Chapter 8: Environmental Evidence

ANIMAL BONE

Middle Duntisbourne and Duntisbourne Grove
By Adrienne Powell

Introduction

Almost all of the excavated animal bone from Duntisbourne Grove and Middle Duntisbourne) came from the enclosure ditches (98% and 99% respectively). This simplifies comparisons between the two sites as the complicating factors of intra-site variation in disposal and survival can be discounted. For the same reason, however, comparisons with other sites are rendered difficult: at sites where a variety of features have produced animal bone, comparison of the feature types can show the impact of these factors on species representation, whereas it is impossible to judge the extent of their biasing effect in the Duntisbourne assemblages. Most aspects of the two assemblages are discussed separately by site. Others, however, such as the size of the livestock, are considered together to facilitate comparison with other sites in the area.

Methodology

Bone has been identified to species where possible, and sheep and goat bones have been distinguished using the criteria of Boessneck (1969) and Payne (1985). The sheep- and cattle-sized categories include vertebrae, which could not be identified to species, and ribs. Bone in these categories has not been included in the percentage of identifiable bone, although this figure does include fragments which were only identifiable as bird.

The assemblage was recorded using the zonal system described by Serjeantson (1996). This produced a basic fragment count, or number of identifiable specimens (NISP). Since differential fragmentation and survival may affect the relative proportions of species and anatomical elements present in an assemblage, the minimum number of elements (MNE) was used in addition to the NISP. This was based on the sum of the most frequent zone for each element and was calculated for the three main domestic animals only. Minimum numbers of individuals (MNI) were derived from the most common element in the MNE counts for these species, taking size into account.

The incidence of burning and butchery was quantified, with the latter categorised as either chop marks or knife cuts. The incidence of carnivore and rodent gnawing was also recorded. Root etching was ubiquitous in both assemblages. Since this will have affected the observed incidence of butchery and gnawing as well as indicating the degree of post-depositional alteration, the amount of root etching was assessed for each context as a whole as: light, where etch lines are present on few or none of the bones; moderate, a greater incidence and more of a fragment's surface area affected; or heavy, where the majority of fragments and most or all of the surface area are affected.

Ageing was based on tooth wear and epiphyseal fusion, although the latter is generally less reliable. Timing of epiphyseal closure is based on Sisson and Grossman (Getty 1975). Tooth wear was recorded after Grant (1982), and attribution to wear stages and respective ages was based on Payne (1973) for sheep and goats, Halstead (1985) for cattle and O'Connor (1988) for pigs. Age was also estimated for horse from measurements of the crown heights of cheek teeth, following Levine (1982).

The material was sexed where possible: horses, cattle; sheep and goats using pelves (Getty 1975, Grigson 1982), and pigs using the morphology of the upper and lower canine teeth (Schmid 1972).

Measurements taken are based on von den Driesch (1976) and Payne and Bull (1988). Data accumulated and validated in the Animal Bone Metrical Archive Project (Centre for Human Ecology 1995) for contemporary sites in southern England were used for comparison.

Duntisbourne Grove

The species composition is summarised in Table 8.1 for both hand-retrieved and sieved bone. There is a total of 4518 fragments in the hand-retrieved assemblage, of which only 571 (13%) are identifiable to species. Only mammal bones are represented and these consist primarily of cattle, sheep/goat and pig (95%), with a small amount of horse and a few wild mammal bones. Sheep bones are present, but no goat bone has been identified; therefore all sheep/goat remains are subsequently referred to as sheep. The sieved bone does not add to the species list.

Table 8.1 Summary fragments count, Duntisbourne Grove.

Taxon	Hand	Sieved	Total	
			No.	%
Horse	26		26	4
Cattle	339	5	344	59
Sheep/goat	71	2	73	13
Sheep	8		8	1
Pig	124	1	125	22
Roe deer	2		2	0.3
Fox	1		1	0.2
Cattle-sized	54	5	59	
Sheep-sized	10	2	12	
Unidentified	3883	132	4015	
Total	4518	147	4665	
% Identified	13		12	

Most of the bone (84% of hand-retrieved fragments) came from the southern linear ditch, 9; and half of the remainder came from ditch 8.

Table 8.2 summarises some taphonomic characteristics of the assemblage; unidentified bone is excluded. The severity of root etching is immediately apparent. This, and the high proportion of isolated teeth, indicate substantial post-depositional alteration of the bone. As a consequence of the high degree of root etching there is little evidence of either gnawing or butchery and the types of butchery marks present also show the effect of etching. Chop marks are more frequent than knife cuts, in contrast to the usual pattern at Iron Age or rural Romano-British sites such as Birdlip Bypass and Birdlip Quarry (Dobney and Jaques 1990; Ayres and Clark nd.), but the fine, shallow nature of knife marks makes them more vulnerable to obliteration by root erosion. No rodent gnawing was observed but, as with knife marks, this would be more easily obscured or destroyed by root etching than would canid gnawing. Burnt bone is also infrequent.

The fragmentation in the identifiable material is a further indication of the poor preservation: less than one third of the fragments were more than 50% complete (five or more zones present). Although this is a greater proportion than at Middle Duntisbourne (less than one quarter) where the bone is in better condition (see below), in view of the degree of root etching and frequency of loose teeth at Duntisbourne Grove this is likely to be due to reduced identifiability of small fragments.

Relative abundance of the main domestic mammals

The relative abundance of the three main domestic animals is compared in Figure 8.1 using the different methods of quantification (NISP, MNE, MNI). Whichever method is used, cattle remains are the most frequent, with pig the next most frequent and sheep bones a relatively minor component. This pattern is an unusual one for contemporary sites in the Cotswolds and it is probable that differential preservation has, to some extent, biased the assemblage.

Analyses of Iron Age assemblages have often shown (Maltby 1981; Maltby 1985; Wilson 1996) that

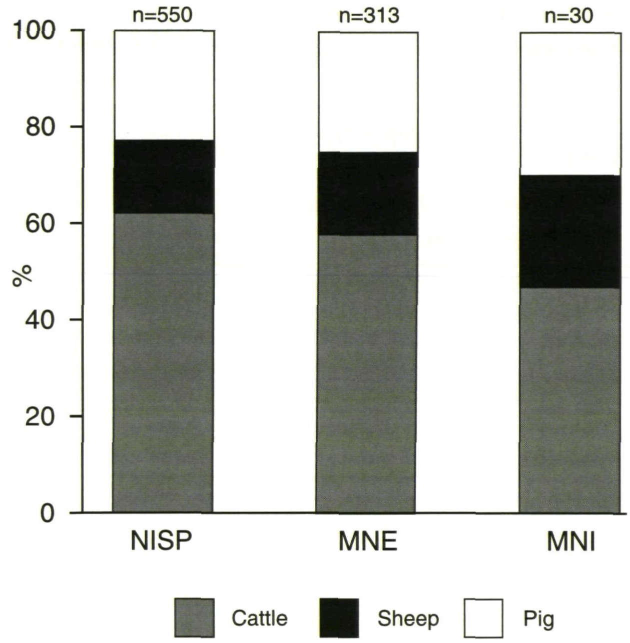

Figure 8.1 Representation of the main domestic species at Duntisbourne Grove.

cattle remains are more common, compared with sheep and pig, in ditches, particularly external ones, than in other features and in some cases this can be clearly linked to the adverse preservational environment of an open ditch biasing the assemblage in favour of the more robust bones of cattle. For example, at Rooksdown (Powell and Clark 1996) the proportion of loose teeth in the ditches (19–27%) was comparable with Duntisbourne Grove, and far higher than in pits; likewise, the relative frequency of cattle bones was greater in the ditches.

Hence the source contexts of the assemblage and the high representation of loose teeth at Duntisbourne Grove suggest potential survival bias in favour of cattle. The representation of body parts in the three main species corroborates this.

The minor contribution of sheep is unusual for this period and this region, where sheep husbandry is an important part of the economy at most sites of middle

Table 8.2 Taphonomy of the animal bone assemblage from Duntisbourne Grove.

Type	Degree			Total No.	Total %
Root etching (by context)	Light	Moderate	Heavy		
	11	25	64	44	
Burned	Charred	Calcined			
	33	67		6	1
Gnawed	Surface	Heavy			
	92	8		36	6
Loose teeth	-	-	-	144	25
Butchered	Chopped	Cut	Sawn		
	63	13	25	16	2

Iron Age date (Cunliffe 1991). That this is not simply poor survival of the smaller domesticates is suggested by the contrasting high representation of pig which distinguishes this site from others in the region. Differential disposal of pigs and sheep might have had some role in this pattern: for example, at Birdlip Quarry (Ayres and Clark nd.) pig bones comprised a greater proportion of the domestic mammal material from ditch contexts (19% in Period 1 and 31% in Period 2) than in the assemblage as a whole (8% in both periods). However, at Duntisbourne Grove the suite of terrestrial molluscan species present indicates a locally wooded environment (see Robinson, chapter 8) which would indeed have been more supportive of non-intensive pig husbandry than sheep herding.

Body part representation and butchery

The distribution of cattle, sheep and pig skeletal elements in the assemblage is shown in Table 8.3. The various skeletal elements of cattle and sheep have a similar pattern of occurrence: predominantly limb bones, followed by girdle bones then other elements. The main differences between these two species are the smaller numbers of sheep carpals, tarsals and phalanges, and the greater number of cattle mandibles. The former is a common observation and is a retrieval bias, while the latter may reflect differential disposal or preservation. Pig skeletal elements are more evenly represented.

This pattern is also demonstrated in Figure 8.2, which shows (for each species) the actual number of body parts present as a percentage of the figure expected if whole carcasses were deposited, derived from the MNI. Only elements occurring in all three species are included: hence horn cores, fibulae, lateral phalanges and metapodials, and carpals and tarsals (with the exception of the astragalus and calcaneus) are excluded. In addition, the elements have been grouped into anatomical regions: *head* comprises skull and mandibles; *axial* is atlas, axis, scapula and pelvis; *limb* is the major limb bones; and *extremities* includes astragalus, calcaneus, metapodials (the MNE is halved for pig) and medial phalanges. Table 8.3 suggests that all parts of an animal's carcass eventually found their way into the ditches, and, with the possible exception of cattle mandibles, it seems that in general there was no appreciable systematic bias between species in the disposal of any skeletal parts. Hence the results in Figure 8.2 are due to differential survival and retrieval.

The figure shows that cattle body parts, particularly mandibles and with the exception of axial elements, have survived better than those of sheep and pig, whereas sheep are poorly represented by all except limb bones. The even representation of pig skeletal elements, observed in Table 8.3, is apparent here in the consistent degree of survival of head, axial and limb elements. The better representation of head parts in comparison with sheep and cattle is due to their more solid and robust structure.

Table 8.3 Minimum number of elements of the main domestic mammals at Duntisbourne Grove.

Element	Species			Total
	Cattle	Sheep	Pig	
Horn core	7	-	-	7
Cranium	3	1	4	8
Mandible	17	3	5	25
Atlas	2	1	-	3
Axis	1	-	-	1
Scapula	9	4	8	21
Humerus	19	7	7	33
Radius	9	6	8	23
Ulna	5	1	2	8
Pelvis	10	4	14	28
Femur	7	1	3	11
Tibia	28	9	12	49
Astragalus	11	1	1	13
Calcaneus	14	1	2	17
Tarsals	5			5
Carpals	3			3
Metacarpal	12	3	4	19
Metatarsal	4	6	2	12
Lateral metapodial	-	-	4	4
Phalanx I	11	1	1	13
Phalanx II	6	1	1	8
Phalanx III	2			2
Total	185	50	78	313
% main domestics	59	16	25	
MNI	15	6	9	30
% MNI	50	20	30	

There are several sets of articulating bone in the assemblage although erosion of the bone surface often made it difficult to be certain that two bones did articulate. Those groups present are all cattle: a left distal humerus with proximal radius and ulna; a left and a right radius/ulna pair; one left metacarpal with articulating first phalanges; two left metatarsals with articulating first phalanges; a right distal tibia with astragalus and calcaneus; and a left metatarsal with navicular-cuboid, lateral cuneiform, one first and one second phalanx. The phalanges of this last group are fused while the metatarsal is distally unfused; this indicates that the animal was between two and a half and three years old. This group is also the only one which shows any evidence of butchery: the first phalanx exhibited a chop mark at the proximal end which may be the result of skinning. All of these articulating groups came from ditch group 9.

The distribution by species of the sparse butchery evidence is given in Table 8.4: most of the observed butchery marks occur on cattle bones, unsurprisingly since they are the most frequently occurring in the assemblage but this also represents the highest frequency within a species, 4% in contrast to the 1% of both sheep and pig material. The sawn elements are all horn cores with saw marks at the base where the horn sheath was removed. The remainder of the butchery marks on cattle bones indicate division of

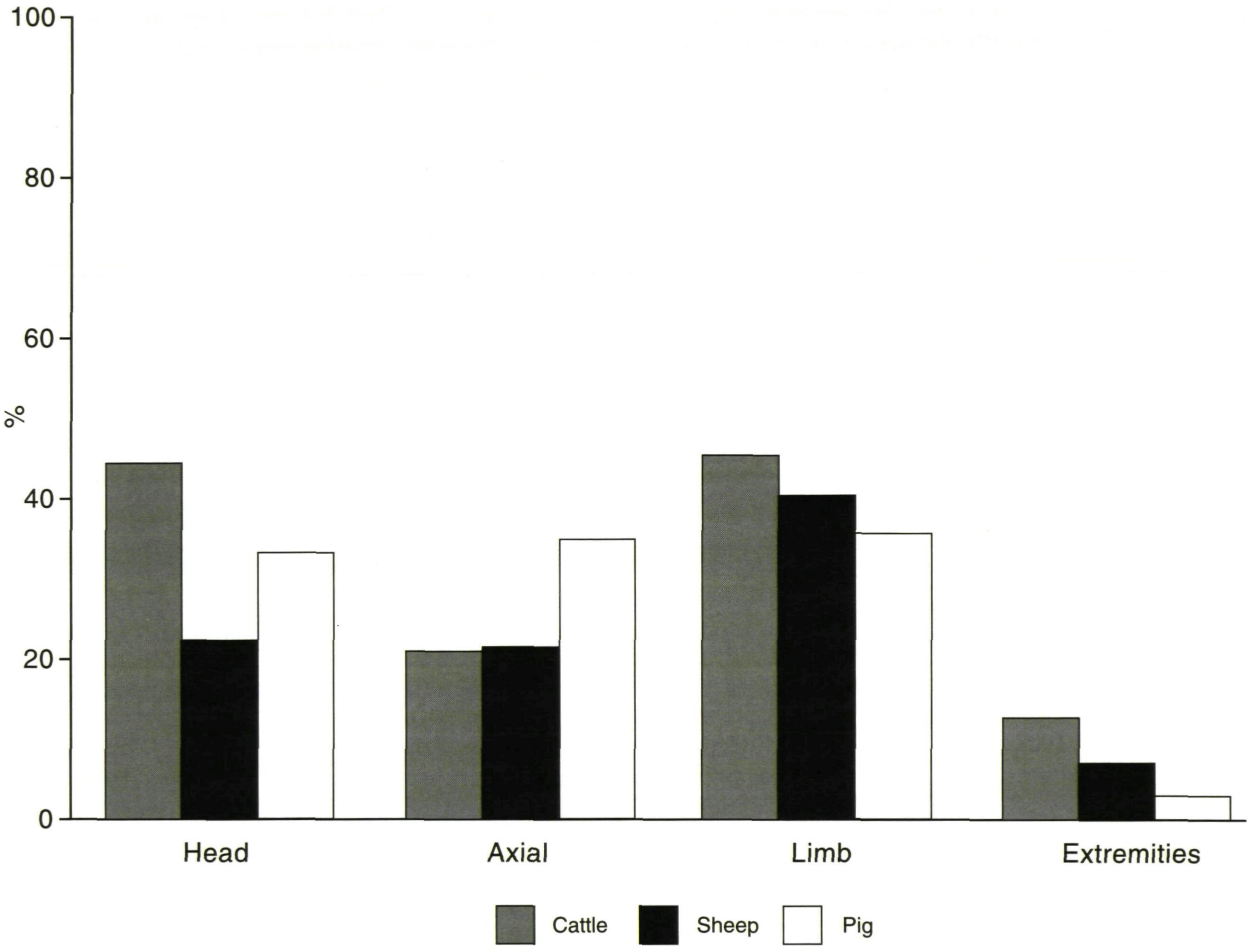

Figure 8.2 Body part representation at Duntisbourne Grove.

the carcass, primarily at the major limb bone joints. However, there are also two pelves where the ilium bears chop marks on the ventral or medial surfaces; these suggest subdivision of the trunk into smaller units once the limbs had been removed.

The single sheep bone bearing evidence of butchery is a radius with a mid-shaft knife cut, probably from filleting. The single butchered pig bone is a humerus with a chop mark, probably from disarticulation, on the distal shaft.

Table 8.4 Distribution of butchery marks by species at Duntisbourne Grove.

Species	Chopped	Cut	Sawn	Total	
				No.	%
Cattle	8	1	4	13	4
Sheep		1		1	1
Pig	1			1	1
Cattle-sized	1			1	2
Total	10	2	4	16	2

Age and sex of the main domestic mammals

The principal caveat in the interpretation of epiphyseal fusion data is that the unfused, porous bones of immature animals are more vulnerable to taphonomic destruction than those of adults and hence the age profile derived from this information may be biased in favour of mature animals. This can be particularly misleading in the case of pigs where most individuals will be slaughtered while immature. This biasing factor is particularly relevant to consideration of this assemblage in view of the evidence for post-depositional alteration.

The fusion data for cattle (Table 8.5) suggest that no animals were slaughtered until they reached two years of age; approximately one third of the bones came from animals which died in their third year and the remainder from animals which survived into full adulthood. This pattern is partially borne out by the dental data (Table 8.6), particularly if the 18-30 month old specimens died at the older end of that age range. Although one third of the specimens came from fully mature adults, including elderly animals, the toothwear data do show a higher proportion of young adults (at least three years old) dying than does the

Table 8.5 Cattle epiphyseal fusion, Duntisbourne Grove.

Age at Fusion	Element	Fused	Unfused	Total
7–10 months	Scapula	8		8
7–10 months	Pelvis	12		12
12–15 months	Radius, p	8		8
15–18 months	Phalanx II	6		6
15–20 months	Humerus, d	20		20
20–24 months	Phalanx I	10		10
24–30 months	Tibia, d	13	7	20
24–30 months	Metapodial, d	5	2	7
36 months	Clacaneus	7	3	10
36–42 months	Femur, p	3	1	4
42–48 months	Radius, d	1		1
42–48 months	Femur, d	1	2	3
42–48 months	Tibia, p	3		3
Total		97	15	112

bone fusion information. The absence of younger juveniles could be a consequence of poor survival, as mentioned above; however, the lack of even loose deciduous teeth implies the absence is likely to be genuine, since the durability of teeth means they are often the last elements to be lost in a poorly preserved assemblage.

The age profile suggests that dairying was not a major part of the site economy: two thirds of the animals died in an age range suitable for optimising carcass weight against continued feed costs. The remaining animals were probably draught beasts and/or breeding cows, although the two are not mutually exclusive. All four of the sexable cattle pelves are female.

As a consequence of the small size of the sheep assemblage, there is little ageing information for this species. Although most of the bones are fused (Table 8.7) there is no evidence for fully adult animals, whereas the few juvenile bones present include one from an individual which died in its first year. The absence of skeletally mature animals is borne out by the dental evidence (Table 8.6): the oldest mandible is from an animal between three and four years old, while the remaining six are spread between one and three years of age.

Thus, as with most of the aged cattle material, the sheep ageing data show only animals culled at

Table 8.7 Sheep epiphyseal fusion, Duntisbourne Grove.

Age at fusion	Element	Fused	Unfused	Total
3–4 months	Humerus, d	5		5
3–4 months	Radius, p	4		4
5 months	Scapula	2		2
5 months	Pelvis	3		3
5–7 months	Phalanx II		1	1
15–20 months	Tibia, d	1		1
20–24 months	Metapodial, d	1		1
36 months	Calcaneus	1		1
36–42 months	Femur, p		1	1
42 months	Radius, d		1	1
Total		17	3	20

optimum meat yielding ages. There is no evidence to suggest that milk or wool were major products of the sheep husbandry: although the absence of lambs younger than one year could be a preservation bias, this would not have affected the contribution of old animals. Two of the three sexable pelves are male.

The fusion evidence for pigs (Table 8.8) suggests that while no animals died in their first year of life, over half died in their second year, but in the absence of ageable late-fusing elements, the proportion which survived beyond full skeletal maturity is unknown. Most of the ageable mandibles are sub-adult. According to Habermehl's (1975) timings for late-maturing pigs, these jaws would have come from animals in their second year and so the predominance of mandibles at this wear stage agrees with the epiphyseal fusion evidence.

Hence the age profile of the Duntisbourne Grove pigs points to non-intensive pig husbandry. There are seven male canines and two female.

Other mammals

Horse is the best represented of the remaining species and most of this material comes from ditch 8. This feature is therefore responsible for the predominance of pelvic fragments and loose teeth in the horse assemblage but also produced three skull fragments and an atlas. Other contexts produced a scapula, radius and more loose teeth. The MNI, derived from the pelvis, is three.

Table 8.6 Cattle, sheep and pig toothwear, Duntisbourne Grove.

Cattle	0–1 months	1–8 months	8–18 months	18–30 months	30–36 months	Young adult	Adult	Old adult	Senile	Total
				2	4	6	4	1	1	18
Sheep	0–2 months	2–6 months	6–12 months	1–2 years	2–3 years	3–4 years	4–6 years	6–8 years	8–10 years	Total
				3	3	1				7
Pig	Neo-natal	Juvenile	Immature	Sub-adult	Adult	Elderly				Total
				4	1					5

Table 8.8 Pig epiphyseal fusion, Duntisbourne Grove.

Age at fusion	Element	Fused	Unfused	Total
12 months	Scapula	5		5
12 months	Humerus, d	7		7
12 months	Radius, p	8		8
12 months	Pelvis	15		15
12 months	Phalanx II	1		1
24 months	Tibia, d	2	2	4
24 months	Metapodial, d	1	1	2
24 months	Phalanx I		1	1
24–30 months	Calcaneus	1	1	2
Total		40	5	45

Where the state of fusion can be determined, none of the bones are unfused and the fused distal radius indicates the presence of an animal older than three and a half years. Further ageing data for the horse assemblage is given by the loose cheek teeth in Table 8.9. All have produced estimates of similar age range: adult but not old animals which, unless broken down through overwork or poor condition, would still have been of working age. Three of the pelvic fragments retain the pubis, allowing the sex to be determined: all are male. None of the horse material shows butchery marks.

Table 8.9 Horse cheek teeth crown heights, Duntisbourne Grove.

Context	Element	Side	Estimated age range	Comment
25	P_2	Right	8–9 years	
28	P_3 / P_4	Left	7–8.75 years	
28	M_1 / M_2	Left	6.5 –9 years	
162	P^2	Right	9–10 years	*
162	P^3	Right	8–9 years	*
162	P^3 – M^2	Left	7–9.75 years	
228	M^3	Left	7–8 years	

* same tooth row

Wild mammals are represented by fox (*Vulpes vulpes*) and roe deer (*Capreolus capreolus*). Fox is unspecialised and versatile in its habitat requirements (Harris and Lloyd 1991) and so the single bone occurring in this assemblage may either be from a scavenger around the site or an animal hunted further afield for its fur. In contrast, roe deer prefer the availability of some woodland as cover (Staines and Ratcliffe 1991). Hence the elements present (scapula and radius, from different ditches) suggest the proximity to the site of a stand of woodland since whole carcasses were brought back to the site, whereas if the animals had been hunted further away the carcasses might have been butchered at the kill site and only the meat and skin with attached extremities brought back.

Middle Duntisbourne

This assemblage is slightly larger than that from Duntisbourne Grove, comprising 5035 fragments in the hand retrieved assemblage (Table 8.10). Most of the bone in the this assemblage (90% of the hand retrieved material) came from the southern ditch of the enclosure (context 4). The amount of identifiable bone, although low at 856 fragments (17%), is greater than at Duntisbourne Grove. The three main domestic mammals comprise an even greater proportion of the assemblage at Middle Duntisbourne (99% of the identifiable bone) and birds, absent at Duntisbourne Grove, occur in small numbers here.

The degree of root etching on bone from Middle Duntisbourne (Table 8.11) is much less severe than at Duntisbourne Grove. The lower frequency of isolated teeth is probably a reflection of this, although it might be due to differential disposal of heads (that is, more were originally deposited in the Duntisbourne Grove ditches). The rate of survival of heads is similar between the two sites (38% at Middle Duntisbourne and 37% at Duntisbourne Grove, for cattle, sheep and pig together) and the relative frequencies of skulls and mandibles in the two assemblages are also the same. Since the minimum number of skulls is based on diagnostic zones (eg. zygomatic or occipital condyle), a set of badly preserved, highly fragmented skulls can yield the same result as a group of intact skulls. However, because of the fragmentation, an assemblage containing the former would have a higher proportion of isolated maxillary teeth than an assemblage containing the latter; the less an assemblage has been affected by fragmentation, the greater the bias should be towards loose mandibular teeth, since cattle and sheep incisors, which are only present in the mandibles, readily fall out of their alveoli. Hence, at Duntisbourne Grove maxillary teeth comprise 63% of the total number of loose teeth, whereas at Middle Duntisbourne they are only 48% of the total.

Although fewer contexts at Middle Duntisbourne contain bone which has been heavily affected by root etching, less than one third of the contexts contain

Table 8.10 Summary fragments count, Middle Duntisbourne.

Species	Hand	Sieved	Total	
			No.	%
Horse		1	1	0.1
Cattle	267	11	278	31.0
Sheep/goat	203	5	208	24.0
Sheep	51		51	6.0
Pig	324	12	336	38.0
Hare	3		3	0.3
Bird	8		8	1.0
Cattle-sized	135	12	147	
Sheep-sized	122	9	131	
Unidentified	3922	194	4116	
Total	5035	244	5279	
% Identified	17		17	

Table 8.11 Taphonomy, Middle Duntisbourne.

Type	Degree			Total No.	%
Root etching	Light	Moderate	Heavy		
(by context)	27	36	38	45	
Burned	Charred	Calcined			
	65	35	20	2	
Gnawed	Surface	Heavy			
	82	18	78	7	
Loose teeth	-	-	-	81	9
Butchered	Chopped	Cut	Both		
	69	24	7	29	2

bone which has only been marginally affected. Consequently, the observed incidence of gnawing and butchery marks is similar to that at Duntisbourne Grove, although slightly more of the butchery marks at Middle Duntisbourne are knife cuts.

Relative abundance of the main domestic mammals

The contributions of cattle, sheep and pig to the assemblage are shown in Figure 8.3, comparing NISP, MNE and MNI. The results are similar whichever method of quantification is used. Cattle remains, around one third of the three main species in this assemblage, are far less frequent than at Duntisbourne Grove (50-63%). This difference is consistent, in view of the argued survival bias in favour of cattle bones, with the lower degree of post-depositional alteration at Middle Duntisbourne.

Sheep are far better represented than at Duntisbourne Grove, and is the most frequently occurring

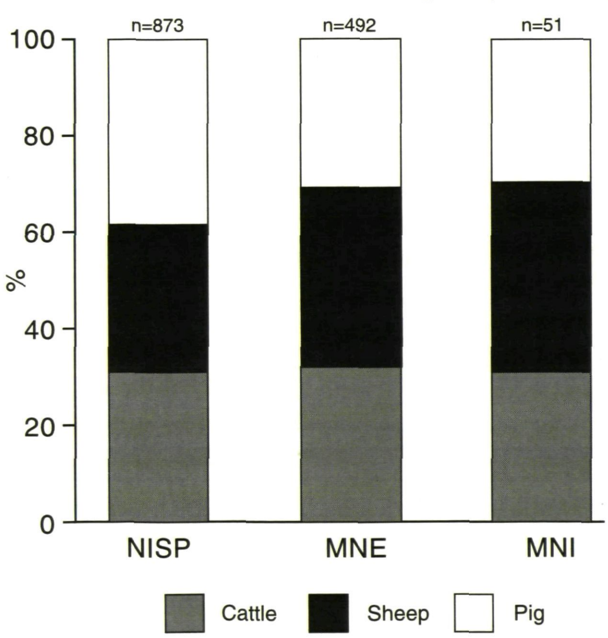

Figure 8.3 Representation of the main domestic species at Middle Duntisbourne.

species in the MNE and MNI figures. This is a more typical pattern for contemporary Cotswold sites, although the occurrence is still relatively low, and the contribution of pig in comparison to sheep is consequently less at Middle Duntisbourne. However, pig is more frequent overall than at Duntisbourne Grove, although this is not as marked as in sheep and is only apparent in the NISP and MNE figures. As at Duntisbourne Grove, the high proportion of pig in the assemblage is consistent with molluscan evidence suggesting the local environment included woodland.

Body part representation and butchery

The presence of the various skeletal elements is shown in Table 8.12 and Figure 8.4, the latter following the same method as in Figure 8.2. The very high representation of pig heads, in comparison with both other pig body parts and the heads of the other two species, is plain and reflects the frequency of both crania and mandibles. A similar, although not so marked, contrast with cattle and sheep skulls was observed in the Duntisbourne Grove assemblage. The sturdy construction which is responsible for this

Table 8.12 Minimum number of elements of the main domestic mammals, Middle Duntisbourne.

Element	Species Cattle	Sheep	Pig	Total
Horn core	-	-	-	0
Cranium	2	3	12	17
Mandible	7	10	24	41
Atlas	1	1	-	2
Axis	-	1	-	1
Scapula	12	23	29	64
Humerus	13	14	7	34
Radius	9	22	2	33
Ulna	3	10	5	18
Pelvis	25	26	17	68
Sacrum	1	0	0	1
Femur	11	10	11	32
Tibia	20	35	11	66
Fibula	-	-	-	0
Patella	1	-	1	2
Astragalus	12	4	2	18
Calcaneus	24	5	5	34
Tarsals	3	1	1	5
Carpals	1	-	1	2
Metacarpal	5	2	2	9
Metatarsal	6	8	5	19
Lateral metapodial	-	-	-	0
1st Phalanx	3	5	2	10
2nd Phalanx	1	-	1	2
3rd Phalanx	1	-	1	2
Lateral phalanx	-	-	-	0
Total	161	180	139	480
% main domestics	34	38	29	
MNI	16	20	15	51
% MNI	31	39	29	

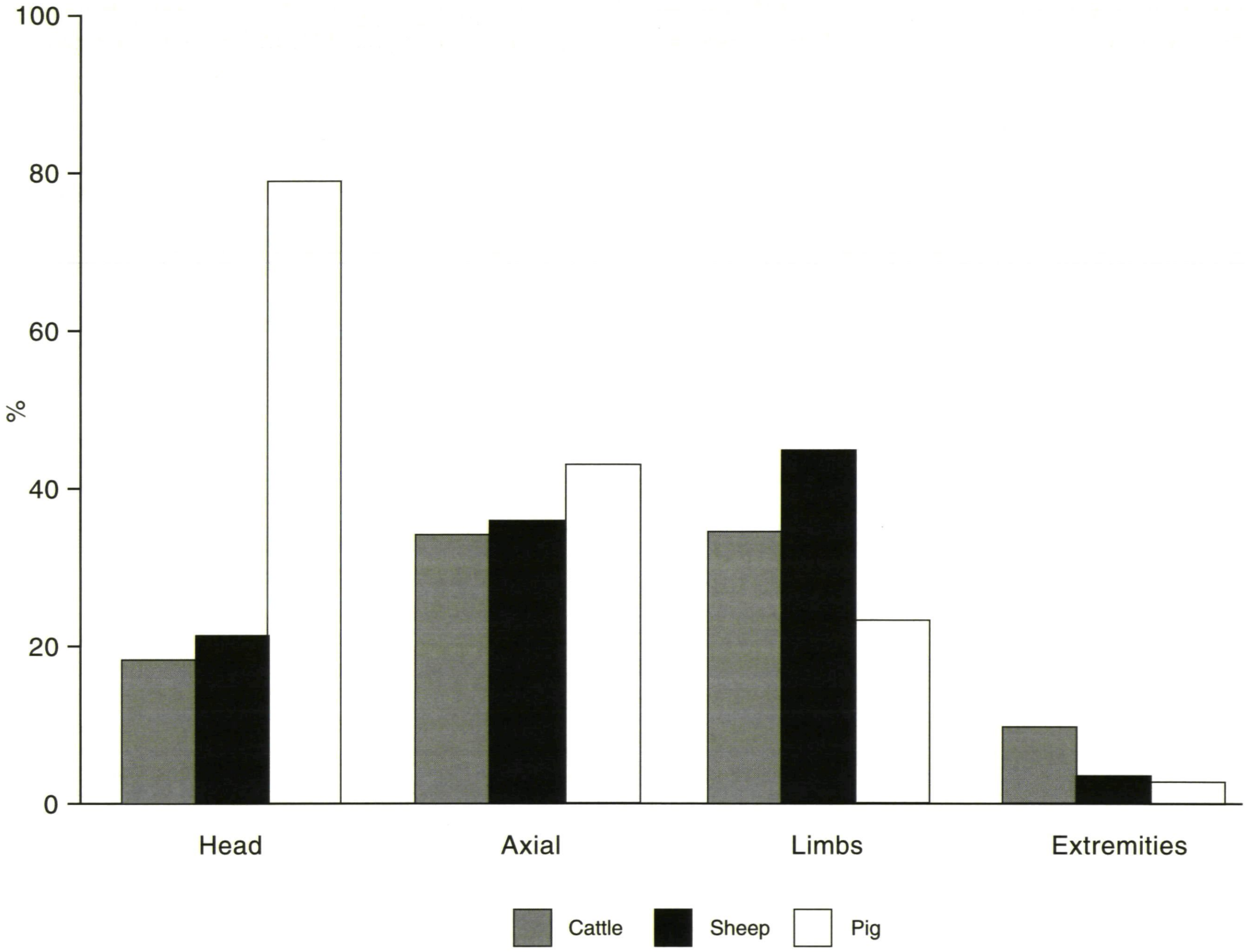

Figure 8.4 Body part representation at Middle Duntisbourne.

pattern is also the major cause of the discrepancy between the NISP and MNE relative proportions of pig versus sheep (Figure 8.3); there are far more identifiable fragments surviving from pig skulls and contributing to the minimum value than there are for sheep: seven and two, respectively, per 'skull'.

Figure 8.4 also shows that, in contrast to Duntisbourne Grove, sheep remains have survived better than those of cattle in all groups except extremities, although the difference is notable only in the limb group. This is probably a reflection of the better preservation of the bone from Middle Duntisbourne, as is the higher representation of axial elements for all three species. It is, however, possible that the relatively low occurrence of pig limb bones, in comparison with cattle and sheep and the frequency of pig heads and axial bones, is due to a disposal bias.

There are only two sets of articulating bones in this assemblage: a cattle right proximal radius and ulna, and a sheep left proximal radius and ulna. Neither pair showed any evidence of butchery.

There is little difference between the species in incidence of butchery marks (Table 8.13), but they are slightly more common on the cattle material. The majority of these may be interpreted as division of the carcass: primarily removal and jointing of the limbs (at the elbow or hip, for example), but also removal of the mandible from the cranium (chop mark at the hinge), separation of the body into sides (chop marks through the proximal end of a rib and the transverse processes of thoracic and lumbar vertebrae) and smaller units (a lumbar vertebra chopped transversely through the caudal end). Filleting is manifested in a single scapula with cuts concentrated around the origin of the spine.

The evidence for sheep butchery, like cattle butchery, consists entirely of disarticulation marks: separation of the forelimb from the trunk by cutting between the ribs and scapula; the hindlimb from the trunk at the hip; jointing of the limbs at the elbow and hock; and, as with cattle, division of the trunk into sides and smaller units. The evidence on pig bones is more limited than for either cattle or sheep, but shows disarticulation of the mandible and limbs. In contrast to the pattern on sheep, a scapula with a chop mark on the rim of the glenoid suggests that pig forelimbs were separated from the trunk at that point, rather than as a unit with the scapula.

Table 8.13 Distribution of butchery marks by species, Middle Duntisbourne.

Species	Chopped	Cut	Both	Total No.	Total %
Cattle	6	3		9	3
Sheep	2	3	1	6	2
Pig	4	1		5	1
Cattle-sized	3	0	1	4	3
Sheep-sized	5			5	4
Total	20	7	2	29	2

Ageing and sexing of the main domestic mammals

It was suggested for the Duntisbourne Grove assemblage that the scarcity of juvenile material might be related to the poor preservation, similarly, the greater proportion of juvenile and immature remains at Middle Duntisbourne may be a consequence of the comparatively better preservation.

The cattle epiphyseal fusion data (Table 8.14) show a moderate proportion of first year mortalities, with unfused pelvic fragments comprising 17% of ageable elements. Three of these are probably from the same animal, a neonate. There is no evidence in the bones for further mortality in the second year, but there is a great increase in the third year: 50% of bones from individuals between two and three years of age are unfused. Thereafter, animals apparently survived through to skeletal maturity. These fully adult animals are, however, under-represented in the toothwear data (Table 8.15), as are the neonates. Otherwise, the two sets of data broadly agree. The much smaller sample of ageable mandibles and teeth in this assemblage may explain the absence of the age groups which are rare at Duntisbourne Grove (old adult and senile), however, the most frequent age group in that assemblage (young adult) is completely absent at Middle Duntisbourne.

Table 8.14 Cattle epiphyseal fusion, Middle Duntisbourne

Age at Fusion	Element	Fused	Unfused	Total
7–10 months	Scapula	10		10
7–10 months	Pelvis	29	8	37
12–15 months	Radius, P	10		10
15–18 months	2nd Phalanx	1		1
15–20 months	Humerus, D	8	1	9
20–24 months	1st Phalanx	3		3
24–30 months	Tibia, D	11	5	16
24–30months	Metapodial, D	3	1	4
36 months	Calcaneus	5	13	18
36–42 months	Femur, P	3	2	5
42–48 months	Radius, D		2	2
42–48 months	Femur, D	2	1	3
42–48 months	Tibia, P	3	1	4
Total		88	34	122

Taking into account the possible effect of the better preservation at Middle Duntisbourne, the age profile suggests an approach to cattle husbandry similar to Duntisbourne Grove. The first year kill-off is not great enough to indicate more than a small-scale role for dairying and, although culled from a narrower age range than at Duntisbourne Grove, prime meat carcasses are predominant. Only one of the 11 sexable pelves is male.

As a consequence of the much greater presence of sheep in this assemblage, there is also much more fusion data (Table 8.16) than at Duntisbourne Grove and comparison of the two samples is affected. A few animals died in their first year (3% of bones in this age range), but the greatest mortality occurred in the second year animals, with another peak in the three to three and a half year range. Only a little less than one third of these late-fusing bones come from animals which survived into full adulthood. As with cattle, the sheep toothwear data do not show these older animals, and they also suggest a much greater mortality of animals in their first year than does the fusion evidence, including a possible neonate. The dental age profile resembles Duntisbourne Grove except for the larger number of first year deaths: since three of these four specimens came from animals which died between 6 and 12 months of age, it is likely they represent individuals too weak to survive their first winter who died or were culled for meat. The sexed elements are predominantly female: 14 pelves and an atlas, compared with only 4 male pelves.

The fusion evidence for the Middle Duntisbourne pigs (Table 8.17) shows the same high second year mortality as Duntisbourne Grove, with a second peak between two and two and a half years and no animals surviving beyond three and a half years. The dental data agree with these major kill-off peaks: although a few animals died towards the end of their first year, 59% of the mandibles came from sub-adults, probably animals between one and two years old and the remaining mandibles (25%) are adult with the lower third molar in early wear, corresponding to the two to two and a half year fusion peak. Most of the sexable canines, 13 out of 17, are male. While more males would be expected in the sub-adult group and more females in the adults, the sample of both aged and sexed mandibles is too small to offer convincing support: one adult and two sub-adult mandibles and one female sub-adult.

Other mammals

Few bones from species other than the three main domesticates are present at Middle Duntisbourne. The single horse bone is the cranial portion of an axis which exhibits no signs of butchery or gnawing. The three hare bones are a fragment of tibia and two left pelves, the latter being comparable in size with brown hare (*Lepus europaeus*) rather than the smaller mountain hare (*L. timidus*). There has been some debate over whether brown hare was present in Britain before the Roman period (Coy 1984; Tapper 1991),

Table 8.15 Cattle, sheep and pig toothwear, Middle Duntisbourne.

Cattle	0–1 months	1–8 months	8–18 months	18–30 months	30–36 months	Young adult	Adult	Old adult	Senile	Total
			1	2	3		2			8
Sheep	**0–2 months**	**2–6 months**	**6–12 months**	**1–2 years**	**2–3 years**	**3–4 years**	**4–6 years**	**6–8 years**	**8–10 years**	**Total**
	1		3	2	3	1				10
Pig	**Neo-natal**	**Juvenile**	**Immature**	**Sub-adult**	**Adult**	**Elderly**				**Total**
	-	1	3	12	5	-				21

Table 8.16 Sheep epiphyseal fusion, Middle Duntisbourne.

Age at fusion	Element	Fused	Unfused	Total
3–4 months	Humerus, D	12	0	12
3–4 months	Radius, P	16	0	16
5 months	Scapula	15	0	15
5 months	Pelvis	30	1	31
7–10 months	1st Phalanx	3	1	4
15–20 months	Tibia, D	10	3	13
20–24 months	Metapodial, D	0	4	4
36 months	Calcaneus	3	2	5
36–42 months	Femur, P	1	1	2
42 months	Radius, D	1	3	4
42 months	Ulna, P	1	6	7
42 months	Femur, D	2	1	3
42 months	Tibia, P	1	2	3
Total		95	24	119

although Coy made definite identifications of it in both late phases at Danebury (1984), and it has also been identified at several other Iron Age sites, for example, Owslebury (Maltby 1987) and Groundwell Farm (Coy 1982). The reason for its presence is not straightforward. According to Caesar (Edwards 1952) the Britons had a taboo against eating hare; furthermore, hare would have been a part of the local wild fauna, as it is abundant in arable areas with associated woods or hedgerows for shelter (Tapper 1991), and thus the bones could be non-anthropogenic. None of the hare bones show evidence of butchery or gnawing damage.

Birds

Of the eight bird bones, six (all limb bones save one scapula) belong to the domestic fowl (*Gallus gallus*). Three of these, from the same context, are comparable in size with bantams. Bantam-size bones also occurred in the late period at Danebury, in addition to a larger type of fowl (Serjeantson 1991a). All of the ageable bones are adult and there are two sexable tarsometatarsi: one male (spurred) and one female (unspurred). There is no evidence of butchery, which is consistent with Caesar's claim (Edwards 1952) that the Britons kept fowl but did not eat them. Domestic fowl bones are present in small numbers at the contemporary Cotswold sites of Bagendon (Jackson 1961; Rielly 1990), Ditches (Rielly 1988) and Birdlip Bypass Period 2 (Dobney and Jaques 1990). The two other bird bones are a distal radius from a duck, probably mallard (*cf. Anas platyrhynchos*) and an ulna from a redwing (*Turdus iliacus*).

