Chapter 7: Environmental Evidence from Castle Hill Environs

HUMAN REMAINS
by Peter Hacking and Ceridwen Boston

Introduction

Disarticulated human bone from three contexts was retrieved during excavation of midden deposits within Trench 14. Two well preserved skeletons, an isolated fragment of human femur and a complete neonatal clavicle were recovered from Trench 15. These human remains were osteologically analysed by Dr Peter Hacking.

Osteological methodology

Adults were aged by dental attrition (Miles 1962) and ectocranial suture closure (Meindl and Lovejoy 1985). Subadults were aged by epiphyseal fusion (Bass 1995; Schwartz 2000) and from diaphyseal long bone length (Scheuer *et al* 1980). The osteological sex of adults was determined from morphology of the skull and pelvis (Ferembach 1980; Buikstra and Ubelaker 1994). The stature of skeleton 15005 was estimated from long bone length, using the regression formulae developed by Trotter and Gleser (1958).

The above methodology complies with the guidelines for the recording of human remains set out by BABAO and the Institute of Field Archaeologists (Brickley and McKinley 2004).

Provenance of the human remains

Trench 14

The early Iron Age deposits in Trench 14 contained three fragments of human bone amongst a quantity of domestic debris. These included two fragments from the uppermost midden deposit, an incomplete head of humerus (from spit 2 of deposit 1401) and a left maxillary 1st molar (from spit 1 of deposit 1401), and a fragment of the right frontal bone of an adult individual from 1445, the fill of a posthole sealed by the midden and cut into layer 1409.

Trench 15

The two skeletons, a late adolescent male (15005) and a 36-38 week old foetus (15131) were discovered within the fill of an early Iron Age circular pit (15003) located within the settlement. Skeleton 15131 lay immediately to the south of the feet and lower legs of skeleton 15005, and was apparently inserted soon after the burial of skeleton 15005. Skeletons 15005 and 15131 lay on their right sides. In contrast to the norm of north-south orientation of Iron Age pit burials (including those found within the hillfort of Castle Hill), both skeletons were orientated east-west, facing the north

(Whimster 1991). Skeleton 15003 was loosely flexed, whilst the foetus (15131) was crouched in a foetal position.

An isolated fragment of femoral shaft (15272) was recovered from the fill of a middle Iron Age ditch (15341), and a complete left clavicle of neonatal age was recovered from an unstratified context within the trench.

Preservation and completeness

Trench 14

The three fragments of human bone recovered from midden deposits (1401 and 1445) were in fair condition, but all bones were incomplete having suffered post-depositional damage. They comprised the incomplete head of a humerus (spit 2, context 1401), the left maxillary 1st molar with broken roots (spit 1, context 1401) and a well preserved supraorbital portion of an adult frontal bone (context 1445).

Trench 15

The left side of the skull and both feet of skeleton 15005 had been truncated by ploughing and/or mechanical stripping of the site, but most other elements were well represented. The pelvis and long bones, except for the left pubis and distal ends of the tibiae, were in fair to good condition, as were the hand bones. The mandible, maxillae and most of the teeth were present. The 3rd molars were not visible, due either to delayed eruption or to developmentally absence (a non-metric genetic variation). Many vertebrae were missing. The preservation of extant vertebrae and ribs was poor.

Foetal skeleton 15131 was represented by numerous small skull fragments, the mandible (lacking the teeth), the vertebrae, ribs, pelvis and most of the long bones of the limbs. Preservation of the skeleton was fair.

A single isolated fragment of human femoral shaft (15272) measuring 73 x 22 mm, was in fair condition. The diaphysis of the neonatal clavicle found within spoil from trench 15 was complete and in good condition.

Assemblage distribution

Trench 14

The three fragments of human remains within midden deposits 1401 and 1445 represent the remains of three individuals. The incomplete head of humerus (SF 2240) found within deposit 1401 was unfused, indicating an adolescent younger than 16-20 years. The dental attrition of the left maxillary 1st molar from deposit 1401 suggested a younger adult, probably aged 22-28 years. The supraorbital fragment of a right frontal bone was adult in size, but was sexually indeterminate.

Trench 15

The pelvic features of skeleton 15005 indicated a male individual. He was aged 18-20 years, on the basis of epiphyseal fusion and dental attrition. All the measurable diaphyseal lengths of skeleton 15131 correspond to those of a 36-37 week foetus.

The isolated fragment of femur (15272) appeared to be adult. Bone dimensions were not indicative of the sex of the individual. An isolated complete clavicle from an unstratified context in Trench 15 (measuring 44 mm in length) was late foetal to neonatal in age.

Stature

Skeleton 15005 was the only skeleton to have complete long bones with which to estimate stature. The stature of this individual was estimated at 1.69 ± 0.02 m or 5'6". This is approximately 1 cm taller than the average male stature for the British Iron Age, calculated by Roberts and Cox (2003, 396).

Skeletal pathology

Osteochondritis dissecans

Active *osteochrondritis dissecans* was observed on the articular surface of the left medial femoral condyle of skeleton 15005. The lesion was ovoid in shape, measuring 21 mm x 16 mm. A plaque of cortical bone had become displaced, revealing the underlying trabecular bone. A smaller, well healed lesion was also present on the medial right femoral condyle, measuring 15 mm x 75 mm. Here the bony plaque had healed onto the joint surface, leaving an ovoid indentation in the surface. *Osteochondritis dissecans* is a fairly common osteological disorder found on the joint surfaces of the major long bones, commonly on the femoral condyle of the knee joint. Physically active young males (such as athletes) are most often affected in the first two decades of life. This disease is due to a significant localised obliteration of the blood supply, causing necrosis of small areas of joint tissue (Roberts and Manchester 1995, 87; Aufderheide and Rodriguez-Martin 1998). Repeated, low-grade, chronic trauma or micro-trauma is thought to play a role in this injury to the blood vessels. The necrotic bone plaque breaks off from the joint surface and may remain loose in the joint, causing chronic pain and often precipitating osteoarthritic changes. The lesion on the left condyle of skeleton 15005 had broken off, but no secondary joint disease had developed. In the left knee, the fragment had not completely dislodged, and had re-attached in its original position. Healing was considerable, and it is unlikely that he had suffered further symptoms. The presence of these lesions indicates that this young male led a physically strenuous existence.

Intervertebral osteochondrosis

The superior and inferior bodies of T10 - L5 showed slight to moderate irregular and crescentic depressions. Lesions were more marked in the thoracic and upper lumbar

vertebrae becoming progressively less severe inferiorly. The lesions ranged in depth from 2 mm to 5 mm, the base being irregular or rugose in appearance. A slight compression of the body of T11 and slight osteophytosis of the body margins was present.

The location of the lesions in the centre or posterior aspect of the bodies is suggestive of Schmorl's nodes. However, the irregular rugose appearance of the lesions is more characteristic of intervertebral osteochondrosis (Kelley 1982, 272). The latter disorder most commonly affects the spine of individuals in the second and third decade of life, and occurs in response to severe and/or everyday stress. The condition is more common in males than females, particularly males of greater stature. Skeleton 15005 is typical of the age and sex distribution of this disease. The presence of bilateral lesions of osteochonditis dissecans on the femoral condyles supports the interpretation that this individual lived a short but physically strenuous existence.

Cribra orbitalia

The right orbit of the fragment of adult skull within early Iron Age context 1445 showed evidence of cribra orbitalia Grade 2 (Stuart-Macadam 1991, 109). Cribra orbitalia is widely thought to occur in response to a deficiency of iron during childhood, most commonly as a result of inadequate dietary intake of iron, and/or as a result of severe intestinal parasite infestation (*ibid*). Red bone marrow produces red blood cells, which require iron for the transportation of oxygen in the blood. To compensate for low serum iron levels, the bones of the skeleton containing red marrow hypertrophy. In children, the diplöe of the cranial vault is one of the most significantly affected bones. Osteologically, this manifests as thickened porous areas in the orbital sockets and on the cranial vault. Although some remodelling of bone does occur throughout life, porosity of the bone may persist into adulthood but remains a generic indicator of physical stress in childhood, as appears to have been the case in this individual.

Dental pathology

Dental pathology was present in skeleton 15005 as moderate dental enamel hypoplasia (DEH) and calculus on the dentition of skeleton 15005.

Dental enamel hypoplasia

The 16 dental crowns of skeleton 15005 displayed dental enamel hypoplasia (DEH), a prevalence of 16/23 or 69.6%. DEH is the interruption or slowing of normal enamel formation during tooth crown development in the first six or seven years of life causing permanent thinning of the enamel (Goodman and Rose 1990). DEH manifests on the buccal surface of the crowns of teeth as pits, horizontal lines or lines of pits. Each line forms as a result of a prolonged episode of illness or malnutrition during childhood, lasting several weeks. Unlike bone, enamel does not remodel throughout life and so DEH acts as a permanent indicator of such a stress episode in the early years of life. The clear lines on the dentition of skeleton 15005 indicate exposure to

moderate stress episodes, such as childhood infections and/or seasonal food shortages. Teeth displayed between 1-3 lines, indicating multiple episodes in the first 8 years of life.

Dental decay

No caries were present in the dentition of skeleton 15005 but slight calculus was noted on 22 of 24 tooth crowns (91.7%). Calculus consists of mineralised plaque. Micro-organisms that accumulate in the mouth after eating become imbedded in a matrix composed of proteins and the saliva and the organisms themselves. Processed sugar in the diet accelerates this process (Hillson 1996, 254-55). These plaques may mineralise to form calculus (colloquially known as tartar). There are two types of calculus: supra-gingival calculus situated above the gum line, and sub-gingival calculus that is found below the gum line on exposed roots. The former was noted on the dentition of skeleton 15005. The deposits are commonly seen on the teeth nearest to the saliva glands (Roberts and Manchester 1995, 55). Regular brushing of the teeth removes most plaque deposits, thus preventing the formation of calculus. The calculus rate was recorded per tooth present, and the size and position on the crown was noted, using recording criteria set out by Brothwell (1981). However, such a detailed presentation of this data is beyond the scope of this report.

Compared to later historical periods, the prevalence of dental disease in prehistory is generally low. An average of 2.9% is cited as the prevalence (TPR) of caries in Iron Age Britain (Roberts and Cox 2003, 101). This probably reflects the relatively low intake of carbohydrates, particularly in the form of refined sugar, and the fairly young overall age of the population. In many later post-medieval and modern populations, ingestion of refined foodstuffs results in minimal wear of the occlusal surfaces of the teeth. The folds of enamel trap food residues, and in the absence of stringent oral hygiene, result in caries formation. This was not the case in prehistory, where the coarseness of the diet and grit introduced during food processing wore flat these folds within the first two decades of life. The dearth of dental decay in skeleton 15005 is probably the result of all the above factors.

Discussion

The insertion of complete articulated individuals, articulated but incomplete body parts, and isolated, presumably skeletonised human bones into ditches, grain-storage pits and postholes is a well recognised range in the treatment of the dead in Iron Age England (Whimster 1981; Wilson 1981; Wait 1985), and has been found widely in southern England, the Midlands (Whimster 1981) and as far north as West Yorkshire (Boston forthcoming). The variation in the treatment of human remains suggests a range of concurrent burial practices, which appear to include the careful placement of the complete corpse within empty or partially features soon after death; dismemberment of fleshed cadavers and the selection of body parts for interment in the above features and/or possible curation elsewhere amongst the living, and the deliberate and/or accidental incorporation of skeletonised bones within settlement features and occupation layers, possibly as a burial rite secondary to excarnation (Carr and Knusel 1997), although this last has not been tested osteologically.

Several individuals, including neonates and adults, were discovered within Iron Age pits of the adjacent hillfort of Castle Hill during excavation of the hillfort interior in 2003 and illustrate the above burial practices. A crouched neonate was discovered within a partially filled middle Iron Age pit. An adjacent pit contained three individuals- at the base, a crouched adult male inhumation (radiocarbon dated to the early Iron Age), in a higher fill the dismembered vertebral column, pelvis and leg of a second adult (possibly female), and overlying this the crouched, prone burial of a neonate. A number of disarticulated bones were also recovered from pit fills on the site (Lamdin-Whymark pers. comm.). Occupation layers of the late Bronze Age to early Iron Age settlement immediately south-west of the hillfort contained three human skull fragments and a tooth (Hingley 1979).

Other Oxfordshire examples of Iron Age pit burials are known from Queen Street, Abingdon (Parrington 1975), Ashville Trading Centre, Abingdon (Parrington 1978), Cassington Mill, Cassington (Chambers 1977), Allen's Pit, Dorchester-on-Thames (Whimster 1981), Mount Farm, Dorchester-on-Thames (Allen and Robinson 1993) and Watkin's Farm, Northmoor (Allen 1990).

Conclusion

The remains of at least five individuals were discovered during this phase of excavation. The two complete inhumations interred within an early Iron Age pit in Trench 15 form part of a growing corpus of inhumations known from Iron Age settlement sites. Young adult male 15005 showed skeletal pathologies consistent with a strenuous physical existence.

Catalogue

The following abbreviations have been employed in the catalogue (Table 7.1):

/ post-mortem tooth loss	X ante-mortem tooth loss
- tooth not present	A dental abscess
C caries	k calculus
DEH dental enamel hypoplasia	R root only (in relation to dentition)
L left	R right
DJD degenerative joint disease	SDJD spinal degenerative joint disease
C1-7 cervical vertebra 1 to 7	T1-12 thoracic vertebra 1 to 12
L1-5 lumbar vertebra 1 to 5	U Unerupted

ANIMAL BONE
by Fay Worley with Jennifer Kitch and Rebecca Nicholson

Introduction

Animal bone was recovered from seven trenches: Trenches 14, 18 and 19 were located to the west of Castle Hill and directly south of Round Hill, while Trenches 13 and 15 were located to the north and south of further excavations at Hill Farm (Chapter 10). A late Bronze Age landsurface and occupation was identified in Trench 14. Late Bronze Age occupation was also identified in Trench 15. Early Iron Age

postholes and midden deposits were investigated in Trench 14 and early and middle Iron Age settlement activity was identified in Trenches 15 and 19. Ditches belonging to late Iron Age or early Roman enclosures were investigated in Trench 15, while Trench 13 targeted a Roman enclosure ditch. Trench 18 was located on Round Hill and identified a medieval or post-medieval boundary or negative lynchet. A few animal bones were also recovered from trenches excavated at Clifton Meadow in Long Wittenham parish. For the detailed reports on these bones see Chapter 13.

