WINCHESTER
A CITY IN THE MAKING

Archaeological excavations between 2002 – 2007
on the sites of Northgate House, Staple Gardens and the former Winchester Library, Jewry St

Section 11

Mammal and Bird Bones
by Lena Strid
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Introduction

Although a large number of excavations have taken place in Winchester, very few reports from intra-mural sites have been published. Most comparative material comes from sites in the northern, western and eastern suburbs (Maltby forthcoming, Serjeantson and Rees 2009). Bone assemblages from sites in the nearby town of Southampton have also been used for comparative purposes in this report (Bates forthcoming; Bourdillon and Andrews 1997; Bourdillon and Coy 1980).

The bones were recovered through hand collection during excavation and from wet sieving of bulk samples sieved to 0.5mm. The sieved fragments constituted 50% of the total number of fragments, but only 4.2% of the total fragment weight. A full record of the assemblage, documented in a Microsoft Access database, together with a fuller report, can be found in the site archive.

Methodology

The bones were identified using the comparative skeletal reference collection at Oxford Archaeology in addition to standard osteological identification manuals, such as Bacher (1967), Cohen and Serjeantson (1996), Hillson (1992), Schmid (1972) and Woelfe (1967). All the animal remains were counted and weighed and, where possible identified to species, element, side and zone. For zoning, Serjeantson (1996) was used, with the addition of mandible zones by Worley (forthcoming). Sheep and goat were identified to species where possible, using Boessneck et al. (1964) and Prummel and Frisch (1986). They were otherwise classified as ‘sheep/goat’. During the recording there was no attempt to distinguish donkey/mules from horse. A later metric analysis of metacarpals and phalanges, using Johnstone (2004) and Reichstein (1995) discovered no donkey or mules and it is therefore assumed that a majority - if not all - equids in the assemblage are horse. Ribs and vertebrae, with the exception of atlas and axis, were classified by size: ‘large mammal’ representing cattle, horse and deer; ‘medium mammal’ representing sheep/goat, pig and large dog and ‘small mammal’ representing small dog, cat and hare. Micromammals include rats, voles, mice etc.

The condition of the bone was graded on a 6-point system (0-5). Grade 0 equating to very well preserved bone, and grade 5 indicating that the bone had suffered such structural and attritional damage as to make it unrecognisable (Table 1).
Modern breaks were disregarded when calculating the total number of fragments. The minimum number of individuals (MNI) was calculated on the most frequently occurring bone for each species, using Serjeantson’s (1996) zoning guide and taking into account left and right sides. For the calculation of the number of identified fragments per species (NISP) all identifiable fragments were counted, although bones with modern breaks were refitted. The weight of bone fragments has been recorded in order to give an idea of their size and to facilitate an alternative means of quantification.

For ageing, Habermehl’s (1975) data on epiphyseal fusion was used. Three fusion stages were recorded: ‘unfused’, ‘in fusion’, and ‘fused’. ‘In fusion’ indicates that the epiphyseal line is still visible. Many bird bones do not fuse per se, instead juvenile bones are characterized by spongy bone on the proximal and distal ends. As the spongy bone grows smooth in fowl occurring at around 6 months of age (Koch 1954, tab.5), the bird bone is defined as adult. Cattle horn cores were aged according to Armitage (1982) using texture and appearance of the horn core surface. Tooth wear was recorded using Grant’s tooth wear stages (Grant 1982) and correlated with tooth eruption (Habermehl 1975). In order to estimate an age for the animals, the methods of Halstead (1985), Payne (1973) and O’Connor (1988) were used for cattle, sheep/goat and pig respectively.

Sex estimation was carried out on morphological traits on cattle metapodials and pelves, sheep/goat pelves, sheep and goat horn cores, and pig mandibular canine teeth, using data from Boessneck et al. (1964), Hatting (1983), Prummel and Frisch (1986), Schmid (1972) and Vretemark (1997). Metrical sex estimation was carried out on cattle metacarpals using data from Mennerich (1968). Equid canines and spurs on fowl tarsometatarsi were used to indicate the presence of male individuals in these taxa (Sadler 1991). Observance of medullary bone in birds were used to indicate the presence of egglaying hens.

Measurements were taken according to von den Driesch (1976), using digital callipers with an accuracy of 0.01 mm. Large bones were measured using an osteometric board, with an accuracy of 1 mm. Withers’ height of horse and dog were calculated using May (1985) and Harcourt (1974) respectively.
Residuality

The presence of residual artefacts and ecofacts is a feature of most urban sites that span centuries of occupation. Many stratigraphically secure post-Roman contexts on the site contained varying amounts of residual Roman pottery. If all contexts containing residual pottery were omitted from the analysis, a large number of significant deposits would be excluded. To provide large enough groups to validate statistical analyses on the bone assemblages, while making a reasonable effort to exclude residual bones, the following strategy was adopted: all contexts containing 10% or fewer sherds of residual pottery would be analysed, as well as contexts containing fewer than 5 sherds of pottery (in which case even one sherd could equal to more than 10%) and stratigraphically secure contexts with no pottery. Exceptions were made for two contexts (NH5168, NH5202), which comprised the base and third fills of pit NH5169, as the three other fills from this pit contained several foot bones of squirrel, suggesting furrier activity.

All medieval contexts from the Discovery Centre were analysed according to the above strategy, but only partial analysis of the assessed medieval context groups from Northgate House was undertaken.

The assemblage

The bone assemblage falls within four main phases: Phase 2 (Roman), Phase 4 (late Saxon), Phase 5 (Anglo-Norman) and Phase 6 (medieval). The late Saxon and Anglo-Norman assemblages were by far the most numerous (Table 2).

Preservation ranged generally from good to fair (Table 3), providing ample opportunities for observation of butchering marks and pathologies. Burnt bones, ranging from charring to calcination, were generally scarce (Table 4).

Gnawed bones were slightly more common in the Roman assemblage, although were still not very numerous. The majority of the bones were gnawed by carnivores, probably dog. Bones with gnaw marks believed to be from cat occurred in Phases 4.2 and 5 (Plate 1). Rodent gnawing was observed on a small number of bones in each phase.

Bones from both meat-rich and meat-poor body parts of cattle, sheep/goat and pig were present in every phase group. This pattern is usually interpreted as animals
being brought in on the hoof to be slaughtered, butchered and disposed of on site. However, specific butchers’ streets are documented for Winchester from the 10th century (Hagen 2002, 315). As these streets are not within the excavated site, the inclusion of meat-poor body parts in the assemblages suggests that body parts such as cattle and sheep/goat metapodials and phalanges were either useful in other ways, such as marrow extraction or glue making, or were included in the portioned carcass.

The avian assemblage from all periods comprises 2285 fragments, 4.1% of the total 56339 faunal assemblage. About 43% of the bird bones could be identified to species/family. It is difficult to distinguish between greylag goose and its descendant the domestic goose, and there is also some overlap in size between domestic duck and mallard. Consequently the proportion of domestic birds in the assemblage can only be estimated. An attempt to distinguish pheasant femora from domestic fowl femora was carried out using Cohen and Serjeantson (1996) and Erbersdobler (1968). Nevertheless, no femora could be identified as pheasant.

The Roman assemblage

The Roman assemblage consisted of 8015 fragments, of which 1756 (21.9%) could be identified to taxon (Tables 5-9).

Of the 639 sheep/goat bones, forty three could be identified as sheep and three as goat, so it is likely that the majority of the sheep/goat bones in the assemblage derive from sheep (cf Maltby 1981, 159-160). The goat bones comprised three horn cores from sub-phase 2.3. All the horn cores had been chopped from the skulls, suggesting tanner’s or horn worker’s waste. The contexts which included goat horn cores (NH2610, NH9543, CC1697) generally comprised mixed butchery/kitchen waste, indicating that the horn cores represent small scale craft activity rather than intensive industrial waste.

Viewing the Roman assemblage as a whole, the most numerous species, based on the number of identified fragments (NISP) is cattle, whereas sheep/goats were the most numerous based on the calculation of minimum number of individuals (MNI). When examining the Roman sub-phases, sheep/goat dominate in the phase 2.1 while cattle are more frequent in phases 2.3 and 2.4, regardless of the quantification method used. Sub-phase 2.2 contained far too few bones to carry out such an analysis. This
provides some, albeit fairly limited, evidence for a change in the focus of pastoral activity in the region as a consequence of Romanisation, from primarily sheep husbandry during the foundation of *Venta Belgarum* to a strategy directed more towards cattle, which the Romans favoured over sheep/goat.

The suburban Roman assemblages from Winchester were analysed as a single unit (Maltby forthcoming) and so it was not possible to determine whether the change in animal husbandry over the Roman period observed at Northgate House and the Discovery Centre occurred elsewhere in Winchester. It is generally believed that at the beginning of the Roman colonisation of Britain, the Roman settlements reflect local dietary preferences. As the Romanisation process progressed and influenced the native population, the relative proportion of cattle and pig in Roman urban sites increased (King 1991, 16-17).

**Meat-providing domestic mammals**

*Cattle*

A relatively low number of ageable and sexable cattle bones were recovered from the individual sub-phases of the Roman period, so the Roman cattle assemblage was analysed as a unit.

All ageing methods showed a predominance of adult cattle (Tables 10-12). The mandibular wear stages correspond closely to those from the Winchester Northern suburbs and the nearby rural settlement of Owslebury (Figure 1; Maltby 1994). The focus on Adult cattle as opposed to Young Adults particularly reflects the importance of cattle as providers of traction for agriculture. If cattle were mainly raised for meat, they would have been slaughtered at a younger age. While a peak of young cattle (MWS:21-25) was observed in the assemblage, this is most likely a product of small sample size and may not be a reliable indicator. There were somewhat fewer Senile cattle at Winchester than at Owslebury, which may indicate that older cattle were less attractive for the meat market.

Of the 12 measurable metacarpals (late Roman phase) five were found to be within the range of cows and seven within the range of bulls and oxen (Mennerich 1968, 11f, 35, in Vretemark 1997, 48). This is in contrast to the pelves, where a majority were female (Table 13). As the sample is rather small, it could not be interpreted on its own. The more numerous metacarpal samples from the northern suburbs contained more female than male cattle, whereas the opposite was true for
Owslebury. Maltby interpreted this data pattern at Owslebury as indicating that the inhabitants mainly sent adult cows to the urban meat markets and kept older oxen for traction purposes (Maltby in print).

The measurable cattle bones are about the same size as bones from other Roman sites in Britain (Table 14). The size differences may reflect different ratios of cows, bulls and bullocks, as well as cattle of different ages and breeds. A small intra-site study reveals that there was a slight increase in size between sub-phase 2.3 and 2.4, in length as well as width (Tables 15-16). The size increase may be influenced by sexual dimorphism. However, since there were very few sexable cattle in the two sub-phases, it was not possible to tell whether there was a preference for selling male cattle to the urban meat market in phase 2.4. A similar size increase was observed at Owslebury (Maltby 1987). As the suburban Winchester assemblages were analysed as a unit, they could not be included in the chronological analysis.

Butchering marks were found on several cattle bones in all four sub-phases. Cut marks resulting from skinning occurred on five first phalanges and around one horn core. Most butchering marks were axial splitting of long bones, presumably for marrow extraction. Chop marks associated with dismemberment were also observed. These occurred proximally, mid-shaft and distally on long bones, as well as on pelvis (ilium), axis and the articular process of the mandible. Knife cuts suggesting dismemberment were found distally on the humerus and metacarpal, and proximally on the femur. Cut marks deriving from filleting occurred on the pelvis (ilium), femur, scapula, hyoid, mandibular ramus and the skull (zygomatic).

Pathological conditions were found on 16 cattle bones, mostly on bones from the lower legs and feet. The assemblage also produced two tarsals and two metatarsals with bone absorption, varying stages of fusion and exostoses. These were interpreted as spavin, and most likely represent older draught animals. Two phalanges displayed lipping around the proximal and distal joint surfaces. Eburnation, a sign of joint disease, was found on one pelvis and on the proximal joint surface of a metatarsal. The pelvis also displayed exostoses around the acetabulum. Infections, possibly periostitis, were present as woven bone growth on a calcaneus, a proximal metatarsal and a proximal radius. Porosity and bone absorption, another indication of infection, occurred on a proximal femur and on a pelvis (acetabulum). An astragalus displayed some porosity and woven bone growth anteriorly between the proximal condyles. This condition also occurred in the Late Saxon and Anglo-Norman assemblages. The
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Aetiology is uncertain, but it may be due to an infection. Oral pathologies were present on one mandible, which displayed bone absorption between M1 and M2, as well as at M3. Evidence of gum infection was found in small numbers of bones, although the inter-site ratio was quite variable. They are often caused by grass and straw lodging between the teeth (Baker and Brothwell 1980, 153-154).

Congenital traits were only observed on mandibles. The last cusp on the M3 was missing on three teeth, and one mandible had an extra foramen on the buccal side of the diastema.

Sheep/goat

Sheep/goats appear to have been steadily culled throughout their first few years of life, with a small peak in culling at 1-2 years (Table 17). When dividing the assemblage into sub-phases, the slaughter pattern shows a focus on 4-6 year olds in phase 2.3 and 1-2 year olds in phase 2.4. The bone fusion is consistent with the dental age estimation, in that almost 55% of the late fusing bones are unfused, and would thus represent sheep/goats of less than 3-3.5 years of age (Table 18). The slaughter age pattern is similar to that at Owslebury and the Roman suburbs (Fig. 2) (Maltby 1994; Maltby forthcoming), showing a cull of young sheep for meat, probably in their second autumn, and a later cull of adult sheep, after they had yielded a few years’ worth of milk, wool, dung and offspring.

The sexed sheep/goat remains display different results depending on which element was used for the sex estimation: The pelves are mainly female, while the horn cores are mainly male (Tables 19-20). While skulls of hornless ewes can skew a horn core assemblage towards a male majority, no hornless skulls were found in the assemblage. Since hornless sheep are recorded from other Roman sites in Winchester, as well as in Late Roman features from Owlesbury (Maltby forthcoming), they were clearly present in the area. Maltby argues that the sheep flock around Winchester contained both hornless sheep, probably a continental import, and native horn bearing sheep (Johnstone and Albarella 2002, 29; Maltby forthcoming). It is, however, not known to what extent the local sheep flocks were hornless and so it would be reasonable to assume that sex estimation carried out on the pelvis provided a more reliable ratio of male to female sheep than the one based on the horn cores.