Size of livestock at Duntisbourne Grove and Middle Duntisbourne

The full suite of measurements taken on the Duntisbourne Grove and Middle Duntisbourne bones appears in appendices 2–3, with only the more frequent ones discussed here. Few bones are complete enough for greatest length measurements to be possible so only a few withers heights, using the factors in Driesch and Boessneck (1974) could be calculated (Table 8.18).

The four cattle withers heights, although within the range for cattle from contemporary southern British sites, suggest the Duntisbourne cattle were of average or below average size. Figure 8.5 compares distal tibia breadth in the Duntisbourne cattle to other 1st century AD and later Roman assemblages in the Cotswolds. These figures show, in agreement with the withers heights, that the Duntisbourne cattle tend to

Table 8.17 Pig epiphyseal fusion, Middle Duntisbourne.

Age at fusion	Element	Fused	Unfused	Total
12 months	Scapula	25	0	25
12 months	Humerus, D	5	0	5
12 months	Radius, P	1	0	1
12 months	Pelvis	18	0	18
12 months	2nd Phalanx	1	0	1
24 months	Tibia, D	5	3	8
24 months	Metapodial, D	0	6	6
24 months	1st Phalanx	2	1	3
24–30 months	Calcaneus	1	5	6
36–42 months	Ulna, P	0	1	1
36–42months	Femur, P	0	1	1
42 months	Radius D	0	1	1
Total		58	18	76

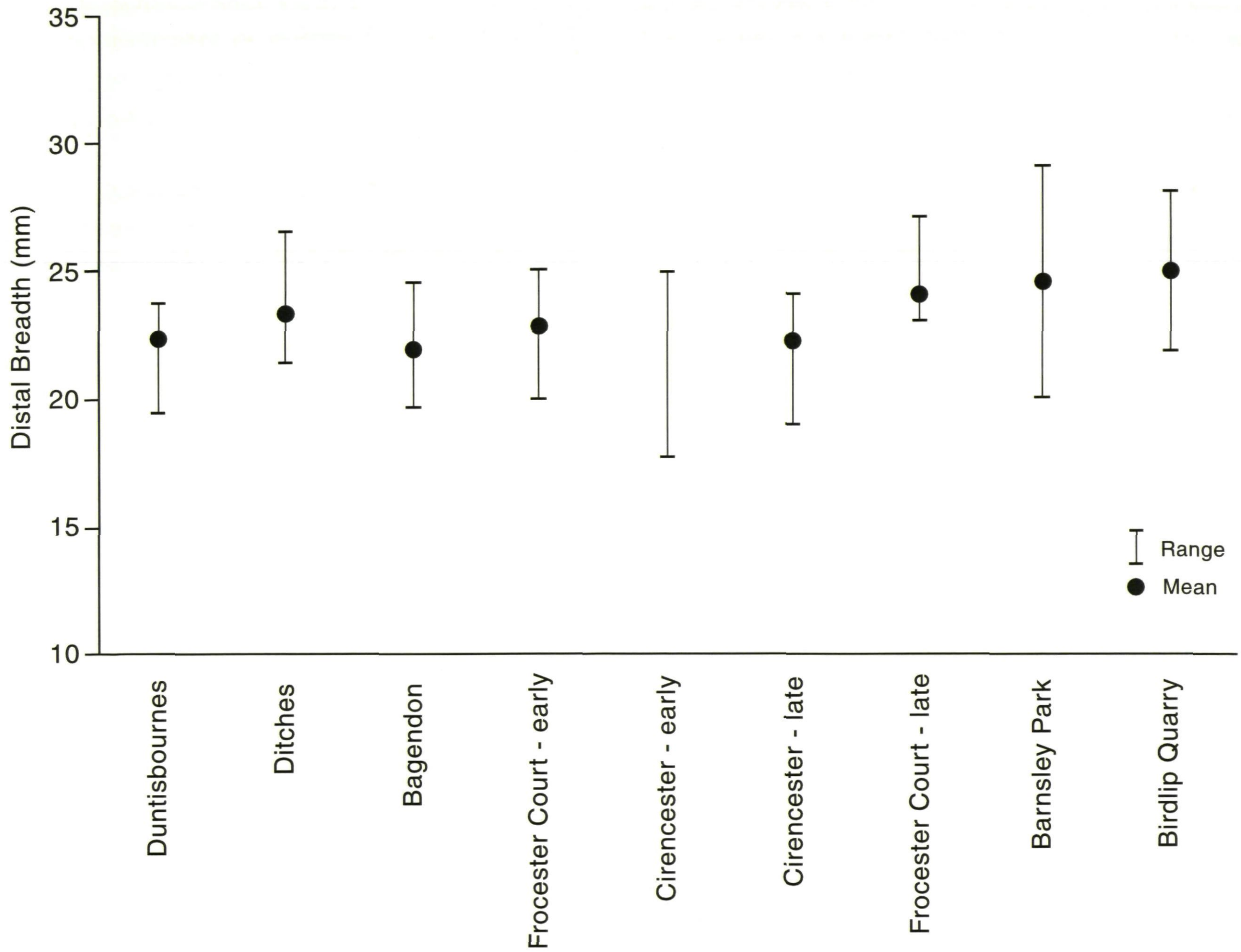

Figure 8.8 Sheep distal tibia. Comparison of distal tibia breadth in sheep.

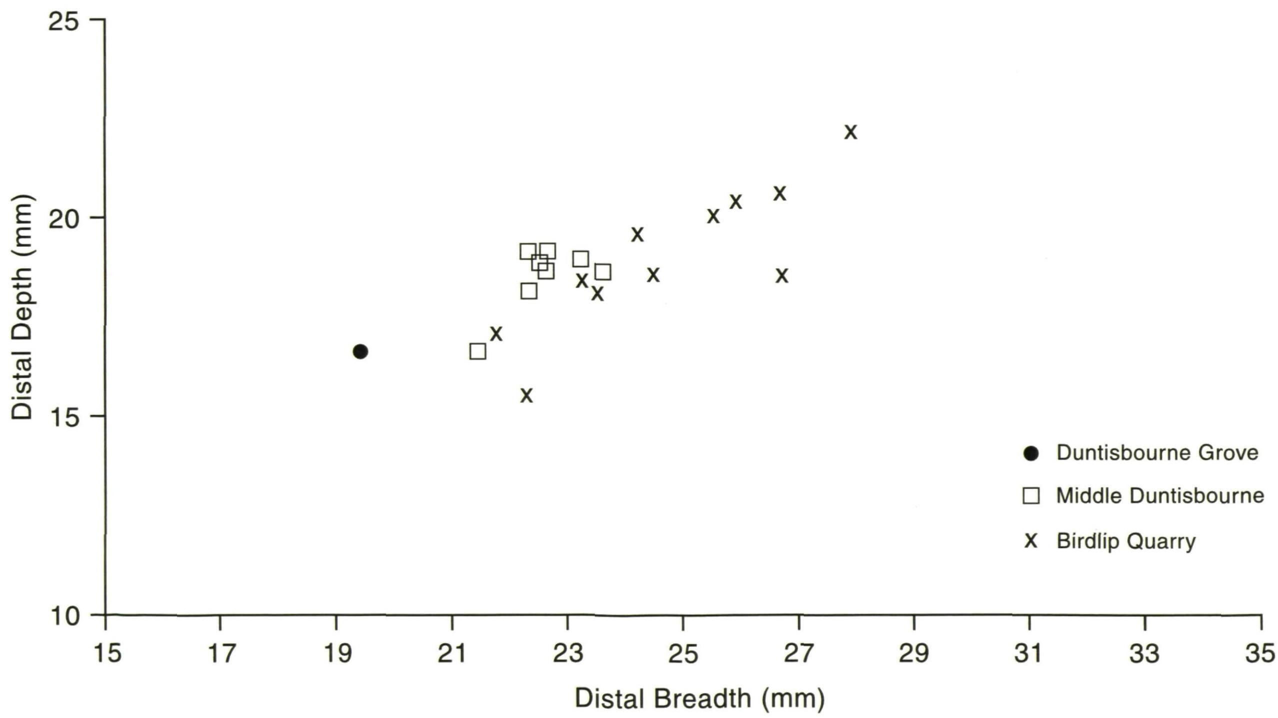

Figure 8.9 Comparison of tibial distal breadth against tibial distal depth in sheep.

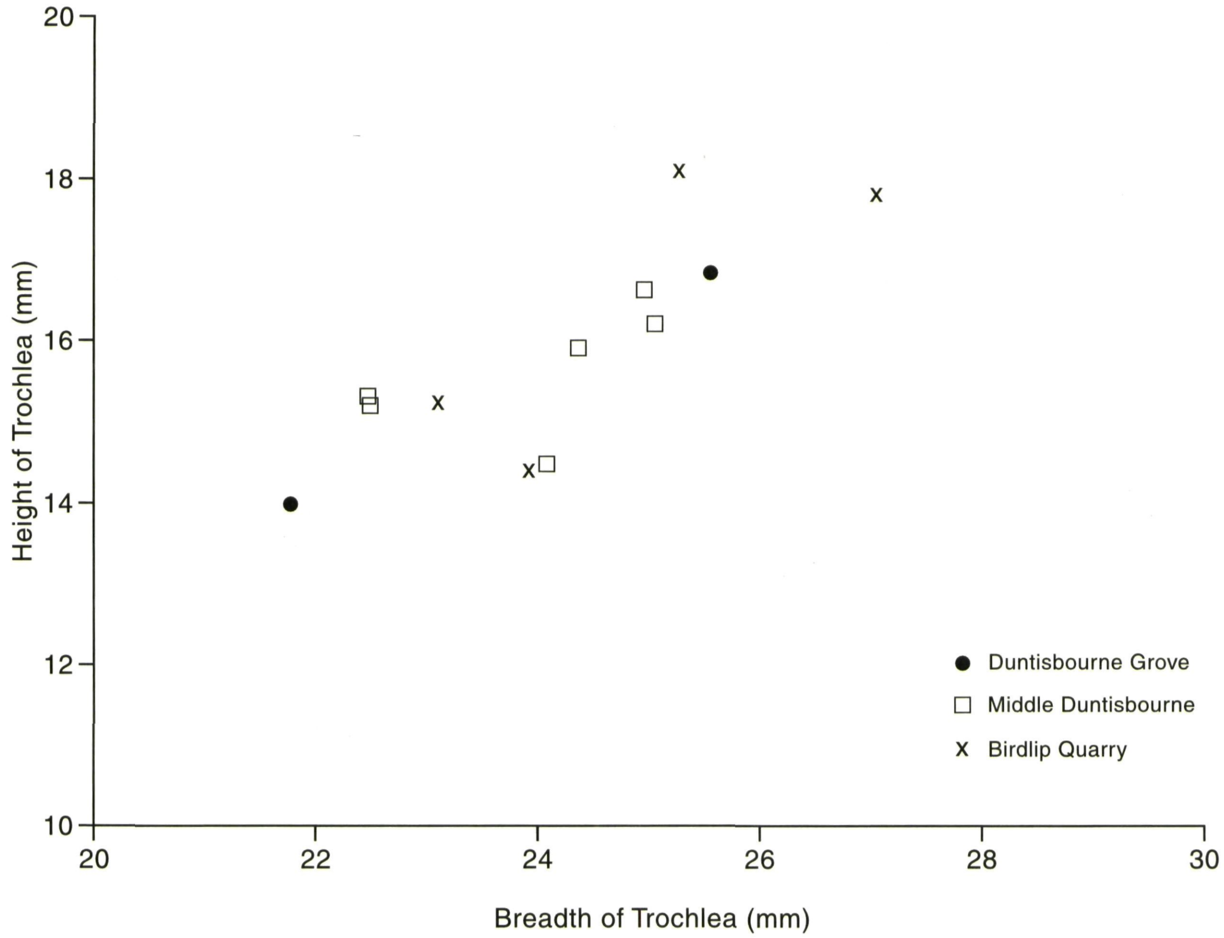

Figure 8.10 Sheep distal humerus. Comparison of distal humerus measurements in sheep.

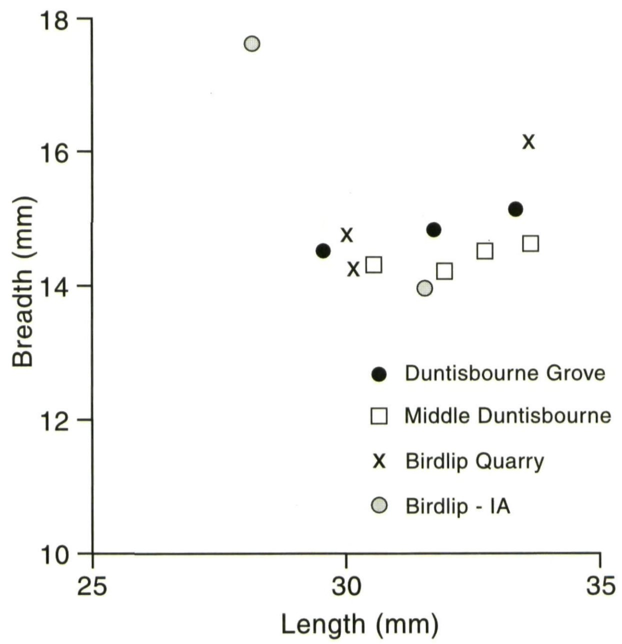

Figure 8.11 Pig third molar length.

Pathology

The incidence of pathology in these two assemblages is surprising low, but in view of the post-deposition modification by root etching and solution it would be expected that much fine pathology would be lost. In particular, surface indications of infection and small areas of proliferative bone indicating early stages of pathological conditions would be unlikely to survive. However, arthropathies in the domestic mammals are robust manifestations which should be visible even with this degree of post-burial damage and the low frequency is concommitant with the age profile for cattle.

There is just one pathological specimen from Duntisbourne Grove, a distal fragment of a cattle tibia (context 15) with small osteophytes at the sites of tendon insertion laterally and medially. This is almost certainly an age-related manifestation with slow, progressive ossification of the tendon extremities during maturity.

At Middle Duntisbourne, the majority of lesions are in cattle. A cattle metatarsal from context 45 shows some articular extension of the medial condyle, but without associated arthropathies, and this is probably a reflection of maturity. An interesting specimen from context 330, another distal tibia, has incomplete sub-

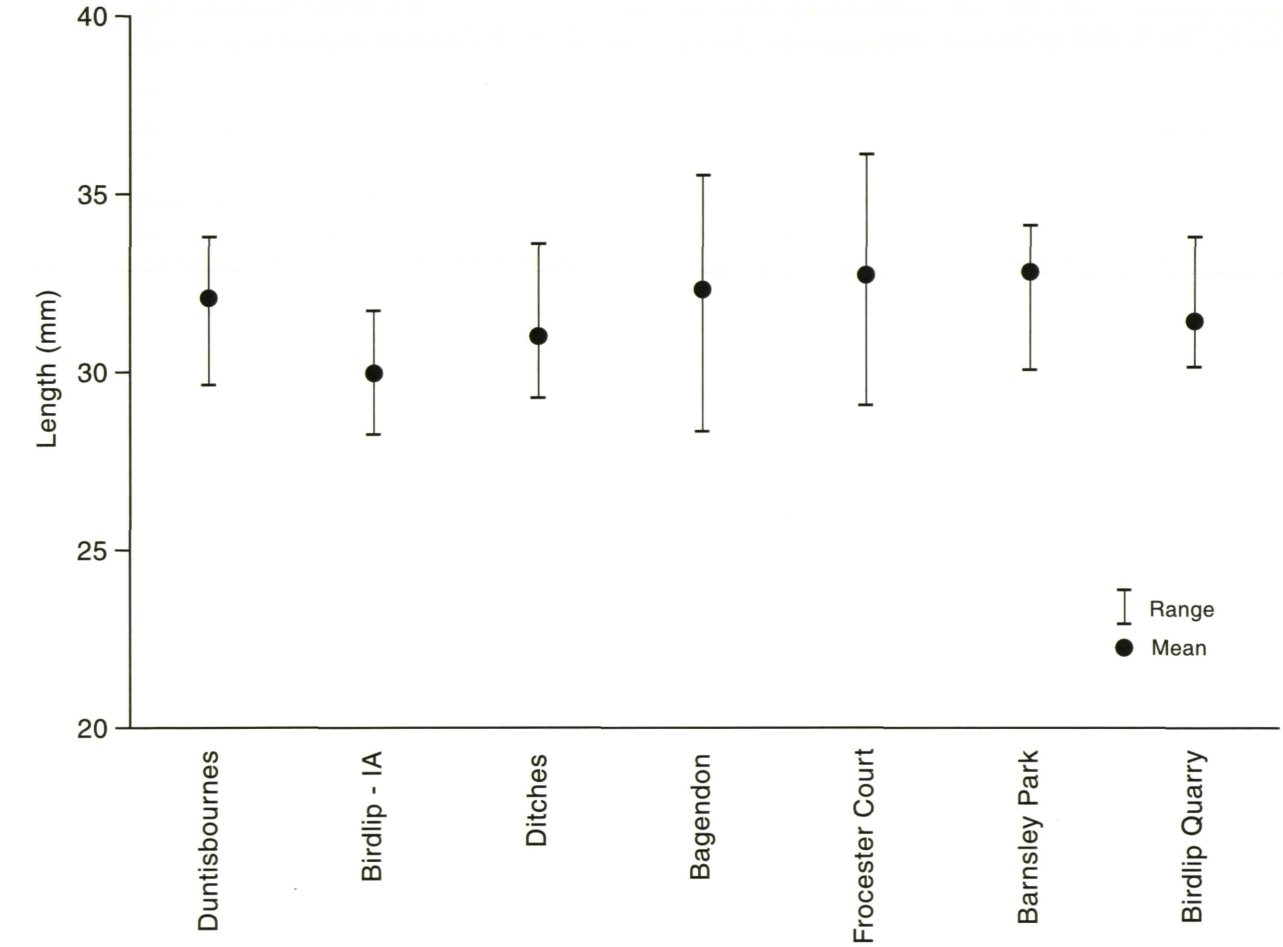

Figure 8.12 Comparison of pig third molar lengths.

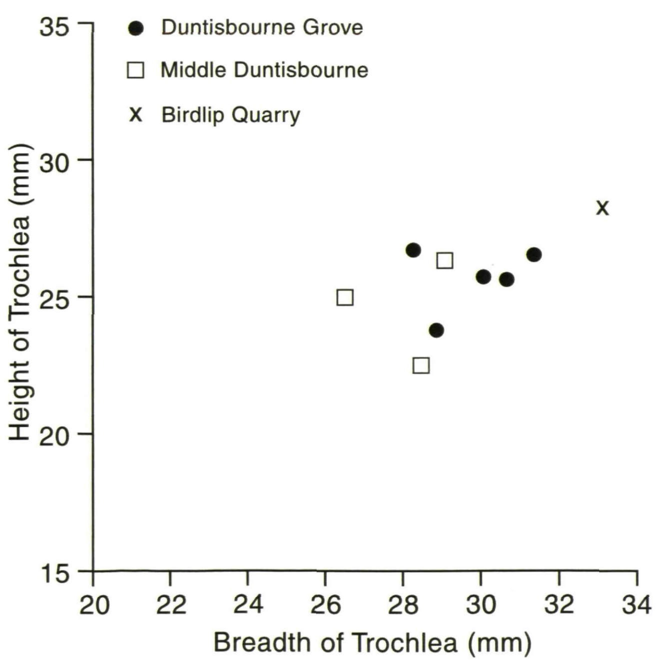

Figure 8.13 Comparison of distal humerus measurements in pig.

chondral bone anteriorly and laterally, and this has resulted in the development of an isolated facet. This is certainly a sub-clinical condition and probably congenital in origin rather than being the result of injury or stress.

There are two instances of infection in the Middle Duntisbourne cattle. A calcaneus has a smooth bony extrusion medially, which is probably the result of a healed or healing infection (context 85), and a mandible (context 45) shows resorption of the bone below the second molar lingually.

A pig mandible (context 57) also has evidence of infection with the loss of the first molar and resorption of the bone around the alveolus. The two other pathological pig specimens both result from trauma; a bony flange on the spine of a scapula from context 218 is probably the result of injury, and a juvenile lateral metapodial has a healing fracture of the distal end (context 69).

A single pathological sheep specimen from context 69, a juvenile mandible, shows possible infection of the mandibular symphysis.

Oral pathology

This category of pathology is often the most common in archaeological material, partly because of the

Plate 8.1 Lateral view of hypoplastic pig third molar.

resistance to destruction of mandibles and teeth, and these two assemblages are no exception. Specimens showing evidence of infection have already been described; the two other, more frequently represented, categories dealt with here are congenital and developmental.

Congenital conditions are present in all three of the main species. In the Duntisbourne Grove assemblage there is a cattle right mandible which retained a third molar with a reduced distal cusp and a left mandible with no second premolar: these two traits are often recorded in archaeological cattle and seem to be particularly common in Iron Age and Romano-British assemblages. Congenitally absent teeth also occur in the Middle Duntisbourne material, but here it is the pigs which are affected: three mandibles lack the first premolar, a frequent occurrence in domestic pigs (Miles and Grigson 1990). This assemblage also contained a cattle left mandible with an accessory nutrient foramen below the second premolar lingually and a sheep right mandible with accessory foramen on the buccal surface below the third premolar. All of these conditions, save the absent first premolar in pigs, were also present in the assemblage from the nearby Ditches hillfort (Rielly 1988).

Developmental anomalies, in the form of hypoplasia and tooth rotation, only occur in the pig material in these two assemblages. Hypoplasia occurs in two specimens from Middle Duntisbourne: a mandible from context 217 with the third molar in early wear (Grant 1982 stage c) shows a deep (7.5 mm) band of small pits on all three cusp units of this tooth (Plate 8.1), the first unit is the most severely affected, with the concentration of pits leading to some areas of dentine exposure; the lower third of the crown is unaffected as is the adjacent second molar. The second specimen is a maxilla from context 45, with the third molar again the affected tooth. In this example, although only the first and second cusp units are affected, the damage is much more severe than in the mandible: only the lower half (7.3 mm) of the crown has enamel present, the upper half has dentine fully exposed (Plates 8.2–3). The tooth was erupting but had not yet come into wear. In both these cases a genetic cause can be excluded since only part of the crown surface area is affected (Hillson 1986).

Hypoplasia can have local causes, for instance injury or abscess (Miles and Grigson 1990), however, in these two examples malnutrition or systemic infection during crown formation are probably more likely and the extent of the effect suggests the cause was prolonged over several months (Miles and Grigson 1990). There may be a correlation with weaning and associated stress. Weaning age is two months in a husbandry system where young pigs are economically important and there are two farrowings a year (Lauwerier 1983). In a less intensive system, such as suggested by the age profiles for the Duntisbourne assemblages, the animals might be older when weaned, closer to the three to four months of wild boar (Macdonald and Barrett 1993). Crown formation of the third molar starts in modern pigs at this age, with the third molar starting slightly later (McCance *et al.* 1961). These timings may have been later in the archaeological animals, as eruption is in wild and unimproved types (Bull and Payne 1982) and the delaying effect of undernutrition on third molar crown formation (McCance *et al.* 1961) is also a complicating factor, but the hypoplastic third molars at Middle Duntisbourne might have resulted if animals were

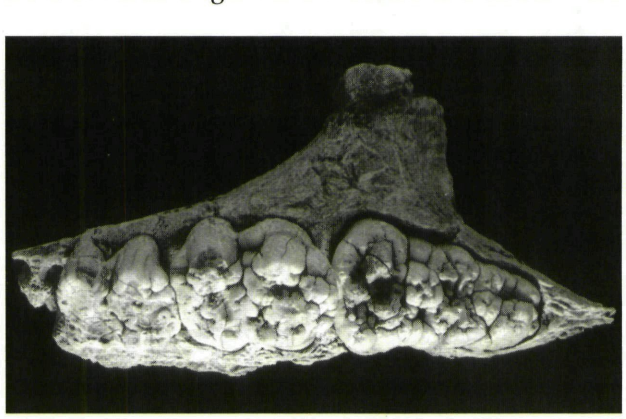

Plate 8.2 Occlusal view of hypoplastic pig maxillary third molar.

Plate 8.3 Cross section of hypoplastic tooth in plate 8.2.

Plate 8.4 Occlusal view of pig maxilla (Middle Duntisbourne, context 217) showing rotated third and fourth molars.

Plate 8.5 Occlusal view of pig maxillary fragment (Middle Duntisbourne, context 84) showing rotated first premolar.

weaned in a bad year with a poor crop of pannage to feed them over the autumn and winter.

Rotation of the teeth arises from overcrowding of the tooth row (Miles and Grigson 1990). One of the possible causes of overcrowding is undernutrition, which prevents the jaws from reaching their proper length and affects the maxilla to a greater extent than the mandible (McCance *et al.* 1961). This would explain why all the examples of rotated teeth in the Duntisbourne assemblages are in the maxilla. The teeth most affected are the latest erupting ones (Miles and Grigson 1990), which in a pig cheek tooth row means the second to fourth premolars and the third molar (Bull and Payne 1982).

The incidence is similar in both assemblages: there are three examples of rotated teeth at Middle Duntisbourne (MNE maxilla = 20) and one at Duntisbourne Grove (MNE = 7). The affected teeth are the first, third and fourth premolars and, in one case, both third and fourth premolars (Plate 8.4). The degree of rotation varies from slight to *c.* 45° and, with the exception of the first premolar (Plate 8.5), is in an anti-clockwise direction. The affected first and third premolars also show crowding and overlapping with adjacent teeth. The maxilla containing the hypoplastic third molar described above also has evidence of overcrowding: the fourth premolar is not rotated and none of the teeth anterior to it are present, but the position of the partially erupted third molar seems to indicate a degree of impaction.

A further effect of undernutrition is relatively short third molars (McCance *et al.* 1961). If undernutrition was the cause of overcrowding in these examples still it was not severe enough to result in third molars differing in length from those at other sites in the region (see above, Figure 8.12).

Discussion

How far are the relative proportions of species, assessed from the recovered remains, an accurate representation of the original species composition? This is the important question to bear in mind when considering the relationship between Duntisbourne Grove and Middle Duntisbourne and between these and other sites in the area. It has often been noted (eg. King 1978; Reilly 1988) that cattle tend to be over-represented by NISP counts. Hence use of MNI figures in inter-site comparisons will reduce the general bias in favour of cattle caused by factors such as better survival and subsequent identifiability of bones from this species and greater retrieval (compared with sheep and pig) of their smaller skeletal elements.

Further problems lie in the potential for intra-site variation in the distribution of species. Spatial patterning of species has been investigated at several Iron Age sites in central southern Britain, for example Winnall Down (Maltby 1985), Owslebury (Maltby 1987) and Mingies Ditch (Wilson 1985; 1996). Maltby (1981; 1985) and has shown that there is a tendency for cattle and horse to occur more frequently in ditches and quarries than in pits, and that bone tends to be more degraded in ditches than in pits. Wilson (1996) has argued that '...it is not the exact species composition which is important in determining bone distributions at sites but the size of bones or the size of species individuals.' Furthermore, the bones of younger animals and small-to medium-sized species suffered demonstrably more damage at Mingies Ditch than the bones of older animals or larger species (Wilson 1985; 1996). Both disposal practices and differential survival are implicated in spatial variation of species proportions.

No similar studies for sites in the Cotswolds have been published, although in some cases, such as at Duntisbourne Grove and Middle Duntisbourne, the absence of more than one feature type prevents such analysis. However, this does mean that when comparing assemblages the relative proportions of sheep and cattle cannot be taken at face value as reasonably accurate reflections of species present originally, or easily be used to discuss site status, function or economy.

The representation of cattle, sheep and pig are shown in Figure 8.14 for late Iron Age and Romano-British assemblages from the area. The biasing effect of poor preservation will have inflated the contribution of cattle in the assemblage from Duntisbourne Grove. Of the three other Iron Age sites close to the Duntisbournes, Bagendon (Rielly 1990) has a low percentage of cattle and high sheep with the bone retrieved entirely from pits, while the assemblage from Ditches (Rielly 1988), with a higher percentage of cattle, was retrieved entirely from ditches. Unpublished data from Ditches (Rielly pers. comm.) indicates a reduced contribution by cattle in the non-ditch features. The Iron Age assemblage from Birdlip Bypass (Dobney and Jaques 1990) came from both pits and ditches and has cattle slightly more frequent than sheep, but the high degree of gnawing observed suggests considerable post-discard alteration could be biasing the assemblage towards cattle. Hence at all of these site, except Bagendon, the frequency of sheep in the husbandry could be underestimated. However, the relative sizes of the species means that cattle probably still made the greater contribution to the diet.

The relative proportions of sheep and pig are likely to be affected less by spatial variation than the relationship between cattle and these smaller domesticates. However, prolific breeding by pigs allows a far higher kill-off of juvenile animals than in cattle or sheep while still maintaining a viable population. Since the bones of these juveniles are more susceptible to destruction it follows that the proportion of pigs in a site economy will almost always be underestimated, especially where preservation is poorer. This may be offset to some degree by the relatively robust cranial bones.

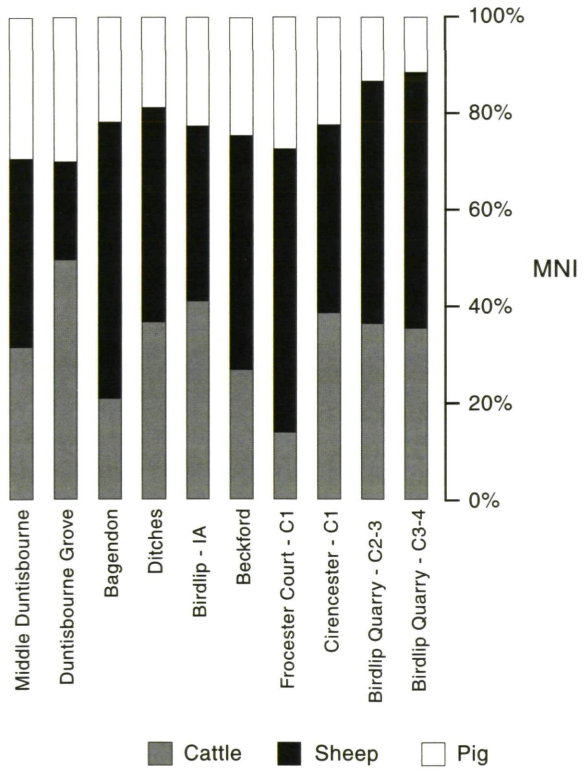

Figure 8.14 Representation of the main domestic animals at 1st-century and later sites in the Cotswolds.

Pigs seem to be relatively common at both Middle Duntisbourne and, particularly, Duntisbourne Grove. The relationship between pig and sheep in assemblages from these and other late Iron Age and Romano-British assemblages from the area is shown in Figure 8.15. This confirms that pigs are more frequent at the Duntisbournes; even at Middle Duntisbourne they are still more common (although only little more than at Iron Age Birdlip) than at any other site, including 1st-century Cirencester (Thawley 1982). This high representation of pigs is consistent with the molluscan evidence (see Robinson, this chapter) at both sites for local woodland which would have provided food in autumn. The pathology on the pig teeth from these sites does suggest, however, that this food source was not always sufficient to prevent some members of the herd from suffering nutritional stress. Pig would have been a more important part of the meat diet at both sites than sheep.

Of the minor species in these two assemblages, the very small number of horse bones is comparable with The Ditches (Rielly 1988) and Bagendon (Rielly 1990) but contrasts with their representation at Iron Age Birdlip (Dobney and Jaques 1990). The low numbers of wild animals indicates hunted food was not an important contribution to the diet at either site, in spite of the presence of woodland which would have offered shelter to deer.

The age profiles of the three main domestic mammals show broad similarities between the Duntisbourne sites and the assemblages from Ditches and Bagendon. The cattle show some variation in the numbers of older immatures versus younger adults killed, with the former more numerous at Middle Duntisbourne and Bagendon and the latter more numerous at Duntisbourne Grove and Ditches. However, variation in preservation may account for some of this and all are alike in having minimal numbers of very young or very old animals. This pattern contrasts the typical Romano-British pattern, as seen at Birdlip Quarry, suggesting that the cattle in these sites were reared as all-purpose animals.

The sheep age profile is likewise similar at all these site: very few young and older animals and more animals dying before maturity than in cattle. Only a few clips could have been produced before these sheep were slaughtered, whereas the use of cattle as draught beasts, particularly in the absence of horses, would have been vital in an arable economy.

The age range of the pigs reflects a non-intensive husbandry with few younger juveniles culled in their first year. Although it must be remembered that this age group may be under-represented, if more animals were allowed to over-winter, the consequent extra pressure on food sources could explain the pathology observed in the pig teeth at Duntisbourne Grove and Middle Duntisbourne.

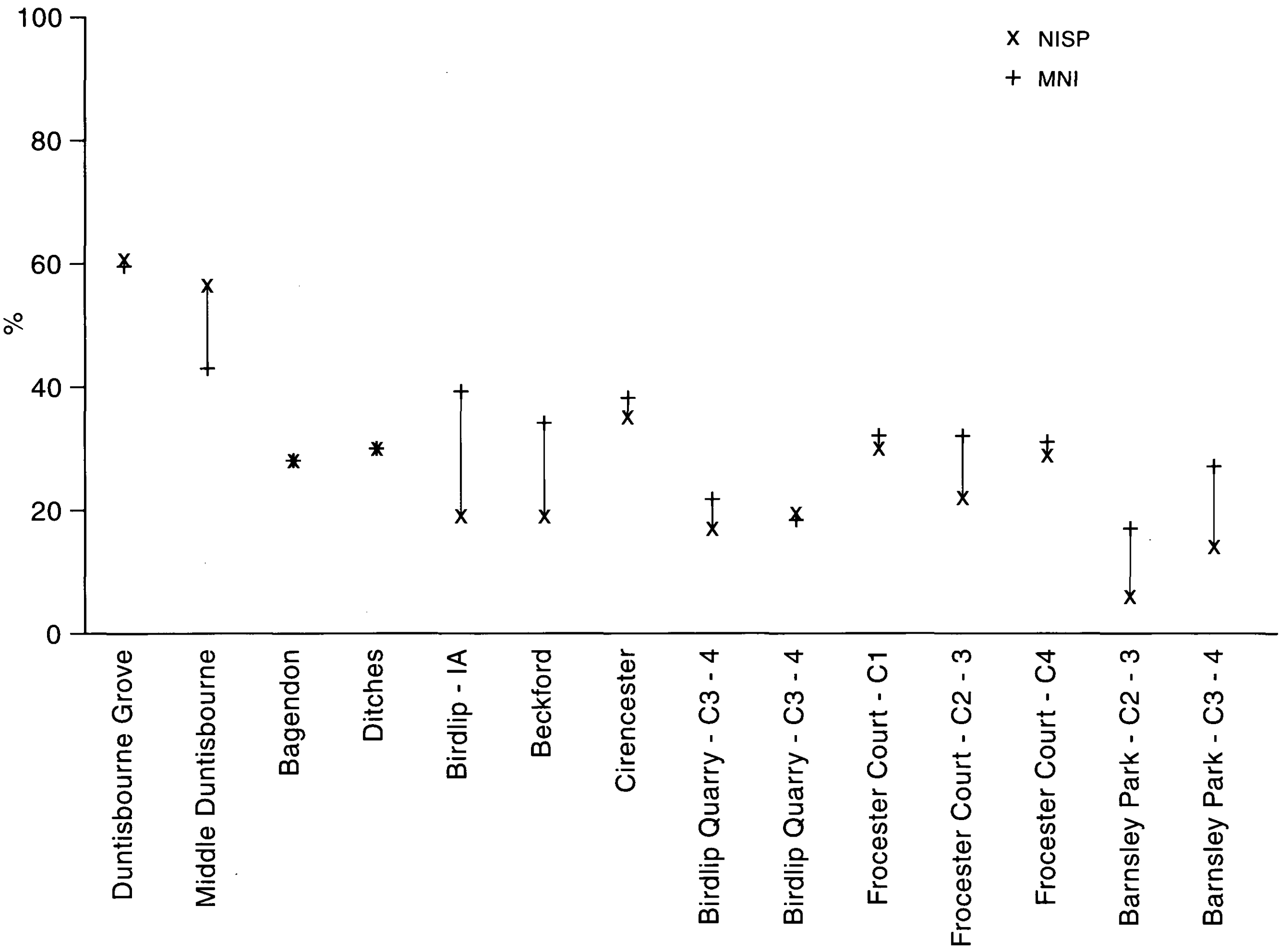

Figure 8.15 The relationship between pig and sheep at 1st-century and later sites in the Cotswolds.

Hence, although the relative frequencies of the domestic mammals differ, both Middle Duntisbourne and Duntisbourne Grove show in their treatment of these species an unspecialised, mixed husbandry which appears to be characteristic of contemporary sites in this part of the Cotswolds.

Birdlip Quarry
By Kathy Ayres and Kate M. Clark

The assemblage. *For methodology see middle Duntisbourne and Duntisbourne Grove above.*

Bone was recovered through hand excavation and sieving of bulk samples, and the hand retrieved assemblage totalled 11,355 fragments. This total is smaller than that estimated during the assessment due to the reconstruction of bones which had been fragmented post-excavation.

Period 1 produced a total of 2415 fragments of animal bone, of which 905 (45%) could be identified to species, while the assemblage from period 2 was much larger, comprising a total of 8948 fragments, 3737 (46%) of which could be identified to species. The NISP and MNI values are given in Table 8.19.

Table 8.19 Numbers of identified species (NISP) and minimum number of individuals (MNI) at Birdlip Quarry.

	Period 1			Period 2		
	NISP	%	MNI	NISP	%	MNI
Cattle	401	44	13	1788	46	35
Sheep/goat	272	30	18	1093	28	52
Sheep	-	-	-	6	<1	-
Goat	1	<1	-	1	<1	-
Pig	57	6	5	265	7	12
Horse	143	16	4	499	13	8
Dog	22	2	5	53	1	7
Cat	-	-	-	7	<1	-
Red deer	-	-	-	9	<1	-
Roe deer	-	-	-	4	<1	-
Hare	-	-	-	3	<1	-
Fox	1	<1	-	2	<1	-
Bird	8	<1	-	4	<1	-
Water vole	-	-	-	3	<1	-
Cattle size	159	-	-	307	-	-
Sheep size	24	-	-	41	-	-
Unident.	1327	-	-	4863	-	-
Total	2415	-	-	8948	-	-

Species representation

Domestic mammal remains (Table 8.19) dominated the assemblages in both periods 1 and 2, the most frequent of these being cattle, sheep/goat, horse and pig. The relative proportions of these were similar between the periods, but varied within each according to the method of quantification used. Cattle were the most abundant species according to the NISP, with sheep/goat second and horse being more frequent than pig. When MNI counts are considered, sheep/goat are the most numerous.

Dogs were well represented. Measured elements are detailed in Tables 8.20.8.22, and although no complete limb bones were available from which to estimate shoulder height, the measurements do give some indication of the characteristics of the individuals represented.

The remains from the earlier period, representing at least five dogs, are those of two types, and, described in terms of modern animals, were medium-sized terriers and labradors. However, the pair of mandibles from context 597 suggest that the "labrador" type had a rather heavier jaw than would be expected in the modern breed, and similarly in context 1584 the "terrier" sized mandibles are also notably robust. This latter pair of mandibles exhibited an area of periostitis around the mental foramen of the right jaw, with the infection extending from the tooth socket to the ventral surface of the mandible.

At least a further seven dogs are represented in the later period, including a partial skeleton from the well (context 847), which comprised the skull, mandibles, higher vertebrae and ribs. This dog has the broad facial aspect of modern Staffordshire terrier crosses, although the atlas and axis suggest that the animal would have been rather taller (Clark 1996).

Context 2018 from a pit produced the remains of at least two young puppies, probably less than four weeks of age, but the remainder of the dogs are either adult or sub-adult. There was very little wear noted on any of the teeth, including those from the earlier period, but tooth wear in dogs is notoriously unreliable as an age indicator due to the diversity of dog eating habits and a propensity to chew.

Period 2 also produced seven cat bones. Morphology and size of the bones suggested domestic rather than wild cat, and the function of the animals was probably that of vermin control.

Several species of wild mammal occurred in low numbers and, with the exception of a single fox bone from period 1, they were only recorded from period 2. Small quantities of domestic and wild bird were recorded from both periods.

Anatomical distribution of domestic mammal bone

All parts of the cattle skeleton were recorded in both assemblages, with a predominance of higher meat yielding bones and mandibles (Tables 8.23–24). Metapodials were also present in high frequencies and, although recorded in lesser quantities, the presence of smaller bones such as tarsals and phalanges indicates the presence of whole carcasses on site. The assemblage from period 2 included an

Table 8.20 Dog measurements: appendicular, Birdlip Quarry.

Element	Period	Context	R/L	Measurement	(mm)
Axis	C2/C3	307		Length including dens	45.7
				Dorsal length	49.6
				Breadth at cranial facies	30.9
	C3/C4	847*		Length including dens	44.9
				Dorsal length	41.4
				Breadth at cranial facies	26.2
Atlas	C3/C4	847*		Cranial breadth	27.8
				Caudal breadth	27.2
				Height	25.6
Scapula	C3/C4	84	L	Breadth of glenoid	26.2
Humerus	C2/C3	372	R	Distal breadth	28.2
				Min. shaft diameter	11.5
	C3/C4	84	L	Distal breadth	38.3
				Min. shaft diameter	14.8
	C3/C4	83	R	Distal breadth	37.3
				Distal depth	31.6
				Min. shaft diameter	15.0
Radius	C3/C4	84	L	Proximal breadth	22.2
Femur	100-200 AD	1057	L	Distal breadth	26.1
				Min. shaft diameter	10.5
Tibia	C3/C4	800	L	Proximal breadth	32.3
				Min. shaft diameter	12.2

* partial skeleton

Table 8.21 Dog measurements: mandibular (all tooth measurements taken at alveolus), Birdlip Quarry.

Measurement	Period	100–300 AD	C2/C3	C2/C3	C3/
C4					
	Context	1584	323	597	847*
	R/L	R	L	R	L
Length M3–P1		69.1		80.3	68.9
Length M3–P2		62.4			64.7
Length of molar row		32.1		39.5	32.4
Length P1–P4		38.1		42.9	36.9
Length P2–P4		32.3		36.3	32.5
Length carnassial alveolus		18.9		23.0	21.0
Thickness of jaw below M1		10.1	12.3	11.9	10.7
Height of vertical ramus					48.5
Height of mandible behind M1		20.0	22.4	26.5	22.8
Height of mandible between P2 and P3		16.4		21.3	20.3

Table 8.22 Cranial measurements from partial dog skeleton in context 847, Birdlip Quarry.

