tridentatum (Risso)								
Acanthinula aculeata (Müller)								
Discus rotundatus (Müller)								*
Vitrea spp.								
Aegopinella nitidula (Draparnaud)								
Oxychilus cellarius (Müller)								
Total estimated number	130	200	250	150	30	25	40	15

environment for the various phases of activity represented. At the most basic level the assessment aimed to determine the presence/absence of molluscan remains, give preliminary data on taxonomic content and indicate the potential for further work.

Methodology

All samples were processed at Oxford Archaeology. Assessment was carried out on small samples, between 0.2 and 1.0 kg, specifically collected for the retrieval of molluscs. The sediment was floated in water onto 0.5 mm mesh and the flots dried. The residues were also sieved to 0.5 mm and dried. The flots were then scanned under a binocular microscope at magnifications of x10 and x20. Flotation was generally found to have given adequate shell recovery for assessment purposes.

The abundance of taxa was recorded on a sliding scale of + (present, 1-3 individuals), ++ (some 4-11), +++ (many 12-50), ++++ (abundant >50). An estimate was also made of the total number of individuals in each flot excluding *Cecilioides acicula*. This species was excluded because it burrows deeply and provides no useful information on conditions as a sediment or soil formed. *C. acicula* can be extremely numerous and its inclusion in the total tends to obscure the indications from the other species.

Results

The results are presented in Table 6.12. For the purposes of assessment the species are grouped at a very basic level by ecological preferences following Evans (1972; 1984). Nomenclature follows Kerney (1999). Overall preservation and abundance of shell was found to be moderate to good, although frequent carbonate encrustation prevented identification of some specimens to species level.

On the whole features such as ditches that silt up naturally are the most useful in which to examine mollusc assemblages. Pits and graves are often/usually deliberately backfilled leading to complex taphonomic problems. As well as shells that could potentially represent individuals living within the feature and those from the surrounding environment, assemblages may also contain residual shells from the soil used to backfill. However some useful broad environmental inferences can usually be made.

Overall, although molluscs were abundant in many of the samples assessed, the composition of the assemblages was very similar with little indication of spatial or temporal variability. All assemblages were of low diversity, dominated by a few open country species. Numerically important species included *Vallonia costata* and *V. excentrica, Pupilla muscorum, Helicella itala* and the rare obligate xerophile *Truncatellina cylindrica* was noted in three samples. The catholic species *Trichia hispida* was also abundant. Shade-demanding species were virtually absent apart from very occasional zonitids, and single specimens of *Discus rotundatus* and *Carychium tridentatum.*

The paucity of shade-demanding species, low diversity and species composition suggests that a long established, very open and dry environment, prevailed sometime prior, during and subsequent to the occupation of the site. The character of the assemblages is consistent with short-turved grassland, possibly well-grazed or trampled, with patches of disturbed bare ground. There is no real indication of significant areas of shade such as scrub or unkempt grassland in the vicinity The small shade-demanding component may represent a residual component hinting at previously less open conditions, though they could also reflect microenvironments prevailing within features as they infilled. Indeed the association of *Oxychillus cellarius*, *Discus rotundatus* and *Vitrea* spp. in some samples may be considered reminiscent of Evans' troglophile faunas of rock rubble habitats (Evans and Jones 1973). Certainly the very low numbers of even the more catholic of the shade-lovers within the ditch fills perhaps suggests that the features themselves were being maintained/grazed during the period of infilling.

Conclusion

The assessment served well in revealing the general character of the local environment for the period of activity represented at the site. However, the limited diversity of individual assemblages, and their similarity to one another means that it is unlikely that further work would provide any significant additional ecological information regarding the local environment.

SOIL MICROMORPHOLOGY, CHEMISTRY AND MAGNETIC SUSCEPTIBILITY

by Dr Richard I Macphail and Dr John Crowther

Introduction

Two monoliths (1335 and 1345), from sections 255 and 256 respectively, and associated bulk soil samples were examined. The two monoliths were taken through pit fill deposits in an area of intercutting graves, cremations and pits associated with the use of the late Roman cemetery. A layer 1629 (=1654=1655) sealed many of these features, and was itself cut by later graves. The chief objective of the soil micromorphological, chemistry and magnetic susceptibility study was to establish whether this buried soil was a turfline, as interpreted on site, and if so how long it had taken to form.