The measurable sheep bones are within the same size range as sheep bones from other Roman sites in Britain (Table 21). The size increase between sub-phase 2.3 and 2.4, which was visible for cattle (see above), is not found for sheep/goat (see
Table 22). However the sample is small, as only distal tibia provided enough measurements in each sub-phase to enable a comparison. A size increase has been observed in other Roman assemblages (cf Johnstone and Albarella 2002, 29; Maltby 1981, 189) and its absence in the assemblage may be explained by a small sample size.

Butchering marks was observed on 31 sheep/goat bones. Cut-marks associated with skinning were found proximally on eight metapodials and distally on two metapodials. Limb bone butchery was limited to one radius, two pelves, two femora and 13 metapodials. The hyoid, radius, femora and pelves had cut marks indicative of filleting. The butchery marks on the metapodials were more varied. These included skinning cut marks at the proximal and distal ends, and axial splitting for marrow extraction. Cutmarks on skull and mandible indicated that the head had been severed and that the mandible had been separated from the skull. Horn cores of both sheep and goat had been chopped off, probably for horn working.

Six sheep/goat bones displayed pathological conditions. Signs of infection were found on a radius shaft, where smooth bone had formed at mid-shaft, and on a skull, showing bone porosity and absorption at the second maxillary molar. Lipping at the anterior part of a humeral trochlea suggest the start of a joint disease or increased muscular stress. One metacarpal had a smooth ridge of extra bone growth on the medial posterior ridge. The aetiology for this condition is uncertain, but has been linked to infection and minor trauma (Brothwell et al. 2005). Further, two lateral metacarpals were found fused to the main metacarpal.

Congenital traits were found on 19 mandibles and two skulls. The frontal bones of the two skulls had not fused, forming a metopic suture. This is a well-known non-metric trait in humans (Larsen 1997, 326) but is seldom recorded in animal bone reports. It is therefore difficult to tell whether the trait is extremely uncommon in animal populations or merely hasn’t been recorded. Eighteen mandibles had an extra foramen on the buccal side. The placement of this foramen can be used to distinguish sheep from goats: if the foramen is found below the premolars the mandible is from a sheep, whereas if the foramen is found on the diastema the mandible is from a goat (Halstead and Collins 2002, 548-549). One mandible had the foramen in front of P2, and two others had it in front of/below P2. The last cusp of the third mandibular molar was missing on one mandible.

*Pig*
The pig dental eruption and attrition data show a widespread slaughter age pattern consisting of Juvenile, Immature and Sub-adult pigs (see Table 23). The bone fusion is consistent with the dental age estimation, in that a large number of the mid fusing and late fusing elements are unfused (Table 24). This is similar to the ageing data from the Northern Suburbs. Pigs’ only value lie in their meat and fat, and there is no economic reason to keep more than the necessary breeding animals when they have reached their full growth. Their high fecundity and growth rate enables routine slaughter of immature individuals.

The pig assemblage displayed a considerable bias in favour of boars (Table 25). A predominance of boar is common in most Roman assemblages in Britain and north-western continental Europe (Luff 1982, 263) and has been interpreted as the slaughter of surplus young boars (Johnstone and Albarella 2002, 31). Bengt Wigh (2001, 80) further extrapolates on this, writing that as sows yield less meat than boars, surplus sows would be slaughtered early, before the eruption of the permanent canines at 6-9 months.

Only one late-fusing pig bone could be measured. Unfortunately, it was not possible to find a suitable range of measurements from contemporary sites, thus preventing a useful size comparison.

The axial splitting of long bones, which is very common for Roman cattle butchery, was virtually non-existent for pig. Cleavers were used for pig butchery; carcasses were dismembered at the joints. Evidence for portioning was found on three pelves, where the ilium had been chopped off. Filleting cut marks occurred on a mandible, indicating the utilisation of cheek meat, whereas cut marks indicating filleting or dismemberment was observed on a distal fibula and on a metatarsal. Instead of being split axially, a tibia had been broken open mid-shaft for marrow extraction.

The only pig bone with a pathology in the assemblage was a maxillary canine, whose root was deformed by exostoses. This is believed to be a result of a chronic infection (Brothwell and Baker 1980, 150-151).

**Other domestic mammals**

**Horse**

The majority of the horse bones are from adult horses, which is consistent with other Romano-British sites (Locker 1990:208, Johnstone and Albarella 2002, 34, Maltby...
1993, 329-330; Luff 1999, 205). In contrast to the Northern suburbs, no articulated remains were found. This may be related to regulations of the disposal of horse carcasses in regards to intra-mural and extra-mural areas (Maltby in print). One tibia in Phase 2.3 was unfused proximally, indicating a horse of less than 3.5 years of age at death. Due to fragmentation, withers’ heights could not be calculated. Butchering marks were not observed.

**Dog**

The dog remains comprise one semi-articulated puppy in Phase 2.3 and two disarticulated sub-adult or adult bones each from phase 2.3 and 2.4. As the bones were fragmented, withers’ heights could not be calculated. While dogs have been used in ritual deposits in wells and other features on Roman sites (Maltby forthcoming; Fulford 2001, 215), the puppy’s placement in a secondary fill of a cess pit, opens up the possibility for a deliberate killing in order to control the dog population.

**Wild mammals**

The wild mammals in the Roman assemblage include deer, rodents, insectivores and amphibians. The deer remains (sub-phase 2.3) consisted of two antler tine fragments from either red deer or fallow deer. While the Romans introduced a small number of fallow deer to Britain, they were kept in game parks or similar enclosures, probably near the owners’ villas (Sykes *et al.* 2006, 953-954). The two fragments of deer antler are therefore most likely from the native red deer. The scarcity of wild fauna in the assemblage is consistent with contemporary sites in Britain and continental Europe (Luff 1982, 268-283), indicating that hunting provided an insignificant part of the diet.

The presence of amphibians and voles suggest that areas adjacent to the site included wetlands and open grassland. The voles and wood mice have probably lived outside the city walls, where they may have been killed by cats and afterwards brought into the city. House mice on the other hand are a commensal species and would have lived in close contact with people, most likely at the site itself.

**Birds**

The two earlier Roman sub-phases contain few bird bones (Tables 6-7). No avian fragments could be identified to species in Phase 2.1, whereas the three bones in Phase 2.2 were identified as domestic fowl. In the later two sub-phases, fowl
dominate the assemblages (Tables 8-9). Duck (*Anatidae, Anas plathyrhynchos*) is the second most common genus. The dominance of duck over goose has been observed at other Roman sites. However, archaeological, documentary and pictorial evidence suggest that duck and goose husbandry in Britain were not fully developed during the Roman period (Albarella 2005). This would indicate that the majority of the ducks and geese in the Winchester assemblage were wild birds.

The number of fowl remains is very low when compared to data from other Romano-British towns, although of a similar level to the suburban Winchester sites (Maltby forthcoming). While retrieval methods and taphonomic differences may play a part, the generally low number of fowl bones from Winchester suggests that poultry formed a very minor part of the diet. Most fowl were adults, or subadults; only a few juveniles were present. Butchering marks occurred on one tibiotarsus, which displayed cut marks on the distally condyles, indicating disarticulation of the foot prior to cooking.

All the duck and goose bones were from skeletally mature birds. Despite the absence of butchering marks, it is assumed that they were eaten. Secondary products such as eggs and feathers were also utilised.

Pigeon is found on many Roman sites, although normally only present in small numbers. It is uncertain whether the pigeon bone derived from the stock dove (*Columba oenas*) or rock pigeon (*Columba livia*) as these species are of similar size. Dovecotes were usually placed on the roof according to Roman authors (Rivet 1982, 207), and would thus elude archaeological discovery.

Cormorant bones, as well as bones from other sea birds, are very rare on Romano-British sites. No sea birds are mentioned in Parker’s 1988 study of birds from Romano-British sites (Parker 1988, 210-213), although one cormorant bone was retrieved from the Roman settlement Halangy Down at the Scilly Isles (Locker 1996). Since cormorants are normally associated with coastal areas, its presence on the Scilly Isles is less unexpected than in Winchester. However, cormorants may live at inland marshes and lakes, and often move inland in winter (Cramp 1980, 202). The paucity of cormorant and other sea birds suggests that they were generally not considered suitable for eating by the Romano-British.
The Late Saxon assemblage

The Late Saxon assemblage could be divided into two sub-phases, Phase 4.1 and Phase 4.2, comprising a total of 4237 and 12920 fragments respectively. A further 4597 animal remains originated from contexts that could not be dated to either phase, and were therefore excluded from the analysis. However, noteworthy bones from un-subphased Late Saxon contexts have been included for discussion where appropriate.

Approximately 16% and 22% of the Late Saxon faunal remains in the two sub-phases could be identified to species (see Tables 26-28). The number of indeterminate fragments was rather high (64.1% and 52.1% respectively), and may be related to the large number of sieved samples of small fractions.

Of the 1230 sheep/goat bones, 149 could be identified as sheep and 37 as goat. It is therefore assumed that the majority of the sheep/goat bones in the assemblage are sheep. The goat remains include horn cores and a small quantity of metapodials recovered from several properties. Since only five of the horn cores have butchering marks, it suggests that horn working was a small-scale craft in this locality.

In both sub-phases, sheep/goat is the most numerous taxa, regardless of quantification method. This is in contrast to other Late Saxon assemblages from Winchester (Bourdillon 2009; Coy 2009) and Mid-Saxon assemblages from Southampton (Bourdillon and Coy 1980; Bourdillon and Andrews 1997), where cattle were the most numerous species. Although the relative proportion of sheep/goat bones can be artificially skewed by either the recovery of large craft waste deposits of metapodials and horn cores, or of articulated skeletons, neither of these deposit types were encountered in the assemblage. It is therefore likely that these differences reflect socio-economic dietary variations within Winchester.

When comparing the NISP between the two sub-phases it is evident that sheep/goat increases in Phase 4.2 at the expense of cattle and to some extent pig. The MNI is however slightly below the recommended minimum of 30 (Hambleton 1999:40), so these results should be considered extremely tentative.

Despite its relatively large size, the assemblage from Phase 4.1 generally contained too few ageable, sexable and measureable bones for valid inter-phase comparisons. However, in order to facilitate future analyses of the separate phases, all tables show sub-phases as well as the combined data.
**Meat providing domestic mammals**

**Cattle**

The dental age estimation for cattle shows two peaks: 18-30 month old and Senile cattle (Table 11). This suggests that the bovine part of the diet consisted of young cattle raised for meat and old breeding cows or draught oxen past their prime. While this age estimation is consistent with the contemporary suburban Winchester assemblages (Bourdillon 2009, 68-69; Coy 2009, 36-38), there are interesting differences between the Northgate House/Discovery Centre, where the 46+ wear stages predominate, and the Western suburbs where the 41-45 wear stages dominate (Figs 3-4). If this is a true difference, and not skewed by the small sample, it may point towards socio-economic differences between the western suburbs and the north-east intramural area. Unfortunately, a more in-depth analysis of all suburban and intramural sites could not be carried out, as raw ageing data were not available for all sites. The peak of sub-adult cattle is confirmed by the horn core age estimation, which, while not a very large sample, is dominated by 2-3 year old cattle (Table 12). The fusion data corresponds to the more reliable dental age estimation (Table 10). The only major difference between Phase 4.1 (n:74) and Phase 4.2 (n:254) occurred in the late fusing bones, where Phase 4.1 displayed a paucity of fused bones. The total number of bones is, however, rather small, and the difference may be accidental.

In general females dominate the assemblage, both on pelvic morphological traits and metacarpal metric analysis (Table 13). The pelves from Phase 4.1 are an exception to this trend, but owing to the small sample size further extrapolation would be unwise. The nearest sexed urban assemblage is from Mid-Saxon Hamwic, where metacarpal distal width/length indices were used to separate the sexes. Cows formed the largest group (68%), a single castrate (5.9%) was found, and a smaller group (28%) were believed to be either bulls or castrates (Bourdillon and Coy 1980, 108). A predominance of cows seems consistent with Maltby’s interpretation of Roman rural livestock trade (see discussion above).

Cattle metatarsals were on average longer than those recovered from contemporary Saxon assemblages in Britain (Table 29) although the width was similar (Fig. 5) All other measured bones are similar in size to the comparative ones. A change in size between the two sub-phases could not be discerned.

Almost 12% of the cattle bones displayed butchery marks. The tradition of axial splitting of long bones evidently continued in the Late Saxon period. A similar
frequency of chop marks indicative of dismembering was observed on long bones as well as on the mandible and pelvis. Dismembering cut marks were more frequent than in the Roman period, and were common on long bone joints, as well as on calcaneus, astragalus and the mandible. Filleting cut marks were found on long bones, hyoid and scapula. Skinning cut marks occurred on the phalanges and at the base of horn cores.

Twenty-seven cattle bones (3%) displayed evidence of some kind of pathology. The majority were affected by thin bone growth on the surface of the bone, indicating infection. Woven bone, indicating an inactive infection, occurred on one humerus, one ulna, one metacarpal, three pelves, two astragali and one calcaneus. Infections that were active at the time of death were recorded on one mandible and one femur. One pelvis had large exostoses around the acetabulum, combined with bone remodelling and small areas of eburnation (Plate 2). As the corresponding femur is not present, it is difficult to tell if the changes were caused by femoral fractures. Other possibilities include infection, age related joint disorder or heavy wear and tear from long term intensive traction. The use of cattle for traction can cause other changes in the skeleton, such as lipping at the joint surfaces, which was recorded on three phalanges, and distal asymmetry in the metapodial condyles (Dobney et al. 1995, 39), which was recorded on two metatarsals. One metacarpal displayed an ossified muscle attachment, a so-called enthesophyte, which are a sign of muscle strain (Roberts and Manchester 1999, 110). Another metacarpal had a depression in the middle of the medial proximal joint surface. The aetiology of this is unknown, but may be connected to joint disorders or minor trauma. Oral pathologies included minor infections at two maxillary tooth rows, occlusal caries on one mandibular M3, and one mandibular infection with subsequent bone absorption and swelling around the premolars. Congenital conditions occurred on a mandibular M3, where the third posterior cusp was congenitally missing.