Measurement	(mm)
Otion to otion	48.5
Breadth occipital condyles	35.8
Breadth foramen magnum	19.0
Euryon to euryon	56.6
Breadth at post-orbital constriction	37.2
Breadth at ectorbitales	45.9
Breadth at entorbitales	31.9
Height of occipital triangle	50.1
Length of carnassial	16.6

Table 8.23 Minimum number of elements (MNE), Birdlip Quarry, Period 1.

	Cattle	Sheep/goat	Pig	Horse
Horn core	0	0	0	0
Mandible	13	18	3	1
Atlas	5	1	0	1
Axis	3	0	0	3
Scapula	7	3	2	3
Humerus	11	6	5	1
Radius	8	10	1	2
Ulna	2	1	1	1
Metacarpal	7	6	0	3
Pelvis	4	4	1	3
Sacrum	1	0	0	1
Femur	5	7	4	2
Tibia	8	12	4	1
Astragalus	3	1	0	3
Calcaneum	4	1	0	3
Nav-Cuboid	2	0	0	0
Metatarsal	7	9		4
1st Phalanx	11	4	1	8
Total	101	83	22	40

Table 8.24 Minimum number of elements (MNE), Birdlip Quarry, Period 2.

	Cattle	Sheep/goat	Pig	Horse
Horn core	2	1	0	0
Mandible	28	35	12	7
Atlas	11	1	1	2
Axis	6	1	0	3
Scapula	35	4	5	7
Humerus	24	20	7	6
Radius	24	34	2	8
Ulna	21	2	2	3
Metacarpal	25	18	1	5
Pelvis	15	5	1	7
Sacrum	2	0	0	2
Femur	17	22	8	6
Tibia	24	52	11	3
Astragalus	18	2	2	3
Calcaneum	18	1	2	4
Nav-Cuboid	4	0	0	0
Metatarsal	21	38	3	5
1st Phalanx	62	4	1	17
Total	357	240	58	88

articulated cattle tibia, calcaneum and navicular cuboid, recovered from well 891.

The relative abundance of anatomical elements of sheep was again similar in both periods with high frequency of mandibles, radii, tibiae and metatarsals (Tables 8.23–24). Other prime meat-bearing bones were recorded in quantities, particularly in the larger assemblage from the later period. Few parts of the head (apart from mandibles) or the feet were present but it is possible that the fragmented nature of the crania and the small size of the foot bones causing a retrieval bias leading to under-representation when compared to the more robust skeletal elements. In general, it would appear most likely that the sheep assemblage derives from the processing of whole carcasses, rather than from joints brought to the site.

The most frequent body parts of pig in both assemblages were main limb bones such as humerus, femur and tibia (Tables 8.23–24). Scapula and pelvis were also present, but there were few smaller bones such as phalanges. There were higher frequencies of mandibles and teeth in period 2. The analysis of element representation for pig is always compromised, however, by the immaturity of the slaughtered animals. Pigs offer no secondary products beyond manure, and there is therefore no incentive to maintain them beyond optimum meat contribution weight which is before skeletal maturity. Because of their fecundity, breeding stock can be kept low. Therefore, there will normally be an excess of juveniles over adults both in the herd and in the processed bone but unfortunately juvenile bone survives poorly in the soil. The numerical results that can be obtained from a pig assemblage, therefore, are likely to be significantly biased towards adult animals, whose actual presence would most likely have been a significant minority.

Many of the parts of the horse skeleton were present in the assemblages (Tables 8.23–24). In period 1 an articulated radius and ulna occurred in a ditch context, and in the later period, groups of bones included an articulated ulna and radius from a well context, and an astragalus and calcaneum in a layer.

Ageing and sexing of the main domestic mammals

In period 1, all of the earlier-fusing elements of cattle (up to approximately 2 years) were fused, except for one bone (Table 8.25). Thereafter, mortality increased, but there was also evidence for some cattle having reached 3–4 years or more. The dental data was dominated by evidence for mature cattle. Of the 17 mandibles available for ageing, 12 were aged as adult or older and 4 as senile. The only evidence for cattle under the age of 1 year in this period was a mandible aged to less than 8 months. The larger set of fusion data in period 2 emphasised the advanced age of the cattle with a lack of evidence for animals dying under the age of 1 year, and few animals dying under 3 years (Table 8.26). Again, there was evidence for most animals surviving beyond 3 years and a lower, but still high, proportion of those surviving over the age of 4. The dominance of mature cattle was further supported by the dental data with 31 of the 41 mandibles and loose teeth available being aged as fully adult or older. Of these, 14 were from senile animals. A small quantity of evidence for animals which had not reached 1 year, and also for older juveniles, was recorded.

The fusion data for sheep/goat in period 1 (Table 8.27) indicated the presence of very young animals, with an unfused metatarsal indicating a foetal lamb. Bones that fuse between 1–3 years and or later were represented. In contrast to the fusion data, there was no dental evidence for individuals aged under 1 year, and most animals were killed between 1 and 4 years, with the majority aged 3–4 years at slaughter (Fig. 8.16). Two mandibles were aged at 8–10 years, indicating some very old animals on site. The data from period 2 shows little evidence in either the fusion (Table 8.28) or dental data for very young lambs, with the majority of mandibles aged to over 1 year and evidence in the fusion data for high mortality in the 3rd and 4th years. The available

Table 8.25 Cattle fusion data, Period 1, Birdlip Quarry.

Age at Fusion	Element	Fused	Unfused	Total
7–10 months	Scapula D	8	0	8
12–15 months	Radius P	6	1	7
15–20 months	Humerus D	10	0	10
20–24 months	1st Phalanx	11	0	11
24–30 months	Tibia D	6	1	7
24–30 months	Metacarpal D	4	2	6
24–30 months	Metatarsal D	4	0	4
36 months	Calcaneum	1	2	3
36 months	Femur P	3	1	4
42 months	Femur D	4	0	4
42–48 months	Humerus P	2	4	6
42–48 months	Radius D	2	1	3
42–48 months	Tibia P	1	1	2
Total		62	13	75

Table 8.26 Cattle fusion data, Period 2, Birdlip Quarry.

Age at Fusion	Element	Fused	Unfused	Total
7–10 months	Scapula, D	44	0	44
12–15 months	Radius, P	45	1	46
15–20 months	Humerus, D	27	2	29
20–24 months	1st Phalanx	58	0	58
24–30 months	Tibia, D	23	1	24
24–30 months	Metacarpal, D	18	1	19
24–30 months	Metatarsal, D	19	2	21
36 months	Calcaneum	3	7	10
36 months	Femur, P	10	4	14
42 months	Femur, D	16	5	21
42 months	Ulna, P	0	3	3
42–48 months	Humerus, P	9	5	14
42–48 months	Radius, D	9	3	12
42–48 months	Tibia, P	7	5	12
Total		288	39	327

Table 8.27 Sheep/goat fusion data, Period 1, Birdlip Quarry.

Age at fusion	Element	Fused	Unfused	Total
3–4 months	Humerus, D	4	4	7
3–4 months	Radius, P	3	1	4
3–4 months	Humerus, P	0	1	1
5 months	Scapula	1	1	2
20–24 months	Metacarpal, D	3	0	3
20–24 months	Metatarsal, D	3	1	4
36 months	Calcaneum	1	0	1
36 months	Femur, P	2	0	2
42 months	Radius, D	1	1	2
42 months	Tibia, P	1	0	1
Total		19	9	27

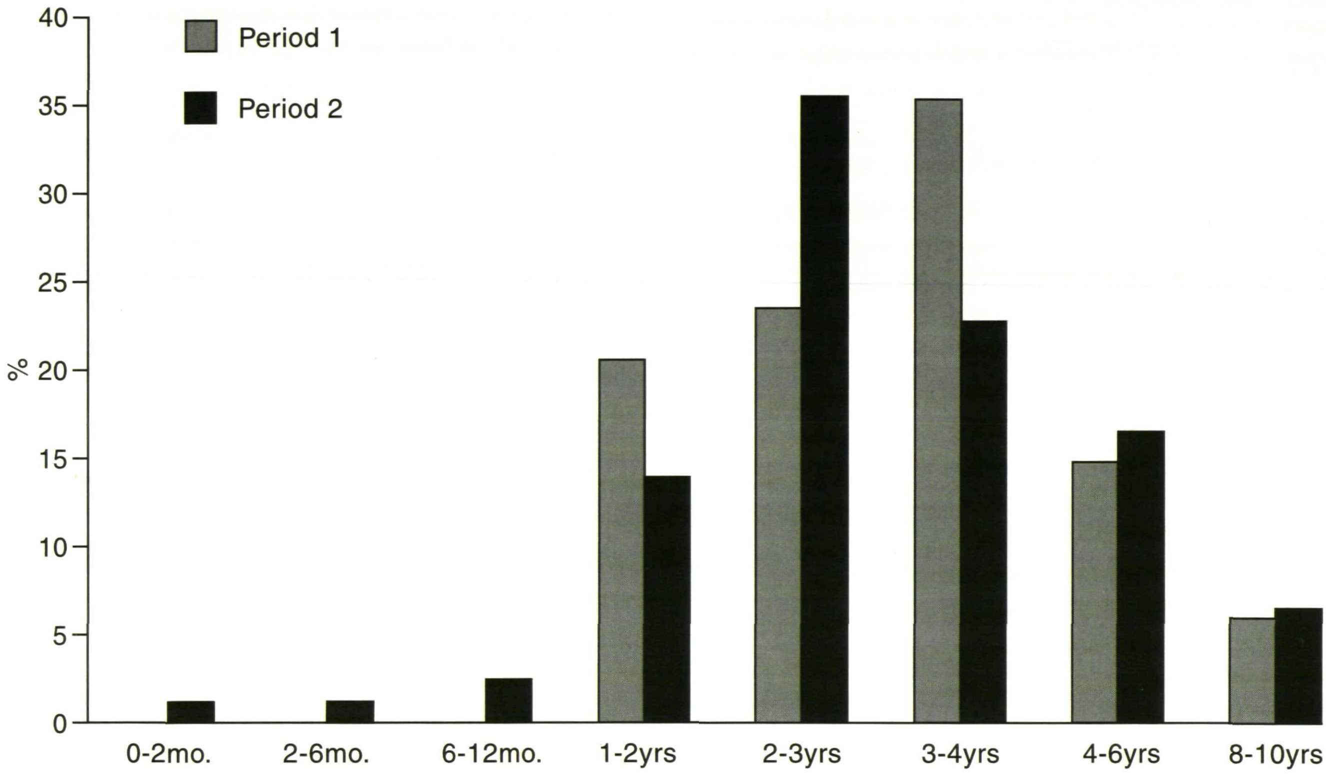

Figure 8.16 Sheep/goat dental data. Period 1: n=34; Period 2: n=90.

Table 8.28 Sheep/goat fusion data, Period 2, Birdlip Quarry.

Age at fusion	Element	Fused	Unfused	Total
3–4 months	Humerus, D	7	0	7
3–4 months	Radius, P	8	2	10
3–4 months	Humerus, P	3	2	5
5 months	Scapula	3	0	3
15–20 months	Tibia, D	14	3	17
20–24 months	Metacarpal, D	7	4	11
20–24 months	Metatarsal, D	4	3	7
36 months	Femur, P	1	4	5
42 months	Radius, D	1	4	5
42 months	Tibia, P	2	2	4
42 months	Ulna, P	2	0	2
42 months	Femur, D	1	3	4
Total		53	27	80

Table 8.29 Pig fusion data, Period 1, Birdlip Quarry.

Age at fusion	Element	Fused	Unfused	Total
12 months	Radius, P	1	0	1
24 months	Tibia, D	1	0	1
36–42 months	Ulna, P	0	1	1
36–42 months	Femur, P	0	1	1
Total		2	2	4

Table 8.30 Pig fusion data, Period 2, Birdlip Quarry.

Age at fusion	Element	Fused	Unfused	Total
12 months	Humerus, D	0	3	3
12 months	Radius, P	1	0	1
12 months	Scapula	1	1	2
24 months	Metacarpal, D	0	1	1
24 months	Metatarsal, D	0	3	3
24 months	Tibia, D	2		2
24–30 months	Calcaneum	0	2	2
36–42 months	Ulna, P	0	1	1
36–42 months	Femur, P	0	2	2
36–42 months	Femur, D	0	2	2
36–42 months	Tibia, P	1		1
Total		5	15	20

mandibles corroborate this high kill-off in the 2–4 year age range and the pattern is similar to period 1, although the highest peak was a year earlier. Five mandibles were aged as senile.

Fusion data for pig from period 1 consist of evidence for animals killed in the 2–3 year age group (Table 8.29). Two mandibles were available for ageing and indicated one immature and one sub-adult animal. In period 2 (Table 8.30), there was a higher proportion of immature bones in the pig assemblage than was recorded for cattle and sheep, with evidence for animals under the age of 1 year and little evidence of animals surviving past 2 years. The majority of

Table 8.31 Horse fusion data, Period 1, Birdlip Quarry.

Age at fusion	Element	Fused	Unfused	Total
9–12 months	Scapula, D	6	0	6
10–12 months	2nd Phalanx	2	0	2
12–15 months	1st Phalanx	7	0	7
15 months	Metapodial, D	10	0	10
15–18 months	Humerus, D	1	0	1
15–18 months	Radius, P	2	0	2
24 months	Tibia, D	2	0	2
36 months	Calcaneum	1	1	2
36–42 months	Femur, P	1	1	2
42 months	Humerus, P	1	0	1
42 months	Radius, D	2	0	2
42 months	Ulna, P	1	0	1
42 months	Femur, D	2	0	2
42 months	Tibia, P	1	0	1
Total		39	2	41

Table 8.32 Horse fusion data, Period 2, Birdlip Quarry.

Age at fusion	Element	Fused	Unfused	Total
9–12 months	Scapula, D	11	0	11
10–12 months	2nd Phalanx	6	0	6
12–15 months	1st Phalanx	14	0	14
15 months	Metapodial, D	14	0	14
15–18 months	Humerus, d	10	0	10
15–18 months	Radius, P	14	0	14
24 months	Tibia, D	1	0	1
36 months	Calcaneum	4	1	5
36–42 months	Femur, P	5	2	7
42 months	Humerus, P	4	0	4
42 months	Radius, D	17	0	17
42 months	Ulna, P	0	3	3
42 months	Femur, D	6	0	6
42 months	Tibia, P	4	0	4
Total		110	6	116

mandibles were aged as sub-adult (11 out of 20), with few very young or very old animals represented.

Pig canine teeth and dental alveoli were sexed and of the four recorded from period 1, two could be identified as male and two as female. Out of the upper and lower canines recorded in period 2, 14 could be sexed as female and 10 as male.

The majority of horse bones from both periods 1 and 2 were fused (Tables 8.31–2) and indicated adult animals, as did the loose teeth available for ageing. In the later period most were clustered around the ages of 7–10 years but some were aged up to 20 years.

A dog humerus with a fused distal end from period 1 indicated an animal over the age of 6–8 months, and in period 2 a pit produced the remains of at least two young puppies probably less than four weeks of age, with the remainder of the dogs either aged as adult or sub-adult. There was very little wear noted on any of the teeth.

All the cat bones recorded from period 2 were fully fused indicating adult cats rather than kittens.

Metrical data

The measurements from Birdlip were studied to investigate the possibility of any changes in size between the early and late Roman period although no significant differences could be observed. Measurements for the main domestic species are shown in Appendix 8.4, with the Animal Bone Metrical Archive Project data (Centre for Human Ecology 1996) from contemporary sites for comparison. The majority of measurements taken from Birdlip in the early Roman period are compatible with those listed in ABMAP although anomalies include a low value for distal breadth of cattle tibia and a high value for greatest length of sheep metacarpal. The latter measurement was also seen to be high at Portway (Noddle 1984). In both periods height of the cattle humerus trochlea was smaller than those from ABMAP. In period 2 the greatest length of cattle tibia was small, although it had high measurements of distal breadth as seen at Frocester Court (Noddle 1979) and Barnsley Park (Noddle 1985). Both the distal depth and breadth at Birdlip were larger than those in ABMAP.

Withers heights were calculated for cattle, sheep and horse from greatest lengths of long bones using formulae of Matolcsi, Teichert and Kiesewalter respectively (von den Driesch and Boessneck 1974). Only two withers heights could be calculated for cattle from the earlier period: 1.12 m and 1.19 m. The larger database of measurements in the later period provided more heights which ranged from 0.95 m to 1.2 m.

Only one withers height was available in either of the periods for sheep, period 1 gave a value of 0.56 m and period 2 of 0.67 m.

Withers heights for horse could be calculated for both periods, and are shown in Figure 8.17, again with the inclusion of comparable ABMAP data for period 2 (there is no useable comparative sample for period 1). The later Birdlip horses are noticeably at the lower end of the ABMAP range.

The shape of cattle metapodials is sexually dimorphic, with bulls having more robust bones than cows (Higham 1969); proximal breadth and depth were plotted to establish whether sexes could be determined in the assemblage. No clustering could be observed in the plotted metatarsals, but the metacarpals show two 'groups' of measurements (Fig. 8.18), of which the larger bones could be bulls and the smaller, cows. Alternatively, as the metacarpal is an early fusing bone, the figure may illustrate different age groups, such as young but skeletally immature animals, and older animals, thereby supporting the ageing data. Although these are not the best measurements for differentiating sexes, there were too few of the more suitable ones.

Wild mammals

The only evidence of wild species in period 1 was fox (*Vulpes vulpes*), represented by a scapula recovered from a well context. In period 2, both red deer

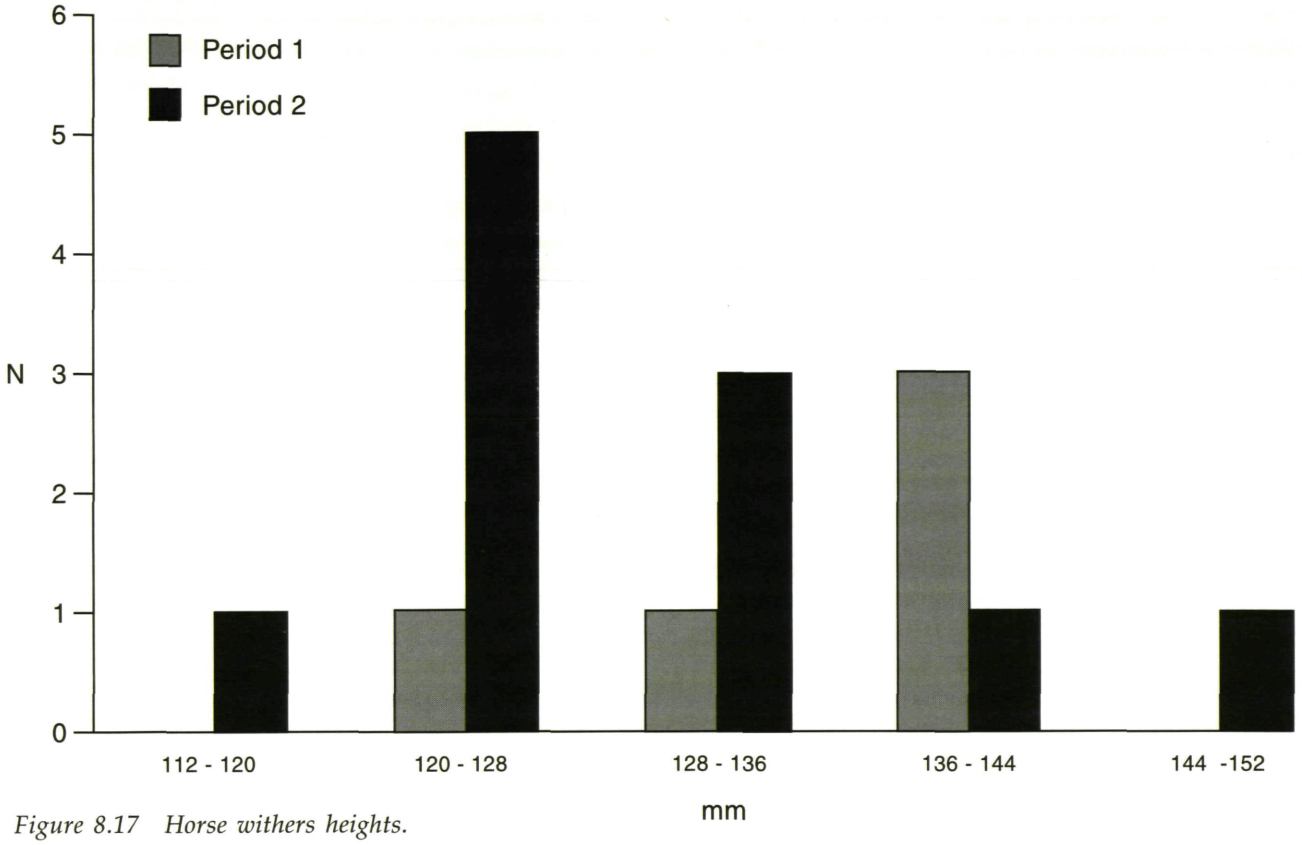

Figure 8.17 Horse withers heights.

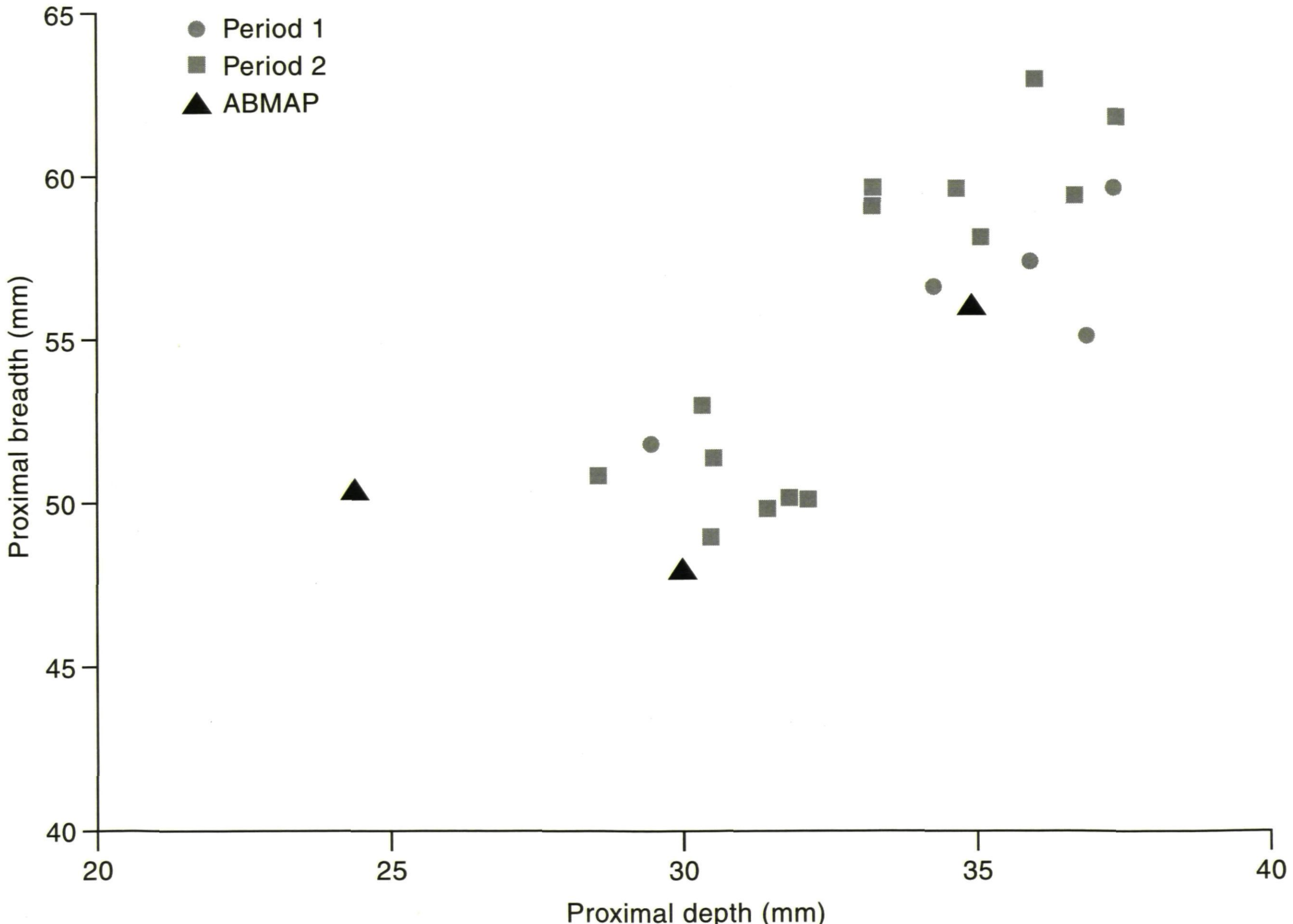

Figure 8.18 Cattle metacarpals.

(Cervus elaphus) and roe deer *(Capreolus capreolus)* were identified, with the former being the more numerous. Four of the nine red deer fragments recorded were antler, but femur and tibia were also present. A fused tibia and the ageable teeth indicated adult animals. Four fragments of roe deer were identified; humerus, ulna, metatarsal and a patella, which also indicated adults. Hare *(Lepus europaeus)* and fox were found in low frequencies, with three fragments of hare and two of fox identified, consisting of long bones and metatarsals. Three bones, two upper incisors and a femur, were identified as water vole *(Arvicola terrestris)*.

Table 8.33 Butchery data, Period 1, Birdlip Quarry.

	Chop	Knife	Chop and Knife	Total
Cattle	17	45	14	76
Sheep/goat	1	11	2	14
Pig	2	3	1	6
Horse	1	6	0	7
Cattle size	3	4	1	8
Sheep size	0	1	0	1
Unidentified	4	32	1	37
Total	28	102	19	149

Birds

Eight bird bone fragments were identified from period 1, six from domestic fowl, a thrush *(Turdus sp.)* humerus, and a woodcock *(Scolopax rusticola)* tibia. Medullary bone was identified in three specimens of the domestic fowl. This is a deposit of bone formed within bones of female birds and is required for the production of eggshell. The bone is deposited some weeks before the eggs are laid. While the eggshells are being formed the medullary bone is depleted and after the last egg is laid the normal internal structure is regained (Driver 1982). It is most easily recognised in long bones due to deposition in the relatively large marrow cavity and was identified in two femora and a tibia of domestic fowl in the Birdlip assemblage. Four bird bones were identified in the assemblage from period 2, three belonged to domestic fowl and one was mallard *(Anas platyrhynchos)*.

Table 8.34 Butchery data, Period 2, Birdlip Quarry.

	Chop	Knife	Chop and Knife	Sawn	Total
Cattle	102	199	32	0	333
Sheep/goat	8	67	1	0	76
Pig	5	17	0	0	22
Horse	1	9	0	0	10
Dog	1	1	0	0	2
Red deer	2	2	0	0	4
Cat	0	1	0	0	1
Cattle size	4	4	0	0	8
Sheep size	0	2	0	0	2
Unidentified	7	98	6	1	112
Total	130	400	39	1	570

Butchery

The majority of bones with identified butchery marks were recorded from contexts in the main occupation areas. Butchery data can be seen in Tables 8.33–34.

Butchery marks were identified on 19% of cattle bone fragments in both periods. Both heavy and light marks were recorded, indicating methods using both heavy chopping instruments and knives. In the earlier period they were most numerous on mandibles and scapula, although the main long bones were frequently marked and evidence was recorded on the extremities. In the later period marks were observed on all elements, including skull and phalanges. The marks are consistent with primary butchery techniques, of the initial dressing of the carcasses, disarticulation of joints (such as the shoulder and pelvis) and also the defleshing of bones. Those on the mandible could possibly indicate its detachment from the rest of the skull and removal of the tongue. The marks on the various skull fragments could be indicative of the disarticulation of the skull from the mandibles and neck, and the removal of the horn and core. Marks on the phalanges suggest skinning.

The majority of marks on sheep/goat bones were made by knives, although some chop marks were identified. In period 1, chop marks occurred on a metacarpal and a scapula indicating the disarticulation of the ankle and shoulder joint respectively and filleting marks were observed on scapula and main limb bones. In period 2, the marks were most frequent on the radius and tibia, but were also present on other meat bones as well as astragalus and metapodials. They are mainly indicative of filleting.

Both chop and knife marks were observed on pig bones, but knife marks were again more frequent in both periods. In period 1 these suggest the detachment of the mandible and disarticulation of the shoulder joint, and the filleting of meat from long bones and scapula, and in the later period they occurred mainly on the limb bones, scapula and pelvis.

Butchery marks were also identified on horse bones in both assemblages. A chop mark on an ulna and six examples of knife marks on limb bones and metapodials were present in the 2nd to 3rd century assemblage. Ten marks were recorded on horse bones in period 2 and included one chop mark on a radius and nine knife marks on meat bones, metatarsals and phalanges. Ribs and vertebrae of main domesticates showed evidence of butchery.

In the later period four marks were recorded on red deer bones. Two marks were observed on dog bones, a knife mark on an ulna and a chop mark on a fibula, and one knife mark was recorded on the tibia of a cat which might again have been the result of skinning.

The burning and smashing of cattle and horse long bones may be indicative of the extraction of marrow. This occurred on six cattle metatarsals and metacarpals, and two horse metatarsals.

Gnawing

Gnaw marks, predominantly inflicted by dogs, were observed on 4% of the bones from period 1 and 5% of those from period 2 and were recovered from all context types, with a higher percentage in wells, which may result from the better preservation of bone in these contexts. In period 1 a higher proportion was retrieved from Area A. The majority of gnaw marks were recorded on bones of the four main domestic species (Table 8.35–36). Both heavy and surface gnawing was observed on the bones. Surface gnawing on sheep/goat bones was most frequent, although one instance of rodent gnawing was noted on a sheep/goat bone from the earlier period. Heavier gnawing was more prevalent on the bones of cattle and had often resulted in the destruction of the epiphysis. Two examples of puncture marks were recorded on a cattle-sized rib fragment in period 1 and a fox bone in period 2. A single dog bone from period 2 showed superficial gnawing. There were two instances of feline gnawing on a sheep pelvis and a domestic fowl femur.

Burning

Burnt bones accounted for only 1% of the total assemblage from periods 1 and 2 (Table 8.37). In period 1 evidence for burning was present on bones of sheep, horse and unidentified fragments and in the later period on cattle, cattle-sized, sheep/goat and unidentified fragments. In period 1 the majority of the burnt fragments of bone were recovered from ditches and hearths in Area A; in period 2, most were from the corn dryer fill and occupation layer by fragment count, but from pits by percentage.

Table 8.37 Burning data, Birdlip Quarry.

Period	Burned	Calcined	Charred	Partly	Total	%
1	26	1	0	5	32	1
2	51	15	1	10	77	1
Total	77	16	1	15	109	

Pathology

The most notable characteristic of the pathological assemblage is the incidence of established and advanced arthropathy. Table 8.38 summarises the distribution of the lesions, all but one of them in the lower limbs, with hindlimbs most commonly affected. The degree of joint damage is remarkable. Those lesions designated as degenerative all comprise substantial reactive bone around the joint margin (periarticular exostoses) together with expansion of the articular area and eburnation and grooving of the subchondral bone (Plate 8.6). Cases described as septic have suffered complete destruction of all or part of the joint surface and this is associated with

Table 8.35 Gnawing data, Period 1, Birdlip Quarry.

	Heavy	Surface	Digested	Punctured	Rodent	Total
Cattle	14	8	0	0	0	22
Sheep/goat	7	26	0	1	1	35
Pig	4	5	0	0	0	9
Horse	4	1	0	0	0	5
Dog	0	1	0	1	0	2
Cattle-sized	0	0	0	1	0	1
Unidentified	5	4	1	0	0	10
Total	34	45	1	3	1	84

Table 8.36 Gnawing data, Period 2, Birdlip Quarry.

	Heavy	Surface	Digested	Punctured	Rodent	Total
Cattle	86	52	0	0	0	138
Sheep/goat	46	134	0	0	0	180
Pig	13	19	0	0	0	32
Horse	7	7	0	0	1	15
Dog	0	1	0	0	0	1
Cattle-sized	0	3	0	0	0	3
Unidentified	10	81	3	1	1	96
Total	162	297	3	1	2	465

Table 8.38 Arthropathic conditions, Birdlip Quarry.

Period	Species	Context	Element	Epiphysis	Status
1	Cattle	852	Metatarsal	D	Articular extension
	Horse	953	Metatarsal	P	Septic
			3rd tarsal	P D	Septic
			Central tarsal	D	Septic
2	Cattle	18	1st Phalanx	D	Degenerative
		84	Metatarsal	P	Degenerative
		206	Metatarsal	P	Degenerative
		815	Metatarsal	P	Septic
		848	Femur	P	Eburnation
		861 / 880	1st Phalanx	P	Degenerative
		1501	Metacarpal	D	Degenerative
			1st Phalanx	P	Degenerative
			Centroquartal	D	Degenerative
	Horse	984	Metatarsal	P	Degenerative
		1228	Astagalus		septic

proliferative infected bony growth. In the case of the 2nd-/3rd-century horse hindlimb from context 953, there has been total collapse and integration of the remains of the third tarsal into the proximal metatarsal, with the degeneration and infection extending into the central tarsal above (Plate 8.7).

A significant observation in this assemblage is the lack of early arthropathic manifestations, and there are two broad explanations that can be forwarded in a collection of this size based on the cattle data. The animals may have been slaughtered at an advanced age, or perhaps in a slaughter pattern which includes only juveniles/young adults and elderly cattle. Alternatively, the progression of the disease has been accelerated by repeated stresses such as those imposed by draught or traction or work over hard surfaces. The latter explanation is often more attractive because of its narrative potential, but analysts are becoming more aware of the complexities of arthropathic change in animals and the external conditions which stimulate it. In the case of the Birdlip cattle assemblage, the ageing data suggest that the pattern of joint abnormality is consistent with the presence of elderly animals.

This absence of such asymptomatic joint remodelling as discrete articular extension is unusual, even in small assemblages. Morphological adjustments to joint surfaces, usually sub-clinical, and age-related manifestations reflecting some degree of maturity within the group are common. In the case of the animals from Birdlip this category of naturally occurring remodelling is missing, but advanced joint degradation is well represented. Here, the second hypothesis, that of repeated unnatural stress, has to

Plate 8.6 Cattle lower forelimb showing degenerative osteoarthropathy.

Plate 8.7 Horse metatarsal and third tarsal showing advanced arthropathy.

be considered seriously and is supported by the eburnated femoral head specimen from context 848. This is unfused, and therefore represents an animal less than about three years of age. This is a very young age indeed for cattle to suffer normal degenerative arthropathy, and it may be far more likely that the animal was subjected to repeated stresses in the hindquarter.

The effects of working over hard surfaces are seen in a case of splints in a horse metatarsal from the 3rd/4th century group (context 84). Splints are bony enlargements which are a result of localised periostitis and occur most commonly in modern horses under the age of six years who are doing strenuous work on hard or uneven surfaces, or who strike the lower limb with the inside of the opposing hoof. In the Birdlip specimen the lesions are on the lateral side so the latter aetiology does not apply. It is more likely that excessive concussion before the animal reached adulthood caused inflammation of the interosseous ligament binding the cannon bone to the smaller metatarsals, and the inflammation spread to the covering periosteum. New bone growth is subsequently stimulated by the irritation and strain.

The remainder of the infectious lesions visible in the assemblage are discrete and unrelated. In the 3rd-/4th-century cattle, a mandible has an infection of a tooth socket with resorption and recession of the bone around the alveolus, and a 2nd-/3rd-century second phalanx has an infection at the site of the medial ligament insertion. A pig calcaneum has a severe infection of the distal end which has resulted in the complete destruction of the articulation; this is undoubtedly due in the first instance to a penetrating wound.

There is only one instance of sheep periodontal disease, with a left mandible exhibiting an abscess from the 3rd-/4th-century context 846. This lack of oral disease in sheep from this period is as notable as the high incidence of advanced arthropathy in the cattle, and adds considerably to the very individual character of this bone assemblage. The only other lesion in sheep remains is a partially healed fracture of a distal tibia, with well developed callus and evidence of infection. A single instance of trauma in cattle is an ossified haematoma on the caudal border of a scapula, probably the result of a strong blow.

Congenital abnormalities are all from the 2nd-/3rd-century material. A horse jaw exhibits an extra mental foramen, and a pair of cattle maxillary third molars have very abnormal wear, due almost certainly to the absence of the third cusp in the opposing mandibular molars. A cattle mandible from context 1505 does indeed show a very reduced third cusp on the third molar with abnormal wear. This mandible has also suffered the loss of the first molar, with the alveolus filling but with infection, recession and resorption of the jawbone. A pair of dog mandibles from period 1 exhibited an area of periostitis around the mental foramen of the right jaw, with the infection extending from the tooth socket to the ventral surface of the mandible.

Worked bone

Only one worked fragment of bone was recorded in the 2nd–3rd century assemblage. This was an unidentified fragment and may have been a waste piece. A fragment of red deer antler in period 2 had been worked and there were four knife marks identified on antler. An unidentified fragment of bone had also been worked.

Sieved bone

Animal bone was also recorded from 5 sieved samples in period 1, and 11 in period 2 (Table 8.39). Cattle remains were the most frequently identified in period 1, although period 2 showed a higher proportion of sheep. However, the number of bones recorded from each sample was not large. In period 1 the fill of the possible votive pot (sample 123) contained frog *(Rana temporaria)*, toad *(Bufo sp.)*, indeterminate amphibian and shrew *(Sorex sp.)* bones which were probably not deposited ritually. Ageing data indicated the presence of mature cattle and horse and juvenile pig. Period 2 contained a higher proportion of sheep bone, and fragments of cattle, pig, horse and dog and cat were also identified.

Spatial analysis

Although bones were recovered from nearly all parts of the site, in both periods 1 and 2 the majority were excavated from the main occupation areas, A-E. In period 2, bone was also excavated from part of Roman Ermin Street. In both assemblages, the largest proportion came from area A alone (52% of period 1, and 38% of period 2). Within these areas, bone was recovered from a number of different contexts which have been grouped into types. In both periods bone was recorded from ditches, layers, pits, wells and structural remains, and in period 1, a single hand-retrieved bone was excavated from a possible votive deposit. Although similar proportions were excavated from the various areas in each period, the distribution of bones by context type differed between the two. In period 1, the majority of bones were recovered from ditches and layers, with similar proportions from each; whereas in the later period, a larger proportion was excavated from layers (62%) and fewer from ditches.

Cattle bone predominated in most areas in both periods although there were exceptions. In period 1, Area 1 had a much higher proportion of horse, although the number of bones excavated from this area was small (66). Similarly in Area 2a, identified as a dump, the assemblage consisted solely of cattle and cattle-sized bone fragments, but the total number of bones was only 23. Cattle and horse fragments were the most frequent in the culvert trench and well 277. Dog was present only in the assemblages from the main occupation areas. Cattle bone was the most frequent in all context groups, although the structural remains had almost equal proportions of sheep/goat. Apart from the sieved bone described above, the votive deposit consisted of only one fragment of hand-retrieved bone and this could not be identified to either species or element level. In period 2, the predominance of cattle remains in most areas was again noted, an exception being area D where sheep were most frequent. Dog was present over a larger area in this period. In both periods the percentage of horse relative to other species was higher outside the main occupation areas. In contrast to period 1, the majority of bones were excavated from layers and again cattle bone was the most frequent in all but the structural deposits.

Most parts of the skeleton were present in the main areas of occupation in period 1, although a predominance of cattle skull fragments and teeth was noted in Area 2A. There was little difference in the distribution of anatomical elements in the context groups. The data from period 2, however, could indicate differential deposition. Main areas of occupation such as A, B and D had higher proportions of limb bones, and fewer fragments of the head and feet, whereas in those areas on the edges of the site, the reverse is true. In Area E and the nearby well (context 891), feet were represented in much higher proportions, and in the section of Ermin Street which had been excavated, there was an abundance of parts of the skull. This could indicate food debris deposited in the main areas of occupation and primary butchery waste outside of these. This was most notable with cattle bone and can be seen in Figure 8.19.

Discussion

The relative abundance of the main domestic species and the age profiles are similar between the two periods and allow them to be discussed together. Cattle were the most frequent species by fragment count although the higher MNI of sheep/goat suggests the important contribution of both these species to the husbandry of the site.

Table 8.39 Number of identified specimens from samples, Birdlip Quarry.

	Cattle	Sheep/goat	Pig	Horse	Dog	Cat	Cattle size	Sheep size	Frog	Toad	Amphibian	Shrew	Uniden.	Total
Period 1														
> 10mm	25	4	3	31			2	1					4	70
Pot fill			0						8	2	1	2	1	14
Period 2														
> 10 mm	5	13	2	2	3			1					11	37
10–4 mm		1			2	3		1					1	8

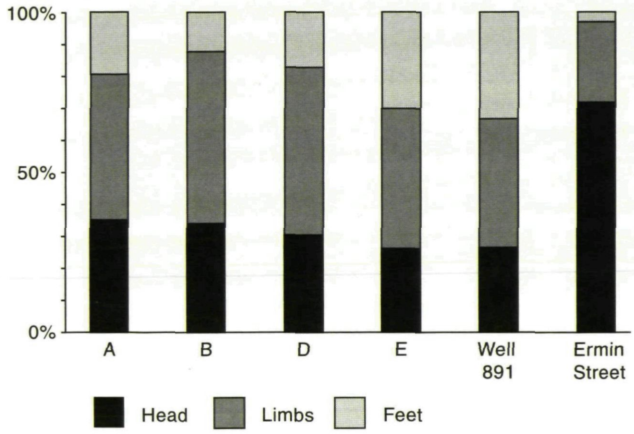

Figure 8.19 Representation of cattle body parts by area.

King, in his survey of British sites (1978), identified cattle husbandry as dominant in the Roman period and concluded that the more 'Romanised' settlements (eg. villas and towns) had fewer sheep than native sites, which continued the Iron Age pattern (King 1991), this trend spreading and becoming more marked in the later Roman period. However, this pattern is based largely on fragments counts which, as argued in the analysis of the Duntisbourne assemblages, will over-represent the contribution of cattle to an assemblage. Hence, although NISP proportions show that by the 4th century this more 'Romanised' pattern of high proportions of cattle occurred at both urban and rural sites near to Birdlip, examination of the MNI proportions (Fig. 8.20) shows that, as at Birdlip, sheep equalled or outnumbered cattle in numbers of animals present.

The predominance of aged cattle was particularly evident in the later period with senile animals the most numerous. This indicates that a role for cattle at Birdlip was as working draught animals. This is also suggested by the advanced arthropathy of the species which indicated stresses through work.