The results of the examination of the monoliths are summarised in the text below and in Tables 6.13 and 6.14. A more detailed report is placed with the site archive.

Samples and methods

Monoliths 1335 and 1345 were subsampled and upper contexts conserved in resin, in order to identify more accurately boundaries (in the sawn resin-impregnated blocks) between contexts in these highly stony fills, which in the case of 1345 was fragmented. Thin sections M1335 and M1345 sampled across the 1629-1627 and 1654-1653 context boundaries (Table 6.14).

Bulk samples 1627, 1629, 1653 and 1654 were analysed for chemistry and magnetic susceptibility. Under natural conditions all three properties (LOI, fractionated P and magnetic susceptibility including χmax; see below) would be expected to be higher in samples from a former turfline, and both phosphate and magnetic susceptibility would be likely to show further enhancement as a result of human activities on a former ground surface. It should be noted that the contexts are all highly calcareous. The presence of chalk will not only 'dilute' any anthropogenic signatures, but variability in chalk content between the samples could well lead to somewhat spurious results. The results from just four samples therefore need to be interpreted with caution, especially in the absence of a control sample(s).

Discussion and conclusions

The site, in the northern part of Winchester, occurs on Brown rendzina soils formed on Chalk (Andover soil association; Jarvis *et al*. 1983). Pit fills 1627 and 1653 from sections 255 and 256 are highly chalky, calcareous soil fills. They are poorly humic in terms of their LOI, but significantly, *more* humic compared to overlying contexts 1629 and 1654 (Table 6.13). The fills contain coarse (eg burned flint) and fine (mainly very fine charcoal, rubefied very fine mineral grains and examples of round/spherical iron droplets) anthropogenic inclusions, the burned material and examples of these spherical droplets producing an enhanced magnetic susceptibility (Table 6.13). Fill 1653 seems to contain a few more burned flint and anthropogenic materials (including coprolitic bone fragments), compared to 1627. Fine organic tissue and organ remains, as well as a possible humified seed, also occur in slightly higher (but still rare) amounts. This slight difference may be reflected in the very slightly higher LOI and phosphate-P concentrations (Table 6.13). The fills are rather enigmatic, because although containing humus-stained land snail fragments, earthworm granules, and the excrements of small to very small invertebrate mesofauna (eg earthworms, and Enchytraeids and Collembola, respectively), they do not resemble humic topsoil deposits, as found for example at Overton Down, where rendzina soils have infilled a ditch (Macphail and Cruise 1996). The organic matter that these contain, rather than being soil humus, could be the oxidized and humified remains of organic matter dumping/ inputs of unknown but possibly coprolitic waste origin; certainly earthworm-worked and oxidized upper cess pit fills may contain highly reduced amounts of organic matter and phosphate compared to basal fills (cf. 12th-century Monkton, Kent; lower fill: 19.6% LOI, 4500 ppm P2O5; upper fill: 4.7% LOI, 700 ppm P2O5; Macphail *et al*. 2000, table 8.1). There is also some likelihood that wet soil slurries were being dumped (in 1627). It seems probable that these fills were also influenced by wind-blown very fine charcoal, burned mineral grains, and on occasion, by ferruginous aerosol droplets, all of which could have been derived from contemporary late Roman cremations which occurred within just a few metres of these pits. The lack of any phosphate enrichment in these soils, however, appears to be enigmatic as it would be expected that ash and burned human remains would contribute to raising phosphate levels (as noted in a shallow ditch fill surrounding a Saxon cremation feature at Sutton Hoo, Suffolk; Macphail and Crowther 2008). Alternatively, fine charcoal and burned mineral particles may have derived from more distant and as-yet unknown Roman industrial activity (for instance carried in a smoke plume).