Sheep/goat

Sheep/goat were most frequently killed at 2-6 years old, with smaller numbers at 3-4 years (Table 17). Despite the perceived preference for older sheep/goats in Phase 4.1, the actual number of mandibles is too few to make any conclusions regarding changes in animal husbandry focus between the two sub-phases. The wide age range of ages suggests a mixed sheep economy, where some sheep were slaughtered early for meat, whereas others were kept longer for wool, dairy products and breeding. This is very similar to the assemblages from the Northern and Eastern suburbs and the City
Defences at Winchester (Serjeantson and Smith 2009, 230-231) (Fig. 6). In order to make a comparison with the assemblage from the Western suburb, all the abovementioned assemblages were converted to Mandible Wear Stages. The three assemblages show a solid peak of MWS 31-40 (Fig. 7), which would be the equivalent of 2-6 years according to Payne.

Most sheep were horned. Three displayed tiny or rudimentary horn cores, and one sheep in an un-phased Late Saxon context (NH11559) was hornless. This is consistent with the other Winchester assemblages, where a minority of the sheep were hornless (Bourdillon 2009, 74; Coy 2009, 38). This has been connected to an influence of imported continental hornless breeds in the Roman period, as both sexes in the native British sheep breeds were horned (Maltby 1994, 94).

Over all, male sheep/goats dominated the Late Saxon assemblage (Tables 19-20) which may reflect a preference for wool husbandry, since wethers yield better quality wool than ewes and rams (Hurst 2005, 45). The larger horn cores of rams would have been more suitable for horn working than the smaller, or non-existing, horn cores of ewes. However, since a large number of ewes are needed for breeding, the missing ewe bones are surprising. It would be useful to discover whether their bones are more common at rural sites, or in other Winchester assemblages. Unfortunately, however, most rural assemblages are too small for detailed analysis, and sexing of sheep horn cores was only carried out in the Northern and Eastern suburban Winchester assemblages, where they were sexed metrically. Four rams were found, but the remaining horn cores could not be distinguished as wethers or ewes (Serjeantson and Smith 2009, 128).

The size difference that occurred in the cattle assemblage (see above) was absent among the sheep/goat bones. There was very little difference in size between sheep/goats in the assemblage and those from other Late Saxon sites (Table 30).

Several sheep/goat bones displayed butchering marks. Evidence for skinning was found on a first phalanx, which had cut marks mid-shaft. Skulls were severed from the rest of the carcass at the axis and in many cases horn cores were chopped off the skulls. Cut marks for disarticulation occurred on the elbow joint, hip joint and the tarsal joint. Disarticulation/portioning chop marks were found not only at the joints of long bones but also mid-shaft. Other evidence for portioning occurred on a scapula, which was chopped in two mid-blade. Filleting cut marks occurred on the mandible, axis, scapula, humerus, radius, pelvis, fer and tibia. Axial splitting of long bones, in
order to extract marrow, only occurred on metapodials. Cut marks on the distal metapodials could either be from skinning or foot removal, possibly in order to boil hooves for glue or rendering them for oil (Serjeantson 1989, 141).

Pathological conditions were recorded on 40 bones, less than 4% of the Late Saxon sheep/goat assemblage. The majority of the pathologies occurred in Phase 4.2: only nine bones in Phase 4.1 were affected. Thumb print depressions on horn cores were recorded on four sheep. This condition is associated with malnutrition and milking stress, although the aetiology is still unclear (Albarella 1995). Evidence of trauma was present on an ulna from Phase 4.2, which displayed a healed fracture at the proximal joint. One axis vertebra showed smooth exostoses on the caudal part of the neural arch, suggesting joint disorder or an infection in the neck.

Exostoses and lipping occurred on one proximal metacarpal, one distal metatarsal, one tarsal bone and two first phalanges. One set of tarsal bones had fused to the metatarsal, with subsequent smooth bone growth around the fused joint. These pathologies are considered signs of joint disorders or muscle strains. Bone absorption occurred on the auricular surface of one pelvis. It is not clear whether this condition derives from infections or from joint disorders.

Exostoses at the elbow joint, so called penning elbow, were recorded on two distal humeri, four radii and two proximal ulnae. This condition can result from repeated trauma on the elbow joint, and, as the name suggests, has been associated with penning of sheep (Baker and Brothwell 1980, 127).

Three metatarsals had bony ridges anteriorly on the proximal half of the bone. Keith Dobney, Deborah Jaques and Brian Irwing (1995) have suggested that the condition may be connected to sheep walking on very hard surfaces or from changes in physical activity due to foot rot and similar diseases. The modern find of a wild red deer metatarsal with the same condition exclude the possibility of this pathology being directly related to the practice of hobbling livestock (Brothwell et al. 2005; Dobney et al. 1995, 43). A further eight sheep/goat bones showed smooth bony ridges on the medial and/or lateral posterior edges of metacarpals and one on the metatarsal. This condition may be related to a similar aetiology.

Oral pathologies were found on several mandibles and included evidence of bone absorption, widening of alveoles and perimortem tooth loss, all traits indicative of infection. An incisor had a groove on one side of the cemento-enamel junction. This condition has been observed on cattle teeth in Medieval Abingdon (Strid
unpublished). It is believed to be connected to long grass, perhaps with the inclusions of abrasive soil, bring drawn between the incisors when the animal was grazing (Davis pers. comm.).

The most common congenital trait was the occurrence of an extra foramen on the buccal side of the mandible. When found below the premolars, it signifies sheep, whereas if found in front of the premolars, it signifies goat (Halstead and Collins 2002, 548-549). According to this 19 mandibles can be attributed to sheep and one to goat. All mandibles with this trait derived from Phase 4.2. One sheep skull from Phase 4.2 displayed a metopic suture.

**Pig**

The pig dental age estimation shows a wide distribution of slaughter ages, ranging from Juvenile to Adult (Table 23). This is confirmed by the epiphyseal fusion, which shows comparatively low percentages of unfused bones in the mid fusing category and high percentages of unfused bones the late fusing categories (Table 24). There were no major differences in fusion between Phase 4.1 (n:67) and Phase 4.2 (n:219). As expected, this slaughter pattern is also found at other Winchester sites. Pigs are only bred for meat, and their high fecundity enables a quick turnover in livestock. A small number of neonatal pig bones were present, which suggests that pig rearing took place at the site.

The number of teeth from boars and sows are roughly equivalent, suggesting a pig husbandry that was not focussed on optimum meat yields (see above). Pig sex estimation was not carried out on the comparative Winchester assemblages, so it is unclear whether the recovery of almost equal quantities of sows and boars was the case for other parts of the city.

Due to the typically early slaughter of pigs, few bones with late fusing epiphyses were available for measuring. When comparing fused distal tibiae from animals over two years of age those from Northgate House/Discovery Centre are only slightly larger than those from the Eastern suburbs and from Southampton (Table 31). The small difference could be due to any number of factors; such as sex differences, maturity, breed and/or food availability/quality.

The butchery marks indicate that pig carcasses were suspended during butchery: both atlas, skull, mandible and pelvis show signs of sagittal splitting. With the exception of the sagittal splits, pig butchery appears to have been overwhelmingly carried out with knives rather than cleavers. Nevertheless, a few chop marks (most
likely by cleavers) were noted on a distal humerus. Disarticulation by knives was recorded on atlas, distal humerus, proximal radius, proximal ulna and proximal metapodials. Filleting marks were observed on the mandible, scapula, ulna, pelvis, femur and metapodials. This indicates that in addition to the utilisation of the larger muscle masses of the body for meat, heads and feet were also utilised.

Pathologies were observed on four pig bones from Phase 4.2. Woven bone growth on an ulna indicates that the pig had fully recovered from an old infection, whereas bone growth from an active infection at the time of death was found on a pelvis. Lipping on the joint surfaces of an atlas suggests muscle strains or joint disease. The latter is possibly more likely since pigs are not traction animals nor likely to be reared in particularly strenuous conditions, such as steep hill slopes. A tibia displayed minor exostoses distally on the lateral side. It is not certain if this condition is related to muscle strains or to an infection in the adjacent fibula (although fibulae were recovered, none could be securely linked to this particular tibia).

**Other domestic mammals**

**Horse**

All horse bones which could be aged, belong to full-grown adult horses. This was also the case in the comparative sites, with the exception of the Western suburbs, where a few immature teeth were found as well as adult horse bones (Bourdillon 2009, 63). A paucity of young horse bones is typical for urban Saxon assemblages, suggesting that horse breeding would have occurred in the countryside rather than in the cities.

The measurable horse metacarpal and metatarsal from Phase 4.1 are within the same size range as those from contemporary sites in Winchester and Southampton (Table 32). Withers’ heights of 128.1 cm and 143.0 cm respectively were calculated from these two bones.

Butchery marks occurred on three horse bones from Phase 4.2. Cut marks observed on the mid-shaft of a femur and a pelvis (ischium) are typical of filleting. A radius displayed chop marks on the distal half of the bone, suggesting disarticulation, or possibly rough filleting. While horse was not normally eaten in Late Saxon England, it is possible that horse flesh was fed to dogs, a practice which is known from post-medieval sources (Thomas and Locock 2000).

A second phalanx from Phase 4.2 had ossified muscle attachments, so called enthesophytes, near the joint surfaces. This condition is connected to muscular stress
(Roberts and Manchester 1999, 110) and may be related to the use of horses for traction or heavy load-carrying.

Dog

Two semi-articulated dog remains were recovered from Phase 4.2: one juvenile head and neck from property BW4 and one hind foot from property BE4. Since they were found in different properties, it is not very likely that they come from the same dog. A further five disarticulated dog bones were also found in this phase. The previously mentioned hind foot displayed exostoses on metatarsal 4 and 5. The pathology is most likely connected to a healed mid-shaft fracture on the latter metatarsal.

Cat

Cat remains comprise 14 disarticulated bones from both adult and sub-adult cats, all from Phase 4.2. Interestingly, one humerus has a cut mark anteriorly mid-shaft, which may indicate butchery for meat. Cat meat was not considered part of the normal Saxon diet, but could be eaten during desperate times, such as long sieges or starvation periods. Another possibility is the use of cat meat for medicinal/magical purposes (Doll 2003, 267). No other cut marks were observed on the cat bones.

Wild mammals

The wild mammals in the Late Saxon assemblage included red deer, roe deer, hare, badger and possible pine marten, as well as amphibians and rodents. Small quantities of red deer and roe deer were present at the Winchester suburbs and the Mid-Saxon Southampton sites. Other wild mammals in Winchester include badger and hare, both present in small numbers (Coy 2009, 41; Serjeantson and Smith 2009, 145). The scarcity of wild mammals is consistent with other Late Saxon sites in Britain (Sykes 2006b, 164), indicating that game formed a very small part of the diet.

Deer

Red deer and roe deer were identified in the assemblage, along with three antler fragments and three limb bone fragments from unidentified deer species. Since fallow deer is unlikely to be present in the vicinity of Late Saxon Winchester (see above), it is probable that the unidentified deer fragments derive from red deer. The red deer remains consisted of antler and non-meat bearing lower leg bones, but it is assumed that this species was eaten as well. The roe deer remains consisted of a neck vertebra and one humerus.
Three antler fragments, one of red deer (Phase 4.2) and two of unidentified deer (Phase 4.1 and Phase 4.2), were sawn off, which strongly suggests antler working in the area. Until the late 18th century, sawing only occurred for bone working, not butchery (MacGregor 1985, 55).

**Hare**

The three hare bones were recovered from three different properties (BE1, BE5 and BW4). All bones are long bones, which would suggest that they represent kitchen waste. Juvenile, sub-adult and adult hares are included in the assemblage.

**Mustelids**

Mustelids, *i.e.* badger, otter, stoat, polecat, weasel, pine marten and stone marten, are generally rare in the archaeological record, and when they occur it is usually in small numbers. Eva Fairnell’s (2003) survey of fur animal bones on archaeological sites in Britain yielded 43 records for badger and 10 for pine marten. Despite mustelids having been utilised for their fur since the Stone Age, actual evidence for skinning is rare: in the survey only two badger and two pine marten bones show cut marks indicating skinning (Fairnell 2003, 36-41).

The badger humerus in property BE4 displayed horizontal cut marks supradistally on the anterior and lateral sides, marks typically resulting from disarticulation of the elbow joint. Historically, badgers have occasionally been utilised for meat and fat (Griffiths 1993, 341; Neal and Cheeseman 1996, 221). It has been estimated that in autumn, approximately 30% of the badger’s body weight is fat (During 1986, 141). Archaeological examples of badger bones with cut marks indicating dismemberment include bones from a Roman fort and 17th century deposits at Carrick Castle (Harman 1993, 232; Thomas 1998, 987).

Comparison of the mustelid metatarsal in property BE5 with modern comparatives in both the Oxford Archaeology and the English Heritage reference collections established that the Winchester metatarsal is larger than a male Welsh ferret and a male pole cat, but smaller than a male Scandinavian pine marten. As a result, it has been tentatively identified as a female pine marten. Deposits of mustelid metapodials and phalanges, combined with an absence of other skeletal elements, usually are considered an indication of fur processing (Fairnell 2003, 10-11).
**Birds**

Domestic fowl is the most numerous bird in the both sub-phases of the Late Saxon bird assemblage, regardless of quantification method, comprising c.90% of the identified avian remains (Table 27-28).

Most skeletal elements of fowl were present. Despite the majority of the bones being long bones, pelvis and sternum, it is likely that entire carcasses were disposed of. These bones are easy to identify to species, and long bones are relatively resistant to breakage. Sexing could only be carried out on fowl bones from Phase 4.2: spurs occurred on three tarsometatarsal bones and another tarsometatarsal displayed woven bone growth where the spur would be. This is suspected to be a reaction to the removal of a spur. Spur removal seem to have had two purposes: either for castration, or to facilitate tied-on metal spurs on fighting cocks (West 1982). Medullary bone was present in six long bones, indicating the slaughter of egg-laying hens.

Two articulated adult fowl skeletons were recovered, both from pit CC2225 (Phase 4.2). Cut marks were absent, which suggests they may have been diseased or died of natural causes and subsequently were judged unfit for consumption. Tarsometatarsi were only associated with one of the birds, and subsequently only this fowl, a hen, could be sexed.