The identification of all parts of the body suggests whole carcasses were present on site. The presence of immature animals does suggest that some animals were slaughtered locally at an age which optimised meat return for food costs. The almost complete absence of very young animals is notable but may well be explained by poor preservation of the bones of younger animals. Maltby (1981) recognises this emphasis of mature cattle in the Roman period but such a high proportion of senile animals at Birdlip is unusual in that this pattern has more frequently been seen on military and urban sites rather than rural, which have evidence for cattle of all ages in their assemblages. However, predominance of mature cattle was also seen at the nearby rural sites of Haymes and Portway and high proportions of mature cattle were also recorded from Frocester Court Villa (Noddle 1979) and Barnsley Park (Noddle 1985).

The keeping of a sheep population for meat in both periods was implied by the peaks in age profile at approximately 2–4 years. Older animals which would have been kept for their wool and milk were also represented, although the absence of loomweights and rarity of spindle whorls in the small finds assemblage suggests that most wool may have left the site as raw fleeces. There was little evidence for very young animals indicating little consumption of young on site or, as with cattle, this could be due to preservational bias. Both Grant (1989) and Maltby (1981) note the increasing importance of meat in the Roman period although they observe that wool production would also have continued. High proportions of immature and mature sheep were recorded at Barnsley Park, Portway and Frocester Court (Noddle 1979; 1984; 1985).

High percentages of immature pigs were also noted at sites in the vicinity. This is a typical pattern for pigs because of their high fertility rate and lack of secondary products, which means there is less reason to keep most of them to maturity. This also means that the role of pig in the site economy is almost certainly understated because of the lesser likelihood of juvenile bones surviving.

In both periods the butchery evidence indicated the dismembering of the carcass and subsequent filleting of the meat from the bones of the main food animals. Grant (1989) observed the change in butchery techniques from the Iron Age to the Roman period, with the use of heavier chopping tools becoming more frequent than the cutting of ligaments by knife, although the latter method continued to be used.

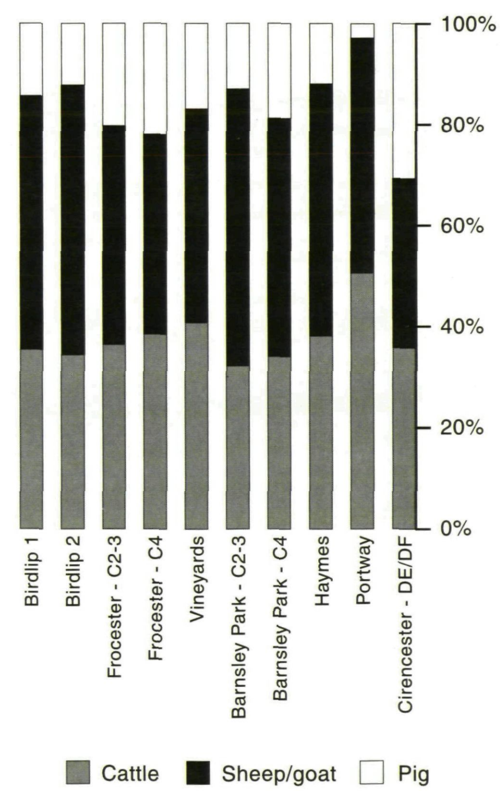

Figure 8.20 Representation of the main domestic mammals at Birdlip and contemporary Cotswolds sites.

In Birdlip, there was a predominance of knife marks on both cattle and sheep bones and Maltby (1989) observed that although chop marks predominated on urban sites where carcasses were more heavily butchered, knife marks were still more frequent on rural sites even in the later Romano-British period. This may be because there is unlikely to have been a specialist butchery practice on rural sites, as there were in towns, and traditional practices were still in use.

Horse is often recorded on Roman sites but is rarely very common and the high proportion of horse bones recorded at Birdlip is unusual. Although butchery marks have been observed on some horse bones at Birdlip, they could have been the result of skinning of the carcasses rather than the removal of meat for human consumption (Grant 1989). In both periods the horses were aged as adult and they would have been used as working animals. According to Hyland (1990) horse power could have been utilised for all farm duties other than 'heavy ploughing'. The pathological evidence has indicated the work related conditions in the Birdlip bones. Particularly high frequencies of horse were also noted at Heneage, Haymes and Portway, although the species was present in most of the sites mentioned above.

The frequency of wild species at Birdlip was not high and it is unlikely that they contributed much to the diet. Deer could be a source of food, or raw material in the form of antler for working and the evidence suggests it was used for both purposes at Birdlip. Femur and tibia were both recorded indicating hunted carcasses brought back to site, and an antler with cut marks was also recorded which may have been used for working. Wild species were found only at the larger sites such as the villa at Barnsley Park (Noddle 1979) where red, roe and fallow deer *(Dama dama)* were all present but again would not have contributed to the diet to any great extent. The settlement and shrine at Portway has an absence of wild species and Vineyards Farm only had small frequencies but included dog, cat, deer, fowl, goose and other bird (Noddle 1984).

Excavations of Iron Age and very early Roman date had taken place previously at Birdlip, the site being situated *c.* 1.5 km further north. Cattle was also identified as the most frequent species by fragment count in this assemblage (Dobney and Jacques 1990), although the wet-sieve data shows a predominance of sheep. The age profiles were similar to that of the later assemblages described in this report with a predominance of mature cattle and immature and mature sheep. Wild species were also rare. The measurements were compared between the different assemblages, and although no change had been found between the two later Roman periods as noted above, the maximum of many of the measurement ranges in these were higher than those in the Iron Age assemblage (Table 8.40). Jewell (1962) identified the presence of small cattle in the Roman period but also greater variation in size than in the Iron Age with the appearance of larger stock. Possible reasons for this include the importation of stock and the improvements in size of native stock. There may also have been regional variations in size.

The animal bone assemblage from Birdlip did not reflect a wealthy site. Cattle and sheep were mainly kept until old which indicates they were utilised fully until too old for working or were barren, with fewer animals kept mainly for their meat. The high incidence of severe pathologies also indicates some cattle and horse being overworked which suggests limited replacement. The assemblage from Birdlip does fit in with those from nearby rural and urban sites and appears to be typical of the Cotswolds region. At present it is not certain how the Roman site relates to the earlier Iron Age site situated nearby, but the assemblages from both periods were very similar and imply a continuation of husbandry practices.

Other sites

By Adrienne Powell

Summary

Apart from the sites discussed above, none of the other animal bone assemblages from the road scheme were considered worthy of any analysis beyond the assessment stage.

Table 8.40 Comparison of measurements from Iron Age (Dobney and Jacques 1990) and Roman periods, Birdlip Quarry.

Species	Element	Measurement	Iron Age	Period 1	Period 2
Cattle	Radius	BFp	60.55 –63.75	-	61.30 –81.80
	Humerus	Bd	67.60 –79.65	70.00	66.00 –85.00
		BT	59.00 –68.85	65.90	50.60 –78.30
	Tibia	Bd	57.05 –59.60	40.30	52.20 –65.10
	Metacarpal	GL	170.80 –176.20	-	171.00 –82.00
		Bp	43.25 –54.50	51.80 –62.90	49.00 –61.80
	Metatarsal	GL	196.10	212.00 –225.00	184.00 –23.00
		Bp	39.75 –44.00	39.60 –51.50	41.20 –53.00
Horse	Humerus	Bd	74.95 –75.25	71.00	68.00 –78.00
	Radius	BFp	66.10	72.00 –73.70	54.30 –80.10

Table 8.18 Withers heights in metres, Middle Duntisbourne and Duntisbourne Grove.

Species	Site	Radius	Metacarpal	Metatarsal	Calcaneus
Cattle	Duntisbourne Grove	1.03	1.13	1.04	
	Middle Duntisbourne			1.13	
	ABMAP: mean, range	1.14, 1.02–1.26	1.10, 0.98–1.19	1.13, 1.03–1.28	
Sheep	Duntisbourne Grove				0.55
	Middle Duntisbourne				0.58, 0.53
	ABMAP: mean range				0.54, 0.50–0.59

be smaller than their local contemporaries. There is also no visible improvement in cattle size until the later assemblages of the 3rd–4th centuries. This size increase is clear in Figure 8.6, which plots tibia distal depth against distal breadth for the Duntisbournes and the 2nd–4th century Birdlip Quarry material. These form two largely separate groups with only a few overlapping values. The narrow range and the lack of smaller animals in the Iron Age assemblage from Birdlip (Figure 8.5) may be a reflection of the small sample size; comparison of humerus trochlea breadth (Figure 8.7) shows a similar size range present at the Duntisbournes and Iron Age Birdlip, with the Birdlip Quarry assemblage containing larger animals than the Iron Age sites.

The three sheep withers heights fit into the average and above part of the range, derived from calcaneus only, for contemporary southern British sites. The comparison of distal tibia breadth in sheep from the Duntisbournes and other Cotswold assemblages

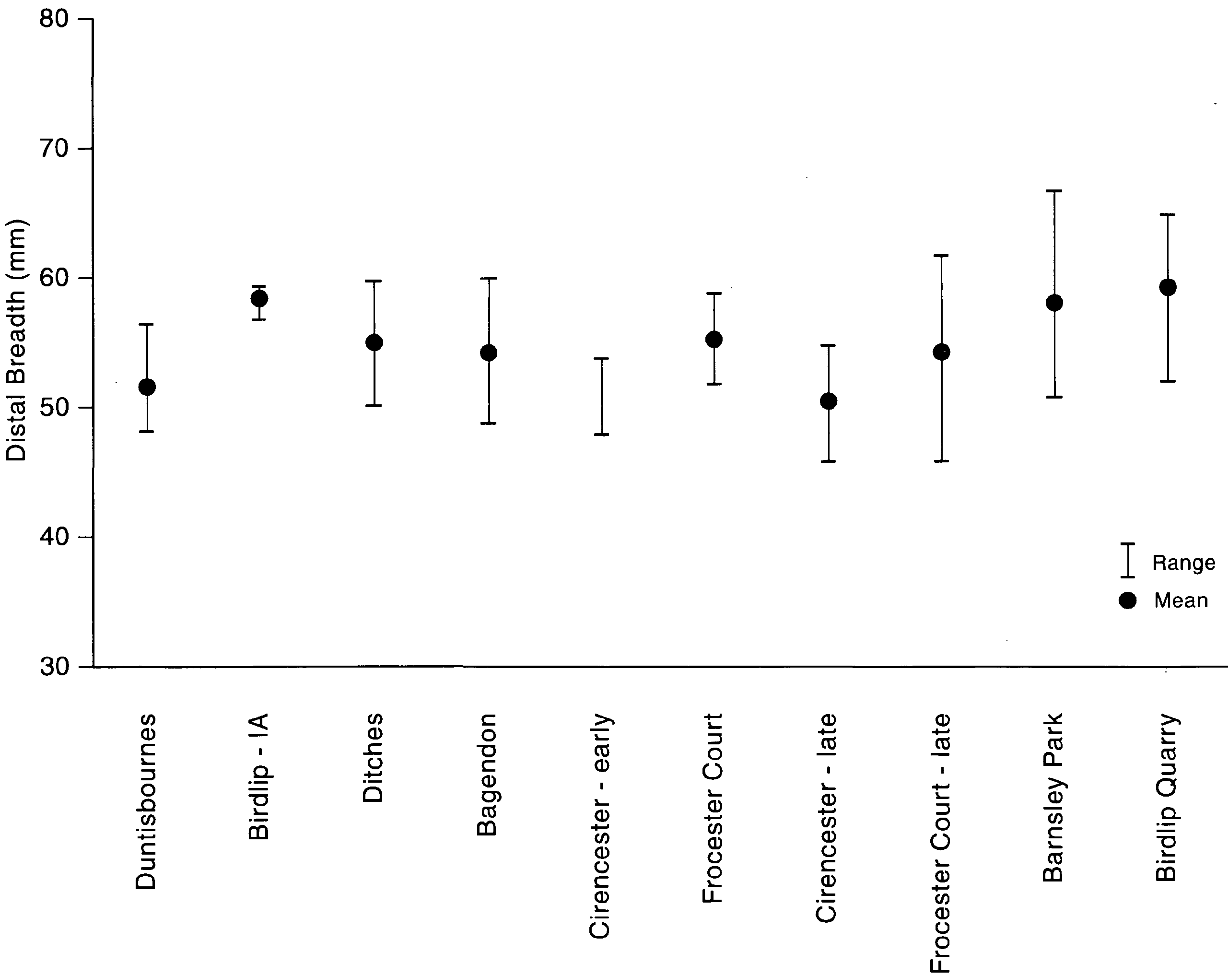

Figure 8.5 Comparison of cattle distal tibia breadth from Duntisbourne Grove and Middle Duntisbourne with other Cotswolds sites.

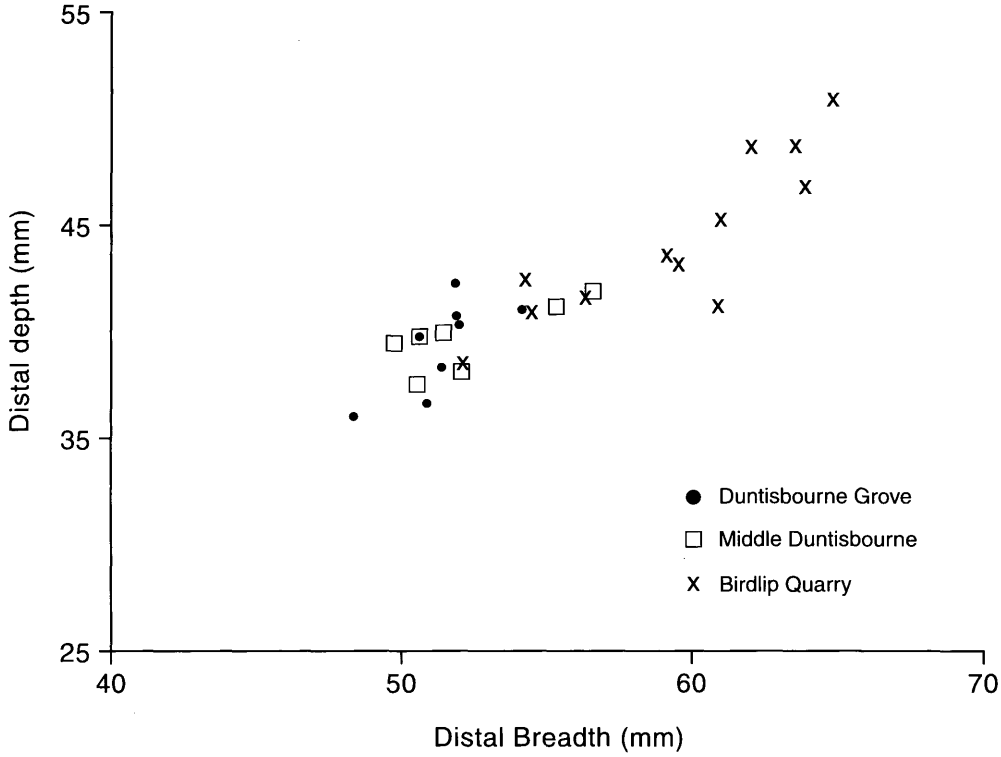

Figure 8.6 Comparison of tibial distal breadth against tibial distal depth in cattle.

(Figure 8.8) shows a similar size range in most of the 1st century assemblages and less variation than in the same measurement for cattle. The Ditches sheep, however, are slightly larger than their contemporaries. Otherwise, as argued by Rielly (1988), there is no apparent increase in the size of sheep until the later

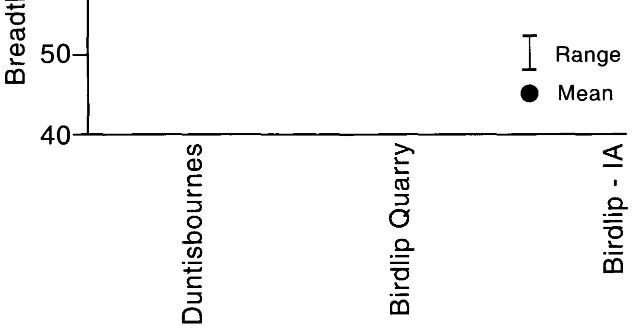

Figure 8.7 Cattle distal humerus. Comparison of humerus trochlea breadth in cattle.

Roman period in the Cotswolds. Figure 8.9 shows that, while most of the Birdlip Quarry measurements are larger than those from the Duntisbournes, all of the distal tibias from Middle Duntisbourne lie within the lower half of the range from Birdlip. If the smaller specimen from Duntisbourne Grove is excluded, the minimum value for the distal breadth (Figure 8.8) is 21.5, comparable with the lower limit at Ditches. Other measurements do not show such a degree of differentiation: the scattergram of distal humerus measurements (Figure 8.10) shows far more congruence between the size ranges at the Duntisbournes and Birdlip Quarry.

No withers heights could be calculated for pigs since the high kill-off of immature animals means there are no complete long bones. The length of the lower third molar (Figure 8.11) suggests there was no change in the size of pigs between the late Iron Age and the late Romano-British period. The range present in the Duntisbourne assemblages is similar to that in the Ditches material, although the latter has a slightly lower mean size as does the later Birdlip Quarry sample. In contrast, the teeth from the Iron Age features at Birdlip Bypass are relatively small, as can also be seen in Figure 8.12. The outlying Iron Age third molar from Birdlip, with a large anterior breadth, is probably from a wild boar (Payne and Bull 1988). Comparison of the Duntisbournes and Birdlip Quarry in Figure 8.13, plotting distal humerus, shows larger animals at the latter in contrast to the third molar data. However, the sample of measurable pig bones is too small at Birdlip Quarry (below) to draw a firm conclusion from this.

The assemblages were examined in their entirety, with the exception, due to time constraints, of Street Farm and Weavers Bridge. The total identifiable fraction was estimated for the latter two sites in the same way as for the larger assemblages (Table 8.41).

The condition of the bone affects its identifiability and the amount of other information which can be recovered, and hence an assemblage's suitability for further analysis. Therefore, the condition of the examined bone was rated on a scale of 1 to 5 for each group of fragments (context or bag). Condition 1 describes bone in excellent or very good preservation, with little post-depositional damage; condition 2 describes bone which may be identifiable to species but which may not retain fully such other data as butchery or gnawing; condition 3 describes bone identifiable to species and element but with little other information preserved; condition 4 indicates few bones identifiable beyond element; and condition 5 describes greatly altered material, only identifiable as 'bone' (Table 8.42). The proportions of the main domestic animals in the identified fraction of the assemblage has also been calculated (Tables 8.43), although as with condition, sites with assemblages containing less than 100 fragments are excluded.

Highgate House

The bone from this site comes from features ranging from prehistoric to Romano-British in date, but most is from the middle-late Iron Age contexts. The level of identification overall is low (17%) and the condition of the bone is moderate to poor. The bones of cattle are the most frequent in all the dated groups and include an articulating adult radius and ulna pair. Sheep/goat and horse bones are also frequent, the former including neonatal material. Pig is present in low numbers. A skull and partial skeleton of a water vole (*Arvicola terrestris*) occurs in a sample from the undated context 139. Butchery marks, gnawing and burning are present.

Five Mile House

Two bones in poor condition were retrieved from this site, the single identifiable bone is sheep/goat.

Duntisbourne Leer

A single unidentifiable fragment of bone was recovered.

Field's Farm

There is only one identifiable bone in this assemblage, a pelvis from an adult horse, the remainder consist mainly of eroded fragments, including some splinters of sheep-sized long bone.

Daglingworth Quarry

The large identifiable portion of this assemblage consists of a partial toad skeleton.

Ermin Street sections

Much of the bone in this assemblage is in good condition, and a high proportion is identifiable to species (70%). Almost half of these are sheep/goat, both adult and juveniles represented, with the remainder largely cattle and pig, equally divided, and one specimen of horse. Gnawmarks are present.

Lynches Trackway

The condition of the bone from this site is variable: the early Iron Age/Romano-British and some of the undated material is in good condition, and most of the early Romano-British bone is moderately well preserved. However, the remainder of the bone, including the largest group from the site, the Iron Age/Romano-British material, is in poor condition, resulting in a relatively low degree of identifiability overall (17%). Cattle bones are the most frequent in all the dated groups, while the proportion of sheep/goat appears to increase through time. Horse bones are present in the early Romano-British material. The skull of a small vole in the undated group may represent a burrowing intrusion. The assemblage is not large enough or closely enough dated to yield much information on husbandry practice.

Burford Road

Most of the bone in this assemblage is from medieval to post-medieval and post-medieval/modern contexts. The later material is mostly in moderate condition, while the remainder is largely in poor condition. The single identifiable Romano-British bone is cattle, while sheep/goat and pig are present in the medieval to post-medieval material, and horse, cattle and sheep/goat bones are present in the post-medieval/modern.

Cherry Tree Lane

The bone in this assemblage is in poor condition, consisting mainly of eroded unidentifiable fragments. The identifiable bone consists of fragments of cattle humerus, pelvis and femur.

Norcote Farm

The bone is poorly preserved and largely unidentifiable, the identifiable bone consists of a horse pelvis from the undated material, and 2 fragments of cattle tibia from the 1st century AD.

Witpit Lane

Although most of the bone from this site is in poor condition, some is moderately well preserved. Nevertheless, the identifiable fraction is small: a cattle humerus and a loose lower third molar from an adult sheep in the post-medieval contexts, and a horse second phalanx from the late 12th–14th century.

Table 8.41 Bone from the remaining smaller assemblages.

Site		?BA	Prehistoric	IA/ prehistoric	EIA/RB	M-LIA	LIA	IA	IA/RB	ERB	LRB
Highgate House	Total		13	168		176	254	48			
	Ident.		1	22		25	40	13			
Five Mile House	Total										
	Ident.										
Duntisbourne Leer	Total									1	
	Ident.									0	
Field's Farm	Total									6	
	Ident.									0	
Daglingworth Quarry	Total										
	Ident.										
Ermin St Sections	Total										
	Ident.										
Lynches Trackway	Total				22				218	99	
	Ident.				14				19	24	
Burford Road	Total									1	
	Ident.									1	
Cherry Tree Lane	Total		4					2			
	Ident.		0					0			
Norcote Farm	Total									8	
	Ident.									2	
Witpit Lane	Total										
	Ident.										
Preston Enclosure	Total					685					
	Ident.					157					
St Augustine's Lane	Total	6	48								
	Ident.	6	0								
St Augustine's Farm South	Total		99								
	Ident.		3								
Ermin Farm	Total					32		47			
	Ident.					7		16			
Cirencester Road	Total										
	Ident.										
Lower Street Furlong	Total		7								
	Ident.		0								
Westfield Farm	Total										
	Ident.										
Latton Roman Pond	Total									41	32
	Ident.									4	8
Court Farm	Total	1	1					90	31	255	
	Ident.	0	0					4	5	66	
nosniwb	Total										
	Ident.										
cirenwb	Total										
	Ident.										
latwb	Total										
	Ident.										
swglwb	Total										
	Ident.										
Total	Total	7	172	168	22	893	254	187	249	411	32
	Ident.	6	4	22	14	189	40	33	24	97	8

RB	?RB/ later	RB/ medieval	RB/ post-medieval	Medieval	Medieval/ post-medieval	Prehistoric/ post-medieval	Post-medieval/ modern	Undated	Total
8 1								85 25	752 127
							2 1		2 1
									1 0
54 1									60 1
							27 25		27 25
								44 31	44 31
							1 0	30 6	370 63
1 0					20 4		14 9	7 2	43 16
					24 4	2 0		19 0	51 4
								57 1	65 3
				10 1			19 2		29 3
									685 157
							2 2	17 3	73 11
									99 3
								45 16	124 39
								1 0	1 0
									7 0
19 0							1 0	32 0	52 0
36 9	185 0	6 3	26 8					413 39	739 71
7 5				2 2			22 1	69 3	478 86
								42 17	42 17
								1 1	1 1
								14 8	14 8
								1 0	1 0
125 16	185 0	6 3	26 8	12 3	44 8	2 0	88 40	877 152	3760 667

Table 8.42 Condition of the animal bone in the smaller assemblages.

Site	Date	Condition				
		1	2	3	4	5
Highgate House	? Prehistoric					100
	Iron Age/prehistoric			9	21	70
	Middle-late Iron Age			22	65	13
	Late Iron Age		4	25	71	
	Iron Age			8	92	
	Romano-British				75	25
	Undated		1	48		51
	Sub-total		1	22	51	26
Lynches Trackway	Early Iron Age/Romano-British		100			
	Iron Age/Romano-British					100
	Early Romano-British			79	21	
	Post-medieval					100
	Undated		13	10		77
	Sub-total		7	22		65
Preston Enclosure	Middle-late Iron Age			41	37	22
Ermin Farm	Middle-late Iron Age		41	38		22
	Iron Age		2	79	11	9
	Undated			53	47	
	Sub-total		11	59	21	9
Latton Roman Pond	Early Romano-British		3	6	84	6
	Late Romano-British		22	3		75
	Romano-British		2	41	17	39
	? Romano-British/later					100
	Romano-British/medieval		83	17		
	Romano-British/post-medieval.		8	69		23
	Undated		1	61	17	20
	Sub-total		3	40	14	43
Street Farm	Medieval		10	48	35	6
	Medieval/post-medieval		17	75	8	
	Post-medieval/modern Modern		46	13	38	2
	Undated	3	20	25	30	21
	Sub-total	2	24	28	32	14
Court Farm	?Bronze Age			100		
	Prehistoric					100
	Iron Age	1	1	17	66	16
	Iron Age/Romano-British				65	35
	Early Romano-British		18	33	10	38
	Romano-British			86		14
	Medieval		100			
	Post-medieval				100	
	Undated			17		83
	Sub-total		10	24	27	38
Weavers Bridge	Late Romano-British			97	3	
	Undated		2	3	94	
	Sub-total			79	20	

Table 8.43 Main domestic mammals in the smaller assemblages.

Site	Date	% of identified fragments				No.
		Horse	Cattle	Sheep	Pig	
Highgate House	? Prehistoric		100			1
	Iron Age/prehistoric	27	68		5	22
	Middle-late Iron Age		60	40		25
	Late Iron Age	13	68	15	5	40
	Iron Age	19	63	19		16
	Romano-British		100			1
	Undated	23	5	5	5	22
Lynches Trackway	Early Iron Age/Romano-British		93	7		14
	Iron Age/Romano-British		63	37		19
	Early Romano-British	21	58	21		24
	Undated	17	17			6
Preston Enclosure	Middle-late Iron Age	13	39	41	5	157
Ermin Farm	Middle-late Iron Age		29	71		7
	Iron Age	6	6	75	13	16
	Undated			100		16
Latton Roman Pond	Early Romano-British	100				4
	Late Romano-British		100			8
	Romano-British	89	11			9
	Romano-British/medieval	67	33			3
	Romano-British/post-medieval	50	38	13		8
	Undated	51	49	3		39
Street Farm	Medieval	15	23	38	23	13
	Medieval/post-medieval	33		67		6
	Post-medieval/modern	14	41	27	9	22
	Undated	20	20	18	7	55
Court Farm	Iron Age	25	75			4
	Iron Age/Romano-British		20	80		5
	Early Romano-British	17	36	30	2	66
	Romano-British			100		5
	Medieval			100		2
	Post-medieval	100				1
	Undated		33		67	3
Weavers Bridge	Late Romano-British	6	61	30	3	64
	Undated	71		24		17

Preston Enclosure

Most of the bone in this assemblage is in moderate to poor condition and the proportion of identifiable bone is 23%. The bones of cattle and sheep/goat, in similar proportions, comprise the bulk of the identifiable material, while horse, followed by pig, is less frequent. The only bones of other species present are two of dog. Measurable bones are present, as is evidence of gnawing.

St Augustine's Lane

The condition of the bone in this assemblage is variable. Those from the Bronze Age and post-medieval contexts are in moderately good condition, the former comprises six loose adult horse teeth, and the latter an adult sheep/goat mandible and a cattle tibia which has been sawn through. The remaining bone, from prehistoric and undated contexts, is in poor condition, the identifiable material being cattle.

St Augustine's Farm South

The condition of the bone in this assemblage is poor, largely due to the high frequency of eroded or calcined material. The identifiable bones are two fragments of a horse radius and one cattle bone, large mammal limb bone fragments are frequent in the remainder.

Ermin Farm

The bone from this site, particularly that from the Iron Age contexts, is mostly in moderate to good condition. Sheep/goat bones predominate in the identified material and include ageable jaws and bones. Cattle is the only other species present in the middle to late Iron Age contexts, however horse and pig (the latter more frequent than cattle and including a male canine) are also present in the Iron Age contexts. Burnt and gnawed bone occurs. Although there is a relatively high proportion of identifiable bone present (31%), much of the bone is from undated contexts, and the quantity of identifiable bone is small.

Cirencester Road

A single unidentifiable fragment of bone is present.

Lower Street Furlong

Several fragments of eroded large mammal long bone, unidentifiable to species.

Westfield Farm

The bones from this site are in poor condition, the high fragment count in the Romano-British and undated material being due to the presence in each case of one highly fragmented long bone from a large mammal.

Latton 'Roman Pond'

This group of bones is one of the largest of the smaller assemblages, but has a low proportion of identified material, due to the high degree of fragmentation and the poor condition of much of the bone, although a substantial proportion is in moderate condition. Horse and cattle bones dominate the assemblage, sheep/goat is only represented by two bones. The fragmentary head, vertebrae and ribs of an adult male horse occur in the undated, possibly Roman ditch upcast (context 395), and it is possible that the limb bones from other contexts come from the same animal, which may have been a disturbed burial.

Street Farm

This site produced bone from features ranging in date from the medieval to post-medieval/modern, of which *c.* 50% were examined. There is a high level of identification and the condition of the bone is moderate to good overall, although it is poorer in the earlier groups. Sheep/goat bones are the most frequent of the domestic species in the medieval and medieval to post-medieval groups and, although the bones of cattle become more frequent in the post-medieval/modern group, sheep/goat bones are still numerous and include a pathological specimen of a radius. Horse and pig bones are also present. Other species represented are cat (several bones from an undated context) and unidentified bird (two bones) in the post-medieval/modern group. Butchery marks are present. The estimated number of identified bones from each period was not large enough to justify more detailed work.

Court Farm

The bone from this site comes from features ranging from Iron Age to post-medieval/modern, however most of the material is Iron Age and Romano-British, and most of the identifiable bone comes from Romano-British contexts. The higher level of identifiability in this group is related to the condition of the bone: moderate to good, whereas the bone from the other groups is more poorly preserved. Sheep/goat bones are the most frequent overall and include, in the early Romano-British group, a pair of right and left goat frontals and horn cores, the only positively identified goat in the entire assemblage. Also in this group, cattle bones are slightly more common than sheep/goat, horse bones are relatively frequent, pig is present and gnawed and burnt bone occurs. Measurable bones are present.

Weavers Bridge

The proportion of this assemblage which was examined (69%) has a low content of identified bone, although the condition of the assemblage is moderate as a whole. Cattle bones are the most frequent, but sheep/goat are also frequent. Horse and pig are present in lower numbers in the dated contexts, the former including loose juvenile cheek teeth. One bird bone is present.

Watching brief: NOSNI section

A high proportion of the few bones present are identifiable, but although some of the material is in moderately good condition (2), much of it is poorly preserved. Most of the identifiable fragments are cattle, with sheep/goat also common, one bone each of horse and pig occurs.

Watching brief: Cirencester section

The single bone recovered is of pig.

Watching brief: Latton section

The few bones in this assemblage are in poor condition (4), the identifiable material consists mainly of cattle, with one sheep/goat bone.

Watching brief (SWGLWB)

One bone unidentifiable to species.

Conclusion

The opportunity for comparing animal husbandry at different periods and in different environments, provided by this project's transect across the Cotswolds, cannot unfortunately be realised, since the quantity of identifiable bone from the smaller assemblages is too little to make meaningful comparisons. However, it may be said that in all the assemblages containing more than 100 fragments, whether Iron Age or Romano-British, cattle is the species most frequently represented, except at Preston Enclosure, Ermin Farm, and the medieval and medieval/post-medieval groups from Street Farm, where sheep/goat bones are more frequent.

HUMAN SKELETAL MATERIAL

By Angela Boyle

Trinity Farm

A small quantity of burnt bone was recovered from the fill (9) of a Beaker pit. Only 2 g of cremated bone was present and nothing was identifiable.

St Augustine's Lane

A pit (3109) was found within a ring ditch, though it was not centrally located. It was interpreted as a possible secondary cremation burial and was found to contain a small quantity of unidentifiable burnt bone. This was present in the 4–0.5 mm residue.

Lynches Trackway

A single skeleton (103) was found in a tightly crouched position on its left side within a small oval grave cut (101) and oriented north-west-south-east. The grave was located on the scarp of a hill (Chapter 3, Fig. 3.33). Approximately half of the grave had been removed by the machine cut for a footpath. The skeleton was virtually complete and preservation was excellent. The assessment of age was based on stage of epiphyseal fusion (Gentry Steele and Bramblett 1988) and degree of dental attrition (Brothwell 1981, 72) and was estimated as 17–25 years. Skull and pelvic morphology indicated that the skeleton was male (Workshop 1980). Stature was estimated at 1.67 m using the formula of Trotter and Gleser (reproduced in Brothwell 1981, 101). Details of the dentition appear in Table 8.44

The burial was unaccompanied, and, although the crouched position is suggestive of a prehistoric date it is not necessarily indicative of one. However, two samples of human bone produced radiocarbon dates of 355–289 cal BC and 235–33 cal BC (2 sigma R24151/22) which places the burial in the middle Iron Age.

Table 8.44 Lynches Trackway Skeleton 103, dentition.

-	-	-	-	-	-	-	-	-	-	-	-	-	6	7	-
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8

- indicates tooth and socket absent

Cirencester, Watching Brief

A single cremation burial (2) was recovered during the watching brief north-west of Whitelands Wood. It was badly damaged and there were only three sherds of Roman pottery associated. In addition five iron nails were also present. It is therefore possible that the burial had originally been placed within a wooden box of the type defined by Philpott (1991, 12–21). The results of the analysis of the cremated bone appear in the table below.

Birdlip Quarry

A small quantity of cremated bone (988) was recovered from within a pottery vessel (978). The vessel had been placed near the entrance of a building and may have been a foundation deposit. The fill associated with a second vessel was also sampled but found to contain no cremated bone. Both vessels were Roman in date. Only a very small quantity of cremated bone was present in the 4–0.5 mm residue and nothing was identifiable.

Weavers Bridge

A broken and incomplete skull (sf 1) was recovered from an undated layer of silty clay (4). It was assessed as a male individual of 33–45 years on the basis of skull morphology (Workshop 1980) and dental attrition (Brothwell 1981, 72). The date of the skull is uncertain.

CHARRED AND WATERLOGGED PLANT REMAINS

By Ruth Pelling

Introduction

Excavation of sites along the route of Roman Ermin Street included a sampling program for the recovery of charred and waterlogged plant remains. The volume of deposit sampled varied depending on the period and nature of the site excavated, and ranged from 2 to 104 litres. Samples were processed at the Oxford Archaeological Unit. Charred remains were processed by bulk water separation and flots retained on a 500 µm mesh. Dried flots were submitted for assessment. Waterlogged deposits were usually subsampled and 1 kg processed by a simple wash over technique. The flots were collected onto 250 µm sieves and kept wet. One sample from below Ermin Street was recognised as waterlogged at the processing stage only. A total of 17 litres was processed by bulk flotation and the flot was kept wet.

Methods

All flots were first assessed by scanning under a binocular microscope at x10 magnification. The abundance of charred remains and the character of the species present was noted. Samples were selected for analysis on the basis of this assessment.

Selected flots were sorted at x10 to x20 magnification. Identifications of seeds and chaff were made based on morphological characteristics and by reference to the modern comparative collection held at the Oxford University Museum. Nomenclature and taxonomic order follows Clapham *et al.* (1989).

Charcoal was identified from several of the sites. Fragments were picked out from the 2 mm mesh. For small flots all fragments were extracted and examined. For larger flots, notably from Birdlip Quarry, the first 10 or 20 fragments randomly selected were examined and the remaining fragments examined in transverse section to ensure no additional species were present. Each fragment was fractured and examined in transverse section at magnification of x20 and x40, and in tangential and radial longitudinal sections at x100 and x200 magnification. Identifications were made by reference to the key for European Hardwoods in Schweingruber (1978) and by comparison with modern reference material.

The results are shown in Tables 8.45–8.59. In the case of cereals the plant part identified is given (grain, rachis etc.). In all other identifications the plant part is the seed, nutlet etc. unless otherwise stated. Quantification of cereal grains was based on embryo ends. The quantification of *Corylus avellana* (hazel) nut shell fragments was based on the number of fragments held within the 2 mm mesh. Smaller fragments could not be identified with certainty and were in some cases too numerous to be manageable. Using the number of fragments is a somewhat arbitrary method of quantification given the potential for variation of fragment size. It is the method most commonly used, however, and does provide an indication of general relative abundance.

Sites included in the assessment but for which no further identifications were made are included in the discussion but not in the tables.

The Neolithic period *(Tables 8.45–8.47)*

Birdlip Quarry

Eleven possible prehistoric samples were taken from nine pits. Two samples which contained useful quantities of charred material were analysed in detail (Tables 8.45 and 8.47, samples 5 and 88). Three further samples (from contexts 202, 356 and 361) contained single grains of *Triticum* sp. (wheat), indeterminate cereal grain and a fragment of *Corylus avellana* (hazel) nut shell.

Sample 5 is the only sample which was taken from a context (pit 88) containing dateable material. Flint flakes of possible early Neolithic date were recovered from this shallow, oval pit. Sample 88 was taken from a nearby pit (pit 620). Small numbers of poorly preserved grain were recovered from both samples. Grains of *Triticum* sp. (wheat) were most commonly identified, one of which was from a hulled variety. Several other *Triticum* sp. grains were more hulled than naked in appearance with a flat ventral surface and slight longitudinal ridges suggesting the grains had been charred while held inside a tightly fitting glume. Distortion was such, however, that it was not possible to definitely assign grain as hulled or naked. *Hordeum* sp. (barley) forms a secondary group of cereal grains. Fragments of *Corylus avellana* (hazel) nut shell were by far the most common component of the samples. A total of 321 fragments were identified in sample 5 and 51 fragments from sample 88.

Duntisbourne Grove

Twelve samples from prehistoric contexts contained charred material, of which five were analysed in detail. All twelve samples were taken from pits containing Neolithic flintwork and other general debris thought to be related to domestic activity. Five samples were selected for detailed analysis, three from pit 94, and two from pit 142. The results are displayed in Table 8.45. All five samples contained large amounts of *Corylus avellana* (hazel) nut shell fragments. Occasional cereal grains were also identified. Occasional grains of *Triticum* sp. (wheat) were identified in sample 10 (pit 142) one of which could be identified as being of a hulled variety. The presence of *T. spelta* is suggested by a single glume base in sample 14. A second glume base could not be identified. *T. spelta* is not known prior to the Bronze Age. It is likely, therefore, that sample 14, taken from the uppermost fill of pit 142 (context 143) contains some later contamination.

Table 8.45 Neolithic charred plant remains.

Site	Birdlip Quarry		Duntisbourne Grove				
Sample	5	88	8	12	13	10	14
Context	89	619	113	111	113	168	143
Type	Pit 88	Pit 620	Pit 94	Pit 94	Pit 94	Pit 142	Pit 142
Volume (litres)	44	14	10	30	52	28	14
Triticum sp. hulled grain	-	1	-	-	-	1	-
Triticum sp. grain	11	1	-	-	-	2	-
Hordeum sp. grain	2	1	-	-	2	1	-
Cerealia indet grain	18	5	2	-	2	6	2
Tritcum cf. *Spelta* glume base	-	-	-	-	-	-	1
T. spelta/dicoccum glume base	-	-	-	-	-	-	1
Corylus avellana nut shell frags.	321	51	189	128	307	332	68
Chenopodiaceae seeds	-	1	-	-	-	-	-
Gramineae, small seeded	1	-	-	-	-	-	-

Table 8.46 Late Neolithic/Bronze Age charred remains.

Site	Trinity Farm			Duntisbourne Leer
Sample	1	2	3	1
Context	9	11	2	3
Date	LN/EBA	LN/EBA	LN/EBA	LN/BA ?
Type	PIT 10	PIT 8	PIT 12	PIT 4
Volume (litres)	104	20	28	12
Hordeum sp. grain	2	-	-	-
Cerealia indet grain	4	-	-	-
T. spelta/dioccum glume base	2	-	-	-
Corylus avellana nut shell frags.	143	29	66	743
Chenopodiaceae seeds	1	-	-	-

Table 8.47 Early prehistoric charcoal.

Site		Birdlip Quarry		Trinity Farm	Duntisbourne Grove	
Sample		5	88	1	8	13
Context		89	619	9	113	113
Pomoideae	Apple, hawthorn etc.	11	7	9	9	14
cf. Pomoideae		-	-	1	-	-
cf. Prunus sp.	Sloe, plum, bullace etc.	6	-	-	3	-
Corylus sp.	Hazel	3	3	8	8	5
Quercus sp.	Oak	-	-	2	-	-
Indet		-	-	-	-	1
Abundance of charcoal		++	+	+	+	+

+ = identifiable fragments present; ++ = common

Free-threshing wheat was not positively identified. Grains of *Hordeum* sp. (barley) were identified in sample 10 from pit 142 and sample 13 from pit 94.

Three samples contain identifiable charcoal, two of which (8 and 13) were examined in detail. Both samples contain Pomoideae charcoal (apple, pear, hawthorn etc.) and *Corylus* sp. (hazel) while sample 8 also contained some possible *Prunus* sp. (sloe, plum, bullace, etc.). A *Crataegus* sp. (hawthorn) stone was provisionally identified in sample 15 (pit 142) during the assessment. This suggests that the Pomoideae charcoal may be of hawthorn.

The late Neolithic/early Bronze Age period

Trinity Farm

Single samples were taken from each of the three pits (8, 10 and 12) located in the north-east corner of the excavation area which contained Beaker pottery. All three samples produced fragments of *Corylus avellana* (hazel) nut shell. In addition, sample 1 (pit 10) produced a spikelet fork of *Triticum* sp. (wheat) and two grains of *Hordeum* sp. (barley). The *Triticum* glume bases were too poorly preserved to enable identification to species. A single seed of indeterminate Chenopodiaceae, identified from sample 1, was the only weed seed recovered (Table 8.46).

No obvious differences in assemblage were noticed between pits, other than a slightly greater quantity of material in pit 10 (sample 1) which is likely to be related to a greater volume of material sampled.

The Bronze Age period

St Augustine's Farm South

A total of 39 samples were taken from ditch segments and from the two pits. Scanning of the samples indicated the presence of very infrequent cereal in two samples (sample 1, context 2010 and sample 22, context 3184), consisting of two indeterminate grain and one barley rachis. Two samples (13, context 3022 and 17, context 3113) also contained occasional fragments of *Quercus* sp. (oak) charcoal.