The animal bone assemblage from the excavations comprised 10,115 fragments (refitted count) weighing 53, 361 g. It was analysed by the author at Oxford Archaeology with fish bones examined by R. Nicholson. Just over half (51%) the animal bone fragments were recovered from early Iron Age features with a further 30% of fragments dated to the middle Iron Age. Late Bronze Age contexts contained 4% of the animal bone. Unphased Iron Age and late Iron Age or early Roman contexts each contributed another 1% of the bone fragments, while Roman contexts produced another 5% of the animal bone assemblage. Modern material comprised 4% of the assemblage and the post-medieval period was represented by only a few fragments of animal bone (Table 7.2). A total of 2400 (24%) bone fragments were identified to taxon. A further 5719 (56%) were identified as large, medium or small mammal sized.

A wolf bone recovered from a clay layer in Trench 14 is of particular interest within the assemblage. Wolves are not often identified in British archaeofaunal assemblages. The Little Wittenham specimen has been radiocarbon dated to the late Bronze Age.

Methods

The animal bone was recovered through hand collection and from wet-sieved residues processed using a 500 μm residue mesh and 200 μm flot mesh. The fragments had been washed prior to analysis. The assemblage was identified through comparison with textual and faunal reference material at Oxford Archaeology. Fragments were counted, weighed and recorded using the zone system as suggested by Serjeantson (1996). Identifications were made to as specific taxonomic levels as possible but with classes of large (cattle size), medium (sheep size), small (rabbit size) and micro (mouse sized) used where further identification was not possible. Bone fusion, tooth eruption and attrition were recorded and interpreted following Silver (1969), Halstead (1985) and Grant (1982). Evidence of butchery, gnawing and burning was also noted and interpreted. Where possible, bones were measured following standard conventions (Driesch 1976). Where appropriate, metric data was used to calculate withers heights of individual animals.

Condition of the assemblage

The condition of the assemblage varied from excellent to poor (Table 7.3) but the overall majority of fragments were in good condition. Between 16% and 47% of fragments from each phase had suffered recent breaks (Table 7.4).

A small proportion (1-3%) of late Bronze Age, early Iron Age, middle Iron Age, late Iron Age to Early Roman and Roman animal bone fragments had been burnt (Table 7.4). Around 7% of the unphased Iron Age bones were burnt, but this may not

be significant due to the small sample size. Between 1-3% of fragments from all periods (excluding the small unphased Iron Age and post-medieval assemblages) had been gnawed by animals (Table 7.4). The majority of gnaw marks indicated carnivore gnawing (286 fragments), but 14 fragments had been gnawed by rodents and 2 fragments had been gnawed by carnivores and rodents. Rodent gnawing was identified in the late Bronze Age, early Iron Age and modern animal bone assemblages. Carnivore gnawing was identified in all phases with gnawed bones. The carnivore gnawing was most likely canid (dogs, wolves and foxes).

Species identified

The animal bone assemblage was found to contain cattle (*Bos taurus*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus scrofa*), horse (*Equis caballus*), dog (*Canis familiaris*), cat (*Felis domesticus*), red deer (*Cervus elaphus*), wolf (*Canis lupus*), rabbit (*Oryctolagus cuniculus*), weasel (*Mustela nivalis*) mole (*Talpa europaea*), black rat (*Rattus rattus*), water vole (*Arvicola terrestris*), goose (*Anser* sp.) and mallard (*Anas platyrhynchos*). Further fragments were identified as large, medium or small mammal, rabbit or hare, frog or toad, vole, bird, probable snake and fish.

Wild mammals and disturbance to archaeological contexts

Small mammal and microfauna bones were recovered from early Iron Age, middle Iron Age and Roman contexts (Table 7.5). Rabbit bones were recovered from an early Iron Age pit fill (15079) and from a midden layer (1401). A fragment of rabbit or hare cranium was recovered from the lower fill of a middle Iron Age ditch (19070). The burrowing nature of rabbits raises the possibility that these are intrusive bones. Current academic belief holds that rabbits were not present in Britain until the medieval period (Yaldon 1999, 158-161). Hares are, however, native species and bones are occasionally recovered from Iron Age or Roman sites (e.g. Wilson in Parrington 1978, 111 Table X, Yaldon 1999, 127). Other burrowing taxa were also identified. A mole radius recovered from middle Iron Age ditch fill 15015 may also be intrusive.

Voles were recovered from the early Iron Age, middle Iron Age and Roman periods, and water voles were recovered from the early Iron Age assemblage. These taxa indicate an open grassland environment; water voles have historically exploited grassland habitats, as they still do in continental Europe. The frog or toad bones recovered from early and middle Iron Age and Roman contexts reflect the proximity of the site to water. A weasel femur was recovered from middle Iron Age ditch 15340, and a rat mandible from middle Iron Age ditch fill 15017. The size of the mandible suggests that it was a black rat. Current academic belief holds that black rats were introduced to Britain in the Roman period (Yaldon 1999, 125), and the rat mandible is therefore probably intrusive in this context.

Metric analysis

A total of 98 animal bone fragments in the assemblage were measured (Table 7.6, Tables 29-34). These included cattle, sheep/goat, pig, dog, horse, wolf and mallard

specimens, and bones dating to the Late Bronze Age, early and middle Iron Ages, Roman, post-medieval and modern periods. Five of the measured bones were unphased. Unfortunately, once divided into phase, species and element categories, there were too few measurements to draw any conclusions regarding sex classes or stock improvement within the excavated assemblage. Using published indices (Fock 1966, Teichert 1975 and Clark 1995), withers heights could be calculated for two cattle, one sheep, one sheep or goat and one dog (Tables 7.29-7.30, 7.33).

A middle Iron Age and a Roman cattle specimen produced withers heights of 1.10 m and 1.08 m respectively. The Iron Age individual is within the size range of Iron Age cattle at the adjacent site of Castle Hill (Chapter 4) and the general range found at other Iron Age sites (see Wilson *et al.* 1988, 116).

An early Iron Age sheep or goat and a middle Iron Age sheep stood at a withers height of 0.55 m. This too is within the height range for early Iron Age sheep at Castle Hill (Worley forthcoming) but slightly shorter than the height of sheep recorded at some other Iron Age sites (see Wilson *et al.* 1988, 117).

A middle Iron Age dog stood at a withers height of 0.47 m. This is within the range of 0.3-0.6 m heights suggested as standard for Iron Age dogs (Harcourt 1974, Clarke 1995)

Evidence for pathology and non-metric traits in the animal bone assemblage

A total of 40 pathological lesions and non-metric traits were recorded on cattle, horse sheep/goat, pig, large and medium mammal fragments dating to the late Bronze Age, early Iron Age, middle Iron Age and unphased periods.

Pathologies and non-metric traits in cattle bones

Pathological lesions and non-metric traits were identified on 18 cattle specimens, two late Bronze Age, nine early Iron Age, five middle Iron Age, one Roman and one modern. A late Bronze Age/earliest Iron Age proximal phalanx from context 1407 had severe pathological changes with eburnation and lipping noted on the distal articulation. Associated bone remodelling (bone destruction and bone growth) extended from the articulation up the medial and lateral faces of the bone but did not affect the proximal articulation. These pathological changes can be classed as osteoarthritis (Baker and Brothwell 1980, 114-116) and may indicate that the animal had been used for heavy traction (following de Cupere *et al.* 2000). A cattle second phalanx from late Bronze Age/early Iron Age clay layer 1435 had pathological bone growth on its lateral aspect. The aetiology of this lesion is not known and refitting the two phalanges was not attempted.

Two of the nine early Iron Age cattle specimens displayed non-metric traits. Creases or lesions were identified on the distal articular surface of an astragalus from midden layer 1413 and a first phalanx from midden layer 1401. Phalangeal non-metric lesions are common in cattle (Baker and Brothwell 1980, 41).

The remaining seven early Iron Age specimens had pathological lesions. These comprised two further first phalanges, a second phalanx and a metacarpal from midden layer 1401, an ulna and a scapula from midden layer 1413, and a mandible from gully fill 19012. The pathological lesions included arthropies (lesions associated with joint diseases), traumatic injuries and oral pathologies.

A first and second phalanx from 1401 had extension of the proximal articular surface and associated bone growth on the proximal diaphysis. The lipping and bone growth on the first phalanx was on the anterior side of the bone. Too few characteristic were noted for these arthropathies to be diagnosed as osteoarthritis but, this may be the cause and they may relate to a traction role. A metacarpal from the same context had splayed condyles and some swelling of the mid diaphysis. The splayed condyles may indicate heavy traction work but the aetiology of the swelling is unclear. The second pathological first phalanx from 1401 had some extra bone growth at the point of fusion of the distal diaphysis, and on the anterior proximal diaphysis. Its fused distal epiphysis overhung the diaphysis. A further arthropathy was noted on an early Iron Age ulna from 1413. The bone had a large extension to the lateral side of the semi-lunar notch.

Traumatic injury was noted on an early Iron Age cattle scapula from context 1413. The spina scapulae had a linear crack on its lateral face running for most of its length (Fig. 7.1, 1). A small band of woven bone followed and overlaid the crack with woven bone also deposited on the medial face, indicating that the trauma occurred in life and had begun to heal. This fracture may have been caused by a sudden blow, jolt or fall or could be the result of stress to the forelimb, again possibly due to traction. The injury may also have made the animal lame and ended its use-life, as it was chosen for slaughter shortly after the event.

Oral pathology was noted on an early Iron Age cattle mandible from 19012. The bone had regressed around the fourth premolar socket. No teeth were present in the jaw.

The four middle Iron Age cattle bones with pathological lesions and non-metric traits comprise a second phalanx from pit fill 19021, a humerus from ditch fill 15048, and mandibles from pit fill 15106 and ditch fill 15230. The phalanx had extension of the proximal articular surface and associated bone growth on the proximal diaphysis, the humerus had a patch of woven bone on its distal diaphysis. Both mandibles displayed non-metric traits. One had a missing hypoconulid on the third molar and the second had a congenitally absent second premolar.

The Roman pathological specimen was a innominate fragment from ditch fill 1306 which had an area of polish in the acetabulum. This indicates joint disease in the hip.

The modern pathological specimen was a radius from pit fill 15223 which had exhibited woven bone formation in the ulnar groove suggesting stress to the joint.

Pathologies and non-metric traits in horse bones

Pathological lesions or non-metric traits were identified on three horse bones. An early Iron Age humerus from pit fill 15013 and a middle Iron Age humerus from ditch fill 15048 both had patches of very thin cortical bone on their distal articulations which may be non-metric or pathological. A Roman cervical vertebra from ditch fill 1306 had lipping of the caudal articular facet.

Pathologies and non-metric traits in sheep or goat bones

Three early Iron Age and two middle Iron Age sheep or goat specimens exhibited pathological change or non-metric traits. Oral pathologies and non-metrics were noted

in the early and middle Iron Age assemblages; a maxilla from early Iron Age midden layer 1401 had woven bone on the palate region and a mandible from the same context had a congenitally missing second premolar. A mandibular second premolar from middle Iron Age pit fill 19021 had a massive build up of calculus.

A middle Iron Age tibia from ditch fill 1309 had woven bone on its lateral distal diaphysis, either from injury or infection. An early Iron Age femur from pit fill 15209 had suffered a severe traumatic injury. The femur had fractured towards the midpoint in the diaphysis, the ends of the fractured bone had passed across each other due to the strength of the hind limb muscles, and healed in this position significantly shortening the hindlimb. This femur is illustrated in Figure 7.1, 2. The animal would have been lame. The fracture was well healed by the time the animal was slaughtered, suggesting that either the animal was left grazing away from supervision and not found until the fracture had healed, or was cared for.

Pathologies and non-metric traits in pig bones

Two pig bones exhibited pathologies. An early Iron Age radius from pit fill 15037 had woven bone on its diaphysis and a middle Iron Age scapula from pit fill 15067 had slight bone growth on the lateral margin of the neck.

Pathologies and non-metric traits in large and medium mammal bones

Three, possibly four, large mammal ribs (one from each of the late Bronze Age/earliest Iron Age, early Iron Age, middle Iron Age and Roman periods), a middle Iron Age lumbar vertebra and an early Iron Age mandible fragment exhibited pathological change. The mandible had woven bone around the hinge area indicating an infection. A middle Iron Age rib body fragment was similarly affected with woven bone and a Roman large mammal rib slight lipping on its anterior margin. A late Bronze Age/earliest Iron Age rib from 1435 also had a pathological swelling on the body. These pathologies may be from a infection such as tuberculosis. An early Iron Age rib from 1413 had a well healed hollow measuring approximately 10 mm by 4 mm towards its head end. Asymmetry was noted in a middle Iron Age lumbar vertebra from ditch fill 19026. The right cranial process protruded further than the left and the spinous process drooped to the right cranially but was upright caudally. There was also slight pathological bone growth on left hand side vertebra.

Seven, possibly eight, medium mammal bone fragments exhibited pathology. Woven bone was present on the surface of a middle Iron Age tibia fragment, early Iron Age long bone fragments from 1404 and 1401, an early Iron Age flat bone fragment from 1401, and possibly an undated cervical vertebral centrum. Pathological bone growth was evident on a middle Iron Age rib fragment, but it was not clear if this was from an infection or a healed fracture. A early Iron Age rib from 1413 also had bone growth on its body which may be from an infection such as tuberculosis.