Butchery marks occurred on 22 fowl fragments. They consist of knife marks from filleting and disarticulation, and are mostly found at the midshaft and at the joints of longbones. A cooked bird is rather easy to disarticulate without tools, which may explain the relative scarcity of butchery marks on bird bones in archaeological assemblages.

Pathological conditions were recorded on 23 fowl bones, 19 of which derived from the abovementioned articulated birds. One of these fowl displayed a protruding flange of smooth bone growth on the supraproximal/medial part of the femoral shaft. This may be an enthesophyte, indicating muscle strains. The same bird also had myeloma growths on the synsacrum. These growths are caused by tumours in the bone marrow, which manifest as spongy new bone formation (Baker and Brothwell 1980, 103-105). The other articulated fowl had several exostoses at its joints: around the scapular cotyla on both coracoids, proximally and distally on five foot phalanges and both tarsometatarsi, as well as on seven vertebral bodies and on the pygostyle. These are likely to be signs of a long-term infection. While exostoses can be age-related, the chicken would be killed for the pot before reaching an advanced age.
Among the disarticulated remains, exostoses were recorded on a distal tibiotarsus, the only pathological bird bone from Phase 1, and at the scapular cotyla on a coracoid. Myeloma occurred on a synsacrum, to which the left pelvis was fused (Plate 3). Woven bone growth on the shaft of a tarsometatarsal indicates infection, possibly linked to spur removal (see above).

Mallard and teal were the only duck species that could be identified with certainty. Using documentary and pictorial sources, Albarella argues that domestic ducks were very rare in England until the Late Medieval period (Albarella 2005, 255-256). It would therefore be more likely that the Winchester duck bones are from wild birds. Most parts of the duck skeleton are present, which suggests that they represent remains of meals. Butchering marks from disarticulation occurred on one bone from unidentified duck, and one mallard bone. The mallard bone also had filleting cut marks mid-shaft.

The other taxa include goose, woodcock, kittiwake as well as unidentified passerine. Geese and waders are commonly eaten, and their presence in the assemblage is not out of the ordinary. Seabirds have been eaten in historical times in communities around the North Sea (Serjeantson 1988), but it is not certain whether they were considered an unremarkable part of the diet for the inhabitants of Late Saxon Winchester. A goose radius and ulna displayed cut marks at the joints, associated with disarticulation.

Birds from Late Saxon contexts not phased to either Phase 4.1 and Phase 4.2 include teal (1 carpometacarpi), lapwing (2 coracoids), woodcock (2 humeri, 1 ulna), unidentified wader (1 humerus, 2 tarsometatarsi) and blackbird-sized passerine (1 humerus, 1 tarsometatarsus).

The Anglo-Norman assemblage

The Anglo-Norman assemblage comprises 25187 bone fragments, of which 6525 (25.9%) could be determined to taxon (Table 33). Of the 2934 sheep/goat bones, 595 could be identified as sheep and 91 as goat. The majority of goat fragments consist of horn cores, many of which were recovered from deposits interpreted as horn/bone working waste dumps. A predominance of goat horn cores over post-cranial elements has been observed on many British and European sites. This may to some extent be
caused by identification bias, since horn cores are very easy to identify to species. However, metapodials are also easy to speciate, and these are not as abundant as horn cores. It has been argued that the over-representation of goat horn cores could be due to goat skins being imported with the horn cores attached (see below). However, post-cranial goat remains are rarely found in large quantities, and the origin of these hypothetical skins remain unknown (Albarella 2003, 80-81).

Sheep/goat is the most common taxon in the assemblage, regardless of method used (Table 33). Similar NISP proportions have been recorded for Winchester’s western suburban assemblages (Coy 2009, 192-9, 204-9). The Northern and Eastern Winchester suburb bone assemblages contained very few faunal remains from the Anglo-Norman period (AD 1050-1225) and therefore could not be used for comparative purposes here. The species proportion in Winchester is in contrast to Southampton, where several assemblages show reversed percentages for cattle and sheep/goat (Coy and Bourdillon 1980, 81; Bourdillon and Andrews 1997, 244, Bates forthcoming) (Fig. 8). The differences in the relative ratio of cattle to sheep/goat at Winchester and Southampton probably reflect the surrounding landscape of these sites. Southampton is closer to the sea, and its nearby wetlands would thus be more suitable for cattle grazing. The similar proportion of pig recovered from both urban settlements suggests that pigs were reared in these towns, and therefore not dependent on ecological differences of the surrounding countryside.

**Meat providing domestic mammals**

**Cattle**

In contrast to the preceding Late Saxon period, the tooth wear analysis of the Anglo-Norman cattle includes almost no younger animals (Table 11). This suggests that traction, and to some extent, dairy products, increased in importance in the Winchester region in this period. The slaughter pattern in the Western suburbs is strongly focussed on cattle with a MWS of 41-45 (Fig. 9). It is uncertain which of Halstead’s (1985) age groups this is the equivalent to, although it would be either Adult or Old Adult.

Age estimation could also be carried out on 110 horncores, most of which belonged to 3-7 year old cattle (Table 12). The scarcity of younger animals is unsurprising: they would have had smaller horn cores, and may have been considered less valuable as a raw material than the larger adult horn cores.
The ageing analysis suggests that there was a limited trade in surplus young adults, probably male, for meat, whereas most cattle were brought into Winchester for slaughter when they were adults. These would have been fully grown cattle, which would have yielded milk and calves for a few years, before they were fattened for the market. The draught and breeding animals were killed at a later age, when they were past their prime.

Regardless of the method used, the sex estimation show a consistent predominance of female cattle (Table 13). The cattle from the western suburbs were not sexed (Bourdillon 2009). In Southampton’s French Quarter, sex estimation based on the pelvis (n: 20) indicated an 80% majority of females (Bates forthcoming). Taken in consideration with the ageing analysis, this would suggest that most male cattle were either killed early, i.e. before the fusing of the distal metapodials, or they were sold off to be fattened and slaughtered elsewhere.

When compared to measurement data from other Anglo-Norman sites in Britain, the cattle bones from the site are at the upper size range (Table 34). The exception is the radius, although the small number of measured radii may bias the comparison. The small size difference overall between this site and the comparative sites may be due to a larger proportion of older and/or male cattle in the former, or the presence of different cattle breeds. Most of the measured bones are fused by 2 years of age, so there is a risk that younger cattle, which are not fully grown, may be compared to fully adult ones. Late-fusing bones are scarce at most archaeological sites, primarily because they are more prone to destructive butchery methods which render them un-measurable.

Almost 13% of the cattle bones displayed butchery marks. Fifty of these resulted from horn working, where horn cores had been chopped off the skull and horn sheaths had been removed from the horn core. They were mostly found in property SE3 (see below). Skinning cut marks occurred on phalanges and around the base of horn cores. Chop marks and cut marks on atlas and axis indicate axial splitting of the carcass, head removal and filleting. Cut marks resulting from disarticulation were found at several limb bone joints and on the mandible. Occasionally, disarticulation at the joints had been carried out by chopping. One femur had been chopped in two at mid-shaft. This may have been done for portioning, or to extract the marrow. Two humeri, three radii and ten metapodials had been split axially,
presumably for marrow extraction. Filleting cut marks were found on mandible, hyoid, scapula, humerus and pelvis.

Several cattle bones displayed pathological conditions, the majority of which were connected to infections or joint disorders. Woven bone growth, indicating an inactive infection occurred on a humerus, an ulna, a pelvis and a tibia. Porous bone growth, indicating an active infection was recorded on a proximal femur and around a maxillary tooth row. Bone absorption is another indication of infectious diseases, and was observed at the mandibular molars of a Senile cow. Oral pathologies such as these are often caused by food remains becoming lodged between the teeth (Baker and Brothwell 1980, 153).

There are several pathological conditions in the assemblage which are linked to the use of cattle for traction. Distal asymmetry on the metapodial condyles were recorded on three metatarsals, one of which also displayed a small spot of eburation on the distal joint. Eburation also occurred on the acetabulum of three pelves and on the vertebral joint of a sacrum. Infections most likely related to joint disorders were recorded on one carpal bone, two metacarpals and four metatarsals. These pathologies manifested as bone absorption, pitting, exostoses, fusing of tarsals and beginning of lipping on and at the proximal joint surface. Lipping was also recorded on at the proximal joint surface of three first phalanges, and at the auricular surface of one pelvis. One proximal metacarpal and one first phalanx displayed ossified muscle attachments, suggesting muscle strains, most likely as a result of the stresses of heavy traction.

Swellings occurred distally on one metatarsal. This may be connected to the practice of hobbling livestock. Hobbling easily leads to repeated minor trauma, causing bleeding in the periosteum, which later may ossify (Brothwell et al. 2005, 78).

The congenital conditions observed in the cattle assemblage included two mandibular third molars with the last cusp missing. Five astragali displayed several small perforations anteriorly between the proximal condyles, the aetiology of which is uncertain.

Sheep/goat
The fusion data suggest that the sheep/goats were primarily slaughtered as sub-adults or adults (Table 16). However, while only eight bones in the early fusing category were unfused, over 240 bones show surface porosity, indicating they were foetal or
neonatal at the time of death (Table 35). The foetal/neonatal bones are present at almost every Anglo-Norman property. However, over a third of those identified were associated with property SE3. This area was known as Snidelingsestret, or Snitherlingastret - The Tailor’s street, in the Anglo-Saxon period (S. Teague pers. comm). Property SE3 has been interpreted as a furrier’s workshop (see discussion below) and it must be considered that not only squirrel, but lamb skin, so-called budge, may have been prepared there as well. Almost half of the foetal/neonatal remains are metapodials, suggesting that they may have arrived at the property as part of uncured skins (cf Serjeantson 1989).

The mandibular age estimation show that half of the Anglo-Norman caprines were slaughtered at 2-4 years of age (Table 17). Despite the large number of post-cranial neonatal bones, few young mandibles were retrieved. The tooth wear data from the site was converted to Mandibular Wear Stages (following Grant 1982) and compared to the assemblage from the Western suburbs. The two assemblages are over all similar (Fig. 10). The majority of the sheep/goat had MWS of 31-40, which would equal about 2-6 years of age according to Payne (1973). This slaughter age pattern suggests that the local sheep husbandry had a mixed strategy, rearing sheep for meat, wool and dairy products. Sheep were slaughtered at a relatively young age for meat, and the young adults of 3-4 years of age would have yielded a few wool clips and offspring before being sold for meat. The older animals represent sheep kept for wool and breeding purposes.

Male sheep/goats dominated the assemblage according to the sex estimation based on pelvis morphology (Table 20). The horn cores show a more nuanced result, where females were more frequent among the goats, and males among the sheep (Table 19). This is probably connected to the large deposits of sheep and goat horn cores in property SE3, which has been interpreted as craft waste. There is a possibility that the horn cores are traded items, and as such may not necessarily relate to the sex ratios of the local sheep and goat populations. Sheep/goat populations with mainly ewes and wethers (castrated male sheep/goat) suggest animal husbandry focussed on wool and, to some extent, dairy products. Wethers give better wool than rams and ewes, as they are not affected by hormonal changes during pregnancy, nor inclined to territorial fighting in the same extent that rams are (Hurst 2005, 45). Ewes are needed for breeding, in order to retain or increase the flock size. However, since the sheep/goats were slaughtered at a rather young age (see above) compared to what is
typically expected for a specialised wool husbandry (Payne 1973, 284), ewe/wether dominated flocks may be less likely.

The Winchester bones are mostly of similar size to those from contemporary Anglo-Norman sites in Britain (Table 36). The hind limb is on average slightly larger, but not drastically so. This may be a feature of the small number of comparable bones from other Anglo-Norman sites, or result from different sex ratios or breeds in the different sites.

A total of 179 sheep and goat horn cores, the majority from property SE3, had been chopped from the skull. Some horn core also showed signs of horn sheath removal. Thirteen skulls had been split sagitally, in order to extract the brain. Sagittal splits also occurred on atlas and axis, showing that the carcass was suspended during the butchering process. A heavy cleaver severed the skull from the rest of the carcass. Further disarticulation by cleavers took place at the scapula, distal radius, proximal and distal femur and distal tibia. Several cut marks were observed at the neck, mandible, elbow, carpal and tarsal joints, suggesting that some disarticulation was carried out by knives. Evidence of portioning was found on the pelvis (ilium) and mid-blade on the scapula. Filleting cut marks were recorded on scapula, radius, pelvis and tibia. Cut marks also occur on a skull and on several hyoids, suggesting removal of cheek meat as well as utilisation of the tongue for meat. A small perforation on one scapula suggests the shoulder being hanged for smoking or for ageing the meat. Several metapodials had been split longitudinally to extract the marrow. Skinning cut marks were found on at the metapodial joints.

The 46 sheep/goat bones that displayed pathological conditions only amounted to 1.6% of the total sheep/goat remains in the Anglo-Norman phase. Several different types of conditions were present. Twenty horn cores, of both sheep and goat, displayed thumb print depressions. The aetiology is unclear, but it is believed that they may be connected to malnutrition or milking stress (Albarella 1995).

Extra bone growth on the lateral distal humerus and proximal radius were recorded on one humerus and six radii. It is believed that this pathology is connected to ‘penning elbow’, a condition on sheep that may result from trauma on the joint, possibly through repeated jostling in narrow or crowded areas (Baker and Brothwell 1980, 127).

Bone absorption and pitting on the medial part of the proximal joint surface of a metatarsal may be a sign of a joint disorder or an infection. A thin layer of woven
bone growth, indicating a previous infection that was healed before death, was recorded on an axis, a metacarpal and a pelvis. Signs of infection also occurred on five mandibles, with subsequent bone absorption at the gum line and widening of alveoles, occasionally leading to tooth loss.

The bony ridges that occurred anteriorly on proximal metatarsals and posteriorly on proximal metacarpals in the Late Saxon sheep/goat assemblage (see above) was also recorded in the Anglo-Norman assemblage. Four metatarsals and nine metacarpals were affected. The aetiology is unclear, although the condition may be connected to animals walking on hard surfaces or from changes in physical activity due to foot rot or similar diseases (Dobney et al. 1995, 43).