St Augustine's Lane

Seven samples were assessed for charred plant remains. The scanning results indicate a general background of very poorly preserved cereal grains, only two of which, a *Triticum* grain and a *Hordeum* grain, were identifiable.

Miscellaneous earlier prehistoric features

Duntisbourne Leer

Three samples were taken from pit features. One sample taken from the fill of pit 4 (sample 1) produced

Table 8.48 The later prehistoric charred plant remains.

			Highgate House	Ermin Farm	Ermin Farm
		Sample	11	1	7
		Date	M-L IA	MIA	MIA
		Type	Ditch	Ditch	Ditch
		Volume (litres)	18	17	32
Triticum spelta	spelt wheat grain		-	-	2
Triticum sp. hulled	wheat grain, hulled		4	3	6
Triticum sp.	wheat grain		1	-	2
Hordeum sp.	barley grain, hulled		1	-	4
Hordeum sp.	barley grain		3	1	1
Cerealia indet	grain		5	2	7
Triticum spelta	spelt wheat glume base		-	3	8
Triticum spelta	small glume base		-	1	-
Triticum cf. *spelta* glume	glume base		-	2	2
Triticum spelta/dicoccum	spelt/emmer wheat glume base		-	10	50
Triticum spelta/dicoccum	spelt/emmer rachis internode		-	2	-
Cerealia indet	detached embryo		-	-	1
Corylus avellana	hazel nut shell fragments		-	-	1
Silene sp.			-	-	1
Montia fontana	Blinks		-	-	1
Chenopodium album L.	Fat hen		-	-	1
Chenopodium sp.			-	1	-
Atriplex sp.	Orache		-	1	-
Chenopodiaceae			-	-	3
Vicia/Lathyrus sp.	Vetch, Tare/Vetchling		-	-	1
Leguminosae small seeded			-	1	4
Labiate			-	-	3
Polygonaceae			-	-	1
Solonaceae			-	-	1
Galium aperine L.	Goosegrass, Cleavers		-	2	1
cf. Compositae gall			-	-	3
Eleocharis palustris	Common spikerush		-	-	1
Cyperaceae			-	-	10
Bromus subsect *Eubromus*	Brome grass		1	1	20
Bromus sterillis	Barren brome		-	-	7
Gramineae	Grass, large seeded		1	2	23
Gramineae	Grass, small seeded		-	10	26
Weed indet			-	4	10
Total cereal grain			14	6	21
Total cereal chaff			-	18	61
Total weeds			2	22	117
Total items			16	46	200

a large quantity of *Corylus avellana* (hazel) nut shell, 743 fragments in a total of 12 litres of deposit. No cereal remains were present. The dating is unclear for this pit, but it is thought to be Neolithic or early Bronze Age (Table 8.46).

The earlier prehistoric economy

The charred plant remains, when taken together, provide a broad picture of the economy of the region from the early Neolithic into the Bronze Age. The evidence from Birdlip Quarry is very useful as it may be the earliest example of charred plant remains from the region to date.

The remains are likely to represent the waste from food preparation or the accidental burning of crops during processing activities involving heat. General low density cereal cultivation is suggested from the early Neolithic until at least the early Bronze Age. Both wheat and barley were being cultivated. A glumed wheat which is likely to be emmer (*Triticum dicoccum*) was cultivated although identification was not possible. The cultivation of both emmer and bread-type wheat, hulled and naked six-row barley is known from the evidence of other Neolithic and early Bronze Age sites (Helbaek 1952; Moffet *et al.* 1989; Greig 1991). There appears to be no increase in the extent of cereal cultivation in the region into the Bronze Age. Indeed, the evidence is less extensive in the early Bronze Age than for the Neolithic.

Wild food resources are likely to have formed a major component of the diet alongside cereals. Hazel nut shell forms a major component of the assemblages throughout the early prehistoric period. Assessment of the relative importance of hazelnut and cereals is difficult given that hazel nuts were quantified by shell fragments and cereals by whole grain. It is also likely that other wild resources were utilised which have not left any evidence in the archaeological record. Fruits have been recorded from Neolithic and Bronze Age sites, notably crab apple, raspberry, blackberry, sloe and hawthorn (Moffet *et al.* 1989). Again, it is difficult to assess the relative importance of such finds given the differential chances of preservation. Cereal grain may come into contact with fire in the course of processing and hazelnut shell may be thrown onto fires once the kernel had been removed. While crab-apples may be heated in order to dry them, fruits would not generally come into contact with fire other than during cooking, and are therefore likely to be under-represented in the archaeological record. So, while no fruit remains were recovered from the prehistoric sites, the association of large numbers of hazelnut shell with cereal remains and fruits on other sites of the same period would suggest a similar utilisation of such wild resources. The charcoal suggests that suitable woodland or scrub habitats within which such fruits could be found, were available.

The later prehistoric period

The middle Iron Age (Table 8.48)

Preston Enclosure

Thirty samples were taken from the enclosure ditch and internal features. Nine samples were assessed of which eight contained low densities of charred remains. Occasional cereal remains were present, although preservation was such that grain and glume bases could only be identified as far as hulled *Triticum* sp. (emmer/spelt wheat). Occasional grains of *Hordeum* sp. (barley) were present and very infrequent weed seeds including a small legume and a Cyperaceae. Fragments of *Quercus* sp. (oak) charcoal were provisionally identified from one pit (context 8).

Ermin Farm

Seven samples were assessed. Two samples taken from ditch sections (contexts 17 and 32) were analysed in detail. *Triticum spelta* (spelt wheat) is represented by both grain and glume bases. More poorly preserved glume bases could not be identified to species so are recorded as *T. spelta/dicoccum* (spelt/emmer). *Hordeum* sp. (barley) was also recorded, including grains which display clear signs of being hulled. The wheat grains outnumber barley grains.

A single fragment of *Corylus avellana* (hazel) nut shell may suggest the collection of wild nuts.

Weed seeds were present in both samples. Grasses form the major component of the weed flora in both assemblages, including *Bromus* subsect *Eubromus* (brome grass) and *Bromus sterillis* (barren brome) as well as large seeded unidentifiable grasses. Small seeded grasses were also common. It is not unusual to find large numbers of grass seeds in prehistoric charred assemblages and it has been suggested that large proportions of grasses are associated with shallow cultivation (Jones 1984b). They could also grow as arable weeds invading from the field margins. Seeds of *Bromus* spp. can be frequent in Iron Age grain assemblages and occasionally dominate which has led to suggestions of deliberate harvesting (eg. Hubbard 1975; Jones 1978). Large grasses may have entered the assemblage as a contaminate of grain, but small seeded grasses must have come in through another route.

Eleocharis palustris (common spike rush) requires at least seasonal flooding, while many of the Cyperaceae are characteristic of damp ground. *Eleocharis palustris* is today not regarded as an arable weed but is more characteristic of damp grassland. It is a species commonly associated with charred cereal assemblages from the Iron Age period which has led to a generally widely held view of cultivation of agriculturally marginal land reaching onto the floodplains in regions like the Upper Thames Valley. These species may indicate the similar cultivation of marginal land which was either seasonally flooded itself or close enough for rhizomous species to invade. Given the number of grass seeds it is also possible that the seeds have entered the assemblage with cut grass. *Galium aperine* which was present in both samples, is an autumn germinating species and commonly associated with autumn sown crops. The remaining weed species are generally common species of arable or disturbed ground, or were too poorly preserved to enable identification to species.

The samples are dominated by weed seeds and glume bases, that is, the by-products of cereal processing. Chaff and weeds together form 87% of the assemblages of sample 1 and 89% of sample 7. Some cereal processing was clearly taking place on the site, albeit possibly on a small scale. It is not clear whether cereals were being produced at the site. It is difficult to assess the relative importance of cereal production on the strength of two samples. It does appear, however, given the general paucity of remains and the scarcity of cereal grains, that cereal production was not on a large scale. Furthermore, cereal grain is less likely to be burnt the further from the site of production it moves and the greater the perceived value becomes. It is likely, therefore, that cereal grains were an important commodity and that whole spikelets were being brought into the site and small quantities were processed when and as they were needed.

Highgate House

A total of 28 samples were taken from enclosure ditch sections, pits and occupation layers. Several samples from upper pit fills contained modern cereal debris interpreted as the remains of stubble burning. Of the remaining samples, small quantities of charred cereal remains were noted in sixteen samples during the assessment. The charred remains include very occasional grains of *Triticum* sp. (wheat) including occasional grains identifiable as *T. spelta* (spelt wheat) or hulled *Triticum* sp. (spelt/emmer wheat), occasional grains of *Hordeum* sp. (barley) and occasional indeterminate grains. A single *Arrhenatherum* tuber (pit 122) and a hazelnut shell fragment (context 139) were also noted. The largest of the samples (11/12) taken from an enclosure ditch terminus (feature 131) was fully sorted and analysed.

Sample 11/12 contained a total of 14 cereal grains. No *Triticum* grains could be convincingly assigned as *T. spelta,* although 4 grains were identifiable as hulled wheat. Hulled grains of *Hordeum* sp. (barley) were identified. Two weed seeds were present, a single *Bromus* subsect *Eubromus* and a large grass.

On the evidence of the charred remains agricultural activity appears to have been minimal. Preservation was poor thus it is likely that the absence of cereal chaff is a reflection of preservation. The cereals identified are in keeping with evidence for the Iron Age elsewhere in southern Britain. It is not possible to comment on cereal processing activities given the absence of chaff and weed seeds.

Middle Duntisbourne

Eight samples were submitted for assessment. The samples were taken from enclsoure ditch fills (contexts 4, 121, 120 and 310). Four samples contained occasional grains of hulled wheat, slightly more frequent *Hordeum* sp. (barley) and very occasional weed seeds. Fragments of Pomoideae (apple, hawthorn etc.) and *Quercus* sp. (oak) charcoal were noted. The samples were not sorted and analysed fully. The remaining samples contained very occasional indeterminate cereal grains. The samples suggest some settlement activity but do not indicate any arable cultivation or cereal processing on any notable scale. It is possible that more intensive settlement activity is located nearby.

Duntisbourne Grove

Seven samples were taken from ditch fills (contexts 9 and 114) and five contained small quantities of charred material which were noted in the assessment. Cereal remains include *Triticum* sp. (wheat) grain some of which may be free-threshing bread-type wheat, and *Hordeum* sp. (barley grain). Nut shell fragments of *Corylus avellana* (hazel) were fairly numerous. It is probable that the remains represent residual redeposited material given the occurrence of early prehistoric activity. Charcoal noted during the assessment included much *Corylus/Alnus* and Pomoideae sp. (apple, hawthorn etc.) charcoal, again very similar to the early prehistoric charcoal assemblage

Miscellaneous later prehistoric features

Cherry Tree Lane (Table 8.49)

A total of thirteen samples were assessed for their charred plant content from Cherry Tree Lane. Samples were taken from two possible hearths (4 and 15) and from pits 12, 13, 35 and 47 and from ditch 40. Samples from the hearth features were very rich in charcoal. Two samples from each hearth were selected for identification of the charcoal, which was demonstrated to consist almost entirely of Pomoideous wood (apple, hawthorn etc.). Very occasional fragments of *Prunus* sp. (sloe, bullace etc.) charcoal were present. It is likely that the Pomoideae charcoal is derived from construction material of the features. Provisional identifications suggest that the charcoal in the remaining hearth samples is also of Pomoideae wood. Two samples from pits 12 and 13 (samples 10 and 9) contained one or two grains of *Triticum spelta, Hordeum* sp. and indeterminate cereals. The samples were not examined in detail. The remaining samples were devoid of any charred remains.

Cereal cultivation and the economy of the later prehistoric period

The analysis of the charred plant remains from the later prehistoric sites provides some information regarding the economic activities of the settlements. The cereal remains that have been identified fit the evidence from elsewhere that the principle cereal crop cultivated in southern Britain at the time was spelt wheat (Helbaek 1952, Greig 1991). Hulled barley was cultivated as a secondary crop. There is no evidence for the cultivation of emmer wheat on any of the sites. It is likely, therefore that emmer had been totally replaced by spelt wheat by this time.

In contrast to sites within the Upper Thames Valley area of Oxfordshire and the Wessex chalklands, cereal cultivation appears to have been on a small scale. While further detailed sampling is needed to provide a more conclusive picture it does appear on present evidence that the major agricultural developments and expansion witnessed elsewhere in southern Britain did not occur in the region until the Roman period. The concentration of cereal remains is very low and the weed flora is a fairly limited one in comparison to sites such as Ashville (Jones 1978) and Barton Court Farm (Jones 1986). There is an absence of the large numbers of weed species usually associated with increased intensification of arable agriculture such as

Table 8.49 The charcoal from Iron Age features at Cherry Tree Lane.

		Sample	3	1	11	12
		Context	5	5	9	9
Pomoideae	apple, hawthorn etc.		19	17	17	20
Prunus sp.	cherry, blackthorn		1	3	3	-
Abundance of charcoal			++++	++++	++++	++++

+ = identifiable fragments present; ++ = common; +++ = frequent; ++++ = abundant

large numbers of leguminous weeds and species of marginal land. The assemblages are perhaps more in line with those from floodplain sites such as Mingies Ditch in the Windrush Valley (Jones and Robinson 1993), where there appears to have been a much greater reliance on the pastoral element of the economy.

There is some evidence to suggest that cereal cultivation was supplemented by the collection of wild food plants. Nut shell fragments of *Corylus avellana*, an *Arrhenatherum* tuber and even wild grasses such as *Bromus* subsect *Eubromus* and *B. sterillis*, could have been harvested.

ERMIN STREET

Four samples, all from buried soils beneath Ermin Street were processed for the retrieval of charred plant remains (Trench 9, context 925; Trench 10, context 1059 (2 samples), Trench 8, context 877). A further sample, 602 (Trench 6, context 673), taken from deposits immediately below the construction layer of Ermin Street (Fig. 5.3) was found to contain waterlogged plant material. This was examined for evidence of the local environment of the road immediately prior to its construction. A total of 17 litres was processed by bulk water flotation and the flot collected onto a 250 µm mesh and kept wet.

The samples taken for charred plant remains produced one *Triticum spelta/dicoccum* (spelt/emmer wheat) glume base and occasional charcoal flecks only. No further comment is made on these samples.

The detailed results of analysis of sample 602 are displayed in Table 8.50. Species of damp ground, meadows or marsh predominate, generally suggestive of a damp grassland or meadow flora. The major damp grassland species present is *Ranunculus repens* (creeping buttercup), while the *Carex* species (sedges) are also included in this group, although not all species are characteristic of damp ground. Other damp grass species include, *Potentilla anserina, Veronica* subgen *Beccabunga* (water-speedwell), *Juncus articulatus* gp. (rush) and *J. bufonius* gp. (toad rush). Drier grassland and pasture species form a more minor group. These include *Ranunculus parviflorus* (small-flowered buttercup), *Viola* subgen *Melanium* (pansy), *Stellaria media* (lesser stichwort), *Aphanes arvensis* (parsley-piert) and *Carduus* sp. (thistle).

Arable or ruderal species are well represented in the sample. These include notably *Arenaria* sp. (sandwort), *Atriplex* sp. (orache), *Urtica dioica* (stinging nettle). Other species include *Stellaria media* (chickweed), *Chenopodium album* (fat hen), *Polygonum aviculare* (knotgrass), *Hyoscyamus niger* (henbane) and *Valerianella dentata* (narrow-fruited cornsalad). Generally, these species are of a more ruderal than arable nature.

In conclusion, the flora represented by the sample indicates an open grassland vegetation with a wetter marshy area over which the road has passed. Some ruderal elements are also present.

WEAVERS BRIDGE

Four samples were assessed for their potential for charred plant remains, two of which, sample 6 from a buried soil horizon and sample 8 from a drainage channel of unknown date, contained useful quantities of material.

Two samples, samples 6 and 7, contained useful quantities of waterlogged plant remains. Sub-samples of 1 kg were processed by hand using a simple wash-over technique for the retrieval of waterlogged remains. The samples were taken from the fills of two man-made channels, features 127 and 20. Subsamples of 1 kg were examined.

Charred plant remains (Table 8.51)

The charred assemblages are dominated by cereal remains. The identifiable cereal grains are dominated by free-threshing *Triticum* sp. (bread-type/rivet wheat). Short, plump grains were most frequently identified and recorded as 'compact'. Occasional longer narrow grains were also recognised and recorded as 'elongated', while intermediate grains were classified separately. Given the inherent difficulties in the identification of free-threshing wheat grains to ploidy level, no attempt was made to identify grains to species. Well preserved free-threshing wheat rachis was present, however, in both samples. Rachis of tetraploid wheat was quite common in sample 6, while a single rachis node each of tetraploid and hexaploid wheats were present in sample 8. Further, more poorly preserved, rachis fragments could not be identified to ploidy level.

It is now generally thought that the tetraploid wheat identified from many sites in England, from the early medieval period onwards, is *Triticum turgidum* (rivet wheat). Documentary evidence is available for its cultivation from the early post-medieval period

Table 8.50 The waterlogged plant remains from Ermin Street.

	Sample	602
	Context	673
	Volume	17
Ranunculus acris subsp. *acris*	Meadow Buttercup	3
Ranunculus cf. *acris*	cf. Meadow Buttercup	2
Ranunculus repens	Creeping Buttercup	35
Ranunculus cf. *reprens*	cf. Creeping Buttercup	37
Ranunculus acris/repens/bulbosus	Buttercup	56
Ranunculus parviflorus	Small-flowered Buttercup	5
Papaver cf. *dubium*	Long-headed Poppy	4
Papaver agremone	Long Prickly-head Poppy	5
Fumaria sp.	Fumitory	1
Viola subgen *Melanium*	Pansy	23
Labiate		1
Cerastium spp.	Mouse-ear Chickweed	37
Stellaria media agg.	Chickweed	7
Stellaria graminea	Lesser Stitchwort	1
Caryophyllaceae		4
Arenaria sp.	Sandwort	16
Montia fontana subsp. *chondrosperma*	Blinks	4
Chenopodium album	Fat Hen	1
Atriplex spp.	Orache	19
Chenopodiacae		3
Potentilla anserina	Silverweed	1
Potentilla reptans	Creeping Cinquefoil	3
Aphanes arvensis	Parsley-piert	67
Aethusa cynapium	Fool's Parsley	4
Polygonum aviculare	Knotgrass	2
Polygonum sp.	Knotgrass/Persicaria	5
Rumex cf. subgen *acetosa*	Sorrel	1
Rumex spp.	Docks	8
Polygonaceae		1
Urtica dioica	Common Nettle	25
Urtica urens	Small Nettle	3
Corylus avellana	Hazel nut, shell fragment	1
Hyoscyamus nigra	Henbane	2
Veronica subgen *Beccabunga*	Water-speedwell	2
Galeopsis sp.	Hemp-nettle	1
Sambucus nigra	Elder	1
Valerianella cf. *carinata*	Keel-fruited Cornsalad	1
Valerianella dentata	*Narrow-fruited Cornsalad*	8
Carduus sp.	Thistle	3
Sonchus asper	Spiny Milk- or Sow-Thistle	1
Juncus articulatus gp.		2
Carex spp.	Sedges, 3 sided	112
Carex spp.	Sedges, 2 faced	1
Gramineae	Grass, small seeded	1
Indet		4
<0.5 mm, 1/10		
Arenaria sp.	Sandwort	3
Juncus bufonius *gp.*	*Toad Rush*	*3*
Juncus articulatus gp.		1
Juncus sp.		1

Table 8.51 Charred plant remains, Weavers Bridge.

	Sample	6	8
	Context	28	92
	Type	Ditch	Soil
	Volume	14	20
CEREAL GRAIN			
Triticum sp.	Free-threshing wheat, compact grain	4	15
Triticum sp.	Free-threshing wheat, intermediate grain	-	6
Triticum sp.	Free-threshing wheat, elongated grain	1	6
Triticum sp.	Wheat grain	1	14
Hordeum sp.	Barley grain	-	1
Hordeum sp.	Hulled grain	-	3
Avena sp.	Oats grain	2	1
CEREAL CHAFF			
Cerealia indet		4	29
Triticum sp.	Free-threshing hexaploid wheat, rachis node	-	1
Triticum sp.	Free-threshing tetraploid rachis node	17	1
Triticum sp.	Free-threshing wheat, rachis node	6	9
Triticum sp.	Free-threshing wheat, basal rachis node	2	1
Hordeum sp.	Barley, rachis node	1	-
Avena sp.	Oats, awn fragment	-	1
Cereal sized	Indet. culm node	1	-
OTHER EDIBLE PLANTS			
Corylus avellana	Hazel nut shell frags.	-	1
Vicia/Lathyrus/Pisum sp.	Cultivated vetch/ beans/ pea etc.	-	8
WEEDS			
Agrostemma githago sp.	Corn cockle	-	1
Stellaria media agg.	Chickweed	-	1
Chenopodiaceae		1	-
Vicia/Lathyrus sp.	Vetch/tare	-	2
Leguminosae small seeded		-	1
Galium sp.	Goosegrass	-	1
Anthemis cotula L.	Stinking mayweed	-	1
Bromus subsect *Eubromus*	Grass, large seeded	1	2
Gramineae		1	1
Weed indet		2	2

(Moffett 1991), while *Triticum durum* (macaroni wheat) the other tetraploid free-threshing wheat is poorly suited to the British climate (Percival 1921). The hexaploid wheat would be a variety of bread wheat. Hexaploid wheat rachis tends to be less well preserved than tetraploid wheat and as such may be under-represented.

It is likely that the two types of wheat chaff had different uses, and therefore experience differential preservation. Bread-type wheats are more likely to be awnless, so are generally more palatable to animals and as such more likely to be used as animal feed. Rivet wheat, however, tends to produce a good quality straw and is therefore more likely to be used as thatch. In addition, there was some evidence from West Cotton, Northamptonshire, to suggest that they were sometimes grown together as a maslin (Campbell forthcoming b). Bread-type wheats produce a far superior flour for bread baking, while rivet wheat flour is more suited for biscuits, but the two flours can be mixed together for a useful multi-purpose flour (Percival 1934).

Hordeum sp. (barley) and *Avena* sp. (oats) were very occasionally identified in both samples. Both species are frequently identified as secondary crops from medieval contexts. Large legumes were also recorded from sample 8 although they were poorly preserved with no testa or hilum left to enable identification.

The weed flora was very limited in both samples. The species present are all common in medieval cereal assemblages and were frequent weeds of cornfields.

Waterlogged plant remains *(Table 8.52)*

Sample 6 produced frequent aquatic species, notably seeds of *Oenanthe aquatica* agg. (water dropwart) and *Schoenoplectus lacustris* (bulrush), which are characteristic of slow-flowing or stagnant water. Other species characteristic of slow-flowing or shallow water were present including *Apium nodiflorum* (fool's watercress), *Sagittaria sagittifolia* (arrow head) and *Sparganum* sp. (bur-reed). *Nuphar lutea* (yellow water-lilly) and *Zannicella palustris* (horned pondweed) will also grow in slow-flowing or still water in ditches

Table 8.52 Waterlogged plant remains, Weavers Bridge.

Species	Sample Context	6 128	7 22
Ranunculus cf. Acris L.	Meadow Buttercup	2	-
Ranunculus cf. Repens L.	Creeping Buttercup	5	9
Ranunculus cf. Bulbosus.L.	Bulbosus Buttercup	-	1
Ranunculus susect *Ranunculus*	Buttercup	8	-
Ranunculus sugen *Batrachium*	Crowfoot	88	13
Nuphar lutea (L.) Sm.	Yellow water lily	2	-
Lychnis flos-cuculi L.	Raggen Robin	1	-
Cerastium sp.	Mouse-ear chickweed	-	6
Myosoton aquaticum (L.) Moench.	Water Chickweed	32	42
Stellaria media agg.	Chickweed	4	5
Caryophyllaceae		3	1
Chenopodium sp.	Goosefoot	3	-
Atriplex patula/hortensis	Orache	18	11
Atriplex sp.	Orache	-	9
Chenopodiaceae		4	2
Rubus fruticosus agg.	Bramble, Blackberry etc.	-	1
Rubus sp.		-	1
Potentilla anserina L.	Silverweed	3	2
Rosaceae type thorn		-	1
Oenanthe aquatica agg.	Water-Dropwort	322	1
Apium nodiflorum (L.) Lag.	Fool's Watercress	23	1
Torilis japonica (Houtt) D.C	Upright Hedge-Parsley	1	-
Umbelliferae		3	-
Polygonum aviculare agg.	Knotgrass	4	2
P.*lapathifloium* L.	Pale Persicaria	69	19
P.persicaria L.	Red Shank, Persicaria	-	8
P.*convolvulus* (L.) A.Love	Black bindweed	2	4
Polygonum sp.		11	17
Rumex hydrolapathum Hudson	Water Dock	1	-
R. *maritimus* L.	Golden Dock	11	14
Rumex sp.		10	13
Polygonacae		3	1
Urtica dioica L.	Common Stinging Nettle	10	13
U. urens L.	Small Nettle	2	-
Menyanthes trifoliata L.	Bogbean	1	-
Solanum sp.	Nightshade	2	1
Mentha sp.	Mint	43	-
Galeopsis sp.	Hemp-Nettle	-	1
Lycopus europaeus L.	Gipsywort	15	-
Plantago *major* L.	Plantain	3	6
Sambucus nigra L.	Elder	-	1
Arctium cf. *Lappa* L.	Great Burdock	-	1
Carduus/Cirsium sp.	Thistle	2	3
Leontodon sp.	Hawkbit	-	1
Picris echioides L.	Bristly Ox-tongue	-	2
Sonchus asper (L.) Hill	Spiny Milk-Thistle	3	4
Taraxacum sp.	Dandelion	-	1
Compositae		1	6
Alisma plantago-aquatica L.	Water Plantain	61	12
Sagittaria sagittiflia L.	Arrow-head	4	5
Potamogeton sp.	Pondweed	4	4
Zannichellia palustris L.	Horned Pondweed	38	-
Juncus effusus agg.	Rushes	8	-
J. bufonis agg.	Rushes	2	-
J. articulatus agg.	Rushes	9	-
Juncus sp.	Rushes	3	-
Sparganium sp.	Bur-Reed	8	-
Scheonoplectus lacustris (L.) Palla	Bulrush	38	-
Eleocharis palustis (l.) (Roemer & Schultes)	Common Spike-Rush	12	2
Carex sp.	Sedges	22	8
Cyperaceae		5	2
Indet		12	11

or ponds, as well as in faster flowing rivers. *Nuphar lutea* requires a pH of 6.0 or greater. Several other species will grow on the muddy sub-strata on the edge of slow-flowing rivers or ditches, including *Alisma plantago-aquatica* (water plantain), *Menyanthes trifoliata* (bog bean) and *Rumex maritimus* (golden dock). *Myosoton aquaticum* (water chickweed) and *Lycopus europaeus* (gipsy wort) generally grow on the banks of rivers or ditches. Overall, the aquatic and semi-aquatic species of sample 6 are suggestive of a slow-flowing shallow ditch with tall dense vegetation.

The terrestrial or semi-terrestrial plants represented include species which could have been growing in wetter parts of grassland or meadows close to the ditch, including *Eleocharis palustris* (common spike rush) which requires at least seasonal flooding, the *Juncus* species (rushes) and *Lychnis flos-cuculi* (ragged robin). *Ranunculus* cf. *acris*, *R.* cf. *repens* and *Potentilla anserina* (silverweed) are also common in damp meadows and grassland. The remaining terrestrial species, such as *Uritica dioica* (stinging nettle) are suggestive of drier disturbed habitats including settlement sites.

The aquatic component is much less significant in sample 7, with only a single seed each of *Oenanthe aquatica* agg, and *Apium nodiflorum*, while seeds of *Potamogeton* (pond weed) are rare. Species characteristic of the muddy sub-strata on the edge of ponds and ditches have generally increased including *Myosoton aquaticum* and *Rumex maritimus*, while *Ranunculus* subsect. *Batrachium* and *Alisma plantago-aquatica* are fewer. A less watery, muddy ditch is suggested by the flora.

Terrestrial species are more common in sample 7. Marshy or damp ground species are present, but much less common than in sample 6, with some *Ranunculus* cf. *repens* and *Potentilla anserine* and occasional *Eleocharis palustris* and *Carex* spp. (sedges). Other grassland and/or meadow species include *Leontodon* sp. (hawkbit) and *Ranunculus bulbosus* (bulbous buttercup). Species of disturbed or cultivated ground are generally fairly common such as *Atriplex* sp. (orache), *Polygonum* spp., *Urtica dioica*, *Solanum* sp., *Sambucus nigra* and *Taraxaccum* sp. (dandelion) all of which could have been growing within the settlement.

Discussion

The dating evidence is unclear, however, the charred remains are typical of assemblages of medieval date, while tetraploid wheats are not found prior to the 11/12th centuries. Indeed sample 6 also contained a mollusc, a species of Helicinae, generally thought to be a medieval introduction.

The waterlogged assemblages provide some information regarding the ditches from which they were taken. Sample 6 suggests that ditch feature 127 contained shallow slow-flowing water. Sample 7 suggests that ditch 20 possibly contained very little water. Both samples contained terrestrial species characteristic of disturbed habitats such as would be expected within a settlement.

THE ROMAN PERIOD AT BIRDLIP QUARRY

A total of 93 samples of Roman date were scanned in order to assess the quality and quantity of charred remains. Charred remains were noted in 64 samples. A total of 18 samples contained sufficient quantities (greater than 20 items) to merit detailed analysis.

Samples representing both the Period 1 and Period 2 occupation of the site were selected for analysis. The features represented include a corn dryer, a pit containing possible corn dryer or similar waste, ovens, a hearth, a ditch section and a well. Samples sizes range from 2–40 litres. Nine samples were selected for the analysis of wood charcoal. Larger flots were split and a fraction ranging from 1/16 to ˘ was sorted.

Cereal remains

Cereal remains were dominated by hulled wheat. *Triticum spelta* (spelt wheat) was identified by both grain and glume bases. No evidence of *Triticum dicoccum* (emmer) was identified. Poorly preserved indeterminate hulled *Triticum* sp. grains and glumes are also likely to be of *T. spelta*. *T. spelta* is the principle cereal crop of southern Britain in the Romano-British period (Greig 1991). Two rachis nodes of free-threshing *Triticum* sp. (bread-type/rivet wheat) were recorded, but no grain (Tables 8.53–8.55).

Several of the *Triticum spelta* grains were noticeably short and plump, yet still displayed distinct signs of being charred while tightly held within glumes. Grains were recorded as short, elongated or intermediate. Long grains tended to outnumber short grains, although intermediate grains form the greatest category.

The glume bases identified from the richer corn dryer and pit samples were quite variable in size and shape. Several glume bases showed morphological characteristics of *Triticum spelta*, but were very small and narrow. These glumes were perhaps from spikelets with single rather than double or triple grains. A further group of glume bases were large with no prominent dorsal keel, but the angle at the ventral keel was too sharp to allow identification as *T. spelta*. Some well preserved spikelet forks retained fragments of rachis internode. Given the absence of any definite *T. dicoccum* it is thought that the glume bases are all likely to be of *T. spelta* and that the variation is that which would occur naturally within a population.

Loose fragments of rachis internode were identified as hexaploid wheat (spelt/bread-type wheat) on the basis of the strong lines on the dorsal surface. Where there was no glume base attached they could not be identified as *T. spelta*.

Hordeum sp. (barley) grains occur in similar numbers of *Triticum* sp. in the Period one samples with the exception of pit 180, but only forms 3.5% of the total grain in Period two. In six-row *Hordeum vulgare* each rachis node generally produces three fertile florets, the outer two of which are generally asymmetrical, resulting in a ratio of two 'twisted' asymmetrical lateral grains to one 'straight' or symmetrical grain. The identification of occasional asymmetrical lateral grains therefore attests to the presence of six-row barley. The identification of two-row barley is more difficult and it can only be stated that it may have been present. *Avena* sp. (oats) is a possible third minor cereal crop represented by nine grains. A single floret base of a wild *Avena* species does, however, raise the possibility that the *Avena* grains are also of wild varieties.

Ecological implications of weeds

The seeds of weed species form a very minor component of the majority of assemblages with the exception of one oven sample (24, context 204) in which they form the major component of the assemblage (Table 8.53). Weeds seeds in Period one samples are dominated by grasses, notably in sample 24. Grass seeds commonly occur in high numbers in prehistoric and Romano-British assemblages and then decrease, as do perennial weed species generally, with the increasing practice of deep ploughing in the early medieval period (Jones 1984b). The assemblage in sample 24 also includes species which are commonly associated with grassland such as *Linum catharticum* (fairly flax), *Prunella vulgaris* (self heal) and small seeded legumes (medicks, clovers etc.). Some species of *Carex* (sedges) are characteristic of damp grassland while *Odontites verna* (red barstia) and *Plantago media/lanceolata* (plantain) can also occur as grassland species. The assemblage is therefore more characteristic of a grassland than arable flora but may have resulted from the collection of rough herbage growing at the edge or on the headlands of arable fields for use as hay or fuel.

Some evidence of the soil types cultivated during the Period one occupation is available. *Linum catharticum* has a strong dependence upon fresh soils and open conditions including grassland, heaths and moors (Godwin 1975) and is especially common and characteristic of calcareous grassland, although is not confined to basic soils (Clapham *et al.* 1989). It will also grow as a heathland plant. *Odontites verna* is characteristic of heavy clay soils. *Prunella vulgaris*, and *Plantago media/lanceolata* are characteristic of neutral or basic soils.

The samples from pit 180, probably also Period one, again contain a large number of grass seeds (Table 8.54). Some of the larger grass seeds such as the *Bromus* subsect *Eubromus* (brome grass) may have entered the assemblage as contaminates of grain, further suggested by the presence of two germinated grains. The greatest number of grasses are, however, small seeded which suggests they have not entered the assemblage as contaminates, but are likely to have derived from fuel. Again there is some evidence regarding the types of soil cultivated. *Anthemis arevensis* (corn chamomile) is a calcicolous arable weed, while species of heavy calcareous clay soils are again present, including *Odontites verna* and *Anthemis cotula* (stinking mayweed), a species which became widespread during the Roman period. Other species are common weeds of arable or ruderal habitats, such as *Stellaria media* (chickweed), *Chenopodium album* (fat hen) and *Rumex* sp. (docks) and are ubiquitous in charred cereal assemblages.

Seeds of grasses are common in the Period two samples but are less dominant than in earlier samples (Table 8.55). Large seeded grasses including *Bromus* subsect *Eubromus* are more frequent suggesting they have entered the assemblage as contaminates of the grain. Species characteristic of heavy calcareous clay soils (*Anthemis cotula* and *Odontites verna*) are quite frequent. Occasional species commonly associated with damp grassland are present such as *Carex* sp. (sedges), *Eleocharis palustris* (common spikerush) and *Ranunculus acris/repens/bulbosus* (buttercup). *Eleocharis palustris* requires at least seasonal flooding, suggesting some cultivation of rather marginal land.

Generally, the weed flora is characteristic of the calcareous soils of the region. There is some cultivation of heavier clay soils, locally present within soils overlying limestone, and of marginal wetter ground, for example at the bottom of river valleys. All the weed species represented could have been growing locally. The collection of rough grass herbage, possibly for hay or fuel, is also suggested.

Sample composition *(Fig. 8.21–8.22)*

Period one

Overall, the Period One samples contain 52.9% chaff, while four of the seven samples each contain more than 50% chaff. Grain forms 18.3% of the samples overall and weeds 32.4% (Table 8.53). Generally, the samples are characteristic of cereal processing waste derived from the later stages of processing. The variation between samples is discussed by feature type. *Triticum* and *Hordeum* sp. grains occur in similar numbers while *Avena* sp. forms a very minor component.

Ovens

Four samples from ovens contained charred plant remains, three of which contained sufficient quantities for analysis (samples 14, 22 and 24). The fourth sample (50) contained a single indeterminate grain and a glume base. Two samples were derived from oven 213 (sample 22 and 24), and one (14) from oven 199. Samples 14 and 22 have similar compositions. In both cases cereal grain forms the minor component, less than 20%. Cereal chaff dominates, mostly glume bases. Weed seeds are a fairly minor component and are dominated by both small and large seeded grasses. Mixed charcoal assemblages were present in each sample, including the charcoal of *Prunus* sp. (sloe, bullace, plum etc.), *Quercus* sp. (oak), *Fraxinus* sp. (ash) and Pomoideae (apple, hawthorn etc.). The ovens are thought to be for industrial rather than domestic use, thus the assemblages are likely to represent the remains of mixed fuel, including cereal processing waste which may have been used as kindling.

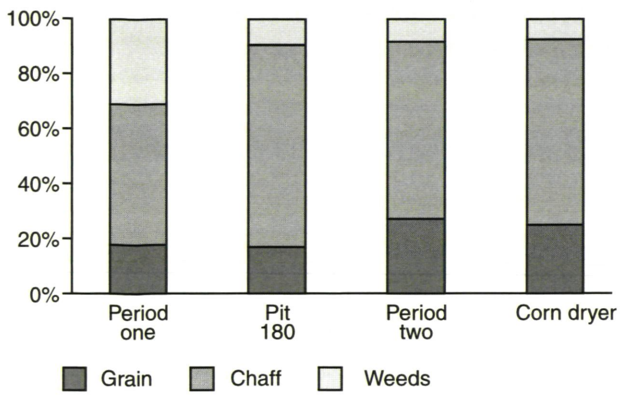

Figure 8.21 Birdlip Quarry, composition of samples by period.

Sample 24, taken from oven 213 is very different in that over 90% of the assemblage consists of weed seeds (Table 8.53). Grasses predominate, of which there are several identifiable as *Poa annua* type. *Plantago media/lanceolata* and *Odontites verna*. are also significant species. The weed seeds are generally small in size. Cereal grain slightly outnumbers chaff which consists of glume bases only, although given the differential survival rates of grain and chaff (Boardman and Jones 1990) it is possible that the chaff is under-represented. It is unlikely that the large number of grassland weeds have derived from cereal processed. As discussed above it is more likely that the assemblage derives from the remains of hay or roughage which has been used as fuel or kindling.

Well (feature 288)

A sample of charred material was taken from one of the wells. The sample is dominated by chaff (95% of the sample), notably glume bases. Cereal grain and weeds form a very minor component. The sample is again likely to represent glume bases and other by-products of cereal processing which have been used as fuel. The absence of weed seeds would suggest that a late stage of processing spikelets is represented and that weed seeds had been sieved off at an earlier stage. The remaining well samples contain occasional glume bases and occasional grain including *Hordeum* sp. (barley).

Other features

A further 18 samples from ditch fills, hearths, a gully and a mortar deposit contain scatters of charred remains. Generally, these consist of one or two indeterminate grains. Three samples did contain sufficient material for full analysis. The samples were from a hearth, a ditch section and a gully. All three samples contain low densities of chaff, grain and weed seeds in varying proportions. Grain of both *Triticum* sp. and *Hordeum* sp. are present. Occasional chaff fragments include *T. spelta* glume bases. The weeds are all common species of cultivated or disturbed ground. Such assemblages are interpreted as representing general background scatters of remains. A mixed charcoal assemblage, including *Prunus* sp. (sloe, plum etc.) *Fraxinus* (ash) and Pomoideae (hawthorn, apple, pear etc.) from the hearth is presumably derived from fuel (Table 8.56). There was no evidence for the use of chaff as fuel, although this could be a result of preservation.

Pit 180 (Table 8.54)

Three samples were taken from pit 180, possibly a Period one feature, from three successive fills (contexts 181, 207, 208). The density of remains is exceptionally high, ranging from 213.6 to 4992 items per litre. Glume bases always outnumber grain, although the ratio of grains to glumes varies considerably from 2:47 in the lower sample (28, context 208) to 1:1.4 in the upper sample (17, context 181). Given the differential survival rate of grains and chaff (Boardman and Jones 1990) the ratio of glumes to grain may have been higher still. It is certainly unlikely that grain is under-represented. Sprouted coleoptiles are present in all three samples in varying numbers. They form a minor component of sample 17 (1 per litre of deposit), but are present in large numbers in sample 28 (418.7 per litre). Germinated grain is present in each sample with approximately 24% of wheat grains in sample 28 showing clear signs of germination. Germinated grains are less frequent in the other samples but are present. Rachis fragments of wheat, including many of hexaploid wheat and some identifiable as *Triticum spelta*, were quite common in sample 28. Awn fragments are very frequent in the two lower samples (21 and 28), both as charred remains and silica skeletons. Weeds form minor components of the lower samples but are slightly more conspicuous in sample 17 (20% of the sample).

The greater number of glumes than grains in all three samples is indicative of processing waste, possibly re-used as fuel, rather than an accidentally burnt product. The much greater number of grains in sample 17 than the earlier samples suggests some accidental burning of product or spoilt crop which

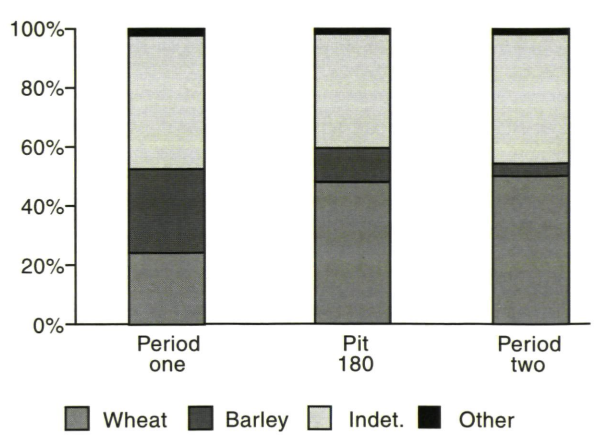

Figure 8.22 Birdlip Quarry, composition of grain by period.

Table 8.53 Charred seeds and chaff From Period 1, Birdlip Quarry.