The Late Bronze Age/earliest Iron Age animal bone assemblage

The late Bronze Age animal bone assemblage comprised 452 fragments of animal bone recovered from eleven contexts in Trench 14 (transitional clay layers 1406/1432/1435 and 1409, pebble layer 1407/1438, posthole fills 1447, 1449, 1451, 1453, charcoal patch 1439) and two probably late Bronze Age contexts in Trench 15 (gully fills 15041 and 15002). The late Bronze Age animal bone assemblage includes fragments identified as cattle, horse, pig, sheep or goat, dog and wolf with further fragments identified as large and medium mammal sized. Cattle, sheep or goat and pigs are most common taxa identified (number of fragments). Taken as a proportion their sum, cattle bone fragments are the most prevalent (51%) followed by sheep or goat (40%) and then pig (9%). Only three horse bone fragments and two canid bones were identified; one dog and one wolf. The element representation for the late Bronze Age assemblage is presented in Table 7.7.

No age-at-death data was obtained from late Bronze Age sheep, goat or cattle mandibular teeth, but least one pig was adult at death (see Tables 21-3). It was possible to investigate age-at-death through cattle and sheep or goat bone fusion (Tables 18-20). Bone fusion indicates that most ageable late Bronze Age cattle elements were over 3.5 years old at death. The sheep or goat bones include individuals less than 1.3 years old. No foetal or neonatal bone elements were recorded.

The Late Bronze Age/earliest Iron Age assemblage from Trench 14

Transitional clay layer 1406/1435/1452 contained 336 fragments of bone including the full range of late Bronze Age mammals identified on the site (Table 7.7) . Clay layer 1409 only contained two unidentifiable large or medium mammal bone fragments. Pebble layer 1407/1438 only contained 47 fragments of bone including cattle, sheep or goat and large and medium mammal bone. Charcoal patch 1439, (context 1440) contained four calcined indeterminate fragments of bone. Trench 14 included four post holes containing animal bone. Postholes 1446 and 1450 each contained a sheep or goat astragalus. Posthole 1446 also contained part of a human femur head and two indeterminate fragments of bone, while posthole 1450 contained a medium mammal long bone and 23 indeterminate fragments. Posthole 1452 contained eight medium mammal bone fragments and posthole 1448 contained a medium mammal bone fragment and six unidentifiable fragments. Whether the sheep or goat astragali were the only identifiable animal bones recovered from the postholes because of their robustness, or because they were placed deposits cannot be determined. Astragali are known to have been curated as gaming or divining pieces in Roman and Greek cultures on the continent and in later British cultures. Sets of astragali were, for example, recovered from Anglo-Saxon cremation burials such as those at Castor-by-Norwich (Wells 1973).

Cattle

All skeletal regions were represented in the cattle bone assemblage (Table 7.7) with multiple humeri and calcanea indicating that a minimum of two individuals were included. Age-at-death data was available for one loose cattle tooth (a fist or second mandibular molar in Grant's (1982) wear stage K) and thirteen elements from bone fusion. The tooth wear indicates that one individual was over 2.5 years old at death. Bone fusion data indicates that at least one individual was less than four years old at

death. Fragments of cattle femur, tibia and radius had been broken while the bone was fresh but no butchery marks were identified on the assemblage.

Sheep or goat

The sheep or goat bone assemblage comprised mandible, tooth, scapula, radius, ulna, metacarpal, tibia, astragalus, calcaneum, metatarsal and phalanx fragments (Table 7.7) from a minimum of two individuals (from multiple tibia and humerus fragments). Age-at-death data was available for one loose tooth a first or second mandibular molar in Grant's (1982) wear stage D to E) and five long bones from epiphyseal fusion. The tooth indicated that the animal was over three months old at death. The long bone fusion indicates that individuals less than 18 months old were included in the assemblage. Butchery marks were identified on one tibia, which had fine cuts on the anterior face of the distal diaphysis. This butchery probably resulted from disarticulation of the foot at this point. An astragalus recovered from posthole fill 1451 had an eroded surface probably due to having been partially digested in the gut of a carnivore or omnivore.

Pig

Pig bones were only recovered from clay layer 1432/1435. They comprise two mandible fragments, three, probably four loose teeth and a scapula fragment. The mandibles were from two different individuals. Age at death could be determined from one mandible and indicated that the animal was adult when it died. No butchery marks were identified on the pig bones.

Canid

A canid radius and calcaneum were recovered from layer 1435. The radius had a proximal breadth of 16.9 mm indicating that it was from a domestic dog but the calcaneum had a greatest length of 61.1mm indicating that it was probably from a wolf (Fig. 7.2). Comparison of the bone with a grey wolf specimen at Oxford University Museum confirmed that identification. The wolf calcaneum was radiocarbon dated to 900-790 cal BC (see Radiocarbon Dating, below). No further canid bones were recovered from the assemblage but fragments identified as medium mammal may be from the dog or wolf. The dog was aged over eleven to twelve months old at death and, following criteria for domestic dogs, the wolf was probably over thirteen to sixteen months old at death. No butchery marks were identified on the canid bones.

Horse

A femur and two teeth from layer 1435 were identified as horse. The femur was from an animal aged at over 3-3.5 years old at death and the height of one tooth indicated that the individual was aged between 6.5-9 years old at death. No butchery marks were identified on the horse bones.

Medium and large animal bones

Medium mammal bones included vertebra and rib fragments that could not be identified to species. One medium mammal vertebra had been chopped transversely, portioning the vertebral column. A large mammal unidentified fragment had been chopped out of the bone and two fragments of large mammal long bone had been broken while they were fresh.

The late Bronze Age/earliest Iron Age assemblage from Trench 15

Gully fill 15041 contained a cattle mandibular premolar. Gully fill 15002 contained a pig tooth, medium mammal unidentified fragment and six indeterminate fragments. No bone fragments were burnt.

The early Iron Age animal bone assemblage

The early Iron Age faunal assemblage comprised 51% of all animal bone recovered from the site. A total of 5190 fragments of animal bone were recovered from early Iron Age contexts in Trenches 14, 15 and 19. In Trench 14 early Iron Age animal bone was recovered from midden deposit groups (1401 1405 and 1422), four postholes (1416, 1419, 1433 and 1436), an unspecified feature (1414) and clay lenses (1420 and 1424). In Trench 15 animal bone was recovered from ten pits and probable pits (groups 15010, 15012, 15021, 15060, 15069, 15125, 15213, 15298, 15301 and 15305), two postholes (15031 and 15091), grave 15003, ditch groups 15342 and 15334, ring gully groups 15330 and 15332 and gully groups 15331 and 15333. In Trench 19 animal bone was recovered from gully group 19183 and associated pits (19002 and 19128), two further gully groups (19189 and 19184), gully group 19011, ditch 19038, pit 19013 and ten postholes. Seven of the post holes (19083, 19042, 19041, 19045, 19077, 19079 and 19047) belong to a possible building, group 19190. Postholes 19171 and 19177 were also possibly associated with another building in the south of the trench. The tenth posthole was 19080.

The early Iron Age animal bone assemblage included domestic mammals (cattle, sheep, goat, pig, horse and dog), wild mammals (red deer, water vole, vole), mallard, frog or toad and fish. Rabbit bones from early Iron Age contexts may be intrusive, though one of these bones may be from a hare. Cattle, sheep or goat and pig were the most common taxa identified. Taken as a proportion of their sum, sheep or goats (including fragments identified as sheep) were represented by 55% of fragments, cattle by 33% of fragments and pigs by only 12% of fragments.

Age-at-death could be estimated for 38 sheep or goat, 11 cattle and six pig mandibles or mandibular teeth (Tables 7.20, 7.22 and 7.24). The sheep and sheep or goat bones included animals that died at a range of ages from neonatal to greater than eight years old. The majority (at least 22 ageable specimens) were from individuals less than 20 months old, fifteen of these died between three and twenty months old. Some sheep or goats did survive into maturity with at least nine specimens over the age of five years at death. Sheep or goat bone fusion evidence (Table 7.21) also suggests that animals died at a range of ages. This mortality data suggests that sheep or goats were probably valued for their meat in the early Iron Age (following Payne 1973), but that older animals were also kept as breeding stock, milk or wool producers. The presence of neonates in the assemblage suggests that sheep or goat breeding to place on or near the site.

The cattle age at death data suggests that calves, juvenile and adult individuals were present in the assemblage, although most animals were killed before the age of 30 months old. Cattle bone fusion evidence (Table 7.19) indicates the presence of some individuals over 42-48 months old-at-death. Foetal cattle bones were recovered from midden layer 1401, suggesting that cattle breeding occurred close to the site. The primary focus of cattle husbandry may also have been meat production in the early Iron Age.

A total of six pig specimens were aged from mandibular tooth wear (Table 7.24). This indicated that animals died as juveniles, immature individuals and sub-adults. Foetal, or possibly neonatal, pig remains were recovered from midden layers 1401 and 1405 (Trench 14), from gully fill 15183 (Trench 15) and from ditch fill 19109 (Trench 19). The presence of these bones suggests that pig breeding took place on or close to the site.

The early Iron Age assemblage from Trench 14

A total of 2939 fragments of early Iron Age animal bone were recovered from Trench 14 (Table 7.8). These included fragments identified as cattle, horse, goat, sheep, pig, dog, red deer, rabbit, vole, water vole, microfauna, bird and fish. The animal bone was recovered from a sequence of buried soils, including midden deposits, and from the fills of four postholes. The postholes each contained between two and nine fragments weighing 6-80 g (Table 7.26). Posthole 1416 contained a large mammal indeterminate fragment and a medium mammal rib fragment. Posthole 1419 contained a fragment of sheep or goat mandible, medium mammal cranial, long bone and indeterminate fragments, and a charred large mammal fragment. Posthole 1433 contained a sheep or goat maxillary molar and medium mammal maxilla fragments and a large mammal tooth fragment. Posthole 1436 contained a fragment of cattle radius, charred large mammal and indeterminate fragments and an unburnt indeterminate fragment.

Cattle

A total of 205 fragments of cattle bone and tooth from a minimum eight individuals (from eight right scapulae) of were recovered from early Iron Age deposits in Trench 14 (Table 7.8). All regions of the skeleton were represented with a dominance of loose teeth and slight preference for fore rather than hind limb long bones.

Butchery marks were identified on 21 bone fragments, and 16 cattle bones (scapula, humeri, radii, ulna, tibiae, metatarsal and phalangeal fragments) had been broken while fresh. The butchery marks consisted of fine knife cuts and chops. The butchery evidence suggests that cattle horn was utilised as well as meat and bone marrow. Cattle carcasses were divided by disarticulating between the bones or chopping through elements. An atlas had been chopped laterally indicating that the thorax was split into sides. Cuts indicate that the mandible was disarticulated from the skull. The anterior portion of a mandible had also been chopped off. This butchery would have allowed access to the jowl meat and mandibular bone marrow (following Landon 1996, 69). Knife cuts indicated that the feet were disarticulated at the carpal and tarsal joints (2 butchered astragali and two butchered carpals) the carpals probably being removed with the feet. On one occasion a metapodial had been chopped through the mid diaphysis. The fore limb was further divided by chopping

through the neck of the scapula (two examples). The scapula was sometimes subdivided longitudinally and may have sometimes been pierced, possibly for hanging; one scapula was recovered with the middle section of the blade missing resulting in a 'V' shaped bone, although it was not clear whether the bone had been purposefully pierced or butchered into this shape. Cuts on the lateral diaphysis of two humeri suggest that meat had been filleted from the bone. The posterior of a cattle ulna had been chopped off, possibly as the fore limb was portioned.

A chop mark on a ventral pubis suggests that the hindquarters were divided into sides. Chop marks were also used to portion the hind limb (a chopped distal tibia). Like a sheep or goat metapodial from this trench, a cattle metatarsal and a metapodial were chopped longitudinally.

Sheep and goat

Both sheep and goat remains (eight and four respective examples) along with 255 fragments identified as sheep or goat were recovered from the early Iron Age assemblage in Trench 14. A minimum of one goat, two sheep (from two right mandibles) and nine sheep or goats (from nine left radii) were represented. The sheep or goat assemblage included elements from all regions of the skeleton with an over representation of loose teeth and forelimb elements and tibiae. The frequency of tibia elements may be in part due to the ease of their identification as compared with other fragmented long bones.

Butchery marks were identified on 18 sheep or goat bones and a further 37 fragments of bone (1 scapula, 4 humeri, 7 radii, 3 metacarpals, 1 femur, 10 tibiae, 6 metatarsals and 5 metapodials) were broken when fresh. Butchery marks on sheep or goat bones indicate carcass division and meat removal. The head was removed by disarticulation of the atlas (two examples). Meat was filleted off the scapula (one example). The forelimb was divided by chopping through the proximal radius (two examples) and distal metacarpal (one example). The hind limb was divided through the tibia (two examples). The feet were sometimes removed by chopping through the metapodials (two examples). Metapodials were found broken longitudinally (one example), presumably to access the bone marrow. A longitudinally chopped third phalanx suggests that the metapodials may have been split while the foot was still attached. A small transverse cut on the lateral corpus of a calcaneum may be from dismembering the foot. The butchering motive for a navicular-cuboid fragment with a hole drilled through the centre of the element remains unclear. It may in fact be bone working rather than butchery.

Pig

Early Iron Age pigs in Trench 14 were represented by 94 fragments from a minimum of three individuals (three right mandibles). The pig bones included elements from all regions of the skeleton. Only one pig bone had been burnt; a charred first phalanx from midden layer 1401. Butchery marks were identified on five pig bones. A further two bones (a fourth metacarpal from midden layer 1413 and a tibia from midden layer 1401), had been broken when fresh. The butchered bones comprised two mandible from midden layer 1401, a skull fragment and the charred phalanx from the same layer and a third metatarsal from midden layer 1408. Cranial butchery marks indicate that the head was roughly chopped from the vertebral column, removing the occipital process and that both jowl meat and probably tongue was utilised. The butchery

marks on the pig phalanx and third metatarsal suggest that the hind foot was disarticulated at the proximal metatarsals and that some feet were subdivided by chopping through the first phalanx.