A metacarpal displayed a large amount of smooth bone growth medially at the lower half of the shaft. As the bone was fragmented, it was clear that this condition had not affected the marrow cavity. Similar haematomas on the metapodials are often interpreted as evidence for hobbling. This practice may cause the animal repeated minor trauma on the legs, leading to subperiostal bleeding which gradually ossifies (Brothwell et al. 2005, 78).

Healed fractures were identified on the acetabulum area of two pelves, one of which also showed pitting and porous bone growth in the acetabulum, most likely caused by infections after the fracture.

Congenital conditions were found primarily on the mandibles, 52 of which displayed an extra foramen on the buccal side at the premolars. The location of this perforation is an indication of species: below the premolars indicate sheep, in front of the premolars indicate goat (Halstead and Collins 2002, 548-549). Of the 52 mandibles with this feature, two had the perforation in front of the second premolar, and would thus be goat. The second premolar was reported as congenitally missing on two mandibles. Metopic sutures occurred on five skulls.

Pig

Pig fusion data show a large number of unfused bones, indicating the slaughter of mostly juvenile and sub-adult pigs. The mandibular age estimation display a peak in the Immature and Sub-Adult age groups, which equates to a preferred slaughter age of 0.5-1.5 years (Habermehl 1975, 147) (Tables 23-24). Since the younger pigs are slaughtered before they were fully grown, pork production at the site was suboptimal. A premature slaughter of young pigs could be a sign of limitations of space or fodder.
The scarcity of neonatal pig remains (Table 35) could indicate that pig rearing did not take place locally. However, the presence/absence of neonatal pigs has been interpreted in various ways, including natural mortalities from pig rearing on site (Bourdillon and Coy 1980, 89) and feasting (suckling pig - O’Connor 1988, 88). The piglet remains from the site are disarticulated and display no butchering marks.

Of the 26 pig mandibular canines that could be sexed, 69% were from boars (Table 25). Since pigs are only bred for meat, surplus sows and boars would have been slaughtered. As sows yield less meat than boars, it is conceivable that sows could have been slaughtered at a younger age, however since most of the canines were loose teeth, this hypothesis cannot be tested here. The few measureable pig bones fall within the same size range as contemporary pig remains from Britain (Table 37).

Thirty pig bones displayed butchering marks. Paramedial and axial splitting occurred on two axis vertebrae, indicating suspension of the carcass during the butchery process. Chop marks originate mostly from portioning rather than from disarticulation. They occurred on the scapula, ulna, pelvis, femur and tibia. Disarticulation seems to have been primarily carried out with knives. Cut marks were recorded on the scapula, humerus, radius and calcaneus. Filleting cut marks were found on the atlas, scapula, humerus, pelvis, femur, tibia and metatarsal.

Pathological conditions occurred on nine bones. The most common pathology was woven bone growth, a sign of an inactive infection, which was found on two humeri, one femur and one tibia. A metacarpal displayed pathological bone growth suggesting an infection that was active at the time of death. Healed fractures were found on a distal fibula and a lateral metapodial. An enthesophyte, suggesting muscle strains (Roberts and Manchester 1999, 110), occurred supradistally on a tibia. A proximal tibia had a small groove laterally on the tibia crest, but the aetiology for this is uncertain.

**Other domestic mammals**

**Horse**

The paucity of horse bones is to be expected for an intermural urban assemblage. Horse bones are generally rare on urban sites, since eating horse meat was prohibited by the Church (Egardt 1962, 77-78.). Judging by epiphyseal fusion and tooth wear, almost all the horses were adult. Immature horse remains consisted of three deciduous
Excavations in Winchester 2002-07 Mammal and bird bones

molars and one ulna. The ulna was unfused proximally, indicating an age at death of less than 3.5 years. Horse remains in urban sites normally consists of adult or old adult horses (Rackham 1995, 173-174).

The few measurable horse bones from the site are all within the same size range as metacarpals from other Anglo-Norman sites in Britain (Table 38). Withers’ heights of 123.1 cm and 137.2 cm respectively were calculated from the metatarsal and the tibia. The measurable horse bones from the Winchester suburbs gave similar withers’ heights (Serjeantson and Smith 2009, 153). While modern day horses of this size would be classified as ponies, it was a normal horse size during the early Medieval period (Rackham 1995, 169-171).

Butchery marks were absent, which is in line with the Church’s prohibition of eating horse meat. Nevertheless, utilisation of horse meat, for human or animal consumption, is known from contemporary sites. Horse bones with butchery marks of any kind are, however, very rare over all. There are a few examples from Medieval suburban Winchester, although most are associated with skinning or feet removal rather than filleting (Serjeantson and Smith 2009, 153).

The only pathological conditions on the horse bones are enthesophytes, indicating muscle strains (Roberts and Manchester 1999, 110). They were found on the dorsal/lateral edge of the ilium/ischium border on a pelvis and on the glenoid process on a scapula.

Dog

Dog remains consist of one semi-articulated skeleton of a juvenile dog from property BE4 and 10 disarticulated bones from a range of properties. With the exception of a neonatal radius from property SE1, all other dog bones were adult. Withers’ heights could be calculated on two radii (Table 39), deriving from dogs of small and medium size. Three of the disarticulate bones displayed pathologies. A pelvis had a healed fracture on the ischium and a radius had some exostoses at the distal joint surface. These may be due to muscle strains. A femur had an unhealed fracture on the supradistal part of the shaft, which had lead to an infection. The infection had subsequently caused large exostoses and smooth bone growth on the shaft (Plates 4-6).

Cat

An overwhelming majority of the 498 cat bones were retrieved from property SE1. Most bones were associated with the pits NH5169 and NH5175. The cat remains in
property SE1 include ten semi-articulated individuals. With the exception of one neonatal kitten, all articulated cats were c. 8.5-11.5 months of age at death. Similarly large quantities of articulated cats in this age group have been found in several Scandinavian sites (see below). Cut marks on mandibles, skulls and paws suggest that the Scandinavian cats were skinned. The cat remains in property SE1 include three bones with cut marks: typical skinning cut marks were observed on the frontal bone of a skull and on the horizontal ramus of a mandible from the same individual. A femur displayed a diagonal cut mark on the anterior side, just below the (unfused) trochanter major. This type of cut mark is associated with butchery, which is unusual to find on cat bones, but was also observed on a cat humerus from the Late Saxon period (see above). Whilst cats were normally not eaten, medieval sources mention the use of cat meat and fat for medicinal purposes (Doll 2003, 267). Butchering marks on cat bones have been recorded from Haithabu, Germany (Johansson and Hüster 1987, 40-44).

**Wild mammals**

The wild mammals present in the assemblage signify craft activity as well as dietary habits. As is common for the Anglo-Norman period, game is rare outside ecclesiastical and high-status sites (Sykes 2006, 164), and would have contributed very little to the average person’s diet.

**Deer**

Apart from three antler fragments, the deer remains include bones from meat-rich body parts, such as shoulder and shank, and meat-poor metapodials. It has been argued that metapodials may have been included in skins sold to tanners (Serjeantson 1989), or been sold as raw material to bone workers (MacGregor 1985, 30), but it could also be argued that the metapodials were included in the portion of venison that was sold by the butchers.

**Hare**

The hare remains primarily derive from meat-rich parts of the front and hind limbs, which suggests they were kitchen waste. A single phalanx from property BE3 may signify butchery waste or furrier’s waste.

**Fox, mustelids and squirrel**

All but two of the fox, mustelid and squirrel bones originated from pit NH5169 in property SE1. Due to the large concentration of bones from the lower limbs and the
absence of other skeletal elements from these taxa, the bones are believed to be waste from a furrier’s workshop (see below).

The mustelid remains comprised stoat and polecat/ferret. Ferret is the domesticated form of polecat, and was used in the Middle Ages for hunting rabbits, by releasing the ferrets into the warrens in order to flush the rabbits out and be netted. As polecat and ferret can only be distinguished on the skull (Bond and O’Connor 1999, 362), it has not been possible to identify the bones to species. The earliest written records of ferret in north-western Europe date to the early 13th century (Van Damme and Ervynck 1988, 281). Securely identified ferret bones are extremely rare archaeologically, most likely due to the limited ways of distinguishing them from the native polecats (Van Damme and Ervynck 1988, 278-279).

Squirrel was the most numerous of the fur animal species. This is not surprising, as squirrel fur was highly popular during the Early Medieval period. It was a high-status fur, which would have been appropriate for garments for many of Winchester’s inhabitants, bearing in mind that Winchester was the capital of Wessex at the time. The grey winter fur of the European red squirrel was considered very attractive, and a large-scale long-distance trade in squirrel pelts took place from Scandinavia and Russia to Western Europe (Veale 2003, 63-65). It is not possible to tell whether the squirrel bones derive from Russian, Scandinavian or British squirrel. Deposits of squirrel bones are rarely found on archaeological sites, most likely because sieving is required to find the small bones. The 14th century site The Bedern in York is the only other British site with large quantities of squirrel bones from the Early Medieval - Medieval period (Fairnell 2003).

**Birds**

Domestic fowl again dominate the Anglo-Norman bird assemblage: over 70% of the identified avian remains are domestic fowl (Table 33). Most parts of the fowl skeleton were present, indicating the utilisation of entire carcasses. Unfused or fusing bones comprised 12% of the bones with fusion indicators present, indicating young fowl being slaughtered. Of the 36 tarsometatarsi with the prerequisite zone intact, 11 had spurs, indicating males. On two of these, the spurs were sawn off or broken off, which suggests castration or cock-fighting (see above). Medullary bone, indicating egg-laying hens, occurred on seven long bones. Butchery marks are somewhat rare, occurring on 24 fowl bones. The most common form of butchery was disarticulation
of tibiotarsus and tarsometatarsus, occurring on 13 bones. Other butchery marks consist of cut marks associated with filleting and disjointing, which were found on femora, coracoids and a scapula. Pathological conditions were found on four fowl bones. Two tarsometatarsi displayed exostoses at the distal metaphysis and trochlea. A similar pathology occurred on a distal humerus. The exostoses may be associated with active infections or muscle strains. A coracoid had a possible enthesophyte at the scapular cotyla, suggesting muscle strains.

Two duck species could be identified: cf. domestic duck and teal. Domestic duck is on average larger than mallard (Woelfle 1967, 81) and in this case the large size of a humerus suggests a domestic bird. The duck remains mostly consist of wing bones. It has been argued that a disproportionate amount of wing bones may be a natural phenomenon, due to decomposition factors, rather than human intervention (Bovy 2002). However, the presence of cut marks on five wing bones disproves this. Three humeri and two ulnae display cut marks associated with disarticulation. One of the humeri also displayed cut marks on its shaft from filleting.

Most goose remains belonged to either greylag goose or domestic goose, although one carpometacarpus could be identified as the smaller Brent goose. Only one non-mature bone was found in the assemblage, which is in contrast to the fowl assemblage, which comprised several juvenile bones (see above). This difference may relate to fowl being raised within the town, and geese outside, being driven into the town for slaughter. Thus there would be little evidence for natural mortalities of young geese. According to Medieval sources, geese were slaughtered in May at 12-16 weeks as ‘green geese’ and in late autumn as ‘stubble geese’ (Serjeantson 2002, 42). These two groups can be difficult to detect in the archaeological material, since geese are skeletaly mature at 16 weeks (Serjeantson 2002, 45-46). Butchering marks occurred on 11 goose bones, mostly consisting of filleting and disarticulation cut marks on long bones. There was also evidence for the portioning of sternum and synsacrum.

It is uncertain whether the pigeons in the assemblage were wild or domestic. While doves were kept in continental Europe during the Roman period, there is little evidence for dove keeping becoming widely established in Roman Britain. It is instead believed that domestic dove keeping was introduced by the Normans (Hansell and Hansell 1988, 59), and the possibility of domestic doves in the Anglo-Norman phase must therefore be considered. The absence of juvenile remains suggests that
dovecotes were absent on the properties (Serjeantson 2006, 141). This in itself is no indication that the bones are from wild pigeon, since domestic birds may have been sold at the butchers.

A relatively large variety of wild birds were present in the assemblage. It is assumed that most remains are from kitchen waste. Snipe and woodcock were the only identified waders in the assemblage. Waders occur fairly frequently in Early Medieval assemblages, but only constituted a small part of the diet.

Grey partridge is less common in urban sites than waders, such as woodcock. Grey partridge is associated with the elite diet, through falconry and game parks (Sykes 2004, 96-97). Its presence in property BW3 opens up the suggestion of higher status inhabitants, or the sale of poached birds on the urban markets.

Crane is a relatively commonly occurring bird in Early Medieval sites, and would only become a high-status food in the Late Medieval period. It is present in small numbers on most sites but never formed a large part of the Anglo-Norman diet (Sykes 2004, 98).

The opportunistic and scavenging corvids are common on urban sites. Jackdaw and crow/rook are the only corvids present. While young rooks are commonly eaten, their scavenging nature makes mature corvids less appetising. Intriguingly, the jackdaw bones in pit NH5175 consist of four complete tarsometatarsi: three right and one left. Are these perhaps remains of cut-off feet, the adherent phalanges being missed during excavation?

A single buzzard humerus may represent utilisation of wing feathers, or merely the remains of a deliberate killing in order to protect the domestic chicken flocks.

Both medium-sized passerines (blackbird size) and small passerines (house sparrow size) are present in the assemblage. Passerines were common food birds in Medieval and Post-medieval England (Serjeantson 2001; Serjeantson 2006, 142), and despite the lack of cut marks on the bones, it would seem likely that they were eaten in the earlier periods as well.
The Medieval assemblage

The medieval assemblage includes 5630 bone fragments, of which 918 (16.3%) could be identified to taxon (Table 40). The low number of identifiable bones is probably due to a large number of indeterminate bone fragments recovered from bulk sieving. Of the 409 sheep/goat bones, 45 could be identified as sheep and six to goat. The goat fragments are all horn cores, three of which display butchering marks indicating horn working. Most of the sheep/goat bones are therefore likely to be sheep.

The trend of sheep/goat numerical predominance, seen in the previous phases, continues in the Medieval period (Fig. 11). This is consistent with the suburban Winchester assemblages (Serjeantson and Smith 2009, 126). In general, cattle or sheep/goat are the dominant taxon on British Medieval sites (Sykes 2006a, 62). Despite sheep/goat having the numerical majority, cattle must have been the most important meat animal, due to their larger weight.