Sample	14	22	24	46	48	121	125
Context	198	209	204	347	368	918	1061
Period	1	1	1	1	1	1	1
Fraction (%)	100	100	100	100	100	100	100
Volume (litres)	37	10	28	32	20	16	
Feature type	oven	oven	oven	ditch	well	hearth	gully
GRAIN							
Triticum spelta (Spelt Wheat) short, sprouted	-	-	-	-	-	-	-
Triticum spelta short	1	-	-	1	-	-	-
Triticum spelta long, sprouted	-	-	-	-	-	-	-
Triticum spelta long	-	-	-	-	-	-	-
Triticum spelta intermediate, sprouted	-	-	-	-	-	-	-
Triticum spelta intermediate	1	2	-	2	2	-	-
Triticum spelta immature grain	-	-	-	-	-	-	-
Triticum sp. hulled (hulled Wheat), sprouted	-	-	-	-	-	-	-
Triticum. sp. hulled	2	2	3	3	-	-	2
Triticum sp.(Wheat)	2	2	-	-	2	4	1
Hordeum vulgare (six-row Barley) hulled, lateral grain	-	-	-	-	-	2	2
Hordeum sp. (Barley) hulled sprouted	-	-	-	-	-	-	-
Hordeum sp. hulled	-	1	-	1	-	2	10
Hordeum sp.	-	5	1	-	1	6	4
Avena sp. (Oats)	-	1	-	-	-	-	1
cf. *Secale cereale* (Rye) sprouted	-	-	-	-	-	-	-
Triticum/Secale (Wheat/Rye)	-	-	-	-	-	-	-
Cerealia indet	10	17	3	9	3	6	11
CHAFF							
Triticum spelta glume base	23	55	2	2	35	-	1
Triticum spelta small glume base	-	-	-	-	3	-	-
Triticum cf. *spelta* glume base	3	2	-	1	7	-	1
Triticum sp. glume base	32	79	2	19	59	-	2
Triticum spelta rachis internode	-	-	-	-	3	-	-
Triticum cf. *spelta* rachis internode	-	-	-	-	-	-	-
Triticum sp. hexaploid rachis internode	-	4	-	1	16	-	-
Triticum sp. hulled wheat rachis internode	-	-	-	-	-	-	-
Triticum sp. hexaploid free-threshing rachis node	-	-	-	-	1	-	-
Triticum sp. free-threshing rachis node	-	-	-	-	-	-	-
Triticum sp. rachis internode	3	3	-	1	9	-	-
Triticum sp. awn fragments (silica & charred)	-	-	-	-	-	-	-
Hordeum sp. rachis internode	-	-	-	-	-	-	-
Avena sp. awn fragment	-	-	-	-	-	-	-
Cerealia indet rachis internode	-	-	-	-	-	-	-
Cerealia indet basal rachis node	-	-	-	-	-	-	-
Cerealia indet sprouted coleoptile	-	-	-	-	-	-	-
Cerealia indet detached embryo	-	-	-	-	-	-	-
Cereal size culm node	-	-	-	-	-	-	-
Corylus avellana (Hazel) nut shell frags	-	-	-	1	-	-	-
WEEDS							
Ranunculus acris/repens/bulbosus (Buttercup)	-	-	-	-	-	-	-
Silene sp. (Campion)	-	-	-	-	-	-	-
Stellaria media agg. (Chickweed)	-	-	-	-	-	-	-
Chenopodium album (Fat Hen)	-	-	-	-	-	-	1
Chenopodium sp. (Fat Hen, Goosegrass)	-	-	-	-	-	-	-
Atriplex sp. (Orache)	-	-	-	-	-	-	-
Linum catharticum (Fairy Flax)	-	-	4	-	-	-	-
Vicia/Lathyrus sp. (Vetch/Tare)	-	1	-	-	-	-	-
Leguminosae small seeded	-	2	8	-	-	-	3
Crataegus sp. (Hawthorn) stone	-	-	-	-	-	-	-

Table 8.53 continued.

Sample	14	22	24	46	48	121	125
Context	198	209	204	347	368	918	1061
Period	1	1	1	1	1	1	1
Fraction (%)	100	100	100	100	100	100	100
Volume (litres)	37	10	28	32	20	16	
Feature type	oven	oven	oven	ditch	well	hearth	gully
Umbelliferae	-	-	-	-	-	-	-
Polygonum persicaria (Knotgrass)	-	-	-	-	-	-	-
Fallopia convolvulus (Black Bindweed)	-	-	-	-	-	-	-
Rumex sp. (Docks)	4	2	-	-	1	-	2
Rumex sp. tubercles	-	-	2	-	-	-	-
Polygonaceae	-	1	-	-	-	-	2
Odontites verna (Red Barstia)	-	2	16	-	-	-	1
Prunella vulgaris (Selfheal)	-	-	2	-	-	-	-
Labiate	-	-	-	-	-	-	-
Plantago media/lanceolata (Plantain)	-	-	25	-	-	1	2
Anthemis cotula (Stinking Mayweed)	-	-	-	-	-	-	-
Anthemis arvensis (Corn Chamomile)	-	-	-	-	-	-	-
cf. *Tripleurospermum inodorum* (Scentless Mayweed)	-	3	-	-	-	-	-
Lapsana communis (Nipplewort)	-	-	-	-	-	-	-
Compositae	-	5	5	-	-	-	-
Eleocharis palustris (Common Spike Rush)	-	-	-	-	-	1	-
Carex sp. (Sedges)	-	-	5	-	-	-	2
Cyperaceae	-	-	1	-	-	-	-
Bromus subsect *Eubromus* (Brome Grass)	2	-	-	-	-	1	-
Bromus subsect *Eubromus* sprouted	-	2	-	-	-	-	-
Bromus sterilis (Barren Brome)	-	1	-	-	-	-	-
Poa annua type (Annual Meadow-grass)	-	-	23	-	-	-	9
Avena sp. (wild Oat) floret base	-	-	-	-	-	-	-
Avena sp. (Oat) awn fragment	-	-	-	-	-	-	-
Gramineae large seeded (Grass)	5	9	2	-	-	1	-
Gramineae small seeded	2	7	9	4	-	1	3
Gramineae tuber	-	-	-	-	-	-	-
Prunus/Craetagus type thorn	-	-	-	-	-	-	-
Indet bud	-	-	-	-	-	-	-
Weed indet	4	2	27	-	2	6	1
Total Grain	16	30	7	16	8	20	31
Total Chaff	61	143	4	24	133	0	4
Total Weeds	17	37	129	9	3	22	26
Total	94	210	129	45	144	31	35

Table 8.54 Charred seeds and chaff from pit 180, Birdlip Quarry.

Sample	17	21	28
Context	181	207	208
Period	1	1	1
Fraction	100%	100%	1/16
Volume	10	2	6
Type	Pit	Pit	Pit
GRAIN			
Triticum spelta (Spelt Wheat) short, sprouted	1	-	-
Triticum spelta short	10	6	-
Triticum spelta long, sprouted	-	-	-
Triticum spelta long	-	-	-
Triticum spelta intermediate, sprouted	4	3	5
Triticum spelta intermediate	71	15	19
Triticum spelta immature grain	6	-	-
Triticum sp. hulled (hulled Wheat), sprouted	7	18	4
Triticum sp. Hulled	117	42	5
Triticum sp. (Wheat)	106	51	4
Hordeum vulgare (six-row Barley) hulled lateral grain	1	-	-
Hordeum sp. (Barley) hulled sprouted	-	-	-
Hordeum sp. hulled	45	2	-
Hordeum sp.	72	-	1
Avena sp. (Oats)	2	1	-
cf. *Secale cereale* (Rye) sprouted	-	-	-
Triticum/Secale sp. (Wheat/Rye)	1	1	-
Cerealia indet	275	120	20
CHAFF			
Triticum spelta glume base	421	375	105
Triticum spelta small glume base	32	56	130
Triticum cf. *spelta* glume base	23	108	65
Triticum sp. glume base	455	968	1064
Triticum spelta rachis internode	1	9	2
Triticum cf. spelta rachis internode	-	-	6
Triticum sp. hexaploid rachis internode	16	5	127
Triticum sp. hulled, rachis internode	2	-	7
Triticum sp. hexaploid free-threshing rachis	-	-	-
Triticum sp. free-threshing rachis node	-	1	-
Triticum sp. rachis internode	24	2	17
Triticum sp. awn fragments (silica & charred)	-	+++	+++
Hordeum sp. rachis internode	1	-	3
Avena sp. awn fragment	1	46	27
Cerealia indet rachis internode	1	-	11
Cerealia indet basal rachis node	-	-	2
Cerealia indet sprouted coleoptile	10	69	157
Cerealia indet detached embryo	7	9	-
Cereal size culm node	-	-	1
Corylus avellana (hazel) nut shell fragment	-	-	-
WEEDS			
Ranunculus acris/repens/bulbosus (Buttercup)	-	-	-
Silene sp. (Campion)	-	-	-
Stellaria media agg. (Chickweed)	2	1	-
Chenopodium album (Fat Hen)	-	-	-
Chenopodium sp. (Fat Hen, Goosegrass)	-	-	1
Atriplex sp. (Orache)	2	-	-
Linum catharticum (Fairy Flax)	-	-	-
Vicia/Lathyrus sp. (Vetch/Tare)	-	-	-
Leguminosae small seeded	1	2	3
Crataegus sp. (Hawthorn) stone	-	-	-

Table 8.54 continued.

	Sample	17	21	28
	Context	181	207	208
	Period	1	1	1
	Fraction	100%	100%	1/16
	Volume	10	2	6
	Type	Pit	Pit	Pit
Umbelliferae		-	-	-
Polygonum persicaria (Knotgrass)		-	-	-
Fallopoia convolvulus (Black Bindweed)		-	-	1
Rumex sp. (Docks)		14	4	4
Rumex sp. Tubercles		-	-	-
Polygonaceae		-	-	-
Odontites verna (Red Barstia)		4	4	-
Prunella vulgaris (Selfheal)		-	-	-
Labiate		-	-	-
Plantago media/lanceolata (Plantain)		-	-	1
Anthemis cotula (Stinking Mayweed)		-	-	1
Anthemis arvensis (Corn Chamomile)		2	-	-
cf. *Tripleurospermum inodorum* (Scentless Mayweed)		4	12	3
Lapsana communis (Nipplewort)		1	-	-
Compositae		-	-	1
Eleocharis palustris (Common Spike Rush)		-	-	-
Carex sp. (Sedges)		-	-	1
Cyperaceae		-	-	1
Bromus subsect *Eubromus* (Brome Grass)		17	11	3
Bromus subsect *Eubromus* sprouted		-	-	2
Bromus sterilis (Barren Brome)		1	1	-
Poa annua type (Annual Meadow-grass)		-	-	-
Avena sp. (wild Oat) floret base		-	-	-
Avena sp. (Oat) awn fragment		-	1	-
Gramineae large seeded (Grass)		19	12	36
Gramineae small seeded		213	119	20
Gramineae tuber		1	-	-
Prunus/Crataegus type thorn		-	-	-
Indet bud		-	-	1
Weed indet		44	22	12
	Total Grain	718	259	58
	Total Chaff	994	1648	1724
	Total Weeds	325	189	91
	Total	2037	2096	1873

Table 8.55 Charred seeds and chaff from Period 2, Birdlip Quarry.

Sample	1	3	4	23	31	32	138	2
Context	33	43	81	190	222	221	1265	41
Period	2	2	2	2	2	2	2	2
Fraction	100%	100%	100%	1/4	1/16	100%	100%	100%
Volume	23	28	28	19	30	28	32	40
Type	CD	CD	CD	CD	CD	CD	pit	pit
GRAIN								
Triticum spelta (Spelt Wheat) short, sprouted	-	-	-	-	-	17	-	-
Triticum spelta short	-	-	-	2	9	-	1	2
Triticum spelta long, sprouted	-	1	-	-	-	10	-	-
Triticum spelta long	-	2	-	-	13	46	-	-
Triticum spelta intermediate, sprouted	-	-	-	1	-	-	-	-
Triticum spelta intermediate	-	-	1	2	7	-	5	2
Triticum spelta immature grain	-	-	-	-	-	-	-	-
Triticum sp. hulled (hulled Wheat) sprouted	-	-	-	-	-	-	-	-
Triticum sp. Hulled	2	3	7	11	18	67	16	10
Triticum sp. (Wheat)	2	3	-	7	64	88	19	6
Hordeum vulgare (six-row Barley) hulled lateral grain	-	-	-	-	-	-	-	-
Hordeum sp. (Barley) hulled sprouted	-	-	-	-	-	2	-	-
Hordeum sp. hulled	-	-	-	-	-	6	-	-
Hordeum sp.	-	-	3	1	2	14	1	2
Avena sp. (Oats)	-	-	1	-	-	2	1	-
cf. *Secale cereale* (Rye) sprouted	-	-	-	-	1	-	-	-
Triticum/Secale sp. (Wheat/Rye)	-	-	-	-	-	-	-	-
Cerealia indet	9	7	27	25	79	191	36	17
CHAFF								
Triticum spelta glume base	5	1	33	88	198	176	1	13
Triticum spelta small glume base	-	-	-	26	27	38	-	1
Triticum cf. *spelta* glume base	-	-	2	-	18	3	-	2
Triticum sp. glume base	16	32	43	89	622	443	2	37
Triticum spelta rachis internode	-	-	-	-	2	-	-	-
Triticum cf. spelta rachis internode	-	-	-	-	-	-	-	-
Triticum sp. hexaploid rachis internode	-	2	1	7	17	10	-	-
Triticum sp. hulled, rachis internode	-	-	-	-	-	-	-	-
Triticum sp. hexaploid free-threshing rachis node	-	-	-	-	-	-	-	-
Triticum sp. free-threshing rachis node	-	-	-	-	-	-	-	-
Triticum sp. rachis internode	-	-	3	3	17	3	-	-
Triticum sp. awn fragments (silica & charred)	-	-	-	-	-	-	-	-
Hordeum sp. rachis internode	-	-	-	-	-	-	-	-
Avena sp. awn fragment	-	-	-	-	2	5	-	-
Cerealia indet rachis internode	-	-	-	-	-	-	-	-
Cerealia indet basal rachis node	-	-	-	-	-	-	-	-
Cerealia indet sprouted coleoptile	-	2	1	8	22	8	-	-
Cerealia indet detached embryo	2	-	-	-	5	12	-	-
Cereal size culm node	-	-	-	-	-	-	-	-
Corylus avellana (Hazel) nut shell fragments	-	-	-	-	-	-	-	-
WEEDS								
Ranunculus acris/repens/bulbosus (Buttercup)	-	-	-	-	-	-	2	-
Silene sp. (Campion)	-	-	-	-	-	-	-	1
Stellaria media agg. (Chickweed)	-	-	1	-	-	-	-	-
Chenopodium album, (Fat Hen)	-	-	-	-	-	-	-	-
Chenopodium sp. (Fat Hen/Goosefoot)	2	-	-	1	1	1	-	-
Atriplex sp. (Orache)	-	-	-	-	-	2	-	-
Linum catharticum (Fairy Flax)	-	-	-	-	-	-	-	-
Vicia/Lathyrus sp. (Vetch/Tare)	-	-	-	1	-	1		-
Leguminosae, small seeded	1	-	2	1	-	-	11	-
Crataegus sp. (Hawthorn) stone	-	-	-	-	-	-	2	

Table 8.55 continued.

Sample	1	3	4	23	31	32	138	2
Context	33	43	81	190	222	221	1265	41
Phase	2	2	2	2	2	2	2	2
Fraction	100%	100%	100%	1/4	1/16	100%	100%	100%
Volume	23	28	28	19	30	28	32	40
Type	CD	CD	CD	CD	CD	CD	pit	pit
Umbelliferae	-	-	-	-	1	-	-	-
Polygonum persicaria (Knotgrass)	-	-	-	2	-	-	-	-
Fallopia convolvulus (Black Bindweed)	-	-	-	-	4	-	-	-
Rumex sp. (Docks)	1	-	1	4	1	3	2	-
Rumex sp. Tubercles	-	-	-	-	-	-	-	-
Polygonaceae	-	1	-	-	1	-	-	-
Odontites verna (Red Barstia)	1	-	2	10	-	1	4	2
Prunella vulgaris (Selfheal)	-	-	-	-	-	-	-	-
Labiate	-	-	-	-	1	-	-	-
Plantago media/lanceolata (Plantain)	-	-	-	-	-	-	1	-
Anthemis cotula (Stinking Mayweed)	1	1	-	-	1	-	-	-
Anthemis arvensis (Corn Chamomile)	-	-	-	-	1	-	-	-
cf.*Tripleurospermum inodorum* (Scentless Mayweed)	-	-	-	-	1	-	-	-
Lapsana communis (Nipplewort)	-	-	-	-	-	-	-	-
Compositae	1	-	-	-	-	6	-	-
Eleocharis palustris (Common Spike-rush)	-	-	-	-	-	-	1	-
Carex sp. (Sedges)	-	-	-	-	-	-	1	-
Cyperaceae	-	-	2	-	-	-	-	-
Bromus subsect *Eubromus* (Brome Grass)	1	-	3	3	11	52	-	-
Bromus subsect *Eubromus* sprouted	-	-	-	-	-	-	-	-
Bromus sterilis (Barren Brome)	-	-	-	-	-	3	-	-
Poa annua type (Annual Meadow-grass)	-	-	-	-	-	-	-	-
Avena sp. (wild Oat) floret base	-	-	-	-	-	-	1	-
Avena sp. (oat) awn fragment	-	-	-	-	-	-	-	-
Gramineae large seeded (Grass)	-	2	3	4	7	1	3	5
Gramineae small seeded	7	8	4	4	2	9	1	6
Gramineae tuber	-	-	1	-	-	-	-	-
Prunus/Craetagus type thorn	-	-	-	3	-	-	-	-
Indet bud	-	-	-	2	-	-	-	1
Weed indet	-	2	9	2	4	4	2	1
Total Grain	13	16	39	49	193	443	79	39
Total Chaff	23	37	83	221	930	698	3	53
Total Weeds	15	14	28	37	36	83	31	16
Total	51	67	150	307	1159	1224	113	108

C.D. = corn dryer

Table 8.56 Charcoal identifications from Birdlip Quarry.

	Sample	4	23	32	17	125	22	121	14	138
	Context	81	190	221	181	885	209	918	198	1265
	Feature	42	42	42	180	1030	213	-	199	1263
Prunus sp.	Plum, sloe, bullace etc.	4	2	3	1	-	4	2	-	5
cf. *Prunus* sp.		-	-	-	-	-	2	-	-	-
Pomoideae	Apple, pear, hawthorn etc.	2	10	3	1	15	11	6	2	4
cf. *Pomoideae*		-	-	-	1	-	-	-	-	-
Fraxinus sp.	Ash	2	2	-	16	5	1	-	8	1
cf. *Fraxinus* sp.		-	-	2	-	-	-	1	-	-
cf. *Rhannus* sp.	Buckthorn	4	5	-	-	-	-	1	-	-
Quercus sp.	Oak	6	1	-	1	-	2	-	-	-
Indet		2	-	2	-	-	-	-	-	-

Table 8.57 Composition of the assemblages from the corn dryer, Birdlip Quarry.

		% germinated grain		No. items	Items per 1	Glum: grain	Sprout: grain	% Weeds	Silica	Charcoal
Sample	Type	Total	Wheat							
4	Bowl	-	-	150	5.3	2.1	1:39	18.7	-	++
23	Bowl	2	4.3	302	15.9	4.1:1	1:6.1	10.6	-	+++
31	Flue	-	-	1167	38.9	4.5:1	1:7.1	3.1	-	+
32	Flue	6.1	11.8	1224	43.7	1.5:1	1:22.2	6.8	-	+
17	Pit	1.7	3.7	2136	213.6	1.3:1	1:42	19.9	-	+
21	Pit	7.8	15.6	2105	1052.5	5.6:1	1:3.4	8.9	++	-
28	Pit	19	24.3	1872	312.0	23.5:1	2.7:1	4.8	++	+

has been subsequently used as fuel. Samples 17 and 21 are of similar composition to the corn dryer deposits, ie. they are likely to have derived from the processing of a cereal crop for consumption/storage.

Sample 28 contains a much greater number of sprouted coleoptiles than any other sample (418.7 per litre, 8.4% of total assemblage). A minimum of 24% of the wheat grains show signs of germination. This figure may be much higher, but many grains are poorly preserved. The numbers of sprouted coleoptiles and germinated grains would seem too high to have occurred naturally in an average harvest. The deposit appears to be most characteristic of malting waste, the detached glumes and sprouts resulting from the rubbing of malted grain. The process of malting is discussed in relation to corn dryers below. If not malting waste, this figure would suggest the burning of a spoilt crop, perhaps as the result of a wet harvest. The large number of rachis internodes and awn fragments suggests that whole ears were processed rather than individual spikelets. A similar deposit recently recovered from a pit at Stratford Road, Alcester (Mudd and Booth forthcoming) has been interpreted as malting waste (the 'cumins') on the basis of the large number of sprouted coleoptiles and glume bases and that the majority of grains showed clear signs of germination (only one grain could definitely be identified as not germinated) (Pelling forthcoming a). Several corn dryers have been interpreted as producing evidence for malting (Van der Veen 1989) including an example at Bancroft Villa, Milton Keynes (Pearson and Robinson 1994) and Catsgore (Hillman 1982). The known examples of possible malting waste from both corn dryers and pits are all of spelt wheat, while the brewing of wheat beer by the Romans is documented by Pliny (Book XVIII).

The assemblages of the pit fills are similar in nature to those of the lower fills of the corn dryer in that they are very rich in the by-products of an intensive processing activity. It seems likely that if not directly related then the pit contains refuse from a similar structure.

Period two

The Period two samples are dominated by the corn dryer (Table 8.57). The greatest component overall is chaff, forming 64.2% of the total assemblage, the majority of which is glume bases. Weeds form only 8.2% over all. The assemblages are characteristic of the very final stages of processing of a tough glumed wheat. The straw and weeds must have been removed at an earlier stage. Wheat forms 51% of the overall grain component, while indeterminate grain forms 44%. Barley and oats are a very minor component.

The corn dryer (feature 42)

Samples were analysed from both the flue and the bowl/stoke hole of the corn dryer and from the post-abandonment fill. Three samples are assumed to be related to the primary function of the feature, two from the flue (samples 31/34, context 222 and 32/33, context 221) and one from the bowl (sample 23, context

190). A summary of the composition of samples is shown in Table 8.57. Glume bases and grains of *Triticum spelta* (spelt wheat) dominate the cereal assemblage, while occasional grains of *Hordeum* sp. (barley) and *Avena* sp. (oats) are present as minor components.

Samples 31/34, 32/33 and 23 are characterised by very large quantities of glume bases, very occasional weeds and few grains, although grain is slightly more numerous in sample 32 (context 221) from the upper flue. The density of remains is high, exceptionally so in the lower flue fill, sample 31 (617.6 items per litre). Small numbers of germinated cereal grains were identified from samples 23 (context 190) and 32 (context 221). Very occasional detached coleoptiles (sprouted embryos) were present in each sample.

Samples 1 (context 33), 3 (context 43) and 4 (context 81) were taken from the post-abandonment fills of the corn dryer. The density of remains is much lower than those in the primary fills (2.2 to 5.4 items per litre). The compositions are much more mixed. Chaff still forms the greatest category of remains, but only makes up about half of the assemblage. Grain and weeds occur in similar quantities. Germinated grain and detached coleoptiles are very infrequent. Preservation of cereal grains was poor. The majority were 'clinkered' in appearance, suggesting high degrees of heat. These samples are likely to represent mixed cereal processing waste and accidentally charred grain. Occasional germinated grain may be expected in an average cereal crop.

The botanical evidence of so-called 'corn dryers' has been addressed in detail by Van der Veen (1989). From the analysis of the botanical assemblages from corn dryers from 21 sites she concludes that they should be regarded as multi-functional structures. The botanical evidence was interpreted as indicating that both the roasting of deliberately germinated grain for the production of malt and the preparation of grain for food production (ie. parching prior to de-husking, milling etc.) and storage (ie. drying) are associated with T-shaped corn dryers. Experiments conducted by Reynolds and Langley (1979), however, suggest that the structures were not actually very suitable for drying grain. Storage of clean grain is unlikely outside Roman military granaries, while hulled spikelets could be dried sufficiently on a barn floor or even in the field. Drying of grain prior to storage is therefore unlikely. Spelt appears to be the only cereal used in the malting process, while both spelt and barley have been recorded from corn dryers in association with evidence for processing prior to storage or consumption.

The roasting of deliberately germinated grain for the production of malt would result in a large number of detached coleoptiles. If roasting took place while grains were still in their glumes, rubbing of the grains would remove glumes and coleoptiles simultaneously. It would also be expected that the greater number of grains would show signs of germination. Van der Veen provides an arbitrary figure of 75% for a minimum number of germinated grains (1989). The waste product of such a process would include glume bases, sprouted coleoptiles and occasional grain, some of which may have germinated. Accidental burning would result in glumes and grain in similar numbers with the majority of grain (say >75%) showing signs of germination.

Processing for consumption/preparation of food covers a range of possible stages/categories including the drying of damp or immature spikelets for the recovery of spoilt harvests or for greencorn, and the parching of spikelets for the removal of glume bases. Accidental burning would result in approximately equal proportions of grain and glume bases with occasional sprouted coleoptiles. General waste which may be burnt as fuel would consist of glume bases, occasional sprouted coleoptiles and occasional grains, a small proportion of which could show signs of germination.

The issue is somewhat compounded by the use of chaff as fuel. Straw and glume bases, mixed with wood and/or peat where available, appear to have been the favoured fuel for all forms of grain parching, especially malting (Hillman 1982). Straw and glume bases would have been readily available if cereal processing was taking place and would have had less effect on the taste of malt than other forms of fuel. Any chaff generated by the activities at the corn dryer is likely to have been thrown straight back in to be used as fuel for the next episode of use. The denser chaff fragments and occasional cereal grains and weed seeds could therefore be expected in the ashes of the bowl/stoke pit, while the deposits in the flue might contain a greater percentage of accidental loss during processing. Some mixing could occur, especially where fuel is blown up into the bowl or material which has built up in the bowl raked down into the fuel.

The high numbers of glume bases must indicate the use of the waste products of cereal processing reused as fuel. The higher proportion of glumes in the bowl/stoke-hole than the upper flue deposits is presumably related to the greater proportion of fuel in that deposit. A mix of wood charcoals including Pomoideae (hawthorn, apple etc.), *Quercus* (oak) and *Fraxinus* (ash) suggests that some wood was also used as fuel. The higher percentage of grain in the upper flue deposits (sample 32) is likely to be due to accidental loss through the processing floor. The number of germinated grains and of sprouted coleoptiles are within a range which would be feasible for occasional spoilt grains within a harvest. The glume-rich deposit in the lowest of the flue samples (context 222) is likely to represent a general build up of small chaff which has trickled down into the base of the flue over successive episodes of use. No germinated grain was present and the number of sprouted coleoptiles is low. The deposits all suggest the activities taking place within the corn dryer involved the processing of grain for consumption, rather than for malting. It must be considered, however, that only the later episodes of use are likely to be represented in the deposits with evidence regarding earlier stages probably having been removed. Therefore, while there is no confirmation of malting as a function of the structure, there is also no evidence to indicate that it did not take place at some point.

In summary, the assemblages within the corn dryer indicate that the charred remains are, at the very least, the product of an episode of waste disposal, probably taking the form of burning cereal processing by-products as fuel. The more likely interpretation of the material is that it represents successive episodes of waste disposal, that waste having been directly derived from episodes of use of the corn dryer in which roasting spikelets or ears of spelt wheat took place for the purpose of processing prior to consumption.

The emergence of corn dryers in the 3rd century AD has been linked to the increase in large-scale cereal processing. Van der Veen (1989) suggests large-scale processing and then storage of clean grain. While clean grain was certainly stored in Roman military granaries, where it was then available for transport when needed, it is unlikely that grain would normally be stored clean in a Romano-British rural settlement. The glumes of hulled wheat provide protection against damage from infection as well as from insect attack. It is more likely that the emergence of corn dryers is related to increased social organisation and that they eventually became commonplace within non-military settlements of any size for use in malting for brewing purposes and for preparation of grain for consumption.

The later, post-abandonment deposits within the corn dryer (samples 1, 3 and 4) are clearly very different in nature to those associated with the original function of the structure. They are more likely to represent general background scatters of the waste products of cereal processing episodes.

Other pits

A further eleven samples from Period 2 pits contained charred plant remains. The majority of these contained occasional indeterminate grains and glume bases. Two samples (138 and 2) (Table 8.55) contained slightly more charred remains and so were analysed in full. Charred remains occur in low concentrations (3.5 and 2.7 items per litre). The cereal remains were dominated by indeterminate and hulled wheat grain and glumes. Weeds and chaff were more numerous than grain in sample 2 suggestive of processing debris. In general, the pit samples contain the low density background scatters of charred seeds and chaff which tend to be common on Romano-British rural sites. The density of remains is much lower than in pit 180.

General discussion

The cereal-based economy at Birdlip Quarry was dominated by spelt wheat, with some barley consumption and possibly oat. The processing of cereals was clearly taking place within the settlement. A background scatter of processing waste including occasional grains, glume bases and weed seeds were recovered from the majority of features sampled. This waste is unlikely to have been redeposited deliberately but rather is likely to have derived from scatters of waste which were generally present. Some more intensive processing is indicated by the remains recovered from the corn dryer and pit 180. The corn dryer provides evidence for the use of such features in the dehusking of glume wheats prior to consumption or storage. There is evidence that the processing waste was used as fuel. It is also possible that at least some of the remains in pit 180 have derived from the by-products of malting spelt wheat for brewing purposes. The weed flora provides some evidence for the cultivation of heavy clay and calcareous soils which could be found locally and possibly some evidence of the cultivation of seasonally marshy ground as might be found in the river valleys. The arable weeds actually form a minor component of the samples. The greater weed element of the assemblages is derived from a grassland flora, suggestive of open, calcareous grassland. The bulk of the arable weed seeds are therefore absent and are likely to have been removed at an earlier stage than is represented, possibly before the cereals even entered the assemblages. At least some of the grassland flora may have entered the site in the form of locally gathered turves or roughage, possibly used as hay or fuel.

Comparable published assemblages from within the Gloucestershire region are rare, although charred assemblages have been recovered from a middle Iron Age to early Roman site on the Birdlip Bypass (Straker 1998). Comparable material has been recovered from Roman sites within the Upper Thames Valley (Robinson and Wilson 1987) and from elsewhere in southern Britain such as Bancroft Villa (Pearson and Robinson 1994). An overview of Romano-British material in southern Britain is provided by Greig (1991). The cereal assemblage from Birdlip Quarry fits the pattern for Romano-British sites in southern Britain in which spelt wheat is the principle cereal, although smaller quantities of free-threshing wheat and of emmer wheat which was not present at Birdlip Quarry, are often recorded, as is hulled barley. The assemblages are similar to those at Bancroft Villa in that the later stages of processing (principally de-husking) are represented while the earlier stages in which the straw and the bulk of the weed seeds are removed. Bancroft Villa, however, is a high-status site in which grain was clearly stored for some period of time, as attested by grain-storage pests. The assemblages were interpreted as being derived from grain that was produced on smaller and lower status sites from which the grain was mostly exported and then stored in spikelet form at the villas. At Birdlip Quarry the dominance of assemblages representing the final stages of processing (malting and de-husking) is a result of the corn dryer and large pit assemblages. These structures suggest some degree of social organisation and centralisation of certain cereal processing activities, probably commonplace on rural Romano-British settlements of this size by the later Roman period.

THE MEDIEVAL PERIOD AT STREET FARM

Eight samples were taken from within the kitchen building dating from the 13th to the early 16th century. Samples were taken from successive floor deposits and from an oven. Original sample sizes ranged from 1 to 12 litres. Five samples, all of which were clearly rich in charred remains were selected for detailed analysis. The oven sample was included in the analysis. Two samples were selected for the identification of charcoal (Tables 8.58–8.59).

Crop species

Cereal crops are represented by grain with occasional chaff fragments (Table 8.58). Free-threshing *Triticum* sp. (bread-type/rivet wheat) is the predominant cereal crop in all samples apart from that taken from the oven (sample 7). This sample, in which wheat and barley occur in similar numbers, contains a much lower number of cereal grains, and as such the ratio of cereal types cannot be taken as statistically representative. Overall, short, plump free-threshing *Triticum* grains, recorded as 'compact', were most numerous. A few longer narrow grains recorded as 'elongated' were also identified. Intermediate grains are classified separately. Occasional rachis nodes identifiable to ploidy level were also present. Given the inherent difficulties in distinguishing between ploidy level on the basis of grain, no attempt was made to identify free-threshing wheat grain to species. The rachis nodes, however, demonstrate the presence of both tetraploid and hexaploid wheat. The tetraploid wheat is likely to be of *Triticum turgidum* (rivet wheat), which appears to have been cultivated from the early medieval period (Moffett 1991), rather than *T. durum* (durum wheat) which is poorly suited to the British climate (Percival 1921). The hexaploid wheat would be a variety of bread wheat.

Hexaploid wheat, *Triticum aestivum* type (bread-type wheat), is less frequently identified by the rachis in the samples, although it is unclear how representative this is as the hexaploid rachis tended to be more abraded, thus suggesting that some of the more poorly preserved *Triticum* rachis which was not assigned to ploidy level could also be hexaploid. It is also likely that the two types of chaff may have had different uses and as a result experience different chances of preservation by charring. Hexaploid free-threshing wheat is more likely to be awnless and to be used as fodder as it is more palatable to the animals, and so is less likely to be charred, while tetraploid wheat tends to give a good quality straw and is more likely to be used for thatch. The likelihood of preservation is also dependent on context. It is therefore very difficult to assess the relative importance of hexaploid and tetraploid wheats. There was some evidence from West Cotton to suggest that the two wheats were sometimes grown together as a maslin (Campbell forthcoming b). Bread-type wheat has far superior qualities for bread baking, while rivet wheat provides a good flour for biscuits, but the two wheats can also be used together as a useful multi-purpose flour (Percival 1934). When both species are grown, either together as a maslin, or separately, they provide added insurance against crop loss as the two crops have different tolerance to infections or frost, thus where one is damaged the other may survive.

Hordeum sp. (barley) and *Avena* sp. (oats) are present in all samples. All seeds identified as *Avena* were recorded as grain. Although this means that any wild oats will be recorded as cultivated, given the absence of floret bases this provides the only reasonable impression of the relative importance of oats in the samples. Oats and barley occur in very similar numbers overall, although the ratios vary from sample to sample. The numbers of barley and oats are similar in sample 1 and 3. In samples 4 and 7, barley is approximately three times as frequent as oats, while oats forms only a minor component of sample 8. The two species were commonly grown together as a mixed crop or drage (Slicker van Bath 1963). They have uses together as a pottage (Bennett 1960) and also for brewing, evidence of which was recovered from West Cotton (Campbell forthcoming b). Each crop can equally be grown and used on its own, for example as pot barley and rolled oats, as well as for flour and individually for brewing. Markham provides documentary evidence for the use of oats on their own for brewing (Markham 1681).

Leguminous crops are represented by *Vicia sativa* subsp. *sativa* (cultivated field vetch) and *Vicia faba* (field bean). The majority of legumes were poorly preserved and lacked their testa and hilum. This group was simply recorded as cultivated *Vicia/Lathyrus/Pisum* sp. which is distinguished from seeds of weed/wild varieties of *Vicia/Lathyrsus* sp. on the basis of size. Pulses are generally poorly represented in archaeological contexts. They are not usually exposed to fire during processing, and if used as fodder the whole plant is fed to the animal therefore leaving little waste to be burnt as fuel. The threshing waste is, however, recommended as a substitute for cereal chaff as a fuel for drying malt by Markham (1681). Evidence for the use of legume chaff as fuel is provided by seeds occurring in ovens in association with large quantities of legume pod fragments at West Cotton (Campbell unpublished). If the structure is domestic in nature then the beans may have been charred during cooking accidents. *Vicia sativa* spp *sativa* is likely to have been grown as animal fodder, thus it may have entered the deposits as fuel, although it could also provide a human famine food. Documentary evidence attests to its cultivation from the early 13th century AD, while examples from West Cotton were recovered from the first half of the 12th century, thought to be the earliest record in Britain (Campbell 1994).

Seeds of *Brassica/Sinapis* spp. were present in three of the samples taken from floor deposits (samples 1, 3 and 4). Seeds of any of the *Brassica/Sinapis* species could have been used as condiments. They also have uses in brewing, both as a flavouring, and as an addition to ale as a means to reduce fermentation (Man and Weir 1984, 14). Large numbers of brassica seeds

Table 8.58 Charred plant remains from Street Farm.

	1	3	4	7	8
Context	500	517	503	602	613
Vol (litres)	2	4	12	1	1
Fraction	100%	100%	100%	100%	50%
Feature type	Layer	Layer	Layer	Oven	Layer
Triticum sp. free-threshing, compact grain	29	113	46	6	102
Triticum sp. free-threshing, intermediate grain	16	30	11	-	19
Triticum sp. free-threshing, elongated grain	-	-	-	5	14
Triticum sp. wheat grain	27	64	36	6	62
Hordeum vulgare lateral grain	2	-	-	-	-
Hordeum sp. hulled	13	36	28	9	18
Hordeum sp. hulled, germinated	-	1	-	-	-
Hordeum sp.	8	-	19	7	15
Avena sp. Oat grain	20	30	15	6	5
Cerealia indet grain	58	132	89	17	87
Triticum sp. hexaploid rachis	-	2	1	-	4
Triticum sp.tetraploid rachis	1	2	4	-	7
Triticum sp. naked rachis	3	3	-	-	32
Hordeum/Secale rachis internode	1	-	9	-	8
Cerealia indet rachis internode	-	2	-	-	
Cerealia indet embryo	-	3	-	-	2
Cerealia indet sprouted embryo	-	1	-	-	
Cereal size culm node	-	-	-	-	2
Vicia sativa subsp. sativa	1	2	6	1	
cf. Vicia faba	-	2	4	-	17
Vicia/Lathyrus/Pisum sp.	19	17	46	10	-
Papaver sp.	-	-	1	-	-
Brassica cf. *Nigra*	-	1	-	-	-
Brassica/Sinapis sp.	1	5	3	-	-
Stellaria media agg.	-	-	1	-	-
Montia fontana subsp. *fontana*	-	1	-	-	-
Caryophyllaceae	1	-	-	-	-
Chenopodium album	-	2	1	1	-
Chenopodium sp.	-	-	1	-	-
Atriplex sp.	-	4	7	2	-
Chenopodiaceae	-	-	13	-	3
Vicia/Lathyrus sp.	4	-	3	-	6
Medicago lupinula	-	1	6	1	11
Leguminosae small seeded	20	-	65	6	39
Rosaceae type thorn	-	-	-	-	1
Polygonum persicaria	-	-	1	-	1
Polygonum convulvulus	-	-	2	-	-
Polygonum sp.	-	-	4	-	-
Rumex sp.	2	3	21	4	6
Polygonaceae	-	2	3	-	-
Polygonaceae/Cyperacacea	-	-	3	-	-
cf. *Anagalis* sp.	3	1	6	-	-
Lithospermun arvensis	-	-	-	-	4
Odontites verna/Euphrasia sp.	-	1	13	1	1
Plantago major	-	2	6	-	-
Galium apernine	-	-	1	-	2
Sambucus nigra	-	-	2	-	-
Anthemis cotula	3	11	61	1	5
Chrysanthemum segetum	-	-	1	1	-
Compositae	-	12	7	-	1
Eleocharis palustris	-	1	8	-	2
Carex sp.	-	-	7	-	-
Cyperacacea	2	-	5	1	-
Phalaris sp.	1	-	-	-	-

Table 8.58 continued.

	1	3	4	7	8
Context	500	517	503	602	613
Vol (litres)	2	4	12	1	1
Fraction	100%	100%	100%	100%	50%
Feature type	Layer	Layer	Layer	Oven	Layer
Granineae large seeded	9	10	19	3	12
Gramineae small seeded	1	15	10	-	1
Weed indet	2	13	45	3	14
Total grain	173	406	244	56	322
Total chaff	5	14	44	0	61
Total legumes	20	21	56	11	19
Total weeds	49	85	326	24	109
Total	247	526	670	91	511

were recovered from the floors of malt-houses at West Cotton (Campbell unpublished). The seeds also often occur in faecal deposits of medieval date, further indicating their use as a spice (Greig 1991). While they do occur as ruderal weeds, they certainly were being cultivated by the medieval period, both for their seeds and their leaves. Either origin is possible for the examples in these deposits.

The weed assemblage

The weed seeds form approximately 20% of the assemblages in four of the five samples. The species represented are generally common weeds of arable or disturbed ground. Sample 12 conversely produced a greater number of weed seeds than cereal grains, with weed seeds forming some 48.7% of the assemblage.

Leguminous weeds form the major group of weeds in all samples. *Medicago lupulina* L. (black medick) was identified where sufficient seed coat remained, while *Vicia/Lathyrus* sp. (vetches) were distinguished from cultivated legumes on the basis of size. The category of small seeded Leguminoseae includes seeds of shape similar to the *Medicago lupulina* but which lacked any seed coat, as well as other small legumes not identifiable as *Vicia/Lathyrus*. Leguminous weeds generally increase in frequency during the late Saxon and early medieval period, for example at the Raunds sites in Northamptonshire (Campbell forthcoming). This may reflect decreasing soil fertility resulting from the agricultural expansion from the 13th century, or the deliberate cultivation or encouragement of natural swards of grass and legumes for animal fodder. Leguminous weeds also tend to occur in large numbers in association with large numbers of cultivated legumes, for example in medieval deposits at Eynsham Abbey, Oxfordshire (Pelling forthcoming b). Climbing leguminous weeds could be growing up with cultivated varieties of the same species, for example, wild and cultivated varieties of *Vicia sativa*. It is possible, therefore, that the leguminous weeds are simply a common weed of cultivated legumes and that increases in number reflect increases in the cultivation of legumes.

Species normally associated with wet ground or damp grass land are present in each sample, most notably sample 4. *Montia fontana* and *Eleocharis palustris* both require at least seasonal flooding. They are known in association with cereal assemblages from the Iron Age onwards, leading to their interpretation as arable weeds, even though they are not regarded as weeds today. Their presence as an arable weed is usually taken to suggest the cultivation of marginal land, possibly that the arable fields go down onto the flood plain of the river Churn. Several of the species of *Carex* are also commonly associated with wet or damp ground. Some evidence is provided regarding the type of soils utilised. The presence of fairly frequent seeds of *Anthemis cotula* and *Odontites verna* suggest the cultivation of rather heavy calcareous claylands, while the seeds of *Papaver* sp. suggest some well drained, lighter calcareous soils may have been cultivated. Some indication is also provided of the cultivation of lighter acid sandy soils by the presence of *Chrysanthemum segetum*.

The remaining weed species include common ruderals such as members of the Chenopodiaceae and Polygonaceae families. Such weeds could have been growing in the settlement area itself or as arable weeds,and are ubiquitous among charred cereal assemblages. Some poorly preserved grasses were present. Cereal grains may be included in the group, while other grasses may have been growing on the headlands of arable fields.

The charcoal

Charcoal of *Ulmus* sp. (elm) and *Quercus* sp. (oak) were present in each of the two samples selected for charcoal analysis (Table 8.59). Two fragments of Pomoideae charcoal (apple, pear, hawthorn etc.) were also identified in sample 4. *Quercus* charcoal is commonly found in archaeological contexts and is a naturally favoured wood for construction purposes. One fragment of *Quercus* charcoal was attached to an iron nail. It has been noticed that *Ulmus* increases in proportion to other wood charcoal during the medieval period (Mark Robinson pers. comm.). Rackham (1986) refers to the deliberate collection of *Ulmus* timbers from hedgerows during the medieval period, if not for construction purposes then at least for repair work. The wood is likely to have been reused as fuel in the oven or hearth within the building.

Acknowledgements

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Table 8.59 Charcoal from Street Farm.