Horse
A total of eight horse bones were identified from a minimum of one individual. The horse bones comprised four teeth, two lateral metapodial fragments, a fragment of scapula and a fragment of humerus. The humerus diaphysis had been broken when fresh. The height of the horse teeth indicated that the animal was 8.5-11 years old at death.

Dog
An innominate, an ulna, a metapodial and seven dog teeth were recovered from midden layers 1401, 1408 and 1413. These bones represent a minimum of one individual. Bone fusion evidence suggests that the dog was over 9-10 months old at death. No dog bones were butchered or burnt.

Red deer
A total of three red deer antler fragments were recovered from midden layers 1401 and 1413. The two fragments from layer 1413 had been worked. A tine tip had been sawn off proximally and then sliced distally. The tine tip was slightly charred on its proximal edge. The second had been chopped longitudinally. The fragment of antler from layer 1401 was also charred. The antler may have been brought to the site as a traded raw material, or collected from the local area.

Wild small mammals
Midden layer 1401 contained three rabbit innominates from a minimum of two individuals. These may be intrusive as current academic belief holds that rabbits were not present in Britain in the early Iron Age (see above). A further 11 small mammal bones were recovered from midden layers 1401 (eight cranial, rib, vertebra, fibula and indeterminate fragments), 1413 (long bone fragment), 1423 (cranial fragment) and from fill 1415 (cranial fragment).

Microfauna
Microfaunal bones included a water vole tibio-fibula (from midden layer 1401), a vole mandible (from midden layer 1408), a vole femur (from midden layer 1413), a rodent tooth (from fill 1415) and two microfaunal vertebrae (from midden layer1408).

Birds
A total of six bird long bones and an indeterminate fragment were recovered from midden later 1401. An indeterminate bird bone was recovered from midden layer 1413. The end of one long bone had had its end cut off. No bird bones could be identified to species.

Fish
A total of five fish bones were recovered from midden layers 1401, 1408 and 1412. Unfortunately, none of the fish bones could be identified to element or species.

The early Iron Age assemblage from Trench 15

A total of 1711 fragments of early Iron Age animal bone were recovered from Trench 15 (Table 7.9). The assemblage was recovered from pit 15003 and from ten other pits, two postholes, two ring gullies, two gullies and two ditches. It included nearly all early Iron Age taxa identified on the site. Only red deer, goat, water vole and fish were not identified.

Pit inhumation 15003
Pit inhumation 15003 included 225 fragments of animal bone, only 12% of which could be identified to species or species group (cattle, horse, sheep, sheep or goat, pig, and frog or toad). A further 22% of bone fragments were recorded as large, medium, small mammal and microfaunal. A total of six medium mammal bones and a sheep or goat astragalus were burnt. No fragments exhibited butchery marks. The only complete elements were the cattle axis and phalanges with all other elements fragmented, and there are no articulating bones. It is likely that the animal bone is general refuse in the pit fill and does not include grave goods. This assemblage should therefore be compared with those from other early Iron Age pit fills (see below).

Animal bone from early Iron Age pits in Trench 15
In addition to pit inhumation 15003, a further 11 pits in Trench 15 contained animal bone. The number of fragments of bone in each pit varied from 13 to 238 with the weight of bone ranging from 29g to 1848 g. The majority of pits contained less than 100 fragments of animal bone; the contents of these pits are presented in Table 7.25. Pit 15012 contained 100 fragments (408 g), pit 15021 contained 198 fragments (1390 g) and pit 15010 contained 238 fragments (1848 g) of animal bone. These pits are considered separately below. Pits 15010 and 15021 were located approximately 3m apart, just to the north of ring gully 15330. Pit 15012 was located less than 1 m to the east of the pit inhumation 15003 and within the area defined by ring gully 15330.

Pit 15010 included cattle, horse, sheep, sheep or goat, pig and rodent bones with further fragments identified as large, medium and small mammal. A total of 17 medium mammal and one large mammal long bone fragments from this pit were charred or calcined. A cattle humerus, four indeterminate large mammal bones and a medium mammal long bone had been broken while fresh, probably during processing of the bone marrow. Butchery marks were identified on four horse bones which indicate that the animal's fore and hind limbs were disarticulated, and probably processed for marrow and that the mandible may have been removed. At least one of the butchered bones was from an individual aged over 15-18 months old at death. Evidence of the mandible being removed or skull portioned comes from an unerupted cheek tooth (therefore from an animal aged less than 52 months old at death) which appeared to have had its occlusal surface chopped off. The remaining, unbutchered horse bones were left and right mandible fragments (aged over 3.5 to 4 years old at

death from tooth eruption but may be significantly older), a left pelvis fragment (from an animal aged over 4.5 to 5 years old at death) a fragment of axis and a hyoid.

Cattle bones in pit 15010 comprise four mandible fragments from a minimum of two individuals (both identified as adult from tooth wear), 17 loose teeth and tooth fragments, and fragments of humerus, metatarsal and phalanx. Sheep and sheep or goat bones in pit 15010 comprise fragments of cranium from a young individual, a hyoid, two fragments of humerus (one from an individual older than ten months at death), two radius fragments, an ulna fragment, left and right femora from an individual aged less than 2.5-3 years old, a metatarsal, a first and a third phalanx (older than 13-16 months old at death) and eight loose teeth (two from an individual aged 3-20 months old at death. The sheep or goat bones are from a minimum of two individuals. The only other identifiable medium mammal bone was a pig radius. A total of 130 medium mammal fragments and 25 large mammal fragments could not be identified to species.

Pit 15012 contained 100 fragments of animal bone including cattle, horse, sheep or goat and pig bones. Only one long mammal long bone was burnt. Very few bones had butchery marks, although several medium mammal long bone fragments had been broken when fresh, probably to obtain the bone marrow, and a left horse humerus had fine cut marks on its distal articulation which indicate that it was disarticulated from the radius and ulna. These butchery marks are similar to those identified on right horse humerus from pit 15010. Both humeri were from animals over 15 to 18 months old at death. The only other horse bone in the pit was an axis vertebra. Cattle bones from the pit comprise two loose teeth, a first phalanx (from an individual aged over 13 to 15 months old at death), a left metatarsal and further metapodial fragment. Fragments identified as large mammal bone comprise pelvis, rib, tooth, jaw and indeterminate fragments. A first phalanx (from an individual aged less than 13 to 16 months old at death) and six loose teeth were the only sheep or goat bones identified. The only pig bones were an ulna and a metapodial fragment. A total of 40 bone fragments including cranial, mandible, rib vertebra and long bone fragments were identified as medium mammal.

Pit 15021 contained 198 fragments of animal bone including cattle, horse, sheep or goat, pig, and one unidentified bird bone. A juvenile rabbit innominate fragment recovered from the pit is probably intrusive (see above). A cattle carpal or tarsal, sheep or goat mandible fragment, large mammal indeterminate fragment, medium mammal rib, vertebra and four indeterminates and an further unidentifiable bone fragment had been burnt. Butchery marks were identified on five bones. A cattle radius and medium mammal long bone had been broken whole fresh. Knife cuts were recorded on a medium mammal vertebra, large mammal rib and cattle humerus. The cuts n the humerus indicate that a knife had been used to disarticulate the elbow (as was seen on horse humeri in pits 15010 and 15012).

Horse bones in pit 15021 comprise a loose tooth and a fused radius and ulna fragment (from an individual aged over 3.5 years old at death). Cattle bone fragments include four teeth, single fragments of mandible, humerus, femur, metatarsal, innominate, scapula, and carpal or tarsal and two radius fragments. The cattle elements come from a minimum of one individual, aged over 3.5 to 4 years old at death from fusion of the femur and tibia. The pit contained five pig bones including a cranium fragment, a mandible and two loose teeth (aged 4-16 months old at death from tooth eruption or juvenile from tooth attrition) and a further fragment from a jaw. The remains may have come from a single young pig's head. Pit 15021 also contained 16 sheep or goat bones including two mandible fragments, two maxilla

fragments, four loose teeth, a neonatal or foetal metacarpal, two further metapodial fragments (one from an animal aged less than 20-28 months old at death), a radius and a femur fragment. The remains come from a minimum of two individuals, one adult and one foetal or neonatal. The adult had survived a broken hind limb (see above and Figure 7.1, 2).

Animal bone from early Iron Age postholes in Trench 15
Postholes 15031 and 15091 contained 45 and 8 fragments of animal bone respectively (Table 7.26). Posthole 15031 contained five loose cattle teeth (possibly from a single mandible) and a cattle metapodial fragment (from an individual aged less than three years old at death), a sheep or goat tarsal, innominate fragment (from an individual aged less than 3.5 years old at death) and radius fragment and 36 large mammal, medium mammal and unidentified fragments. Posthole 15091 contained a sheep or goat metapodial fragment, two large mammal flat bone fragments and five medium mammal long bone and unidentified fragments.

Animal bone from ditches in Trench 15
Ditch group 15342 contained 107 fragments of animal bone recovered from four interventions. The remains included cattle, horse, pig, sheep or goat and a large bird long bone fragment with a further 70 fragments of large and medium mammal bones and 18 unidentifiable fragments. Cattle was represented by four tooth fragments and two scapula fragments from a minimum of one individual aged less than 24 to 30 months at death from two unerupted third molars. Horse was represented by fragments of left and right scapula (from a minimum of one individual aged over a year old at death). Pig was represented by a burnt cranial fragment and a molar tooth. The burnt pig bone is the only burnt bone from the ditch. Sheep or goat was represented by three loose teeth, fragments of innominate, left and right femur, humerus and first phalanx. The sheep or goat bones come from a minimum of two individuals, one aged less than 3.5 years old from fusion of the distal femur and the second aged over eight years old at death from tooth attrition. The sheep or goat femur is the only butchered bone from the ditch. It had a knife cut indicating that the leg had been disarticulated at the knee.

Ditch group 15334 contained 32 fragments of animal bone from contexts 15077 and 15078. These fragments comprised a cattle tooth, two sheep or goat teeth, long bone fragments (3 large mammal and 8 medium mammal) and 18 unidentified fragments including 15 rib fragments. No butchery marks were identified and no bone fragments were burnt.

Animal bone from gully groups in Trench 15
A total of 385 fragments of animal bone was recovered from ring gully groups 15330 and 15332 and gully groups 15331 and 15333. The assemblage included cattle, horse, sheep or goat, pig, frog or toad with further fragments identified as mammal size classes or unidentified (Table 7.27). Evidence of butchery was noted on 12 fragments of bone. Cattle femur, radius and long bone fragments found in gully group 15332 and four medium mammal long bone fragments from gully group 15330 had been broken

when fresh. Two medium or small mammal bone fragments found in group 15330 had been burnt.

Ring gully group 15330 comprised 43 fragment of animal bone including cattle, sheep or goat, large and medium mammal bone. Cattle was represented by a mandible, a maxilla, a maxillary tooth, a third phalanx and radius and scapula fragments. Large mammal long bone, mandible and indeterminate fragments may also be cattle. The cattle radius exhibited knife cuts indicating that it had been disarticulated from the humerus. Sheep or goat was represented by a mandible, three loose teeth, a radius and a metatarsal. Medium mammal long bone, alveolar and indeterminate fragments may also be sheep or goat. One medium mammal long bone had been broken when fresh and a second exhibited knife cuts. Two fragments of medium or small mammal bone from this gully group had been charred.

Gully group 15331 contained 90 fragments of animal bone including cattle, sheep or goat, pig, frog or toad, and fragments recorded as large medium or small mammal, or indeterminate. No butchered bones were recovered from this gully. The only burnt bone was a medium mammal long bone fragment. The cattle bones comprised four loose mandibular teeth, a radius fragment and a scaphoid carpal. Large mammal fragments comprised 19 tooth, mandible, petrous, rib, vertebra, scapula and indeterminate fragments. Pig was represented by a single third metacarpal from a young individual. Sheep or goat was represented by three loose teeth, left and right mandible fragments from different individuals, an axis, a hyoid, humerus, radius, calcaneum and metapodial fragments. Frog or toad bones comprised a humerus and radio-ulna.

Ring gully group 15332 contained 240 fragments of animal bone, more than any other gully in Trench 15. The animal bone included fragments identified as cattle, horse, sheep or goat and pig with further fragments identified as large mammal, medium mammal and unidentified. The only burnt bone was a medium mammal long bone. Two sheep or goat bones had cut marks and a cattle radius and femur and large mammal long bone had been broken when fresh. The cattle bone included 16 fragments of bone from a minimum of three individuals (from three right humeri). In addition to the humeri, four mandibular teeth, two mandible fragments, two radius fragments, and ulna, metacarpal, innominate, femur and metapodial fragments were identified. The horse bone was a fragment of left mandible. In addition to the horse and cattle bones, 24 bone fragments were identified as large mammal. These included mandible, humerus, vertebral, rib, long bone and indeterminate fragments.

A total of 55 sheep or goat elements were identified. These included mandibular and maxillary teeth (20 specimens), a mandible and maxilla fragment, a scapula fragment, five radius fragments (from a minimum of two individuals), two carpals, two innominate fragments, two tibiae fragments, and fragments of metatarsal, metapodial, and first, second and third phalanges. The innominate fragments had both been butchered, with knife cuts on the ilium and pubis indicating that the femur was disarticulated from the acetabulum. A total of 109 medium mammal bone fragments were recorded. These included cranial, mandible, vertebral, rib, long bone and indeterminate fragments.

Gully group 15333 contained only 12 fragments of animal bone comprising a cattle first phalanx, sheep or goat tooth, medium mammal cranial and long bone fragments, large mammal long bone, mandible, rib and indeterminate fragments and an indeterminate fragment. The large mammal indeterminate fragment had been butchered. No burnt bones were recovered from this gully fill.