The uppermost fill in section 255, ie context 1629, contains no coarse anthropogenic inclusions (such as burned flint), and is more biologically worked and homogenized compared to context 1627 below which still retains some features of being formed in a wet state. Context 1629 therefore has the structural characteristics of being a turf line, but not the expected humus content (in terms of its chemistry or soil micromorphology) and more likely reflects rapid subsoil silting of the pit sides into the pit (or dumping/back filling); such fills can be rapidly worked and homogenized by biological activity over a season(s) (cf. Overton Down rendzinas; Crowther *et al*. 1996; Macphail and Cruise 1996; see also Babel 1975; Bal 1982). Moreover, the dominant subsoil microfabric of SMT 1c in context 1654, despite inclusions of relict organic matter fragments, again suggests rapid filling from subsoil silting/deliberate infilling (as suggested by its stony character), rather than the slow formation of a turf line. The presence of coprolitic bone could also be associated with scavenging of unburned bone associated with cremations – bird excrement, for example, has been found in (animal) cremation features at Roman Scole, Norfolk (Ashwin and Tester forthcoming).

The pit fills at Lankhills reflect the nearby cremation burials, through their magnetic susceptibility and included fine burned material. They appear to have been sealed by rapid 'silting' or possible backfills of very poorly humic and chalky subsoil material, which also records these nearby cremations. Rapid biological working of these upper layers has taken place, but no earthworm sorting or topsoil humus accumulation took place.

RADIOCARBON DATING

Ten samples, all of human bone, were submitted for radiocarbon dating to the Rafter Radiocarbon Laboratory, New Zealand. The aim of the radiocarbon dating programme was to try to refine questions of chronology relating to the earliest and latest stages of the excavated burial sequence. Features in the early part of the sequence included

Table 6.13: Soil sample chemical and magnetic susceptibility data

Context	Description	LOI (%)	Phosphate-Pi ($mg\ g^{-1}$)	Phosphate-Po ($mg\ g^{-1}$)	Phosphate-P[a] ($mg\ g^{-1}$)	Phosphate-Pi:P (%)	Phosphate-Po:P (%)	$X(10^{-8}$ SI)	X^{max} (10^{-8} SI)	X^{conv} [b] (%)
Section 255: Monolith 1335										
1629	Buried soil	1.47	0.651	0.169	0.820	79.4	20.6	22.1	290	7.62*
1627	Upper pit fill	1.98	0.782	0.305	1.09	71.9	28.1	33.6	516	6.51*
Section 256: Monolith 1345										
1654	Buried soil	2.26	0.925	0.314	1.24	74.7	25.3	33.8	534	6.33*
1653	Pit fill	2.51	0.832	0.377	1.21	68.8	31.2	35.5	497	7.14*

[a] Phosphate-P: the concentrations recorded are all quite low, and none of the contexts shows clear signs of enrichment
[b] X^{conv}: all four samples are highlighted to indicate likely enhancement, though none of the samples are 'strongly enhanced':
* = 'enhanced' (5.00–9.99%)

Table 6.14: Soil micromorphology - samples and counts

Monolith	*Sample*	*Layer*	*Depth*	*Relative Microfacies*	*SMT*	*Voids*	*Chalk*	*Flint*	*Landsnail shell*	*Biogenic calcite*	*Burned flint*	*Rubefied grains*
1335	M1335	Context 1629	80-125 mm	A2	SMT 1b (1a)	40%	fff		aa	a		aa
		Context 1627	125-150 mm	A1	SMT 1a (1b)	30%	fff	*	aa	a	a	aa
1345	M1345	Context 1654	60-85 mm	B1	SMT 1c	55%	ffff	*	aa	a		
		Context 1653	85-140 mm	A2	SMT 1b	55%	ffff	f	aa	a	aa	aa

Sample	*Layer*	*Iron droplet?*	*Iron Fragment*	*Burned clay*	*Coarse Charcoal*	*Coprolitic bone*	*Coprolitic seed?*	*Matrix coatings*	*Thin burrows*	*Broad burrows*	*Thin Excrements*	*Broad Excrements*
M1335	Context 1629	a-1			a				aaa	aaaaa	aaa	aaaaa
	Context 1627				a			aa	aaa	aaaaa	aaa	aaaaa
M1345	Context 1654				a	a-4			aaa	aaaaa	aaa	aaaaa
	Context 1653	a*	a-1	a-1	a	a-3	a-1		aaa	aaaaa	aaa	aaaaa