	Sample	4	5
	Context	503	552
Quercus	Oak	4	38
Ulmus sp.	Elm	15	4
Pomoideae	Apple, pear, hawthorn etc.	2	-

LAND AND FRESHWATER MOLLUSCA

By Mark Robinson

Introduction

The route of the A417/419 runs entirely over calcareous substrata from the Oolitic Limestone of the Cotswold Hills between Birdlip and Cirencester, the cornbrash on the edge of the Thames Valley below Cirencester to the Pleistocene terrace gravels of the Thames system around Cricklade. Such conditions might seem ideal for the palaeoecological investigation of mollusca from archaeological sediments and buried soils. However, the Jurassic limestones of the Cotswolds and the Pleistocene gravels derived from them are hard. Deeper soil profiles over them tend to be circumneutral rather than calcareous unless they have been disturbed, so are not always conducive to the survival of shells. The brashy nature of the limestone, other than where it is in the form of Pleistocene gravel, can present problems of interpretation for land molluscs because some species which are usually characteristic of woodland can also find favourable conditions in the interstices to the fills of archaeological features (Evans and Jones 1973, 125).

During the excavations, snail shells were observed in the sediments at many of the sites and extensive sampling was undertaken. A total of 90 samples, from 17 excavations, was assessed for the range of molluscs present in them and their archaeological implications. All the samples yielded at least some snails, although in many cases the concentrations were very low or the results were of limited archaeological significance. On the basis of the assessment, eight sites were selected for detailed analysis: Highgate House, Field Farm, Middle Duntisbourne, Duntisbourne Grove, Trinity Farm, Latton 'Roman Pond', Street Farm and Weavers Bridge. Subsequently, further sections were cut through Ermin Street and a buried soil suitable for detailed analysis was found at Dartley Bottom.

Methods and results

Sub-samples weighing 1 kg were weighed out for each sample, broken up in water and any shells which floated were poured off onto a 0.5 mm mesh and dried. The residue was then sieved over a 0.5 mm mesh and dried. Both the flots and residues were sorted under a binocular microscope and any shells picked out. The shells were examined at up to x50 magnification and identified with reference to the collections of the Oxford University Museum of Natural History. The results are listed in a table for each site (Tables 8.60–8.65, 8.67–8.69), which lists the minimum number of individuals recorded for each sample. *Cecilioides acicula* has been excluded from the totals because it is a deeply burrowing species. It proved necessary to analyse some of the charred plant remains flots from Dartley Bottom and Duntisbourne Grove for molluscs. In the case of Duntisbourne Grove sample 6 there were sufficient shells that the equivalent of a 1 kg sample could be counted. Shells were sparse in the other samples so only the presence of species was recorded. Nomenclature for land snails follows Waldén (1976).

The lower samples from Latton 'Roman Pond' were waterlogged and some contained macroscopic plant remains. Sub-samples, weighing 1 kg, from these contexts were washed over onto a 0.25 mm mesh, sorted under a binocular microscope and the seeds from them identified at up to x50 magnifications using reference material. The results are given in Table 8.66, the nomenclature following Clapham *et al.* (1989).

Highgate House

The results from a sequence of samples from colluvial sediments in Trench 3 through what is now a small dry valley (section 18) are given in Table 8.60. Molluscs were virtually absent from the lowest colluvial sediments excavated (samples 36, 34, 33) apart from a very few shell fragments of terrestrial species. The occurrence of a few shells of *Lymnaea truncatula* and *Anisus leucostoma*, which are stagnant water to amphibious species, in sample 32 (context 306) suggests that there was formerly water seepage in the valley. The deposit was of Bronze Age, or perhaps earlier, date. Molluscs were absent from the overlying colluvial sediments.

Table 8.60 Molluscs, Highgate House.

Column/Section	18			
Sample	36	34	33	32
Context	312	308	307	306
Depth (m.)				0.4 - 0.5
Lymnaea truncatula (Müll.)	-	-	-	1
Anisus leucostoma (Mill.)	-	-	-	5
Cochlicopa sp.	-	-	1	-
Trichia hispida gp.	1	1	-	-

Field's Farm

A column of samples was investigated through the ditch fill of a square barrow of probable early Roman date (section 6) and the molluscs listed in Table 8.61. The ditch was cut into limestone. The lowest sample, from context 52, had a strong rock-rubble element to the fauna, represented by *Discus rotundatus* and *Oxychilus cellarius*. This was a result of the high limestone content of the primary fill, which had fallen in from the monument. Rupestral conditions also seem to have favoured *Punctatum pygmaeum*. The lower deposits of the ditch (context 52, 51 and 50) also contained high concentrations of dry-ground open-country molluscs, especially *Vallonia excentrica* but also *Pupilla muscorum*, *V. costata* and *Helicella itala*. Another open-country species from the ditch, *Vertigo pygmaea*, is not restricted to dry habitats. These species would have been reflecting the more general conditions on the site. Above context 52, the stone content of the ditch fill declined and the rock-rubble species almost disappeared. Numbers of all shells apart from *Cecilioides acicula*, a burrowing species, were very much reduced in the uppermost sample, from context 20.

Table 8.61 Molluscs, Field's Farm.

Column/section	6			
Sample	18	18	18	18
Context	52	51	50	20
Depth (m.)				
Pomatias elegans (Müll.)	-	2	1	-
Carychium cf. *tridentatum* (Risso)	-	2	1	-
Cochlicopa sp.	-	4	1	-
Vertigo pygmaea (drap.)	4	5	5	-
Pupilla muscorum (L.)	9	2	1	1
Vallonia costata (Müll.)	5	6	1	-
V. excentrica Sterki	11	18	2	1
Vallonia sp.	7	24	6	2
Punctum pygmaeum (Drap.)	10	7	1	-
Discus rotundatus (Müll.)	10	-	-	-
Vitrina pellucida (Müll.)	2	-	-	-
Vitrea cf. *contracta* (West.)	2	1	1	-
Aegopinella pura (Ald.)	-	1	-	-
A. nitidula (Drap.)	2	2	1	-
Oxychilus cellarius (Müll.)	11	-	-	-
Limax or *Deroceras* sp.	7	8	9	2
Cecilioides acicula (Müll.)	4	3	9	7
Helicella itala (L.)	3	2	1	1
Trichia hispida gp.	13	56	10	1
Cepaea nemoralis (L.)	-	1	-	-
Cepaea sp.	-	1	-	-
Total (excluding *Cecilioides acicula*)	96	142	41	8

Ermin Street, Trench 8, Dartley Bottom

A low concentration of shells was found to have survived in the soil sealed beneath Ermin Street and above the limestone bedrock in Trench 8. Although there were insufficient shells for detailed analysis in a sample column through the buried soil (context 877), an adequate assemblage was recovered from a bulk sample (sample 800). The results are given in Table 8.62. The fauna was characteristic of woodland, obligate open-country species being absent. Shells of *Carychium* cf. *tridentatum* were the most numerous but a full range of woodland species was present including *Ena obscura*, *Discus rotundatus*, *Oxychilus cellarius* and *Cochlodina laminata*. Relatively undisturbed, long-established woodland was suggested by the occurrence of *Acicula fusca*.

Table 8.62 Molluscs, Ermin Street, Trench 8, Dartley Bottom.

Column / Section	8
Sample	800
Context	877
Acicula fusca (Mont.)	+
Carychium cf. *tridentatum* (Risso)	++
Cochlicopa sp.	+
Vertigo sp.	+
Acanthinula aculeata (Müll.)	+
Ena obscura (Müll.)	+
Discus rotundatus (Müll.)	+
Vitrea sp.	++
Nesovitrea hammonis (Ström)	+
Aegopinella pura (Ald.)	+
A. nitidula (Drap.)	+
Oxychilus cellarius (Müll.)	+
Cochlodina laminata (Mont.)	+
Trichia hispida gp.	+

Middle Duntisbourne

A rich molluscan sequence was obtained from a closely-sampled column through a late Iron Age enclosure ditch (ditch 4, Fig. 3.39, section 29). The shells were somewhat eroded but still fully identifiable and the results are given in Table 8.63. They showed that several changes in environment occurred during the life of the ditch.

The primary fill of the ditch (context 58, samples 70–68) was clay loam almost devoid of shells. Above this was clay loam with much limestone rubble (context 57, samples 67–61). It contained a high concentration of shells, almost all of which are woodland species. One of the more numerous molluscs, *Discus rotundatus*, can also occur in rock-rubble faunas, living in the interstices between the stones, as can two other species from these samples, *Vitrea* cf. *contracta* and *Oxychilus cellarius*. However, a balanced woodland fauna was present, including many individuals of *Carychium* cf. *tridentatum*, which does not occur in rubble habitats. Most of the woodland species, such as *Aegopinella pura*, *A. nitidula*, *Cochlodina laminata* and *Trichia striolata* are still widespread in woodland on calcareous substrates in England. There were also several individuals of *Acicula fusca* and *Ena montana*, two species of limited distribution which tend to characterise old woodland (Kerney and Cameron 1979, 54–100). Around 2.5% of

Table 8.63 Molluscs, Middle Duntisbourne.

Column/Section	29															
Sample	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
Context	58	58	58	57	57	57	57	57	57	57	56	56	56	153	153	153
Depth (m.)	1.35-1.40	1.30-1.35	1.25-1.30	1.20-1.25	1.15-1.20	1.10-1.15	1.05-1.10	1.00-1.05	0.95-1.00	0.90-0.95	0.85-0.90	0.80-0.85	0.75-0.80	0.70-0.75	0.65-0.70	0.60-0.65
Acicula fusca (Mont.)	-	-	-	1	-	-	-	-	1	2	-	-	-	-	-	-
Carychium cf. *tridentatum* (Risso)	-	-	-	10	3	10	5	17	38	71	5	10	5	1	6	-
Cochlicopa sp.	-	-	-	1	2	-	-	3	5	4	-	-	-	-	-	-
Vertigo pygmaea (Drap.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Pupilla muscorum (L.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vallonia costata (Müll.)	-	-	-	-	-	1	-	1	-	1	1	1	-	-	1	-
V. excentrica Sterki	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Vallonia sp.	-	-	-	3	1	2	-	1	1	-	3	-	-	1	-	-
Ena montana (Drap.)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
E. obscura (Müll.)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Punctum pygmaeum (Drap.)	-	-	-	1	-	-	1	1	-	2	-	-	-	-	1	-
Discus rotundatus (Müll.)	-	1	1	14	13	12	9	7	15	21	2	2	1	-	3	-
Vitrina pellucida (Müll.)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Vitrea cf. *contracta* (West.)	-	-	-	2	1	-	-	2	4	6	2	-	-	-	-	-
Nesovitrea hammonis (Ström)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegopinella pura (Ald.)	-	-	-	1	3	-	-	3	2	4	-	1	2	-	1	-
A. nitidula (Drap.)	-	-	-	2	4	1	-	5	8	8	-	-	-	-	2	-
Oxychilus cellarius (Müll.)	-	-	-	3	6	1	1	3	1	1	-	1	-	-	1	-
Limax or *Deroceras* sp.	-	-	-	3	1	7	-	1	1	1	1	2	-	1	-	-
Cecilioides acicula (Müll.)	-	-	-	1	1	-	-	5	5	1	-	1	-	-	-	-
Cochlodina laminata (Mont.)	-	-	-	-	-	1	1	-	3	1	-	-	-	-	-	-
Clausilia bidentata (Ström)	-	-	-	-	1	-	2	-	1	1	-	-	-	-	-	-
Helicella itala (L.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichia striolata (Pfeiff.)	-	-	-	3	14	11	14	5	12	14	-	-	-	-	-	-
T. hispida gp.	-	1	-	3	3	1	4	4	7	2	2	1	-	1	1	-
Arianta arbustorum (L.)	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-
Helicigona lapicida (L.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cepaea sp.	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Arianta or *Cepaea* sp.	-	-	-	-	1	1	-	-	1	2	-	-	1	-	1	1
Helicellidae indet.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total excluding *Cecilioides acicula*	1	2	1	47	55	51	37	55	101	142	16	18	9	5	17	2

the shells were from open country species of the genus *Vallonia*. *V. excentrica* was present in addition to *V. costata*, which does also occur in low numbers in woodland (Evans 1972, 156–7).

There was a decrease in the concentration of shells in the clay loam of the next layer in the ditch (context 56, samples 60–58). *Trichia striolata* disappeared and the old woodland species were absent. However, *Carychium* cf. *tridentatum* was the most numerous mollusc and the proportion of open country species remained low. Similar conditions seem to have prevailed in the lower part of the layer of stony clay loam above (context 153, samples 57–56). Only two shells were found in the top sample from this layer (sample 55).

Shell numbers increased in the clay loam of context 54 (samples 54–51) and remained high in the lower two-thirds of context 55 (samples 50–46), the next layers up the sequence. The most numerous shells were from the genus *Vallonia*, which comprises open country species. *Vallonia costata* was the best represented amongst those which could be attributed to species. There was a significant presence of *Carychium* cf. *tridentatum*, which also occurs on long grass but otherwise there were few shells of woodland species. The calcite internal plates of the slugs *Limax* or *Deroceras* were well-represented.

Shell numbers declined somewhat in sample 45, increasing again in the top two samples from the ditch (context 55, samples 44–43). *Carychium* cf. *tridentatum* was absent. Shells from the genus *Vallonia* predominated, with both *V. costata* and *V. excentrica* present. There was a slight presence of two other open country species, *Pupilla muscorum* and *Helicella itala*.

The primary fill of the ditch presumably accumulated rapidly after it had been dug. The fauna of context 57 (samples 67–61) suggested conditions of old woodland. It is possible that the enclosure had

54	53	52	51	50	49	48	47	46	45	44	43
54	54	54	55	55	55	55	55	55	55	55	55
0.55- 0.60	0.50- 0.55	0.45- 0.50	0.40- 0.45	0.35- 0.40	0.30- 0.35	0.25- 0.30	0.20- 0.30	0.15- 0.20	0.10- 0.15	0.05- 0.10	0- 0.05
-	-	-	-	-	-	-	-	-	-	-	-
3	9	2	3	7	22	7	1	-	-	-	-
-	1	-	-	2	1	-	2	-	-	-	-
1	4	1	1	-	-	1	-	-	2	-	1
-	-	-	-	-	2	-	-	-	-	1	1
1	2	2	1	3	5	2	1	-	2	3	3
1	-	-	-	-	4	3	2	2	4	4	4
1	9	5	2	3	19	6	1	5	5	13	15
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
1	1	-	2	5	3	-	-	-	-	-	-
3	6	-	1	1	-	1	-	-	-	-	2
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1	3	1	1	-	-	1	1
-	-	-	-	-	1	-	-	-	-	-	-
-	1	-	1	-	3	-	-	-	-	1	-
2	2	1	-	-	5	1	1	1	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
8	8	14	19	17	12	8	18	10	1	1	3
-	2	-	-	-	-	1	-	-	-	1	-
-	-	-	-	-	1	-	-	-	-	-	-
1	1	1	1	-	-	-	-	-	-	1	1
-	1	-	-	-	1	2	-	1	-	1	2
3	1	-	-	-	-	-	-	-	-	-	-
6	12	10	4	8	9	5	7	7	5	2	3
-	-	-	-	-	-	-	1	-	-	-	-
-	-	1	-	-	-	-	-	-	-	-	-
1	-	-	1	-	-	-	-	-	-	-	-
2	1	1	-	-	2	1	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
34	59	38	36	47	93	38	36	26	19	28	36

been constructed in an area of woodland and regeneration was allowed to occur over the ditch. The few shells of *Vallonia* sp. could have been the result of the interior being kept open. The faunal changes with the deposition of contexts 56 and 153 (samples 60–56) probably reflected changing environmental conditions although the site seems to have remained wooded.

The virtual absence of shells from the top of context 153 (sample 55) was probably the result of the site being cleared. Throughout the period of deposition of context 54 and the lower two-thirds of context 55 (samples 54–46) the surrounds of the ditch were open. It is possible that there was some scrub on the site in a hedge alongside the ditch but tall herbaceous vegetation in the ditch would be sufficient explanation for the occurrence of the shade-loving species. The top three samples from context 55 (samples 45–43) showed fully open conditions without any tall vegetation in the ditch.

Duntisbourne Grove

Two samples were analysed from the bottom of two sections through a large rock-cut ditch of late Iron Age date (ditch 114, Fig. 3.43, sections 30 and 29). A short column of samples was also investigated from a small Iron Age ditch 9 (section 15). The results are given in Table 8.64. Samples 6 and 9 from ditch 114 contained rich woodland faunas, with numerous shells of *Carychium* cf. *tridentatum*. *Discus rotundatus*, *Vitrea* cf. *contracta* and *Oxychilus cellarius* were also well represented. While the last three species can live in rock rubble habitats, *C. tridentatum* does not. There were smaller numbers of other shade-loving species which do not occur in rock-rubble faunas including *Ena obscura*, *Clausilia bidentata* and *Trichia striolata*. There was only a slight presence of molluscs of open habitats in the form of one shell of *Vertigo pygmaea* and several shells of *Vallonia costata*. *V. pygmaea* does not occur in woodland but *V. costata* has been recorded in low numbers in woodland (Evans 1972, 156-7). These samples were from low in the fill of the ditch, so it seems unlikely that they post-dated the abandonment of the enclosure made by the ditch, unless it had a very short life. it seems more likely that either the enclosure was indeed set in woodland or that hedges along either side of the ditch had merged.

Molluscs were sparse from section 15 (samples 5, 4, 2) from ditch 9. The assemblages included *Pupilla muscorum*, *Vallonia excentrica* and *Helicella itala*. They indicated very different conditions from those suggested by the assemblages from the large Iron Age ditch, woodland species being entirely absent.

Trinity Farm

Molluscs were recovered from one of a group of late Neolithic to Beaker shallow rock-cut pits (section 11, context 11). They included both open-country species (*Pupilla muscorum* and *Vallonia excentrica*) and shade-loving species (*Discus rotundatus* and *Oxychilus cellarius*) (Table 8.65). While *D. rotundatus* and *O. cellarius* could represent a rock-rubble element to the fauna, the assemblage was small and conditions need by no means have been fully open.

Latton 'Roman Pond' macroscopic plant remains and Mollusca *(Fig. 4.30)*

Field observations by OAU suggested that the hollow which had been interpreted as a Roman pond was, on the basis of topography, a palaeochannel in the lower gravel terrace rather than a dug feature. This was confirmed by excavating a trench across it. The feature

Table 8.64 Molluscs, Duntisbourne Grove.

Column/Section	30	29	15		
Sample	9	6	5	4	2
Context	134	87	74	64	47
Depth (m.)					
Carychium cf. *tridentatum* (Risso)	27	47	-	-	-
Cochlicopa sp.	4	4	-	-	-
Vertigo pygmaea (Drap.)	-	1	-	-	-
Pupilla muscorum (L.)	-	-	+	-	+
Vallonia costata (Müll.)	2	6	-	-	-
V. excentrica Sterki	-	-	+	-	+
Vallonia sp.	1	1	+	-	+
Ena obscura (Müll.)	1	-	-	-	-
Punctum pygmaeum (Drap.)	1	1	-	-	-
Discus rotundatus (Müll.)	18	12	-	-	-
Vitrina pellucida (Müll.)	2	1	-	-	-
Vitrea cf. *contracta* (West.)	8	12	-	-	-
Nesovitrea hammonis (Ström)	1	1	-	-	+
Aegopinella pura (Ald.)	3	6	-	-	-
A. nitidula (Drap.)	1	2	-	-	-
Oxychilus cellarius (Müll.)	8	15	-	-	-
Limax or *Deroceras* sp.	1	-	-	-	-
Cecilioides acicula (Müll.)	4	3	+	-	+
Cochlodina laminata (Mont.)	1	-	-	-	-
Clausilia bidentata (Ström)	1	1	-	-	-
Helicella itala (L.)	-	-	+	-	-
Helicellinae indet.	-	-	-	-	+
Trichia striolata (Pfeiff.)	5	6	-	-	-
T. hispida gp.	4	10	+	+	+
Arianta arbustorum (L.)	1	1	-	-	-
Cepaea nemoralis (L.)	-	3	-	-	-
Total excluding *Cecilioides acicula*	90	130			

+ present

was shown to be shallow, with gently sloping sides and to overlie leached Pleistocene terrace gravels. The gravel bed of the channel showed involutions characteristic of tree-throw holes, which contained woody organic sediments and redeposited gravel. Some of these features cut yellowish-brown clay which overlay the gravel. The tree-throw holes were covered by a dark grey-brown humic alluvial clay (context 506), which graded upwards into peaty clay (context 505). The peaty clay was cut by some ditches and a grey gravelly clay loam ploughsoil extended a short distance from the north-west edge of the channel, partly covering the ditches. The ploughsoil and peat were overlain by mottled grey brown alluvial clay loam (contexts 504, 503, 502). A ploughsoil, which supported the modern turf, had been created from the top part of the alluvium in recent years (context 501).

A column of samples was taken through these sediments (section 501). Shells and organic remains other than roots were absent from the lowest two samples (context 507, 0.50–0.55 m, context 506, 0.47–0.50 m). The next three samples (context 506, 0.43–0.47 m, context 505, 0.40–0.43 m, 0.35–0.40 m) contained badly preserved waterlogged seeds (Table 8.66). Some *Alnus/Corylus* (alder/hazel) charcoal, a waterlogged *Crataegus/Prunus* (hawthorn/sloe) thorn and two waterlogged prickles of *Rubus* sp. were also present in the sample from context 506, 0.43–0.47 m. The sample from context 505, 0.40–0.43 m also contained two carbonised nut shell fragments of *Corylus avellana* (hazel). The remains from context 506, 0.43–0.47 m suggested dry fen scrub or carr grew in the palaeo-channel. Seeds of fully aquatic plants were absent, but there were many seeds of *Eupatorium cannabinum* (hemp agrimony), a plant of damp shaded habitats including fen woods. A scrub element was suggested by the remains of *Rubus fruticosus* agg. (blackberry), *Crataegus* or *Prunus* sp. (hawthorn or sloe) and *Sambucus nigra* (elder). While it is possible that remains of more substantial trees had not been preserved, remains would have been expected to survive from *Alnus glutinosa* (alder), the tree most likely to have been growing on the channel bed prior to clearance. The other seeds were mostly from species which will grow in damp scrub such as *Ranunculus* cf. *repens* (buttercup), *Viola* S. *Viola* sp. (violet) and *Ajuga reptans* (bugle) although they are by no means restricted to this habitat. Preservation was very poor in the two samples above, but seeds of *E. cannabinum* were absent and there was a decline in the number of remains from shrubs, perhaps suggesting conditions becoming more open. The burnt fragments of hazelnut shell were perhaps from nearby prehistoric activity.

Remains were entirely absent from context 504, 0.30–0.35 m but mollusc shells were recovered from context 503, 0.27–0.30 m, context 502, 0.20–0.27 m and context 501, 0– 0.20 m (Table 8.67). The occurrence of the flowing water mollusc *Valvata piscinalis* confirmed the riverine origin of the alluvial sediments. There was also a stagnant water to amphibious component of the fauna comprising *Lymnaea truncatula* and *Anisus leucostoma* which probably flourished in pools left by receding floodwaters. The majority of shells, however, were from species favoured by damp grassland including *Carychium* sp., *Vallonia pulchella* and *Trichia hispida* gp. These three faunal elements are particularly characteristic of grassland on the

Table 8.65 Molluscs, Trinity Farm.

Column/Section	11
Sample	2
Context	11
Depth (m.)	
Vertigo pygmaea (Drap.)	1
Pupilla muscorum (L.)	2
V. excentrica Sterki	1
Vallonia sp.	2
Discus rotundatus (Müll.)	5
Oxychilus cellarius (Müll.)	2
Cecilioides acicula (Müll.)	631
Cepaea sp.	1
Total excluding *Cecilioides acicula*	14

Table 8.66 Waterlogged seeds, Latton 'Roman Pond'.

	Column / Section	501		
	Sample			
	Context	506	505	505
	Depth (m)	0.43–0.47	0.40–0.43	0.35–0.40
Ranunculus cf. *acris* L.	Meadow buttercup	-	-	1
R. cf. *repens* L.	Creeping buttercup	2	-	-
Viola S. *Viola* sp.	Violet	1	1	-
Atriplex sp.	Orache	2	1	-
Rubus cf. *fruticosus* agg.	Blackberry	12	3	-
Chaerophyllum temulentum L.	Rough chervil	1	-	-
Mentha cf. *aquatica* L.	Water mint	-	2	3
Ajuga reptans L.	Bugle	2	5	8
Sambucus nigra L.	Elder	8	1	1
Eupatorium cannabinum L.	Hemp agrimony	34	-	-
Juncus sp.	Rush	1	-	-
Carex sp.	Sedge	1	2	5
Total		64	15	18

floodplain of the Upper Thames that is managed as hay meadow (Robinson 1988). The few shells of *Vallonia excentrica* in the uppermost sample were perhaps a reflection of recent drainage and cultivation. However, the numerous shells of *Carychium* sp. in this sample showed that cultivation had not been occurring for long.

Table 8.67 Molluscs, Latton 'Roman Pond'.

Column/Section	501		
Sample			
Context	503	502	501
Depth (m.)	0.27–0.30	0.20–0.27	0–0.20
Valvata piscinalis (Müll.)	-	-	1
Carychium sp.	1	31	28
Lymnaea truncatula (Müll.)	-	8	6
L. peregra (Müll.)	-	-	1
Anisus leucostoma (Mill.)	-	2	5
Bathyomphalus contortus (L.)	1	-	-
Succinea or *Oxyloma* sp.	1	1	-
Cochlicopa sp.	-	5	9
Vertigo pygmaea (Drap.)	-	-	2
Vertigo sp.	-	2	-
Pupilla muscorum (L.)	-	-	1
Vallonia pulchella (Müll.)	1	10	6
V. excentrica Sterki	-	-	4
Vallonia sp.	5	31	34
Acanthinula aculeata (Müll.)	-	1	-
Punctum pygmaeum (Drap.)	-	1	1
Vitrea sp.	-	-	1
Nesovitrea hammonis (Ström)	-	1	-
Aegopinella pura (Ald.)	-	1	-
Zonitoides nitidus (Müll.)	-	1	-
Limax or *Deroceras* sp.	-	12	10
Cecilioides acicula (Müll.)	-	-	1
Helicellinae indet.	-	-	1
Trichia hispida gp.	3	38	28
Total excluding *Cecilioides acicula*	12	145	138

Table 8.68 Molluscs, Street Farm.

Column/Section	28
Sample	2
Context	365
Depth (m.)	
Vertigo pygmaea (Drap.)	1
V. excentrica Sterki	6
Vallonia sp.	13
Vitrina pellucida (Müll.)	1
Cecilioides acicula (Müll.)	3
Helicella itala (L.)	1
Trichia hispida gp.	1
Arianta or *Cepaea* sp.	1
Total excluding *Cecilioides acicula*	24

The "pond" probably had its origin as a minor channel re-working the top of the gravels in the Late Devensian. It could have been dry throughout most of the Holocene and trees grew on its bed. However, a rise in the water table resulted in the preservation of organic material in tree-throw holes and the soil becoming humic. Following clearance, fen peat which supported scrub began to develop in the palaeochannel. By analogy with events further downstream in the Upper Thames Valley, the rising water table was perhaps occurring in the 1st millennium BC as a response to tree clearance in the Cotswolds (Robinson 1992a). A radiocarbon date of 2943±63BP (R24151/19) was obtained on waterlogged seeds from the bottom of the organic sequence (context 506, 0.43–0.47). Some cultivation, perhaps of Iron Age or Roman date occurred alongside the palaeochannel. Subsequently, alluvial clay partly f illed the palaeochannel. Again by analogy with the evidence from further downstream, there were major episodes of overbank alluviation in the Roman and late Saxon to medieval periods as a result of erosion in the Cotswolds caused by extensive cultivation on the slopes (Robinson 1992a). The evidence of the molluscs from the alluvium for hay meadow also fits into the general pattern of the region. Hay meadow became extensive on the floodplain of the Upper Thames in the medieval period.

Street Farm

A sample was examined from a buried soil overlying the terrace gravels in the south-east corner of the site (Fig. 6.2) and perhaps sealed by Ermin Street (section 28, context 365). The snails from it (Table 8.68) gave evidence of open conditions, with *Vallonia excentrica* predominating. The assemblage was too small to determine whether the soil supported grassland or arable vegetation.

Weavers Bridge

A column of alluvial clay sediment was examined from the floodplain of the river Churn near the Roman midden. The lowest part of the sequence (context 92) was dark grey silty clay which overlay the Pleistocene gravels and contained some charred plant remains, including cereals. Above was grey silty clay (context 91). The molluscs are listed in Table 8.69. The majority of the shells from the alluvium were of aquatic or amphibious species, *Lymnaea truncatula* being particularly abundant. Shells of snails of vegetated permanently marshy habitats and of fully terrestrial habitats were almost absent. *L. truncatula* is an amphibious species characteristic of wet mud as well as small bodies of stagnant water. It probably flourished along with *Anisus leucostoma* in the pools left by retreating floodwaters in the spring. When the floodplain dried out in the spring, they would have retreated into cracks. Such a fauna occurs on low-lying flood pastures in the Upper Thames Valley (Robinson 1988). The shells of some of the other aquatic species, for example *Planorbis planorbis* and *Gyraulus albus* had probably been deposited from the river by floodwater.

Table 8.69 Molluscs, Weavers Bridge.

Column/Section	23		
Sample	2	3	5
Context	92	91	91
Depth (m.)			
Carychium cf. *minimum* (Müll.)	-	-	1
Lymnaea truncatula (Müll.)	9	47	39
L. peregra (Müll.)	3	4	1
Planorbis planorbis (L.)	2	5	1
Anisus leucostoma (Mill.)	2	4	7
Bathyomphalus contortus (L.)	1	-	-
Gyraulus albus (Müll.)	-	1	-
Succinea or *Oxyloma* sp.	-	1	-
Vallonia pulchella (Müll.)	-	-	1
Candidula or *Cernuella* sp.	1	-	-
Trichia hispida gp.	1	2	1
Pisidium sp.	1	-	-
Total	20	64	51

The occurrence of a shell of *Candidula* or *Cernuella* sp. in sample 2 suggested that context 92 post-dated the Roman midden because they are regarded as medieval introductions to Britain. This was confirmed by the Saxon/medieval character of the charred plant remains from the deposit (see Pelling, above).

THE CHURN VALLEY PROFILE AND SEDIMENTARY SEQUENCE

By Rob Scaife

Introduction

A 12 m long trench (BAULT96 Trench 2) was excavated through alluvial sediments to investigate well-preserved organic deposits which had been identified in the original auger sampling transect (Cores 11 and 14) (Fig. 8.23). The trench was positioned well-preserved organic deposits which had been identified in the original auger sampling transect (Cores 11 and 14) (Fig. 8.23). The trench was positioned within a shallow depression marking the infilled course of a stream channel. This appears to have been the main channel of the river Churn before the river was canalised on the western side to lengthen the mill leat or pound, effectively cutting off this meander. The parish boundary between Baunton and Bagendon follows the meander rather than the more recent channel to the west.

Trench 2

The trench was excavated primarily for the investigation of environmental remains. Samples were taken for pollen, macroscopic plant and insect remains, mollusca and charred plant remains. Samples for radiocarbon dating were also obtained. Artefacts were absent except for a sharpened oak post (sample 24) from the lowest deposit in the channel (see Mitchell, Chapter 7). This sediment, about 0.3 m thick, was a slightly gleyed fine sandy silt with frequent waterlogged organic inclusions. This was overlain by a discontinuous deposit of grey and brown gleyed silt, which, at the eastern end of the trench, was separated from the upper layers by a thin band of sand. The middle third of the channel was a grey sandy silt up to 0.3 m thick. The upper deposits were an orange-brown silt and clay with fine gravel inclusions, overlain by a similar but more clayey sediment under the modern topsoil. It is not clear that any of these deposits can be interpreted as upcast from the mill pound, as identified in Evaluation Trench 549.

The macroscopic plant and insect remains from this section were poorly preserved and unremarkable (see Pelling, this chapter), reflecting mostly fen and aquatic species. However, pollen preservation was good, providing evidence of vegetation from both the local and wider catchments. Two pollen columns were taken (samples 13 and 14). That from the eastern end of the trench (sample 14) was found to have a more complete profile and was analysed in detail (see Scaife, this chapter).

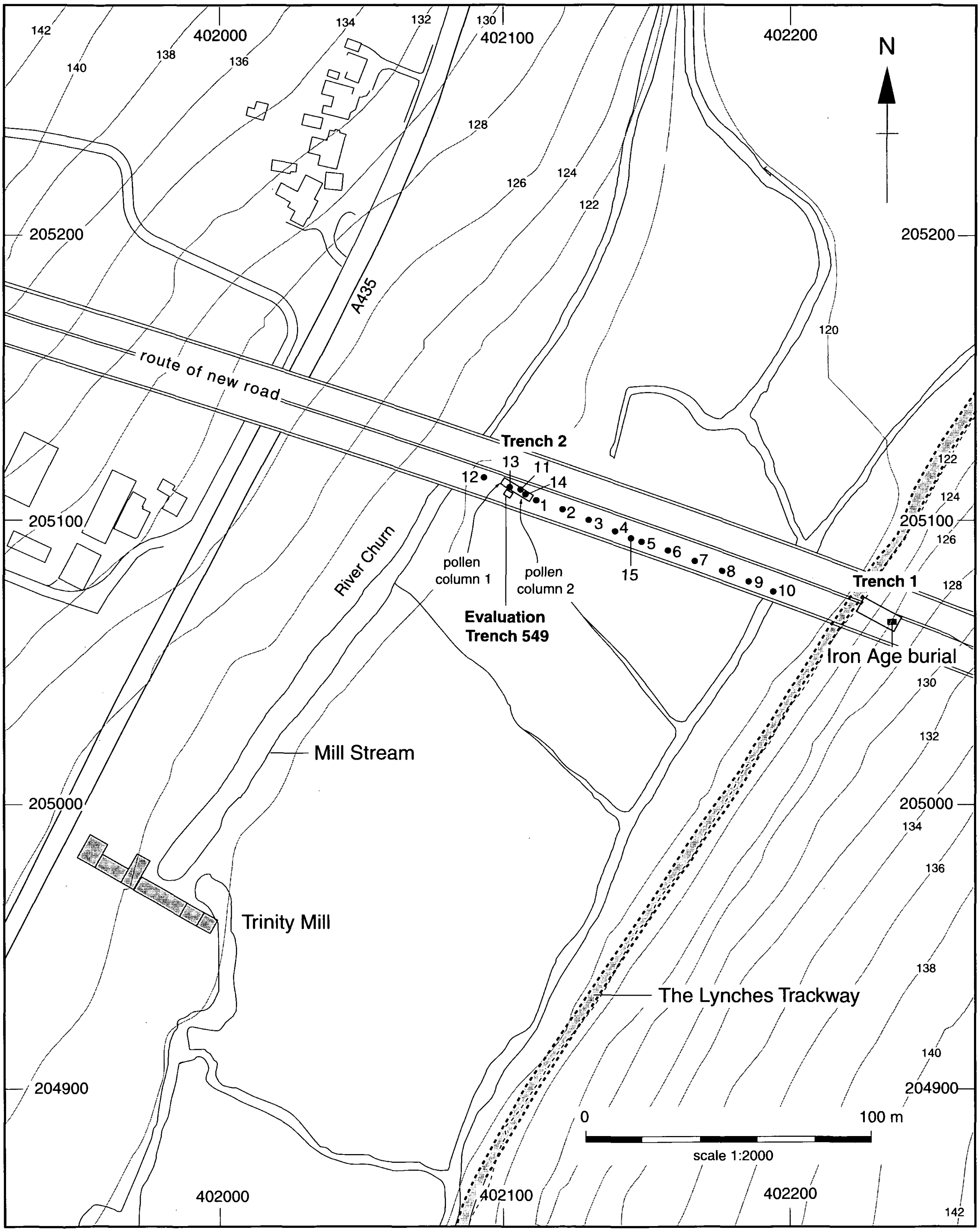


Figure 8.23 Churn Valley, plan of borehole locations and Mill stream.

The Churn Valley alluvial sediments

A cross-valley stratigraphical transect was carried out to assess the overall depth and character of the alluvial fills of the Churn Valley along the road corridor (Fig. 8.24). From this survey, a suitable point was chosen for pollen coring (Russian/Jowsey). Only the lower half of the sediment profile was sampled since the upper, alluvial stratigraphy was very gleyed and oxidised. A 1.25 m sequence was recovered and comprised inorganic, grey, alluvial clays with silt. Due to the local alkalinity of the bedrock and the highly inorganic character of the material examined, little pollen was expected. This was found to be the case with poor preservation. Preliminary pollen counts were obtained only with great difficulty. The data should, therefore, be treated carefully. The very substantial numbers of pre-Quaternary palynomorphs also attest to this and reflect the derived (allochthonous) origins of the sediment and possibly much of the pollen.

Pollen spectra obtained from the basal levels of the alluvial fill of the valley contained a greater number of trees with *Quercus* (oak) and *Corylus avellana* type (hazel/sweet gale) with some *Tilia* (lime) and *Fraxinus* (ash). Herbs are more important in the upper levels and are dominated by Lactucae (dandelion types) and Poaceae (grasses). The former were in general poorly preserved and are strong evidence of differential preservation (through oxidation and gleying) and the resulting skewed pollen spectra. This is also evidenced by the substantial numbers of fern spores and pre-Quaternary palynomorphs already noted.

Because of the poor pollen preservation and absence of dating (due to absence of suitable organic material), no detailed interpretations can be made. However, the presence of hazel, oak, ash and lime pollen provides evidence of woodland on the drier valley side areas above the floodplain. Lime in the lowest level is interesting and may be attributed to lime woodland which has also been evidenced at Latton 'Roman Pond'. Radiocarbon dating of the latter to the late Bronze Age may indicate that the lowest levels here are also of late Bronze Age date although the 'lime decline' occurred at different times in different regions. Subsequently, oak and hazel woodland was predominant. Indications of a reduction in woodland in upper levels is associated with increased herbs including cereal pollen. This may be evidence for woodland clearance and agriculture such as has also been discussed for Latton 'Roman Pond'. However, as noted, there is strong evidence for differential pollen destruction and information here must be regarded with care.

Cyperaceae (sedges) reflect the character of the 'on-site' vegetation which appears to have been sedge/grass fen marginal to the river. This would have been subject to overbank deposition of sediments. Little more can be deduced from this site as pollen preservation and absolute numbers of grains were very poor.

POLLEN ANALYSIS OF THE CHURN VALLEY RIVER CHANNEL

By Rob Scaife

Introduction

The primary sediment sequences of the river Churn valley and the secondary fills of the river channel were initially assessed for pollen and spore content (CAT 1991; Scaife 1997). Whilst some pollen was present in the primary valley fills (see above), preservation and absolute pollen frequencies were not sufficient to warrant full pollen analysis. Pollen was, however, identifiable and countable in the fill of the channel. Given the limestone geology of the region, that is, on Jurassic Oolite on both sides of the valley and Forest marbles on the tops of the hill, it is somewhat surprising that such pollen is present.

At the evaluation stage a small hand-dug trial pit recovered some organic deposits which when assessed were found to have good pollen preservation (CAT 1991a, 48–49). Although it was speculated that the pollen sequence may have a Saxon component, and this has been repeated in publication (Gerrard 1994a; 97), no dating evidence was obtained. Radiocarbon dates from the current project produced two late medieval dates of 1421–1471 cal AD (R24151/20, 2 sigma) and 1431–1482 cal AD (R24151/211; 2 sigma).

Stratigraphy

Two monolith samples were taken from the excavated section (Fig. 8.25). Of these, monolith B appeared to have the most complete and undisturbed profile. Consequently, it was this profile which was pollen analysed. The stratigraphy was described in the laboratory at the same time as sampling for pollen was carried out. The stratigraphy comprises:

Depth cm:	0–4	Orange/brown clay and silt (10YR 6/8) to 7.YR 5/8).
	6–8	Large stone
	8–22	Grey sandy silt (2.5Y 4/2) with freshwater molluscs. Sand band from 19-20 cm.
	22–46	Grey (2.5Y 4/2) gleyed brown (5Y 5/8). Evidence of fine roots now eroded.
	46–72	Grey, fine sandy silt (5YR 4/1). Less gleying than above. Freshwater molluscs to base.
	72–73	Sand and silt with occasional pebbles to 3 cm.
	73	Base of profile.

Pollen methodology

Samples for pollen analysis were obtained directly from the open sections using monolith trays. These monoliths were sub-sampled for pollen analysis in the laboratory of the Department of Geography,

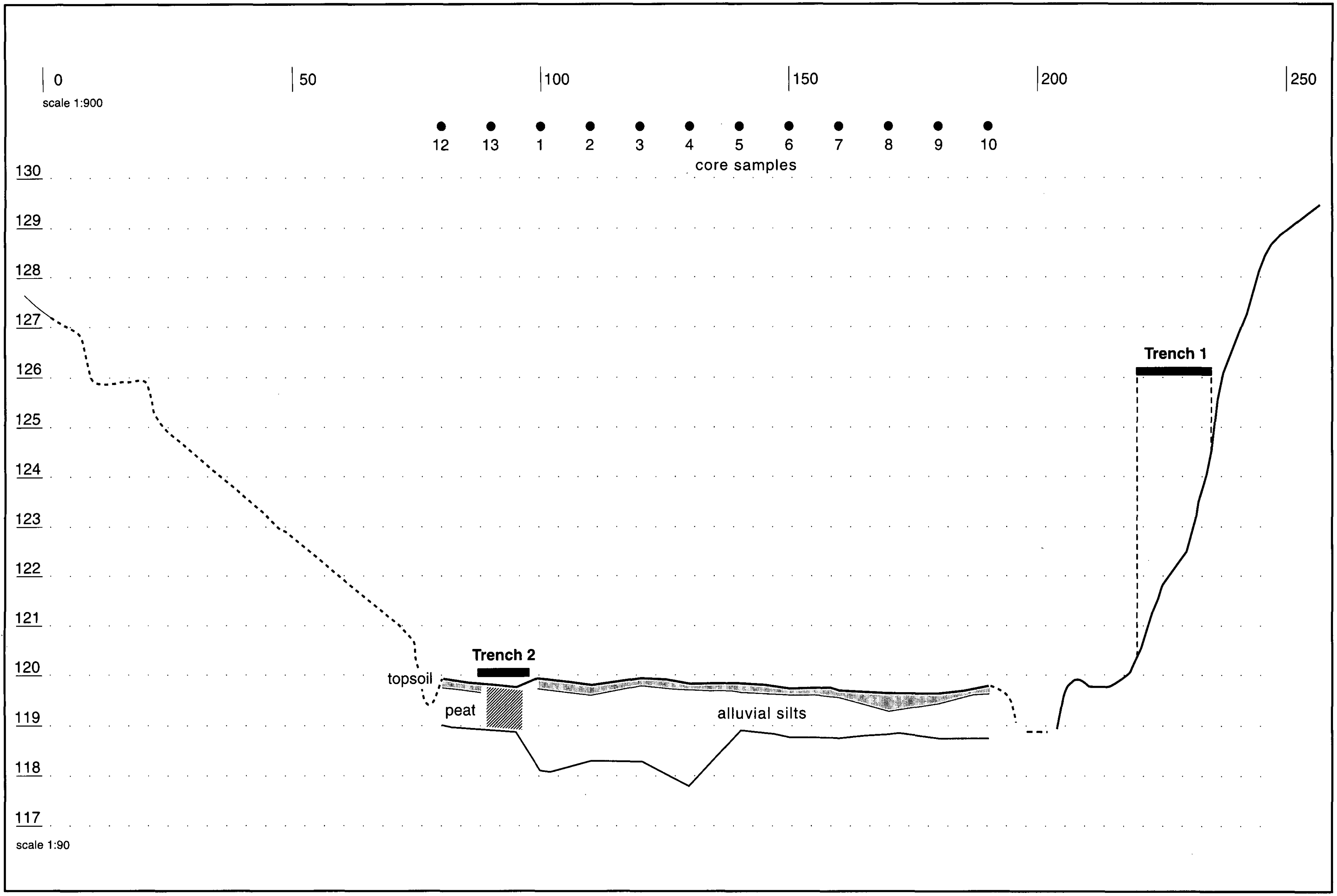


Figure 8.24 Churn Valley, cross profile.