The early Iron Age assemblage from Trench 19

A total of 546 fragments of early Iron Age animal bone were recovered from four gully groups, three pits and ten postholes in Trench 19 (Table 7.10). Species identified comprised cattle, sheep or goat, pig, horse, dog, small mammal, vole and microfauna.

Animal bone from early Iron Age pits in Trench 19

A total of 36 fragments of animal bone was recovered from pits 19002, 19013 and 19128 in Trench 19. Pit 19002 contained 14 fragments; a sheep or goat astragalus, large mammal cranial, flat bones, long bone and indeterminate fragments and unidentifiable fragments. Pit 19013 contained 20 fragments of bone; a cattle astragalus, two cattle teeth, a horse metapodial, a sheep or goat astragalus, tooth and metacarpal and medium and large mammal, and unidentified indeterminate and long bone fragments. Pit 19128 contained two medium mammal long bone fragments. No burnt or butchered bones were recovered from the pit fills.

Animal bone from early Iron Age postholes in Trench 19

Animal bone was recovered from ten postholes in Trench 19 (Table 7.26). Each posthole contained 1-20 fragments of bone weighing between 1 and 155 g. No burnt bones were recovered from posthole fills in Trench 19. Single teeth were recovered from postholes 19041 (sheep or goat) and 19171 (cattle). A cattle humerus fragment which had been broken while fresh was recovered from 19083. Posthole 19045 contained 20 fragments from a single large mammal scapula. Posthole 19177 contained a single medium mammal rib fragment and posthole 19042 contained seven indeterminate medium mammal bone fragments. Posthole 19047 contained a pig tooth and ten medium mammal bones (8 cranial and 2 long bone fragments). Posthole 19077 contained four medium mammal and one small mammal fragments. Posthole 19079 contained a horse tooth, medium mammal long bone and indeterminate fragments and an indeterminate fragment. Posthole 19081 contained the largest mass of animal bone. It included a cattle scapula, two medium mammal indeterminate fragments, and an indeterminate fragment. The only evidence for butchery in the bones from postholes was the fragment of cattle humerus from posthole 19083.

Animal bone from early Iron Age ditches in Trench 19

A total of 31 fragments of bone were recovered from the fills of ditch 19038. This included six cattle bone fragments (from a humerus, radius and mandible), a sheep or goat horn core and four medium mammal cranial fragments, 17 large mammal fragments including tibia, long bone, flat bone and indeterminate fragments and three unidentified bone fragments. The large mammal tibia fragment had been broken when fresh but no other butchery marks were identified in the ditch assemblage. No bone fragments had been burnt. The cattle ones were from a minimum of one individual. Epiphyseal fusion of the cattle bones indicates that an age at death of death of 1-4 years from the radius and over 3.5-4 years from the humerus.

Animal bone from early Iron Age gullies in Trench 19

A total of 421 fragments of animal bone were recovered from four gully groups; gully group 19011 and ring gullies 19183 (interventions 19009, 19027, 19037 and 19115), 19184 (intervention 19006) and 19189 (intervention 19126). Of this total, 352 (84%) were indeterminate.

Ring gully 19184 contained four medium mammal long bone fragments and 30 indeterminate fragments (28 of these were medium mammal sized).

Gully group 19011 contained seven refitted animal bone fragments. These comprised two cattle mandible fragments (possibly from the same bone), a portion of horse skull (broken into 123 fragments, weighing 349 g) and a lateral metapodial, a sheep or goat tooth, a large mammal axis fragment and a medium mammal long bone fragment. The horse skull suggests that this assemblage may include a placed deposit in the terminal of the gully. A medium mammal long bone fragment from this context which had been broken when fresh was the only butchered bone from early Iron Age gullies in Trench 19. The sheep or goat femur was from an animal aged less than 2.5-3 years old at death.

Ring gully group 19189 contained 55 fragments of animal bone including a horse radius, 11 large mammal long bones, a sheep or goat radius and 5 tooth fragments, 6 medium mammal long bones, a medium mammal skull fragment, 28 medium mammal indeterminate fragments and 2 indeterminate fragments. the horse radius was from an individual aged over 3.5 years old-at-death. The sheep or goat radius was from an individual aged over three years old at death.

Ring gully 19183 contained 325 fragments of animal bone, of which 274 (84%) were indeterminate and only 15 could be identified to species. Identified bones include fragments of sheep or goat femur, mandible and six loose teeth, cattle phalanx and two loose teeth, a pig tooth, a dog tooth and two vole teeth. Large mammal cranial, tooth, long bone and vertebral fragments, medium mammal cranial, tooth, long bone, sesamoid and vertebral fragments, and microfaunal long bone and vertebral fragments were also identified. The sheep of goat mandible was from an individual aged 5-8 years old at death.

The middle Iron Age animal bone assemblage

A total of 3016 fragments of animal bone were recovered from Middle Iron Age contexts in Trenches 13, 15 and 19. Features containing animal bone in Trench 13 comprised animal bone deposit 1302 in ditch group 1349, and fills 1309 and 1314 from the same ditch. Middle Iron Age animal bone in Trench 15 was recovered from pits 15254 and 15006 and from ditch group 15334, enclosure ditch group 15340 and its recut 15341. Features containing animal bone in Trench 19 comprise four pits (19019, 19050, 19055 and 19154), ditch 19185, ditch 19060 and ditch recut 19187.

Middle Iron Age contexts contained nearly all species identified on site; cattle, sheep, sheep or goat, pig, horse, dog, cat, lagomorph, weasel, mole, rat, vole, goose, bird, frog or toad, probable snake and fish. Cattle, sheep or goat and pig were the most common taxa identified. Taken as a proportion of their sum, cattle were represented by 47% of fragments, sheep or goats (including fragments identified as sheep) by 45% of fragments and pigs by only 8% of fragments. Element representation in the middle Iron Age assemblage is presented in Tables 7.11 to 7.13.

Mandibular tooth attrition could be used to estimate an age-at-death for 29 middle Iron Age sheep or goat, 18 middle Iron Age cattle and 2 middle Iron Age pig specimens (Tables 7.20, 7.22 and 7.24). The age at death data suggests that sheep or

goats died at a similar range of ages to the early Iron Age specimens. There is less evidence of the slaughter of animals aged one to ten months old than in the early Iron Age but many more individuals aged 20-34 months old. At least 14 specimens fall within this age range. Although there was no evidence for neonatal individuals from mandibular tooth attrition, foetal and neonatal sheep or goat bones were recovered from ditch fills 15015, 15203, 15271 and 15344, and pit fills 15252 in Trench 15; and from pit fills 19020 and 19114 in Trench 19.

Mandibular tooth attrition could be used to estimate an age-at-death for 18 middle Iron Age cattle specimens. Cattle were killed at a range of ages from 1-8 months old to senile. Half the ageable cattle specimens were from adults. No foetal or neonatal cattle were recorded. This mortality data suggests that although some cattle were used primarily for meat, others had a role in life such as traction or milk production.

Early Iron Age pigs were killed as juveniles, immature individuals and sub-adults. A foetal pig humerus was recovered from ditch fill 19109 in Trench 19.

The middle Iron Age assemblage from Trench 13

Ditch group 1349 contained 307 fragments of animal bone including cattle, horse, sheep or goat and vole, with further fragments identified as large and medium mammal (Table 7.11). No fragments has been burnt. The upper fill of the ditch (1302) included a deposit of at least six fragmented cattle mandibles (see below) together with other cattle limb bones, a horse tooth, sheep or goat teeth and large and medium mammal sized fragments.

Cattle

Cattle was represented by 105 fragments of bone from a minimum of three individuals. The cattle bone assemblage primarily comprised cranial and forelimb elements, although some innominate, calcaneum and metapodial fragments were also identified. The cattle bone assemblages included a deposit of at least six cattle mandibles, three left and three right. The right mandibles included one aged 1.5-3 years old at death (based on the eruption of its third and fourth premolar) and one aged adult to senile at death (based on tooth attrition). The left mandibles included one probably aged 2.5-3 years old at death (from a deciduous fourth premolar in wear stage m) and one from a senile individual (from a third molar in wear stage k). Fused scapula, metapodial and humerus fragments from the same deposit indicate animals aged over 7 -10 months, 2-2.5 years and 3.5-4 years old at death respectively.

Butchery marks were identified on four cattle elements, two mandibles, a humerus and an innominate. Both mandibles had knife cuts on the anterior margin of the hinge, indicating that the mandibles were disarticulated from the skull. The cattle innominate had cut and scrape marks on the ischium, suggesting that the femur was disarticulated from the pelvis. Both mandibles and the innominate were recovered from animal bone deposit 1302. The humerus had had its distal diaphysis chopped off. This butchery was aimed at either dividing the limb or accessing the bone marrow.

Sheep or goat

Sheep or goats were represented by six bone fragments; two teeth and four tibia fragments from a minimum of three individuals). One tibia was unfused distally indicating that the animal was younger than two years old at death. Tooth wear indicated that one animal was over three months old at death. The three tibiae were all from the left side. Two had been butchered. One tibia had a small diagonal cut on the lateral distal diaphysis and possible scrapes down the dorsal/lateral diaphysis, the bone had also been marrow fractured. These butchery marks suggest that meat was filleted of the bone prior to marrow fracturing. The scrape marks may relate to scraping off the periosteum to aid breaking the bone. The second tibia also had a diagonal cut on the lateral distal diaphysis.

Horse
Horse was represented by a single mandibular tooth.

Medium and large mammals
A total of 170 large mammal and 15 medium mammal bone fragments were recovered from trench 13. Many of these fragments were probably part of the identified cattle, horse and sheep or goat bones.

The middle Iron Age assemblage from Trench 15

A total of 1521 fragments of animal bone were recovered from pits and ditches in Trench 15 (Table 7.12). Taxa identified include cattle, sheep, sheep or goat, pig, dog, horse, goose, bird, weasel, mole, rat, vole, probable snake, frog or toad and fish. a pig astragalus, sheep or goat calcaneum and metatarsal and 21 further large and medium mammal bones had been burnt.

Cattle
Cattle was represented by 87 fragments of bone from a minimum of four individuals (from four right humeri and mandibles). All regions of the cattle skeleton were represented but hind limb bones were uncommon. Butchery marks were identified on five cattle bones and a further four fragments (a humerus, tibia, radius and scapula fragment) were broken when fresh. The butchery marks indicate that a blade was used to disarticulate the carcass rather than chopping through the bones. A hind foot was removed at the tarsal joint (marks on a navicular-cubiod and a metatarsal) and the forelimb was portioned at the elbow (two butchered humeri). A pubis had cuts on both faces which may have resulted from portioning or meat removal.

Sheep and sheep or goat
Sheep were represented by four fragments of bone, a further 127 fragments were identified as sheep or goat. The fragments originated from a minimum of six individuals (from six left mandibles). Mandibular tooth attrition suggests that three individuals were three to ten months old at death, one was aged three to five years old, one was aged over eight years old and the remaining sheep or goat survived to over ten months old at death.

Butchery marks were identified on eight fragments of sheep or goat bone. The butchery marks comprised cut marks resulting from disarticulating the knee (on a distal humerus), hip (on an ilium) and the ankle (on a calcaneum). The ilium also had cuts on its blade relating to disarticulating the sacrum from the pelvis. Two tibia fragments and a femur fragment had been broken while fresh and two radius fragments had had their diaphyses chopped diagonally.

Pig
Pigs were represented by 15 fragment of bone from a minimum of two individuals (from two mandibles). Tooth attrition suggests that one individual was immature and the second was subadult. Butchery marks were identified on an astragalus indicating that the foot had been disarticulated at this point. A humerus had also been broken while fresh.

Dog
Dogs were represented by eight fragments of bone and teeth from a minimum of one individual. No butchery marks were identified on the dog bones.

Horse
Horse was represented by a minimum of seven fragments including cranial fragments, teeth, an atlas vertebra and forelimb elements. Fusion of the radius and humerus suggest that the horse was over 15-18 months old at death. The atlas exhibited butchery marks indicating that the horse had been decapitated.

Birds
A goose humerus was recovered from ditch 15181. Two further bird long bones were recovered from ditch group 15341 but neither could be further identified.

Fish
A fish cranial fragment was recovered from ditch group 15340. The fish bone could not be further identified.

Microfauna
Mole, vole, rat, weasel and probable snake together with fragments identified as rodent and microfauna were also recovered from middle Iron Age contexts in Trench 15.

The middle Iron Age assemblage from Trench 19

A total of 1168 fragments of animal bone were recovered from middle Iron Age pits gullies and ditches in Trench 19 (Table 7.13). Taxa identified include cattle, sheep and sheep or goat pig, dog, horse, cat, rabbit or hare and microfauna. Very few burnt

bones were recovered. One cattle, one sheep or goat and eighteen large mammal, medium mammal and unidentified fragments had been burnt.

Cattle

Cattle was represented by 76 fragments of bone from a minimum of two individuals (from two left and two right humeri). Cattle remains included all skeletal regions with an overrepresentation of forelimb bones, particularly humeri, mandibles and loose teeth. No *in situ* teeth survived in the mandibles to assess attrition based age-at-death but a loose third molar was from an adult individual. Bone fusion indicated that at least one individual was over 3.5-4 years old at death (from a fused proximal humerus and distal radius), a second individual may have been less than 3-3.5 years old at death (from an unfused calcaneum). Alternatively, these bones may be from the same individual aged approximately 3.5 years old. A middle Iron Age cattle phalanx was pathological (see above). One cattle patella was charred.

Horizontal cut marks were identified on a cattle metacarpal indicating that the fore foot was removed at this point. Two humerus, one radius and one metatarsal fragment were broken while fresh, indicating that their marrow was probably utilised.

Sheep and sheep or goats

Sheep were represented by two teeth and sheep or goat were represented by a further 117 fragments of animal bone from middle Iron Age contexts in Trench 19. Sheep or goat bones included elements from all regions of the skeleton with a very high proportion of mandibles and loose teeth. The sheep or goat bones derived from at least five individuals, at least one of which was a neonate. Mandibular tooth attrition and eruption indicated that at least one individual was 21 to 24 months old at death, one was 20 to 30 months old and one was five to eight years old at death.