* - very few 0-5%, f - few 5-15%, ff - frequent 15-30%, fff - common 30-50%, ffff - dominant 50-70%, fffff - very dominant >70%
a - rare <2% (a*1%; a-1, single occurrence), aa - occasional 2-5%, aaa - many 5-10%, aaaa - abundant 10-20%, aaaaa - very abundant >20%

Table 6.15: Summary of radiocarbon dates in Grave group number order

Grave group no.	*Skeleton no.*	*Burial type*	*Dated material*	*NZA lab no.*	*Conventional age*	*Calibrated 68% confidence*	*Calibrated 95% confidence*	*Earliest possible 'archaeological' date*	*Comment*
87	157	Inhumation	Human bone	29973	1756 ± 35 BP	AD 238-336	AD 141-152 & AD 169-388	350 pottery	associated pottery vessel (230) dated AD 350-400+, note that 3 out of 4 egs in Clarke are in graves dated after 380
655	607	Cremation ('*bustum*' type)	Human bone	30117	1644 ± 30 BP	AD 348-369 & AD 379-433	AD 267-272 & AD 335-465 & AD 482-533	352 coin	associated pottery vessel (606) dated AD 340-400+; latest burial in sequence in this part of the site, cutting Grave 1010 with a coin of AD 352-3
1175	1119	Inhumation	Human bone	29975	1731 ± 35 BP	AD 254-346 & AD 373-377	AD 237-400	388 coin	coin dated 388-395, also 'late' buckle and knife; burial cuts eastern ditch
1385	1438	Inhumation	Human bone	29974	1732 ± 35 BP	AD 253-346 & AD 373-376	AD 236-400	270 pottery	1 sherd NFCC pottery in grave backfill; cuts northern boundary ditch
1440	1441	Inhumation	Human bone	29977	1725 ± 35 BP	AD 256-304 & AD 315-352 & AD 367-381	AD 240-401	388 coin	grave goods include vessels and 5 coins, 2 dated 388-402; latest burial in sequence in NW corner of site
1491	1488	Inhumation	Human bone	30158	1703 ± 25 BP	AD 263-279 & AD 329-389	AD 257-303 & AD 316-408	330 context date?	latest burial in sequence in this part of site, above group of cremations, cuts 'turf line' of late 3rd-4th century date. Coin of 260-268 residual in backfill of grave
1622	1621	Inhumation	Human bone	29976	1767 ± 35 BP	AD 227-265 & AD 274-335	AD 138-380	270 later than burial 1904	vessel 1592 (dated 270-350) inverted above grave fill and presumed associated; beneath 'turf line', cuts cremation burial 1904
1845	1843	Cremation	Human bone	30237	1977 ± 25 BP	AD 2-60	38 BC-AD 60	300 cremation urn	later than undated pits, only other secure relationship is beneath 'turf line' of AD 330(+)
1846	1848	Inhumation	Human bone	29978	1701 ± 35 BP	AD 261-282 & AD 325-397	AD 255-414	?360 metal objects	grave goods are gilded crossbow brooch, silver belt fittings and spurs
1904	1749	Cremation	Human bone	30116	1831 ± 35 BP	AD 134-223	AD 84-254 & AD 308-312	?*	cuts undated pit, beneath 'turf line' of AD 330(+)

*Another ?burial (1547, no body) in this cluster of features has a horse skull and a coin of AD 330-331.
The latter provides a tpq for the overlying 'turf line' and may suggest a date for the closely associated but otherwise undated cremation burials.