Sheep/goat is the most common taxon in the assemblage, regardless of method used (Table 40). Similar proportions of NISP have been found in Winchester’s suburban assemblages (Serjeantson and Smith 2009, 218-225). This is in contrast to Southampton, where the French Quarter assemblage shows a reversed pattern for cattle and sheep/goat when compared to Winchester (Bates forthcoming) (Fig. 12). As discussed above, the different species ratio between Winchester and Southampton probably reflects the surrounding landscape. The similar proportion of pig bones from the three sites suggest that pigs were reared in the backyards within the towns.

The meat providing domestic mammals

Cattle

Very few cattle bones could be aged. The three ageable mandibles had tooth wear patterns indicative of Adult and Senile cattle, which was consistent with the age ranges from horn cores (Tables 10-12). The epiphyseal fusion data was similar to that from the Anglo-Norman phase, although a larger proportion of unfused bones were in the late fusing category. This suggests that the medieval cattle slaughter pattern was similar to the Anglo-Norman one. Although based of a relatively small data set, the slaughter age pattern for the northern and eastern suburban sites also shows that adult cattle were primarily butchered (Fig. 13). Among the suburban horn cores, 3-7 year old cattle dominate slightly over the 7-10 year old ones (Serjeantson and Smith 2009,
The relatively advanced age of cattle suggests that meat was not the only focus of cattle rearing.

It was only possible to determine the sex from a few bones (Table 13). The measureable bones were all within the size range for Medieval sites in Britain (Table 41). The two measured metatarsals have a comparatively large distal width, and may have belonged to draught oxen.

Butchery marks were present on 24 bones. Four horn cores had cut marks or chop marks at their bases, indicating removal of horn sheath for horn working. One skull had its snout chopped off, but otherwise the skulls and mandibles displayed no butchering marks. Two atlas vertebrae showed signs of sagittal splitting as well as disarticulation from the skull. Sagittal splitting of the axial skeleton is generally considered a sign of suspension of the carcass during the butchery process (O’Connor 1982, 16). Most disarticulation was carried out by knives. Cut marks were observed on calcaneus, distal humerus, proximal radius and proximal metapodials. Evidence of portioning of the carcass was only found on three scapulae, which had been split through the glenoid surface. One metatarsal had been split longitudinally, most likely in order to extract the marrow.

Pathological conditions occurred on six cattle bones. Smooth woven bone growth suggesting an inactive infection was found on a calcaneus, a metatarsal, at the neck of a scapula and along the entire tooth row of a mandible. Another metatarsal was affected by slight porosity on the proximal joint surface: a sign of infection, which may have been the beginning of spavin (Baker 1984, 253). Distal asymmetry occurred on a metacarpal. This condition has been associated with repeated stress that might be caused by using the animal for traction (Dobney et al. 1995, 39).

Sheep/goat

The mandibular tooth wear data show three peaks for age at death: at 2-6 months, at 2-3 years and then at 4-6 years (Table 17). This slaughter age pattern is similar to medieval high-status assemblages in England (Sykes 2006a, 67-68). The high percentage of lambs is more typical of a rural assemblage, however the number of ageable mandibles is low: the three peaks only comprise 7, 7 and 5 mandibles each. Further, there are generally few differences in sheep slaughter ages between rural, urban and high-status assemblages (Sykes 2006a, 67-68). The sheep assemblage from the Northern and Eastern suburbs show a peak of 4-6 year olds (Fig. 14), which is in line with the expansion of the woollen industry that took place during the Middle
Ages. On a countrywide basis, most sheep in rural and urban settlements were slaughtered between 1-6 years of age, whereas at ‘high status’ sites sheep remains reflect a slaughter age between 2-6 years (Sykes 2006a, 67-68).

When viewing the assemblage as a whole, there was a predominance of male sheep/goats (see Tables 19-20). While the pelves showed a similar proportion of males and females, the horn cores were mostly from male animals. This discrepancy between the two sexing methods probably reflects the presence of hornless ewes. This is further supported by the lack of any record of horned ewes in medieval English manuscript illuminations (Armitage and Goodall 1977).

When compared to other Medieval British sites, the sheep/goat bones are fairly similar in size to those recovered elsewhere (Table 42). Any minor metrical differences are most likely due to sexual dimorphism or differences in breeds.

Butchery marks occurred on 38 sheep/goat bones. Five sheep and three goat horn cores had been removed, for use in horn working. They came from four different properties (BE2, BE4, BW2 and BW5) and the bone assemblage gives no evidence for large-scale horn working on the sites in this period. Cut marks indicative of skinning were only found on a first phalanx. One metacarpal and one metatarsal had cut marks on their proximal ends, which could result from either skinning or disarticulation. One sheep/goat axis and 15 vertebrae from medium mammals (probably sheep/goat, due to the relatively smaller number of pig bones from this phase) had been split axially, which is considered typical of the practise of suspending the carcass while butchering. Paramedial and sagittal splitting occurred in almost equal numbers. Disarticulation of limb bones took place at the joints of long bones and mandibles, by using heavy cleavers. Cut marks at joints, suggesting disarticulation using knives, were observed on mandible, calcaneus, distal humerus, proximal radius and proximal metapodials. Filleting cut marks were found on hyoid, radius and tibia. An ilium being severed from the rest of the pelvis was the only indication of portioning in the assemblage. Two metapodials and one radius had been split longitudinally in order to extract marrow.

Pathological conditions were observed only on horn cores and metapodials. Thumb print depressions were found on two horn cores, from a wether and a ewe respectively. The aetiology is not clear, but has been linked to malnutrition and milking stress (Albarella 1995). One metatarsal had a small area of eburnation on the proximal joint surface and small exostoses around the proximal end: a sign of
degenerative joint disorder. One haematoma, a smooth bone swelling caused by sub-periosteal bleeding (Baker and Brothwell 1980, 83), was found on a metacarpal. Metapodials are vulnerable to haematomas, since there is no muscle mass to protect the bone against minor trauma. This bone, as well as four other metacarpals, had a narrow swollen area on the supraproximal lateral and/or medial posterior ridges. The aetiology for this pathology is uncertain. Theories include congenital or developmental anomalies, and biomechanical stress (Brothwell et al. 2005). An enthesophyte (Roberts and Manchester 1999, 110) was present on the anterior side of a proximal metatarsal.

Twelve sheep/goat mandibles displayed an extra foramen on the buccal side of the horizontal ramus. As mentioned above, this non-metric trait has been used to distinguish sheep and goats (Halstead and Collins 2002, 548-549). One mandible was typical of goats, whereas the rest could be identified as sheep.

**Pig**

Only a few pig bones could be aged, and consequently the age analysis is tentative. As before, most pigs were Immature or Sub-Adult at death (Table 24). Few bones belong to pigs older than 3.5 years (Table 23). All mandibular canines recovered were male (Table 25), although few sexable teeth were recovered.

Due to the generally young nature of the pig assemblage, few bones could be measured. This aspect was also a problem for selecting comparative biometric material: Only one site provided measurements for the same element (Table 43).

Butchery marks on pig bones primarily consisted of disarticulating cut marks. These occurred on three distal humeri and on the neck region of two skulls. A cleaver had been used in the disarticulation of one metatarsal. Cut marks on a scapula neck suggest filleting or disarticulation. Other butchering marks included sagittal splits of a pelvis, a mandible and a skull, the latter suggesting extraction of the brain. One axis had been split.

Pathologies occurred on four bones. A skull had a smooth pit (c. 13x13 mm) above the left orbit, which could be a healed trauma. Similar traumas have been found on Danish Mesolithic wild boar skulls, which have been interpreted as humans defending themselves with axes from enraged pigs (Noe Nygaard 1974). A thin layer of woven bone growth, a sign of an inactive infection occurred mid-shaft on a tibia. Ossified muscle attachments, so called enthesophytes (Roberts and Manchester 1999, 110) were recorded on a distal radius and mid-bone on an ulna.
**Other domestic mammals**

**Horse**

Only five horse bones were retrieved from the medieval phase. Judging by the surface structure, immature horses were absent. One skull had a canine, suggesting it was male. This is, however, not a secure sex determination, as mares with canines occur occasionally (Habermehl 1975, 54; Pieper et al. 1995, 135). Due to fragmentation, no bones could be measured. Butchering marks and pathologies were absent. The anterior part of a metacarpal was flattened and smooth, suggesting it was used as a skate. Skates are commonly occurring finds in Medieval assemblages. They were mostly made of cattle and horse metapodials (MacGregor 1985, 141-144).

**Dog**

Dog remains were rare, comprising only three bones from adult dogs. A withers’ height of 35 cm could be calculated from measurements taken on one humerus.

**Cat**

Cat bones were found in small numbers in four different properties. Despite the small number, juvenile, sub-adult and adult cats were present. Cut marks were absent, suggesting that these cats were not skinned.

**Wild mammals**

The wild mammals in the medieval assemblage comprise deer, hare and squirrel. The deer remains comprise two metatarsals from either red or fallow deer. They may have been transported to the site as part of a deer hide, although it is also possible that venison was eaten by the inhabitants of the properties where the bones were found. The hare bones derive from the front limb and the paws, and likely comprise meal remains. The single squirrel metatarsal indicates that a small amount of furrier activity took place at the site. The bone was found in property BE4, which also contained a small amount of cattle and sheep/goat horn cores. It is not certain whether this indicates a diversification of the craft activity at the property, or whether the squirrel bone’s presence is accidental. The guild structure was rather strict in the Middle Ages, specifically in terms of who was allowed to carry out which tasks within a craft (Shaw 1996, 116-117).
Birds

The medieval assemblage is strongly dominated by domestic fowl. Goose, duck, pigeon, woodcock and snipe are present in small numbers (Table 40). The assemblage follows the general trend of medieval bird bone assemblages in Britain: fowl are by far the most common species, followed by goose (Serjeantson 2006, 134). No wild geese could be identified in the assemblage. However, since there is a size overlap between greylag goose and domestic goose (Bacher 1967), the presence of wild geese cannot be excluded.

Almost one fifth of the fowl remains derived from juvenile chickens, which is consistent with other contemporary Winchester sites (Serjeantson and Smith 2009, 134). Eggs must have been much more important for the inhabitants than meat. Butchering marks were found on three fowl bones: a coracoid, humerus and tibiotarsus, indicating portioning, filleting and disarticulation respectively.

All goose remains were adults. Juvenile goose bones are rare on urban archaeological sites, possibly connected to early maturation and breeding taking place outside the towns (Serjeantson 2002, 51). Geese moult twice a year and feathers and down can then be collected. There is documentary evidence of plumers, *i.e.* people who dealt in feathers, from 15th century Winchester (Serjeantson and Smith 2009, 140). They would have provided, among others, the large monastic community with feathers for quills and down for bedding. Goose meat was also consumed: three bones bear butchering marks indicating disarticulation and portioning of long bones.

The duck bones are all in the mallard/domestic duck size range, and it is thus uncertain whether they are domestic or wild. The small number of duck bones is consistent with other medieval Winchester sites (Serjeantson and Smith 2009, 141-142). All bones derived from adults. Pathological conditions, suggesting infection or possibly muscle strains, were present on a tarsometatarsus, which displayed bone growths on the mid-shaft as well as on the ‘shaft’ of the trochlea for the second metatarsal.

The single, adult, pigeon bone in the assemblage could not be identified as a wild or domestic bird. The unequivocally wild birds are represented by woodcock, snipe and passerines. These species are commonly found in small numbers in medieval urban assemblages, and formed a minor part of the diet.
**Worked bone and other crafts using animal remains**

Four plots (BE3, BE4, SE1, SE3) from Phase 5 show a significant amount of work waste, suggesting the presence of bone and horn workshops. Small amounts of worked bone and antler have been found all over the excavation area, in contexts dating from the Roman period and onwards. Previous excavations in Winchester have also revealed a scattered background of bone and antler work waste on almost all sites and phases. This is consistent with many contemporary sites in north-western Europe. Bone, antler and horn working doesn’t require large structural investments, and can therefore take place anywhere. This is in contrast to tanners, whose work requires long term planning and access to water. The larger deposits of bone and horn work waste, such as found in properties BE3, SE1 and SE3, are fairly straightforward to interpret. But what of the scattered work waste that is found in small numbers around the city? Even assuming the same level of taphonomic loss that has affected the non-worked bones, there are too few waste fragments to account for the craft being full-time occupation (Mainman and Rogers 2000, 2535-2536).

Ailsa Mainman argues that the making of non-complicated products may have been sporadic activities, carried out on a household production level (Mainman 1999, 1872). An alternative interpretation has been argued by Kristina Ambrosiani and Axel Christofersen. Combs display large chronological and typological similarities in the Norse culture sphere: from Dublin in the west, to Staraja Lagoda in the east. While one could suspect a centralised production site, with subsequent trade, there are large amounts of comb making waste in all urban centres in northern Europe. This indicates local production. However, the amount of comb making waste seems too small to occupy a comb maker full time, and Ambrosiani and Christofersen argue thus that comb making was carried out by itinerant craftsmen (Ambrosiani 1982; Christofersen 1980, 217). Ambrosiani further posits that this may also be the case for other crafts: several metal moulds from different sites are virtually identical (Ambrosiani 1982).

In the second half of the 11th century, specialist areas became more common in urban centres (Henry 2005), probably connected to the founding of guilds as a way to control the quality of the products and, consequently, also its members (Riley 1868, 328-330). Some crafts settled in specific areas early: Tannerestret (Tanner’s Street) and Flescmangerstret (Butcher’s Street) are known from the 10th century (Biddle and Keene 1990, 245; Hagen 2002, 15 (in Sykes 2006a, 69); City of Winchester 2008).
The archaeological finds indicate that bone, antler and horn craftsmen did not restrict their location until later.

The larger work waste deposits that are occasionally found would probably have resulted from specialised productions. Depending on the finished products, this would fall into ‘attached specialist production’ or ‘workshop production for trade’. These categories, coined by Eva Andersson (2003, 47), identify four different levels of production (Table 44). The categories must be seen as a general trend, rather than absolute stages. Two or more categories may have existed side by side on the same street, or indeed, the same property. The high status nature of Winchester makes it highly likely that attached specialist production occurred within its walls. With the exception of the squirrel bones, none of the bone or antler finds show signs of high status production.