Butchery marks were uncommon in sheep or goat bones. A radius and a long bone fragment had been broken when fresh, probably in order to utilise the bone marrow. A fragment of unfused distal tibia diaphysis had a circular hole through the centre of the metaphyseal bone. The function of this hole is unclear but it may have been to access the bone marrow or have been created during bone working.

Pig

Pigs were represented by 31 fragments of bone from a minimum of two individuals, one aged less than a year old (based on an unfused distal humerus) and one aged over two years old at death (based on a fused first phalanx). A canine tooth was from a male individual. The only evidence of butchery was a radius fragment which had been broken when fresh. The other pig elements were three maxilla fragments, five mandible fragments, 14 loose teeth, two scapula fragments and four further phalanges.

Dog

Dogs were represented by seven elements including a left mandible, maxilla and premaxilla, three incisor teeth and a third metatarsal. All elements may have come from a single individual. Tooth eruption in the mandible indicated that the dog was

aged over six to seven months old at death. Metric data indicates that it was quite a large animal.

Horse
Horses were represented by 12 fragments of bone from a minimum of two individuals (from two right innominates). Horse bones comprised nine fragments of innominate, a metatarsal, a first phalanx and a tooth. At least one individual was aged over 1.5-2 years old at death. No butchery marks were identified on horse bones in Trench 19.

Cat and rabbit or hare
A single cat mandibular canine was recovered from ditch group 19060. This tooth is the only evidence for cats from the site. The tooth may be intrusive, but if not it indicates that there were cats at the site in the middle Iron Age. A single rabbit or hare skull fragment was recovered from gully 19185. It is not clear whether this bone is an intrusive rabbit bone or is hare, bones of which are occasionally found in Iron Age deposits. No definite hare elements were recovered from the site. A further four small mammal ribs and a long bone fragment may be rabbit, hare or cat. No butchery marks were identified on any small mammal bones.

Microfauna
A possible rat caudal vertebrae, a vole tooth, and two vole femora were recovered from middle Iron Age contexts in Trench 19 together with eight microfaunal long bones.

Medium and large mammals
A total of 175 fragments were identified as large mammal, 412 were identified as medium mammal and eight were identified as large or medium mammal. As might be expected, most large and medium mammal bones were cranial, vertebral or long bone. the relative proportion of identified species suggests that most of these were probably cattle, sheep or goat. Butchery marks were identified on three large mammal long bone fragments and one large mammal rib fragment. the long bone fragments had been broken when fresh and the rib exhibited fine knife cuts characteristic of meat removal.

The Iron Age animal bone assemblage

A total of 36 bone fragments were recovered from unphased Iron Age contexts in Trenches 15 and 19 (Table 7.14). The majority of these fragments could not be identified to species, but fourteen were from sheep or goat. The unphased Iron Age animal bones were recovered from pit 15236 in Trench 15, pits 19089 and 19173 and posthole 19163 Trench 19.

The late Iron Age to early Roman animal bone assemblage

A total of 112 fragments of late Iron Age to early Roman animal bone were recovered from the fills of ditch 15337 in Trench 15. The assemblage included cattle, pig, sheep or goat and horse bone fragments together with fragments identified as large or medium mammal (Table 7.15). The cattle, pig and horse bones represent a minimum of one individual, the sheep or goat bones derive from a minimum of three individuals. Cattle bone comprised teeth and limb fragments, further skull, rib and pelvis fragments were identified as large mammal. The cattle radius and ulna articulated suggesting that they were from the same animal and possible deposited as one unit. Sheep or goat bone comprised mandible, tooth and limb bone elements while pig bones were limited to a skull fragment, a humerus fragment and second phalanx. A calcaneum was the only horse bone identified in this feature. Further skull, long bone, phalanx and unidentified medium mammal fragments may have been pig, sheep or goat. One large mammal long bone fragment had been charred. The same bone exhibited a heavy chop mark. Additional butchery marks were noted on a second large mammal long bone with fine cut marks, and cattle femur and humerus fragments which had been broken while fresh.

Age-at-death determined by tooth wear and bone fusion indicated that the sheep or goat bone assemblage included remains from at least three individuals; a neonate, an individual aged 24-30 months old at death and an individual aged 36-60 months old at death. The cattle bone included a freshly fused distal tibia indicating that the animal was aged approximately 30-36 months old at death.

The Roman animal bone assemblage

A total of 513 fragments of animal bone were recovered from Roman contexts in Trenches 13 and 15 (Table 7.16). Features containing animal bone comprised the fills from the Roman recut enclosure ditch in Trench 13 (1306, 1308, 1310, 1311, 1313 and 1324) and the fills of ditches 15336 and 15339, gully 15338 and pit 15176 in Trench 15. The assemblage included cattle, sheep, sheep or goat, pig, horse, dog, red deer, vole and frog or toad fragments together with fragments identified as large, medium and small mammal and microfauna (Table 7.15). Cattle, sheep or goat and pig were the most common taxa identified. Taken as a proportion of their sum, sheep or goats (including fragments identified as sheep) were represented by 58% of fragments, cattle by 35% of fragments and pigs by only 7% of fragments.

The Roman assemblage included five ageable sheep or goat mandibular tooth specimens. Two were very young (less than one month old), one was 3-10 months old, one was 30-20 months old and one was 10-20 months old. Gully fill 15142, in Trench 15, contained neonatal sheep or goat femora, humerus and metapodial fragments possibly from an articulated deposition. Two cattle specimens could also be aged, one was from a senile individual and the other was adult or senile at death. These cattle were probably kept for traction, breeding or milk prior to slaughter.

The Roman assemblage from Trench 13

The recuts of the enclosure ditch in Trench 13 contained 186 fragments of animal bone including cattle, horse, sheep or goat, red deer, vole and frog or toad bones. One large mammal unidentified bone and two indeterminate bones had been burnt.

Cattle
Cattle was represented by eight fragments including three mandibular fragments, two loose teeth an axis, an innominate and a tibia fragment. These elements were from a minimum of one individual. The innominate exhibited butchery (see above). No pathology was noted.

Sheep or goat
Sheep or goat was represented by nine fragments of bone including six horn core fragments, two loose teeth and a calcaneum. No pathology or butchery was noted.

Horse
Horse was represented by five fragments of bone including fragments of a mandible, cervical vertabra, humerus, femur and second phalanx from a minimum of one individual. The distal epiphysis of the femur had fused shortly before death indicating that the animal was probably around 3-3.5 years old at death. The cervical vertebra exhibited pathology (see above). No certain butchery marks were identified although the femur may have been broken when fresh.

Red deer
Red deer was represented by a single lunate carpal. The bone was in very good condition with no evidence of butchery or pathology. Carpals have little attached meat value; this bone may have been brought to the site articulated to other bones in a joint of meat or perhaps attached to a deer skin.

Medium and large mammal bones
A total of 11 medium mammal fragments and 102 large mammal fragments were recovered from Roman contexts in Trench 13. The medium mammal fragments were restricted to rib and long bone fragments but the large mammal remains included ribs, vertebrae, teeth, long bones and unidentified fragments. Only large mammal rib exhibited pathology (see above). No butchery marks were noted.

The Roman assemblage from Trench 15

The fills of ditches 15336 and 15339, and gully 15338 contained 183 fragments of animal bone including cattle, sheep, sheep or goat, pig, horse, dog, large and medium mammal bone. Pit 15176 contained a sheep or goat first and second phalanx and a medium mammal sized rib fragment. The animal bones from the ditch deposits are discussed below.

Cattle
Cattle was represented by 29 fragments of bone from a minimum of one individual. The fragments comprised cranial fragments, including ten loose teeth, fore limb bones and an astragalus from the hind limb. Four cattle bones exhibited butchery marks, all knife cuts. A left and a right humerus had fine knife cuts on their anterior region of

the medial distal diaphysis, probably from disarticulating the elbow, a metacarpal had horizontal cuts at the proximal end, also suggesting disarticulation of the joint and a mandible had cuts on the lateral hinge and the coronal process had been chopped off, these butchery marks suggest the removal of the mandible from the skull. Age-at-death data from the cattle bone assemblage indicated that one animal was approximately 3.5-4 years old at death (from a freshly fused distal radius), the prime age to kill cattle for their meat. Fusion of other elements suggested ages of over seven to ten months, over 12 to18 months, over 24 to 30 months and under 42 to 48 months old at death. No ages-at-death could be determined from tooth wear.

Sheep and sheep or goat
A mandible and a loose tooth were identified as sheep. A total of 50 further fragments were identified as sheep or goat. The sheep or goat bones were from a minimum of three individuals (from three left tibiae). Sheep or goat element representation included cranial elements, including ten loose teeth, and limb bones. Bone fusion indicated that at least one individual was a very young neonate with two unfused metapodial fragments and neonatal humerus, femur fragments. This neonate may have been an articulated deposition. At least one individual was over three years old at death from a fused distal radius. Tooth attrition can be used to suggest that the sheep mandible and loose tooth were from individuals ages less than a month and three to ten months old at death while sheep or goat tooth attrition indicate a neonate and a three to 20 (possibly 10-20) month old individual were present. A sheep or goat humerus and two radii had been butchered. The humerus had two fine knife cuts from dismemberment or meat removal on the posterior distal diaphysis. One radius had been broken while fresh to access the bone marrow while the other had four fine knife cuts on the posterior diaphysis which may also be from dismembering the elbow.

Pig
A total of eight bone fragments were identified as pig including cranial fragments, a scapula, a metapodial and two phalanges from a minimum of one individual. The scapula had been butchered with three fine meat filleting cuts identified. Fusion of the phalanges and metapodial indicated an age-at-death of less than a year old and less than 27 months old respectively.

Horse
Horse was represented by a mandible fragment and a femur fragment. The femur had been butchered, with scrapes from meat removal identified on the edge of the supracondyloid fossa. Horse was not commonly butchered in Roman Britain (Maltby 1981, 184); the meat was not necessarily removed for human consumption and may have been fed to other animals.

Dog
Dog was represented by a left radius and a metatarsal fragment. The radius was from an individual aged over 11-12 months old at death and the metatarsal was from an individual older than ten months at death. No pathology or butchery was noted.

Medium and large mammal bones
A total of 60 large mammal and 139 medium mammal sized bones were recovered. The large mammal bones included cranial elements, ribs, ulna and innominate fragments together with fragments of flat bones and long bones. The medium mammal assemblage included mandible, rib, vertebra, humerus and long bone fragments. Some medium and large mammal long bone fragments had been broken when fresh, possibly to access the bone marrow. No further butchery marks were identified.

The post-medieval animal bone assemblage

A total of 28 fragments of post-medieval animal bone were recovered from furrow fill 15009 in Trench 15, colluvium 1801 in Trench 18 and alluvium 11001 in Trench 11 (Table 7.17). See Chapter 13 for details of the bone from Trench 11. A cattle tooth was recovered from colluvium 1801 in Trench 18. The animal bone from the furrow fill comprised a cattle second phalanx, a sheep or goat first phalanx and tooth, a pig tooth, a dog tooth, large mammal, medium mammal and unidentified fragments. No butchery marks were identified. Bone fusion suggests that cattle and sheep phalanges from furrow fill 15009 were from individuals aged at over 1.5 years and less than 13-16 months old at death respectively. A cattle tooth from colluvium 1801 was from a senile individual.

The modern animal bone assemblage

A total of 240 fragments of modern animal bone were recovered from topsoil in trenches 13, 14 and 15 (contexts 1300, 1411 and 15000) plough soil 1302 in Trench 13, and the fill of an animal burrow disturbing earlier contexts in Trench 15 (context 15223). Cattle, horse, sheep or goat, pig and dog bones were included in the assemblage. No further data analysis was conducted on the modern material but the fragments are recorded in full in the archived database and the species and element distribution presented in Table 7.18.

The faunal economy of Castle Hill environs

The animal bone assemblage excavated in Trenches 13-15 and 18-19 provides evidence of animal utilisation in the environs of Castle Hill from the late Bronze Age to Roman periods, with further evidence from post-medieval and modern animal bones. The late Iron Age or early Roman period is less well represented than other phases. Throughout the Prehistoric and Roman periods represented, the faunal economy was dominated by the bones of domestic mammals, predominantly cattle, sheep or goat and pig (domestic meat taxa). Horses were also present in all the Prehistoric and Roman periods, and dogs were present in all periods except the late Iron Age to Roman contexts. A single cat tooth was recovered from a middle Iron Age context. The relative proportions of cattle, sheep or goat and pig bone fragments varied throughout the periods considered (Table 7.28 and Figure 7.3). Pig bone fragments were relatively uncommon throughout the use of the site, they represented 7-9% of fragments in the late Bronze Age, Middle Iron Age and Roman periods but

were slightly more significant in the early Iron Age when they made up 12% of fragments from domestic meat taxa. The proportion of domestic meat taxa bone fragments identified as cattle was 47-51% in the late Bronze Age and middle Iron Age but only 33-35% in the early Iron Age and Roman periods. Conversely sheep or goat bones were most common in the early Iron Age and Roman periods (55-58%) and slightly less common in the late Bronze Age and middle Iron Age (40-45% of domestic meat taxa fragments). If the minimum numbers of individuals (MNI) represented is considered rather than the number of identified specimens (NISP), the picture portrayed is different (Table 7.28 and Figure 7.3). The MNI data suggests that pigs were as frequent on site as cattle in the late Bronze Age but of lesser importance in the later periods. The presence of cattle remains fairly constant throughout time but sheep become increasing prevalent during the Iron Age.