Churn Valley

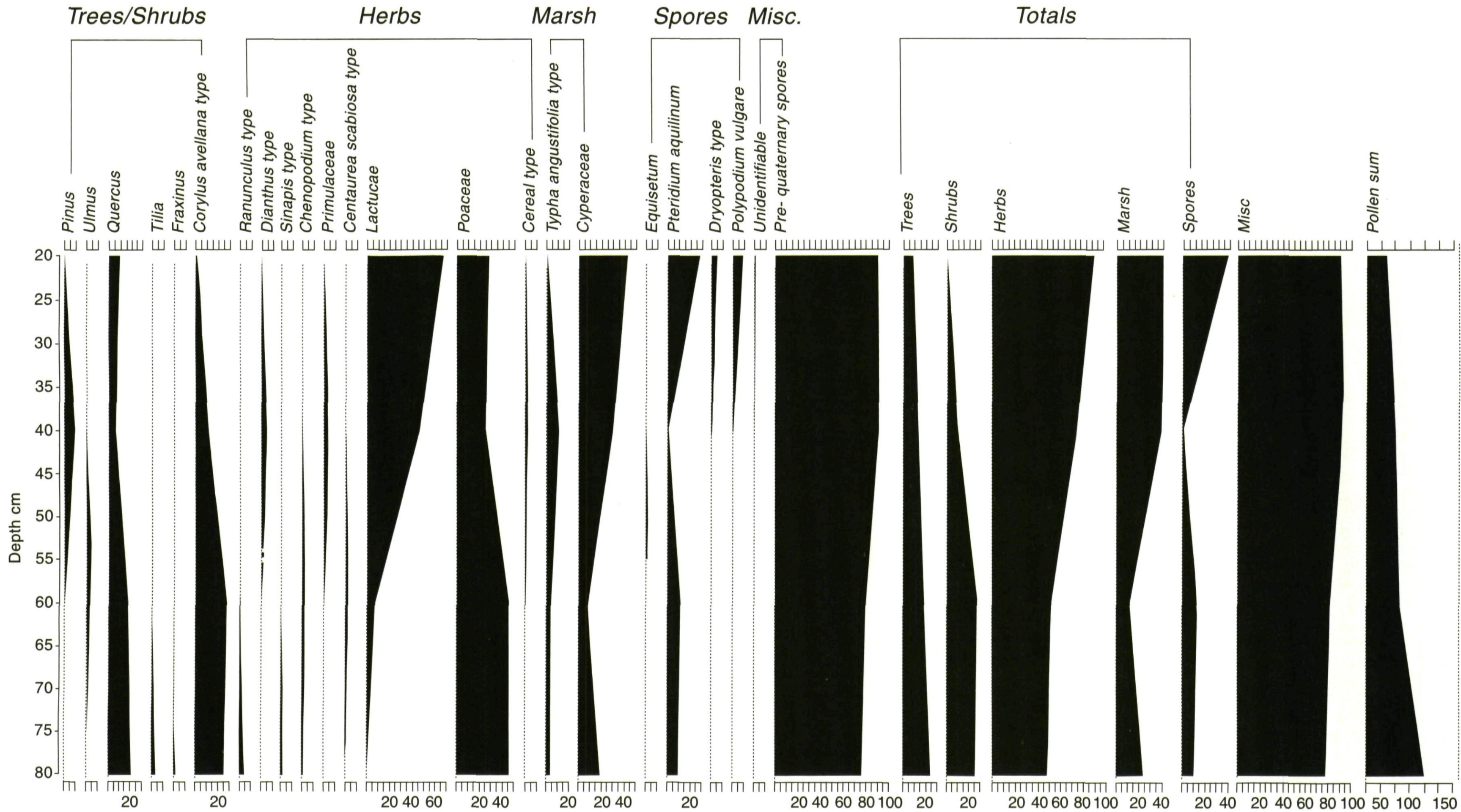


Figure 8.25 Churn Valley, pollen diagram.

University of Southampton. Samples of 2–3 ml were taken at 40 mm intervals. Standard procedures were used for the extraction of the sub-fossil pollen and spores (Moore and Webb 1978; Moore *et al.* 1991). These are described in more detail in appendix 8.4. Pollen counts of *c.* 400 grains of dry land taxa and extant mire/aquatic and spores were counted. These data are presented in standard pollen diagram form (Fig. 8.25) with the pollen sum comprising dry-land pollen as a percentage of its sum and mire taxa and spores as percentages of these groups plus the total of dry-land taxa for each level. Absolute pollen frequencies were calculated using the addition of a known number of exotic spores (*Lycopodium*) to a known volumes of sample. Pollen taxonomy generally follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) in accord with Stace (1991). The pollen diagram was plotted using *Tilia* and *Tilia* Graph. These procedures were carried out in the Department of Geography, University of Southampton.

Pollen data

A diverse pollen flora was found comprising a total of 109 taxa recorded in the 18 levels examined which contained pollen. Absolute pollen frequencies average *c.* 50,000 grains/ml with higher values between 56–60 cm (to 168,000 grains/ml.). It should, however, be noted that pollen becomes less well preserved towards the top of the profile with relative expansion of taxa, especially Lactucae, with robust exines. This is indicative of differential preservation in favour of these taxa and thus some possible skewing of the data. This is undoubtedly due to the alkalinity of the site and gleying which has taken place in the upper sedimentary units.

Overall, the pollen spectra are dominated by a diverse range of herbs/assemblages with few trees and shrubs. There are indications of a number of different plant communities including strong evidence of arable/cereal cultivation and possibly pastoral land use. Other cultivated crops recorded include *Cannabis sativa* and interestingly, *Vitis*. These are discussed further below. The range of herbs present can be attributed to these communities plus the autochthonous aquatic/marsh components.

Two local pollen assemblage zones (l.p.a.z.) have been delimited on the inherent changes in the pollen spectra which appear to correspond with stratigraphical changes in the sediment fills of the channel. These zones are characterised from the base of the profile as follows:

l.p.a.z. CHURN:1 (72–42 cm) Delimited by greater herb diversity than zone 2 above with higher percentage values of *Plantago lanceolata* (to 11%), *Plantago major* type (4%), *Ranunculus* type (5%), *Rumex* spp., *Sanguisorba minor* and *Cannabis sativa* type. Cereal pollen becomes progressively more important towards the top of the zone (to 40%). *Vitis vinifera* is present (72 cm and 56 cm). Tree and shrub pollen although subordinate to herbs have higher values in this zone. *Quercus* (11%) and *Fraxinus* (5%) are most important with sporadic records of *Betula, Ulmus, Tilia, Taxus, Fagus* and *Juglans*. Shrubs comprise *Corylus avellana* (5%), *Salix, Euonymus, Cornus* and *Viburnum*. Marsh and aquatic taxa are dominated by Cyperaceae (to 10%) with *Typha angustifolia/ Sparganium* and *Potamogeton*. *Nymphaea, Callitriche, Lemna, Iris* and possibly *Isoetes* are also present.

l.p.a.z. CHURN: 2 (42–4 cm) The change to this zone corresponds with stratigraphical change to more heterogeneous sediments and poorer pollen preservation. There are reductions in *Plantago lanceolata* (to <5%), *Fraxinus, Ranunculus* type, *Plantago lanceolata, Sanguisorba minor*. Cereal pollen is important at the base of the zone but declines upwards. There are expansions of Cyperaceae, *Pteridium aquilinum* and particularly derived pre- Quaternary palynomorphs (Jurassic). There remains a relatively diverse herbaceous component. Tree and shrub pollen is diminished (<10%) with declining *Fraxinus*. *Quercus* remains the most important/consistent taxon.

Discussion and inferred vegetation

This study of the channel was undertaken to date the feature and to characterise the local environment and particularly the local land use. Preservation of pollen in limestone terrains is unusual and this provides the first detailed pollen analysis for this region.

The depositional environment

Since the site is a river channel, marginal aquatic and aquatic taxa might be expected in the pollen spectra. This is the case although such types are frequently under-represented in pollen assemblages due to production of small quantities of pollen and the fact that liberated pollen is readily dispersed in flowing water. This is of course less so in still-water lake habitats. Here, a range of marsh, aquatic and marginal aquatic attest to slow flowing water. *Nymphaea, Myriophyllum verticillatum, Callitriche, Lemna* and *Potamogeton* are the typical aquatic plants. Marginal reeds comprised *Iris, Alisma Plantago-aquatica, Typha angustifolia* and/or *Sparganium, Littorella* and Cyperaceae. Although the latter are important in the assemblages, they may also be referable to the wetter areas of the water meadow. This similarly applies to a number of taxa which may also have been growing in the floodplain water meadow including *Caltha* type, *Succisa, Filipendula ulmaria,* and Apiaceae type 3 (such as *Oenanthe*). In l.p.a.z. CHURN:2, there is a very marked increase in the numbers of reworked pre-Quaternary (Jurassic) palynomorphs. These may indicate some form of land use change which was responsible for bedrock erosion and inclusion of these geological microfossils.

Lynches Trackway

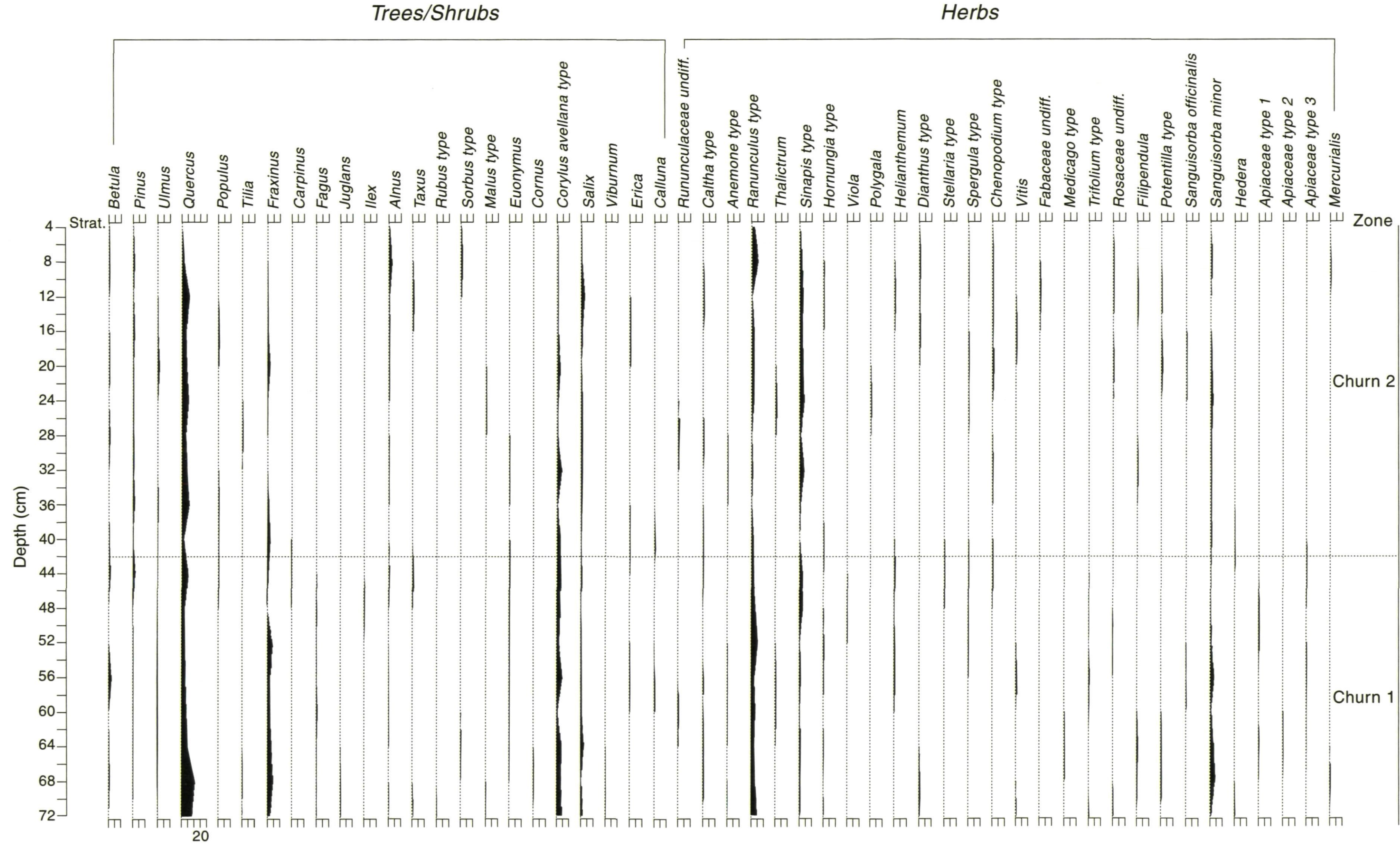


Figure 8.26a Lynches Trackway, pollen diagram.

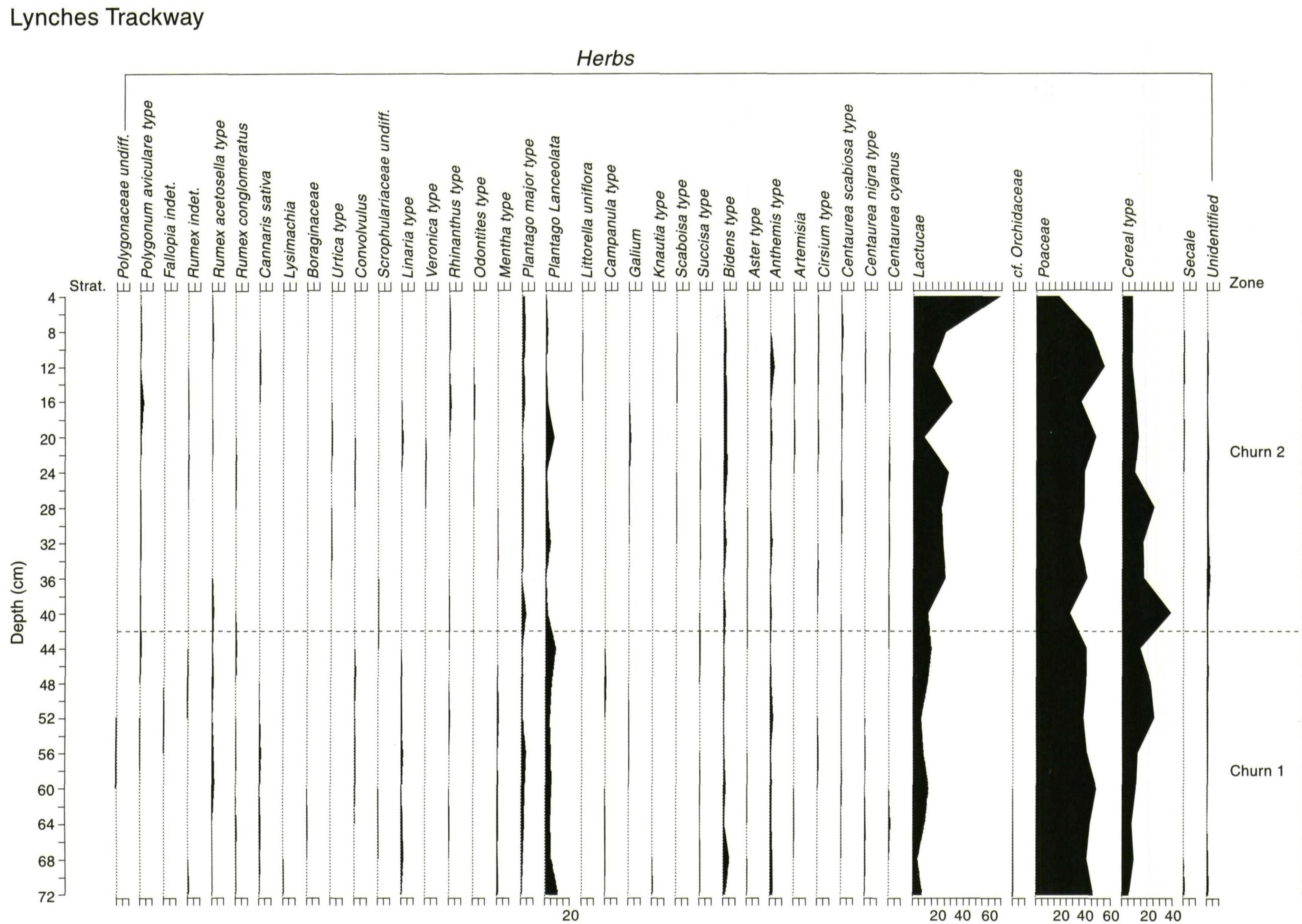


Figure 8.26b Lynches Trackway, pollen diagram.

Lynches Trackway

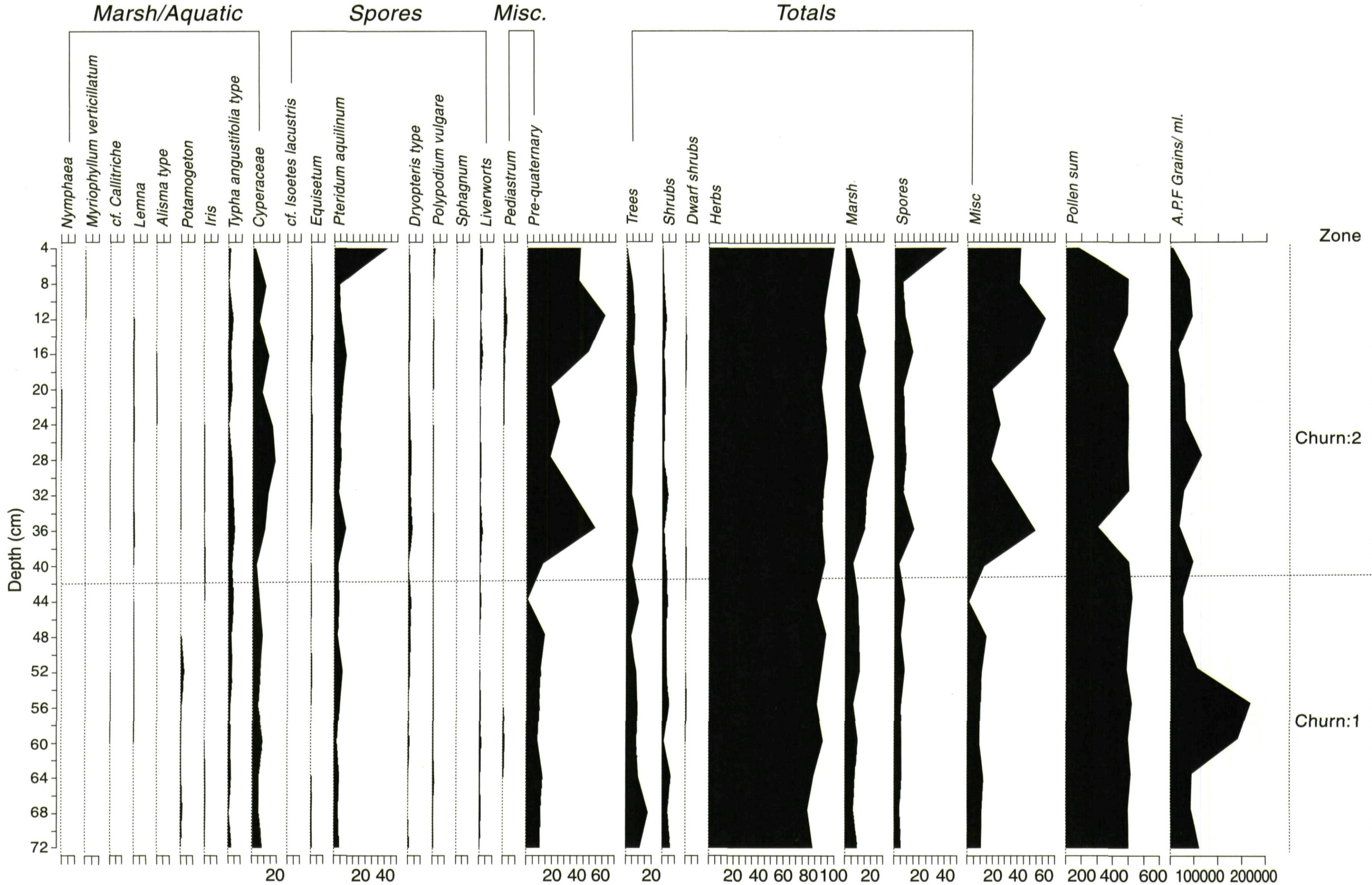


Figure 8.26c Lynches Trackway, pollen diagram.

The agricultural environment

There is strong evidence both for cultivation of crops and for pastoral grassland. The latter is most likely to derive from the extensive water meadows growing on the floodplain of the Churn valley and is evidenced by the higher percentages of Poaceae and associated taxa associated with tall grassland / meadow. Typical pastoral indicators are *Plantago lanceolata, Ranunculus* type, *Thalictrum, Rumex acetosella* type, *R. obtusifolius/ conglomeratus* type, *Sanguisorba officinalis,* Asteraceae types (including *Centaurea scabiosa* type, *C. nigra* type, Lactucae) and possibly Orchidaceae. Many other taxa may also be referable to this habitat but whose pollen does not allow differentiation to a lower taxonomic level; for example *Rhinanthus* type. *Mentha* type, *Campanula* type and *Lysimachia.* In addition to the tall grassland of the floodplain / water meadow, there is also evidence for short turf grassland. Whilst Poaceae in part are attributable, the presence of *Helianthemum* and *Sanguisorba minor* and *Polygala* are significant. These taxa are substantially under-represented in pollen spectra due to their low growing form and entomophily. They are, however, diagnostic calcicolous plants typical of short turf, species rich calcareous grassland growing today on chalk and limestone. It is not possible to state where this habitat was but it may be postulated that the upper, grazed slopes of the valley side interfluves are the most likely source. Taphonomy of the pollen should also be considered in that it is also not possible to define to what extent pollen has been fluvially transported down the river / catchment rather than deposited via normal airborne means.

The cultivated crops

Cultivated plants are more easily delimited in pollen assemblages than pastoral elements. Here there is a clear importance of cereal cultivation along with *Cannabis sativa* (hemp) and *Vitis* (viticulture).

Arable cultivation

Cereals are largely dominated by *Triticum* (wheat) and *Hordeum* type (barley) with some *Secale* (rye). These are also associated with weeds of disturbed and cultivated ground (segetals) including *Centaurea cyanus* (blue cornflower), *Polygonum aviculare, Fallopia convolvulus, Spergula/Spergularia,* Chenopodiaceae, Brassicaceae (*Sinapis* type), *Artemisia.* Wheat, barley and especially rye, are crops typical of medieval cultivation. The latter has generally been regarded as a Roman introduction, although, there is an increasing number of records from the late prehistoric, Bronze Age and Iron Age periods (Chambers 1989). However, its importance in later periods, especially the medieval is unquestioned. It is frequently associated with *Cannabis sativa* and *Linum* (Godwin 1975, 414) and this appears to be the case here although absolute pollen numbers of *Secale* are small. Since *Secale* is anemophilous and produces substantial quantities of pollen it seems that rye was not of especial local significance. *Triticum* and / or *Hordeum* (wheat / barley), however, are the principal crops present and, given the high percentages values of associated weeds, were likely to have been cultivated in close proximity on the adjacent valley side. It must also be considered that with the proximity of the mill, local crop processing may also have been responsible for liberating pollen trapped in the husks of cereals (Robinson and Hubbard 1977; Scaife 1986; 1995).

Cereal pollen is more abundant in the middle of the profile (60–30 cm) and occurs after a reduction of *Plantago lanceolata* (ribwort plantain) and *Ranunculus* type (buttercups). This might be tentatively attributed to a change from pastoral to arable land-use in field(s) adjacent to the pollen sample site.

Viticulture

The presence of *Vitis vinifera* (grape) is somewhat unusual and important. Whilst there are frequent seed records of grape especially from the Roman and later periods these are largely attributed to imports. Jones and Legge (1987) provide the earliest radiocarbon record with a Neolithic seed from Hambledon Hill. Records of pollen are, however, more likely to be attributable to local viticulture. Godwin (1975) records a single Holocene pollen record obtained by K. Barker from medieval deposits adjacent to Lanercost Priory dated to 1150–1350 AD. Chambers (personal communication and in press) has found pollen at Mingies Ditch, Oxfordshire in an Iron Age ditch context. Possible Romano-British bedding trenches in Northamptonshire (Brown and Meadows pers. comm.) have been attributed to vine cultivation and are associated with pollen (Brown pers. comm.). Saxon vine pollen has also been found at Market Lavington, Wiltshire (Allen pers. comm.). Thus, there is an increasing number of records of vine cultivation in England during the later prehistoric and historic periods. The pollen record (3 grains) obtained from the Churn valley river implies local viticulture.

Hemp cultivation

Cannabis sativa L. is present especially in l.p.a.z. CHURN:1 and a single record in CHURN:2. This is typical of medieval pollen records implying the importance of *Cannabis* as a crop for production of hemp used for rope and coarse textiles. This is particularly useful as a dating / marker in pollen spectra in the north-west of England (e.g. Dumayne-Peaty and Barber 1998) and is also frequently associated with cultivation of rye and flax (Godwin 1967; 1975). This was undoubtedly a locally grown crop in the Churn valley.

The woodland/arboreal flora

The small percentage values / small absolute pollen frequencies suggest that the landscape was largely open with pastoral and arable agriculture predominant.

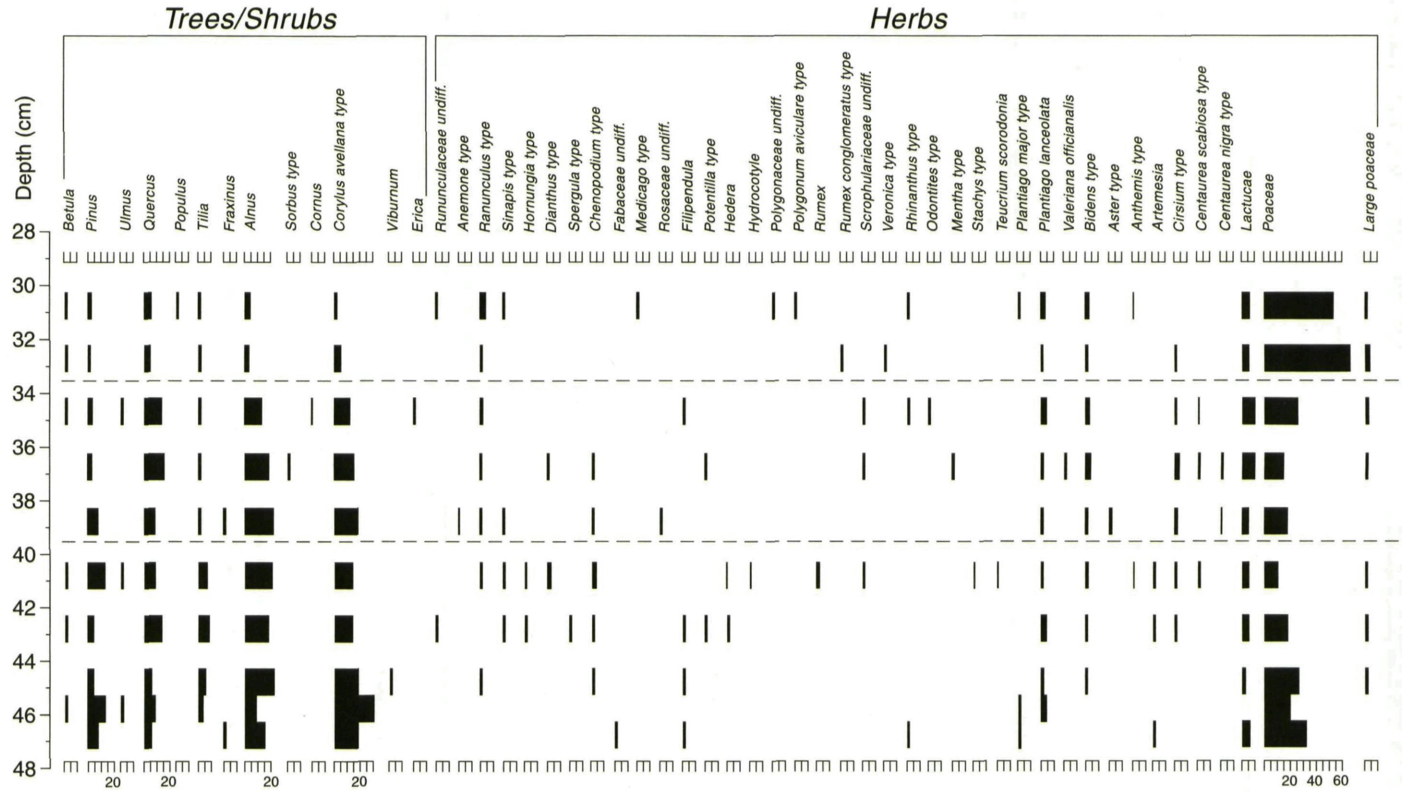


Figure 8.27 Latton 'Roman Pond', pollen diagram.

Sporadic occurrences of *Betula* (birch), *Pinus* (pine), *Alnus* (alder), *Juglans* (walnut), *Populus* (poplar) and *Carpinus* (hornbeam) are attributed to long distant transport from extra-regional sources. *Juglans* is regarded as a Roman introduction adding further evidence of a historic date for the sequence. *Quercus* (oak) and *Corylus avellana* (hazel) possibly represent areas of coppice managed woodland. *Fraxinus* (ash) is under-represented in pollen spectra (Andersen 1970; 1973) and as such the records in zone 1 imply that it was relatively more important locally. Other poorly represented taxa include *Fagus* (beech) *Salix* and *Ilex* (holly) and it is possible that these were also growing locally although fluvial transport from up- stream must also be considered. *Salix* was most likely growing along the margins of the river channel as it does today.

Conclusion

Pollen analysis carried out on the sediment fills of the river has provided information on the medieval palaeoevegation, palaeoeconomy and environment of the Churn valley. The data obtained are some of the very few obtained from limestone areas of Britain. Such areas do not usually offer potential for pollen preserving environments. Preservation has occurred here because the river channel has remained continuously waterlogged. Furthermore, there are few pollen analytical studies of recent/historic sediments. The study illustrates an open agricultural environment with possibly pastoral use of water meadows but with cereal cultivation (wheat/barley and rye) and hemp (*Cannabis* for its bast fibres) and importantly local viticulture. Where trees are present, these are oak and hazel, possibly managed woodland with local ash.

POLLEN FROM LATTON 'ROMAN POND'

By Rob Scaife

Introduction

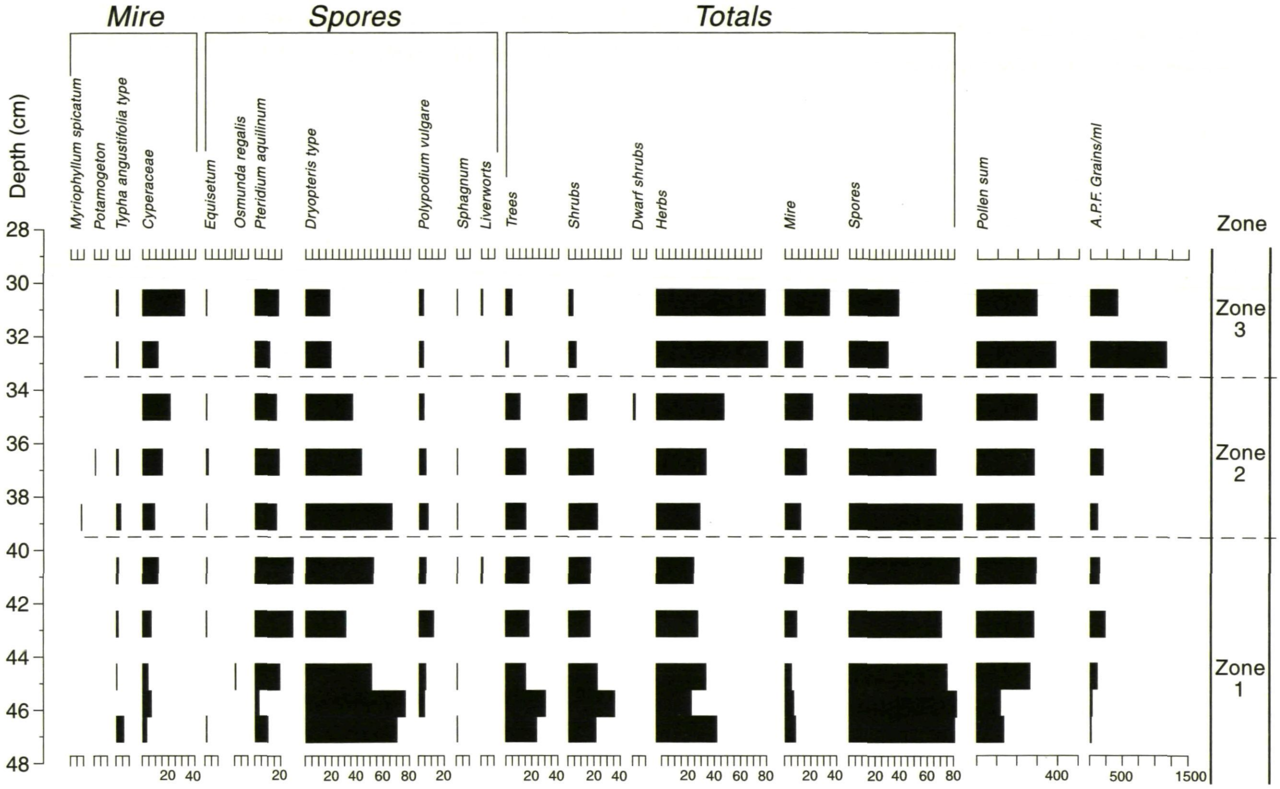
Pollen analysis has been carried out on the organic, peat and silty peats which have accumulated in a shallow depressions in the basal Devensian gravels (Fig. 8.27). Preliminary analysis (Scaife 1997) showed that there was sufficient pollen to enable detailed pollen counts to be made. Subsequently, additional monoliths and samples for radiocarbon dating were obtained. Dating has shown that the peats accumulated during the late Bronze Age. Pollen analysis has been undertaken on one of the profiles in conjunction with plant macro and insect analysis by Dr Mark Robinson providing information on the local vegetation and environment.

Methodology

See Churn Valley, above.

Stratigraphy

The peat and sediment stratigraphy as recorded in the monolith is described as follows and is related to the contexts recorded in the field although depths are slightly discordant.



Depth cm	
0–27	Topsoil. Brown (contexts 510-511). Upper plough soil and modern turf with underlying clay/silt 'B' horizon
27–31	Pale brown chalky marl (context 512). Slightly more organic than overlying soil.
31–45	Black, highly humified, detrital peat with silt (context 513).
45–47	Transition (context 514).
47–50	Buff silt/marl. Lower alluvium? (context 515).
50–64	Coarse grit/marl with limestone fragments. Basement/natural or Devensian colluvium?

Palynology *(Fig. 8.27)*

Three pollen zones have been recognised. The lower, zone 1 (48-39 cm) has been defined by the generally higher percentages of tree pollen in particular, *Tilia* (lime) and *Pinus* (pine). *Quercus* (oak), *Alnus* (alder) and *Corylus avellana* type (hazel and sweet gale) are the other principal trees and shrubs. Herbs are relatively important (48% of total pollen) with Poaceae (grasses) dominant (to 38%). *Plantago lanceolata* (ribwort plantain), Lactucae (dandelion types) and range of sporadically occurring herbs are also present. These also include large poaceae (cereal type). There are high values of monolete (*Dryopteris* type) fern spores and *Pteridium aquilinum* (bracken). Between 38–40 cm, (zone: 1/2 boundary), *Tilia* declines to much lower percentage values and *Pinus* from just above. *Quercus, Alnus* and *Corylus avellana* type remain important. Herbs remain broadly similar in importance with some indications ofexpansion towards the top of the zone. From 33–34 cm. (zone 3) there is a marked reduction in percentages of tree pollen to <5%. Conversely, Poaceae (grasses) expand sharply to 75%. There is also a slight increase in Large Poaceae (cereal type).

Throughout the profile, marsh and aquatic taxa comprise predominantly Cyperaceae (sedges) which become more important in the upper, zone 3 (to 35% tdlp+mire). *Typha angustifolia* type (bur reed and reed mace) are consistent Throughout. *Osmunda regalis* (royal fern) is present at 44-45cm (zone 1). There are few true aquatic taxa with only single occurrences of *Myriophyllum* and *Potamogeton* type. *Alnus* (zone 1 and 2) is also attributable to wetland fen-carr or fringing aquatic.

Inferred vegetation and suggested dating

Both the preliminary assessment study of an adjacent monolith and this analysis have provided evidence of woodland in local pollen assemblage zone 1. this consisted of oak, lime and hazel on drier soils with some evidence of lime on wetter areas (carr woodland probably at some distance) or from more localised growth marginal to the river. Pine also present in zone 1 may be attributed to long distance transport but, percentages to 18% are enigmatic and may represent some local or near regional growth.

The lowest levels of the sequence (Zone 1) represent the period of dominant lime woodland evidenced from southern and eastern Britain during the middle and early part of the later Holocene (Moore 1977; Scaife 1980; Grieg 1982) and which sibsequently remained well into the late prehistoric period in many areas. It should be noted that *Tilia* is under-represented in pollen spectra due to its insect (rather than wind) pollination (Andersen 1970; 1973). Production of small numbers of pollen grains during the height of summer when leaves are present on trees also negates widespread dispersal of its pollen. Its marked decline in many pollen profiles was in the past attributed to climatic change (Godwin 1940; 1956) but is now widely attributed to forest clearance and agriculture (Turner 1962). A model of paludification has also been presented by Waller (1994). Whilst the lime decline has now been demonstrated as asynchronous (Baker *et al.* 1979) with dates spanning the late Neolithic (Scaife 1980) to the Saxon period (Baker *et al.* 1979) the majority of dates appear to be from the late Bronze Age. This is the case here where lime declines at 40–39 cm. Radiocarbon measurements of this organic sequence produced a date of 2943±63 BP (1258–1020 BC) (NZA-8579, R24151/9). This, therefore, places the vegetation sequence within the late Bronze Age, suggested in earlier assessments on the basis of the vegetation and especially the presence of the 'lime decline' (zones 2/3 boundary). Removal of lime at this time may form part of the changing land use patterns of this period due to increasing land pressure with need for more agricultural land (Ellison and Harris 1972).

In pollen zone 2, although lime is greatly diminished, considering its under-representation in pollen spectra (Andersen 1970; 1973), oak, hazel and alder remain important woodland elements. This suggests that areas of dominant lime were cleared whilst other areas of deciduous woodland remained. From 34–33 cm, (zone 3), there is further evidence of an increase in local woodland clearance and expansion of herb communities which similarly appear to be pasture with expansion of grasses and other herbs and also of cereal cultivation which may perhaps be attributed to more intensive Iron Age agriculture.

Conclusions

Radiocarbon dating has placed the age of this organic accumulation in the late Bronze Age thus providing the necessary dating framework within which to place the environmental data obtained. The habitats suggested by the pollen show an initial woodland of oak, lime and hazel in the vicinity. Subsequently, there are two phases of woodland decline, most likely through human clearance for agriculture. In the first, lime becomes less important (in zone 2) and subsequently all other remaining tree types, that is, oak, hazel and alder (pollen zone 3). Quantities of pine noted largely in zone 1 are enigmatic and may represent some local growth. If so, this is rather an unusual occurrence. Concurrent with the reduction of woodland is the expansion of herbs indicative of arable and pastoral agriculture.

MARINE SHELL

By G Campbell

Summary of Results

Approximately 270 identifiable and 120 fragmentary marine shells were recovered from eight sites. All of the shell was from oyster, and all of the identifiable shells were the Roman or edible oyster *Ostrea edulis* L. The upper and lower valves were counted within each context, and the number of fragments were counted for the smaller groups and estimated for the larger groups.

Refitting was not attempted, but the assemblage comprised a minimum of 140 individual oysters. Upper and lower valves occurred in relatively similar amounts regardless of site or deposit. Shells appear to be confined to deposits resulting from intense human activity (middens, pit fills and floor surfaces principally) during the Roman era. The great majority of the deposits comprised only one or two shells, with two exceptions:

1 Birdlip Quarry. A small group of 33 shells in the sequence of occupation layers 1318, 1322, 1324 and stone surfaces 1323, 1319.

2 Weavers Bridge. The largest single group at any of the sites includes the largest single group in one deposit, a midden (context 57) containing 154 shells.

Discussion

The number of individuals from the midden deposit at Weavers Bridge is still probably too small for any conclusions regarding Roman oyster bed management to be statistically valid, despite this being the largest single group in the assemblage. Of greater importance is the association of oyster shell with other materials in the same contexts. The dates of these contexts can identify whether the consumption of oysters was restricted to a specific period of time, or was occurring throughout the Roman period. It is clear from the similar number of upper and lower valves recovered that oysters were not served 'on the half-shell' principally.

Note on the hand-recovered terrestrial shell

Terrestrial snails were recovered from one or two deposits at seven sites. Since these were recovered only in small numbers, it is unlikely that any were collected as food. This view is reinforced by the small size of the shells; the larger shells are more likely to be the Common Garden Snail, (*Helix aspersa*) rather than that mammoth of British land snails, the Roman or Apple Snail (*H. pomatia*). The groups are biased heavily towards the larger snails, and therefore of no value in reconstructing deposit formation or ecology.