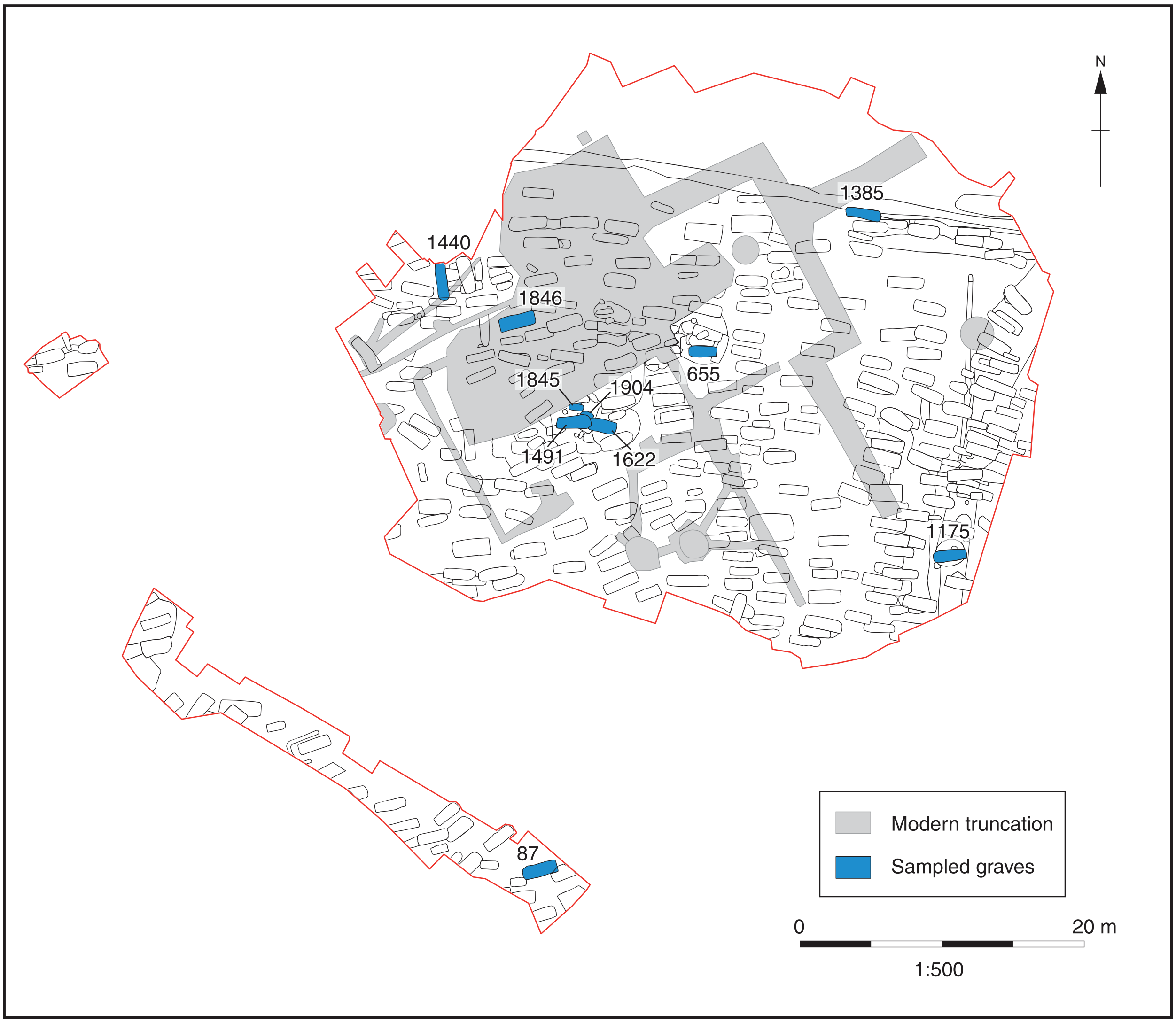

Fig. 6.4 Location of graves sampled for radiocarbon dating

undated cremation burials. The question about these concerned their relationship to the rest of the sequence; did they immediately predate the main 4th-century burial sequence, or did they represent funerary activity on the site over a longer period of time prior to the establishment of the late Roman cemetery?