Only the sample sizes for early and middle Iron Age NISP and early Iron Age MNI are large enough to allow for reliable comparison with other sites (following Hambleton 1999, 39). The MNI sample for middle Iron Age domestic meat taxa is only four individuals below Hambleton's minimum threshold of 30 MNI. If the relative proportions of species are compared with other contemporary sites in Britain, they fall into the general pattern recognised elsewhere (Hambleton 1999, 57). However, in the early Iron Age those occupying the area around Castle Hill had a relatively low proportion of cattle and a relatively high proportion of sheep and pigs. In the middle Iron Age they had a relatively low proportion of sheep and goats. If the early and middle Iron Age remains are compared with others found in the Upper Thames Valley, the relative proportion of species (NISP) falls into the general pattern exhibited elsewhere in the region.

Although the herd sizes of cattle and sheep may have varied through time, throughout the occupation of the site it is likely that beef made a greater contribution to the diet than mutton or lamb due to the relative size of the animals.

Both sheep and goats were utilised in the early Iron Age. Sheep were also utilised in middle Iron Age and Roman periods. No fragments could be distinguished to either sheep or goat in the remaining periods. Domestic fowl are known from British archaeological contexts from the middle or late Iron Age onwards. Birds played only a very small role in the animal economy around Castle Hill and there is no evidence for the utilisation of domestic fowl on the settlement outside the hillfort. The only potential evidence for domestic birds is a goose humerus recovered from a middle Iron Age ditch. This goose could be domestic or wild. A further nine bird bone fragments were recovered from early and middle Iron Age contexts but none could be identified to species. One early Iron Age bird bone had been butchered indicating that birds were sometimes eaten.

There is very little evidence for the utilisation of wild faunal resources. This is in common with the general picture of Iron Age economies in Britain (Hambleton 1999). The only evidence for the hunting of wild birds is a possibly articulated duck wing (probably mallard) recovered from early Iron Age pit 15305 in Trench 15. Unfortunately, this pit was truncated by a middle Iron Age ditch destroying any potential evidence for further wild bird utilisation.

There is no solid evidence for wild mammal hunting. The only wild mammal remains are early Iron Age red deer antler and a Roman red deer lunate carpal. The antler may have been traded as a resource, as it had been discarded when partially worked. The carpal may have been brought into the site attached to a deer skin or perhaps as a curated object. Other animal bones are known to have been curated in the Roman period and are sometimes interpreted as amulets (Meany 1981). There was no

evidence for wild boar in the pig bone assemblage, although domestic and wild pigs can be hard to distinguish. No suitable measurements were available to distinguish the species osteometrically (following Payne and Bull 1988, Magnell 2006). A wolf calcaneum was recovered from late Bronze Age layer 1435. The calcaneum showed no evidence of having been butchered and its presence is unexplained. Like the deer carpal it may have been curated, but there is no evidence of surface modification through handling. Curiously, in later periods, canid feet were kept as an amulet to prevent illness (Meany 1981). A more mundane explanation for the presence of the wolf bone may be that it is all that may have been recovered from an animal killed to protect the late Bronze Age herds and flocks.

There is evidence for fishing in the early and middle Iron Age contexts. Unfortunately, the small number of fish bone fragments could not be identified to species. Fish bones are not commonly found on Iron Age sites in Britain but were also identified in small numbers from excavations on Castle Hill (see Chapter 4).

Animal husbandry

Throughout the use of the site, the element representation of domestic mammal bones includes those regions which are normally removed in the first stages of butchery. This indicates that the complete animals were present on site rather than imported meat portions. Perhaps the easiest way to trade meat in prehistoric periods was to transport it 'on the hoof'. The presence of neonates and foetal animals in the faunal assemblages can be used to suggest that sheep or goats were bred in the vicinity of the hillfort in the early Iron Age, middle Iron Age and Roman periods, that pigs were also bred in the early and middle Iron Ages and that cattle were bred in the early Iron Age. There is thus no evidence that animals of any of these species were brought into the site rather than bred and raised there.

Although only a relatively small amount of evidence for age-at-death was recorded, the mortality profile of domestic animals suggests that domestic animals were utilised for multiple products (such as meat, milk, wool, traction and horn).

Cattle epiphyseal fusion data suggests a slight general decrease in the age-at-death of cattle from the late Bronze Age through to the middle Iron Age (Table 7.19). However, mandibular tooth attrition data can be used to indicate that a higher frequency of older cattle were present in the middle Iron Age than in the early Iron Age assemblage (Table 7.20). It is likely that cattle were utilised for milk and or traction as well as meat. Evidence of osteoarthritis on a late Bronze Age cattle bone, and possibly early Iron Age cattle bones, and a splayed early Iron Age cattle metacarpal, can also be interpreted as indicating that the animals were used for traction.

Sheep or goat bone fusion suggests a higher proportion of lambs being killed in their first year in the middle Iron Age than the early Iron Age, although the sample sizes are very different for these two periods (Table 7.21). Sheep or goat tooth attrition can be used to suggest the opposite pattern, with a much higher proportion of early Iron Age sheep or goats killed in their first year (29% as opposed to 17% of middle Iron Age) and 69% of the middle Iron Age specimens killed at over 20 months old (only 32% of early Iron Age) (Table 7.22).

Pig bone fusion suggests that only animals aged less than 2.5 years old at death were present in the early and middle Iron Ages, mandibular tooth attrition indicates that animals were killed from juvenile to sub-adult (Tables 7.23 and 7.24).

The prime motivation for keeping pigs is meat production, although they can also be used for by products and manure.

There is very little evidence for the sex of animals present on site from sexually dimorphic characteristics or osteometry. The bone assemblage did not include enough measurable bones to comment on changes in animal size or investigate herd structure through size. Where it was possible to calculate a withers height, however, the animals were within the expected size ranges for the time.

OYSTER SHELL

by Adam Partington

Introduction

A total of 21 (66 g) fragments of shell were discovered during excavations at Little Wittenham, including oyster, bivalve and freshwater mussel species (Table 7.35). Shells were broadly identified into three different categories: Oyster, Mussel and Bivalve. Seven fragments came from Trench 14, four of which were identified as bivalve, and the remaining three as oyster shell. Fourteen fragments came from Trench 15, four of which were identified as 'bivalve', one as freshwater mussel, and nine as oyster shell.

Provenance

The seven shell fragments in Trench 14 came from the top layer (1401 = 1404) of an early Iron Age midden. In Trench five of the 15 shell fragments were recovered from the topsoil, one oyster fragment from the top fill of each of early to middle Iron Age ditches 15072, 15077 and 15163, and a further oyster shell from the top of middle Iron Age ditch 15341, from cut 15107. Four bivalve fragments came from the lower fills (15036, 15037) of pit 15010, and a single, almost complete freshwater mussel shell from the fill (15300) of pit 15301.

Discussion

Due to the fragmentary and dispersed nature of the shell finds, the overall significance of the assemblage is low. The recovery of bivalve fragments from Iron Age pit fills (15036, 15037, 15300) is notable as shellfish are not a common component of Iron Age diet. Bivalve shells were, however, also recovered from the top fill of an Iron Age pit on Castle Hill (see Chapter 4). The presence of oyster shells in upper Iron Age pit and ditch fills (15072, 15106, 15077, and 15163), and in the uppermost Iron Age midden layers (1401, 1404) is likely to represent the incorporation of intrusive Roman material from the overlying horizon through later ploughing.

CHARRED PLANT REMAINS
by Wendy Smith, Mark Robinson and Ben Harrold

A total of 57 samples for charred plant remains were collected from Trench 15, six of which were considered suitably rich to merit further analysis (Robinson 2005). This report presents the results for the six samples recovered from early to middle Iron Age pit deposits, which have been phased as follows (Table 7.36):

Full analysis of the samples from Trench 15 allows us to examine to following issues:

- what cereal crops were in use? and did this change over time?
- does this assemblage provide information on crop processing activities?
- does this assemblage provide information on cultivation conditions?
- does this assemblage provide information on the surrounding environment?
- does this assemblage provide information on patterns of rubbish disposal on site?

Method

Samples were collected from sealed deposits and were processed by Oxford Archaeology environmental officers, using water flotation. The flots (the material which floats on the water's surface) were sieved to 250µm and the heavy residues (the material which does not float) were wet sieved to 500µm. Both the flots and heavy residues were air dried at room temperature. The Oxford Archaeology environmental officers examined the heavy residues for charred plant remains, but only charcoal was observed.

Ben Harrold sorted the flots for charred plant remains using a low-power binocular microscope at x10–x20 magnification. In all cases, 100 % of the flot was sorted for charred plant remains. Identifications were made at magnifications between x10 and x45, under the supervision of Professor Mark Robinson and in comparison with the Oxford University Museum of Natural History's archaeobotanical reference collection. Nomenclature for the plant remains follows Stace (1997) for indigenous species and Zohary and Hopf (2000) for cultivated species. The traditional binomial system for the cereals has been used here, following Zohary and Hopf (2000, 28, Table 3 and 65, Table 5).

Results

The charred plant remains recovered from Trench 15 are listed by period in order of sample number in Tables 7.37. The summary of the main categories of plant remains is presented in Table 7.38 and in Figure 7.4.

The deposits were comprised a mixture of cereal grain, cereal chaff and weed/ wild plants. These types of remain are typical of most charred archaeobotanical assemblages and most likely represent crop processing activities (e.g. Jones 1988, 44). Trench 15 samples are generally of a mixture of cereal grain, cereal chaff and weed/ wild plant seeds, with the exception of sample 15002, which is rich in cereal chaff.

Hulled barley (*Hordeum* sp.) and spelt wheat (*Triticum spelta* L.) appear to be the main cereals cultivated, although small quantities of possible emmer grain (*Triticum* cf. *dicoccum* Schübl.) and/or chaff fragments have been identified from Trench 15. The majority of weed/ wild plants recovered typically occur as weeds of arable field and/or cultivation; however, there are some taxa present which suggest damp or even wet conditions. In addition, there is limited evidence for hedges or scrub.

Discussion of the charred plant remains from Trenches 3, 4 and 6 (Castle Hill; see Chapter 4) and Trench 15 (Castle Hill environs; this chapter)

The late Bronze Age enclosure ditch (sample 606) sample was almost entirely charred cereal grain (N = 95.9 %). The Iron Age post-hole (sample 604) and all the Iron Age pit samples from Trenches 3, 4 and 6 are also dominated by charred cereal grain, but they also contain small quantities of cereal chaff and sometimes fairly sizeable assemblages of charred weed/ wild seeds (ranging from 18.5 % to 29.5 % of all identifications). The early – middle Iron Age pit (sample 304), however, was contained a fairly even mixture of charred weed/ wild seeds (54 %) and cereal grain (42 %), with a small quantity of cereal chaff (4 %) also present. Trench 15 Iron Age pit samples contain a more even mixture of cereal grain: cereal chaff: weed/wild seeds; however, the middle Iron Age deposit (sample 15002) is strongly dominated by spelt glume/ glume bases and indeterminate emmer/ spelt glume/glume bases, accounting for 83.3 % of all identifications from this sample.

There is no apparent difference in the composition of samples between pits dating to the late Bronze Age, early Iron Age, transitional early–middle Iron Age or middle Iron Age. This suggests that throughout the period of site occupation hulled barley and spelt were the main cereal crops cultivated. This also compares favourably with the Iron Age results from nearby Hill Farm (Chapter 10).

In terms of taphonomy, it is likely that all the samples represent secondary deposition of charred plant remains. Use of cereal processing waste as fuel is well attested (Hillman 1981, 1984) and disposal of spent fuel into pits seems the most likely explanation for the arrival of this material on site. The fairly pure deposit of charred cereal grain in the late Bronze Age enclosure ditch, however, may not necessarily represent spent fuel, but instead could either represent accidental charring of grain during food preparation/ processing or intentional deposition, although nothing 'structured' was observed about this particular deposit.

Early Medieval pit deposits from Trenches 4 and 6 are almost entirely cereal grain. In both cases the majority of wheat grain identified was a short-grained free-threshing variety. Sample 405 also contained a large quantity of hulled barley grain. Two deposits are not likely to be representative of the full range of activities in the Early Medieval period. In addition, the limited recovery of cereal chaff and weed/ wild seeds; however, means that it is not possible to discuss these samples further.

The charred plant remains from late Bronze Age through middle Iron Age deposits at Castle Hill, Little Wittenham provide evidence for the type of cereal cultivation, cereal crop processing activities and cultivation conditions. They also provide limited evidence for either hedges or scrub woodland in the vicinity. Finally, there is an interesting difference in the general pattern of dominance between the Hill Farm (Chapter 10) and the Castle Hill Trenches 3, 4 and 6 and Trench 15 samples,

which may relate to the location of cereal processing activities and/or deposition activities on site.

Cereals cultivated in the Iron Age

In terms of cultivation of cereal, spelt (*Triticum spelta* L.) or indeterminate emmer/ spelt (*Triticum dicoccum* Schübl./ *spelta* L.) were most frequently recovered. Both grain and glume/ glume bases were securely identified as spelt. As a result, it seems likely that spelt was the main wheat crop cultivated. In addition, hulled barley (*Hordeum* sp.) grains were frequently recovered. Preservation of twisted barley grain and clear six-rowed barley (*Hordeum vulgare* L.) rachis nodes was suggests that six-rowed barley was cultivated.

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

Cereal crop processing activities

It is not possible to claim that the pits sampled are fully representative of cereal processing activities taking place on site during the late Bronze Age through middle Iron Age; nevertheless, the consistent recovery of samples dominated by charred cereal grain in Trenches 3, 4 and 6 does suggest accidental burning of a cereal processing product or in food preparation. The more mixed deposits from Trench 15 are somewhat harder to interpret and may simply represent a mixture of separate deposition events related to cereal processing and/or food preparation.

The ubiquity of barley grain the pit and post-hole samples from Castle Hill; however, does suggest that barley was also likely to have been cultivated throughout the late Bronze Age through middle Bronze Age phase of the site. Because crop processing of hulled barley grain requires the removal of the awn, a process known as hummelling (e.g. Hillman 1985, 20; Langer and Hill 1991, 67), before consumption by animals or humans. It is, perhaps, not unsurprising that barley was not found in large quantities in deposits clearly dominated by spelt wheat, except in the case of sample 414 where a fairly even mix of barley and spelt grain was recovered. It is plausible that this sample simply represents an extremely mixed deposit, representing any number of separate crop processing/ food processing events; which have ultimately been deposited, or indeed re-deposited, into this pit feature.