**Horn working**

Horn cores from cattle, sheep and goat, many of them bearing evidence of having been chopped off from the skull, occurred in plot BE3 (pit CC1268), plot BE4 (pits CC2035, CC2043) and plot SE3 (pit NH1598), all dating to the Anglo-Norman phase. Curiously, the very old cattle that are rather common in the whole Anglo-Norman assemblage are almost entirely absent from these deposits. Instead the cattle horn cores derive mainly from 3-7 year old cattle and, in fewer numbers, from 2-3 year old cattle (Table 45). All horn cores in the abovementioned pits were short horned according to Armitage’s and Clutton-Brock’s (1976, 331) definition. The horn cores in the entire Anglo-Norman assemblage follow this trend, with almost 90% being short horned (n:19). One small horned and one long horned cattle were also identified.

Cattle horn cores may be sexed biometrically, but is highly dependent on the amount of genetic diversity among the assemblage. Biometric sexing failed in Lincoln and in Southampton (O’Connor 1982, 22; Bourdillon and Coy 1980, 106-107), whereas Swedish assemblages gave a positive, albeit cautious, result (Vretemark 1997, 106-107). Two metric analyses were carried out on the horn cores from the four properties: The greatest basal circumference was plotted against the minimum/maximum basal diameter, and the greatest basal circumference was plotted against the outer curvature of the horn core. Both analyses gave a rather homogenous group, and no sex identifications could be made. When extending these analyses to all horn cores in the Anglo-Norman phase, the result was slightly different. Plotting the
greatest basal circumference against the minimum/maximum basal diameter gave no
distinction among the group. In the greatest basal circumference/outer curvature plot
one horn core was singled out from the group, and would most likely have belonged
to a bull or ox (Figs 15-16).

The sheep horn cores are almost exclusively male, whereas the goat horn cores
are mostly female (Table 46). Since female caprine horn cores are smaller than male
ones, it would be reasonable to assume that male horn cores would be more useful for
horn workers, and that they would therefore be numerically dominant. However, goat
rearing was primarily undertaken for dairy production, one reason being that
The predominance of female goat horn cores may therefore be directly correlated to a
dairy based population structure.

Sixteenth century artworks indicate that hides were delivered to the tanning
yards with the horns and feet intact. The tanners removed feet and horns, which they
would sell on to other craftsmen: one crafts waste being another crafts raw material
(Serjeantson 1989, 136-138). Sometimes large deposits of horn cores and foot bones
are found in excavated tanning yards, and it has been suggested that these were
disposed of because decomposition had progressed too far, and/or because no sale
could be made (O’Connor pers. comm.). In Winchester, the tanners’ yards were
situated on what was then Tannerestret, and is now Lower Brook Street, in the low-
lying eastern part of the town. The horn core deposits in properties BE3 and SE3 are
therefore more likely to indicate horn workers’ yards than tanning yards.

In order to remove the horn sheath from the horn core, the horn must either be
soaked or laid in the open for the soft tissues to decompose to such an extent that the
horn sheath can be twisted loose (Albarella 2003, 74). The horn sheath was then
heated, cut open and pressed flat. This procedure yields a flat sheet of horn, which can
then be used to make objects such as lantern panes and combs (MacGregor 1985, 66-
67).

Slightly over half of the horn cores in properties BE3, BE4 and SE3 displayed
butchering marks (Tables 47-49). As expected, the majority of these were chopped off
at the base. The relative scarcity of butchering marks mid-horn core and at the tip
indicates that most horn sheaths were removed entirely from the horn core. Albarella
(2003, 74) posits that tips were sawn or chopped off in order to facilitate the removal
of the horn sheath or to use the solid tip as a raw material.
Bone and antler working

Pit NH1598 in property SE3 contained 589 fragments of large mammal ribs, in various stages of production. The ribs had been sawn off transversally and split down the mid-line. In many cases the inner bone surface had been smoothed and some pieces had holes for rivets drilled in the midline of the fragments. None were decorated. Such fragments were used as mounts, for example on caskets, but also as strengthening plates for double sided horn combs (MacGregor 1985, 95) Similar work waste fragments are known from several sites in north-western Europe, such as 13th-14th C. Winchester Western Suburbs, M10th-M11th century York and 11th-14th century Schleswig (Rees et al. 2008, 361; MacGregor et al. 1999, 1952-1959; Ulbricht 1984, 37-38). The Western suburb fragments are decorated with incised lines and a ring-and-dot motif, while the York deposits contain both decorated and plain fragments. The presence of plain fragments suggests some utilitarian purpose, possibly industrial (MacGregor et al. 1999, 1952).

Occasional bone and antler working took place in all phases and at most properties. The Roman finds included two fragments of chopped antler and one half-finished mount made of a large mammal rib. Mount production continued in the Late Saxon phase, where 11 half-finished rib fragments were found in property SE3, six in property BW2 and one each in of properties SE2, BE4 and BW5. There was no evidence for mount production in the Anglo-Norman phase. Half-finished bone objects include two spindle whorls made from cattle femoral heads (Properties BE4, BW4; Late Saxon) and a skate made from a horse metacarpal (Property SE1; medieval). Three Anglo-Norman sheep metapodials had holes drilled into the proximal joint surface. This procedure can be used for marrow extraction, but since it was more common to split the bones open in order to extract marrow, it is more likely that the metapodials are crude implement handles. Late Saxon and Anglo-Norman antler working took place in properties SE2, BW4, BW6 and BE4. Most antler fragments were tines and offcuts of the main branch. Two antlers from the Anglo-Norman phase were shed. There is no evidence that unshed antlers were present, but the considerable fragmentation of antler remains makes it difficult to be certain.

Furrier

Pit NH5169 in plot SE1 contained the most interesting evidence for craft activity: 745 bones of cat, fox, squirrel, ferret/polecat, stoat and unidentified small mammals were
recovered (Table 50). The remains of fox, squirrel, polecat/ferret and stoat are exclusively from the feet and the lower legs, whereas most elements of the cat skeleton are represented. While cut marks were only observed on two individual cats, the composition of the assemblage suggests craft waste from furriers.

Furs from squirrels and mustelids formed a very extensive trade in Early Medieval Europe. While local animals were also hunted and trapped, the highest quality furs came from north-eastern Europe. The foot bones were often left on the fur, and were later removed by furriers at their final destination. Similar deposits of foot bones are known from the Bedern site in York (14th century), St Denis, France (12th century) and Birka, Sweden (8th-10th century) (Bond and O’Connor 1999, 365-366; L’Unité d’archéologie 2008; Wigh 2001, 121-123).

Over 95% of this deposit came from sieved samples; another indication of the importance of sieving, as well as a possible explanation of the rarity of these finds, despite the extensiveness of the Medieval fur trade (cf Veale 2003).

In contrast to the squirrel, fox and mustelids, the cat remains comprised semi-articulated skeletons. While these may represent natural deaths or disposal of unwanted animals, their presence in deposits full of fur animal bones suggest otherwise. Deposits of large number of articulated and semi-articulated cat skeletons interpreted as remains of furrier activity have been found in Cambridge (Luff and Moreno 1995) and in several 9th-11th century Scandinavian sites, such as Birka, Odense, Lund, Viborg and Lödöse (Wigh 2001; Hatting 1990; Magnell 2006; Enghoff 2007; Vretemark 2000). In all these cases, including Winchester, the majority of the cat bones were unfused or fusing, suggesting juvenile and sub-adult animals. This is not a natural mortality curve, but has been interpreted as the deliberate slaughter of almost fully grown cats, in order to utilise their fur. This is further emphasised by the presence of cutmarks from skinning on skulls and mandibles.

Disarticulated bones from at least three juvenile cats, with no cutmarks present, were also found in the nearby pit NH5175. Apart from cat bones, the pit contained one fox metatarsal, seven bones from at least two neonatal sheep/goats, as well as assorted kitchen waste.

Tawying, furrying or parchment making?

Pit NH5169 also contained bones from neonatal lambs/kids. Due to the lack of cut marks it is difficult to tell whether these are remains of meals or tawying waste. There
is a slight over-representation of metapodials, which is usually seen as an indication of leatherworking waste (Serjeantson 1989). Furriers and tawyers were separate professions according to medieval guild structures. However, evidence of blurred lines between the various crafts preparing skins and hides are known from other sites, such as Northampton, where the guild structure was weak (Shaw 1996, 116-117). Since the guild system was less developed in the Anglo-Norman period, it is plausible that workshops could carry out several adjacent crafts.

A similar combination of sub-adult cat bones and neonatal/juvenile lamb bones were found in 14th century Cambridge (Luff 1996, 120) and in 11th-12th century Lund, Sweden (Magnell 2006, 24-29), possibly signifying a specialisation of furrier work. Cat and lamb skins were considered low status furs in medieval England: suitable for nuns, monks, craftsmen, servants and farmers (Newton 1980, 66-68; Veale 2003, 5). Despite the high status nature of Winchester in the early Medieval period, there would have been plenty of inhabitants whose purse stretched more towards cat and lamb pelts. It would be interesting to pursue the combination of lamb and cat further, and see whether it occurs in more places than the three mentioned above, and whether other fur bearing species are represented as well. That would, however, be beyond the scope of this report.

Another, less likely, possibility is that the lamb remains are waste from small scale parchment production. The monasteries and court officials would have required large amounts of parchment, so there clearly was a local demand for it. To make parchment, the hides of young lambs, kids and calves were de-haired, and placed in a lime solution for a few days. They were then shaved thin, rubbed with pumice and dried on a stretch-frame (Reed 1975, 74). In order to avoid cuts in the skin, small pebbles were put at the edges of the skin and the thongs were tied around them (Carver and Spall 2004, 188). Elaborate structures were not needed for this process. The skins are small, and a medium-sized barrel might be enough for soaking. On the other hand, the absence of pumice stones and pebbles argues against parchment production taking place at property SE1 (Shaffrey pers.comm.). It must, however, be noted that pumice and pebbles are less well-known finds categories, and there is a small possibility that they may have been overlooked during excavation.
Intra-site comparison between properties

The fourteen properties represented in the assemblage provide an opportunity to carry out an intra-site comparison. However, a combined NISP of more than 300 bones is required in order to facilitate a useful analysis between the three major domesticates (cattle, sheep/goat and pig) (Hambleton 1999, 39-40). This requirement reduced the number of properties available for such an analysis. In addition, the large craft waste deposits in properties SE1 and SE3 would skew the assemblages, and therefore all cattle and sheep/goat horn cores were removed from the comparative fragment count (Table 51). While the neonatal sheep/goat bones from property SE3 also represent craft waste, they constitute a small proportion of the assemblage, and neonatal bones were therefore not removed from any property.

The intra-site comparison is further complicated by mitigation taking place to various levels in several plots. The backyard of property BE4 was particularly affected: mitigation level generally being 0-0.5 metres. Despite this the property contained a large number of animal bones. However, the intra-species ratio may be skewed by the limited retrieval of bones. Property SE1, and to lesser extent, properties BW4 and BW5, are not affected by mitigation.

Four Late Saxon and six Anglo-Norman properties met the abovementioned requirements. Unfortunately, a comparison between the two Late Saxon sub-phases could not be carried out, due to too small assemblages in Phase 4.1. As a whole, all properties in the late Saxon phase except BW5 were dominated by sheep/goat bones (Tables 53-53). The cattle assemblage in BW5 includes a wide range of skeletal elements, and the predominance of cattle is therefore not due to over-representation of horn cores, metapodials, or any other craft related skeletal element. High-status Saxon sites in south-western England are normally dominated by cattle (Sykes 2006a, 66), which would tentatively suggest that the inhabitants in property BW5 were slightly wealthier than their neighbours. Venison is usually regarded as high status food in the Saxon period, but deer bones from meat-rich body parts were only recovered from property BW2.

In the Anglo-Norman phase, sheep/goat is the most numerous species in all properties (Table 54), with exception to property BW4, where the percentage of sheep/goat is equal to that of cattle. This follows the general trend of increasing wool production in the region (Serjeantson 2009). While an intense wool production
suggests a predominance of elderly sheep, this age category is relatively uncommon in the assemblage. The urban economy may have prioritised younger sheep, and therefore older sheep were more likely to be eaten on the rural sites. However another possibility is that the increased wool production merely led to sheep being kept for an additional year or two before slaughter, in order to increase the total wool yield, while retaining their value as meat providers.

The Anglo-Norman phase of property BW3 contains the largest diversity of bird species. The small game birds, such as woodcock, are usually considered an expensive food item, which is confirmed by medieval records from the monastery of Durham (Ticehurst 1923, 33).

Mammalian game, represented by red deer, roe deer and hare, is present in small numbers in six properties. Hare is only marginally more common in the Anglo-Norman phase, found in two properties rather than one. Since deer remains were used as raw material for bone and antler workers, only deer bones from meat rich parts of the body will be discussed below. Game is usually associated with high-status households and ritual hunting, although this only became the case after the Norman Conquest. Saxon laws state that everyone had a right to hunt on their own land (Sykes 2006b, 162-163). While the inhabitants of Winchester may not have owned land where they could have hunted, venison would have been sold to the urban butchers, who thereby could provide the inhabitants with a variety of meat. Occasionally, over-representation of certain skeletal elements of game suggests that specific body parts were brought in for sale (Sykes 2006b, 172). In the Late Saxon assemblage, all deer bones derived from the front limb, whereas the Anglo-Norman assemblage included bones from front and hind limb in almost equal quantities.

Butchering of the deer was an important ritual in Norman hunting, called ‘unmaking’. The carcass was butchered in a set fashion, and specific body parts were presented to the various people - and dogs - who had participated in the hunt. (Sykes 2006b, 170-171). The traditional Saxon butchering of deer appears instead to have comprised a much simpler quartering of the carcass (Sykes 2006b, 174). As bones from both front and hind limb were present, it would seem as if the Norman ‘unmaking’ ritual was not the only deer butchering method that was used in the area.