A number of the latest burials from the cemetery were selected for dating because it was thought desirable to obtain dates supplementary to, but independent of, artefact-based and historical chronologies. In particular it was hoped that radiocarbon dates might shed some light on the date of the end of use of the cemetery. The selected burials included ones which were stratigraphically the latest in particular areas of the site, and ones for which there was some artefact dating, including two burials with a terminus post quem of AD 388 on coin evidence. The locations of the burials selected for dating are shown in Figure 6.4.

The dated samples are listed in Grave number order in Table 6.15, in which key archaeological information is also given. The dates, calibrated using OXCAL v4.0.5, are presented graphically in Figure 6.4.

The dates are discussed further in Chapter 7 below. Here it suffices to note a very early (possibly pre-Roman) date for one of the cremation burials, although it subsequently emerged that this burial was associated with late Roman pottery, and the generally consistent, broadly 4th-century date ranges assigned to most of the dated inhumation burials. These ranges do not sit particularly well with the later – and in some cases very late – 4th-century dates indicated by the associated artefacts in some of the graves.

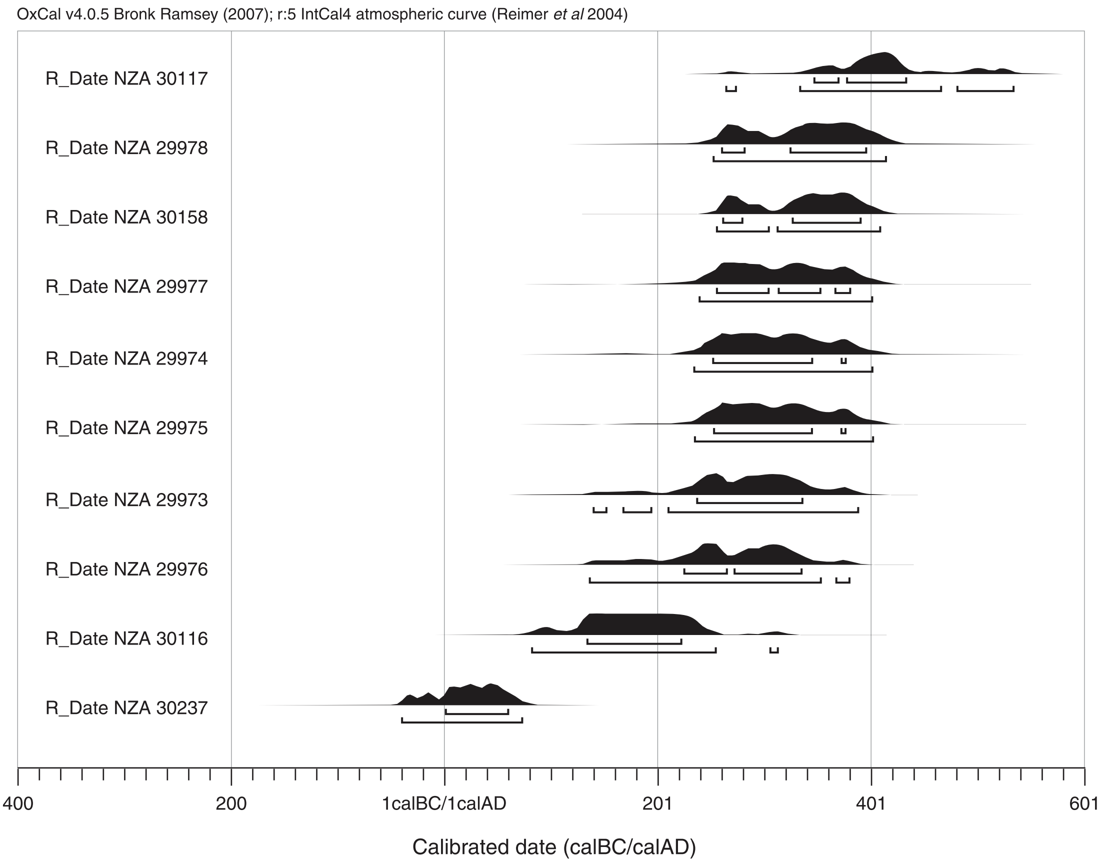

Fig. 6.5 Radiocarbon dates