Cultivation Conditions

The weed/ wild plants recovered from Hill Farm, Little Wittenham frequently occur as weeds of arable crops (see Tables 1–2, column 2). This includes such taxa as

brome (*Bromus* spp.), chickweed (*Stellaria media*), cleaver (*Galium aparine*), corn gromwell (*Lithospermum arvense*), fat-hen (*Chenopodium* spp.), fumitory (*Fumaria* spp.), knotgrass (*Polygonum aviculare*), wild or cultivated oat (*Avena* spp.), orache (*Atriplex* spp.), scentless mayweed (*Tripleurospermum inodorum*) and thorow-wax (*Bupleurum rotundifolium*). In addition, vetch/ vetchling (*Vicia* spp./ *Lathyrus* spp.) typically occur in either arable fields or in grassland (e.g. Stace 1997); however, it is rarely possible to identify these to species level (e.g. Butler 1996).

A few of the taxa (such as *Eleocharis* spp., *Schoenoplectus lacustris* and *Carex* spp.) recovered suggest cultivation in areas with damp or even seasonally flooded soil conditions.

Limited evidence for scrub or hedges

Two hazel (*Corylus avellana*) nutshell fragments from sample 317 (Trench 3) and one hawthorn (*Crataegus monogyna*) haw from sample 15018 (Trench 15) provide extremely limited evidence for the presence of scrub or hedges in the vicinity of the site.

Comparison with other Iron Age results in Oxfordshire

Iron Age samples from Oxfordshire sites at Ashville Trading Estate, Barton Court Farm and Farmoor studied by Martin Jones (1978, 1984; Robinson *et al*. 1979) had assemblages frequently dominated by spelt wheat grain and chaff or including mixtures of spelt and hulled barley grain and chaff; all with remarkably similar weed floras. Taxa such as brome (*Bromus* spp.), chickweed (*Stellaria media*), cleaver (*Galium* spp.), oat (*Avena* sp.), scentless mayweed (*Tripleurospermum inodorum*) and vetch/ vetchling (*Vicia* spp./ *Lathyrus* spp.) are frequently present in deposits from these sites. Results from slightly further afield at the Cleeve–Didcot Pipeline (Carruthers 1990); Oxford Road, Bicester, Oxfordshire (Pearson 1997); Slade Farm, Bicester, Oxfordshire (Monckton 2000) are less similar, both in terms of weed flora and composition of cereal remains. All three sites produced deposits primarily dominated by cereal chaff, especially spelt glume bases and spikelet forks.

Conclusions

The late Bronze Age through middle Iron Age post-hole and pit samples analysed from Castle Hill, Little Wittenham appear to be part of a remarkably consistent pattern of disposal of crop processing products and/or by-products related to the cultivation of spelt in Oxfordshire. However, these deposits are much richer in cereal grain. The weed flora from the Castle Hill sites contained a range of taxa typical of arable cultivation with a few indicators for damp to wet soil conditions. Limited evidence for scrub or hedges in the Iron Age is possible with the recovery of a small quantity of hazel and hawthorn remains.

POLLEN AND PHYTOLITHS FROM TRENCH 14
by Adrian Parker

Four samples were prepared from a column sample recovered by Oxford Archaeology from Trench 14. The samples were chosen to examine four separate contexts within the lower part of the stratigraphic sequence (see Table 7.39 for details). No pollen was recovered except for a few resistant Compositae Liguliforae grains. Three of the phytolith samples (from contexts 1406 = 1455, 1407 = 1456 and 1409 = 1457 below the midden) did yield countable material. All three samples were dominated by grassland elements with a few Ligneous Dicotyledonous forms, suggesting that some phytoliths were derived from woody material. These were, however, very low in number. The grass elements were dominated by round/square/oblong short-sell forms. These are typically found in C3 grasses that are the dominant form in temperate regions of the world. A number of dumbbell/cross forms were present which a typically derived from C4 Panicoid forms. However, it should be noted that some C3 types may produce these forms as well.

All three phytolith yielding samples contained dendriforms. These are derived from the inflorescence spikes of grasses and are often associated with cereals. The relatively high proportion of these forms may suggest that cereal were processed at the site. This would also account for the high proportion of C3 (round/square/oblong) forms also found. The latter types may also have been derived from the surrounding pasture used for animal grazing, grasses collected for animal fodder or bedding, or derived from their dung.

SOIL MICROMORPHOLOGY

by Marta Perez

Aims

Soil micromorphological analysis was carried out on the 'midden' found in Trench 14, in an attempt to understand the formation and character or this deposit, the character of the soil horizon prior to the deposition of the midden and the environmental conditions under which it formed. The midden sealed a buried soil profile, the top of which contained a wolf bone radiocarbon dated to 2680 ± 35BP. In section, the midden appeared to consist of two main deposits separated by a horizon overlain by clay patches and cut by several postholes.

During excavation, this horizon was only evident where there were separating layers, such as the clay patches, and the analysis aimed to establish whether the horizon could be identified within the soil profile. The analysis also examined whether the middening above and below this horizon was of different character, and if so, whether this was caused by different inputs, by post-depositional chemical processes, or by disturbance of the upper part of the deposit. The analysis also looked for other horizons within the deposit, in order to assist in establishing whether the deposit formed rapidly or slowly, and what the scale of inputs was.

Methodology

Two monoliths (0.5 m long) were collected by Oxford Archaeology from the section excavated through the midden . The monoliths were sub-sampled to provide three thin sections through deposits 1409, 1406 and the interface between 1413 and 1401. The three thin-section samples were made at Reading University under the supervision of the technical staff. They were impregnated with a crystic resin mixture and cured (Courty, Goldberg and Macphail 1989). These sections were examined using an optical polarizing microscope (examined in plane-polarized light and cross-polarized light) at magnifications of x40-x400 and described following Courty, Goldberg and Macphail (1989) and Fitzpatrick (1993). The different elements found in the section were identified with the help of Dr. Wendy Mathews, who supervised the micromorphological work.

Discussion

The lowest soil in the sampled sequence (1409) appears to contain a rendzina soil that is totally biologically reworked, containing fewer chalk clasts and other anthropogenic aggregates (pottery, building material, digestive matter) than to the overlying soils.

These elements occur throughout the depth of the overlying soils, including the midden, although the presence of ashes and spherulites is more common in the lower part of the profile. The term spherulite has been widely used in micromorphological, sedimentological and archaeological literature to describe crystal aggregates or calcium oxalate druses from plants ingested by herbivores (Canti 1997, 219). A general survey of animal faeces has been carried out to determine which species produced faecal spherulites and which do not. Their largest number appears to be produced only in the ruminants (sheep, cow, goat and deer), low numbers are produced by omnivorous and carnivorous species (pig, man, badger, dog, cat and fox) and they are absent from the faeces of horses, rabbits and hares. (Canti 1997, 254). This could indicate that the dung produced by domestic animals was burnt (probably in hearths) and then dumped in this deposit.

Chemically, the high levels of organic carbon are remarkable. Variations of organic carbon in the three thin-sections studied (higher in the two lower thin-sections) represent the integrated result of the effect of various soil-forming factors. These soil-forming factors can be grouped into: management of the soil, climate, biota (vegetation and soil organisms) and topography (Baldock and Skjemstad 1999,164).

The near total absence of charcoal is surprising given the evidence of burning from ashes. The fact that these ashes appear with digestive matter seems to indicate a possible use of dung as fuel, a practice for which there is evidence from areas of North Scotland (Orkney), Europe and the Middle East (references, please).

Alternatively, it could be an indication of manuring. It seems likely that some manuring of the arable soils took place, which may have involved the dispersal of settlement waste (e.g. pottery). Macphail *et al*. have shown that the micromorphological observation of preserved organic matter derived from domestic or animal waste can be used as an indicator of the manuring of soils (Macphail *et al*. 1990). He lists indicators as: fragments of charcoal, excrement, coprolites, phytoliths and calcareous sand and marl, nearly all of which are absent in this deposit. In Trench 14, the fact that the dung appears only with ashes makes it likely that dung was used as fuel rather than as manure, and was then discarded in this deposit. Fuel ash residues

are frequently found in archaeological sites, mixed with other forms of occupational debris and subjected to a range of post-depositional processes (Simpson 2003, 1402).

One of the questions raised during the excavation of this 'midden' was whether it was possible to identify the buried soil prior to the creation of this deposit by its chemical signature, and to determine its character and use. In this case, however, the soils have been severely disturbed by plants and burrowing fauna, which have probably altered the chemical composition of the soils and produced a mixed stratigraphy. Studies in a project on Papa Stour, Shetland (Davidson 2002,1252) indicated that the total reworking of the soil by animals and plants could occur within 40 years. Micromorphological features diagnostic of cultivation will therefore be lost within decades unless such soils are very quickly sealed within archaeological contexts. In this case, there has been structural breakdown within the fossil horizon, as shown by the movement of fine material through the deposit horizons.

Trampling is suggested by the high degree of homogenisation of the archaeological material within the natural sediments and the absence of clear layering of the sediments. In addition, the fragments of shell found in these thin sections are crushed and show sharp edges, characteristics typical of trampling. Trampling can also cause compaction, and is often indicated by a compact structure of closely packed grains (Exaltus 1994, 295). These characteristics have been observed in the three thin sections studied here, indicating that not only was this feature used as a 'dumping' area, but that it was also heavily trampled by the inhabitants of the site and probably also by animals.

The sections seem to indicate that soils 1406, 1413 and 1401 were not formed *in situ*, but were anthropogenically formed and then dumped in the deposit. Models of such 'midden' formation have been discussed and illustrated at Potterne, Wiltshire (Lawson 2000).

AN INTEGRATED INTERPRETATION OF THE ENVIRONMENTAL EVIDENCE *by Adrian Parker*

Layer 1410 equates to Rhodes Chalk Clay and is most likely to represent *in situ* weathered Chalk. There may be an element of soliflucted, slope material, with some Greensand inclusions. However, this is likely to be localised as I would expect Plateau Gravel materials to have been incorporated had widespread solifluction, slope wash have occurred. Speed suggested that this corresponded with Rhodes' Layer 4, which is clearly wrong. I think he has interpreted the Chalk Clay as bedrock and 1409 as 1410.

Layer 1409 corresponds to Rhodes' layer 4 (yellow clay) and the micromorphological work suggested that this was at one time a Rendzina soil (a shallow soil which usually forms over Chalk, typically under grassland conditions). Few artefacts occurred in this layer (also noted by Rhodes). This layer is not the lower part of the midden (as reported by Perez) but is found beneath the midden. Phytolith (plant silica) work (Parker this volume) suggested a low count with a distinct grassland element. Siliceous plant remains were also noted in the micromorphological sample from this unit but no further evidence as to the nature of this material was suggested. Perez also suggested that this soil was bioturbated. Evidence for grassland is further supported by the presence of spherulites (derived from the dung of herbivores such as cattle, goat, sheep or deer). Perez suggested that this may have originated from the burning of dung for fuel, but while this is a possibility, a more likely scenario is that this layer

represents an old soil surface covered in grassland, which was grazed. This would also account for the post-depositional clay coated in former root voids.
Layer 1407 comprised the bunter pebble-rich horizon with some chalk inclusions and charcoal. This layer was not sampled/investigated by the micromorphological work. The phytolith work suggested grassland with reasonable preservation. It is likely that this unit reflects colluvial slope wash most likely related to clearance of woodland or instability derived from disturbance related to constructional activities on the hillslopes above. This would account for the presence of bunter pebbles, which would have been derived from the top of Round Hill.

Layer1406 represents colluvial material, supported by the presence of angular quartz and greensand in the micromorphological sample. This soil contained occasional charcoal flecks, and the presence of ash and spherulites. This would suggest grazing by herbivores in the area. However, Perez suggests that the spherulites may have been incorporated by manuring or via ash from the burning of dung. The phytolith evidence suggests grassland and the phytoliths could have been derived from the dung (having been ingested and defecated) via manuring or from ash via burning of dung. The latter may be supported by the presence of dendriform phytoliths. Whilst these are found in the inflorescence bracts of grasses, the types observed were more akin to those found in cereals. Cereal chaff is often used to temper dung cakes for fuel and thus burning is a possibility supported by the presence of charcoal. Both units 1406 and 1407 represent Rhodes'Layer 3. Layer 1406 is dated to 2680± 35BP and contained abundant animal bone remains including cattle, goat and sheep supporting the evidence for the presnece of animal dung. The micromorpholical work by Perez indicates extensive bioturbation in soils 1406/1407, which would support the notion of worm sorting and the concentration of bunter pebbles derived from colluvial processes from middle?/late Bronze Age activity.

Layers 1401/1413 represent the early Iron Age midden. This unit was charcoal rich with only a small presence of spherulites and ash. It is interesting to note that there were few phytoliths in unit 1413, suggesting that spherulites and phytoliths are closely linked taphonomically in Trench 14. The midden was rich in pottery, bone and shell fragments. Unit 1413 represents Rhodes' layer 2, whilst unit 1401 represents Rhodes' layer 1. The uppermost units are disturbed by ploughing

RADIOCARBON DATING
by Tim Allen

Three samples of animal bone were submitted to the Poznan Radiocarbon laboratory for accelerator mass spectrometry (AMS) dating (Table 7.40). The determinations have been calibrated using OxCal v3.10 and atmospheric data from Reimer *et al*. (2004).

The date obtained on the wolf calcaneum was consistent with that of much of the pottery from the same context. The two dates obtained on cattle mandibles from a ditch in Trench 13 were consistent with one another, and although somewhat later than the few diagnostic pottery sherds from the ditch, these sherds may well be residual. There is therefore no reason to doubt the validity of the dates obtained.