Three properties, BE4, BW4 and BW5, contained assemblages of a suitable size in both the Late Saxon and Anglo-Norman phases. When carrying out an inter-phase analysis, it was found that properties BW5 and BE4 show a decrease of cattle
and pig and an increase of sheep/goat, in line with the general trend in the area. Cattle are on the other hand become more frequent in property BW4, whereas sheep/goat and pig decrease through time. This may suggest a higher socio-economic status in property BW4 during the Anglo-Norman than in the Late Saxon period; however, game increases slightly in the Anglo-Saxon period for properties BW5 and BE4, whereas it is the opposite for property BW4. The numbers of fragments are, however, small. The avian assemblages show few differences. There is a small increase in the number of species present in property BW5 and BE4, although the numbers of fragments are again too small to draw meaningful conclusions.

In conclusion, the faunal remains give little evidence of any major difference in socio-economic status between these 10 properties. The Late Saxon inhabitants of property BW5 may have been somewhat wealthier than their neighbours, based on the predominance of cattle bones. Over all, the bone assemblages from the properties are dominated by cattle and sheep/goat. Pig and domestic fowl were relatively common, whereas game and wild birds formed a minor part of the diet, perhaps eaten on festive occasions.

**Discussion and conclusions**

*Animal husbandry*

The diversification of the urban community renders generalisations on animal husbandry practices of the hinterland, based on a small proportion of the town, difficult (cf Bond and O’Connor 1999; Dobney et al. 1995, 20). Socio-economic differences between households will govern their dietary choices: high-status households consuming gamer and younger domesticates than low-status households. Nevertheless, by using the assemblage in combination with the suburban Winchester sites discussed by Maltby (forthcoming) and Serjeanton and Rees (2009), some conclusions can be made.

As is normal for Roman and post-Roman assemblages, the main sources of meat were cattle, sheep/goat and pig. Game and poultry formed a minor part of the diet. Cattle are the dominant species in the Roman assemblage. The slaughter pattern is very similar to both the extramural Roman assemblages from Winchester and rural assemblage from nearby Owslebury (Maltby 1987; Maltby forthcoming). There were slightly more Senile cattle in Owslebury, suggesting that older cattle were less
attractive for the urban market. The focus on adult female cattle is consistently observed at Roman urban sites, and suggests a wide-spread organised purchasing strategy (Maltby forthcoming). In contrast, the cattle from post-Roman Winchester were equally distributed between Adult and Senile cattle. The increase of Senile cattle in the urban assemblage suggests an intensification of agriculture and subsequently an increased use of cattle for traction. Female cattle still dominate the post-Roman assemblages.

Despite the nearby downs being suitable for sheep grazing, and the rising trend for a high wool production in Saxon and medieval England, the assemblage contained few elderly sheep. It is clear that mutton was good value for the surrounding farmers, who made sure they got a few years’ worth of wool clips, milk yields and lambs before sending their livestock to the urban markets. It is likely that older animals, kept mainly for secondary products, would have had a far lower meat value, and were, therefore, consumed locally. This has been recorded for cattle and sheep/goat in the rural high-status site Flixborough (Dobney et al. 2007, 141, 144). This possible difference in slaughter age pattern is less marked in the Roman sheep/goat assemblages (Fig. 2), which suggests that wool production was less intensified during the Roman period. This would lead to more sheep being slaughtered at an adult or young adult age, as opposed to the wool production’s optimum of elderly sheep.

Pig remains comprise between 14% and 20% of the three major domesticates (Fig. 11). While urban and military Early Roman sites usually are dominated by cattle and pig, this is less marked in the later Roman period (King 1991, 16-17). Pig is normally the least common of the three domesticates, regardless of time period, and Winchester follows this pattern. The presence of piglets in all phases indicates that pigs were reared within the urban centre.

**Wild mammals**

Wild mammals formed, as expected, a very minor part of the faunal assemblage in all phases. The majority of the wild mammal bones were from deposits relating to bone working and furrier activity. Game for consumption included red deer, roe deer and hare. Their remains are few, and occur fairly evenly over the four phases. Fur animals were recorded in small numbers in the Roman, Late Saxon and Medieval phases. The Anglo-Norman phase of the SE1 property contained large numbers of bones from the
lower limbs of squirrel, as well as some fox, ferret/polecat and stoat foot bones. Despite the large extent of the Early Medieval and Medieval fur industry in Britain, deposits of fur animal foot bones are rarely recovered (Fairnell 2003).

**Birds**
Avian remains comprised 0.9%, 4.1%, 4.0% and 7.7% respectively of the total number of faunal remains in the four phases. Domestic fowl were by far the most numerous species in all phases, followed by lesser numbers of goose and duck. While it can be difficult to distinguish the domestic forms from greylag goose and mallard, it is likely that the duck and goose remains in the Roman period mainly derived from wild birds. According to Maltby (1981, 161), large scale goose husbandry appears to start in the Saxon period. The scarcity of duck remains suggest that they were not kept as domestic duck within the town but rather were wild birds, caught occasionally. Other wild bird species/families, such as waders, corvids and small galliformes constituted a small part of the avian assemblage.

It would seem that from the late Saxon period, poultry formed a small but important part of the diet. Chickens are easy to keep in backyards, and they would have provided the owners with meat, eggs and feathers. Geese require larger grazing grounds, such as stubble fields, and ducks need regular access to open water (Crabtree 1996, 71). Both ponds and fields could be found outside the town, and a trade in goose products must have regularly occurred in the markets. Domestication of duck is not believed to be wide-spread until the Late Middle Ages (Albarella 2005, 255-256). However, one duck bone from the Late Saxon phase was larger than mallard, and was therefore interpreted as domestic. Wild birds, mainly waders and passerines, formed a small part of the diet. They are found in almost all properties, but only as a few skeletal fragments.

**Butchery**
While Roman cattle carcasses were skinned and butchered horizontally or semi-horizontally (Seetah 2006), in later periods the carcasses were split in half while suspended. This change seem to occur in the 11th century and has been associated with changes in building techniques, as structures need to be able to hold the weight of a cattle carcass (Bourdillon 2009, 66). Two different techniques have been observed regarding carcass splitting. Either the split occurs at the mid-line of the
spine, here called sagittal splitting, or paramedially, i.e. between the dorsal spine and the transverse processes. Both techniques were used until the late Middle Ages, when the practice of paramedial division of a carcass appears to fall out of use (O’Connor 1982, 16). Generally, paramedial splitting was more common in the assemblage than sagittal splitting (Table 55). Splitting of vertebrae was more often encountered among the medium mammal remains. Perhaps this is connected to the lower carcass weight of sheep/goat and pig, which would thus not require such sturdy structures for butchery as cattle (Bourdillon 2009; Coy 2009, 34).

Butchery of main meat-producing species varied slightly between and within the phases. Severing of the skull and disjionting of the mandible were recorded for all four phases and for all three main meat-producing taxa. Further, the ribs were separated from the spine, and the ribs divided into two or three parts. Dismembering of the limbs mainly occurred at the joints, where both knives and cleavers were used. The most common butchery method for the Roman assemblage was axial splitting of long bones. This is a ubiquitous method in Roman urban and military assemblages, and has been connected to the need for intense exploitation of the carcasses (Maltby 2007; Seetah 2006). Axial splitting of the joints in the front limb continued from the Roman period into the Late Saxon period, but got outnumbered by transverse splitting in the later periods. Axial splitting of the meat-bearing bones in the hind limb was only recorded on one Late Saxon cattle femur. Perforations in the blade of the scapula, which were common in the Roman levels of Lincoln and York (Dobney et al. 1995, 26-27; O’Connor 1988, 82-84), were only found on one Anglo-Norman sheep. Since they were absent in the Roman extramural assemblages as well (Maltby forthcoming), it would seem that this type of meat processing either did not occur in Venta Bulgarum, or was associated with a particular subset of the population, so far unexcavated. Portioning of scapula and pelvis were recorded for all phases, but was more commonly found on sheep/goat. All domestic species, except dog and cat, displayed filleting cut marks. These occurred on skeletal elements from most parts of the body. ‘Blademark’ butchery, where the meat is roughly chopped or scooped off the bone, was not noted in the assemblage, although it was recorded in the Late Saxon western suburbs of Winchester and in Saxon Southampton (Coy 2009, 34-35).

Butchery marks on avian remains were mainly found on the ends of long bones, indicating disarticulation by a cleaver or knife. Cut marks suggesting filleting were observed in most phases. Portioning of goose carcasses was only recorded in the...
Anglo-Norman phase, although it is believed that this practice must have occurred in other phases as well.

In species not commonly used for food, butchery marks were only recorded on badger, cat and horse from the Late Saxon and Anglo-Norman phase. The cat bones from the Anglo-Norman phase displayed typical skinning marks on skull and mandible. The butchery marks observed in the Late Saxon phase mainly derive from filleting and disarticulation. Horse flesh, while prohibited for human consumption, could have been used to feed dogs. Written sources record the use of cat meat for medicinal/magical purposes (Doll 2003, 267).

**Pathology**

A small number of bones from each phase displayed pathological conditions, ranging between 0.3%-0.6% of the total number of bones per phase. Most conditions are related to infections and joint disorders. The pathologies present in the assemblage are typical for the time periods, both in terms of number of affected bones and in the range of pathological conditions. In terms of the percentage of pathological fragments per species, excluding species with few fragments - horse bones exhibited the highest number of pathologies, with cattle and sheep/goat coming second and third. This suggests that the pathologies observed reflect the local animal husbandry strategies.

Fractures aside, most pathologies only leave traces in soft tissue. As bone tissue is generally slow to respond to pathologies, only long-lasting conditions will leave evidence in bone (Mays 1998, 122). Cattle and horse were often kept to old age and worked hard, leaving plenty of time for serious illnesses to leave traces in their bones. In contrast, pigs were mainly killed at an early age, suggesting that the majority of their pathological conditions would only have affected soft tissue. Sheep/goats were not kept to an advanced age, so the reason for their relatively high prevalence of pathologies in the assemblage must be found elsewhere. Almost all sheep/goat pathologies belong to one of the following conditions: thumb print depressions on horn cores, penning elbow, and smooth cigar-shaped bone growths anteriorly and posteriorly on metapodials. Their aetiologies are connected to malnutrition, penning of sheep, and possibly walking on hard surfaces/foot rot (cf Brothwell et al. 2005, 78; Dobney et al. 1995, 43). The sheep/goat pathologies may therefore be connected to the grazing environment on the downs near Winchester.
Other species with pathological conditions comprise dog, fowl and duck. The pathological dog remains are recorded from the Roman and Anglo-Norman phase, and consist of fractures with subsequent infections as well as exostoses suggesting muscle strains. Healed fractures, most likely caused by animal abuse, are regularly recorded on archaeological dog remains (Baker and Brothwell 1980, 93-94; Dobney et al. 1995, 47-48; Teegen 2005), although accidents possibly involving livestock cannot be excluded as a cause of trauma. The pathological fowl and duck remains display exostoses on long bones suggesting infections and muscle strains. In addition, myeloma growths were recorded on two fowl synsacrum.

The medium mammal and large mammal bones were mostly affected by trauma and infections. Trauma was mainly present as healed rib fractures. The centre of a large mammal vertebral body was pushed inwards, which may have been caused by a fracture. Large mammal vertebrae and ribs were also affected by joint disorders, including eburnation. This would be connected to the use of cattle for traction.

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Excavations in Winchester 2002-07 Mammal and bird bones

Animal Bone Figures

Figure 1. Mandible wear stages of cattle in NH/SG/CC compared to the Roman assemblages of Winchester northern suburbs and Owslebury.

Figure 2. Mandible wear stages of sheep/goat in NH/SG/CC compared to the Roman assemblages of Winchester northern suburbs and Owslebury.

Figure 3. Mandible wear stages of cattle in NH/SG/CC compared to the Late Saxon assemblages of Winchester Western suburbs.
Figure 4. Dental analysis of cattle in NH/SG/CC compared to the Late Saxon assemblages of Winchester northern and eastern suburbs, using Halstead (1985).

Figure 5. Greatest length and greatest distal width of cattle metatarsals in the NH/SG/CC assemblage and Late Saxon sites in Britain (ABMAP).
Figure 6. Mandible wear stages of sheep/goat in NH/SG/CC compared to the Late Saxon assemblages of Winchester northern and eastern suburbs.

Figure 7. Mandible wear stages of sheep/goat in NH/SG/CC compared to the Late Saxon assemblages of Winchester northern and eastern suburbs and the Late Saxon-Medieval assemblages of Winchester western suburbs.

Figure 8. Anglo-Norman assemblage: NISP (%) for cattle, sheep/goat and pig at NH/SG/CC, the Winchester western suburbs and the Southampton sites Melbourne Street, Six Dials, and the French Quarter.
Figure 9. Mandible wear stages of cattle in NH/SG/CC compared to the Anglo-Norman assemblages of Winchester western suburbs.

Figure 10. Mandible wear stages of sheep/goat in NH/SG/CC compared to the Late Saxon-Medieval assemblages of Winchester western suburbs.

Figure 11: NISP (%) for cattle, sheep/goat and pig in all phases of NH/SG/CC
Figure 12. Medieval assemblage: NISP (%) for cattle, sheep/goat and pig at NH/SG/CC, the Winchester western suburbs and the Southampton site The French Quarter.

Figure 13. Mandible wear stages of cattle in NH/SG/CC compared to the Medieval assemblages of Winchester northern and eastern suburbs

Figure 14. Mandible wear stages of sheep/goat in NH/SG/CC compared to the Medieval assemblages of Winchester northern and eastern suburbs
Figure 15. Anglo-Norman assemblage: Cattle metric sex estimation on horncores from properties BE3 and SE3

Figure 16. Anglo-Norman assemblage: Cattle metric sex estimation on horncores from properties BE3 and SE3
Section 11
Plate 1: Fowl humerus with cat gnaw marks.
Plate 2: Cattle pelvis with eburnation and remodelling of bone.
Plate 3: Synsacrum of domestic fowl with myeloma growths.
Plate 4: Fractured dog femur (unhealed) with extensive bone growth at the fracture. Normal dog femur to the left. Anterior view.
Plate 5: Fractured dog femur (unhealed) with extensive bone growth at the fracture. Normal dog femur to the left. Posterior view.
Plate 6: Fractured dog femur (unhealed) with extensive bone growth at the fracture. Mal-aligned with a 4.5cm overlap. Lateral view.
WINCHESTER
A CITY IN THE MAKING

Archaeological excavations between 2002 – 2007
on the sites of Northgate House, Staple Gardens and the former Winchester Library, Jewry St

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